

Cabinet

Supplementary Information



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Venue: The Council Chamber - City Hall, College Green, Bristol, BS1 5TR

9. Clean Air Zone Project update
Full Business Case attached

(Pages 2 - 336)

Issued by: Corrina Haskins, Democratic Services
City Hall, Bristol, BS1 9NE

E-mail: democratic.services@bristol.gov.uk

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Bristol City Council Clean Air Plan

Management Case

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Bristol City Council

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6. Management Case

6.1 Introduction

The purpose of the Management Case is to ensure that delivery is achievable for the programme team, which includes ensuring appropriate governance arrangements are in place to successfully deliver the Bristol Clean Air Zone (CAZ), including the CAZ D (commercial and private non-compliant vehicle charging area), additional non-charging measures and wider programme of Clean Air Fund (CAF) measures. In line with JAQU Guidance, the Management Case builds on both the Strategic Outline and Outline Business Cases by clearly identifying the optimal solution to the following issues:

- Programme Governance structure during the design, implementation and operational phases of the programme, including key management roles and responsibilities and the programme organogram.
- Evaluation and monitoring processes and associated benefits realisation.
- The Change Control and Financial Management processes.
- Risk management and mitigation, including the setting of contingency elements of the budget.
- Clear and achievable project plan.
- Programme Management arrangements, including within the wider transport programme.
- Communications & Engagement arrangements.

6.2 Previous Experience & Lessons Learned

Bristol City Council (BCC) has a proven track record of delivering major transport infrastructure projects and programmes of a similar nature and scale to the proposed Bristol CAZ. Moreover, the Transport Service includes an in-house project / programme management team; the Transport Programme Team (TPT). This team grows and employs the learning from these projects and programmes to continually improve project and programme delivery. They are supported by the central BCC Portfolio Management Office (PMO) and are supporting CAZ in relation to this project. Examples of major infrastructure projects include Metrobus, Resident Parking Zones, Street Space Schemes and the Showcase and Greater Bristol Bus Network (GBBN) infrastructure improvements. A summary of these projects follows, with key delivery and monitoring lessons that can be applied to support delivery of the Bristol CAZ highlighted.

BCC operates a cutting-edge Operations Centre which will be key in coordinating and managing traffic and camera enforcement across the city. This will be vital to integrating the operation of the CAZ seamlessly with the rest of the city minimising disruption to stakeholder, business, tourists and residents in Bristol.

6.2.1 Resident Parking Zones

The Resident Parking Zones (RPZ) project is a permit system for residential parking, introduced from 2012 onwards in multiple city centre zones across the city. In order to enforce these zones, a legal network of signage and Traffic Regulation Orders (TROs) were implemented, with residents able to purchase annual permits. Roaming 'camera-cars' equipped with Approved Enforcement Device cameras are now the principal method of identifying parked cars that contravene the regulations. This approach will be key to driving compliance with our CAZ in terms of in-zone journeys.

This project demonstrated BCC's ability to implement a large signage TRO for an enforcement project. A single RPZ comprises of approximately 900 signs, TROs each with its own associated design, surveying, and implementation. 15 of these zones were delivered across the city.

The successful operation of the central permit system, through an Approved Camera Enforcement Device, clearly demonstrates BCC Parking Enforcement Team's ability to operate our proposed CAZ using a central back-office system. This experience will be central to Bristol's successful delivery of the CAZ.

6.2.2 Bus Lane Enforcement

The Joint Local Transport Plan 3 (JLTP3), adopted in 2011, identified bus priority measures as a strategic goal for the city to improve public transport. This was in order to facilitate faster and more reliable public transport, delivered via the GBBN and Showcase projects. Bus priority measures have since been implemented on four major strategic corridors in the city i.e. A37 Wells Road, A38, Gloucester Road, the Centre and Hotwells Road.

The enforcement of these lanes is vital to achieving faster and more reliable public transport. This is principally done through an Approved Enforcement Device system using fixed cameras and signage. Penalty Notices are then issued by BCC for contraventions of TROs applying to bus lanes. BCC has issued an average of over 4000 Penalty Charge Notices (PCN) per month since the integration of the latest lane in April 2018.

This clearly demonstrates the BCC Operational Enforcement Team's ability to operate and enforce the CAZ D. In addition, BCC operates a dedicated Appeals Team to review and assess contested contraventions of both the Bus Lanes and Resident Parking Zones. The Appeals Team, since 2018, has processed an average of over 500 appeals per month related to Bus Lane PCNs. These resources, experience and skills will be vital to the successful delivery of the CAZ D charging zone and then transitioning to business as usual.

6.2.3 Metrobus

The Metrobus programme is a Bus Rapid Transit (BRT) system covering three initial routes into the City of Bristol, from the wider sub-region, and was implemented as part of sub-regional package comprising over

£250m of funding. The infrastructure delivered is extensive, comprising some 3.5km busway segregated from general traffic, 8 road bridges, 3 railway bridges, 92 new bus stops, 282 new cycle stands, over 10km of new cycle routes, 6km of new road space, and over 17km of new bus priority measures.

The programme included a number of technological and systemically innovative elements, such as the i-Points, at bus stops. This included new back office systems and software to support smart and integrated ticketing that is fundamentally off-bus, allowing customer flexibility and reduced ticketing-associated delay for the bus journeys themselves.

Metrobus also demonstrates BCC's experience in delivering large programme style works across the city and sub-region, with the associated level of complex and tailored governance to ensure successful programme delivery. The programme was governed by a senior Programme Assurance Board, above a Network Integration Board, in addition to the Project Boards for each of the three large infrastructure projects (Ashton Vale to Temple Meads, North Fringe to Hengrove, and South Bristol Link). Given the scale of the Bristol CAZ programme, including the central zone and complementary infrastructure measures, this experience of integrated working at the senior, programme, and project level will prove invaluable in the successful delivery of the Bristol CAZ.

Officers who were key to the successful delivery of this programme will work as part of the Bristol CAZ implementation team, including the Programme Manager and Design Team.

6.2.4 Street Space Schemes

In June 2020 emergency funding was awarded to BCC for the immediate implementation of measures aimed at facilitating social distancing: Street Space Schemes. The Street Space schemes have been/are being implemented to open-up road space usually reserved for parking and movement of general traffic to cyclists and pedestrians to:

- Enable better social distancing, especially in local shopping areas;

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- Encourage people to travel by bike or walk; and
- Reduce air pollution.

Traffic lane closures, segregated cycle routes and pedestrian paths were all included as part of the initial Street Space measures, all offering improvements to air quality as well as enabling social distancing. The team used experience from other schemes and plans already partially drawn up as part of future aspirations, to implement schemes in a very short timescale. This demonstrates the ability and expertise of the team to react quickly.

Some of the team involved with Street Space are also working on the CAZ Programme, this offers an invaluable insight into the methodologies behind quick development and implementation of measures required to improve air quality.

6.3 Governance Structure

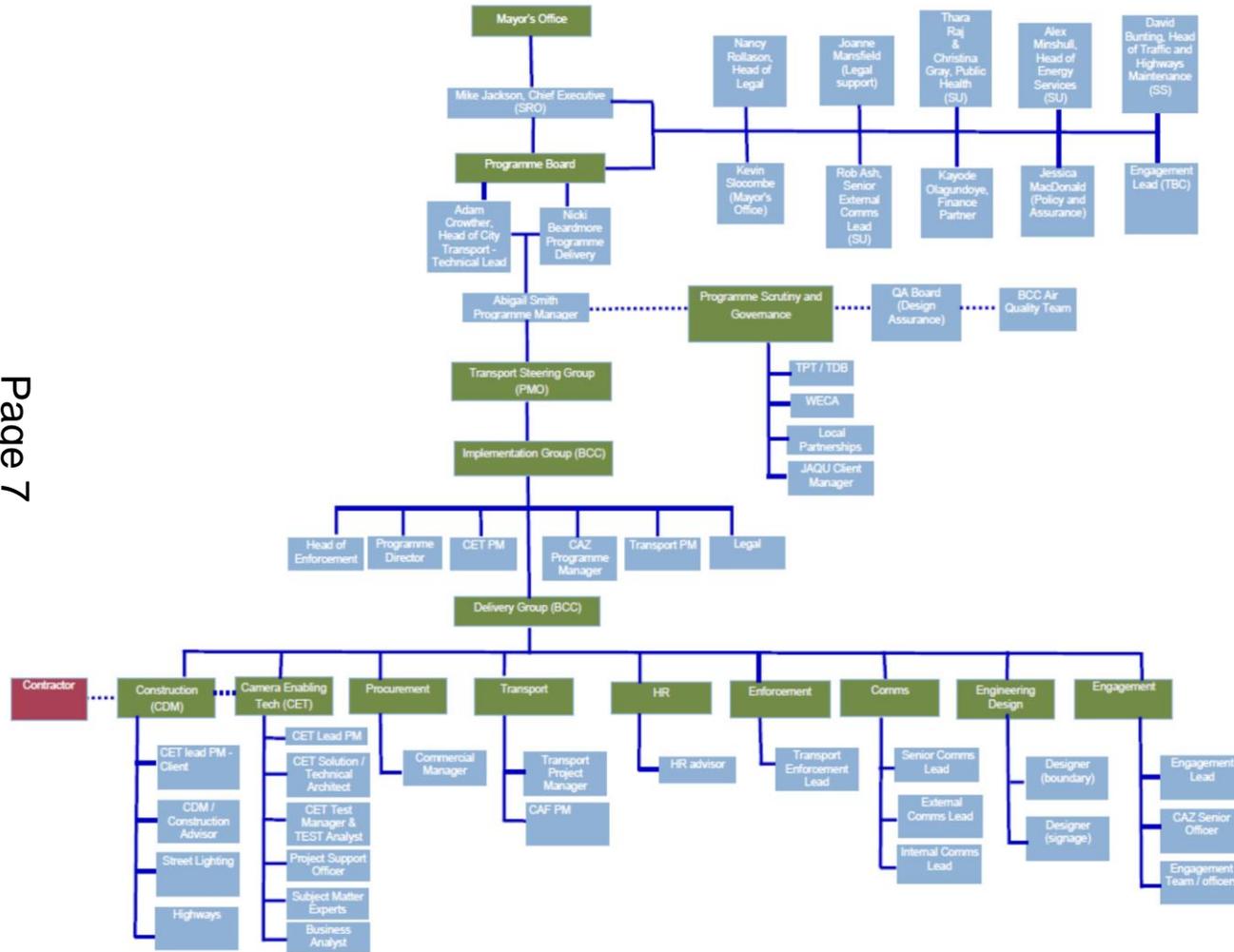
6.3.1 General

The programme will be managed under the general principles specified in the BCC programme manual for the delivery of transport capital projects and programmes, which are based on PRINCE2 / APM methodologies which are largely Agile focused. The Transport Programme Team (TPT), in its capacity as the central project management resource for the Transport Service, will support the project. Due to the size, complexity, and public nature of this programme, the governance structure has been tailored to the specific project environment. The programme will be governed by the Bristol Clean Air Plan Programme Board. The Senior Responsible Owner (SRO) is Mike Jackson, Chief Executive. In addition, the Director of Public Health and the Mayor's Office have key roles on the Programme Board, the later as a representative of the Executive.

The key roles identified within the programme structure are illustrated in the organogram (Figure 6-1) and are detailed below with a description of each role.

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Figure 6-1: Organogram to Implementation



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Implementation will be managed by enhancing the structure above to bring in more expertise in the delivery elements of the scheme. The structure for Programme Board and scrutiny remains the same as above with the added line in reporting being added, Implementation Group. This group will meet on a fortnightly basis to unlock any issues raised in Delivery Group in the interim board periods where decisions need to be made. To that end, the group will consist of managers representing Enforcement, Highways and Legal who will be able to make decisions and where this is not possible, escalate to board via a standing board agenda item 'Escalations Tracker'.

6.3.2 Senior Responsible Officer (SRO)

BCC Senior Leadership identified the Senior Responsible Owner (SRO) for the project as Mike Jackson, Chief Executive. The SRO has overall responsibility for ensuring the Bristol CAZ delivers the project benefits i.e. reduced air pollution in the shortest time possible cost on time, within budget and to the agreed quality as set out in the FBC.

Having the Chief Executive as the programme SRO has proven to be beneficial to the team, in terms of being able to coordinate cross council resources and put calls to action out to all council staff. For the OBC, the SRO raised the CAZ Programme (during an address to all staff as part of some organised talks) as being a key council priority and asked that staff support the Programme Team. The CAZ Programme requires a multidiscipline team to work together towards a common goal, with many teams council wide either being affected by (Fleet for example) or needing to input into a programme of this scale (Highways for example) with tight deadlines. That could either be reprioritising staff resource to support the programme, supplying expertise and experience or by helping to utilise communication channels within an established network. Completing the FBC has been a whole council achievement and this ethos will continue into implementation.

Having the Chief Executive as the programme SRO has enabled the programme team to reflect upon the role of the Council in achieving compliance. The internal comms lead within the comms workstream has worked closely with the internal Bristol City Council HR department. This workstream has enabled the programme team to identify issues within the Council's existing policies and BAU teams which may conflict with the City's moral and legal obligation to achieve compliance. The internal comms lead has since briefed individual service directors around the Air Quality impact that their fleet and grey fleet movements have on the City. Consequently, the Council's Travel Plan will be updated to reflect the organisation's role in achieving compliance.

The SRO is the chair of the Programme Board with overall responsibility for the delivery of the Clean Air Zone Programme. The SRO is responsible for ensuring delivery and implementation of the programme and realisation of the required projected benefits. The Programme Director role is responsible for ensuring programme delivery, senior stakeholder management and engagement and is also Programme Sponsor. The Technical Lead is the owner of all technical data and recommendations in relation to traffic modelling, air quality impacts, compliance, and boundaries. This role is also the interface with the council's Highways and Transport departments and wider Transport Strategy. The Programme Manager is responsible for the day to day delivery of the programme including governance, risk management and assurance.

6.3.3 Programme Board

A dedicated project board was set up specifically for delivery and implementation of this important programme and those appointed to the Board will continue to have responsibility for governance, oversight, implementation, and decision making through to successful scheme operation.

The Programme Board comprises representatives with decision-making authority from the Senior Management and the Mayor's Office of BCC, Senior Users (SU) from relevant service areas such as Transport and Energy, senior financial officers, and Senior Suppliers (SS). These members were selected on the basis of their skills, expertise, and authority being appropriate in order to hold responsibility for the programme as a whole, make appropriate decisions, provide senior expertise and knowledge, access required resources and ensure delivery.

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The Programme Board has the authority and responsibility for the delivery of the Bristol CAZ. Meetings of the board are held on a monthly basis; this will continue as set out above for implementation. Meetings are chaired by the SRO, Mike Jackson.

The membership of the CAZ Programme Board is set out in the organogram, and consists of:

- Mike Jackson – Executive Director: Resources & Head of Paid Service (SRO)
- Nicki Beardmore – Programme Delivery (PS)
- Adam Crowther- Head of Strategic City Transport, (Technical Lead)
- Abigail Smith – Programme Manager (PM)
- Rob Harris – CAZ Project Manager
- Kayode Olagundoye – Finance Business Partner (FP)
- Nancy Rollason – Head of Service, Legal
- Joanne Mansfield – Legal support
- Kevin Slocombe – Mayor’s Office representing the Cabinet Member for Transport
- Christina Gray (Director Public Health) and Thara Raj - Public Health
- Jessica MacDonald – Policy and Assurance
- Rob Ash – Senior External Communications Lead (SU)
- Alex Minshull- Head of Service, Energy (SU)
- David Bunting – Head of Traffic and Highways Maintenance (SS)
- TBC – Engagement Lead

In addition to these BCC members, guest officers from partner government agencies attend for appropriate agenda items as necessary. These are:

- Anthony Combe - JAQU Account Manager
- Huw Russell- Local Partnerships Project Director

The board’s responsibility is the general exercise of, but is not limited to, the following functions:

- To be accountable for the success or failure of the programme, as defined by the programme objectives and benefits in the FBC, under the leadership of the SRO.
- To review and approve the Programme Initiation Document.
- To approve the Risk Register and review it on a monthly basis.
- To ensure appropriate governance and assurance
- To provide oversight and decision making to ensure programme delivery and implementation

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- To provide expertise and knowledge in relation to the delivery of the programme as a whole and the realisation of defined benefits.
- To receive regular Highlight Reports from the Programme Manager.
- To provide unified direction to the project and Programme Manager, taking responsibility for joint decisions on the delivery of the programme and changes within the scope agreed.
- To provide the resources and authorize spend of budget for the programme and ensure that the programme is delivering to budget.
- To provide visible and sustained support for the programme delivery team.
- To ensure effective communication within the programme team and with external stakeholders.
- To review and approve, on the completion of the programme, the Programme Closure Report.

The board have been instrumental in supporting the delivery of the FBC, supporting the programme with all available resources, reprioritising teams to allow for this priority work to be inputted into and making sure that any approvals required / documents reviewing are prioritised.

6.3.4 Programme Sponsor

The Programme Sponsor is responsible for the direct supervision of the Programme Manager (PM) in the successful delivery of the programme. Sitting above the PM and Project Teams / workstreams, they are able to provide a level of day-to-day steer and decision-making for issues that do not merit escalation to the Programme Board or SRO. They are also responsible for supporting the PM when issues are escalated to decision-making bodies both within and outside the programme governance structure.

The Programme Sponsor for this programme has been identified as Nicki Beardmore, Programme Director. Nicki has extensive experience initiating and supervising a range of major projects under BCC and was previously the Corporate Director of Resources and Head of Paid Service for the Council. Nicki brings a fresh perspective to the Programme and is able to bring her experience on a range of programmes to the CAZ.

The responsibility for escalating any concerns with any aspect of programme resourcing and prioritisation to the Programme Board sits primarily with the Programme Sponsor.

6.3.5 Technical Lead

The Technical Lead is a critical role within the CAZ programme and has the responsibility for owning, reviewing and assessing all technical / modelling and traffic data reports relating to the CAZ. This role makes recommendations and advises the board on all technical data, reports and presents data in a format all can review and understand.

The Technical Lead for the CAZ programme is Adam Crowther, Head of Service (HoS) for City Transport at BCC. Adam holds a very senior role within the council's transport department and works on a local, regional and national level on behalf of the council. He has held transport management roles within BCC for many years. He therefore understands how to best interpret the systems in place and is able to analyse complex data sources and dependencies. He is able to make appropriate decisions and recommendations that also take into account the wider strategic transport needs and requirements.

6.3.6 Programme Manager

The Project Board appointed the Programme Manager (PM), Abigail Smith to the project initially and she will continue to manage the programme through to full implementation of the CAZ. The delivery of the Bristol CAZ is being led by City Transport Service, with the support of the Transport Programme Team. Over the course of the

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Feasibility Study the project evolved into a programme of works, divided into manageable work streams each having their own responsible project manager. This is managed through the Delivery Working Group.

Abigail is an experienced Senior Transport Project and Programme Manager with over 10 years' experience delivering major infrastructure projects, including Metrobus (North Fringe Hengrove package).

The Programme Manager, sitting in the TPT (Transport Programme Team), allows for additional resource to be drawn upon when required. When the work has peaked, additional staff have been able to step in, using their experience and expertise in project and programme management to help the team meet deadlines as they arise. This has freed the Programme Manager up to undertake the strategic overview, coordination and assurance role required for a programme of this scale. The programme manager has also built up a strong and supportive working relationship with other LAs which has proven to be an invaluable support.

The Programme Manager presented the Project Initiation Document (PID) to the Project Board in June 2018, which has subsequently undergone a number of iterations in line with the fast pace the project evolved, and this includes the following information:

- The product(s) that will be produced, including the CAZ D enforcement areas and enabling infrastructure, the wider mitigation measures such as Clean Air Fund (CAF), cycling infrastructure and wider soft measures under the Clean Air Plan.
- The timescale within which the work is to be carried out, including identifying the appropriate level of resource, both internally within Council services but more broadly with consultants, stakeholders and third parties, required to successfully deliver programme benefits.

The Programme Manager will be responsible and accountable for managing and delivering the programme in accordance with the procedures detailed in Section 6.8. including risk management, financial governance and escalation of decisions to the appropriate level.

6.3.7 Project/Programme Team

As well as the programme manager, the programme will require a series of project teams / workstreams to support the PM in assuring successful delivery. These are drawn from a range of services across the Transport Division covering the wide scope of relevant technical and operational expertise for each work package of the scheme. These include, but are not limited to:

- Network Management
- Change Services
- Parking Enforcement
- Street Lighting
- Engineering Design
- Legal
- Procurement
- ICT
- Communications

In addition, officers from council-wide teams have been and will continue to be drawn into the programme as and when a need exists. These officers will continue to be a part of the CAZ Delivery Group which functions as a

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forum within which to assure progress, highlight risks and issues and escalates issues / challenges to board as appropriate. This builds on a successful format the Programme Manager established for MetroBus which worked well.

The PM is reviewing team resources on regular basis with the Programme Director and reporting to both the Programme Board and Transport Delivery Board (TDB). The Transport Delivery Board has been set up to provide more focus and coordination in the delivery of the transport capital programme, meeting on a bi-weekly basis. TDB will also retain an oversight role for programme dependencies relating to other areas of work across the Transport Service, from providing recommendations on proposed integrations with other technical teams and their projects, to bids for funding, as well as ensuring post-delivery evaluation and auditing are completed. As detailed below in section 6.6.5, the Quality Assurance Board will be the principal resource for scrutinising design.

All time spent on this capially funded programme will be recharged to it, subject to any conditions of the funding.

Roles identified at this point are:

- Programme Director
- Technical Lead
- Programme Manager
- Project Manager
- Construction Project Manager – overseeing construction, managing CDM meetings, site liaison
- Project Manager – CAF measures, admin support
- Design Lead – boundary
- Design Lead – signage
- 2 Lighting Team officers for implementation / contractor liaison
- CET Project Manager
- CET Solution/Technical Architect
- QA/Test Lead
- CET Test Manager
- CET Test Analyst
- CET PM – citizen-facing activities
- Project Support Officer
- Business Analyst
- Subject Matter Expert 1
- Subject Matter Expert 2
- Procurement lead

- Legal Lead
- HR Lead
- Senior Communications Lead
- Comms Lead
- BCC Internal Comms
- BCC External Comms
- Financial management
- Engagement Team – detailed in the CAF Bid, FBC 17

The Programme Manager proceeds on the principle that, whenever possible, it is optimal to use in-house BCC resource to develop and deliver the project. This enables development of expertise within the workforce, which will aid in smooth operation and refinement of the Bristol CAZ. It also provides proper oversight of a public responsibility for improving air quality.

However, in addition to the BCC Project Teams / workstreams, consultants will be employed as necessary to lead or support certain areas of technical work in delivery / implementation (where BCC does not retain or have access to the necessary expertise). This is led by the Principal Consultant, who liaises directly with the Programme Manager. These are principally, but are not limited to:

- Air Quality Modelling;
- Traffic Modelling; and
- Economic Modelling & Financial Modelling.

BCC has an established Professional Services Framework from which to obtain such support. This will allow for quick procurement, avoiding delays to the programme.

6.4 Project/Programme Management Process

The Bristol CAZ will be managed according to the general principles specified in the BCC TPT programme manual, based on PRINCE2 / APM methodologies. This emphasises continued business justification, a defined organisation structure for the project and programme management, and an emphasis on dividing the programme into projects with manageable and controllable stages. However, as noted above, this process has been adapted according to the specific project and programme environment that exists in Bristol.

These principles as defined in the programme manual include templates such as the Project Initiation Document (PID), Highlight and Closure Reports. Through this system, BCC will deliver the products and benefits of the Bristol CAZ, to reduce NO₂ levels in Bristol in the shortest time possible. The PID was presented by the PM to the Project Board and approved. This document lays out the scope, budget, and benefits of the project. A monthly Highlight Report is presented to the project board. This document will track delivery and spend against the programme and scope specified in the PID, as well as providing an avenue for escalation of change requests. The Project Closure Report will be presented to the Programme Board for approval by the PM at the end of the Feasibility phase of the CAZ before moving into Implementation. This will specify how the project has delivered the scope and benefits as laid out in the PID as well as the handover to business as usual processes. All these documents and templates are available on request. All of these resources will be reviewed and revised following submission of the FBC as the project transitions into an implementation programme.

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All the above project and programme documentation, as well as any other relevant documents, reports or designs, will be stored in an agreed central file location on the BCC shared drives. The versions kept here and maintained by the PM will be the agreed master files. This will also allow all authorised persons, including the SRO and Programme Sponsor, access for the purposes of monitoring.

The CAZ programme has an impact on a number of projects in that it may increase demand for more sustainable modes of transports. The CAZ programme can therefore be linked to Bristol and WECA projects such as;

- The emerging Bus Deal, a strategic programme which aims to improve journey reliability for bus operators along strategic radial corridors
- The West of England's Local Cycling and Walking Investment Plans, a strategic investment portfolio aiming to unlock the region's propensity to cycle and walk
- Mass Transit, a long-term vision for delivering rapid mass transit through a combination of over and underground services
- Bristol Streetspace, utilising Emergency Active Travel Funding (EATF) to prioritise and improve walking and cycling routes in the central region and protect passenger transport during a time of reduced capacity
- BAU freight consolidation and the recently announced Zero Emissions Freight Consolidation Grant
- And MetroWest, a long-term vision for upgrading the Rail Network within the West of England.

Due to the scale and tight timescales involved, the CAZ programme is likely to impact across all workstreams within the Transport Service, as well as other teams' council wide, in terms of staff resource requirements and changes to the network and existing systems. The CAZ must therefore continue to be managed in the cohesive and collaborative manner it has to date. Communication has played a vital part in the FBC development, especially more recently following the Covid-19 pandemic. The measures implemented impacted on the CAZ but strong communication channels have been established across the teams involved and will continue as ongoing programmes overlap and seek to share resources and expertise, for example sharing programme plans and planning resource requirements collaboratively to ensure successful delivery across the board.

6.5 Financial Management

6.5.1 Financial Reporting

Regular financial reporting will be critical to monitoring the success of the programme, as with the project phase. Through regular updates, via the monthly Highlight Report, the PM will ensure that the Programme Sponsor, SRO, and Programme Board can continue to track financial progress against the milestones established in the revised PID. The programme will be supported by the Growth & Regeneration Finance Business Partner throughout its delivery who is responsible for assuring accurate financial data and reporting, recommendations in relation to all financial matters and providing a financial lens on all recommendations to Board, . The Finance Business Partner sits on the Programme Board and is the day-to-day support for financial comment and scrutiny, they will also provide monthly finance reports to the CAZ board, breaking down spend to date and providing an overall summary of the financial status of the programme. The PM will continue to work closely with JAQU colleagues in this regard.

In addition, the programme will be subject to the standard Council financial regulations that govern capital expenditure, including use of the central financial system, Unit4 Business World. This includes monthly forecasting on expected spend across the entirety of the project. The role of the Business Finance Partner will ensure the appropriate level of information, detail and scrutiny in this regard.

6.5.2 Change Control

Change control is a normal part of any programme in relation to delivery plan, scope, budget and quality. In order to ensure effective management of the programme, the process for agreeing these changes is clearly set out in the PID. As specified above, the principal internal mechanism for identifying, recording, and, if necessary, escalating change requests will be through the monthly Highlight Report. Where activities are not being carried out to the plan, cost, or scope agreed in the project plan as part of the PID, the change will be escalated to the appropriate level.

The determination of the change tolerances for the above process is defined in the PID, subject to the Council's internal schemes of delegation. This has provided the PM and Programme Sponsor with appropriate level of delegation to make changes, with subsequent escalation to the SRO, and then finally to the Programme Board if required.

For the PM, Programme Sponsor and SRO, this level of delegation will be judged cumulatively, in order that multiple small changes amounting to a significant one will be given proper scrutiny. In all cases, even where changes are fully within the remit of the PM, these will be recorded on the Highlight Report in order that proper scrutiny can be applied by the Programme Board.

The following change controls and tolerances are identified for Time, Budget and Scope in the CAZ PID: Time;

- Programme slippage of 2 weeks will be managed by the Project Managers / Workstream Leads, providing that slippage does not impact on the critical path. If delays breach this tolerance then the Project Manager will escalate the issue to the Programme manager, through the established escalation process in place through the Delivery Group and Weekly Highlight Reports.
- Programme slippage of 4 weeks will be managed by the Programme Manager (the Programme Director will be notified), providing that slippage does not impact on the critical path. If delays breach this tolerance, then the Programme Manager will escalate the issue to the Programme Director who will provide appropriate decision making and guidance. The Programme Director will escalate to the SRO if required. Programme Board will be informed through the Monthly Highlight Reporting process.

Budget;

- Changes in budget between 1 and 5% of an allocated budget within a work stream will be managed directly by Project Managers / Workstream Leads. Budget increases over this percentage will be escalated to the Programme Manager (who will notify the Programme Director and Finance Business Partner) Board will be notified through the monthly Finance Reporting in place). Such changes will be funded from contingency / risk provisions as appropriate and are not expected to result in an overspend.
- Changes in budget between 5 and 15% of an allocated budget within a workstream will be managed directly by the Programme Manager. Budget increases over this percentage will be escalated to the Programme Director and if required, the SRO and Programme Board for a decision before a change request is issued to the funding body. Such changes will be funded from contingency / risk provisions as appropriate and are not expected to result in an overspend.

Scope;

- Due to the nature of the programme any change in scope will be escalated immediately to the Programme Manager, the Programme Director and Programme Board as necessary.

6.5.3 Interdependencies

To best manage interdependencies and the risks this can pose, each work stream lead has been asked to consider their key deliverables and milestones and examine the dependencies on delivering their deliverables /

milestones for their workstream. This has been considered in the context the wider programme to identify where there are dependencies that could be removed to reduce the risk to the overall programme plan.

Furthermore, working with the wider team and internal stakeholders through the established forums in place, we are able to map out what other priorities are coming up and potentially posing issues with resources, contractor resource, conflicting priorities etc. These are worked out in the forums or escalated to the Implementation Group and if not resolved there then they will be escalated to Board. Examples of managing such potential conflict is best demonstrated with the sudden announcement of Emergency Active Travel Funding. This affects the CAZ in terms of staff resources, impact on key routes through the CAZ and modelling work. Through effective engagement in the Delivery Group, we were able to consider ways to support both projects. The Delivery Group is the forum most appropriate for such dependencies to be discussed in and this will continue through the implementation stage.

6.6 Programme Plan

There are several key stages that occur for any scheme or programme, which include planning, design development, detailed design, mobilisation, construction, and project end. The planned programme for the Bristol CAZ is laid out in a Gantt Chart in Appendix K of the FBC and lays out the anticipated timescales for each element of the programme.

This plan is broken down into three main work packages, as required to identify the critical path and other key relationships between items of work, including how design and procurement are developed and reported.

The implementation is at this point expected to commence in line with instructions from JAQU and following review and approval of the FBC. The council is currently under legal direction to implement the CAZ in October 2021. This is subject to review and approval of the FBC, and any new legal direction that may be received as a result of that review.

The detailed Gantt Chart for the programme is shown in Appendix K. A high-level summary of the key milestones is shown in Table 6-1 below (please note that these dates are subject to change following contractor engagement and alignment with JAQU timescales).

Table 6-1: Key Milestones

Milestone	Date
FBC Submission	30.06.2021
Architecture phase began (previously called pre-on-boarding)	20.01.2021
Procurement of signage begins	05.07.2021
Implementation of the scheme begins – initial contractor discussions and design work	23.06.2021
Planning the purchase of approved devices begins	23.06.2021
Back office system installation complete	30.11.2021
All testing completed	11.02.2022
CAZ Operation Commences	Spring 2022
Monitoring	Ongoing

6.6.1 Management of the Programme Plan

The Programme Plan will be managed by the PM in accordance with the Change Control process. The PM and Programme Sponsor currently review this project plan on a weekly basis but it is also reported formally to both

Programme Board and TDB through the Highlight Reporting process, with authorised changes which impact upon the expected timescale for affected work packages. The weekly Delivery Group meetings also feed into this review process, providing an escalation route for all risks, issues and queries.

6.6.2 Consenting Strategy

The Charging order is a critical element of delivering the CAZ D with the programme benefits being dependent upon their successful enactment. The consenting strategy for the Bristol CAZ comprises of:

- Charging Order for the Small CAZ D, this is included as an Appendix T, FBC 48.

The requirements for the Charging Order are as follows:

- The order needs to be finalised once the FBC is approved, with amounts and timescales being included / confirmed
- Formal submission of the Order to Council/JAQU
- Order granted

The council has the power to enforce the Charging Order for the Small CAZ D which is drafted and ready to be enacted once approvals are granted.

6.6.3 Budget Management

As detailed in section 6.5, the PM will have responsibility for the management of the budget in collaboration with the Finance Business Partner, and financial reporting to the Programme Sponsor, SRO and Programme Board, through the Highlight Report and BCC central finance system (Unit 4 Business World). This is formally presented by the Finance Business Partner in their monthly finance report to board. In addition to following the governance structure for the programme laid out earlier in the Business Case, all financial transactions and budget changes will follow the BCC's schemes of financial delegation as explained in this section of the business case.

During the completion of the OBC and during a Cabinet meeting in September 2020, delegated authority was passed to the SRO; Mike Jackson with regards to further funding bids for the CAZ. This was also in consultation with the Cabinet member for Finance, Governance & Performance and the Director of Finance & S151 Officer. This will remain in place for Implementation, with any further requests for funding from JAQU being approved by the SRO, with no need to go to Cabinet. Approval to spend the Implementation budget has already been agreed by Cabinet up to £12m (on the 28th April 2020). The submission of the FBC went to Cabinet on the 25 February 2021 and agreed the following recommendations:

- Authorise the Chief Executive, in consultation with the Cabinet Member for Finance, Governance & Performance, and S151 officer, to apply for further funding for implementation of the Clean Air Zone and submit the Clean Air Fund (CAF) bid
- Authorise the Chief Executive, in consultation with the S151 officer, to make amendments to the existing Clean Air Fund (CAF) bid if required, whilst ensuring no changes are made that would impact on legal compliance being achieved
- Authorise officers to continue to work with JAQU to agree implementation plans for the Clean Air Zone and resource allocation in line with the existing scheme of delegation

The Technical Lead for the CAZ Programme is the Head of Service (HoS) for City Transport. In the new guidance published in February 2021; Directorate Scheme of Delegations: Growth and Regeneration, the HoS now has delegated authority to approve spend and to delegate spend approval levels to Programme Managers as

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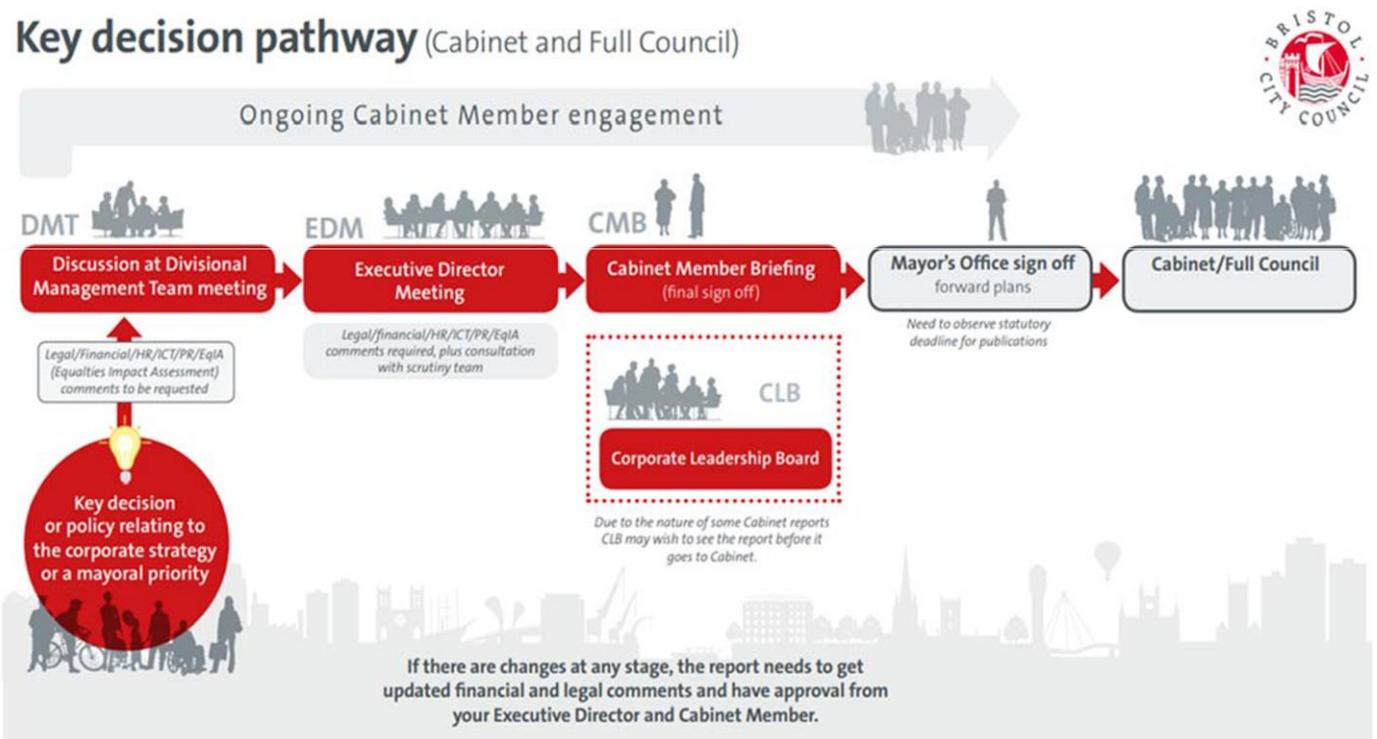
appropriate. This will be put in place for Implementation, reducing the risk of delays caused by awaiting spend to be authorised at Director level for elements of the CAZ including staff costs and materials.

6.6.4 Decision Pathway

BCC has defined a decision pathway which is the route by which information is escalated through levels of senior management and to the Mayor ensuring appropriate level of decision making, scrutiny and challenge is applied to decisions. This is shown in Figure 6-2. This Business Case and the delivery and spend to support the activities therein, has gone through this pathway in order for it to be presented to Cabinet for a decision to be made (approved on 25 February 2021). Approval has been granted to submit the case and deliver the programme infrastructure, with the authority to carry out these activities delegated at the appropriate level, e.g. PM, Sponsor, Director, SRO or the Programme Team.

However, as specified in section 6.6.2, any significant changes to the scope of the planned delivery or budget will be escalated to the appropriate decision-making body as listed in Figure 6-2 and in line with PID requirements, in addition to following the specific project governance. However, given the timescales, and challenges facing the delivery, key members from the Mayor's Office, Corporate Leadership Board (CLB) and Cabinet Members have been included on the Programme Board, in order to accelerate or delegate decisions through this process as appropriate. This structure will remain in place for the implementation phase to ensure there is a robust change management and reporting system in place for the programme.

Figure 6-2: Decision Pathway Process



Following submission of the FBC, the Project Board will transition into a Programme Board with a complete revision of all paperwork.

6.6.5 Quality Assurance

In accordance with BCC Transport standard practice, the Quality Assurance (QA) Board will be used to scrutinise design throughout the lifecycle of the programme. The design work completed so far to advance the project to FBC has already been taken through the two initial stages of QA. The four QA stages are summarised below:

Management Case

- QA1; Scheme approval. An outline of the project, including a description of the works, the reason for them, and proposed outcomes/ scheme objectives. This approval was granted to the Bristol CAZ on 1st October 2019.
- QA2; Approval of feasibility/ preliminary design. Early conflicts removed and outline design available for consultation.
- QA3; Approval of final design for construction. Detailed design has been through consultation and statutory process. The Bristol CAZ is currently bringing designs to the board for this approval level in anticipation of FBC submission.
- QA4; Notification of completion. This final stage triggers the adoption process and moves the Bristol CAZ out of the Project Team to being operational and business as usual.

The QA Board is responsible for the overall quality of scheme delivered on street. The technical assessment of the scheme, and each different workstream, will be done through scheme review, TDB and ultimately Programme Board.

6.6.6 Programme Assurance

Independent internal Programme assurance on the Bristol CAZ and CAF programme will be undertaken by the BCC Portfolio Management Office (PMO). A representative from the PMO will report on the Programme and will provide board with independent and objective assurance that the project is being conducted correctly throughout its life cycle, and assurance on the programmes likely future performance (i.e. is the programme on track to deliver its objectives and benefits to time and budget), as well as providing assurance on the Highlight Reporting system.

Its key aims are to:

- Provide oversight of the likely future performance of a project / programme for those responsible for approving and/or financing such an undertaking.
- Help manage risk and improve delivery confidence in relation to time, budget and quality
- Support and increase the likelihood of good, informed decision-making.
- Obtain maximum value for money and delivery of benefits through helping to keep all projects on the right track.
- Support the desire to drive up organisational programme management capability, increasing the likelihood of sustainable, ongoing success of our projects / programmes and reducing an over-reliance on change support.

The Programme Manager will also continue to work alongside JAQU and Local Partnership colleagues, providing additional project assurance.

6.7 Communication and Stakeholder Management

6.7.1 Communication between Programme Management Team and wider stakeholders in Bristol City Council

This programme is managed through City Transport but has implications for other departments and teams.

Regular communication will ensure staff have an accurate and up-to-date understanding of the programme.

This will be achieved through:

Management Case

- Senior user representation on the Programme Board, including the heads of Energy and City Transport, senior leadership and the Mayor's Office representatives
- Weekly Delivery Group meetings to ensure efficient coordinated working
- Coordination across the Transport Service through the Transport Delivery Board (TDB)
- Communication through the directorate structure via biweekly reports to the Transport Management Team (TMT), highlighting any cross-working issues

Highlight reports will form the basis of this communication to the TPT; however, a two-way flow of information will be provided at all times.

The collaboration with the council's own Transport Engagement and Active Travel team has also opened new opportunities for the CAZ programme. This proved to be successful during the recent second full public consultation.

The Transport Engagement and Active Travel team are highly experienced and have established effective communication and engagement channels. They hold weekly internal stakeholder meetings with representatives from different sectors of the council including HR and Fleet management and are able to communicate with all council staff and internal groups through established council champions. They also manage regular and successful sustainable transport challenges to encourage use of sustainable transport modes both internally and externally with business networks. The team offer a further level of support and the ability to communicate more widely and quickly for the CAZ Team.

The Delivery Group will continue to function in the same way during the implementation stage, evolving more into delivery focused requirements. Workstream leads will continue to feed through into Delivery Group from their own team and project workstream meetings. The Transport Engagement and Active Travel team and communications support regularly feedback about current trends of enquiries, update on engagement with different businesses and community groups and advise on changes to web pages and communication resources required in order to address concerns being raised.

An Implementation Group will provide an operational escalation route, unlock issues, move work forward avoiding delays between board meetings. The Programme Manager will manage these meetings and have oversight across all key meetings, to ensure a joined-up approach is achieved and will be supported by the Programme Director who will also be in attendance.

6.7.2 Communications Plans

Communication and engagement are critical to the success of the CAZ Programme. We have a comprehensive plan to achieve this. The full plan providing all relevant detail, costs and timings for communication and engagement is in Appendix B.

Following FBC submission, the implementation stage of the programme will begin. Activities will include:

- Preparing residents, businesses, and stakeholders for the introduction of the CAZ
- Signing contracts and mobilising teams and contractors for Camera Enabling Technology (CET), Signage and CAF measures

Communication and engagement activity will focus on:

- Raising awareness of the need for action around air quality in Bristol
- Supporting and preparing people for the implementation of the Clean Air Zone

Management Case

- Helping the people to understand their role in tackling air pollution
- Helping people to understand mitigations and support available
- How a Clean Air Zone will help us create a fair, healthy and sustainable city

6.7.3 Stakeholder Management

The CAZ programme involves internal and external stakeholders.

Internal stakeholders will be included in the Delivery or Implementation Groups.

Our Engagement, Communications and HR Teams will communicate and work with internal teams to raise awareness of the CAZ, identify potential issues and work with internal CAZ champions.

Key internal stakeholders include:

- Press Team
- Switchboard
- Events Team
- Economic Development
- Night-Time Economy Lead
- Fleet
- HR
- Policy Team

External engagement work has continued throughout FBC development and includes regular communication and meetings to address concerns, raise awareness and share resources. The team also have a dedicated transport engagement inbox and phone line that is being used to respond to enquiries and update webpages with FAQs, maps and information based on feedback from enquiries.

For external stakeholders the team have created engagement action plans and contact lists for key stakeholders, internal stakeholders, all business sectors, community groups including the voluntary and 3rd sector organisations and educational facilities. The workstreams are split by geographical location and sector type for the team to prioritise those within the zone and those who will be more affected by the CAZ boundary. Below is a summary of those included:

- Key stakeholders (large organisations such as University of Bristol, University Hospitals Bristol NHS Trust, Bristol Waste, Royal Mail, Emergency Services and other business networks, trade associations)
- Businesses (markets, builder merchants, catering, consultants, distributors, driving schools, engineering, enterprises, estate agents, finance services, housing associations, legal services, manufacturing, membership organisations, telecommunications, trade associations, unions)
- Retail (local shopping centres, independent shops, chains, supermarkets)
- Transport providers (car hire, driving schools, garages, motorcycles, taxis firms, car clubs, bus operators, rail network, ferry company)

Management Case

- Utilities (energy, telecommunications, water, sewage)
- Business parks/ Industrial Trading Estates (Avonmouth including distribution centres, Filwood Green business park, Barnack Trading Estate, St Philips Marsh area including Temple Meads and Avon Meads)
- Communities (deprived wards, community groups, faith groups, equality groups, educational facilities, health providers etc)
- Internal BCC departments (fleet, resources, parks, highways and maintenance, events team, culture team, film office, Bottleyard, waste, sustainability, contractors, libraries, home to school transport etc)
- Neighbouring authorities (SGC, NSC, BANES, parish councils etc)

6.7.4 Consultation to date

A report on consultation undertaken to date is in Appendix N. Ongoing communications and stakeholder management has been informed by previous consultation and is summarised below.

First consultation

Between 1 July and 12 August 2019, the council consulted on two options for a traffic Clean Air Zone.

- Option 1: Clean Air Zone (private cars not charged)
- Option 2: Diesel car ban

The consultation asked respondents how concerned they are about the health impacts of poor air quality and sought feedback from citizens, businesses and other stakeholders on the two options. The consultation findings are detailed in the consultation report included with the OBC. A Stakeholder Summit was held on Monday 18 November 2019.

Second consultation

A second consultation was held from the 8 Oct 2020 to 13 December 2020. Two further options were presented to the public.

- Option 1: Clean Air Zone C (private cars not charged) with a smaller inner zone of a CAZ D (private cars charged)
- Option 2: Small area CAZ D

The consultation also asked respondents how concerned they are about the health impacts of poor air quality and sought feedback from citizens, businesses, and other stakeholders on the two further options. A copy of the Communications Plan is presented as Appendix B to the FBC.

Due to the limitations caused by the COVID-19 pandemic, we were unable to hold drop-in sessions and face-to-face activities. To boost response rates and target low-responding parts of Bristol, 20,000 paper surveys were delivered to addresses in areas with historically low response rates to consultations and high levels of deprivation. We also emailed all key stakeholders and put up posters in over 120 locations on main shopping centres and carried out targeted social media posts, newsletters and articles and disseminated the CAZ toolkit to targeted business parks and stakeholders.

During the consultation the Transport Engagement team led on the business engagement and used existing business networks. The team also researched, emailed, and called 1,385 businesses to get them to complete the consultation and inform them of the sustainable travel advice and support services available to encourage a modal shift towards walking, cycling and public transport.

Briefings were held with several groups including Business West (with 55 businesses joining), University Hospital Bristol NHS Trust, Southmead Hospital, University of Bristol, University of West of England, Bristol Workplace Travel Network, waste contractors, and neighbouring councils.

The second consultation received 4,225 responses. A summary of responses from groups with protected characteristics and income deciles is contained within the report. More than half of respondents (54%; 2,250 respondents) agree or strongly agree that Option 1 is a good way to improve air quality (20% strongly agree and 34% agree). A higher proportion of respondents (60%; 2,466 respondents) agree or strongly agree that Option 2 is a good way to improve air quality (32% strongly agree and 28% agree).

6.7.5 Engagement to date

Since the consultation ended the team have continued with the engagement work in a reactive and planning capacity. They have been developing the communication plan, engagement and behaviour change strategy and associated timelines for each phase e.g. raising awareness, reaching compliance and behaviour change work. They have been working on communication materials, designing the branding required for the project and setting out action plans for different groups for the proactive engagement stage once the FBC is approved.

The current reactive phase has also included responding to enquiries and addressing any queries and concerns that different stakeholders may raise, updating websites and feeding into other workstreams to ensure we have considered different vehicles exemptions and impacts on finance packages.

Due to Covid-19 and the restrictions during this engagement work most of the activity has had to be carried out remotely via email, telephone and video conferencing where we have presented to key stakeholders. The team has led both the business and community engagement. The Business Engagement Officers work with businesses to encourage investment in sustainable travel modes for their fleets and their employees. Advice and support ranges from match funded grants, electric bike loans, and workplace travel audits, to staff engagement events, personalised travel planning and bike maintenance sessions.

The team's travel advisors have led the contact, phone calls and emails, with businesses and have been explaining the CAZ project and current sustainable travel support available. During the consultation, officers sent 1,005 businesses one or more emails with information about the Clean Air Zone, a call to action to complete the consultation and information about support.

The travel advisors telephoned all business where a response had not been obtained. This enabled officers to reach more businesses as the initial data gathering exercise often returned general email addresses. By telephoning the team could often get to speak to the correct person or obtain an email address for them.

As part of this work the Business Engagement Officers also held a range of virtual meetings with the larger employers in the city to delve a little deeper into the details of CAZ and what that will mean for their organisations. The officers answered questions, talked through any concerns, and have agreed to continue these meetings to provide ongoing support whilst the details of the CAZ are developed.

The community engagement officers have also been responding to enquiries from the public via the Transport Engagement inbox and phone line. They have also been providing individuals with sustainable travel advice and have explained about the support that is available and will begin the proactive stage once the project moves to the implementation stage.

This work and a similar thorough approach will be taken during the implementation stage of the CAZ. FBC 17 – CAF includes a bid for funds to continue engagement on a wider scale.

6.8 Risk Management Strategy

Risks are defined as uncertain events that, should they occur, will have an impact on achieving the programme objectives; issues are problems that have occurred are live and are having an effect on a programme achieving its objectives.

A requirement of the process is that risks need to be identified at programme start up and reviewed throughout the programme's lifetime. The principal mechanism for identifying and reviewing risks is the Risk Register. This document holds a record of all the identified risks. Each is graded on probability (1-4) and Impact (1, 3, 5, or 7) to produce an overall risk rating. The agreed action for each risk is then recorded, both in general terms (Accept, Reduce, Avoid), and a specific mitigation. The Residual Risk, being the remaining risk level with mitigation in place, is then recorded in terms of probability and impact to give a residual risk rating.

As mitigation proceeds and the programme is develops, these ratings will be continually reviewed by the PM and Programme Director and reported monthly to Programme Board by exception. Both the risk and mitigation are given recorded owners to ensure continued responsibility is taken for the management of each.

The Risk Register also forms the basis of the QRA. This process allocates a cost to each risk being realised and multiplies this by the probability to generate a likely cost impact of all the identified risks becoming issues. At a level of risk agreed between BCC and JAQU, the results are then used to establish a quantified contingency budget.

The QRA figure being included financial case is the 80th Percentile - P (80). In addition, the 50th Percentile (P (50)) and the P(Mean), the mean percentile value also provide further levels of confidence.

The QRA for the FBC stage is shown in Table 6-2:

Table 6-2: Summary of QRA

	P (50)	P (80)	P (Mean)
Grand Total Risk (Financial + Delay)	£879,000	£1,225,000	£908,000

The risks associated with the FBC stage of the project have been grouped into a number of categories with the associated financial values, see Table 6-3 for details.

Table 6-3: Summary of risk categories

Risk Category	Risk Value p(80)
Brexit	£14,187
Communications / stakeholder challenge	£179,483
Construction	£104,631
COVID-19	£88,670
Financial	£191,084
Legal / process	£3,547
On-street effects	£61,367
Political	£380,099
Procurement	£4,581

Risk Category	Risk Value p(80)
Resources	£65,394
Technical / Design	£65,394
Total	£1,225,000

Further details on the QRA are held in FBC 35 – BCC CAZ Risk Management QRA.

Issues are to be reported in a similar manner. Because the issue has occurred, the matter of impact (in cost and time) will be reported; an owner of the issue will be identified and a timescale within which it is to be resolved via the agreed mitigating actions.

6.9 Monitoring and Evaluation Plan and Benefits Realisation Strategy

The focus of the Bristol CAZ is achieving air quality and public health improvements in compliance with the legal requirements laid down by UK courts: that is, achieving compliance as quickly as possible, reducing human exposure to pollutants as quickly as possible, and ensuring that such compliance is possible.

The full Monitoring & Evaluation Plan can be found in FBC 38. This document sets out how the benefits of the scheme will be monitored, evaluated, and realised. It has been produced in line with the Inceptions, Evidence and Options Appraisal packages of Guidance issued by JAQU in 2017 (and subsequently revised), and HM Treasury Green Book, in order to comply with best practice and provide a thorough and evidenced basis for the performance of the scheme.

Monitoring will be undertaken by BCC's Air Quality Team, supported by consultants to be employed as necessary to lead or support certain areas of technical work. Both Process and Impact Evaluation will take place. Process Evaluation seeks to answer the question 'How Was the scheme delivered?' including:

- Scheme build; achievement of timescale and key milestones, risk outcomes and stakeholder feedback.
- Delivered scheme; scheme refinements and success of design and materials.
- Outturn costs; as compared to forecasts, including capital expenditure and ongoing operational costs.

Impact Evaluations attempt to provide an objective test of changes, and the extent to which these are attributable to the scheme, including:

- The Primary Critical Success (CSF) of reducing NO2 concentrations below legal limits.
- Secondary CSFs, such as mitigating financial impact on low income households.

The resource needed to undertake and manage this monitoring has been included in the financial case as operational expenditure by BCC for the full 8 years of monitoring, as referred to in section 6.10, Project Closure and Handover. New infrastructure and equipment costs have also been included as capital cost items.

6.10 Project Closure and Handover

As laid out in section 6.4, upon project completion, the PM will present the Project Closure Report to the Programme Board for review and approval. This will take place once this FBC is submitted prior to the transition to a programme for implementation. This report will lay out how the project has delivered to the plan laid out in the PID, subject to approved changes, and how it has achieved the project benefits i.e. compliance in the shortest time possible. It will also give a financial summary of the project, listing project expenditure as compared to original budget.

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This fits within the overall phasing of the programme:

- Phase 1 – FBC submission and approval

Once approved, Programme Closure Report taken to Board, to acknowledge the move into Implementation

- Phase 2 – Implementation stage

Once completed, following go live, final Programme Closure Report taken to Board

- Phase 3 – BAU

Following go live, the scheme will transition into BAU with support from the contract management team

Within the Phase 1 Closure Report, the next phase of the programme will be explained. As part of the Phase 2 Programme Closure Report post implementation, a further report will detail how and within what timescales the programme will be handed over to Business-as-Usual (BAU) operation. This will also specify the BCC teams which will take over the operational duties.

The move to Phase 3 will include a list of all new assets and as built drawings, plans, plus new systems and processes being provided to the appropriate teams. A full handover meeting will take place with all relevant internal stakeholders to ensure a smooth transition to BAU takes place. Those taking on a BAU role, Highways, Enforcement etc. are already involved in the programme and part of the Delivery Group, Implementation Group and / or Board.

Where there is temporary infrastructure to be removed, this will be coordinated through the Implementation Group to ensure any work required such as tenders for contractor work is procured within the timescales of the CAZ Programme. This will be discussed, planned for and resource allocated as part of Phase 2 of the programme.

As detailed in section 6.2, BCC's experience from previous measures in the operation of Approved Enforcement Device enforced bus lanes, and in the operation of a central permit system for the Residents Parking Zones means that the teams required have already been identified within the existing BCC Transport Service structure. These are chiefly:

- The Parking Enforcement Team
- The Parking Appeals Team
- The Network Management Team and Operations Centre.

It is agreed that the existing resource within these teams will not be sufficient to operate the Small CAZ D. Again, from its existing operational experience, BCC has a clear idea of the extent and structure of the resource requirements. It has been included in the Financial Case with relation to implementation and operational costs and briefly consists of:

- 2 Civil Enforcement Officer (CEO) per 30,000 annual PCNs.
- 3 Appeals Officer (AO) per 10,000 annual PCNs
- 1 Senior Officer Traffic Penalty Tribunal (TPT)
- 1 Contract Manager to oversee all contracts
- 1 Contract Management Support officer
- 1 Network Management Officer

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- 3 CAZ Administrators – public facing
- 3 CAZ Exemptions Administrators
- 1 Senior CAZ Exemptions Administrator
- 1 CAZ Operations Officer

It is anticipated that these additional staff will be folded into the existing management structure under the Team Manager (Enforcement) and Team Manager (Appeals). The roles will exist for a period of 3 years to ensure the scheme is fully covered for its duration and any outstanding appeals etc. are finalized and resolved.

The Closure Report will also detail the handover to BAU with regards to ongoing monitoring and reporting. As detailed in the Monitoring & Evaluation Plan (FBC 38), this will be carried out by the Sustainability Team.

Resource for this has also been costed and included in the Financial Case, consisting of:

- 1 Air Quality Management (average annual cost used for ongoing management of air quality monitoring including changing diffusion tubes and calibrating continuous monitor every month)
- 1 Monitoring Traffic Levels – ongoing (indicative estimate used for CAZ-specific traffic count surveys)
- 1 Scheme Monitoring – ongoing (staff member at 0.21 FTE)

The team are also going to be working alongside JAQU and Ipsos Mori to take part in a 'Deep Dive'. This will complement our own evaluation of the scheme and will be led by the Air Quality Team alongside the monitoring and evaluation for the CAZ scheme.



Bristol City Council Clean Air Plan

Full Business Case

Strategic Case

FBC-4 | 5

July 2021

Bristol City Council

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Acronyms and Abbreviations

AQMA	Air Quality Management Area
AQAP	Air Quality Action Plan
AQO	Air Quality Objective
BCC	Bristol City Council
CAZ	Clean Air Zone
CAP	Clean Air Plan
CSF	Critical Success Factor
Defra	Department for Environment, Food & Rural Affairs
EU	European Union
EV	Electric Vehicle
GBATS4M	Greater Bristol Area Transport Study v4M
GUL	Go Ultra Low
HE	Highways England
HGV	Heavy Goods Vehicle
JAQU	Joint Air Quality Unit
JLTP	Joint Local Transport Plan
JTS	Joint Transport Study
JSP	Joint Spatial Plan
LEP	Local Enterprise Partnership
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
NAEI	National Atmospheric Emissions Inventory
NO _x	Nitrogen Oxides
NO ₂	Nitrogen Dioxide
OBC	Outline Business Case
PCM	Pollution Climate Mapping
PHV	Private Hire Vehicle
PM	Particulate Matter
PT	Public Transport
QRA	Quantified Risk Assessment
SEP	Strategic Economic Plan
SME	Small and medium-sized enterprises
SOC	Strategic Outline Case
ULEV	Ultra low emission vehicles
VDM	Variable demand model
WECA	West of England Combined Authority

2. Strategic Case

2.1 Introduction

2.1.1 Clean Air Zone Context

Building on the findings of the Strategic Outline Case (SOC), Outline Business Case (OBC) and Revised OBC, the purpose of the Strategic Case in the Full Business Case (FBC) is to establish the reassessed case for change and preferred way forward by:

- Identifying Bristol City Council's (BCC) statutory and regulatory air quality obligations;
- Presenting existing air quality conditions (including specific air quality problems arising from the aforementioned obligations, based on updated air quality and traffic modelling); and
- Outlining the desired goals of this intervention.

Within this context, and in accordance with the Inception package of JAQUs guidance, this Strategic Case considers the following:

- The strategic context, underpinned by European, national and local policies which are pertinent to the project;
- Presentation of the results of the more detailed baseline air quality and transport modelling using the agreed target determination values;
- Based on these findings, reconsideration of the strategic case put forward as part of the Strategic Outline Case; with the case for change and preferred way forward reassessed;
- More detailed understanding of the project's benefits, risks, constraints and dependencies;
- Evidence of detailed stakeholder engagement; and
- Presentation of a detailed logic map or theory of change.

2.2 Update since November 2019 OBC

The OBC submitted in November 2019 identified the Hybrid option as the preferred option. However, following the OBC submission, work was undertaken to explore an alternative option which could produce similar levels of benefits as the Hybrid option, but without the delivery risks associated with the implementation of a diesel car ban. This resulted in the development of the Medium CAZ C/Small CAZ D option, consisting of a CAZ C across the medium zone and a CAZ D across the small zone, in addition to the following measures:

- Close Cumberland Road inbound to general traffic;
- M32 Park and Ride with bus lane inbound; and
- Holding back traffic to the City Centre through the use of existing signals.

The Medium CAZ C/Small CAZ D option had a compliance year of 2023.

During the COVID-19 Pandemic, a number of Street Space Schemes were implemented or planned around Bristol in order to facilitate social distancing and improve air quality. In order to reflect this updated position, the baseline model was updated to include Street Space schemes.

In addition to this, assessment of the Medium CAZ C/Small CAZ D indicated that the majority of the air quality receptors driving compliance are situated within the Small CAZ D zone. Modelling of the Small CAZ D zone without Medium CAZ C, with the Fast Track Measures, also indicated a compliance year of 2023. This scheme therefore achieves the same compliance year as the Medium CAZ C/Small CAZ D Option, without the wider

economic impacts associated with a Medium CAZ C zone. Therefore, the Small CAZ D Option has been progressed within this FBC.

The Small CAZ D Option includes the following measures:

- Small Area Class D (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs);
- Fast Track Measures:
 - Closure of Cumberland Road inbound to general traffic; and
 - Detailed VMS (Variable Message Sign) strategy which includes the use of existing transport infrastructure such as traffic signals and modelling

This version of the Strategic Case addresses comments JAQU raised following the FBC submission.

2.3 Air Quality: Background and Context

Poor air quality is the largest known environmental risk to public health in the UK. Investing in cleaner air and doing more to tackle air pollution are priorities for the EU and UK governments, as well as for Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the COVID-19 pandemic. Recent research that suggests poor air quality may be correlated with higher death / infection rates from COVID-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill¹, to ensure that certain standards of air quality continue to be met, by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. 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 Bristol. 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 has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), an Outline Business Case (November 2019 and updated between April and June 2020) and a Full Business Case in February 2021.

¹ Environment Bill 2019-21 <https://services.parliament.uk/bills/2019-21/environment.html>

2.3.1 European requirements

The UK Government has an obligation to achieve European Air Quality Limit Values (Directive 2008/50/EC, Annex III). The most relevant Limit Values relate to nitrogen dioxide (NO₂) and Particulate Matter smaller than 10 µm (PM₁₀) which must not exceed 40 µg/m₃ as an annual mean (i.e. measured over a calendar year). The primary drivers for these 'Limit Values' are public health concerns associated with NO₂ and PM₁₀. Specific health impacts for these pollutants can be summarised as follows²:

- NO₂: high concentrations can lead to inflammation of the airways. Long-term exposure can increase symptoms of bronchitis in asthmatic children and reduced lung development and function; and
- PM: Long-term exposure can increase risk of developing cardiovascular and respiratory diseases, including lung cancer. Research shows that particles with a diameter of 10 microns and smaller (PM₁₀), and especially particles with a diameter of 2.5 microns or smaller (PM_{2.5}) can be inhaled deep into the respiratory tract.

More generally, a range of other public health issues are linked to poor air quality, as detailed below. These issues are believed to affect at-risk groups such older people, children, people with pre-existing lung and heart conditions³.

- Long-term exposure to air pollution is linked to chronic mortality;
- Long term exposure can also reduce life expectancy by increasing deaths from lung, heart, and circulatory conditions;
- Short term exposure can contribute to adverse health effects including exacerbation of asthma, effects on lung function and increases in hospital admissions; and
- Other adverse health effects including diabetes, cognitive decline and dementia, and effects on the unborn child⁴ are also linked to exposure.

In light of the public health issues outlined above, the UK government is legally responsible for ensuring that it complies with the provisions of the EU Air Quality Directives. The Government assesses air quality compliance with the European Directive in 43 areas across the country at single locations, using both monitoring and modelling. It uses Defra's Pollution Climate Mapping (PCM) model to forecast exceedances, which is adjusted based on the monitored data. This is the approved means of reporting air quality information to assess legal compliance with the European legislation.

2.3.2 UK Government requirements

To meet UK Government regulations, local authorities must demonstrate that they are working towards the National Air Quality Objectives. The objective level for concentrations of NO₂ and PM₁₀ within the national legislation are the same as the European regulations (annual mean of 40 µg/m³) but are applied and assessed differently. Air Quality Objectives only apply where people are exposed for the averaging period of the objective (i.e. for a year) and therefore compliance with air quality objectives is assessed most commonly at building facades (where people are regularly present) including around busy major junctions.

The Government's Local Air Quality Management (LAQM) regime requires all local authorities to regularly review and assess whether Air Quality Objectives (AQOs) have been achieved at relevant locations. Where the assessment shows exceedances at relevant locations, the authority must declare an Air Quality Management Area (AQMA) and prepare an action plan which identifies appropriate measures in pursuit of the objectives.

² [Ambient \(Outdoor\) Air Quality and Health Fact Sheet](#). World Health Organisation (2016). Accessed February 2018.

³ World Health Organization (2013) *Review of evidence on health aspects of air pollution – REVIHAAP Project*. <http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2013/review-of-evidence-on-health-aspects-of-air-pollution-revihaap-project-final-technical-report>

⁴ Royal College of Physicians (2016) *'Every breath we take: the lifelong impact of air pollution'*, 2016 www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution

2.3.3 Local Assessment

The results of the national modelling indicate widespread exceedances in NO₂ along several arterial routes into the city centre of Bristol, including the M32. It should be noted that monitoring locations are not necessarily at the same distance from the road as is assumed in the PCM model, and hence some differences would be expected between the PCM outputs and monitored exceedances. Monitoring locations largely represent relevant exposure where practical.

BCC collects NO₂ monitoring data using a combination of automatic (a series of reference method instruments approved for use by Defra) and non-automatic (passive diffusion tube) monitoring. The local monitoring data shows greater and more widespread exceedances than are indicated within the PCM model in Bristol. Figure 2 1 shows the PCM modelled concentrations in Bristol (required to meet European regulations), and the local monitoring data recorded by BCC (required to meet UK Government regulations) as recorded in 2015.

The UK Government’s latest air quality plan (July 2017) identifies that for the majority of non-complying zones, a network of Clean Air Zones is the most effective route to compliance of annual mean NO₂ with legal limits. Defra’s vision for Clean Air Zones is: “Clean Air Zones improve the urban environment to support public health and the local economy, making cities more attractive places to live, work, do business and spend leisure time. They support cities to grow and transition to a low emission economy thus ensuring these benefits are sustainable for the long term.” The UK government has discretionary powers to pass on their responsibility (and associated legal outcomes) to local authorities.

BCC was directed in July 2017 to produce a Local Clean Air Plan to address the air quality Limit Value exceedances within Bristol to achieve compliance with the NO₂ legal limit in the shortest possible time and reduce human exposure as quickly as possible. There are both public health and regulatory imperatives for improving air quality in Bristol City.

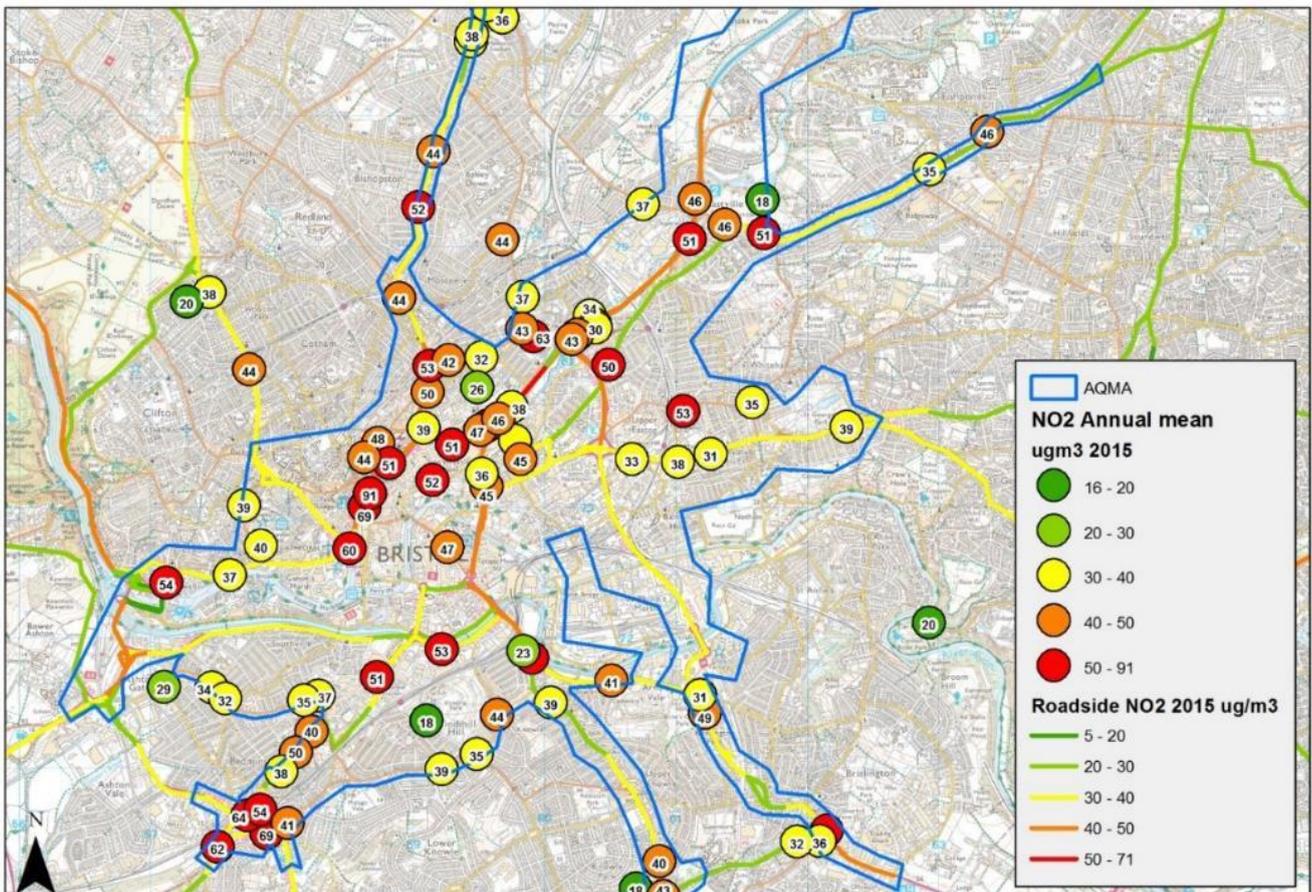


Figure 2.1: Comparison of Annual Nitrogen Dioxide Concentrations Measured at Monitoring Sites in Bristol and Estimated by the PCM Model

2.3.4 Local Health Impacts

Bristol City Council's 2019 Air Quality Annual Status Report states: *Air pollution has negative impacts on the health of people in Bristol, especially vulnerable members of the population. Evidence suggests that it can cause permanent lung damage in babies and young children and exacerbates lung and heart disease in older people. A recent report into the health effects of air pollution in Bristol concluded that around 300 premature deaths each year in the City of Bristol can be attributed to exposure to NO₂ and fine particulate matter (PM_{2.5}), with roughly an equal number attributable to both pollutants. This represents about 8.5% of deaths in the administrative area of Bristol being attributable to air pollution. This has an estimated cost to the NHS of £83m.*

2.4 Transport, Business and Air Quality: Policy Context

2.4.1 Policy Context

2.4.1.1 Links between Transport, Business and Air Quality

Transport is widely acknowledged as a key driver of air quality issues, with highway traffic problems such as congestion and fleet composition considered as a primary source of air pollution. For example, the Department for Environment, Food and Rural Affairs (DEFRA) have estimated that within areas of the UK that are exceeding NO₂ limits, 80% of the NO_x emissions at these locations is due to transport, with diesel cars and vans being the largest source of emissions⁵. The causal link between road transport and air quality is even more marked in Bristol City, given that 59% of locally controllable nitrogen dioxide within the City of Bristol is associated with local road traffic.⁶

Further, despite the long-term shift towards less-polluting road vehicles, background traffic growth associated with economic development could delay the betterment of, or even worsen, traffic-related air quality issues. Therefore, even though the fleet composition may become more environmentally friendly over time, absolute growth of vehicle numbers on the network could suppress the air quality benefits that improved fleet composition would be expected to provide.

Growth in vehicular traffic is tied to economic development and growth. Within this context, it is critical to understand the interactions between transport, economic development and air quality policy.

2.4.1.2 Sub-regional Policy and Strategy

Bristol sits within a wider economic region known as the West of England (which includes Bath North East Somerset, Bristol, North Somerset and South Gloucestershire) and is part of the West of England Combined Local Authority known as WECA (which is formed of the above authorities minus North Somerset).

Air quality considerations need to be at the heart of transport and business planning policy and strategy at the sub-regional level if improvements are to be realised. The West of England LEP's Strategic Economic Plan (2015-30) established the economic vision for the sub-region. This explicitly recognises the need to improve and protect air quality by aiming to achieve economic growth and development with no detriment to air quality.

The Draft West of England Joint Local Transport Plan 4 (2019-36) has been prepared by WECA and the four West of England local authorities. It supports delivery of the more detailed interventions set out in local transport strategies across the region. One of the five objectives for the draft plan is to 'address poor air quality and take

⁵ Improving Air Quality in the UK: tackling nitrogen dioxide in our towns and cities (May 2017) https://consult.defra.gov.uk/airquality/air-quality-plan-for-tackling-nitrogen-dioxide/supporting_documents/Draft%20Revised%20AQ%20Plan.pdf

⁶ Item 2.9 <https://www.bristol.gov.uk/documents/20182/32675/Health+Impacts+of+Air+Pollution+in+Bristol+February+2017/4df2fce5-e2fc-4c22-b5c7-5e7a5ae56701>

action against climate change'. There are five outcomes associated with this objective that this plan is seeking to achieve, as follows:

- NOx, particulates and carbon emissions are reduced;
- Air quality in the AQMAs is improved;
- Air quality remains better than national standards outside the AQMAs;
- The transport network is resilient and adaptable; and
- Technological advances to improve air quality and monitoring are embraced.

Within the Local Connectivity section of the plan there is a policy to 'support the identification and implementation of measures that will improve air quality', which demonstrates the importance given to air quality in JLTP4. This section identifies three interventions, to:

- Support ongoing work to manage the impact of transport on air quality and climate change;
- Support ongoing work on Clear Air Zones and the UK Air Quality Plan; and
- Support work on Zero and Low Emission Vehicles.

As part of this, the authorities have committed to 'support the preparation of Air Quality Action Plans and delivery of specific measures identified to improve air quality'.

The West of England was awarded £7m Go Ultra Low (GUL) Funding to spend over 5 years to promote the uptake of electric vehicles (EVs) across the region, following a Go Ultra Low West (GULW) bid. There was a target set of 5,000 new EV registrations per year in the West of England, by 2020. GULW included initiatives such as installing over 120 new public charging point connections within the west of England in addition to building 4 rapid charging hubs (under Revive which is the council's charging infrastructure project team), providing 50% match funding for charge points to be installed in businesses across the four WECA local authority areas and adding over 70 electric vehicles to local authority car fleets within the West of England.

The GULW project is now at the closing stage of the project. The Revive vehicle charging network has been launched (replacing Source West). The final completion of new sites has been delayed due to the COVID-19 pandemic, but is still on track to deliver the expected benefits by the end of 2021. Early Revive network use continues to increase and we are investigating the best method to accurately measure EV uptake specific to the GULW region. It is considered that there will be a transition to electric vehicles over the next 10 years, but the rate of conversion is hard to estimate, and will not alone be able to resolve air quality issues in the city; electric vehicles will not reduce the need for the CAZ scheme in the short term, although the CAZ may help accelerate the uptake of electric mobility.

2.4.1.3 Local Policy and Strategy

BCC is responsible for the development of local policies and transport plans that support the delivery of both West of England and Bristol aims and policies. As a result, it is necessary to assess how the various options considered to improve the air quality in Bristol will align with and support the realisation of the strategic objectives within the policy documents. The key strategic themes and principles of the existing policies overlap with several of critical success factors used in the economic assessment, including those related to air quality improvements, benefits to the economy, social inclusion and public health benefits.

The Bristol City Council Corporate Strategy covers the period from 2018 – 2023. This strategy includes aims to 'keep Bristol on course to be run entirely on clean energy by 2050 whilst improving our environment to ensure people enjoy cleaner air, cleaner streets and access to parks and green spaces'.

A draft Bristol Transport Strategy⁷ was prepared in 2018 to fill the gap in transport policy for Bristol between the West of England level (JLTP4) and individual transport strategies, such as walking and cycling. The Transport Strategy was consulted on at the end of 2018 and was adopted in July 2019⁸. The vision is for Bristol to be *'a well-connected city that enables people to move around efficiently with increased transport options that are accessible and inclusive to all'*. It focuses on how we can get people from all areas of the city to be able to access jobs, training, education and everyday facilities by many different transport options, such as buses, trains, cycling and walking. The aim is to reduce congestion and address wider challenges by exploring, enabling and delivering actions with neighbouring councils and other groups and partners across the city. The Transport Strategy is supported by a number of mode specific plans that will support the wider air quality objection. This includes work on options for mass transit, park and ride and the development of a Parking Strategy. The Parking Strategy is based on a number of key objectives including the reduction of private car use, enhancement of the vitality of the city, encouraging alternative modes of travel and guiding appropriate scale, location and standards of all car parking within the city. These will all support the wider air quality objective.

The Bristol One City Plan outlines how the city will become an inclusive and sustainable city by 2050. The aim of the One City Plan is to bring together the ideas and goals of many stakeholders across Bristol and combine these into a focused long-term plan for the city. The vision is to make Bristol *"a fair, healthy and sustainable city. A city of hope and aspiration, where everyone can share in its success"*.

The Plan includes six priority themes that will be worked towards, including Connectivity; Economy; Health and Wellbeing; Homes and Communities; Learning and Skills. Goals for each decade will be set around these themes. Change will be promoted by facilitating participation in the Plan, creating more resilient public services by promoting shared agendas, and enabling the City Office to work as a hub to support and coordinate city resources.

The key strategic themes and principles of the existing strategy documents are set out in Table 2.1.

2.4.1.4 National policy landscape

In January 2019 the Government published a Clean Air Strategy for England in which air pollution as referred to as the top environmental risk to human health in the UK. The Strategy acknowledged the damaging effects of roadside and industrial pollution and set out the case for tackling other sources of air pollution, including from agricultural food production, heating homes and cleaning with certain solvents.

Some elements of the Clean Air Strategy require legislation. Provisions in the Environment Bill will introduce a duty to set a target for PM2.5, a further long-term air quality target, and will amend the local authority air quality framework and powers. The Bill will also establish a new environmental governance body. This is intended to take over the role of European Institutions in the wake of Brexit. This new body will have a role in monitoring and enforcing air quality policy across England. The progress of the Environment Bill through Parliament has been delayed due to the pandemic. Environmental organisations are concerned that in turn this will delay the establishment of the new governance body. The Bill will also require the Government to set an (unspecified) target for PM2.5.

The Covid-19 pandemic has brought air quality back to the fore with concerns arising about whether there is a link between poor air quality and Covid-19 outcomes. It is accepted that poor air quality makes people more susceptible to respiratory infections and other illnesses. The NHS has warned that those people with certain pre-existing conditions, such as respiratory illnesses, may have an increased vulnerability to Covid-19. The Government has said that there is no clear evidence to suggest that nitrogen dioxide and / or nitric oxide have a direct link to the infection rate or death rate of Covid-19. Public Health England and other Government departments are undertaking reviews, which includes *'assessing whether there is any evidence of an association between exposure to gaseous pollutants or particulates and Covid-19 mortality in the United Kingdom.'*

⁷ <https://www.bristol.gov.uk/documents/20182/3641895/Bristol+Transport+Strategy+-+adopted+2019.pdf/383a996e-2219-dbbb-dc75-3a270bfce26c>

⁸ <https://www.bristol.gov.uk/documents/20182/3641895/Bristol+Transport+Strategy+-+adopted+2019.pdf/383a996e-2219-dbbb-dc75-3a270bfce26c>

There have been calls for a 'green recovery' from Covid-19, which includes asks on improving local variations in air quality.

Table 2.1: Objectives of policies relevant to Air Quality

Policy	Objective			
	Economic	Environmental	Social	Other
West of England Local Enterprise Partnership's Strategic Economic Plan	<ul style="list-style-type: none"> Create the right conditions for business to thrive. Give confidence and certainty to our investors to attract and retain investment to stimulate and 9 minimizing9 growth. Ensure a resilient economy, which operates within environmental limits. That is a low carbon and resource efficient economy, increases natural capital, and is proofed against future environmental, economic and social shocks. 		<ul style="list-style-type: none"> Create places where people want to live and work, through delivery of cultural infrastructure and essential infrastructure, including broadband, transport and housing to unlock suitable locations for economic growth. Shape the local workforce to provide people with skills that businesses need to succeed and that will provide them with job opportunities. Ensure all our communities share in the prosperity, health and well-being and reduce the inequality gap. 	
Core Strategy	<ul style="list-style-type: none"> To deliver a city with sustainable economic and housing growth 	<ul style="list-style-type: none"> A city which reduces its carbon emissions and addresses the challenges of climate change 	<ul style="list-style-type: none"> An accessible and digitally connected city with a transport system which meets its needs A safe and healthy city made up of thriving neighbourhoods with a high quality of life A prosperous, cohesive and sustainable city, a regional capital which is a great place to live 	
Joint Local Transport Plan 4	<ul style="list-style-type: none"> Support sustainable and inclusive economic growth 	<ul style="list-style-type: none"> Address poor air quality and take action against climate change Create better places 	<ul style="list-style-type: none"> Enable equality and improve accessibility Contribute to better health, wellbeing, safety and security 	
Bristol Council Corporate Strategy		<ul style="list-style-type: none"> Will put Bristol on course to be run entirely on clean energy by 2050 whilst improving our environment to ensure 	<ul style="list-style-type: none"> Build 2,000 new homes (800) affordable per year by 2020 Deliver work experience and apprenticeships for every young person 	

		people enjoy cleaner air, cleaner streets and access to parks and green spaces	<ul style="list-style-type: none"> Protect children’s centre services Increase the number of school places and introduce a fairer admissions process Will be a leading cultural city, making culture and sport accessible to all 	
Bristol Transport Strategy	<ul style="list-style-type: none"> Support sustainable growth by enabling efficient movement of people and goods, reducing carbon emissions and embracing new technologies 		<ul style="list-style-type: none"> Provide transport improvements to accommodate increased demand from growth in housing, jobs & regeneration on an already congested network with complex movements from within and outside the city boundary. Enable equality within an inclusive transport system that provides realistic transport options for all. Create healthy places, promoting active transport, improving air quality, and implementing a safe systems approach to road safety. 	<ul style="list-style-type: none"> Create better places that make better use of our streets and enable point to point journeys to be made efficiently. Enable reliable journeys by minimising the negative impacts of congestion and increasing network efficiency and resilience.
Bristol Parking Strategy			<ul style="list-style-type: none"> Enhance the vitality of the city. 	<ul style="list-style-type: none"> Reduce unnecessary use of private cars especially in the city centre. Encourage alternative modes of transport. Guide appropriate scale, location and standards for all private and public parking, including branding of all city parking
Bristol One City Plan	<ul style="list-style-type: none"> By 2050 everyone in Bristol will contribute to a sustainable, inclusive and growing economy from which all will benefit 	<ul style="list-style-type: none"> By 2050 Bristol will be a sustainable city, with low impact on our planet and a healthy environment for all 	<ul style="list-style-type: none"> By 2050 everyone will be well connected with digital services and transport that is efficient, sustainable and inclusive; supporting vibrant local neighbourhoods and a thriving city centre. By 2050 everyone in Bristol will have the opportunity to live a life in which they are mentally and physically healthy 	

Strategic Case

			<ul style="list-style-type: none">▪ By 2050 everyone in Bristol will live in a home that meets their needs within a thriving and safe community▪ By 2050 everyone in Bristol will have the best start in life, gaining the support and skills they need to thrive and prosper in adulthood	
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2.5 Assessment of Baseline Air Quality and Transport Conditions

2.5.1 Original Baseline

In 2013, BCC commissioned CH2M (now Jacobs) to update the existing GBATS model, primarily to assess the MetroWest scheme. The updated model is called the GBATS4 Metro Model (GBATS4M). The GBATS4M model consists of:

- A Highway Assignment Model representing vehicle-based movements across the Greater Bristol area for a 2013 autumn weekday morning peak hour (08:00-09:00), an average inter-peak hour (10:00-16:00) and an evening peak hour (17:00-18:00);
- A Public Transport (PT) Assignment Model representing bus- and rail-based movements across the same area and time periods; and
- A five-stage multi-modal incremental Variable Demand Model (VDM) that forecasts changes in trip frequency and choice of main mode, time period of travel, destination, and sub-mode choice, in response to changes in generalised costs across the 12-hour period (07:00-19:00).

The air quality model base year is 2015 since the 2017 data was not available at the time the model was developed, and in 2016 there was a significant amount of disruption from roadworks in the city (related to the Metrobus scheme) which prevented some monitoring data from being collected and altered the typical travel patterns across the city.

As the GBATS4M model has a base year of 2013, a 2015 traffic model has been developed to support this by interpolating from the 2013 and 2021 models. It was therefore pragmatic to undertake disaggregation of the traffic model by vehicle compliance / fuel type in the 2015 model rather than 2013. The validation of the 2015 fleet composition will be reported within the T4 Transport Modelling Forecast Report.

2.5.2 Updated Baseline

The Baseline model has been updated for the FBC to include a number of Street Space schemes being implemented across Bristol.

The Street Space schemes have been/are being implemented to open up road space usually reserved for parking and movement of general traffic to public transport, cyclists and pedestrians to:

- Enable better social distancing, especially in local shopping areas;
- Encourage people to travel by bike or walk; and
- Reduce air pollution.

The model years for the Street Space Baseline model are:

- 2021 – the planned opening year of the CAZ scheme⁹; and
- 2023 – the compliance year of the CAZ scheme.

Technical work undertaken for the Strategic Outline Case¹⁰ indicated compliance was likely to be achieved at most locations in the year of opening (2021). The latest analysis undertaken since the OBC submission has indicated a compliance year of 2023 and hence that year has been modelled as the compliance year for the FBC.

The Street Space schemes have been coded directly into the 2021 and 2023 Baseline SATURN Highway models for the AM, Inter-peak and PM and run with the variable demand model (VDM). Therefore, there will be some demand suppression as a result of the schemes and also the effects of re-routing through the Bristol network. It should be noted that the VDM does not apply to LGVs, HGVs and Coaches. The growth for each year is applied

⁹ The scheme is now planned to open in 2022

¹⁰ <https://www.cleanairforbristol.org/bristols-clean-air-plan/>

separately and is fixed. Due to the Street Space schemes significantly reducing the capacity within Bristol city centre, some signal optimisation has been required to reduce over capacity delays, particularly along Marlborough Street, Rupert Street and Lewins Mead. Network congestion has an adverse impact on air quality and therefore this optimisation was undertaken in order to improve the representation of the scheme in the modelling.

The inclusion of the Street Space schemes now provides an updated Baseline model against which the Clean Air Zone scheme requirements can be assessed. No reduction of traffic levels has been modelled in this scenario to reflect COVID-19 impacts.

There is a limit to how much the detailed operational on-street measures can be reflected in a strategic transport model, hence it will be important to monitor the operation of the Street Space schemes on-street and potentially refine the scheme further based on recently observed conditions and traffic volumes. See 'Street Space Baseline Modelling' report appended to the FBC for more details.

2.5.3 Consideration of recent traffic volume and air quality data

Bristol City Council have collated traffic and air quality data to consider the impact of the COVID-19 pandemic. Combining the evidence base available for both traffic volumes and air quality before, during and post lockdowns, the work concluded that the evidence shows a decline in traffic volumes and improvements to air quality during the first lockdown in particular. The second lockdown however, was less restrictive than the first and as such didn't lead to such a steep decline in traffic volumes. Following lockdown 2 and a subsequent transition between tiers 2 and 3, traffic numbers appeared to have returned to that of a similar pattern to pre-lockdown and a worsening of air quality in some parts of the city.

For comparative purposes, data from October 2019 and October 2020 was considered as October 2020 was the key period when traffic had most chance to return to normal levels; before the lockdown 2 and Christmas period changed things again. This showed that traffic in the critical locations during October 2020 was 82% of that same time the previous year.

Taking everything into consideration, it was concluded that with some areas of the city back to near normal traffic levels (although not all), that compliance will not be achieved at a small number of key sites by non-charging measures alone and therefore this means that annual compliance will not be met.

2.5.4 Air Quality in Bristol

Section 2.2 establishes that the key drivers for improving air quality in BCC relate to public health and regulatory issues. Non-compliance with the EU's Limit Values and the UK Governments AQOs for NO₂ represents a significant threat to public health and BCC legal and regulatory responsibilities. As such, it is essential that a robust understanding of the current and future, scale and extent of exceedances is established under the reference case, informed by baseline air quality modelling.

2.5.5 Monitoring data in Bristol

Air quality monitoring in Bristol is comprehensive and long standing. Bristol's monitoring network is focused on NO₂ as the concentrations of this pollutant near busy roads exceed the health-based national Objectives and European Limit Values, though some data is available about particulate matter. The current air quality situation in Bristol is presented in the form of a map in Figure 2-2, showing measurements of nitrogen dioxide at locations within the city centre.

The Bristol City Council and Defra monitoring network in 2019 consisted of:

- 7 real time NO₂ monitors which provide continuous live data which is uploaded automatically to a public website: <https://opendata.bristol.gov.uk/pages/air-quality-dashboard-new/air-quality-now#air-quality-now>

- 4 real time particulate monitors (1 x PM_{2.5} and 3 x PM₁₀)
- 102 NO₂ diffusion tubes which provide a monthly and annual concentration for this pollutant.

In BCC's Annual Status Report for 2019, states that:

- Taking an average of all diffusion tube sites for which there is data since 2015 (78 in total) there has been an average of an 8.7µg/m³ reduction in annual NO₂ values over the period 2015-2019. When looking at the difference between 2019 data compared to 2018 at the 85 sites with data for both years, the average reduction in NO₂ concentrations was an average of a 6.6µg/m³ reduction. These monitoring sites are kerbside or roadside sites with the exception of two urban background sites.
- Consideration of trends in NO₂ concentrations at a selection of kerb/roadside sites on the busiest road corridors throughout Bristol, since 2010, show that a similar pattern is observed in all parts of the city. Monitoring has shown consistent exceedance of the annual objectives for NO₂ at many locations but with a consistent reduction in concentrations of NO₂ over this period. Some sites have seen larger reductions than others over this period. The red line at 40µg/m³ in Figure 2-3 represents the annual objective for nitrogen dioxide.

The city centre NO₂ measurements shown in Figure 2-3 are all above the Air Quality Objective. All these sites are at roadside locations, which is an indication of the source of the air quality problem. As is shown in Figure 2-2, many parts of Bristol, especially near busy roads and in the city centre, NO₂ exceeds legal national objectives and European Limit Values.

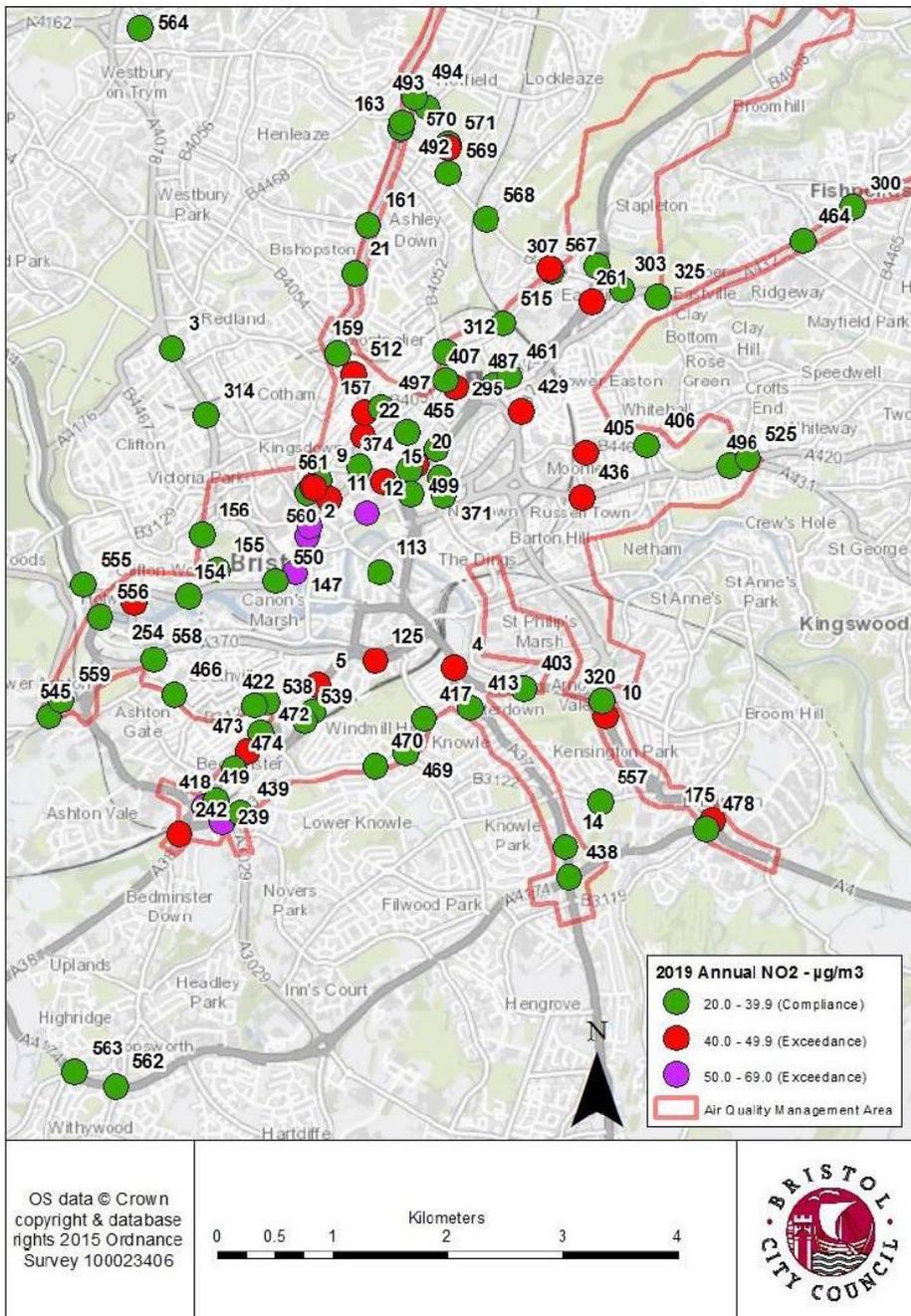


Figure 2.2: Annual mean NO₂ concentrations across the Bristol Urban Area in 2019 (taken from BCC's Air Quality Annual Status Report, 2020)

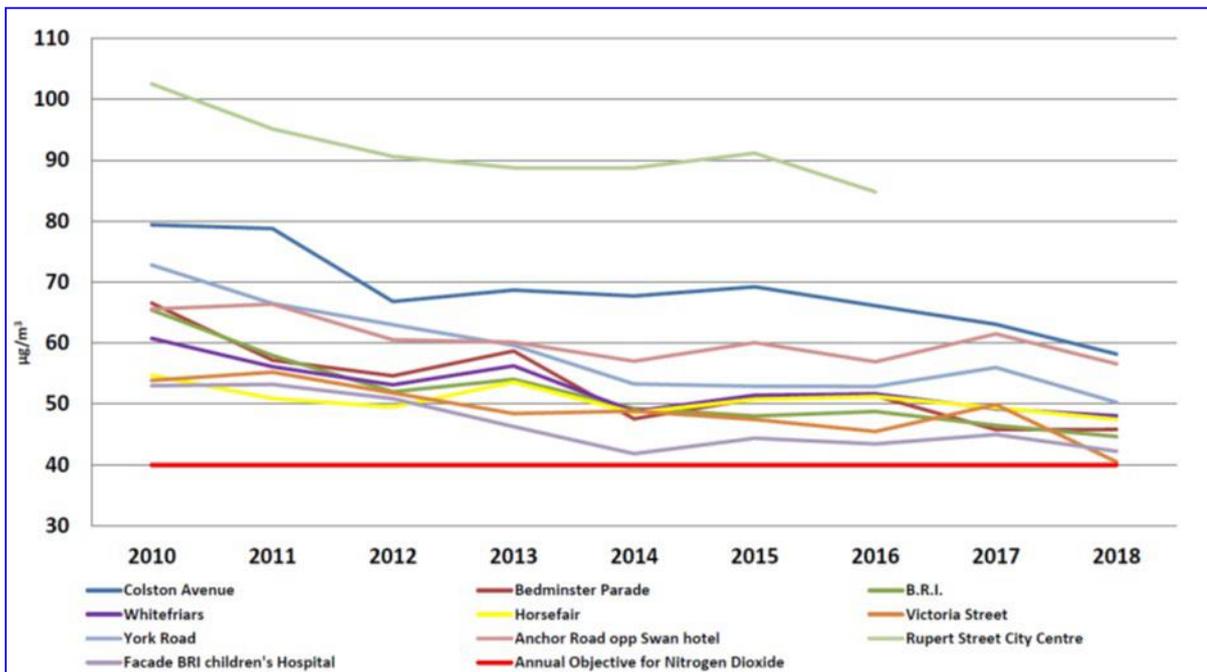


Figure 2.3: Trends in Annual NO₂ at City Centre Sites (2010-2018) A (taken from BCC's Air Quality Annual Status Report, 2019)

2.5.6 Source Apportionment

There are many sources of NO_x and PM₁₀ in the UK, including, but not limited to, power stations, transport, domestic combustion (including wood burning stoves), agriculture and industrial processes. The National Atmospheric Emissions Inventory (NAEI) provides estimates of the amount of different pollutants that are emitted to the air each year from human activity in the UK. Road transport is the main contributor of emissions of nitrogen oxides (NO_x), particularly at roadside locations, and therefore the predominant cause in locations where NO₂ concentrations are not complying with Limit Values or Air Quality Objectives.

Nitrogen oxides is a generic term which includes both NO and NO₂. According to NAEI estimates, around a third of the UK NO_x emissions in 2015 arose from road transport, most of which came from diesel vehicles (NAEI, 2017)¹¹. Some disparities exist due to the increase in the proportion of NO_x emitted directly as NO₂ (also known as primary NO₂) from the exhausts of modern diesel vehicles, as a result of emission control systems that aim to reduce total NO_x and particulate matter emissions. Contributions from transport to NO_x emissions, in central Bristol will be higher than the UK as a whole. No other major sources of NO_x (e.g. from energy production, domestic combustion or other industrial processes) have been identified within the Bristol area, and other sources of NO_x are included in the background concentrations. Background concentrations are those measured well away from any significant sources of pollution, such as busy roads, railway lines or industrial sites with emissions to air, or modelled based on monitored background concentrations.

Emissions of NO_x are a combination of nitrogen oxide (NO) and NO₂ and are dependent on the type of vehicle (both in terms of size and age of the vehicle). Figure 2-4 shows the proportion of NO_x emissions by the vehicle fleet in the centre of Bristol in 2021, calculated from the vehicle movements in the GBATS model, and the latest vehicle emission factors provided by Defra specifically for work contributing to the National Air Quality Plan. This shows that diesel vehicles contribute around 93% of the total.

¹¹ NAEI, Air Quality Pollutant Inventories for England, Scotland, Wales, and Northern Ireland: 1990-2015 (August 2017)

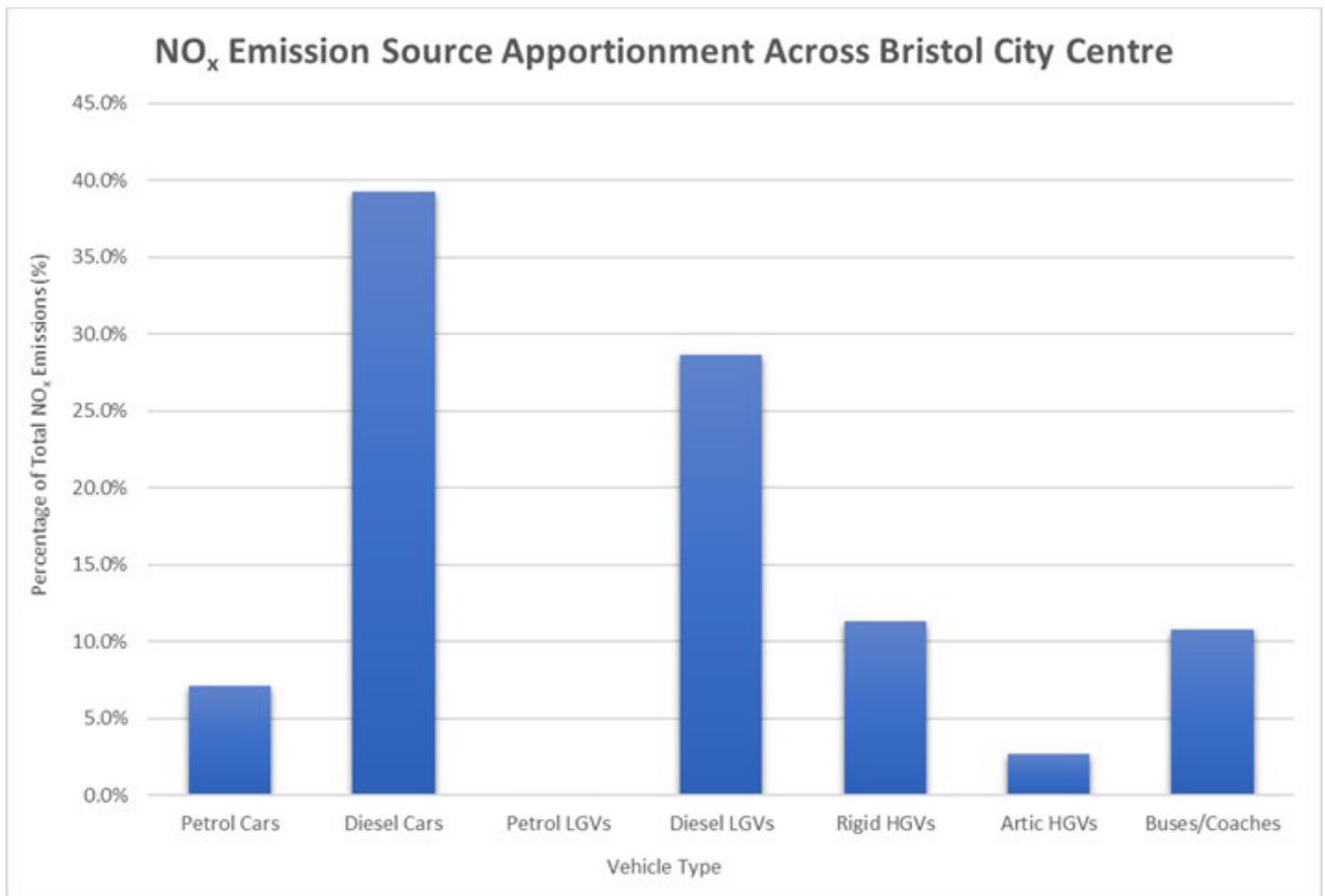


Figure 2.4: NO_x source apportionment by vehicle category across Bristol City Centre (%) – 2021 baseline.
Source: Option Assessment Report, appended to the FBC. Air Quality Model Specification

This section of the FBC discusses the results of the modelling without the CAP in place, in order to understand what level the problem would be in the future without any positive interventions. This forms part of a wider set of modelled scenarios which are described below for clarity.

2.5.6.1 Baseline Results –2021

The predicted annual mean concentrations of nitrogen dioxide still shows 77 exceedances in 2021, as shown in Figure 2-5. The critical areas are predominately in the centre.

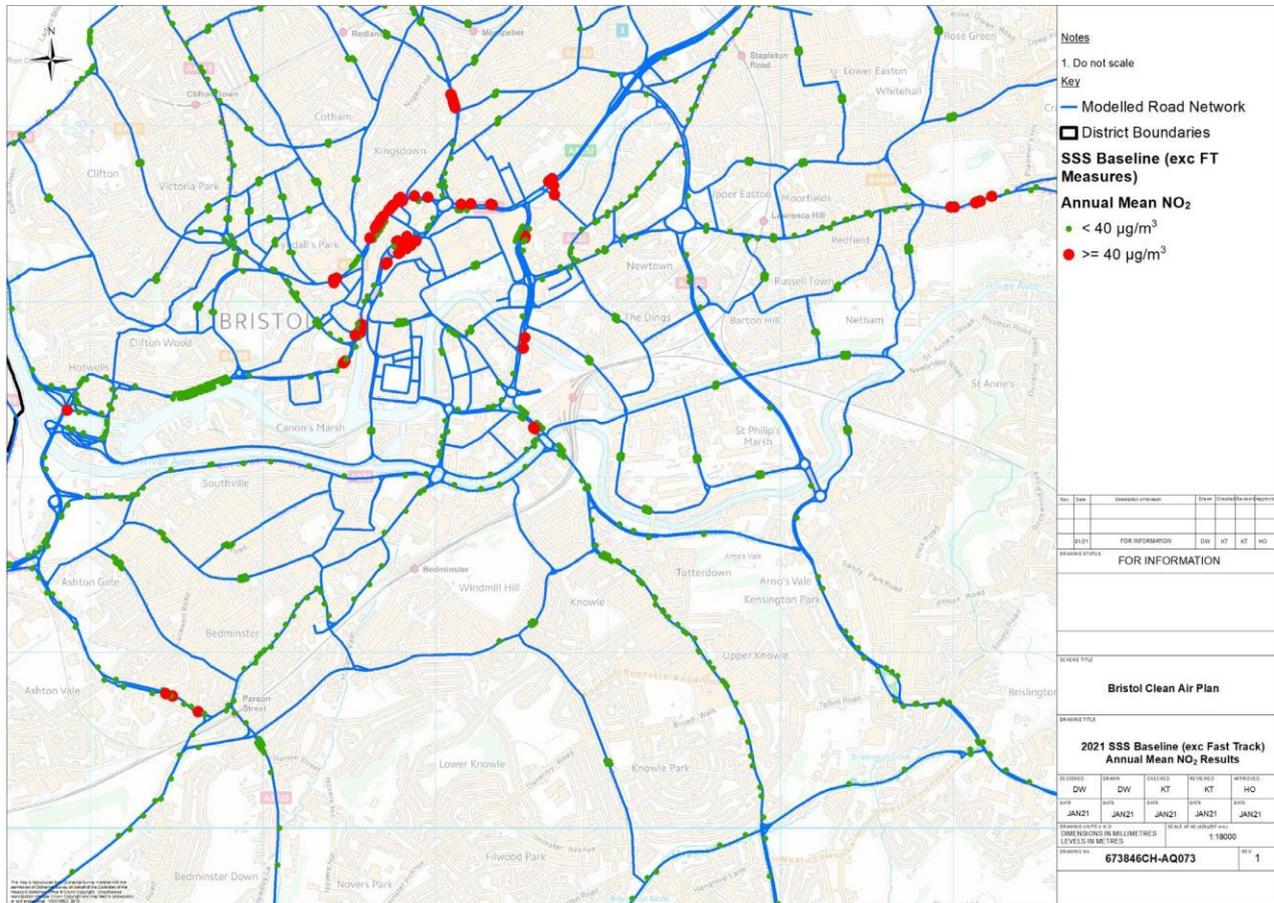


Figure 2.5: 2021 Street Space Schemes Baseline scenario modelled annual mean NO₂ results

2.5.7 AQMAs

BCC declared an AQMA in 2001 for NO₂ and PM₁₀. The boundary has been amended since but still covers the city centre and arterial routes. Approximately 100,000 people live within the AQMA and it also includes the central employment, leisure and shopping districts, major hospitals and dozens of schools. Therefore, many more than the 100,000 people who live within the AQMA are exposed to air pollution concentrations exceeding the Air Quality Objectives in their daily lives. The designation of an AQMA does not require that a Clean Air Zone be put in place; but it does require the local authority to take action to reduce levels of pollution. It should be noted that Bristol currently achieves the relevant Air Quality Objectives for PM₁₀, although the AQMA remains as a precautionary measure.

There are also three small AQMAs in South Gloucestershire, in Kingswood/Warmley, Staple Hill and adjacent to the roundabout at Junction 17 of the M5. The breaches in these areas are not as significant as those within the BCC AQMA in central Bristol.

2.5.8 Summary of problems identified

In the case of air quality in Bristol, the current problem that needs to be addressed is the identified exceedance of the legal annual mean Limit Value for NO₂. BCC has monitored and endeavoured to address air quality in Bristol since 2002. Despite this, Bristol has ongoing exceedances of the legal limits for NO₂ and these are predicted to continue until around 2027 without intervention.

The Pollution Climate Mapping (PCM) model (Base Year 2015) is a collection of models designed to fulfil part of the UK's EU Directive (2008/50/EC) requirements to report on the concentrations of particular pollutants in the atmosphere in the context of the EU Limit Values. The PCM model predicted exceedances of the nitrogen dioxide (NO₂) EU Limit Value (i.e. receptor locations alongside roads on the PCM network) within Bristol, including on Newfoundland Way. Local monitoring data provides evidence of more widespread NO₂ exceedances within Bristol than was indicated within the PCM model. The results of the 2017 BCC NO₂ monitoring for example, indicated several exceedances of the EU Limit Value, particularly in the city centre. The likely cause of the exceedances at these locations is a combination of the traffic mix (particularly diesel vehicles), road speed (i.e. slower speeds tending to increase emissions) and presence of canyons (generally tall buildings on either side of the road which prevent pollutants from dispersing as effectively as they would in an open area).

In the absence of suitably targeted interventions, the exceedances are expected to persist, meaning an improvement in public health will not be accelerated in Bristol. Therefore, BCC would fail to comply with its regulatory responsibilities as air quality problems continue.

2.6 Spending objectives and success factors

A robust case for change requires a thorough understanding of what the project is seeking to achieve. The objectives and success factors identified for the project need to be rooted in the local and strategic context (i.e. Section 2.2 and 2.3) and specific issues and problems identified (i.e. Section 2.4), which the project seeks to address.

Within this context, the primary spending objective of the Plan, in accordance with JAQU Options Appraisal Guidance and in line with the issues raised in the air quality background and context section above, is to deliver a scheme that leads to compliance with the EU's mandatory NO₂ concentration Limit Values in the shortest possible time and reduces human exposure most quickly.

A secondary spending objective is also proposed; to deliver a scheme which leads to compliance with the LAQM air quality objectives as set out in the Air Quality (England) Regulations (SI 2000/ 928 as amended). The difference between Limit Values and LAQM air quality objectives are set out in Section 2.2 of this document.

To support the realisation of the spending objectives documented above, a number of critical success factors (CSFs) were identified as part of the SOC process to appraise and refine the longlist of options into the shortlist of options considered at OBC and FBC stage. These CSFs can be differentiated into two groups, Primary and Secondary:

- 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 the that time) were shortlisted for further analysis; and
- 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 whilst recognising that the overriding test was delivery of compliance in accordance with the Primary CSF:
 - **Strategic**
 - Provide equity across different vehicle type and trip purpose; and
 - Compliance with Defra Draft CAZ framework, including minimum requirements.
 - **Economic**
 - Mitigate financial impact on low income households;
 - Improve health of low-income households;
 - Maximise positive effects on the economy, whilst minimising any negative impacts and
 - Improve public health across Bristol.

- **Commercial**
 - Delivery timescale risks of procurement.
- **Financial**
 - Likelihood of revenue equating to implementation/operational costs;¹²
 - Upfront capital required for scheme; and
 - Risk of financial penalty to the Council/s.
- **Management**
 - Public acceptability which could impact on the option's deliverability;
 - Political acceptability which could impact on the option's deliverability.

2.7 Case for Change

The baseline assessment work¹³ shows that in 2021, with no Clean Air Zone intervention, there will be 77 non-compliant reportable locations within Bristol. Intervention is required to ensure compliance is achieved within the shortest possible time.

2.8 Optioneering Process

2.8.1 SOC Options Analysis

A key part of the Strategic Outline Case was the option assessment work. This comprised of developing a long list of schemes, and assessing them against an evaluation criterion, which resulted in a short list of schemes for assessment in this FBC.

The primary CSF were brought together with the other secondary CSFs to develop the evaluation criteria with which the options will be refined. The evaluation criteria are set out in Table 2.2.

Table 2-2: Summary of Evaluation Criteria

Cases	ID	Evaluation Criteria	Priority
Strategic	1	Deliver compliance with NO ₂ air quality Limit Values and Air Quality Objectives in the shortest possible timescales	Pass/Fail
	2	Provide equity across different vehicle types and trip purposes	Low
	3	Compliance with the CAZ framework	High
Economic	4	Mitigate financial impact on low income households	Very High
	5	Improve health of low-income households	Very High
	6	Economic effects	Medium
	7	Improve public health	Very High
Commercial	8	Delivery timescale risks of procurement	Low
Financial	9	Likelihood of revenue equating to implementation/operational costs	n/a
	10	Upfront capital required for scheme	n/a
	11	Risk of financial penalty to the Council/s	Low

¹² Complying with the legal test which was set out by the High Court in November 2016 in R (ClientEarth) (NO₂) V Secretary of State for Environment Food and Rural Affairs [2016] EWHC 2740 (Admin), only shortlisted options which achieve compliance with the NO₂ Limit Value in the shortest possible time, are appraised across this criterion. The relevant analysis is presented in the Financial Case chapter.

¹³ Note this figure is for the Street Space scheme Baseline (excluding fast track measures) scenario

Management	12	Public acceptability	Medium
	13	Political acceptability	Medium

The SOC recommended that the following Options were considered in the development of options for consideration in the OBC:

- **Option 1** – Benchmark option – medium area Class D charging zone. In line with JAQU’s’ Option Appraisal Guidance, the lowest class required to achieve compliance in the shortest possible timescales.
- **Option 2** – Package of non-charging interventions. Having reviewed the effectiveness of the non-charging measures, the single most effective measure would be the prohibition of diesel cars from polluted parts of the city, which has been assumed to be the small zone.
- **Option 3** – Medium area Class C charging option with complementary non-charging interventions – Class C CAZ at Medium geography level with the addition of complementary non-charging measures.
- **Option 4** – Medium area Class D charging option with complementary non-charging interventions – Class D CAZ at Medium geography level.
- **Option 5** – Small area Class C charging option with complementary non-charging interventions – Class C CAZ at Small geography level, with the addition of non-charging measures.
- **Option 6** – Small area Class D charging option with complementary non-charging interventions – Class D CAZ at Small geography level, with the addition of the non-charging measures

Non-charging measures could include:

- Introduction and enforcement of anti - idling zones for buses in the city centre
- Increased Euro Standard requirements for taxis and private hire vehicles in licensing agreements
- Restrictions on goods vehicles movements in the City Centre and / or AQMA during peak hours

2.8.2 Options Developed: OBC Consideration

Following initial analysis, a further option of a diesel car exclusion over a small area with bus and taxi fleet improvement to Euro 6 or better (Option 2c) was developed to improve compliance.

The results of the modelling showed that Options 4 and 2c were the better performing options in terms of NO₂ compliance. Further economic assessments were undertaken for each of the two options. The economic assessments concluded Option 4 would achieve compliance at all locations by 2027, with the exception of the north section of Upper Maudlin Street, which would be compliant by 2030. Comparatively, Option 2c was expected to achieve compliance at all locations by 2023, with the exception of the north section of Upper Maudlin Street which would be compliant only by 2024.

However, following consideration of these results, it was decided that the impact of the identified options on lower income households was such that there was a need to identify further options which would meet the air quality obligations of the Council but avoid or reduce these impacts. Following this decision, the BCC Mayor and JAQU were in contact to resolve the issue of clean air and identify a way forward that would meet all priorities and aims.

2.8.2.1 Development of Variant 1

The priority of Variant 1 was to achieve compliance with the legal tests; however it also aimed to develop an option that targeted reduction of NO₂ from taxis, HGVs, LGVs, Buses/Coaches, since restrictions to these vehicle classes has less impact on lower income households than restrictions for cars. The BCC Mayor is keen to develop a sustainable scheme to achieve air quality compliance, and which is integrated into the other future vision, plans and projects currently being developed across the city, including the One City Plan.

Variant 1 includes the following measures:

- Fleet improvements to all buses to Euro 6 (this will also be in the reference case);
- All BCC taxis and private hire vehicles are upgraded to compliance (this will also be in the reference case);
- Increased use of Avonmouth freight consolidation site;
- Upgrade all BCC waste vehicles to Euro 6 or better – (it should be noted that this component was not modelled);
- Ban HGVs from NO₂ critical links;
- A car scrappage scheme;
- Bus and local traffic interventions in the most polluting areas; this includes a Park and Ride on the M32, an inbound bus lane on the M32 from Junction 2 to Cabot Circus car park, an inbound bus lane on Cumberland Road, and using existing traffic signals to control the amount of traffic entering congested areas with poor air quality.

Modelling indicated that the Variant 1 option would achieve a compliance date of 2030 which was driven by compliance at Marlborough Street (i.e. this would be the location that meets compliance last). This compliance date is later than the Hybrid Option and New Benchmark Option (2027).

2.8.2.2 New Option 1

New Option 1 consisted of the following measures:

- A charging scheme for non-compliant buses, taxis, HGVs and LGVs (a Class “C” CAZ). This charge applies once a day regardless of how many times you go in or out of the medium zone.
 - Taxis, PHVs, LGVs £9.00
 - HGVs, Buses and Coaches £100.00
- A 24-hour a day seven days a week HGV weight restriction (3.5 tons) on some of the most polluted routes: Rupert St, Baldwin Street, Park Row/Upper Maudlin Street, Marlborough Street and Lewins Mead.
- A diesel car ban on Upper Maudlin Street and Park Row running from St James Barton roundabout to Park Street – not including James Barton roundabout itself. 7am-3pm, 7 days a week (does not apply to taxis, private hire vehicles or emergency vehicles).
- Bus and local traffic interventions in the most polluted areas; this includes a Park and Ride on the M32, an inbound bus lane on the M32 from Junction 2 to Cabot Circus car park, an inbound bus lane on Cumberland Road, and using existing traffic signals to control the amount of traffic entering congested areas with poor air quality.

The New Option 1 differed to Variant 1 in that Variant 1 did not include a charging zone, whereas Option 1 consisted of a CAZ C zone.

2.8.2.3 New Option 2

This option refined the 24-hour diesel car ban option modelled in Step 1 and 2 (Option 2c) with an 8-hour restriction. This was modelled because the previous diesel car ban option had the shortest compliance date. The option comprised a diesel car ban over a specific small central area from 7am to 3pm, 7 days a week (does not apply to taxis, private hire vehicles or emergency vehicles). The scheme could be complemented by mitigation schemes including a local scrappage scheme.

2.8.2.4 New Benchmark Option: Medium CAZ D with New Option 1 components (private cars charged)

This option represented the “benchmark” option, and included:

- A charging scheme for non-compliant cars, buses, taxis, HGVs and LGVs (A Class “D” CAZ). This charge applies once a day regardless of how many times you go in or out of the medium zone.
- A 24-hour a day seven days a week HGV weight restriction (3.5 tons) on some of the most polluted routes: Rupert St, Baldwin Street, Park Row/Upper Maudlin Street, Marlborough Street and Lewins Mead.
- A diesel car ban on Upper Maudlin Street and Park Row running from St James Barton roundabout to Park Street – not including James Barton roundabout itself. 7am-3pm, 7 days a week (does not apply to taxis, private hire vehicles or emergency vehicles).
- Bus and local traffic interventions in the most polluting areas; this includes a Park and Ride on the M32, an inbound bus lane on the M32 from Junction 2 to Cabot Circus car park, an inbound bus lane on Cumberland Road, and using existing traffic signals to control the amount of traffic entering congested areas with poor air quality.
- A scrappage scheme (up to £2,000) for private diesel cars. This would provide a grant towards a new vehicle or an alternative mode of transport. Vehicles belonging to residents in Bristol, Bath & North East Somerset, North Somerset and South Gloucestershire would be eligible – as long as their drive into work includes the Option 1 charging zone area or they live in the area.

2.8.2.5 Hybrid Option of New Option 1 and New Option 2

The Hybrid Option was developed in order to improve the year of compliance and offer the best solution to the air quality problems within the city. It was also a response to a number of comments within the consultation (July/August 2019), suggesting that combining Option 1 and 2 would provide a better solution to the city’s air quality issues. The Hybrid Option that was developed included:

- A charging scheme for non-compliant buses, taxis, HGVs and LGVs. This charge applies once a day regardless of how many times you go in or out of the medium zone.
- A 24hr a day seven days a week HGV weight restriction (3.5 tons) on some of the most polluted routes: Rupert St, Baldwin Street, Park Row/Upper Maudlin Street, Marlborough Street and Lewins Mead
- Bus and local traffic interventions in the most polluting areas; this includes a Park and Ride on the M32, an inbound bus lane on the M32 from Junction 2 to Cabot Circus car park, an inbound bus lane on Cumberland Road, and using existing traffic signals to control the amount of traffic entering congested areas with poor air quality.
- A scrappage scheme (up to £2,000) for private diesel cars. This would provide a grant towards a new vehicle or an alternative mode of transport. Vehicles belonging to residents in Bristol, Bath & North East Somerset, North Somerset and South Gloucestershire would be eligible – as long as their drive into work includes the Option 1 charging zone area or they live in the area.
- A diesel car ban over a specific small central area from 7am to 3pm, 7 days a week (does not apply to taxis, private hire vehicles or emergency vehicles).

The assessment was reported in the transport and air quality modelling reports appended to the OBC (Appendix D OBC -18 and OBC-19, Appendix E OBC-23 and OBC-27) showed that the Hybrid Option and the New Benchmark Option are expected to achieve compliance by 2027. The Hybrid Option compliance date was driven by exceedances at only one location - Church Road whereas the New Benchmark Option compliance date was driven by three locations (Park Street, Marlborough Street and Church Road). For this reason, this option was identified as the preferred option.

Following this work, a 2025 model scenario was developed, to provide more certainty of the compliance year. This work showed that compliance would be achieved by 2025 in the Hybrid scenario. This work was reported in the Church Road assessment and 2025 modelling report OBC-20 (Appendix D).

2.8.3 Further Option Development

2.8.3.1 Church Road Adjustment

Air Quality modelling undertaken and reported in AQ3 (OBC-19) identified Church Road as having the highest exceedance of NO₂ for the Hybrid Option. Further investigation of available data was undertaken for this location due to the high modelled concentrations and since the location is outside the scheme area, to help identify whether specific measures are required for this corridor.

Further analysis of the data at this location showed that the 2015 base modelling results had overestimated the concentrations recorded at the monitoring site by approximately 25%. Traffic flows in the GBATS model were validated at the nearby locations, near to Lawrence Hill station to the west and along the A420 further to the east, but not on the section of Church Road next to St George Park, which is the location reported as having the highest NO₂ level. Additional analysis was conducted using available count data in order to identify potential reasons for such a discrepancy in traffic flows and to establish the best estimate for AADT at this location.

Adjustment factors were identified and applied to Church Road traffic flows in order to improve the accuracy of the Air Quality modelling for this location. Two-way and directional adjustment factors were calculated (see OBC-20). Based on the differences in the comparison by direction, the directional adjustment factors were applied.

2.8.3.2 2025 Modelling

Air Quality modelling of the 2025 Hybrid scenario was undertaken. In addition to the Hybrid scenario, the modelling included an evaluation of the effects of modifying the existing traffic forecast applied to Church Road.

The 2025 traffic model was run to test the efficacy of the Hybrid scenario. In doing so, the reference case was also run for comparison with previous modelling results and to examine the current forecast of when BCC is likely to become naturally compliant with the NO₂ annual mean Limit Value. The indication is that with the Hybrid scenario, compliance will be achieved in 2025. However, accounting for adjustment to the traffic flows on Church Road which was driving non-compliance outside of the Hybrid area of influence leads to a further reduction in the maximum concentration at 2025. An indicative estimation shows that this improvement in the maximum concentration to 33.6 µg/m³ across the BCC study area could lead to an earlier compliance year of 2024.

2.8.3.3 Medium CAZ C and Small CAZ D Option

The Hybrid Option has a number of legislative risks associated with the implementation of a diesel car ban, which could have significant impacts on scheme delivery. Therefore, work was undertaken to explore alternative options, which could produce similar levels of benefits as the Hybrid Option but with lower delivery risks. This work resulted in the development of a scheme option consisting of a CAZ C across the medium zone and a CAZ D across the small zone. This medium CAZ C/Small CAZ D Option is more closely aligned to the CAZ Framework than the Hybrid option, and does not include a diesel car ban, thereby reducing delivery risks.

This option includes the following measures:

- A charging scheme for non-compliant buses, taxis, HGVS and LGVs (CAZ C) across the medium zone
- A charging scheme for non-compliant buses, taxis, HGVs, LGVs and cars (CAZ D) across the small zone
- Close Cumberland Road inbound to general traffic
- M32 Park and Ride with bus lane inbound
- Holding back traffic to the City Centre through the use of existing signals.

Updated modelling shows that both the Medium CAZ C/Small CAZ D option and Revised Hybrid option would be compliant with legal air quality limits by 2023. More detail on the modelling work can be found in the Option

Assessment Report. Based on the results of the air quality modelling the Hybrid and Medium CAZ C/Small CAZ D were progressed for further sensitivity tests and economic analysis.

2.8.3.4 Update to Baseline and Small CAZ D Option

During the COVID-19 Pandemic, a number of Street Space Schemes were implemented or planned around Bristol in order to facilitate social distancing and improve air quality. These schemes have significantly improved air quality in the centre of Bristol. It was hoped that these schemes alongside other measures would enable the council to meet its air quality aims without a charging zone. Due in part to the COVID-19 pandemic, it was not possible to demonstrate sufficient behavioural change on key corridors, such as Upper Maudlin St/Marlborough St to avoid having a charging zone. Further work was therefore carried out to assess what impact the street space schemes would have on the charging zone options and the baseline model was updated to include Street Space schemes.

In addition to this, assessment of the Medium CAZ C/Small CAZ D zone previously indicated that the majority of air quality receptors driving compliance are situated within the Small CAZ D zone. An option comprising the Small CAZ D was developed, including the following measures:

- Small Area Class D (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs);
- Fast Track Measures:
 - Closure of Cumberland Road inbound to general traffic; and
 - Detailed VMS (Variable Message Sign) strategy which includes the use of existing transport infrastructure such as traffic signals and modelling.

This option was modelled and indicated a compliance year of 2023. This scheme therefore achieves the same compliance year as the Medium CAZ C/Small CAZ D Option, without the wider economic impacts associated with a Medium CAZ C zone.

As a result of the option assessment work, the Small CAZ D Option has been taken forward for further assessment within this FBC.

In addition to the items listed above, the Fast Track Measures include the proposed Old Market Gap project which will facilitate and support the delivery of a CAZ D by completing a missing gap in active mode infrastructure on a key strategic route into the city centre. Provision of active mode infrastructure will help reduce reliance on private car for short journeys, particularly for those commuting from the north east fringe of the city centre and lower income groups. The project will help encourage all forms of movement that impact positively on the health and of the local community.

2.9 Benefits, Risks, Constraints & Dependencies

2.9.1 Benefits

The Clean Air Plan could provide benefits in the following areas:

- Public Health, including mortality rates caused to some extent by NO₂
- Transport (decongestion, journey times, accident rates)
- Financial revenue streams

2.9.1.1 Public health and the environment

The most substantial benefit of the Plan is an improvement in public health through a reduction in NO₂ concentrations. These benefits are associated with a reduction in both morbidity and mortality.

Reducing morbidity will lead to a reduction in public health expenditure and reducing mortality will lead to a reduction in the lost output and human costs.

2.9.1.2 Transport

Road transport is responsible for the largest proportion of NO₂ concentrations in Bristol and hence the Plan will include measures to tackle this source and either reduce traffic volumes or reduce the emissions from this source. The proposed Small CAZ D scheme would combat a major source of pollution, while attempting to minimise impacts on vulnerable citizens.

The Plan also includes mitigation measures which increase travel by sustainable modes such as public transport, walking and cycling. An increase in use of these modes would produce health benefits through increased physical activity, resulting in reduced risk of premature death and reduced absenteeism from work. Further information on these measures can be found within the CAF Scheme Proposal, which will be provided in addition to the FBC.

2.9.1.3 Financial Revenue Streams

The Small CAZ D Option involves a charging element – the scheme would charge non-compliant buses, coaches, taxis, HGVs, LGVs and cars across the small zone. These charging elements of the schemes could provide Bristol City Council with an ongoing additional revenue stream. Defra’s Clean Air Zone Framework (May 2017) prevents Local Authorities from setting a charge as a revenue raising measure, but any charging scheme will need to be set at a level to produce a change in behaviour. As a result, the Plan may produce revenue in excess of the operational costs of running the scheme. In accordance with the Transport Act 2000 this revenue should be re-invested to facilitate the achievement of local transport policies which aim to improve air quality and support the delivery of the ambitions of the Plan. In this way, the Plan may realise additional benefits through supporting further measures with any excess revenue. The anticipated revenue from the Plan has been calculated alongside the operational costs to understand the potential for excess revenue – see Financial Case for further details.

Any excess revenue produced by the scheme will be spent on BCC’s Liveable Neighbourhoods Programme. This programme provides the opportunity to bid for funding for long-term schemes that encourage walking, cycling and public transport, reducing reliance on cars within a neighbourhood. A similar programme has been successfully implemented by Transport for London, allowing boroughs to bid for funding for community-supported schemes. In London this included possible schemes such as creating green spaces, improving cycle infrastructure, redesigning junctions and widening walking routes.

2.9.2 Risks

The Clean Air Plan has the following risks associated with it:

- Unknown impacts of the COVID-19 pandemic
- Changes in carbon emissions
- Changes in particulate matter emissions
- Economic impacts
- Resource demand
- Impacts on vulnerable groups, particularly low-income groups

Mitigation to minimise the potential impacts of project risks have been identified within the QRA report (Appendix L to the FBC).

2.9.2.1 Carbon

The Plan is focused on one pollutant; nitrogen dioxide. However, the main sources of nitrogen dioxide, vehicles, also produce other pollutants including carbon dioxide and particulate matter. There is a risk that the selected

Plan could achieve compliance with the legal limit for NO₂ concentrations, but simultaneously result in an increase in other harmful pollutants.

Based on air quality modelling outputs, the intervention option will marginally increase the quantum of Greenhouse Gas emissions. This is linked to changes to vehicle speeds, vehicle redistribution, and fleet composition induced by the intervention. Further detail on Greenhouse Gas emissions can be found within the Economic Case (FBC-5).

2.9.2.2 Particulate Matter

There are Limit Values and Air Quality Objectives for particulate matter (PM), specifically PM₁₀ (40 µg/m³) and PM_{2.5} (25 µg/m³). Recent monitoring data within Bristol has demonstrated that PM emissions in Bristol have been under both Limit Values and Objectives for several years. Table 2-4 indicates that PM emissions are likely to reduce as a result of the Plan in 2021 and 2023 particularly.

Table 2-3: PM Annual Link Emissions

Scenario	Annual Link Emissions (tonnes / yr)	
	PM ₁₀	PM _{2.5}
	2021	
SSS Baseline (exc fast track measures)	56.4	32.0
Small CAZ D RB4 (inc. fast track measures and SSS)	55.0	30.8
	2023	
SSS Baseline (exc fast track measures)	55.8	31.0
Small CAZ D RB4 (inc. fast track measures and SSS)	54.9	30.3
	2031	
SSS Baseline (exc fast track measures)	57.0	30.9
Small CAZ D RB4 (inc. fast track measures and SSS)	56.9	30.9

The impacts of PM are explored further in the Distributional and Equalities Impact Assessment, Appendix H.

2.9.2.3 Economic impacts

The Plan will impact the local economy, as detailed in the Economic Case. A significant proportion of jobs in Bristol are located within the city centre where some of the most significant exceedances are located. It is therefore likely that the measures will be targeted at reducing emissions in the central area of Bristol and depending on the measures selected could restrict access to the jobs or services within the same area. However, the CAP scheme would also include a number of mitigations to reduce any impacts of the scheme, including the economic effects. These will be outlined within the CAF proposal provided as part of the FBC

2.9.2.4 Resource Demand

This Plan is one of 15 similar plans being developed across the country within the same time frame. The objectives of all these plans are to achieve compliance with the NO₂ Limit Values. It is therefore likely that similar schemes could be proposed in multiple locations, putting pressure on the market supply of particular items, such as Approved Enforcement Devices and compliant buses. BCC are already taking measures to avoid such a scenario, by engaging early with suppliers as part of the procurement strategy and ensuring that potential suppliers know the scale and scope of the BCC scheme.

There is also likely to be demand on central government resources. A proportion of the expected behaviour change is predicated on grant funding. If such grants are not awarded to BCC then the change in behaviour could fail to occur to the extent predicted and therefore potentially impact on the compliance date.

2.9.2.5 Vulnerable Groups

There are specific risks that relate only to the implementation of a charging zone which may form part of the Plan. There is potential to disproportionately penalise vulnerable groups in society, depending on the geographic location, scale and the structure of vehicle compliance standards. In particular, it is appropriate to consider the differential impacts of the Plan on low income households since this is correlated to the likely public and political acceptance of the Plan. This assessment is set out in the Distributional and Equalities Impact Assessment, Appendix H.

BCC is working hard to minimise the impacts of the proposed option on vulnerable groups. The Distributional and Equalities Impact Assessment (Appendix H) outlined which groups could potentially be targeted for mitigation measures (see table Table 2-4).

Table 2-4: Summary distributional impacts – potential mitigation targets

Potential mitigation target group ^a	CAP scheme
Residents	
Residents of the CAZ area	✓
Specific trip needs	
Disabled people – blue badge	✓ ^b
Disabled people – with specialist vehicle adaptations	✓ ^b
Out-patient access to hospital	✓ ^b
Car owners	
Low income non-compliant car owners	✓
Low-income compliant car owners	✗
1-car households	✗
Businesses	
SMEs located in the CAZ area	✓
LGV/HGV-dependent businesses not specifically located in the CAZ area but that need to travel into it	✓
Taxi owners/drivers – BCC registered	✓
Taxi owners/drivers – other authority registration	✓

Note:

- a) Groups that could be potential mitigation targets indicated with; '✓' are those where there is the potential for mitigation to be sought by or on behalf of the group, though not necessarily that it would be granted as part of implementing the CAP; '✗' indicates that it is less likely that any mitigation would be applicable to this group. However, both are indicative, and neither a positive nor negative indication in this table is a definitive indicator of future proposals.
- b) Could be linked with a destination specifically in the CAZ area and/or owning/using a non-compliant car

The Clean Air Fund report (FBC-17) sets out a number of proposed measures to mitigate the impacts of the CAZ. These measures include:

Financial Support:

- A loan / grant scheme to assist those earning low incomes / needing to travel into the zone to work, to replace or upgrade their vehicle
- Provision of grants for taxi, private hire and LGV drivers to upgrade and / or retrofit their vehicles
- A loan scheme to assist small local businesses to replace their vehicles
- Additional funding for supported bus services and coaches as part of the retrofitting of their vehicles to avoid CAZ charges (funding for bus retrofitting was awarded to BCC in May 2021 following an initial FBC submission. Additional funding is required to cover engine refurbishment costs).

Infrastructure:

- Increase, Improve and update Legible City Signage
- Old Market Gap Cycle Scheme

Sustainable Travel Choices:

- Mobility credits and/ or subsidised bus travel for certain demographic or income groups
- Targeted door knocking / roadshows in areas of deprivation
- Business support and engagement including personalised travel planning and building audits, targeted at small local businesses
- CAF scheme promotion; publicity / events / website etc.

Freight:

- Micro-consolidation unit with cargo freight bikes and Only Mile Delivery centre

2.9.3 Constraints

2.9.3.1 Legal

The most significant constraint on the Plan is the legal situation through which it has materialised. Specifically, the requirement for the UK Government to achieve compliance with the Limit Values in the shortest time possible, and only considering cost when comparing between two equally quick schemes. Specifically, in November 2016 following a judicial review challenge brought by ClientEarth against the Department for Food, Environment and Rural Affairs (DEFRA), the High Court found that *'I reject any suggestion that the state can have any regard to cost in fixing the target date for compliance or in determining the route by which the compliance can be achieved where one route produces results quicker than another. In those respects, the determining consideration has to be the efficacy of the measure in question and not their cost. That, it seems to me, flows inevitably from the requirements in the Article to keep the exceedance period as short as possible'*.¹⁴

¹⁴ November 2016 in R (ClientEarth) (NO₂) V Secretary of State for Environment Food and Rural Affairs [2016] EWHC 2740 (Admin).

2.9.3.2 Planning/Consenting

A local charging order is required to allow the development and operation of charging measures such as a CAZ. The primary factor for approval of a charging order is whether the local traffic authority is satisfied that the local charging scheme appears desirable, for the purpose of, directly or indirectly facilitating the achievement of local transport plan policies, of both the local traffic authority/charging authority and any combined authority within whose area the proposed order will take effect. Other factors that need to be satisfied prior to bringing a local charging order into effect include:

- Public Sector Equality Duty and possibly Human Rights Act issues will need to be carefully and demonstrably considered.

2.9.3.3 Resources

The Plan could necessitate significant recruitment to manage and operate any back-office and enforcement functions required to ensure successful delivery. This scale and form of staff resources required to deliver the Plan will vary depending on the management and operation processes selected. In the event that back office and enforcement functions are retained in-house, BCC could be required to recruit a large number of temporary and flexible staff, particularly to deal with contraventions. BCC could struggle to fill the specific roles created as a result of the Plan. At the same time, existing functions such as Human Resources, Property and IT may be exposed to considerable pressure to ensure that the recruitment process is adequately resourced. These issues have been considered by BCC within their procurement strategy and the Quantified Risk Assessment (QRA) process. To reduce this risk, the QRA proposes to 'Identify staff with appropriate experience/knowledge in advance of work being undertaken. Identify early whether this risk is likely to materialise in order to find alternative resources to support project. Consider recruiting if necessary'.

2.9.3.4 Social acceptability

Results from the second Bristol City Council CAZ Consultation (October to December 2020) suggest that there is a reasonable level of public support for a Small area CAZ D Option - more than half of all respondents (55%; 2,717 respondents) agree or strongly agree that Option 2 of the consultation (Small area CAZ D) is a good way to improve air quality (32% strongly agree and 23% agree).

2.9.4 Dependencies

The Plan is dependent on the progression of other workstreams which may feed into the development of the schemes which form the final package of measures. Specifically, projects considering the most effective public transport priority schemes and walking/cycling schemes have recently been commissioned by WECA and will be relied upon by this Plan in order to meet the required timescales.

The delivery and success of the Plan is linked to a range of national, sub-regional and local stakeholders and statutory bodies, whose activities, programmes and policies could have significant implications on the transport and air quality context. Further, various agents hold a range of transport data (for example compliance, registration, taxi licensing, fleet databases) and air quality data (for example PCM/AQMA receptor information) that will be critical to ensuring the ongoing operation and monitoring of the Plan's intervention measures. Therefore, close collaboration across various partners is essential to ensuring timely progress of the Plan.

2.9.4.1 Highways England

Concerning national stakeholders, Highways England (HE) currently manage and operate the M5 and M32, which provide links around and into Bristol. There are key exceedances of the NO₂ Limit Value on the M32. The project manager, engineers and designers are already working closely with Highways England on this issue.

2.9.4.2 Low Emissions Vehicles

The Plan is also dependent on the ongoing nationwide roll-out and promotion of LEV uptake, by both the private and public sector. The opportunity for individuals to switch to new and used compliant vehicles is related to the availability of vehicles in the market, the provision of the appropriate infrastructure and facilities to support these type of vehicles, and promotional programmes and incentives to buy LEV.

The West of England was awarded £7m Go Ultra Low (GUL) Funding to spend over 5 years to promote the uptake of electric vehicles (EVs) across the region, following a Go Ultra Low West bid (GULW). There was a target set of 5,000 new EV registrations per year in the West of England, by 2020. GULW included initiatives such as installing over 120 new public charging point connections within the west of England in addition to building 4 rapid charging hubs, providing 50% match funding for charge points to be installed in businesses across the four WECA local authority areas and adding over 70 electric vehicles to local authority car fleets within the West of England.

2.9.4.3 West of England Combined Authorities

At a sub-regional and local level, the Plan is dependent on the progression of the West of England Combined Authority's (WECA) existing and proposed major scheme intervention programme. A range of transport initiatives may contribute to an improvement in air quality in advance of, or alongside, the Plan. Therefore, this could have some influence over the ability to meet the required timescales or affect the overall outcome. The wider WECA programmes typically have longer timescales for delivery and implementation, meaning the overlap between the Plan and wider initiatives could be limited. However, this will need to be considered in the CAP.

Further, collaboration with WECA will be critical where the Plan is expected to interact with the (as yet not identified) Key Route Network. As such, discussion with WECA is ongoing to understand the interactions between the Plan and existing and future programmes undertaken by WECA.

2.9.4.4 Neighbouring Authorities

Neighbouring authorities including Wiltshire, B&NES, South Gloucestershire, Somerset and, further afield, South Wales, are also closely related to development of the Plan, in light of travel to work patterns for employees working in Bristol.

B&NES have been directed to implement a CAP as part of the UK Air Quality Plan alongside Bristol City Council. The implementation of two Plans in close proximity may reduce the potential for displacement of traffic and economic activity from one affected area to another, as both local authorities are subject to similar measures.

Discussions are ongoing between BCC and neighbouring authorities are ongoing to better understand the interactions between the Plan and existing and future programmes undertaken by proximate authorities.

2.10 Stakeholder and Public Engagement

2.10.1 Communications Plan

The Bristol City Council Clean Air Zone Communications Plan seeks to provide an overview of activity undertaken to date and intended future focus of engagement with residents and city stakeholders during the upcoming stages of preparation, ahead of implementation of the traffic Clean Air Zone.

Between 1 July and 12 August 2019, the council consulted on two options for a traffic Clean Air Zone which are designed to achieve compliance with legal NO₂ limits in the shortest possible time (further information on the two options can be found within Section 2.10.2). The options were:

- Option 1: Clean Air Zone (private cars not charged)

- Option 2: Diesel car ban

The consultation asked respondents how concerned they are about the health impacts of poor air quality in Bristol and it sought feedback from citizens, businesses and other stakeholders on the two options. The findings of this consultation are summarised within the Consultation report associated with the OBC. A Stakeholder summit was run by BCC on Monday 18 November 2019.

A second consultation was held from the 8 Oct 2020 to 13 December 2020. Two further options were presented to the public, both designed to achieve compliance with legal NO₂ limits in the shortest possible time. The options were:

- Option 1: Clean Air Zone C (private cars not charged) with a smaller inner zone of a CAZ D (private cars charged)
- Option 2: Small area CAZ D

The consultation also asked respondents how concerned they are about the health impacts of poor air quality in Bristol and it sought feedback from citizens, businesses and other stakeholders on the two further options.

A copy of the Communications Plan is presented as Appendix B to the FBC.

2.10.2 CAZ Consultation (July/August 2019)

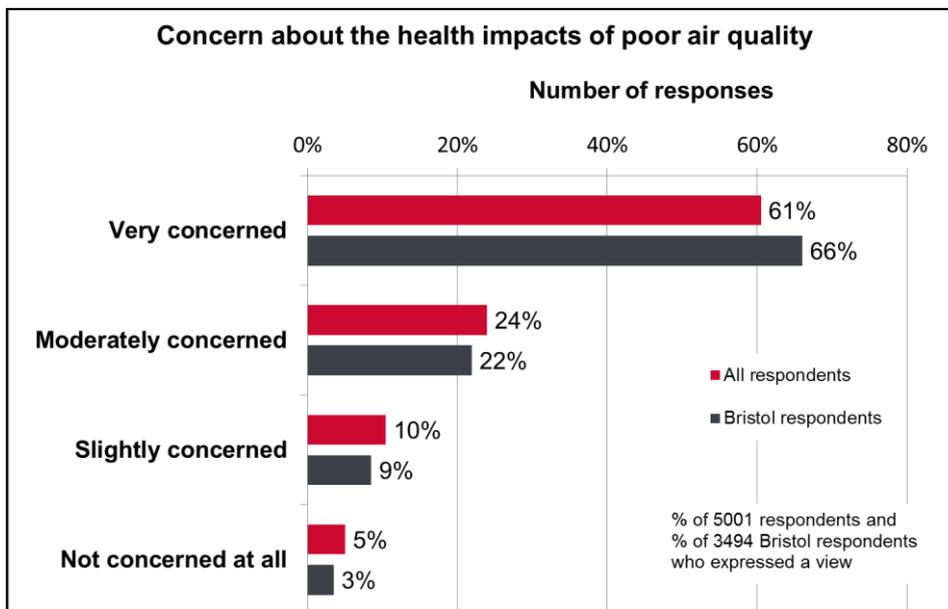
Bristol City Council undertook a six-week consultation from 1 July to 12 August 2019 on the original options 1 and 2. Engagement as part of the consultation included:

- six drop-in sessions across the city
- Communications Toolkits distributed to partner organisations to help them publicise the consultation
- public events such as the Harbour Festival
- media engagement
- social media posts
- bus shelter and variable message road side advertisements.

Data was collected via online and paper copies of the questionnaire, interview surveys with under-represented groups, meetings with specific stakeholder groups and letters and emails received by the Council. As a result, the Council received 5,034 responses to the consultation. 70% of these responses were from within the BCC area, 7% were from South Gloucestershire, 3% were from North Somerset, and 1% were from Bath & North East Somerset (B&NES).

Respondents indicated a high level of concern about health impacts of air quality in the city, as can be seen in Figure 2.6, with over 60% of respondents expressing that they are very concerned. This high proportion of respondents in Bristol who are very concerned about health impacts, was reflected across all deprivation deciles.

Figure 2.6: Concern about health impacts of poor air quality



There was a high level of support for Option 1, with more than two thirds of all respondents (69%; 3,414 respondents) who agree or strongly agree that Option 1 is a good way to improve air quality (39% strongly agree and 32% agree). This is more than three times the 21% (1,018) of all respondents who disagree or strongly disagree. 11% (534 respondents) neither agree nor disagree.

More than half of all respondents (55%; 2,717 respondents) agree or strongly agree that Option 2 is a good way to improve air quality (32% strongly agree and 23% agree). This is more than one and a half times the 34% (1,702) of all respondents who disagree or strongly disagree. 11% (534 respondents) neither agree nor disagree (the same proportion as for Option 1).

Question 5 asked respondents to 'please tell us why you agree or disagree with each option'. Feedback from respondents on Option 1 (question 5a) found that 41% of respondents provided reasons indicating support for Option 1, including that Option 1 targets the correct vehicles (56%), general support for Option 1 (14%), Option 1 will promote behavior change (13%), and Option 1 will have a positive impact on air quality (11%).

Feedback from respondents on Option 2 (question 5b) found that 29% of respondents outlined reasons for supporting Option 2 including that Option 2 targets the correct vehicles (47%), Option 2 will encourage behaviour change (15%), Option 2 will improve air quality (14%) and general comments in support of Option 2 (11%).

Within Option 1, there was high levels of support (62% of respondents) that community and school transport vehicles for disabled people and their carers, should pay no CAZ charge. In addition, between 64-69% of respondents believed that HGVs, buses/coaches and LGVs for businesses based within the Option 1 zone, should pay the full charge, however this dropped to 42-46% for those businesses with low turnover.

Some of the most popular additional improvements and incentives to the Option 1 scheme included new/improved walking/cycle routes (50% of respondents), anti-idling zones for buses in the city centre (36%), traffic signal timings to minimise queues in areas with poor air quality (35%), improved public transport to hospitals on Upper Maudlin Street (34%), amongst other suggestions. For Option 2 the most popular additional improvements and incentives included new/improved cycle/walking routes (51% of respondents), subsidised bus travel for certain demographic or income groups (35%), improved public transport to the hospitals on Upper Maudlin Street (33%), traffic signals to minimise queues in areas with poor air quality (32%) and scrappage scheme for diesel cars (31%), amongst others.

Question 5 was a free-text question ('Please tell us why you agree or disagree with each option'). Feedback from respondents on Option 1 (question 5a) found that 166 respondents (20%) provided comments suggesting that both Option 1 and 2 should be implemented. Feedback from respondents on Option 2 (question 5b) found that 184 respondents (20%) provided comments suggesting that both Option 1 and 2 should be implemented together.

Of the comments given in response to question 5a (regarding Option 1) 46% of respondents had reservations about Option 1, 41% had reasons for supporting Option 1, 26% offered alterations to the option and 22% gave alternative scheme suggestions. In response to question 5b (Option 2), 21% of respondents who answered this question had reservations about Option 2, 54% had reasons for supporting Option 2, 29% suggested alterations to this option and 26% gave alternative scheme suggestions.

Further details are available in the Consultation Report, appendix N of the OBC.

2.10.3 Second CAZ Consultation (October to December 2020)

The second public CAZ consultation ran from the 8 Oct 2020 to 13 December 2020 on the new options 1 and 2.

Due to the limitations caused by the COVID-19 Pandemic, drop-in sessions and face-to-face activities were much reduced. To boost response rates and to target low-responding parts of Bristol, 20,000 paper surveys were delivered direct to addresses in areas which have historically low response rates to consultations and high levels of deprivation. The Traffic Clean Air Zones Consultation survey received 4,225 responses. A summary of responses from groups with protected characteristics and income deciles is contained within the report. More than half of respondents (54%; 2,250 respondents) agree or strongly agree that Option 1 is a good way to improve air quality (20% strongly agree and 34% agree). A higher proportion of respondents (60%; 2,466 respondents) agree or strongly agree that Option 2 is a good way to improve air quality (32% strongly agree and 28% agree).

Engagement as part of the consultation included:

- Four engagement events across the city (planned programme of engagement events was halted due to COVID)
- Communications Toolkits distributed to partner organisations to help them publicise the consultation
- media engagement
- social media posts
- Radio advertisements

Briefings were held with several groups including Business West (with 55 businesses joining), University Hospital Bristol NHS Trust, Southmead Hospital, University of Bristol, University of West of England, Bristol Workplace Travel Network, waste contractors, and neighbouring councils. We also contacted 1,385 businesses about the consultation.

For further detail, see Traffic Clean Air Zones Consultation Report (Appendix N to the FBC).

2.10.4 Scrutiny Meetings

Since early 2019, the CAZ project has been considered at ten Council Scrutiny Meetings with numerous written responses and updates provided throughout that time

2.11 Logic Map

The logic map presented in Table 2-5 highlights the theory of change underpinning the Plan for the Small CAZ D option. It demonstrates how inputs (in the form of programme expenditure) generates outputs (in the form of activities and scheme elements delivered) which drive outcomes (in the form of behavioural, transport and economic changes) leading to impacts (long-term societal changes).

Table 2-5: Logic Map (Small CAZ D)

Inputs	Outputs	Outcomes	Impacts
<ul style="list-style-type: none"> Implementation Fund Clean Air Fund Scheme Revenue 	<ul style="list-style-type: none"> Small Area Class D (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs) Close Cumberland Road inbound to general traffic Detailed VMS (Variable Message Sign) strategy which includes the use of existing transport infrastructure such as traffic signals and modelling. 	<p>Behavioural change leading to:</p> <ul style="list-style-type: none"> Accelerated vehicle upgrading Switch in preference for compliant buses/taxis/HGVs/LGVs Reduction non-compliant vehicle fleet Increased mode share of public transport Increased share of active travel modes Diverted trips and trips avoiding the charging zone Cancelled trips <p>Implications of behavioural change:</p> <ul style="list-style-type: none"> Cost of compliance Reduction in local NO₂ concentrations Potential increase in CO₂ concentrations Changes to capacity of highway network across BCC Changes to location of economic activity Decrease in value of non-compliant vehicles in the local area 'Neutralised' negative impacts on Small and Medium-sized Enterprises (SMEs) / micro businesses and disadvantaged groups 	<ul style="list-style-type: none"> Improved air quality Increased physical activity Improved human health Loss of some economic activity

2.12 Conclusions

Evidence from local monitoring data indicates that there are widespread exceedances of the Limit Value and Air Quality Objective for NO₂ across Bristol. Defra predicts that without further action exceedances will exist beyond 2020, but local assessments suggest that compliance would not naturally occur until 2027. Due to the forecast air quality exceedances Bristol City Council has been directed by the Minister to produce a Clean Air Plan to achieve air quality improvements in the shortest possible time.

The Clean Air Plan fits well with the objectives of existing policies in the region. The measures proposed within the Clean Air Plan are likely to be complimentary to existing policy objectives and to support wider transport initiatives. Bristol City Council is working closely with WECA to ensure that emerging policy also reflects the magnitude of the air quality problem and the urgent need to address it.

Any intervention will have impacts across the region which are both positive and negative. There are likely to be benefits to public health, and also possibly a reduction in congestion and the associated impacts. Conversely, there is a risk that the chosen measures could increase carbon or particulate matter emissions, or negatively impact the economy or vulnerable groups. In addition, the development of similar plans across the country could result in high demand for particular infrastructure or services, which the existing market cannot fulfil. The selection of measures to include within the Clean Air Plan will consider these risks and seek to mitigate them wherever possible whilst maximising the benefits.

The preferred option presented within this FBC is the Small CAZ D option with Fast Track measures. This option was selected as, alongside the Medium CAZ C/Small CAZ D option, it is predicted to have the earliest compliance year (2023). However, this option is expected to have reduced wider economic impacts when compared to the Medium CAZ C/Small CAZ D, whilst achieving similar air quality benefits.

Bristol City Council Clean Air Plan

Commercial Case

Document: FBC-06

July 2021

Bristol City Council

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4. Commercial Case

4.1 Introduction

The Commercial case will set out all the procurement options we have considered, in order to demonstrate how we identified the most efficient route to market for all CAZ related procurement items. In line with JAQU Guidance, this Commercial Case builds on the previous versions submitted as part of the Strategic Outline Case and Outline Business Case by confirming the detail where possible. We are following best practice which is caveated with the need to meet the deadline set, we are also working closely with BaNES and Birmingham sharing experience, expertise and resources where possible.

BCC are currently undergoing tender evaluation of the submitted bids for the BHAM&AWF Framework which currently runs to October 2021. This will be explained further within this document. The existing framework can be used post October 2021 where agreements are already in place. It is therefore possible that this project will utilize both the existing and new framework.

Furthermore, since the FBC was submitted in February 2021, the term contractor has been re-tendered and 'BCC Term Service Contract in relation to Maintenance and Installation of Highways Electrical Assets 2021-2025' was recently awarded to Centregreat Ltd.

4.2 Bristol City Council Procurement Policy

When carrying out procurement exercises, council staff must ensure that:

- the council acts in a fair and transparent manner
- we're accountable for the public money involved
- the contribution to the council's strategic objectives is maximised
- we act legally

To achieve this, there is a set of procurement rules which include the need to 'promote social value, including the local economy and environmental sustainability, to the extent that it is legally permitted'.

Another rule particularly relevant to the CAZ is: 'Timescales for submission of tenders / quotations shall be reasonable, sufficient and proportionate in order to enable suppliers to submit a suitable response in order to facilitate genuine competition and compliance with the relevant PCR requirements'.

And furthermore:

'Public authorities are required, under the Public Services (Social Value) Act 2012 to, when commissioning a public service, consider how the service they are procuring could bring added economic, environmental and social benefits'.

When considering appropriate routes to procurement the council's procurement rules must be adhered to. The CAZ is under very strict timescales, but we still can't deviate from policy which is in place to protect the interest of all involved. This has been followed for all current and recent CAZ procurement exercises and will continue to be used for any remaining procurement actions.

4.3 Procurement Specification

In order to deliver the small CAZ D option consisting of 1 initial operational zone, the following measures will need to be procured:

Commercial Case

- Design (including specification)
- Approved Device (included ANPR cameras, back office system and comms)
- Infrastructure (on road)
- Traffic Management
- Back office system
- Enforcement
- Operations - staff
- Communications and Engagement activities and resources (including working with a telemarketing team).

The following measures will be required as part of the CAF bid but will still need to be procured / documents signed once funding is confirmed / awarded.

- Provision of grants and loans for taxi, private hire, HGV and LGV drivers to upgrade and / or retrofit their vehicles
- A loan and grant scheme to assist businesses replace their vehicles
- A refurbishment scheme for scheduled bus services to upgrade their vehicles engines alongside retrofitting
- A cycle scheme – Old Market Gap
- Increase, Improve, update Legible City Signage
- Mobility credits and/or subsidised bus travel for certain demographic or income groups. Business support including personalised travel planning, targeted door knocking and roadshows, travel plan support and CAF scheme promotional publicity.
- Micro - consolidation unit.

4.4 Procurement Options

With a complex scheme of this nature, all procurement options must be considered for each of the deliverables within the project. There are four primary routes available to deliver the scheme which were considered in detail prior to making a final decision:

- Leveraging relevant current BCC contracts;
- Through existing BCC frameworks;
- Through frameworks commissioned by other conveners such as Crown Commercial Services (CCS), the UK Government's professional procurement service for the public sector. We are also working with BaNES to share frameworks where possible; and
- Open tender through the Official Journal of the European Union (OJEU), or as otherwise instructed post Brexit.

Commercial Case

These options were considered for each of the deliverables at the OBC stage and a preferred approach is identified as being through Bristol frameworks.

Bus Lane Enforcement

Collaboration with the Bus Lane Enforcement Team was set up to purchase the cameras required for both schemes. This builds on and utilises a long-standing understanding, experience and expertise for operating such systems within BCC. This was agreed and to align with the CAZ requirement both provisions were put out together as one tender. The tender ran through to December 2020 and was recently awarded to Systems Engineering Assessment Ltd (SEA), this is detailed further in FBC 32- Procurement Strategy.

Further details of this collaboration will be included in other sections of the Full Business Case (FBC) but there is a copy of the project mandate attached as an appendix item.

4.5 Recommended Procurement Strategy

It is recommended that the Clean Air Zone for Bristol is delivered, where appropriate, through pre-existing contracts and frameworks established by BCC for most of the deliverables. This provides the following assurances to the project:

- To meet the tight timescales of the project, leveraging existing arrangements or frameworks will provide a compliant procurement process in the shortest timeframe.
- These contracts were competitively tendered and were awarded on MEAT (Most Economically Advantageous Tender) criteria ensuring both quality and value for money
- By utilising current technology, existing operations can maintain business as usual and minimise disruption
- Existing supplier relationships will allow for swift project on - boarding and encourage innovation
- Current technology deployed which is utilised to also support the CAZ will offer savings on licenses

Although it is envisaged that BCC contractual arrangements will be able to fulfil the majority of the deliverables, it is acknowledged that some agreements were not optimal. When found to be the case and current arrangements are not wholly aligned with the CAZ requirements then BCC sought alternate supply routes. Where a BCC contract or framework was not deemed appropriate or for deliverables where no existing arrangements are in place, other public sector frameworks were investigated, for example CCS, Central Government (in the case of GOV.UK Pay and GoGardess) and ESPO. These arrangements provide the benefits of spend aggregation across the public sector, have been competed compliantly and have robust commercial terms. BCC ran a mini competition to re-open competition between the pre-selected suppliers to ensure specification compliance, delivery targets and value for money.

Please see below for a summary table of CAZ deliverables and how BCC will achieve these:

	Procurement Option	Procurement Route
DecoVMSDesignC AZ System and Implementation	Design (including specification)	BCC Highways consultancy framework
	Approved Device	CCS Traffic Management Technology 2 Framework competition. The suppliers that submitted were Neology,SEA Ltd and Siemens with SEA Ltd winning the bid
	Connecting camera equipment to existing BCC electrical infrastructure (on road)	Current BCC Term Service Contract in relation to Maintenance and Installation of Highways Electrical Assets 2021-2025 with Centregreat Ltd
	Traffic Management (Cameras)	Current BCC Term Service Contract in relation to Maintenance and

Commercial Case

	Procurement Option	Procurement Route
		Installation of Highways Electrical Assets 2021-2025 with Centregreat Ltd
	Provisional item (BNET connection for Cameras if WiFi signal found wanting)	BCC Term Contractor for BNET installation and maintenance - Fibre and CCTV contract (Chroma Vision).
	Non illuminated traffic signs (boundary and advanced) on BCC and North Somerset Council Highway Networks	Bristol Highway Asset Management and Associated Works Framework (BHAM&AWF) 2021-25, yet to be awarded under evaluation Lot 6 Contractor - Competitive mini tender between 4 contractors
	Non illuminated traffic signs accommodation works - NAL sockets	Existing Bristol Highway Asset Management and Associated Works Framework (BHAM&AWF) 2017-21 Lot 6 Contractor - ETM Contracts Limited
	Illuminated sign removal and repositioning to enable boundary sign installation	Current BCC Term Service Contract in relation to Maintenance and Installation of Highways Electrical Assets 2021-2025 with Centregreat Ltd
	Temporary Signage to support launch	Bristol Highway Asset Management and Associated Works Framework (BHAM&AWF) 2021-25, yet to be awarded Lot 5 Contractor
	Design and Supervision of advanced traffic sign on M32 (Highways England)	WECA Professional Services Framework
	Advanced traffic sign on M32 (Highways England)	Highways England Approved Contractor from their Local Construction Works Framework (CWF) - Competitive mini tender. May use BCC BHAM&AWF 2021-25 if yet to be appointed Contractors are on HE CWF.
	Decommissioning of non-illuminated traffic signs (boundary and advanced)	Bristol Highway Asset Management and Associated Works Framework (BHAM&AWF) 2021-25, yet to be awarded Lot 6 Contractor - Competitive mini tender between 4 contractors
	VMS Signs	BCC Traffic Signals and UTC and specialist contractor
	Back office system	Part of the Approved Device
	Enforcement	Current BCC contract with Conduent (SiDem contract has been amended to change from an on prem to a hosted site). Amend contract value to allow for development enforcement interface with CAZ
	Closure of Cumberland Rd	Bristol Highway Asset Management and Associated Works Framework (BHAM&AWF) 2021-25
	Enforcement	Current BCC contract with Chipside (MiPermit contract will be amended to include CAZ Permits for exemptions)
	Operations	In House provision using BCC existing resource and contracts as required
	Telemarketing Team	To be delivered under the BaNES Framework
	Communications and Engagement	In House provision using BCC existing resource and contracts as required. An additional contract will be required to fill a gap in expertise which will involve a mini quotation exercise

	Procurement Option	Procurement Route
	New air quality monitoring units	In House provision using BCC existing resource and contracts as required
Additional Measures	Provision of grants for taxi, private hire, HGV and LGV drivers to upgrade and / or retrofit their vehicles (CAF)	BaNES have established a framework which BCC and other authorities are able to draw down from. We will be signing a Participation Agreement to be able to use the BaNES framework, which has been approved by the BCC Legal Team in preparation
	A loan and grant scheme to assist businesses and the public meeting certain criteria to replace their vehicles (CAF)	BaNES have established a framework which BCC and other authorities are able to draw down from. We will be signing a Participation Agreement to be able to use the BaNES framework, which has been approved by the BCC Legal Team in preparation
	Provision of a grant for scheduled bus services to retrofit their vehicles (CAF)	In House provision from the Transport Engagement Team, an existing in-house resource
	Increase, Improve, update Legible City Signage (CAF)	BCC Highways framework and BCC Electrical Term Contract, existing contracts already in place or nearing award for the majority of this work
	Mobility credits and/or subsidised bus travel for certain demographic or income groups (CAF)	In House provision from the Transport Engagement Team, an existing BCC resource
	Business support including personalised travel planning, targeted door knocking and roadshows, travel plan support and CAF scheme promotional publicity (CAF)	In House provision from the Transport Engagement Team, an existing BCC resource
	Micro-consolidation unit (CAF)	Competition for a concession contract to be run following market engagement, once funding is awarded
	Old Market Gap cycle scheme (CAF)	BCC Highways framework (BHAM&AWF 2021-2025), team member already lined up and developer is engaged

The proposed procurement route for each item listed in the table, is described in more detail in FBC-32 'Procurement Strategy' in Appendix I of this FBC.

4.6 Payment Mechanisms, Pricing Framework and Charging Mechanisms

BCC arrangements for payment terms have been pre-defined and deliverables awarded based on the pre-existing terms. New agreements will be based on the pre-defined payment terms of the framework where an open tender has been completed on the standard payment terms of BCC, which are 30 days from receipt of an undisputed invoice. Stage payments will be applied for services and works - this is in arrears following satisfactory completion of the work.

For the hardware:

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BCC requires a Programme of Works to be provided by the Principal Contractor and a Costed Programme by SEA (the supplier of the approved devices and back office system). Milestone 1 - Payment one on production of the approved full design and implementation programme/plan (20%).

Payments will then be made monthly on an 'as built' basis against the completion of works as specified in the respective programmes.

BCC will be sent early warning notices in the event of any potential delays and the monthly invoices will be paid with a 10% retention until full sign off on a fully working system.

BCC have standard penalties in all Lot 6 or 7 schemes using the NEC3/NEC4 calculation from BHAM&AWF Contract Data Part one and two, but it is rarely, if ever, actioned because of the multitude of factors that can influence it, that are outside the contractors control especially when dealing with a site on the live public highway.

For the software:

Payment one; software licenses to enable solution build.

Payment two; on production of an approved full system design and implementation programme/plan (20% of the implementation costs)

Payment three; following production of the approved SAT certificates- including integrations (40% of the implementation costs)

Payment four; following satisfactory UAT (40% of the implementation costs) and remaining software licenses.

Charging Mechanisms

Should the Supplier fail to pass all of the acceptance test set out in the Programme, the cost of the Software Licenses shall be refunded back to BCC

Delay damages for delivery of the whole system will be 25% of JAQU fine for failing to meet the deadline for implementing the Clean Air Zone. The contract will describe the deadline date as a revised baseline date expected to be no earlier than summer 2022 but exact date yet to be confirmed by JAQU.

4.7 Risk Allocation and Transfer

As with any agreement, there is always risk. BCC have identified where these risks can be mitigated by the procurement approach and/or by the contractual terms applied to the agreements. Using existing contracts or established frameworks provides mitigation.

Procurement Risk	Likelihood	Impact	Mitigation
Delays in procuring approved ICT hardware, e.g. secure managed network switches leading to a delay in go live and potential impact on other aspect of the programme leading to delays	M	M	Agreed scope early with BCC ICT. Use existing approved hardware where possible. Try to avoid 'goldplating' the solution This risk is 80% owned by the project team and 20% owned by BCC ICT
Procurement of signs for neighbouring local authorities / HE - not covered by the BCC Framework which could lead to delays in the programme due to their policy and procedures	M	H	Continue to engage with HE and neighbouring LAs to agree procurement routes. Considering all viable options well in advance. Could use temporary signage.

Procurement Risk	Likelihood	Impact	Mitigation
			This risk is 80% owned by BCC, 10% owned by HE and 10% owned by North Somerset Council
Steel and cement are in short supply due to Covid and therefore cost will have increased threefold by end of this year	H	M	Conversations taking regarding purchasing these materials earlier that required to avoid and delay in delivery and increased costs. This risk is owned by the Principal Designer.
Requirement for BNET (Bristol’s fibre network) due to poor network coverage for approved devices to capture images	M	M	We have already carried out an initial assessment and determined 10 sites that may potentially require BNET. The BNET team and supplier are engaged. This risk is owned by the Project Team

4.8 Contract Length

The contract length is for five years with an option to extend for a further five years in periods of 12 months at a time.

An indicative programme of works has been developed for the implementation and is further detailed in FBC-32 ‘Procurement Strategy’ in Appendix I of this FBC.

It is envisaged that the implementation works will commence as soon as the FBC approval is received.

Contracts to maintain the supporting technology and infrastructure are further detailed in FBC-32 ‘Procurement Strategy’ in Appendix I of this FBC.

4.9 Human Resources

No relevant personnel, people management or trade union implications, including Transfer of Undertakings (Protection of Employment) Regulations 1981 (TUPE) have been identified for this project. However there will be some recruitment required to support the programme. HR is supporting CAZ in the early production of relevant paperwork in preparation for recruitment to take place. This will be managed within current Bristol City Council HR policies.

4.10 Contract Management

BCC have a new contract management team in place following a service restructure. Procurement has been split resulting in there now being a Strategic Procurement Team and a Strategic Supplier Relations Team (SSRM). The Strategic Supplier Relations Service will be developing tools and governance to support contract owners and contract managers manage their contracts. SSRM will support the development of a contract management plan (CMP) which will document all the key information about the contract, how it must be managed and what the reporting requirements will be.

The CAZ Team are already working with the SSRM to ensure effective management of all of the contracts involved in the delivery of the CAZ for Bristol. Individual project managers working on discrete work packages will report to the CAZ programme manager who will maintain overall responsibility. The contractors’ performance will be monitored and reported on using Key Performance Indicators (KPIs), where appropriate, to ensure any issues are highlighted early and can be remedied before effecting dependent work-packages. These KPIs’ were pre-agreed in order for suppliers to access the framework.

Where BCC are using NEC3 contracts there are a number of roles to help administer the contract. The team already includes 2 members who specialize in managing construction contracts. It is acknowledged that the NEC3

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Project Manager role is key to managing these objectives. There is also a Supervisor role to check that the works are delivered in accordance with the contract and in line with CDM guidance. Unless we are bound by a framework, we will look at either NEC 3 or 4 if they are appropriate. However, we may also use a different form of contract if we think that appropriate.

The contract management support runs right through to contract award, management of the contract and KPIs and on to the handover to BAU.

4.11 Accounting Treatment

The CAZ Implementation costs are deemed to be Capital expenditure and will be treated as creating an asset which will be depreciated in accordance with the Councils accounting policies.

The grant will be held on balance sheet. It will be used as financing the capital cost similar to deferred grants but charged straight to the Capital Adjustment Account as part of financing the capital programme. Note Service areas will receive the budget for depreciation charges.

The CAZ schemes Operating costs will be offset against revenue generated from the CAZ charges and any revenue generated from Penalty charge notices, and any potential surplus generated will be allocated to a designated account similar to a PPRA and will be ring-fenced for use towards, offsetting future year deficits, funding the Decommissioning costs, to fund any mitigation measures against realised risks, as well as fund transport related initiatives including those that support the CAZ objectives.

A specific reserve will be created to cover the cost of decommissioning the scheme after 10 years, as well as mitigating any potential risks during operation. The cost of decommissioning has been estimated as £0.56m and it is deemed that a year of operational cost (£2m) will provide adequate provision for potential risk (allowing for a full year of costs with no offsetting Revenue, which could be the case in extreme cases like a pandemic year). The Council will decide how to build up such a reserve within the early years of the scheme.

Clean Air Fund (CAF)

For all the CAF mitigations measures, the Council will treat the expenditure as "Revenue Expenditure" applying a statutory exemption available for "Revenue Expenditure Funded by Capital Under Statute" (REFCUS). This allows items that commonly require revenue funding to be funded through a capital grant. Capital funded items will use REFCUS to be expensed in the year of expenditure although they are capital funded, as they will not be creating an asset on the Council's balance sheet. Expenditure can only be treated as capital expenditure if the authority grant funding to a third party towards expenditure which would, if incurred by the authority, be capital expenditure.

Any CAF Grant received will be held in a designated account and disbursed within the year of receipt. Any balance at year-end will be carried forward and disbursed in subsequent year or used to enable other mitigation measures in line with the terms of the grant conditions or returned to JAQU if it is agreed to be surplus to requirement.

4.12 Summary

The procurement process ran over the course of 5 weeks and a total of 3 submissions were posted on the ProContract website. No suppliers were disqualified during the process, and all questions were evaluated by 2 or more individuals. The evaluation process had to be carried out twice due to a formal challenge by an unsuccessful bidder. This has now been concluded and BCC will be awarding at the end of the standstill period, subject to there being no further challenge.

A number of tenders that are aligned with this project are in the process of being procured once the CAZ measures have been approved. Some contracts have already been procured that directly affect this provision in order to provide more continuity, these include;

- SiDem upgrade to hosted solution – a variation to the contract has been signed (Feb 21) to move this to a hosted solution and in addition extend the contract for a further 2 years (as it was due to expire in March 2021). This will provide a more robust solution for managing the additional PCNs; circa 50,000 that CAZ will likely generate. This upgrade is being funded Bristol Parking Services and has just moved to into the delivery stage with an expected completion date of the end of June 2021
- SiDem upgrade to develop an enforcement interface with JAQU back office solution – we have obtained a quote from Conduent and have submitted an official request to our Procurement team to assist us in agreeing the most appropriate procurement route
- MiPermit – potential variation to existing contract to manage the local exemptions that will require a permit. This includes installing ‘pods’ (tablets) in all hospital reception areas for patients to register their vehicle and see if they qualify for an exemption. We have captured the requirements and discussed and shared these with Chipside and obtained a quotation for the work. The Procurement Team will assist us in agreeing the most appropriate procurement route.
- GOV.UK/Pay / Stripe – The payment mechanism for charging users will be easily awarded as a direct award due to the fact that it is the only payment mechanism Gov.UK Pay will communicate with.

These outstanding tenders are being scoped now and will be progressed once the preferred option is approved following approval of the FBC as these contracts would not otherwise be being procured.

4.13 Outstanding Contracts

There are a number of procurement exercises outstanding. These are namely the call off projects linked to the main Camera Enabling Technology contract as noted above.

Where there are other contracts still to be tendered, this is largely due to the uncertainty around funding. We have the internal resource required to undertake the tenders, but this work would not ordinarily be taking place, so confirmation of funding is required as a first step. For example:

Telemarketing Team – as noted in the Procurement Route table above, there is a gap in the experience of the internal comms and engagement teams to run a large-scale cold calling exercise. We have worked with BaNES and have a copy of their procurement and project documents related to the tender exercise they undertook for the same service provision. We are adapting the paperwork to be Bristol focused and have already engaged in some light soft market testing to get an idea of the sort of support available from the finance providers. The Telemarketing Team will bridge a vital gap in contacting local businesses, understanding the potential issues being faced, mitigation required and creating a detailed database of contacts. This work would not be required if the CAZ was not taking place, so with no guarantees of funding, we will procure this as soon as we have funding approved. The procurement team are already on hand to help us with the tender. The cost assumptions are very robust as BaNES procured exactly the same work, so we are confident with our bid.

Cycle scheme – the scheme is fully developed and costed with a developer lined up to deliver the majority of the scheme, with one section missing. It’s this ‘missing link’ that we wish to fund through CAF. There may be scope to bring this section forward, but we can’t have those conversations until we have lined up the contractor to undertake this work. The costs in the CAF bid are based on many years of experience using schedules of rates from the frameworks and other schemes. The design has progressed to an advanced stage which provides an additional level of confidence in the plans included in the CAF Bid. BCC has a wealth of experience of delivering this type of project and there is a team member on standby to take this project through to delivery as soon as funding is awarded (more details of this are held in the CAF Bid, FBC 17).

VMS Strategy (Fast Track Measure) – this is a set of measures based around one central strategy aimed at being able to control areas which suffer from congestion and therefore poor air quality. This is a scheme designed purely for the CAZ Project, without it there is no funding to progress it. The experienced Traffic Operations Team have used existing framework costs and experience from other projects to put a proposal forward. This involves

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procurement of new software and traffic modelling to manipulate signals, moving traffic in a more controlled way around the city. There is no budget or resource to progress the proposal into a more robust scoping plan until we have the funding agreed. The expertise of the team has provided a 'best guess' forecast of the work involved and the potential benefits. We have some key corridors such as Marlborough St, where we have tried the majority of more traditional traffic management tools, but we still have exceedances. This scheme would focus on the most congested and polluted corridors first, seeking to use advanced and innovative technology / methods to approach a long-standing issue. This would then be rolled out to other corridors according to pollution / congestion levels.



**Bristol City Council Clean Air Plan
Full Business Case**

Finance Case

FBC-7

July 2021

Bristol City Council

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Acronyms and Abbreviations

ANPR	Automatic Number Plate Recognition
BCC	Bristol City Council
CAF	Clean Air Fund
CAP	Clean Air Plan
CAPEX	Capital expenditure
CAZ	Clean Air Zone
EU	European Union
HGV	Heavy Goods Vehicle
JAQU	Joint Air Quality Unit
LGV	Light Goods Vehicle
NO ₂	Nitrogen Dioxide
OBC	Outline Business Case
OPEX	Operational expenditure
PCN	Penalty Charge Notice

5. Finance Case

5.1 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 Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the COVID-19 pandemic. Recent research suggests that poor air quality may be correlated with higher death / infection rates from COVID-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill², to ensure that certain standards of air quality continue to be met, by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. 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 Bristol. 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 has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), and an Outline Business Case (November 2019 and updated between April and June 2020). A Full Business Case was submitted to JAQU in February 2021.

The Finance Case sets out the overall financial position for the preferred Clean Air Plan appraised in the economic case. The preferred option can be summarised as follows:

- Small Area Class D CAZ (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs);
- Fast Track measures;
 - a) Closure of Cumberland Road inbound to general traffic; and

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 Environment Bill 2019-21 <https://services.parliament.uk/bills/19-21/environment.html>

- b) Holding back traffic to the city centre through the use of existing signals.

Information about the scheme development and evolution of the preferred option is set out in detail in the strategic case.

The Finance Case outlines the funding and expenditure requirements for the CAP, as well as outlining wider financial impacts and consequences of the proposed arrangement for BCC and the Government. It outlines the revenue and capital needs (and associated profile) to deliver the project and is underpinned by a financial model which profiles the scale and sources of proposed funding alongside the timing of expenditure. In summary, this section thus focuses on outlining:

- Capital and operational expenditure for the project.
- Funding sources for this expenditure and the funding that has been bid for to allow delivery and operations of the intervention and affordability of the scheme.
- Revenue generation estimates from the operation of a charging CAZ.
- The net operational position of the project.

Note that, for the purposes of this version of the financial case, whilst costs have been forecast as accurately as possible, some cost and revenue items remain as estimates. Details of the scheme costs are provided in the following FBC appendices documents:

- Appendix J Projects costs (FBC-33); and
- Appendix L Risk Management Strategy - QRA (FBC-35).

5.2 Project costs

5.2.1 Summary of capital expenditure (CAPEX)

A summary of the scheme implementation costs is provided here for the preferred option. A detailed breakdown of CAPEX costs is provided in 'Project Costs' in Appendix J of this FBC, noting the point raised in section 5.2.1. CAPEX will be incurred by BCC across a range of activities as listed below:

Enforcement System:

- Supply, installation, configuration and testing of fixed ANPR cameras and back-office system;
- Fully-equipped mobile enforcement vehicle (MEV) and a back office system;
- System integration and interfacing with other systems

Estimated costs of the enforcement system are £0.8 million (2021 prices).

Highway works:

- Camera and communications network infrastructure (all required cabinets, mounting posts, ducting and cabling for camera installation as well as ducting, power supply, cabling and connection of the data communications network); and
- Road signing, marking and traffic management.

Estimated costs for street works are £1.9 million (2021 prices).

CAZ Project Delivery and Ongoing Operational Management Team:

- Staff role relating to various implementation and delivery activities, lasting from July 2021 up to, and including where appropriate June 2022 (i.e. up to one year), estimated to cost £1.6 million (2021 prices)

CAZ Publicity and Advertising

- Including activities relating to publicity, advertising and appointment of a telemarketing team, lasting from July 2021 to June 2022, inclusive), estimated to cost £0.5 million (2021 prices)

Non-Charging Measures for CAZ Implementation:

- FastTrack traffic management measures
- Closure of Cumberland Road to inbound general traffic;
- Variable Message Signs (VMS) strategy including use of existing infrastructure.

Estimated costs for non-charging measures for CAZ implementation are £0.6 million (2021 prices).

Non-Charging Measures for Clean Air Fund:

- Estimated costs for non-charging measures for Clean Air Fund are £46.6 million (2021 prices).

Other CAPEX:

- Air quality monitoring installations, estimated to cost c. £20,000 (2021 prices)

Risk:

- Estimated at £1.2 million, based on use of P(80) output from QRA (2021 prices).

A summary of the total capital costs incurred by the proposed scheme is provided in Table 5.1 below, which demonstrates that total capital costs will be in the order of £53.2 million (2021 prices). Given some capital expenditure (CAPEX) is expected to take place in 2022, minor inflation adjustments are made to this estimated cost to generate outturn costs of £54.1 million³. Around 12% of CAPEX funding is requested from JAQU via the Implementation Fund with the residual funding requested from the Clean Air Fund.

³ CAPEX inflation is estimated at 3.5% per calendar year, based on BGIS tender price forecasts

Table 5.1: CAPEX by broad theme and funding source (£forecast outturn prices)

CAPEX Item	Small CAZ D
Implementation Fund	
Enforcement System	773,521
Highway Works	1,932,939
CAZ Project Delivery and Ongoing Operational Management Team	1,552,881
CAZ Publicity and Advertising	462,200
Other CAPEX	20,149
Non-Charging Measures - Implementation Fund	630,250
Risk	1,225,000
Clean Air Fund	
Non-Charging Measures – Clean Air Fund	46,629,169
Total	53,226,109

5.2.2 Summary of operational expenditure (OPEX)

OPEX will be incurred by BCC across a range of activities, throughout the operation life of the CAZ, these include:

- Systems operations and maintenance
- Camera, communications, signage and buildings maintenance
- Monitoring and evaluation
- Decommissioning
- PCN production

The majority of these operational costs are accrued on either a fixed, annual basis for the lifecycle of the project or as one-off costs. However, cost items relating to PCN/Traffic Penalty Tribunal (TPT) activities and enforcement staff requirements are contingent on variations in vehicle non-compliance and contravention. This results in operational costs being sensitive to key operational assumptions. In particular, changes in compliance levels can result in differing degree of civil enforcement, appeals and associated activities that need to take place. Also the cost associated with revenue payment to support ongoing operation of JAQU central payment system will vary in line with compliance. As a starting point, for the purposes of the 'core' scenario, the revenue payment to JAQU is assumed to include 10% of all CAZ charge revenue only (i.e. exclusive of PCN revenue).

In addition, two operational scenarios have been considered:

- Short operation from June 2022 to December 2024⁴; and
- Ten year operation from June 2022 to May 2031 (i.e. end of appraisal period)

The shorter operational period recognises that the CAP is anticipated to reduce the annual mean concentrations of NO₂ to below the EU limit value threshold by 2023. Continuing the scheme until September 2024 will allow a

⁴ Given that compliance is assumed to be achieved by end of 2023, the shorter operational period is defined as June 2022 to December 2024 (i.e. 'compliance year +1')

further period of consolidation of NO₂ concentrations, supporting a stabilised, long-run concentration level within the EU limit values. The longer operational period is also considered to reflect the potential for the CAP to be extended into a long-term programme and to ensure steady-state compliance with EU limit values. This longer operational period could provide transport operators with a more stable environment in which to make investment decisions.

With reference to the longer term operational period in particular, it is acknowledged that the schemes are forecast to achieved compliance well before 2030. Hence, the scale of revenues and costs are both expected to diminish towards the end of the appraisal period.

Within this context, the central estimate for operational costs is between £6.8 million (shorter operational period) and £17.7 million (longer operational period) in 2021 prices. This estimate increases to between £7.2 million and £20.1 million taking into account inflation (labour costs inflated at 2.9% per annum based on OBR's retail price index growth forecast and other operating costs inflated at 2.9% also in line with OBR's retail price index growth forecast). A detailed breakdown of OPEX costs is provided in BoQ format in 'Project Costs' in Appendix J of the FBC.

5.2.3 Funding sources

There are four main funding sources for the set-up and operation of CAZ. These are:

- An Early Measures Fund - this is expected to support small, ambitious and good value early measures to improve air quality and start to reduce concentrations in CAZ. A maximum of £3 million per local authority has been allocated for this funding which is part of the CAF.
- A £255 million Implementation Fund - this is designed to support local authorities in the planning and delivery of targeted action to improve air quality
- A £220 million Clean Air Fund - an opportunity for local authorities to implement additional measures tailored to their area which minimise the potential impact of local air quality plans - either by enabling the local authority to implement local plans that collectively impact on fewer people, or by providing direct support to those impacted.
- Revenue from CAZ charges - funding will become available from the charges that are applied to each CAZ.

5.2.4 Funding applications

BCC is reliant on funding from the Implementation Fund, Clean Air Fund and anticipated revenue to deliver this Clean Air Plan. Funding requirements are described below:

- Implementation Fund – The funding grant requested from central government through the implementation fund is £6.7 million grant for capital expenditure. This funding requirement is consistent across both the shorter and longer operational period scenarios.
- Clean Air Fund - The funding grant requested from central government through the Clean Air Fund is £47.4 million for capital expenditure.
- Revenue from CAZ charges – BCC will utilise anticipated revenue from the CAZ schemes to finance the ongoing operational cost of running the scheme.

5.3 Financial model

5.3.1 Overview

Modelling of the finances for the Bristol CAP has been undertaken to analyse the potential financial performance of the project. Full details of the financial model development and results are included in FBC-41 'Financial Report' in Appendix Q of this FBC.

The Clean Air Zone Framework states that local authorities should not set the level of charge as a revenue raising measure. The Transport Act 2000 requires any excess revenue that may arise from charges above the costs of operation to be re-invested to facilitate the achievement of local transport policies. These should aim to improve air quality and support the delivery of the ambitions of the zone. The revenue re-investment reserve described below provides a mechanism for utilising any excess revenue generated within these parameters.

The financial model is underpinned by key assumptions, as listed below:

- Two scenarios, as described in Section 5.2.3:
- Short operation from June 2022 to December 2024⁵; and
 - Ten year operation from June 2022 to May 2031 (i.e. end of appraisal period)
- Non-compliant buses, coaches, taxis, private hire vehicles (PHVs), HGVs, LGVs and cars are all charged for travel into/through the small area CAZ boundary. CAZ charges are imposed as follows:
 - £9 for cars, taxis, PHVs and LGVs;
 - £100 for buses, coaches and HGVs
- No change in CAZ charges are assumed over the appraisal period. The current CAZ charges proposed are kept constant for the entire appraisal period. In contrast, operational costs are assumed to increase at the prevailing rate for general operational costs (2.9% per annum⁶) and staff costs (2.9% per annum⁷)
- Operational phase begins in June 2022. The forecast number of non-compliant vehicles in 2021 are used as a proxy for non-compliant vehicles in 2022. Further, 2023 and 2031 volumes of non-compliant vehicles are adopted directly from transport modelling outputs, with non-compliant vehicles forecasts for intervening years based on interpolation also undertaken as part of transport modelling. Note that given the traffic modelling outputs provide average annual daily flows, the 2022 non-compliant vehicles are profiled from June 1st to December 31st only, rather than for the full year.
- To reflect the introduction of exemptions from CAZ charges, some 11% of unique non-compliant cars that would otherwise be expected to pay the CAZ charge are exempt in the first year of operation (June 2022-May 2023). Informed by traffic modelling, this reflects the proportion of non-compliant cars registered to low income households that are interacting with the CAZ for work/education purposes and residents of the CAZ that travel out of the zone for work⁸.
- To reflect the anticipated roll out of the financial assistance schemes as part of the CAF bid, the following further adjustments are made to the basic non-compliant vehicle forecast for the duration of the appraisal:

⁵ Given that compliance is assumed to be achieved by end of 2023, the shorter operational period is defined as June 2022 to December 2024 (i.e. 'compliance year +1')

⁶ As per retail price index published by OBR

⁷ As per retail price index published by OBR

⁸ It is accepted that the proposed exemptions are more far-reaching than the two specific exemptions factored into the analysis here. However, due to a lack of data, it is not possible to accurately forecast the potential impact of exemptions on other user groups. The analysis therefore presents a conservative view on the potential reduction in non-compliant vehicles paying the CAZ charge in the first year of operation due to the introduction of exemptions.

- 19% reduction in non-compliant cars
- 95% reduction in non-compliant taxis
- 48% reduction in non-compliant LGVs
- 79% reduction in non-compliant buses/coaches
- 18% reduction in HGVs
- A contravention rate of 5% is applied to capture non-compliant vehicles that do not pay the charge and are instead issued with a penalty charge notice (PCN). The contravention rate remains static across the appraisal period. This assumption reflects BCC's experience of contravention of other schemes (e.g. car parking, bus lane enforcement), but also the wider national experience provided by contravention of schemes such as ULEZ and Dartford Crossing.
- Based on BCC's experience of the contravention and resulting PCN process, some 65% of vehicles issued with a PCN are assumed to pay the resulting charge. The vast majority pay at the discount rate (92% at £60, plus the original CAZ charge), with the residual contraveners paying at the full rate (8% at £120, plus the original CAZ charge). Of the 35% of contraveners that do not pay the charge, the following outcomes are anticipated:
 - 46% of PCNs cancelled; no charge incurred
 - 6% issued with a Charge Certificate (50% increase on full PCN rate)
 - 15% followed up with Traffic Enforcement Centre (TEC) proceedings (at full PCN rate)
 - 34% of PCNs written off
- First time offenders are not charged or issued with PCNs. Instead, individuals are issued with a warning letter only.
- All charge and PCN income is assumed to be accrued in the same month that the non-compliant vehicle enters the CAZ. No delay or deferment of charge or PCN income is assumed⁹.
- As advised by BCC, PCN operations incur costs of £0.30 per PCN for Traffic Penalty Tribunal (TPT) charges, £1.43 per PCN for stationary and supplies and £0.85 per PCN for postage. A multiplier of 1.35 is applied to postage costs to reflect additional communication efforts resulting from unresponsive contraveners.
- Further, BCC advised that staff costs to manage PCN operations include civil enforcement officers (CEOs, c. £54,587 per annum per role) and appeals officers (c.£54,587 per annum per role). Based on current operations, BCC indicated that 50,000 PCNs per annum necessitated 2 CEOs and 3 Appeals Officers, suggesting a ratio of 1 CEO per 25,000 PCNs and 1 Appeals Officer per c. 17,000 PCNs.
- A proportion of revenue secured through CAZ charge payments are transferred to JAQU. Although the exact figure has not been determined at this stage, a 10% and 20% transfer of CAZ charge revenue is considered.

The overarching framework for revenue generation as a result of CAZ is outlined in Figure 5.1, see Section 5.3.2 for further details on revenue generation assumptions.

⁹ It is accepted that this approach to profiling revenue represents a simplification of the charge and fine payment process. However, in the absence of detailed evidence regarding the extent of deferment or delay in payments, including potentially lengthy delays related to tribunal and legal activity associated with some PCN payments, a simplified approach to revenue forecasting was considered most robust.

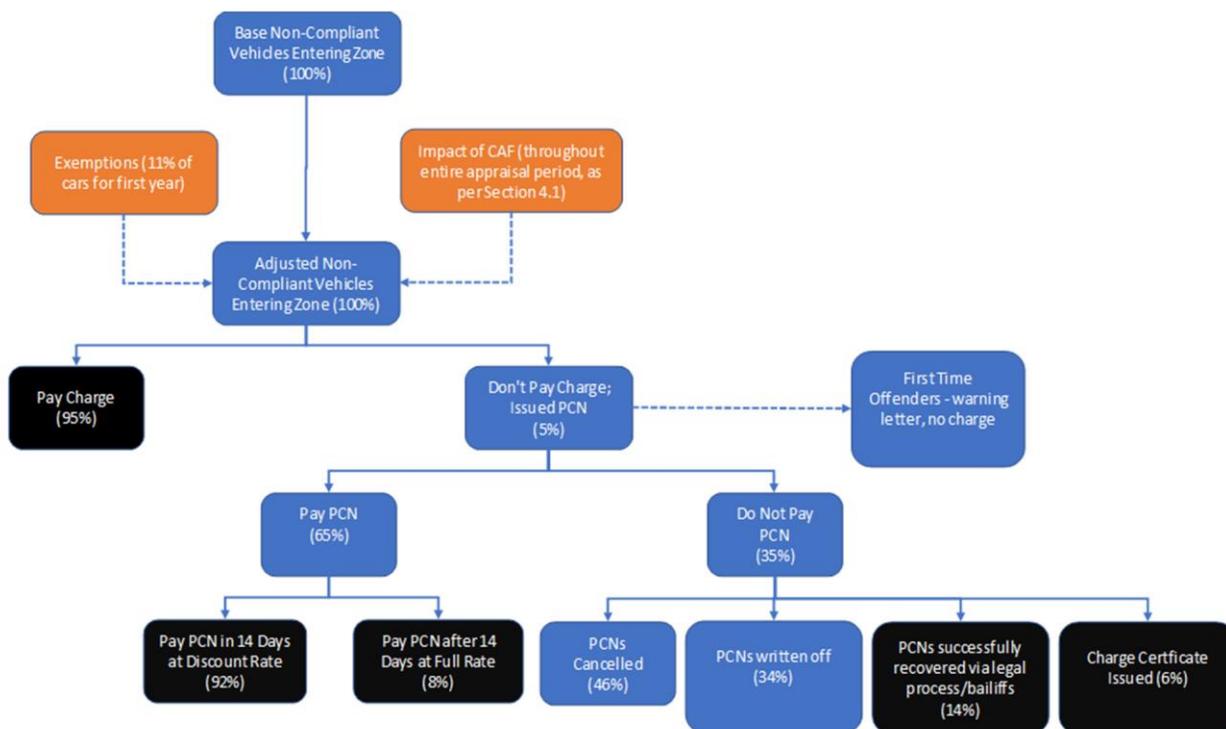


Figure 5.1: CAZ revenue generation framework

5.3.2 Revenue generation

Table 5.2 summarises the anticipated income from the CAZ including direct CAZ income (from the charge) plus the indirect CAZ income (from the PCN process). Calculations suggest the CAZ could generate a stream of revenue over the appraisal period that amounts to £21.3 million at the end of a short operational period, or £44.2 million in 2030 across the ten year operational period. Note that for the longer operational period in particular, the scale of total income generation declines rapidly over time from £8.7 million in the first year of operation (2022/23) to £0.1 million at the end of the appraisal period (2031/32).

It should be noted that the revenue generation is reliant on a number of key assumptions which have some uncertainty. BCC has made reasonable attempts to estimate these assumptions based on similar schemes delivered in the UK or experience of enforcement within the authority, but since a CAZ has not yet been implemented the available evidence is limited and hence the forecasts are uncertain. In addition to the analysis above, a range of detailed sensitivity tests are being undertaken to understand the impact of amending key assumptions on the forecast revenue generation and will be presented when available.

Table 5.2: CAZ revenue generation summary table

Variable	Total
Short Operation	
No. Non-Compliant Vehicles ¹⁰ (000s)	2, 071.4

¹⁰ This figure represents the base number of non-compliant vehicles before any adjustments to account for exemptions/CAF-related financial assistance (as per Section 5.3.1)

Variable	Total
No. Paying CAZ Charge ¹¹ (000s)	1,322.3
No. Contravening CAZ Charge ¹² (000s)	62.9
A) CAZ Charge Income (£'000s)	£17,478
No. Paying PCN (000s)	40.9
No. Paying After TPT (000's)	4.4
B) CAZ PCN Fine Income (£'000s)	£3,824
A + B) Total CAZ Income (£'000s)	£21,301
Ten Year Operation	
No. Non-Compliant Vehicles (000s)	4,281.4
No. Paying CAZ Charge (000s)	2,784.2
No. Contravening CAZ Charge (000s)	132.6
A) CAZ Charge Income (£'000s)	£36,135
No. Paying PCN (000s)	86.2
No. Paying After TPT (000's)	9.3
B) CAZ PCN Fine Income (£'000s)	£8,036
A + B) Total CAZ Income (£'000s)	£44,171

5.3.3 Net operational position (before extended mitigations)

The current analysis indicates that in the 'core' scenario, cumulatively revenue generation is predicted to exceed operational costs, resulting in an estimated net operational surplus of between £14.1 million (short operation) and £24.0 million (ten year operation) across the appraisal periods in outturn prices.

However, the scheme is forecast to generate a net operational deficit in later years of the project's operation. For the short appraisal period, a deficit relates to ongoing costs associated with an eight-year monitoring and evaluation period. For the ten year appraisal period, a deficit is incurred in the final years of operation as most vehicles become compliant but high fixed costs of operation are retained. It is intended that the net operational deficit identified in the later years of the appraisal period can be covered by the anticipated net operational surplus identified above.

Table 5.3: Net Operating Position (£000s)

Variable	2021 Prices	Outturn Prices
Short Operation		
Operational Income	21,302	21,302
CAZ-Related OPEX	6,840	7,228

¹¹ This figure takes into account the introduction of exemptions and the availability of CAF-related financial assistance for some non-compliant car users (see Section 5.3.1)

¹² This figure takes into account the policy to waive first time offenders charges

Variable	2021 Prices	Outturn Prices
Net Operating Position (pre IF grant)	14,462	14,074
Ten Year Operation		
Operational Income	44,171	44,171
CAZ-Related OPEX	17,720	20,129
Net Operating Position (pre IF grant)	26,451	24,042

The Operational Summary demonstrates that the Clean Air Plan is forecast to generate a significant positive cash flow over the appraisal period. Any cashflow surplus associated with the scheme will be ringfenced for the following purposes, in order of priority:

- Deficit coverage for ongoing and long-term operational expenditure, particularly in latter years of operation when the various schemes are anticipated to face an operational deficit, as well as decommissioning.
- Creation of a reinvestment reserve to support:
 - any underestimation of operational costs.
 - Delivery of BCC's 'Liveable Neighbourhoods' aspirations (estimated cost range £45m to £283m);
 - supplementary schemes to the CAF measures, as well providing an opportunity to further invest in engagement with businesses and local residents affected by the schemes. For example, this funding source would support or extend some of the following measures which may form part of the CAF bid:
- Increase, Improve, update Legible City Signage on key radials and in city centre;
- An 'unintended consequences' fund for minor local implementations such as one-ways;
- Support for additional buses to the Bristol Royal Infirmary.

Within this context, the residual cash position for the CAP in Bristol is expected to be neutral throughout the appraisal period, as demonstrated in Table 5.4 below.

Table 5.4: Residual Cash Flow Position –Outturn Values (£'000s)

Net Cash Flow Position (£'000s)		
Operational Item	Short Operational Period	Ten Year Operational Period
Net Cumulative Cashflow	14,074	24,042
Deficit Coverage ¹³	302	1,405
Reinvestment Reserve (residual monies)	14,074	24,042
Residual Cash Position	0	0

¹³ To cover ongoing and long-term operational expenditure, particularly in latter years of operation when the various schemes are anticipated to face an operational deficit, as well as decommissioning

5.4 Sensitivity Testing

In light of the significant uncertainty and lack of precedent regarding operation of Clean Air Plan's, extensive sensitivity testing is being undertaken to better understand the potential range of net operating positions for the project, based on variance in key assumptions. The following key sensitivities are considered:

- Base Non-Compliant Traffic Analysis: no consideration of exemptions or CAF impacts on base traffic flows.
- Base + Exemptions Non-Compliant Traffic Analysis: consideration of exemptions but not CAF impacts on base traffic flows.
- Sensitivity Test 1: As per 'core' scenario, but with 20% JAQU revenue payment instead of 10%
- Sensitivity Test 2: As per 'core' scenario, but increase in contravention rate from 5% to 20%
- Sensitivity Test 3: As per 'core' scenario, but reduction in CAZ and PCN Charges by 50%
- Sensitivity Test 4: As per 'core' scenario, but reduction in non-compliant traffic flows by 25% compared to core scenario
- Sensitivity Test 5: As per 'core' scenario, but increase in non-compliant traffic flows by 25% compared to core scenario
- Sensitivity Test 6: As per 'core' scenario, but exponential profile of non-compliant traffic flow reduction rather than more gradual profile suggested by traffic modelling
- Sensitivity Test 7: Combination of Sensitivity Tests 3, 4 and 6, plus an assumption that the contravention rate declines at an exponential rate rather than stabilising at 5% across the appraisal period, representing a worst-case revenue generating scenario that has:
 - 20% JAQU revenue payment instead of 10%
 - Reduction in CAZ and PCN Charges by 50%
 - Reduction in non-compliant traffic flows by 25% compared to core scenario
 - Exponential profile of non-compliant traffic flow reduction rather than more gradual profile suggested by traffic modelling
- Sensitivity Test 8: As per 'core' scenario, but reduction in non-compliant traffic flows to 82% of 'core' scenario levels, reflecting traffic patterns for Bristol in wake of COVID19 pandemic
- Sensitivity Test 9: As per 'core' scenario, but with an increase in CAZ & contravention charges of 25% to reflect the possibility of increase the charges if the level of compliance is not achieved.

The outputs of these sensitivity tests in terms of outturn cashflow is presented in the following table. The outputs demonstrate that a change in the profile of non-compliant traffic reduction and the value of the CAZ/PCN charges are the key drivers of net operating position. In particular, any acceleration in the reduction of non-compliant traffic over time (as modelled through Sensitivity Test 6 and captured as part of Sensitivity Test 7) has a particularly significant impact on operating position.

Table 5.5: Sensitivity Test Analysis–Outturn Net Operational Position Values (£'000s)¹⁴

Variable	Short Operation	Ten Year Operation
Base	23,095	41,942
Base + Exemptions	22,477	41,323
Core Scenario	14,074	24,042
Sensitivity Test 1	12,326	20,429
Sensitivity Test 2	21,193	38,927
Sensitivity Test 3	4,297	3,763
Sensitivity Test 4	9,392	14,377
Sensitivity Test 5	18,787	33,737
Sensitivity Test 6	2,936	-6,829
Sensitivity Test 7	-2,154	-12,311
Sensitivity Test 8	10,728	17,143
Sensitivity Test 9	17,891	32,028

5.5 Summary

The financial analysis of the Clean Air Plan options demonstrates that the capital cost of implementation will amount to £54.1 million (outturn values). BCC is requesting 12% of this funding from the Implementation Fund to support capital expenditure. BCC is requesting the residual funding from the Clean Air Fund to support capital expenditure on mitigation measures.

From an operational perspective, the financial analysis demonstrates that CAZ revenue is sufficient to cover operational costs for all Clean Air Plan options based on core scenario analysis. However, there is significant uncertainty around the timing, profile and scale of CAZ revenue generation. Sensitivity testing demonstrates that changes to profiling of the reduction in non-compliant traffic have the largest impact on the operational position of the Clean Air Plan. For example, significant acceleration in the reduction of non-compliant vehicles (e.g. because the rate of vehicle upgrading or behavioural choices towards non-car travel materialise faster than forecast) could significantly reduce CAZ income and transform any operational surplus into an operational deficit.

In summary, the total request to central government for the delivery of the Clean Air Plan can be summarised as follows:

- £54.1 million in capital grant funding, of which:
 - £6.7 million from the Implementation Fund
 - £47.4 million from the Clean Air Fund

¹⁴ Note that only the 'core scenario' and Sensitivity Test 9 reflect the latest cost estimates. However, as noted in Section 5.2.1, the change in costs between the historic cost estimates used for other scenarios and the latest cost estimates is insufficient to fundamentally change the scale of net operational positions outlined in the table.

Under the core scenario for financial modelling, both operational period scenarios can achieve a net operational surplus of between c. £14.1 million and c. £24.0 million over the appraisal period. It is intended that any surplus can be used for the following purposes, in order of priority:

- Deficit coverage for ongoing and long-term operational expenditure, particularly in latter years of operation when the various schemes are anticipated to face an operational deficit, as well as decommissioning.
- Creation of a reinvestment reserve to support:
 - Any underestimation of operational costs.
 - Delivery of BCC's 'Liveable Neighbourhoods' aspirations (estimated cost range £45m to £283m);
 - Supplementary schemes to the CAF measures, as well providing an opportunity to further invest in engagement with businesses and local residents affected by the schemes. For example, this funding source would support or extend some of the following measures which may form part of the CAF bid:
- Increase, Improve, update Legible City Signage on key radials and in city centre;
- An 'unintended consequences' fund for minor local implementations such as one-ways; and
- Support for additional buses to the Bristol Royal Infirmary.

Bristol City Council Clean Air Plan

Full Business Case – Clean Air Fund Report

FBC-17 | 1 F

July 2021

Bristol City Council

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Appendix A – Vehicle valuation research

Appendix B. Loan/ Grant Package Assumptions

- B.1 - Upper Upgrade Estimate
- B.2 - Middle Upgrade Estimate
- B.3 - Lower Upgrade Estimate

1. Introduction

1.1 Context

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 Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the Covid-19 pandemic. Recent research suggests that poor air quality may be correlated with higher death / infection rates from Covid-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill², to ensure that certain standards of air quality continue to be met, by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. 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 Bristol. 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 has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), and an Outline Business Case (November 2019 and updated between April and June 2020).

1.2 Purpose of this Report

This report has been written to support the FBC, ready to be submitted to JAQU by BCC. It assesses a long list of potential options, provides reasoning, and details for the chosen mitigation measures and explains the amount of funding requested from the Clean Air Fund (CAF).

Section 2 describes the process to determine the mitigation measures and provides a summary of the social distribution impact assessment and the public consultation.

Section 3 sets out proposed exemptions.

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 Environment Bill 2019-21 <https://services.parliament.uk/bills/2019-21/environment.html>

Section 4 describes and includes a long list of options considered for mitigating measures, comparing each to Critical Success Factors (CSFs) to determine the short list of measures which has been included in the CAF application. This section also sets out the proposed mitigation measures and an initial estimate of costs.

Section 5 sets out details of the consultation. This is based on the most recent consultation which ran from the 8th October through to the 13th December 2020. It includes feedback received which supports the need for the measures as included in this bid.

Section 6 provides a detailed section on each of the short-listed measures and an explanation for their costs. It also sets out how each measure fits with the CAF objectives.

2. Process of Designing Mitigation Measures

2.1 Overview

In order to design mitigation measures that are important to the successful implementation of the CAZ, the following process was followed:

1) Key conclusions were drawn from the OBC-31 'Distribution and Equalities Impact Analysis Report (DEIA)' Appendix H of the OBC, to identify the groups most negatively impacted by the CAZ and, therefore, most in need of support. The impact on those with protected characteristics, were also considered to ensure they were not disproportionately impacted. This was later used as a baseline for the FBC but was also updated to reflect changes in the scheme. This section of the report seeks to provide the background and stages involved in this process.

2) From the DEIA conclusions, a longlist of mitigation measures was created. A deliberately wide range of measures were considered which could mitigate the negative impacts identified in the DEIA so they could be investigated and analysed further.

3) The longlist measures were then assessed against the Critical Success Factors (CSF), as identified in the Strategic Outline Case (SOC). These are divided into:

- Primary CSF: Whether the measure delays reaching compliance in the shortest possible timeframe. This is a pass/ fail criterion as it is crucial to the overall project success, if this was not achieved the measure was rejected.
- Secondary CSFs: These are required to undertake a comparative assessment of the best options relative to the project objectives, they have been grouped using the five-case model approach set out in the DfT's guidance on 'Transport Business Cases' (2013) 3 as a framework:
 - Strategic
 - All trip purposes treated equitably
 - Compliance with Defra Draft 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 4
 - Upfront capital required for scheme
 - Risk of financial penalty to the Council(s)

o Management

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

- 4) Upon comparison of the measures with the CSFs, a qualitative decision was made whether to progress the measure to the short list. During this process the details of the measure were finalised.
- 5) The short list of measures was then analysed and quantified before a final decision was made on the items taken forward for the funding request to the CAF.

2.2 Distribution and Equalities Impact Analysis Report – summary

2.2.1 Impact Summary

Distributional impacts of air quality improvements are broadly even, though impacts for a few combinations of demographic groups are not evenly distributed. Accessibility impacts are likely to be mixed, and as such both trip matrices and journey time benefits have been interrogated to determine movements by non-compliant vehicles (and thus propensity to be impacted) and quantified proxy impacts respectively. Trip-making propensity impacts are evenly distributed in comparison with population distributions but are most heavily on the middle and lower quintiles of income deprived areas. Affordability impacts will be negative across the socio-economic and business groups that directly interact with the CAZ area where non-compliant vehicles are still used, though vehicle operating costs improve overall. Impacts are slightly disproportionately felt by the least income deprived communities.

Table 2-1 summarises the distributional impacts for each social/business group. Table 2-2 provides a brief qualitative summary of the distributional impacts of the CAP scheme. Table 2-3 indicates some of the potential mitigation target groups that could arise from the CAP scheme.

Table 2-1: Summary impact:

Social or Business Group	Air Quality		Accessibility		Affordability	
	Net +ve impact	Distribution	Net +ve impact	Distribution	Net +ve impact	Distribution
Deprivation / low income	✓	Slightly uneven	✓	Slightly uneven	✗	Uneven
Children	✓	Reasonably even	✓	Slightly uneven		
Elderly people	✓	Slightly uneven	✓	Reasonably even		
Disabled people			✓	Slightly uneven		
Women			✓	Slightly uneven		
Ethnic minorities			✓	Reasonably even		
Businesses – SMEs					✗	Reasonably even
Businesses – LGVs/HGVs					✗	Uneven
Businesses – taxis					✗	Reasonably even

Table 2-2: Summary distributional impacts

Impact group	CAP scheme
Air quality	Improvements across the city. Distribution of impacts is reasonably even across social groups, though slightly uneven compared to distributions of income deprivation and elderly residents.
Accessibility	Time benefit calculations are all positive, and the distributional impact is slightly reasonable for some groups but would not overall be considered problematic. Trip-making propensity by people with non-compliant cars related to the CAZ area is evenly distributed.

Impact group	CAP scheme
Affordability	Vehicle operating cost impacts are unevenly distributed, being disproportionately felt by the least income deprived communities, which see a slight net disbenefit in vehicle operating costs; others have net benefits.
Businesses	There are potential direct impacts on costs for LGV/HGV reliant businesses. Though trips by non-compliant LGV/HGV reliant businesses are reasonably spread around the city, those making trips related to the CAZ area will be affected; the CAZ area is reasonably small but covers most of the city centre.
Car owners	Impact on all non-compliant car owners. Distribution of non-compliant car ownerships is slightly skewed to lower income groups, but ability to react to charges more so (such as households with more than one vehicle).

Table 2-3: Summary distributional impacts – potential mitigation targets

Potential mitigation target group ^a	CAP scheme
Residents	
Residents of the CAZ area	✓
Specific trip needs	
Disabled people – blue badge	✓ ^b
Disabled people – with specialist vehicle adaptations	✓ ^b
Out-patient access to hospital	✓ ^b
Car owners	
Low income non-compliant car owners	✓
Low-income compliant car owners	✗
1-car households	✗
Businesses	
SMEs located in the CAZ area	✓
LGV/HGV-dependent businesses not specifically located in the CAZ area but that need to travel into it	✓
Taxi owners/drivers – BCC registered	✓
Taxi owners/drivers – other authority registration	✓

Note:

- a) Groups that could be potential mitigation targets indicated with; '✓' are those where there is the potential for mitigation to be sought by or on behalf of the group, though not necessarily that it would be granted as part of implementing the CAP; '✗' indicates that it is less likely that any mitigation would be applicable to this group/option. However, both are indicative, and neither a positive nor negative indication in this table is a definitive indicator of future proposals.
- b) Could be linked with a destination specifically in the CAZ area and/or owning/using a non-compliant car

2.2.2 Concluding remarks

Air quality improves for most residents. Distributional impacts of air quality changes are also broadly even, though exceptions again exist, with impacts for some demographic groups not being evenly distributed.

Accessibility impacts are likely to be mixed. Trip-making propensity impacts are evenly distributed in comparison with population distributions but are most heavily on the middle and lower quintiles of income deprived areas, areas with the most children and those that have the lowest proportions of females. Impacts are disproportionately felt by the higher quintiles of the concentration of ethnic minorities, middle quintiles for disabled residents and more evenly for elderly residents. TUBA time benefits are also used as a proxy for accessibility; these are largely beneficial and the distributional impact broadly even.

Affordability impacts are likely to be negative across the socio-economic and business groups that directly interact with CAZ area, especially where there are charges for non-compliant cars or any restrictions on specific movements. Impacts are disproportionately felt by the second most and least income deprived communities. Impacts also fall on businesses operating non-compliant LGVs and HGVs who are either based in the CAZ area or

based elsewhere but operate within central Bristol and hence also interact with the CAZ area. Using TUBA vehicle operating cost benefits as a proxy for affordability indicates that the impacts are positive overall across the city as a whole, although impacts are slightly disproportionately felt by the least income deprived communities, which see a slight disbenefit in vehicle operating costs.

There will be direct impacts on the costs of operation for LGV/HGV reliant businesses, where their operations interact with the CAZ area. Trips by non-compliant LGV/ HGV reliant businesses are reasonably spread around the city.

The extent of impact on non-compliant car owners varies with the extent of users' trip-making requirements associated with the class 'D' charging measures in the CAZ area. Distribution of non-compliant car ownership is slightly skewed to lower income groups. However, the (in)ability of households to react to restrictions is unevenly felt by lower income groups (for instance, there are fewer multi-car households that could potentially using a compliant vehicle).

3. Exemptions

Table 3-1 sets out the planned exemptions to the Small CAZ D scheme.

Table 3-1: Exemptions offered

Measure	Description	Length
Historic vehicles	Full exemption as per the national CAZ framework – would need to register for an exemption. This applies to all vehicles with a tax class of which JAQU will check against the DVLA database. This applies to vehicles over 40 years old so new vehicles will be added each year	
Disabled passenger vehicle tax class 85	Full exemption as per the national CAZ Framework. This applies to all vehicles with a tax class of 85 which JAQU will check against the DVLA database. These vehicles are specially adapted for disabled passengers and difficult to modify. This only applies to vehicles adapted to accommodate disabled passengers and not individual blue badge holders (see separate blue badge holder exemption).	
Disabled Tax Class 78	This applies to all vehicles with a tax class of 78 which JAQU will check against the DVLA database. To qualify for this tax class requires an application to the DVLA with evidence issued by either the Department for Works and Pensions or the Service Personnel and Veterans Agency that the vehicle is used by, or for the purpose of a disabled person. This only applies to vehicles with this tax class and not individual blue badge holders (see separate blue badge holder exemption).	
Diplomatic Vehicles, Military Vehicles	Full exemption as per the national CAZ Framework. The MOD will provide a list of vehicles that are registered as diplomatic and military vehicles to JAQU	
Local Exemptions – The majority of local exemptions are initially being offered on a one-year temporary basis.		
Motorcycles	Full exemption - motorcycle means a motor bicycle or a motor tricycle but does not include an electrically propelled vehicle.	n/a
Specialist vehicles (e.g. cranes, agricultural vehicles and specific security vehicles)	<p>It has been agreed with JAQU that specialist vehicles that would be expensive to replace and difficult/impossible to retrofit will be offered a one-year temporary exemption from paying CAZ charges. While this is a national exemption it is to be managed by local authorities, in this case Bristol City Council. Vehicles that meet BCC eligibility criteria will be offered a one-year temporary exemption.</p> <p>To provide guidelines on what should be classed as a specialist vehicle, BCC will be using the Special Vehicles (8), Special Concessionary (11) and Special Types (4) tax classes as outlined in DVLA document V355/1. Vehicles with these tax classes will be eligible for the exemption but the owner will still need to make an application and prove this.</p> <p>There may be other types of vehicles that do not have one of these tax classes but that qualify because they are designed for specific uses and therefore hard to upgrade or retrofit. If the vehicle owner can prove this, they will be granted the exemption, however it is the responsibility of the vehicle owner to make the case for their vehicle.</p> <p>The registered keeper of the vehicle will need to create an account with MiPermit and register for the exemption before planned travel. Decisions will be made on a case-by-case basis with approved vehicles being added to the local permitted vehicle list, held and manually managed by BCC.</p> <p>To apply for this exemption, the following evidence is required:</p> <ul style="list-style-type: none"> • V5C for the vehicle • Proof of tax class of the vehicle 	1 year initially

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Measure	Description	Length
Recovery vehicles	Must be licensed as a recovery vehicle under paragraph 5 of Schedule 1 to the 1994 Act, this will all be fully confirmed and explained once the preferred option is approved by Government.	1 year initially
Showman's vehicles	Must be registered under the 1994 Act and is a "showman's vehicle" or "showman's goods vehicle" within the meaning of section 62 of the 1994 Act	1 year initially
Emergency service vehicles - Police, Fire, Ambulance services	<p>Police, fire and rescue services or ambulance services entering the CAZ in the exercise of their duties will be given a one-year exemption. This includes:</p> <ul style="list-style-type: none"> • Emergency police vehicles fitted with a blue warning beacon • Emergency fire vehicles fitted with a blue warning beacon • Emergency ambulances fitted with a blue warning beacon <p>Local service providers/trusts will be asked to provide a list of vehicles and their registration numbers which will then be added to the manually managed permitted vehicle list held by BCC.</p> <p>Any unmarked police vehicles not included on this list due to security reasons that enter the CAZ will be able to appeal the charges.</p> <p>Local service providers/trust will also sign a Memorandum of Understanding with BCC guaranteeing that, where possible, they will prioritise using the compliant vehicles in their fleets inside the CAZ and try to move non-complaint vehicles to routes outside the CAZ.</p>	1 year initially
Support for residents living inside the zone	<p>All residents living inside the CAZ area with a non-compliant vehicle will be offered a one-year exemption. Residents will need to create an account with MiPermit. MiPermit will validate their account against council tax records supplied by BCC to check they are a resident within the CAZ. Once the resident has created an account and had it verified, they will be able to apply for exemptions for each of their non-compliant vehicles, providing their V5C as evidence. These vehicles will then be added to the local permitted vehicles list.</p> <p>During this time financial support packages will be available and prioritised to those on low incomes and residents living inside the zone, subject to status and availability</p>	1 year initially
Registered community transport vehicles	<p>Registered community transport Euro 4 and 5 diesel vehicles with a valid Section 19 or Section 22 Permit, that are not otherwise exempt vehicles, will be exempt for at least the first year - to be reviewed. The registered keeper of the vehicle will need to create an account with MiPermit and then apply for an exemption for the individual vehicles. To apply for this exemption, the following evidence is required:</p> <ul style="list-style-type: none"> • Evidence of Section 19 or 22 permit • V5C <p>Vehicles that operate a community transport style function without a Section 19 or Section 22 Permit will have access to financial support packages subject to status and availability.</p> <p>This will all be fully confirmed and explained once the preferred option is approved by Government.</p>	1 year initially
Low income earners travelling into the zone or out of the zone for work purposes	<p>People entering the CAZ to work will be offered a one-year temporary exemption, provided they meet the following criteria:</p> <ul style="list-style-type: none"> • Annual income less than £26K (gross) • An hourly rate no higher than £13.51 • Work at least 18 hours a week at business premises located inside the CAZ 	1 year initially

Measure	Description	Length
	<p>A second round of funding will be held from early 2022 for those earning up to £27k to avoid those in need of support marginally missing out.</p> <p>This threshold is based on individual salary/income and not household income. The exemption would only be available for one non-compliant vehicle per individual.</p> <p>People who are either employed or self-employed and work from premises based inside the CAZ and meet the above financial criteria will need to create an account on MiPermit and then register for the exemption. To apply for this exemption, the following evidence is required:</p> <ul style="list-style-type: none"> • V5C showing they are the registered keeper of the vehicle • A letter from employer/s on headed paper to confirm business address and hours worked • P60 (or payslip/s if not been there a year)/self-assessment tax return <p>Once an individual has been granted this exemption, their vehicle will be exempt from CAZ charges for all journeys into the CAZ, whether for work purposes or not.</p> <p>Low income earners will also be prioritised for the financial support packages available subject to status and availability.</p>	
<p>Commercial vehicles with existing finance agreements exemption</p>	<p>This one-year temporary exemption will be available to companies based at an address within the Clean Air Zone and businesses keeping or storing vehicles overnight at an address within the Clean Air Zone. It applies to vehicles leased/purchased prior to 25th February 2021.</p> <p>The registered keeper of the vehicle would need to create an account with MiPermit and register for the exemption. To apply for this exemption, the following evidence is required:</p> <ul style="list-style-type: none"> • Evidence the business is registered within the zone • V5C for the vehicle • Evidence of the existing finance agreement on the vehicle 	<p>1 year initially</p>
<p>Visitors to the BRI complex</p>	<p>An exemption will be offered to visitors to the BRI hospital complex to waive any CAZ charges they incur, particularly those attending on a daily basis over a prolonged period of time. Because of the delicate nature of this exemption we will be deferring to hospital staff to decide who can apply for this exemption using the same criteria they use for issuing parking permits to visitors.</p> <p>Specified hospitals are:</p> <ul style="list-style-type: none"> • Bristol Royal Infirmary • Bristol Heart Institute • Bristol Royal Hospital for Children • Bristol Haematology and Oncology Centre • St Michael’s Hospital • Bristol Dental Hospital • Bristol Eye Hospital • Central Health Clinic <p>This exemption will tie in with an existing permit system operated by hospital staff. Exemptions will be issued for a 7-day period and can be renewed if the patient is still in the hospital after the initial 7 days. There is no limit to how many times this can be renewed, as long as the patient is still an inpatient at the hospital.</p> <p>There are also other exemptions that apply to hospital appointments and emergency attendance at A&E – see below.</p>	<p>1 year initially</p>

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Measure	Description	Length
Support for Blue Badge holders	<p>Blue Badge holders will need to create an account with MiPermit and provide a photo of their blue badge as evidence.</p> <p>Once the account is verified the blue badge holder will be able to:</p> <ul style="list-style-type: none"> a) register their main vehicle on MiPermit to be exempted for the full 12 months and added to the local permitted vehicle list b) apply for an allocation of 50 daily exemption permits to be used as required – best option if travelling in different vehicles c) do a combination of the two <p>Permits for travelling in other vehicles will work in a similar way to RPS visitor permits bought by residents with parking permits, although there would be no charge for the blue badge exemption permits.</p> <p>The Blue Badge holder would have to use one of their allocated permits if travelling in a different vehicle to their main registered vehicle, or if they do not have a registered main vehicle. To use the permit, the Blue Badge holder would have to activate it on MiPermit and provide the vehicle registration number of the vehicle they are to travel in along with the date of travel. This vehicle will then be added to the local permitted vehicles list for that day of travel only.</p> <p>Blue Badge holders will be able to apply for more exemption permits as needed if they use up their initial allowance.</p>	1 year initially
Home to School Transport buses / minibuses / coaches only	<p>Buses, minibuses and coaches only carrying out only a home to school service (serving Bristol schools but may be registered elsewhere). Passenger Services team will provide a list of vehicles providing the service to be added to a manually managed local permitted vehicle list held by BCC. If there are last minute changes (for example due to a vehicle breaking down) Passenger Services will have to contact the CAZ team to have any replacement vehicles added to the permitted vehicles list for that day.</p> <p>We were awarded £2.1m for bus retrofit support as part of the Clean Air Fund bid submitted alongside the Full Business Case. It is our intention to award funding before the CAZ scheme is implemented.</p> <p>Taxi services don't qualify for this exemption but will be able to access financial support packages subject to status and availability.</p>	1 year initially
Families with Personal Travel Budgets (PTBs) Who Travel Through the CAZ	<p>As well as running the Home to School service, Passenger Services also provide some low-income families with personal travel budgets (PTBs) to help cover the costs of transporting their child(ren) to their allocated school. Passenger Services have identified a small number of families whose route to school would take them through the CAZ.</p> <p>These families will be offered a one-year temporary exemption. Passenger Services will contact them directly and collect their vehicle registration number(s) and add them to a manually managed local permitted vehicle list held by BCC.</p> <p>In the case that one of these families moves or their child(ren) move schools they will be required to let Passenger Services know so they can assess whether their route still crosses the CAZ. If it does not the exemption will be revoked.</p>	1 year initially
Patients attending appointments at the BRI Hospital complex	<p>A one-year temporary exemption will be offered for patients attending appointments at the BRI hospital complex to waive any CAZ charges they incur attending their appointment. The BRI hospital complex includes:</p> <ul style="list-style-type: none"> • Bristol Royal Infirmary 	1 year initially

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Measure	Description	Length
	<ul style="list-style-type: none"> • Bristol Heart Institute • Bristol Royal Hospital for Children • Bristol Haematology and Oncology Centre • St Michael's Hospital • Bristol Dental Hospital • Bristol Eye Hospital • Central Health Clinic <p>The exemption will be outlined in appointment letters sent out from the hospital along with information for patients about how to apply if their vehicle is non-compliant. There will also be signage in the hospitals with information for patients about the CAZ and the exemption, including BCC contact details.</p> <p>The patient does not have to be the driver of the vehicle and can register more than one vehicle if they are dropped off/picked up by different vehicles. Patients will need to register for a separate exemption per charging day (12am-12pm) they travel.</p> <p>Patients will be able to visit MiPermit online and enter their registration number and journey details as well as a unique appointment number, which will be included in the letter inviting them to their appointment. Their vehicle will then be added to the list of locally permitted vehicles for that day. Patients can register online anytime within the payment window (6 days before, the day of travel and 6 days after) and do not need to create a MiPermit account. For those attending the hospital without appointments (e.g. visiting A&E), codes will be displayed in relevant reception areas for the patients to enter online within the payment window. These will be changed periodically by BCC staff to limit abuse.</p> <p>BCC will also be placing 2 pods at all main reception areas in the hospital complex and in the emergency department of the BRI, a total of 18 devices across 9 locations. Patients will be able to enter their vehicle registration number at these pods to register for the exemption on the day.</p> <p>The CSC will be available to help guide people through the online process or to talk them through using the pods. They will also be available to register exemptions for those struggling through a MiPermit browser page, provided patients contact them within the payment window.</p>	

Note - The above exemptions are a revision of the previous exemptions which were considered further following the OBC submission and in light of the potential impact on citizens as a result of Covid-19. JAQU have sought consistency of exemptions for CAZ schemes. There were further changes to exemptions made in the updated CAZ Guidance Pack released in December 2020. There have also been revisions in light of the as yet still unknown impact of the Pandemic.

BCC considers these exemptions as important measures to give specific vehicles and users, along with businesses unable to access financial support, an extended time frame to adapt to the CAZ. BCC will also keep the exemptions under review to ensure they are not impacting or hindering the delivering of compliance.

Further work was undertaken after the OBC to engage with the groups directly affected and refine the exemptions to best minimise negative impacts of the scheme, whilst maintaining the planned compliance date. Following this, legal advice was sought on the completion in the Charging Order.

However, BCC also recognise that the exemptions have restricted applicability, and do not help the majority of affected groups other than in some cases providing a longer period to adjust. In some cases, affected groups could be faced with the same issues following the exemption period as they would have done without a concession. To assist those groups affected by the scheme, BCC has devised a list of mitigation measures to be implemented alongside the exemptions. These are outlined in the next section.

These exemptions are subject to change following feedback provided by JAQU.

4. Mitigation Measures

4.1 Long list of mitigating measures

After the target groups were identified through the DEIA, a long list of measures was created. Shown below in Table 4-1 are the measures designed to aid the disadvantaged user groups in adapting to the scheme. Marking against the Primary and Secondary CSFs is rated Good, OK or Poor fit. It should be noted that whilst a mitigating measure may be rated as a 'poor fit', it is likely to be because it is already being run by the council or others so wouldn't offer best value as part of the CAP, and not that the measure itself is of poor value to Bristol.

Table 4-1: Longlist of Mitigation Measures

Mitigation Measure	Primary CSF	Secondary CSF	Bring to Shortlist?
Financial Support:			
Provision of grants for taxi, private hire and LGV drivers to upgrade and / or retrofit their vehicles	N/A – Private hires can benefit from scrappage scheme. LGV vehicles can benefit from the interest free loans described below.	N/A – see comments to the left.	No
An interest-free loan scheme to assist businesses replace their vehicles	Good – Can be implemented in the short term and should provide air quality improvements.	Good – High capital cost, but will aid impacted groups, provide economic, health and air quality benefits and be acceptable locally.	Yes
A grant (non-repayable) scheme for diesel car drivers	Good – Can be implemented in the short term and should provide air quality improvements.	Good – High capital cost, but will aid impacted groups, provide economic, health and air quality benefits and be acceptable locally.	Yes
Business Rate Relief for SMEs	OK – Does not target air quality improvements.	Poor Fit – Not compliant with CAZ framework, will not provide direct air quality improvements and will not impact affected groups or economic benefits.	No
Additional funding for supported bus services to use Euro VI vehicles and avoid CAZ charges	OK – Can be implemented in the short term and should provide some air quality improvements.	Good – High public and politically acceptability. BCC shown to be leading the way in CAZ compliance, rather than paying the charge for non-compliance.	Yes
Infrastructure:			
Optimisation of traffic signal timings across the city	OK – this could see air quality improvements, though likely to be long term as a very large number of traffic signals across the city to optimise.	Poor Fit – concern over availability of enough specialist technical resource requirement (in-house, external, on-site technicians) could delay implementation timescale.	No
Review and reconfigure pedestrian crossing phase configurations	OK – unlikely to be very noticeable by pedestrians to effect major modal change	Poor Fit - concern over availability of specialist technical resource requirement (in-house, external, on-site technicians) could delay implementation timescale.	No
Introduction of further Bus Priority Schemes	OK – this could see air quality improvements and encourage modal shift to the bus.	Poor Fit – funding is currently available in other schemes for a number of bus priority schemes, separate to the CAZ.	No
Easton Way, completion from Stapleton Rd Junction to J3, M32	Good – will help encourage walking and cycling from an area on the CAZ boundary	Good – this will help mitigate the impact on low income groups, improve health and increase safety.	Yes

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Mitigation Measure	Primary CSF	Secondary CSF	Bring to Shortlist?
Old Market Connections completing 'Temple Way Slip'	Good – will help encourage walking and cycling in a 'missing link' in the CAZ.	Good – this will help mitigate the impact on low income groups from the east of the city and improve health and increase safety.	Yes
Bedminster Bridges walking / cycling improvements	Good – will help encourage walking and cycling on the southern boundary of the CAZ.	Good – this will help mitigate the impact on low income groups from the south of the city and improve health and increase safety.	Yes
Extend footways on Upper Maudlin Street by BRI	Good – will help encourage walking and cycling on the very busy Upper Maudlin Street for the BRI	Good – this will help mitigate the impact users of the BRI, improve health and increase safety.	Yes
Hotwell Road shared cycleway and path	Good – will help encourage walking and cycling on the western boundary of the CAZ.	Good – this will help mitigate the impact on low income groups from the west of the city and improve health and increase safety.	Yes
Midland Road (bottom of Bristol to Bath Cycle Path)	Good – will help encourage walking and cycling in a 'missing link' in the CAZ.	Good – this will help mitigate the impact on low income groups from the east of the city and improve health and increase safety.	Yes
Newfoundland Road light segregation	Good – will help encourage walking and cycling on the north-eastern boundary of the CAZ.	Good – this will help mitigate the impact on low income groups from the north-east of the city and improve health and increase safety.	Yes
Redcliffe Hill filling in subway and walking and cycle improvements	Good – will help encourage walking and cycling on the southern boundary of the CAZ.	Good – this will help mitigate the impact on low income groups from the south of the city and improve health and increase safety.	Yes
Nelson Street segregated contraflow	Good – will help encourage walking and cycling in the city centre, in the centre of the CAZ.	Good – this will help achieve modal shift to sustainable modes, improve health and increase safety.	Yes
Dovercourt Road cycleway	Good – will help encourage walking and cycling from the north-east of the CAZ including a very low-income areas (Lockleaze)	Good – this will help achieve modal shift to sustainable modes, improve health and increase safety.	Yes
Additional Bristol to Bath cycleway improvements	OK – may help encourage walking and cycling from the east of the city but may be too far out to have major benefits for the CAZ	Poor Fit – relationship to the CAZ will be less clear to users than other walking and cycling improvements	No
More cycle stands / cycle hangers / cycle hubs / cobble treatment	OK – may help encourage cycling but other funding sources should be available.	Poor Fit – relationship to the CAZ will be less clear to users than other walking and cycling improvements	No
Increase, Improve, update Legible City Signage on key radials and in city centre	Good – will help encourage walking and cycling along some key radial routes and within the CAZ boundary	Good – this will help achieve modal shift to sustainable modes, improve health and increase safety.	Yes
Remove on-street clutter, e.g. North Street	OK – unlikely to be very noticeable by pedestrians and cyclists to effect major modal change	Poor Fit – relationship to the CAZ will be less clear to users than other walking and cycling improvements	No

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Mitigation Measure	Primary CSF	Secondary CSF	Bring to Shortlist?
Side Road priority / improve crossings	Poor Fit – unlikely to be very noticeable by pedestrians and cyclists to effect major modal change and could increase congestion / delays / reduce air quality	Poor Fit – in relation to the CAZ. Likely to difficult to deliver on large scale in the timescale required.	No
Additional electric vehicle charging points	Good – needed to support the encouragement of the uptake in electric vehicles.	OK – some already planned. More may favour more advantaged communities but would also help businesses and taxi / private hires	Yes
Work with new build developments to put in EV charging points	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. Already being led by a team in the council.	No
Expansion of Portway P&R site (550 spaces with 350 additional to be unlocked)	Good – needed to offer motorists from west/north-west of the city with an alternative to access the city centre.	Good – existing site, currently the smallest and large potential to increase use.	Yes
Promoting Sustainable Travel Choices:			
Mobility Credits and/or introduction of subsidised or free bus travel for certain demographic or income groups	Good - this will help compliance to happen more quickly	Good – will help mitigate the effects for low income groups and other demographics.	Yes
Loan bikes	OK – this could help reach compliance, but likely to have a limited overall effect	OK – could help improve overall public health, but a scheme is already in operation by the council and others that could be used.	No
Electric bike hire scheme	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. Recent local experience shows a lack of interest from the market and no clear user demand	No
Car clubs / electric vehicle car clubs	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. Experience has shown that this would be expensive to set up and would need to be commercial going forward.	No
Car club and charging points for Hartcliffe	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. Whilst this would target an area of low income, the need for this to be focused on Hartcliffe is not clear, would be expensive to set up and would need to be commercial going forward.	No
Targeted door knocking to explain about the CAZ and offer alternative travel solutions	Good - this has been demonstrated to be very effective and will help compliance to happen more quickly	Good – based on previous experience, this is good value for money and can have positive effects on the harder-to-reach parts of the community.	Yes
Targeted roadshows to explain about the CAZ and offer alternative travel solutions	Good - this has been demonstrated to be very effective and will help compliance to happen more quickly	Good – based on previous experience, this is good value for money and can have positive effects on the harder-to-reach parts of the community.	Yes
Clean Air Zone helpline	N/A – some form of helpline will be needed, but this should be funded as part of the overall marketing and communications package.	N/A – see comments to the left.	No

Mitigation Measure	Primary CSF	Secondary CSF	Bring to Shortlist?
Business support including personalised travel planning	Good – this will help compliance to happen more quickly.	Good – this will help the acceptability of the CAZ to businesses	Yes
Target main visitor destinations	Good – this will help compliance to happen more quickly.	Good – this will help the acceptability of the CAZ to main visitor attractions	Yes
TravelWest Challenges such as using apps to record miles travelled sustainably	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. Other measures are likely to have a greater effect and be more related to the CAZ. Also, currently in place with others in the council.	No
CAZ / CAF scheme promotion. Leaflets / publicity etc	Good – this will be needed to promote the understanding and benefits of the CAZ, and of the complimentary measures.	Good – schemes and complimentary measures will have less benefit if they are not promoted to potential users.	Yes
Driver training for delivery fleets on green driving techniques	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. Other measures are likely to have a greater effect and be more related to the CAZ. Also, currently in place with others in the council.	No
School engagement	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. other measures are likely to have a greater effect and be more related to the CAZ. Engagement with children on wider environmental / travel issues happens already. Also, currently in place with others in the council	No
Green fleet events	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. Other measures are likely to have a greater effect such as the interest free loans and demonstration vehicles for small businesses. But be open to events promoted by the private sector if the opportunity arises.	No
Introduce variable parking tariffs in council owned car parks to discourage polluting / incentivise electric vehicles	OK – this could help reach compliance, but likely to have a limited overall effect	OK – it would show BCC's support for more environmentally friendly vehicles but at the same time as CAZ charges and diesel car ban could be seen as too much of a 'stick'.	No
Freight:			
EV Centre of Excellence (Demonstration vehicles for small businesses)	Good – this will help compliance to happen more quickly.	Good – this will help support businesses affected by the CAZ	Yes
Micro-consolidation with cargo freight bikes	Good – this will help reduce the number of commercial / delivery vehicles and build on the success of the existing Bristol Freight Consolidation Centre	Good – this will help support businesses affected by the CAZ and makes a positive statement about supporting businesses and reducing the effects of delivery vehicles.	Yes
Freight Lockers	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. Not proven to have any significant effect and other measures are likely to have a greater effect and be more related to the CAZ.	No

Mitigation Measure	Primary CSF	Secondary CSF	Bring to Shortlist?
Waste Consolidation	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. Not proven to have any significant effect and may have significant organisational and commercial barriers.	No
Others:			
Introduction and enforcement of anti-idling zones for buses in the city centre	OK – this could help reach compliance, but likely to have a limited overall effect	Poor Fit – in relation to the CAZ. newer buses will be a lot more environmentally friendly than the old buses, and many have stop-start technology fitted as standard. May be hard to enforce	No
Increased Euro Standard requirements for taxis and private hire vehicles in licensing agreements	N/A - Already happening due to recent changes in licensing arrangements	N/A – see comments to the left.	No
Enforcement of mandatory compliance for buses, taxis, and private hire vehicles to access bus lanes and / or franchise routes	OK – Buses, taxis and private hires will be subject to other measures to ensure compliance.	Poor Fit – in relation to the CAZ. this would be difficult to set and enforce.	No
Retrofitting of Council and privately-owned waste vehicles	OK – Waste vehicles will be subject to other measures to ensure compliance.	Poor Fit – in relation to the CAZ. Council waste fleet is currently being upgraded under a separate initiative.	No
Restrictions on goods vehicles movements in the CAZ during peak hours	OK – Goods vehicles will be subject to other measures to ensure compliance.	OK – Key roads are already planned to have HGV bans	No
Funding to improve council fleets	OK – this could help reach compliance, but likely to have a limited overall effect	OK – Many parts of the council fleet are currently being upgraded under separate initiatives, but additional funding would be welcomed.	No

4.2 Shortlist of Mitigation Measures

As a result of the assessment, the following mitigation measures were shortlisted for inclusion in the CAF bid at OBC stage. The shortlisted items were:

Financial Support:

- Provision of grants for taxi, private hire and LGV drivers to upgrade and / or retrofit their vehicles
- A loan scheme to assist businesses replace their vehicles
- A scrappage grant scheme for diesel car drivers (due to the Hybrid scheme including a small area diesel car ban at the time the OBC was put together)
- Additional funding for supported bus services to use Euro VI vehicles and avoid CAZ charges

Infrastructure:

- Easton Way walking and cycle scheme, completion from Stapleton Rd Junction to J3, M32
- Old Market Connections completing 'Temple Way Slip' walking and cycling scheme
- Bedminster Bridges walking and cycle Improvements
- Other additional walking and cycling schemes, such as extended footways on Upper Maudlin Street; Hotwell Road; Midland Road; Newfoundland Road light segregation; Redcliffe Hill subways; Nelson Street; and/ or Dovercourt Road / Concorde Way cycleway.
- Increase, Improve, update Legible City Signage
- Additional electric vehicle charging points
- Expansion of Portway P&R site (550 spaces with 350 additional to be unlocked)

Sustainable Travel Choices:

- Mobility credits and/ or subsidised bus travel for certain demographic or income groups
- Targeted door knocking
- Targeted roadshows
- Business support including personalised travel planning
- Target main visitor destinations with travel plan support
- CAF scheme promotion. Leaflets / publicity etc.

Freight:

- EV Centre of Excellence
- Micro-consolidation with cargo freight bikes
- The cost of measures originally proposed to support the Bristol Clean Air Zone Hybrid option was £38.6 million. This cost was included the cost estimate presented in the financial case and the economic assessment presented in the economic case for the OBC.

4.3 Revised Shortlisted Mitigation Measures

Following the OBC submission, work was carried out to consider whether a Medium CAZ C with a Small CAZ D may reach compliance in the same year as the Hybrid option. This work concluded, as directed, with the submission of modelling data between March and June 2020. JAQU agreed that the submitted data was adequate to demonstrate that the CAZ C/ D combination would be the preferred option. This was followed up with a further legal direction in August 2020. However, once the global pandemic hit it required a further review of all the mitigation measures and the entire scheme proposals. The baseline was revised to capture the changes on street, as a result of the measures implemented to improve / enable social distancing. This showed that there was potentially no longer a need for the CAZ C/ D combination and that a Small CAZ D with additional measures may be enough to reach compliance, however this was far from certain. It was decided that another public consultation would be needed given all the changes in the project. This put forward two options; the CAZ C/ D combination and the Small CAZ D with additional measures, should a charging CAZ be required to reach compliance in the shortest possible time. Further evidence submitted to JAQU between September and December showed that in all likelihood a CAZ would still be required to reach compliance, but that a Small CAZ D with additional measures would achieve the required outcome.

The final list of measures taking into consideration the impact of the Covid-19 pandemic, new consultation data, business engagement feedback, previous evidence are as follows:

Financial Support:

- A loan / grant scheme to assist those earning low incomes / needing to travel into the zone to work, to replace or upgrade their vehicle
- Provision of grants for taxi, private hire and LGV drivers to upgrade and / or retrofit their vehicles
- A loan scheme to assist small local businesses to replace their vehicles
- Additional funding for supported bus services and coaches as part of the retrofitting of their vehicles to avoid CAZ charges (funding for bus retrofitting was awarded to BCC in May 2021 following an initial FBC submission. The remaining bid is to cover engine refurbishment costs).

Infrastructure:

- Increase, Improve and update Legible City Signage
- Old Market Gap Cycle Scheme

Sustainable Travel Choices:

- Mobility credits and/ or subsidised bus travel for certain demographic or income groups
- Targeted door knocking / roadshows in areas of deprivation
- Business support and engagement including personalised travel planning and building audits, targeted at small local businesses
- CAF scheme promotion; publicity / events / website etc.

Freight:

- Micro-consolidation unit with cargo freight bikes and Only Mile Delivery centre

4.4 Summary of Revised Shortlisted Measures

Table 4-2: Summary of Revised shortlisted Mitigation measures

Measure	Group Impacted	Geographic Scope	Summary of Measure	DEIA	Costs
Financial support					
A loan / grant scheme to assist businesses to upgrade or replace their vehicles	SME businesses, self - employed, HGV / LGV fleets, non -schedules bus and coach services, Hackney Carriages, PHVs	City-wide, prioritisation given to SMEs and those located directly in affected areas	Interest-free loan and grant scheme to assist with upgrading of vehicle(s) or replacing vehicles. This will provide financial support for businesses already hugely affected by the pandemic, otherwise unable to afford the cost of moving to a compliant vehicle. This will result in a rise in compliant vehicles entering the zone and so improving air quality	<p>SMEs; defined by the Gov.UK definition of SMEs.</p> <p>Self-employed; defined by the Gov.UK definition of self-employed and in this instance relates only to self-employed people with a premises based within the zone</p> <p>Businesses operating in the zone that rely on road transport to operate will be disproportionately affected. Higher costs would then likely be passed down to the customer, potentially affecting trade. For taxis, this could lead to fare rises which in turn could lead to an increase in car use.</p>	£32,457,616
A loan / grant scheme to assist those earning low incomes / needing to travel into the zone to work, to replace or upgrade their vehicle	Commuters and residents earning low incomes	City wide	Interest-free loan and grant scheme to assist with upgrading of vehicle(s) or replacing vehicles. Prioritisation given to those on low incomes and needing to travel in non-compliant vehicles to work / study in the zone.	<p>Low income car owners who need to travel into the zone / use their car for work. Without this support they will be disproportionately affected which may affect their ability to work, potentially raising unemployment. Providing this support avoids this.</p> <p>According to the DEIA 'Affordability impacts will be negative across the socio-economic and business groups that directly interact with the CAZ area where non-compliant vehicles are still used, though vehicle operating costs improve overall. Impacts are slightly disproportionately felt by the least income deprived communities'.</p>	£1,851,953

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Measure	Group Impacted	Geographic Scope	Summary of Measure	DEIA	Costs
Bus retro-fit / support for the purchase of new vehicles	Local bus companies – schedules services only	City wide	A grant to retrofit or purchase new buses for use locally to undertake scheduled services only. This is aimed at mitigating the impact on air quality caused by continued use of non-compliant vehicles in the central area	Local bus operators offering scheduled services within the CAZ zone could be disproportionately impacted. This could result in higher fares for customers who may be on low incomes. Supporting them to become compliant would avoid fare rises and potential move to the car as a cheaper alternative which would also impact compliance.	£2,075,388
Bus (engine) refurbishment	Local bus companies – schedules services only	City wide	A grant to be utilised by local buses used to undertake scheduled services only. This is aimed at mitigating the impact on air quality caused by supporting the retrofitting grant, already awarded, to enable older vehicles to last for longer once retrofitted. This will further ensure continued use of non-compliant vehicles in the central area for longer	Local bus operators offering scheduled services within the CAZ zone could be disproportionately impacted. This could result in higher fares for customers who may be on low incomes. Supporting them to become compliant would avoid fare rises and potential move to the car as a cheaper alternative which would also impact compliance.	£1,170,000
Infrastructure					
Increase, Improve, update LegibleCity Signage	All people moving around the city, especially those on foot and by cycle.	Various routes to the centre of Bristol linking in key areas such as Temple Meads with the shopping district and leisure facilities	Building on the success of the existing Bristol Legible City signage project, this would see new and updated signage and mapping making it easier for people to navigate around the city without relying on cars	Residents, visitors, businesses. Asking people to change their mode of transport requires alternative modes to be made accessible and attractive plus easy to use. This support will make walking and cycling routes clearer and more accessible, thus enabling and encouraging a modal shift to more sustainable modes of transport. This will benefit visitors who may arrive in the city unaware of how accessible the facilities are by foot or bike. But it also benefits those residents who may be unable to afford to use buses, taxis or to maintain the upkeep of a vehicle. Making routes and timings clearer can make walking a very accessible option.	£500,000

Measure	Group Impacted	Geographic Scope	Summary of Measure	DEIA	Costs
Old Market Gap cycle scheme	Cyclists, people earning low incomes but needing to travel into the city, residents	This scheme will complete the only unimproved section of East - West city centre cycle route, which provides a link to the Bristol to Bath Railway Path which is a key commuting corridor for cyclists.	<p>Cycles currently mixing with high volume of vehicle traffic at junction, or conflicting with pedestrians on busy shared use footway. Existing footway width inadequate and not designed for high levels of cycle or pedestrian flows. Conflict level is high, and comfort levels poor.</p> <p>Requires segregation between pedestrians and cycles to restore comfort, remove conflict, and provide good alternative to cycling on carriageway</p>	<p>This scheme offers not only an opportunity to complete a vital cross city link, but it aims to further increase cycling levels resulting in a modal shift away from reliance upon the private car. This all supports our aim of improving air quality in the central area. To encourage people from their cars we need to provide viable alternatives. The CAZ will have an impact on the citizens of Bristol, this will be a positive way to help mitigate that impact whilst at the same time reducing air pollution.</p> <p>Cycling may become the only viable option for some. According to the DEIA: <i>'Vehicle operating cost impacts are unevenly distributed, being disproportionately felt by the least income deprived communities, which see a slight net disbenefit in vehicle operating costs; others have net benefits'</i></p> <p>And;</p> <p><i>'The (in)ability of households to react to restrictions is unevenly felt by lower income groups (for instance, there are fewer multi-car households that could potentially using a compliant vehicle).'</i></p> <p>Making the case for a complete cross city cycling route.</p>	£720,726

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Measure	Group Impacted	Geographic Scope	Summary of Measure	DEIA	Costs
Sustainable Travel Team					
Mobility credits and / or subsidised bus travel for certain demographic or income groups	People earning low incomes, residents and operating small businesses within the CAZ	CAZ boundary	Mobility credits in the form of a grant to support subsidised bus travel for certain groups, low income earners, residents, and small business owners. The grants will also be offered to upgrade office facilities with showers, lockers, and cycle parking. It will also be used to encourage a modal shift away from the private car to further improve air quality alongside other CAF measures.	Residents, low income families and owners of small businesses. There is a great network of cycle and walking routes around the central area, utilising infrastructure such as the legible signage noted above, means using these routes becomes more accessible. Not everyone can afford a bike or a bus ticket. If people are keen to change from using an old non-compliant vehicle then we need to support them to make this change. Owning an older vehicle can be expensive so this support helps them make the transition whilst also improving air quality	
Business support including personalised travel planning	Businesses within the CAZ	CAZ boundary	Support for businesses, both large and small, in terms of visits, roadshows for staff and visitors, customised travel information and personalised travel planning	SMEs will be more affected by the CAZ being introduced but larger businesses will also need to manage the impact of the CAZ in terms of informing staff, supply chain, customers etc. They may have work forces who are trying to change their mode of travel but are unaware of the route from home to work and then may be unable to lock their bike up at work for example. This will be support aimed at all businesses to make those transitions. Small businesses will be less able to make changes such as installing cycle parking so they would be more in need of financial support whereas larger companies will likely need more travel planning support.	

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Measure	Group Impacted	Geographic Scope	Summary of Measure	DEIA	Costs
CAF scheme promotion. Leaflets / publicity, language translations, alternative formats etc.	All	Bristol City Council area	Targeted promotion specifically covering all the measures as part of the CAF to ensure people most in need of support know about them and they are used effectively	Support and messaging to target areas of deprivation. Residents in these areas may not have considered changing their mode before due to the financial implications i.e. getting to work. As with the Mobility Credits support, this is aimed at helping people most in need of support aware that it's there. We will work with local groups to ensure we fully understand language and cultural barriers to ensure areas of deprivation are fully engaged with the CAZ.	£5,853,496.00 (covering all three offers)
Freight					
Micro-consolidation with cargo freight bikes and Only Mile Delivery Centre.	Small businesses within the CAZ / those earning lower incomes.	CAZ / city centre area	<p>Set up a micro-consolidation facility in or near the city centre for small deliveries, including 'last mile' delivery by electric carts and/ or cargo cycles. This will build upon the success of the existing Bristol Freight Consolidation scheme, based at Avonmouth but serving the city centre and targeted at SMEs.</p> <p>Work with Bath and North East Somerset (B&NES) to extend the Only Mile Delivery centre scheme being proposed. This focusses on business to business deliveries within the zone, seeking to replace those journeys by non-compliant vehicles with compliant delivery vehicles, subsidised so that this only costs the same as standard postage. This will include further add-on products, such as a shopping concierge service.</p>	<p>Small businesses will be hardest hit by the introduction of a charging zone. As detailed in the DEIA: 'There are potential direct impacts on costs for LGV/ HGV reliant businesses. Though trips by non-compliant LGV/ HGV reliant businesses are reasonably spread around the city, those making trips related to the CAZ area will be affected; the CAZ area is reasonably small but covers most of the city centre'.</p> <p>This measure will mitigate the impact by enabling quicker deliveries at no additional cost to the business and reducing the need to travel through the zone so saving CAZ charges whilst also improving air quality.</p> <p>The biggest benefit is in improved air quality as freight journeys through the zone are reduced and better managed. Cleaner air provides benefits to all; residents, visitors, those with health conditions etc.</p>	£2,000,000
TOTAL					£46,629,169

5. Clean Air Zone Consultation

The feedback detailed in this Section is intended to give an **overview** of the range of comments received in relation to possible mitigating measures and exemptions. It does not detail every comment but lists the key themes arising from the consultation.

Table 5-1: Comments on possible mitigations and exemptions

Theme	Comment
<p>Loans</p>	<p>Owners of private cars (21%) and LGVs (13%) are the most likely to take a loan.</p> <p>The proportion of respondents who would take a loan for other vehicle types is:</p> <ul style="list-style-type: none"> • Private hire vehicles: 8% (all at the maximum 8%) • Hackney carriages (taxis): 7% • HGVs: 11% • Buses: 8% • Coaches: 7% <p>Private cars: Of the 3,089 respondents who selected one of the options for a private car, 29 (1%) said they would take a £1,000 loan, 76 (2%) a £2,000 loan, and 538 (17%) a £3,000 loan. 2,446 (79%) respondents said they would not take a loan.</p> <p>LGVs: of 270 respondents who selected one of the options for LGVs, none said that they would take a £1,000 or a £2,000 loan, 35 (13%) said they would take a £3,000 loan, and 235 (87%) said they would not take a loan.</p> <p>Private hire vehicles: Of 185 respondents who selected an option for private hire vehicles, none said they would take a £1,000 or £2,000 loan, 14 (8%) said they would take a £3,000 loan and 171 (92%) said they would not take a loan.</p> <p>Hackney carriage (taxi): of 176 respondents who selected an option for hackney carriages, 1 (1%) said they would take a £4,000 loan, 1 (1%) said they would take a £5,000 loan ,10 (6%) said they would take a £6,000 loan, and 164 (93%) said they would not take a loan.</p> <p>Heavy Goods Vehicles (HGVs): of 191 respondents who selected an option for HGVs, 2 (1%) said they would take a £10,000 loan, 1 (1%) said they would take a £13,000 loan, and 18 (9%) said they would take a £16,000 loan. 170 (89%) said they would not take a loan.</p> <p>Buses: of 189 respondents who selected an option for buses, 5 (3%) said they would take a £20,000 loan, 1 (1%) said they would take a £25,000 loan, and 10 (5%) said they would take a £30,000 loan. 173 (92%) said they would not take a loan.</p> <p>Coaches: of the 170 respondents who selected an option for coaches, 1 (1%) said they would take a £20,000 loan, 1 (1%) a £25,000 loan, and 10 (6%) a £30,000 loan. 158 (93%) said they would not take a loan.</p>
<p>Grants / Mobility Credit</p>	<p>Respondents were much more likely to use a grant than a mobility credit for all four vehicle types.</p> <p>More than half of people who stated their intentions would use a grant to replace a petrol car (52%) or diesel car (57%).</p> <p>Fewer respondents would use a grant to replace an LGV (35%) or taxi (22%).</p> <p>This level of uptake for grants is much higher than for loans for all four vehicle types.</p> <p>Petrol cars: 1,967 respondents stated their intentions for petrol cars (Figure 38), of whom:</p> <ul style="list-style-type: none"> • 1,015 (52%) said they would replace their vehicle using a £2,000 grant • 271 (14%) said they would replace it using a £2,000 mobility credit • 865 (44%) said they would not replace their vehicle. <p>Diesel cars: 1,345 respondents stated their intentions for diesel cars (Figure 39), of whom:</p> <ul style="list-style-type: none"> • 760 (57%) said they would replace their vehicle using a £2,000 grant • 159 (12%) said they would replace it using a £2,000 mobility credit • 544 (40%) said they would not replace their vehicle. <p>LGVs: 176 respondents stated their intentions for LGVs (Figure 40), of whom:</p> <ul style="list-style-type: none"> • 61 (35%) said they would replace their vehicle using a £2,000 grant • 13 (7%) said they would replace it using a £2,000 mobility credit • 111 (63%) said they would not replace their vehicle.

Theme	Comment
	<p>Taxis: 85 respondents stated their intentions for taxis (Figure 41), of whom:</p> <ul style="list-style-type: none"> • 19 (22%) said they would replace their vehicle using a £2,000 grant • 7 (8%) said they would replace it using a £2,000 mobility credit • 61 (72%) said they would not replace their vehicle
<p>Exemptions - Respondents were asked to give their views on four groups: bus operators, coach operators, people living in the CAZ D area using private cars, and 'other' specified by the respondent</p>	<p>Over three quarters of respondents thought the people living in the CAZ D area using private cars should be eligible for exemptions (40%) or concessions (37%). 4,053 (96%) respondents provided views on exemptions and concessions.</p> <p>Bus operators: Of 3,783 respondents who gave a view on concessions and exemptions for bus operators:</p> <ul style="list-style-type: none"> • 1,260 (33%) said they should receive an exemption • 1,014 (27%) supported a concession • 1,509 (40%) said they should pay the full charge to drive a non-compliant vehicle in the proposed charging zones. <p>Coach operators: Of the 3,686 respondents who gave a view on coach operators:</p> <ul style="list-style-type: none"> • 631 (17%) said they should receive an exemption (approximately half the proportion for bus operators) • 1,033 (28%) respondents said coach operators should receive a concession (similar to the proportion for bus operators) • 2,022 (55%) respondents said coach operators they should pay full charge. <p>People living in CAZ D area using private cars: 3,864 respondents gave a view on people living in the CAZ D area using private cars. Over three quarters of the respondents thought this group should receive either an exemption or concession:</p> <ul style="list-style-type: none"> • 1,545 (40%) said CAZ D area residents using private cars should receive an exemption • 1,423 (37%) said they should receive a concession • 896 (23%) said they should pay a full charge. <p>Other groups suggested by respondents: 1,472 respondents provided free text answers for the 'other' category. Of these, the most frequently suggested were disabled people, people who need to drive for work, people on low incomes, people living in CAZ areas, hospital users and taxis. This aligns with several of the concessions and exemptions being considered following the 2019 consultation.</p> <p>The breakdown of 'other' groups that respondents said should receive exemptions and concessions is provided below:</p> <ul style="list-style-type: none"> • 367 (25%) said disabled people should receive exemptions/concessions • 346 (24%) said workers should be eligible, including emergency service workers, delivery drivers, hospital workers and frontline workers • 121 (8%) said that people on low incomes should be eligible • 86 (6%) said that taxis should be exempt or receive concessions • 71 (5%) said that people who live in the CAZ should be eligible • 67 (5%) said that patients and visitors to hospitals should be eligible • 67 (5%) said that businesses should be exempt or receive concessions • 63 (4%) said that bus operators should be exempt or receive concessions • 49 (3%) said that private vehicles should be exempt or receive concessions, including classic cars, camper vans, and hybrid/electric vehicles • 41 (3%) said that Bristol residents should be exempt or receive concessions • 18 (1%) said that older people should be exempt or receive concessions. <p>Other groups specified include parents, out-of-town drivers, community transport, hire cars, religious groups, and volunteers.</p>
<p>General comments</p>	<p>Of the 2,034 (48%) respondents who provided further comments on the proposals: 876 (43%) made suggestions for additional measures to improve air quality.</p> <p>The main comments included requests for more public transport improvements (434 respondents, 21%), more improvements to facilitate cycling and walking (215 responses, 11%), encouraging the use of electric vehicles (136 responses, 7%), and improving the traffic and road layout (88 responses, 4%)</p>

Theme	Comment
	<p>590 (29%) provided comments detailing general support or lack of support for the proposals and/or air quality improvements. Most of these comments stated respondents' concerns that the proposals are not ambitious enough and changes need to be made immediately, but generally support the need to improve air quality in Bristol</p> <p>365 (18%) proposed changes to the proposals, specifically inclusion of exemptions and concessions, targeting of specific vehicles, and changes to the scheme boundaries</p> <p>275 (14%) expressed concern about impacts of a CAZ on specific groups, journeys, and places</p> <p>105 (5%) commented on loans, grants, and other financial incentives</p> <p>65 (3%) outlined alternative scheme suggestions to a CAZ, such as pedestrianising the city centre, implementing more road closures, or bringing in a congestion charge</p>
Businesses	<p>19 letters and emails were received, providing responses to the consultation. Of these:</p> <ul style="list-style-type: none"> • 18 were from businesses and organisations (see Table 3 for details); and • One was from a member of the public. <p>Comments are categorised into the following five main themes :</p> <ul style="list-style-type: none"> • 16 respondents (84%) suggested alterations to the proposals • 11 respondents (58%) expressed support for the proposals • 11 respondents (58%) commented on their reservations about the proposals • 5 respondents (26%) said that further information was required to determine the most effective way to reduce air pollution. • 5 respondents (26%) said that further information was required to determine the most effective way to reduce air pollution, including: <ul style="list-style-type: none"> ○ Identifying the root cause of air pollution in the impacted areas ○ Information about the air quality and traffic modelling ○ How businesses would be affected by the proposals.

A summary of the level of support for different themes of improvements/incentives are set out below:

Options 1 & 2: Summary of additional improvements and incentives:

- Owners of private cars (21%) and LGVs (13%) are the most likely to take a loan
- Respondents were much more likely to use a grant than a mobility credit for all four vehicle types
- Over three quarters of respondents thought the people living in the CAZ D area using private cars should be eligible for exemptions (40%) or concessions (37%)
- 896 (23%) said residents should pay a full charge
- 367 (25%) said disabled people should receive exemptions/concessions
- 121 (8%) said that people on low incomes should be eligible
- 1,260 (33%) said bus operators should receive an exemption
- 631 (17%) said coach operators should receive an exemption (approximately half the proportion for bus operators)

6. Details of measures

6.1 Financial support package

This section presents an evidence base to estimate the upgrade cost of the different vehicle types eligible for the grant and interest-free finance scheme. The financial package being sought will enable BCC to offer grant and interest-free finance values that will cover a fair amount of the cost of upgrading to a compliant vehicle, while also being able to offer assistance to as many businesses and low income households as possible. BCC is requesting the funds to cover the interest, administration, and default costs from JAQU as part of the package of non-charging measures.

6.1.1 Delivery plan

As soon as the FBC is submitted and funding levels are known, Bristol will issue a pre-application form for businesses to register their interest in applying for financial support, with support from a telemarketing team. This will be used to ensure the funding levels are adequate and will be the beginning of the application process. The aim is to make the support available as soon as possible to allow time to retrofit, upgrade or exchange vehicles and consider a change of mode i.e. buying a bike, considering walking routes etc.

The scheme will be overseen by the Engagement Team who will also be able to signpost applicants to other sources of support available for businesses such as Mobility Credits, Roadshows etc. The telemarketing team will also signpost businesses to the other support available with a database being created to capture this type of interest / enquiry.

Bristol will be signing a Participation Agreement with B&NES, to draw down support from their Financial Assistance Framework. This will mean Bristol can liaise with finance companies on the framework and agree a Bristol Financial Assistance Scheme. This will all be possible once the FBC is approved. Once BCC are able to utilise the framework, applicants will be notified by the telemarketing / engagement teams and will be invited to apply. The first stage of the process is to have a criteria check. This involves having a telematics unit fitted to their vehicle for a set period of time, providing evidence that support is required. If applicants meet the criteria, then they will be put in touch with the finance company to apply directly for their support. The Engagement Team will liaise with the telemarketing team and loan company throughout to ensure signposting is taking place and to monitor uptake and budgets.

Experience from B&NES, who have the first live Clean Air Zone, has shown that demand has been high for loans and grants combined and that their upper level of uptake was met. We want to ensure that as many people, businesses, taxi drivers and bus companies are supported as possible. We are therefore basing our assumptions on the higher uptake level for loans and grants.

As noted above, the application process will be the same as it is for the Bath CAZ, applicants will need to have a telematics unit installed to provide evidence of the need to travel regularly into the zone to justify the request for financial assistance. This will be the same process for loans and grants with evidence from B&NES showing that people are applying for both at the same time to cover different elements of the transition to a compliant vehicle. The costs of the telematics units are built into the telemarketing cost estimates, approximately 500 units will be purchased at a maximum cost of £30k. The units can be re-used after each use.

6.1.2 Vehicle Upgrade Costs

The values presented within this section of the report reflect BCC's current understanding of vehicle upgrade costs and will be discussed further with JAQU. The financial support package uses figures provided by JAQU.

Evidence about the research into vehicle upgrade costs is set out in Appendix A.

Following initial discussions with JAQU, the assumptions of the maximum loan/ grant values for each type of vehicle are shown in Table 6-1 below.

Table 6-1: Maximum grant and loan value available for each vehicle type (Source: FBC-26 'Primary Behavioural Response Calculation Methodology')

Vehicle type	Maximum Grant Available	Maximum Loan Value
LGV	£4,500	£16,000
HGV	£16,000	£26,000
Coach	£16,000	£35,000
Taxi (PHV)	£1,500	£9,000
Taxi (Hackney)	£4,000	£9,000
Cars	£2,000	£5,000

6.1.3 Frequency Analysis

In order to quantify the number of vehicles that may be eligible for the grant and loan scheme a calculation was undertaken using the most relevant available data, the process of which is described below.

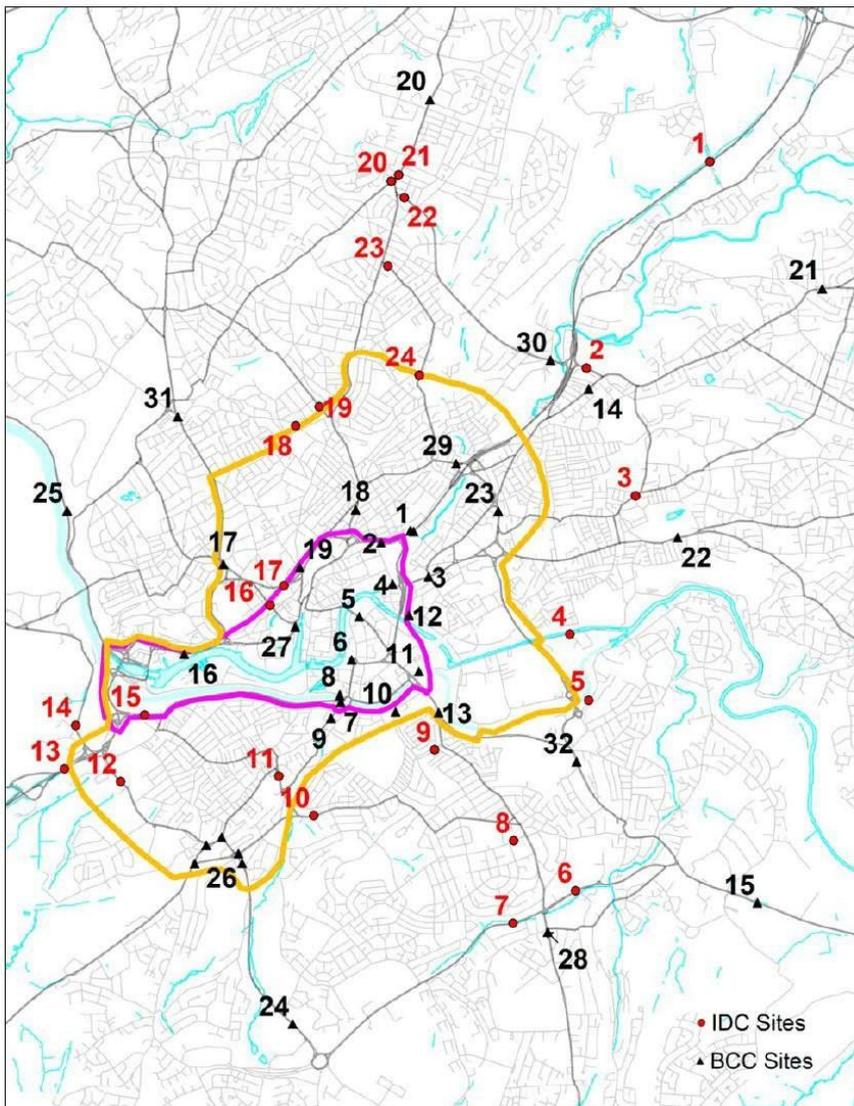
This vehicle data was then used to provide a best estimate of the cost of the schemes overall, and therefore, the funds requested from the CAF.

ANPR data was obtained for cameras within the zone, from records for June and July 2017 (61 days). The data was processed to extract distinct combinations of vehicle registration marks (VRM) and dates. A count was then performed on the number of records for each VRM providing the number of days out of the 61 that each VRM had been seen. This data was then summarised by vehicle class, fuel type and euro classification to produce frequency splits.

The ANPR data indicates a very high number of vehicles are seen on only a few days a month. It was considered that the proportions produced from the whole 2 months were likely unrealistic for commuting, particularly as the ANPR data does not differentiate by purpose. To account for this, Cars seen 7 days or fewer of the 61 were removed from consideration producing the proportions. Further an allowance of two weeks' holiday is made in the subsequent calculation given the 2-month time period during the early part of the summer.

Figure 6-1 shows the location of both the permanent and commissioned ANPR sites.

Figure 6-1: ANPR Survey Locations



The registration data from the ANPR surveys have been cross referenced with data purchased from Carweb to gain information on vehicle type, fuel type and Euro Standard. The information on the vehicle specifications was obtained for June and July in 2017 to compare the July data with equivalent data from June, a neutral month.

Table 6-2 presents trip frequency analysis (factored to 2021 based on the projected change in Euro class composition)./

Table 6-2: Predicted composition of the non-compliant BCC fleet in 2021

Vehicle type	Number of days travelling in the CAZ in 7 days						
	1 or more	2 or more	3 or more	4 or more	5 or more	6 or more	7 or more
LGV	6732	3315	1750	903	285	52	6
HGV	669	328	174	96	27	9	1
Coach	81	44	25	13	5	1	0
Taxi (PHV)	-	-	-	-	-	-	588
Taxi (Hackney)	-	-	-	-	-	-	330
Car	3917	2009	1230	833	488	241	106

Note: this table presents the number of individual vehicles that are sighted 1,2,3...etc days and aggregates directly to determine the numbers of vehicles that enter the CAZ on 1,2,3... days per week. Average daily figures for vehicle-trips into the CAZ area derived from the ANPR data are quoted elsewhere in the report.

Through number plate matching across the 7-day period, frequency analysis was undertaken to identify the number of days each pre-Euro 6 diesel and pre-Euro 4 petrol vehicle was recorded in the ANPR data for Small CAZ zone. Note that the total numbers of non-compliant PHV (588) and Hackney cabs (330) were sourced from data provided by BCC. No frequency adjustment is applied to taxis as it is assumed that those registered in Bristol are likely to all be operating in any zone on a regular basis.

ANPR analysis over 7 days adjusted to 2021 levels indicate a total of 12,316 non-compliant vehicles entering the CAZ, and therefore potentially eligible for these schemes; this figure consists of 6732 LGVs, 669 HGVs, 81 coaches, 918 taxis (PHV and Hackney) and 3917 cars. Note though that this is not a direct estimate of the relevant number of commercial vehicles that would be eligible for the scheme; there could be other vehicles that are otherwise regulars in central Bristol but did not travel on days covered by ANPR data, and conversely the ANPR data will have included other vehicles that drive into central Bristol less frequently.

This data can be used to calculate an approximation of the number of vehicles that may be eligible to apply for the grant and interest-free finance scheme. The duty cycle of the vehicles, especially the frequency of entry, is expected to be an important marking criterion in the application for the schemes, as this directly relates to the financial impacts of the CAZ on the company. For these reasons it is initially assumed that only vehicles entering the CAZ at least twice a week will apply, due to the relative lower expense of paying the charge. Whilst this may not make pure economic sense, the value of a newer vehicle would present other benefits in terms of reduced operational maintenance costs and fuel efficiency.

Using this assumption, in Table 6-3 figures entitled '2 or more' (days a vehicle was recorded in the CAZ) show the predicted number of non-compliant vehicles, split by vehicle type, that will drive into the CAZ at least twice a week, and therefore likely to result in an application for finance or a grant from a business or private vehicle owner. Note that coach figures were further assessed, because comparatively few enter the CAZ on a weekly basis, but far more do on a monthly basis, reflecting regular day-tourism business that is important to many local operators. As such, the criteria for coaches to be included was based on regular monthly trips to the CAZ area³.

The LGV and HGV figures below relate to the 2 day a week totals from ANPR surveys of non-compliant vehicles as follows:

- The 3315 eligible LGVs represent 22.3% of total non-compliant LGVs recorded once per month in the ANPR survey (14868), and 9.3% of all non-compliant LGVs recorded in the ANPR survey (35567)
- The 328 eligible HGVs represent 18.9% of total non-compliant HGVs recorded once per month in the ANPR survey (1738), and 7.0% of all non-compliant HGVs recorded in the ANPR survey (4605)

³ Coaches (per month) are observed in the ANPR data as follows: 166 (once), 113 (twice), 92 (three times), 81 (4/ month or 1/ week)

6.1.4 Overall Cost of Scheme

Using a combination of the data presented in Sections 6.1.2 and 6.1.3 above, a calculation can be made to estimate the total cost of the scheme and the funding requested from the Government required to implement it. To calculate the overall value of the financial support scheme, a series of estimates have been prepared. These are based on the number vehicles observed at different frequencies of accessing the CAZ area, taking the key assumption that vehicles entering the CAZ twice a week are likely to be considered the minimum eligibility requirement:

- Lower uptake – assumes only vehicles which enter the CAZ area on 5 or more days per week would be eligible for the scheme (6 day per month for coaches);
- Middle uptake – assumes only vehicles which enter the CAZ area on 3.5 or more days per week would be eligible for the scheme (4.5 days per month for HGVs and 4 days per month for coaches); and
- Upper uptake – this assumes that only vehicles which enter the CAZ area on 2 or more days per week would be eligible for the scheme (4 days per month for HGVs and 2 days per month for coaches).

The consultation work indicated that there would be a greater interest in grants, than loans for car upgrades than was previously assumed, so the assessment has been revised to reflect this. The uptake levels have been informed by the loan and grant applications being made to B&NES and the consultation feedback.

The number of vehicles for these uptake assumptions can be seen in Table 6-3 and in Appendix B. Note that an individual income cap of £27,000 has been applied to car loan and grant schemes, therefore only individuals with a non-compliant vehicle and individual income of less than £27,000 would be eligible for funding.

The 'upper uptake' figures have been taken forward in the totals requested in this CAF bid; £34,309,559 in total (including contingency).

Table 6-3: Lower, medium and upper uptake assumption values of total scheme cost

	Vehicle type	Grant amount per vehicle	Finance amount per vehicle	Number expected to upgrade	Number of grant applicants	Total value of grant	Number of finance applicants	Total value of finance (to the project, excluding contingency)
Lower uptake	LGV	£4,500	£16,000	271	285	£1,339,754	257	£820,956
	HGV	£16,000	£26,000	26	21	£336,000	5	£27,619
	Coach	£16,000	£35,000	61	49	£784,000	12	£84,779
	Taxi (PHV)	£1,500	£9,000	588	523	£902,580	65	£116,424
	Taxi (Hackney)	£4,000	£9,000	330	240	£1,188,000	90	£162,000
	Car	£2,000	£5,000	216	173	£380,296	43	£43,215
	Total	-	-	1,492	1,291	£4,930,630	472	£1,254,994
Middle uptake	LGV	£4,500	£16,000	1210	1274	£5,988,017	1147	£3,669,253
	HGV	£16,000	£26,000	54	43	£688,000	11	£55,772
	Coach	£16,000	£35,000	81	65	£1,040,000	16	£113,092
	Taxi (PHV)	£1,500	£9,000	588	523	£902,580	65	£116,424
	Taxi (Hackney)	£4,000	£9,000	330	240	£1,188,000	90	£162,000
	Car	£2,000	£5,000	449	359	£789,476	90	£89,713

	Vehicle type	Grant amount per vehicle	Finance amount per vehicle	Number expected to upgrade	Number of grant applicants	Total value of grant	Number of finance applicants	Total value of finance (to the project, excluding contingency)
	Total	-	-	2,712	2,504	£10,596,072	1,419	£4,206,254
Upper uptake	LGV	£4,500	£16,000	3149	3315	£15,578,994	2983	£9,546,277
	HGV	£16,000	£26,000	96	77	£1,232,000	19	£99,840
	Coach	£16,000	£35,000	114	91	£1,456,000	23	£158,828
	Taxi (PHV)	£1,500	£9,000	588	523	£902,580	65	£116,424
	Taxi (Hackney)	£4,000	£9,000	330	240	£1,188,000	90	£162,000
	Car	£2,000	£5,000	891	784	£1,723,732	107	£106,843
	Total	-	-	5,168	5,030	£22,081,306	3,287	£10,190,212

Table 6-3 also shows the average interest-free finance and grant amount calculated for each vehicle type. The values provided for the grant scheme include the value of the grant in addition to the overhead costs, whereas the figures provided for the finance scheme include only overhead costs. Overhead costs include interest, administration fee and default costs. BCC is requesting the funds to cover the interest, administration, and default costs from JAQU as part of the package of non-charging measures. In relation to this, the following assumptions have been made:

- The overhead costs (administration, interest and default costs) for all vehicles have assumed to be approximately 20% of the total cost of the finance provided to the individual or business;
- A 20% contingency has been applied to the loan financial estimate in the overall financial model, as this has not been agreed with the finance supplier (the contingency is shown in the ; and
- The administration fee for the grant scheme is estimated to be £200 per grant.

Also, in addition to the costs in the table, the costs of marketing and collecting telematics data will be included in the implementation fund proposal.

6.1.5 Prioritisation Criteria

SMEs

In terms of loan and grant funding, SMEs will be prioritized in an initial round of funding. Following the first round, and depending on funding levels remaining, the support will be opened up to all businesses based in Bristol not having already applied.

SMEs are defined according to the Companies Act 2016 (see [www.gov.uk/government/publications/life-of-a-company-annual-requirements/ life-of-a-company-part-1-accounts](http://www.gov.uk/government/publications/life-of-a-company-annual-requirements/life-of-a-company-part-1-accounts)). Non-compliant vehicles that are to be upgraded will need to be registered to an SME with premises located within the Bristol CAZ area.

In support of this measure, a telemarketing team will be employed to work alongside the Engagement Team to ensure all businesses are made aware of the CAZ, the support available and to create a record of all business contacts and the likely impact of CAZ on businesses across the city. This will be carried out well in advance of the go live date to ensure there is adequate time for businesses to assess and apply for the funding they need.

Support will be prioritized for SMEs and self- employed businesses based in Bristol. Applications will be assessed based on the criteria as noted in the exemptions table and with self- assessment tax forms for self- employed. This

will relate to the business premises only; taxis will not therefore count as a business in this context as there is a separate funding allocation for taxis.

The telemarketing company will contact all businesses in the zone area and surrounding area on the outside of the boundary. They will compile a complete contact list and call, email and write to all businesses explaining about the CAZ, what's involved and what support is available. They will work with businesses to gauge the likely impact of the CAZ and signpost them to the support available. There will also be a pre-registration process for the financial support available, with additional funding being sought should current forecasts prove to be insufficient.

Those earning low incomes

Priority will be given to those earning low incomes and needing to travel into the zone for work purposes, the threshold for 'low income' is £26k. This is calculated based on the median annual wage for residents of Bristol. When discussing the threshold, the ONS calculation of defining those on low income being 60% of the median annual wage was deemed too low, especially given the economic uncertainties at the moment. We therefore have a Bristol specific threshold which is 80% of the median annual income per individual in Bristol, which will be capped at £26k for the initial round of funding. A second round of funding will be available for those earning up to £27k, this avoids anyone in need of support just missing out making the scheme fairer.

When applying for financial assistance those people needing to travel into the zone for work purposes and earning what we define as a low income will be prioritized for funding. Evidence of meeting this criteria will need to be provided in the form of a V5C showing they are the registered keeper of the vehicle, a letter from employer on headed paper to confirm business address and hours worked and a P60 (or a pay slip if not been there a year) /self-assessment tax return. The loans and grants will be managed by a finance company appointed through the framework BaNES have established. They will administer the financial support following the criteria we agree with them as part of a signed agreement.

6.1.6 Value for Money Assessment

6.1.6.1 Quantifiable Impacts

The grant component of the financial support mitigation measure will provide funding towards the replacement of 5,168 non-compliant vehicles owned by businesses or private individuals. Section 5.3.3 demonstrates that the aggregate cost of providing grant funding towards the replacement of 5,168 non-compliant vehicles is £34.3 million (including administration fee for each grant). Recipients of this grant funding avoid upgrade costs amounting to £34.3 million. This avoided cost represents an economic benefit to upgraders. Hence, the grant funding therefore directly offsets expenditure by businesses and individuals at a 1:1 ratio.

The interest-free finance component of the financial support mitigation measure is to be provided to 2,018 qualifying non-compliant vehicles. The finance structure means that whilst recipients do not avoid the upgrade cost attributable to businesses/ individuals, they can save on interest costs (plus default costs and administration fees) associated with purchase of compliant vehicles via a commercial finance arrangement. The finance therefore directly offsets expenditure by businesses and individuals at a 1:1 ratio.

6.1.6.2 Additional Non-Quantifiable Impacts

In addition to the quantified and monetised benefits described above, the mitigation measure is expected to have the following wider, non-quantifiable benefits:

- Prevent job losses amongst trades people in Bristol, as the availability of financial support allows vehicular upgrade.
- Maintains Bristol as a location that is attractive to local trades people, ensuring that consumers continue to have choice.
- Supports dependent businesses such as retail. The mitigation measure safeguards the delivery of stock on a reliable basis. This will help prevent job losses and help maintain the vitality and viability of Bristol City Centre.

- Supports the leisure and tourism industry in the city by providing opportunities for eligible coach companies to access financial support.
- Most businesses across all sectors are reliant to some extent on freight or delivery services. If non-compliant vehicles continued to enter the CAZ, any associated charge would likely be passed on to end consumers. Provision of financial support for eligible freight vehicles reduces the amount of non-compliant freight vehicles entering the CAZ zone and therefore helps to minimise pass-through of CAZ costs.
- Protects local freight businesses and traders by reducing the capital cost burden of upgrading to compliant vehicles. This is particularly important for SMEs and sole traders, who may be more vulnerable to a significant financial shock such as upgrading to a compliant vehicle.
- Provides a monetary stimulus for the local economy as new vehicles may be purchased from local dealerships.
- Prevents negative publicity. In the event that SMEs or trades people went out of business as a consequence of the CAZ, both BCC and central government may be perceived to lack support for vulnerable business groups.

Through its support and prioritisation of financial support for applications to upgrade to electric vehicles, the measure also has the potential to support the emerging electric vehicle industry. Further, by encouraging the use of electric vehicles, the mitigation measure will increase awareness within the nascent market. Electric vehicles will also contribute to lower operating costs and noise pollution.

6.2 Bus Retrofit

6.2.1 Overview

An Expression of Interest (EOI) for the Clean Air Zone retrofit funding ran from 20/11/20 to 11/12/20. The EOI was sent to approx. 130 email addresses at 75 bus and coach companies (stakeholder list compiled using contacts from BCC & WECA). In total responses were received from 16 companies with estimates being received from 10 of the 16 companies.

During the EOI period, queries were received from First Bus about refurbishment funding which would take place alongside the retrofit, this was estimated as being £390,000 for their fleet, at a cost of £10k per vehicle. We would like to roll this out to all operators who completed the EOI (total of 117 vehicles), as a way of mitigating some of the difficulties with retrofitting these larger vehicles, capped at £400k per operator. We therefore propose funding of £1,170,000.00 to cover this, which is deemed to be the most cost effective and reliable way of undertaking the retrofitting within the given timescale before going live. First Bus have provided some valuable insights into retrofitting as the primary bus provider in the city with considerable experience of retrofitting buses. Other operators may not be aware of the additional work and costs involved in retrofitting their vehicles, this budget is to mitigate the risk of any delays to retrofitting. First Bus are fully versed in what is required and from their lessons learnt, refurbishment costs are a vital part of the process of retrofitting buses.

The refurbishment process involves installing retrofit kit + efans on vehicles such as Euro III, Volvo B7TL Double Deckers. The aim being to ensure these older vehicles would be good for another 5-7 years' service, which in addition requires an engine refurbishment at the same time as the retrofit.

The amount of funding being requested is based on the feedback provided in the EOI relating to the fleet numbers each operator provided. The total number of vehicles that would be refurbished alongside retrofitting to ensure the vehicles last longer is 117.

Following engagement with bus operators and JAQU following an initial submission of the FBC, it has been agreed that bus operators would be able to utilise the retrofitting budget allocation on retrofitting their existing fleet or they could put it towards the purchase of a new vehicle.

6.2.2 CAF Objectives

This resource meets the objectives of the CAF by offering “community-wide measures such as road layout changes, changes to cycling or walking infrastructure, improved public transport, park and ride schemes, promoting car clubs, vehicle retrofit; or better travel planning services”.

Furthermore, these measures will reduce transport costs for people fitting in with the CAF Guidance as being; “measures aimed directly at supporting individuals or businesses such as local travel discounts (which could be linked to smart ticketing), cycle to work schemes, local scrappage schemes or support for upgrading to a new vehicle (including ultra- low emission vehicles).

6.2.3 Delivery Plan

BCC already has experience of administering grants to retrofit buses and sustainable transport grants. This experience and existing staff / team resource will be utilised to work alongside the Engagement Team administering the grants, providing guidance and expertise. The team are already mobilised, with current funding ending in the spring, to easily be able to pick up this work once funding is awarded. The team are already carrying out exploratory work and planning how this could all be managed. With the EOI already having taken place, we have contacts ready to go. The team would create a bespoke document to capture the operator details, number of vehicles, amount of the grant awarded and whether they are retrofitting or purchasing new vehicles. They will then carry out monitoring and follow up activities to provide updates on the compliance levels of each operator.

High level indicative draft programme –

Application period – 6 weeks

Evaluation of applicants – 2 weeks

Funding start date – 8 weeks from application period beginning

Grant agreement signed – 2 weeks

Once the funding is awarded, in under 3 months operators could be in a position to begin booking in retrofits or ordering new vehicles. As the go live date has now moved to summer 2022, this provides as long a lead in time as possible to ensure the majority of the fleet are retrofitted ahead of go live or at least within the first year of CAZ operation.

Refurbishment total estimate £1,170,000.00

Retrofit total estimate £2,075,388

Total retrofitting cost estimate £3,245,388.00

Below is a summary of the content of the EOI email that was sent out

Vehicle type - Euro Category Euro standard

Bus M3 (GVW over 5000 kg and more than eight seats in addition to the driver) Euro VI

Coach M2 (GVW not exceeding 5000 kg, ref mass exceeding 2610 kg and more than eight seats in addition to the driver) Euro VI

Charges would apply to diesel vehicles which are Euro 5 or older and petrol vehicles which are Euro 3 or older – known as ‘non-compliant vehicles’. Charges would NOT apply to Euro 6 diesel vehicles and Euro 4, 5 and 6 petrol vehicles.

Bristol have a Legal Direction to implement a scheme which results in meeting the legal air quality limits in the shortest possible time, and its recognised that this could impact on businesses such as Bus Operators. In response to this JAQU has set aside Clean Air Funding (CAF) to mitigate against and attempt to minimise impact of a

charging CAZ, should the evidence show that is required to reach compliance. JAQU has recently suggested that Bristol City Council should consider allocating part of Bristol's CAF to retrofit buses following a very successful example of Leeds City Council.

To demonstrate interest in retrofitting non-compliant vehicle funding, and to provide an idea of the total amount of funding that would be required, we are now contacting all bus operators in the sub-region for expressions of interest.

Funding information guidance

At this stage we are inviting expressions of interest before applying for the funding from JAQU and a scheme is fully developed. However, for guidance, the following should be considered as a basis for decision making.

- Funding is for buses and coaches only (as defined in the table above)
- The funding will be applied for as a grant.
- Applications will be scored and grants awarded based on a prioritisation matrix.
- Monitoring and proof of eligible spend will be part of the terms and conditions of any grant agreement.
- There will likely be minimum and maximum levels of funding to apply for per vehicle. The average cost for retrofitting a bus is £17,000, the initial proposed minimum and maximum value range is between £13,000 and £20,000. It is acknowledged there may be some costlier retrofits for hard to replace/specialist models, and applications outside this range could be considered on a case by case basis.
- Eligible vehicles will need to demonstrate that they are operated within the CAZ D area:

CAZ D draft boundary plan https://bristol.citizenspace.com/growth-regeneration/caz2020/user_uploads/bd13351-caz-inner-zone-map-cd--with-insets-1-v2.pdf

- Any awarded funding must be spent/ fully committed before the date specified once the funding is agreed.
- The grant value is to be determined but could be up to 100% of the non-compliant vehicles retrofit equipment costs (on-going costs following the retrofit will not be eligible).
- Retrofits must be carried out by an accredited Clean Vehicle Retrofit Accreditation Scheme supplier. A list of accredited suppliers company details can be found here <https://energysavingtrust.org.uk/wp-content/uploads/2020/10/CVRAS-Approved-Devices-Open-List-Version-26-11.09.2020.pdf>
- Retrofitting methods and suppliers
- Buses: Retrofit solutions for buses are well-established. Exhaust after-treatment systems combining Diesel Particulate Filter (DPF) and Selective Catalytic Reduction (SCR) technology are the most widely applied. Other technologies include re-powering, where the old engine is replaced with a new engine with lower emissions, such as replacing diesel engine with an electric or hybrid drivetrain.
- Coaches: Similar to buses, there is diesel particulate filter (DPF) and selective catalytic reduction (SCR) technology applicable to coach retrofit applications. These systems are tested on specific coach test cycle protocol.

The £17k fee for retrofitting buses was as a result of the market research carried out. Suppliers were contacted for an estimate of min and max costs. We also researched various other funding initiatives and academic papers. The conclusions of this work were that averages for busses was £15,958.33 and coaches was £18,250.00 with a meanvalue being calculated.

Please note, the £17k figure did not include the extra funding that First Bus are seeking for engine refurbishment as part of the retrofit process which is now included in the funding request.

6.2.4 CAF Objectives

This resource meets the objectives of the CAF by offering “community-wide measures such as road layout changes, changes to cycling or walking infrastructure, improved public transport, park and ride schemes, promoting car clubs, vehicle retrofit; or better travel planning services”.

Furthermore, these measures will reduce transport costs for people fitting in with the CAF Guidance as being; “measures aimed directly at supporting individuals or businesses such as local travel discounts (which could be linked to smart ticketing), cycle to work schemes, local scrappage schemes or support for upgrading to a new vehicle (including ultra- low emission vehicles).

6.2.5 Value for Money Assessment

6.2.5.1 Quantifiable Impacts

By making non-compliant vehicles compliant, the refurbishment alongside retrofitting measure allows bus companies to avoid upgrading their fleet or cancelling services, which may occur in the absence of the measure. This additional process will ensure vehicles last longer, this is a business benefit and mitigates the impact of the CAZ, particularly for smaller operators. However, as with the bus retrofitting mitigation measure, this was incorporated into the core economic model, but these economic costs are avoided within the model.

As such, it is possible to derive a proxy for the economic benefit of the measure by adjusting key inputs to the core model, to mimic a scenario where bus retrofitting does not take place and bus companies are forced to either upgrade or change their travel behaviours. Within this context, the negative economic impact of cancelling the bus retrofitting measure can be retrospectively added to the model, to understand the avoided cost of bus companies upgrading their fleet in response to the CAZ.

An additional impact could be that bus companies may cancel journeys or avoid the zone as a result of the CAZ charge, which in turn reflects a disbenefit to bus companies. However, it is not possible to calculate the welfare loss associated with avoiding cancelled bus services for the Bristol CAZ area because appropriate data is not available from traffic models. As such, this is not included in the quantified impact. It is worth noting though that other studies have estimated that up to 5% of (initially) non-compliant bus journeys could be cancelled relative to a baseline in the absence of upgrades or retrofitting, though the number of cancelled journeys relative to the baseline will fall over time, thus also reducing the avoided welfare benefit loss.

In order to model the scenario of avoided costs for bus companies, the core economic model was adjusted to include assumptions around the scale and timing of bus upgrading and cancelled/ foregone bus journeys in the absence of the bus retrofitting measure. The retrofit and repower measure will support some 158 non-compliant buses. In the absence of the retrofitting measure, these non-compliant buses will be expected to upgrade (at the expense of bus companies) or have their journeys cancelled. Based on the behavioural responses adopted in the model, some 95% of non-compliant bus trips (representing 75% of all bus vehicles) will be upgraded to compliant vehicles.

With respect to the 158 non-compliant buses expected to benefit from retrofitting, these behavioural responses translate to some 119 vehicles incurring upgrade costs to bus companies in the absence of retrofitting (i.e. 75% of all non-compliant buses proposed for retrofitting). These behavioural responses will result in economic costs to the bus companies, as the cost of upgrading and cost of cancelling journeys increases. In terms of upgrading in the absence of bus retrofitting, the economic cost to bus companies can be summarised as follows:

- Vehicle age estimates were combined with the estimated vehicle values by age (based on depreciation rates) to estimate the residual value of vehicles by Euro Standard (a proxy for age), across vehicle types and across years

- The cost differential between upgrading in 2021 and all other years in the appraisal period was calculated based on residual value of vehicles in each year
- The differential proportion of vehicles upgrading in each year by baseline/ intervention scenario was applied to the cost differential for upgrading in each year, to arrive at a weighted cost differential
- The weighted cost differentials for upgrading was summed across all years to arrive at an aggregate cost differential
- The proportion of vehicles upgrading (split by age, as indicated by Euro Standard) was applied to the aggregate cost differential for upgrading, to arrive at a blended average upgrade cost differential between the baseline and intervention.

Following this approach, a cost to upgrade was estimated at £43,500 per vehicle for switching to new vehicles. The equivalent upgrade cost for switching to second-hand vehicles was estimated at £9,400 per vehicle. As a result, the cost of upgrading will vary depending on any assumption regarding a switch to new or used buses. Adopting an assumption that all upgrading buses switch to a new vehicle, the economic cost of upgrading 119 non-compliant buses in the absence of the retrofitting measure is £5.3m (2019 prices). Assuming that all upgrading buses switch to a second-hand compliant vehicle, the economic cost of upgrading reduces to £1.1 million. However, given that the market for second-hand compliant bus vehicles is understood to be relatively small, it is likely that the choice to upgrade would require a switch to a new vehicle.

The assumption that 119 non-compliant vehicles will need to be upgraded to new vehicles in the absence of the retrofitting measure results in potential for additional economic costs to bus companies relating to vehicle scrappage. Vehicle scrappage occurs because the overall fleet size is assumed to stay the same. Hence, an influx of new vehicles to the bus fleet will result in the scrappage of older non-compliant vehicles. Vehicle scrappage costs arise because the intervention case is assumed to bring forward the upgrading (and therefore scrappage) of vehicles. This means vehicles are scrapped earlier and with higher residual values than they would have been under the baseline scenario. As a result, the intervention case leads to a greater loss of residual asset value.

The differential in residual asset value between the baseline and intervention options can be summarised as follows:

- Established the asset value of vehicles to be scrapped based on age and depreciation rates
- Subtracted the asset value of vehicles to be scrapped in each year of the appraisal period from the 2021 value to establish an asset value differential per vehicle scrapped earlier than intended, across all years
- Used the interpolation rates to determine the proportion of vehicles scrapped each year in the intervention case, and applied the proportion to the asset value differential per vehicle identified above
- Summed the asset value differential across all years and Euro Standards to arrive at a weighted average asset value differential to act as a proxy for scrappage cost change between the baseline and intervention cases.

Adopting this approach, the residual value of scrapped vehicles was around £6,000 per unit for buses. Multiplying this value by the 119 buses that would be scrapped to cater for replacement new buses, the aggregate economic cost of vehicle scrappage is estimated at £724,000 (2018 prices).

Table 6-4 demonstrates that combined, the economic cost of upgrading or cancelling bus journeys and scrapping vehicles earlier than would otherwise occur in the absence of the Bristol Clean Air Plan amounts to almost £6.0 million. This economic cost would be incurred in the absence of the bus retrofitting measure. The proposed retrofitting measure allows these costs to be avoided. As a result, the avoided cost of £6.0 million can be considered an economic benefit of the proposed retrofitting measure.

Table 6-4: Aggregate Value for Money Assessment

Economic Impact Category	Value (2018 Prices, Undiscounted)
Avoided Upgrade Cost Associated with Replacing Vehicle	5,265,873
Avoided Welfare Loss from Cancelled Bus Services	n/a
Avoided Residual Value Loss for Scrapped Vehicles	724,359
Total Benefits	5,990,232
Total Costs	3,245,388
Benefit Cost Ratio	1.85

Set against a total bus refurbishment and retrofitting cost of £3.25 million, the economic benefits identified above could generate an indicative BCR of 1.85 in response to implementing the retrofitting measure.

Note that the resolution of the economic model does not allow bespoke calculation of a range of potential economic impacts without the provision of more detailed air quality and traffic modelling inputs. As no additional air quality or traffic modelling was undertaken for this exercise, impacts relating to air quality, traffic flows, accidents and greenhouse gas emissions were not estimated for introducing this measure. That said, it should be noted that the impact of not implementing the retrofitting mitigation measure is expected to be negligible across these economic drivers. Further, active mode analysis was not undertaken as the proposed retrofitting measure is not expected to significantly change the number of people choosing to walk or cycle. Transaction cost impacts were not estimated because no transaction cost was identified for purchasing replacement bus vehicles; hence no avoided cost would be achieved by implementing the retrofitting measure.

6.2.5.2 Additional Non-Quantifiable Impacts

In addition to the quantified and monetised benefits described above, the mitigation measure is expected to have the following wider, non-quantifiable benefits:

- Reduced severance for some communities that may lose access to Bristol City Centre. As bus companies are expected to cancel some services in response to the CAZ (in the absence of bus retrofitting), the mitigation measure will ensure that services are retained.
- Although outside the city centre, in surrounding areas, particularly outer suburban areas, the bus network that feeds into the city is characterised by multiple operators including a number of small, locally focussed operators.
- The mitigation measure will ensure that the cost of upgrading to compliant vehicles does not fall on small operators, thus challenging their long-term viability.
- By ensuring bus services are retained, the mitigation measure will avoid any negative publicity associated with reducing key public services.
- By ensuring bus services are retained, the mitigation measure will support wider efforts to achieve mode shift from private car use to public transport. Attempts to promote use of public transport could appear illogical if the bus network contracted in response to the CAZ.
- Retention of bus services will support the ongoing vitality and viability of Bristol city centre, by ensuring that consumers can continue to access the central area and maintain current levels of retail expenditure. Should bus services be cancelled, expenditure in the city centre could fall as consumers that rely on bus services to access the centre are forced to use alternative retail areas or modes.

- Similarly, retention of bus services will also ensure that residents that rely on bus travel can continue to access civic functions and social activities located in Bristol city centre. This will safeguard social inclusion and cohesion.

Updates:

Following initial submission of the FBC CAF Bid in February 2021, £2.1m was awarded to retrofit buses. This will now be rolled out with only the refurbishment costs remaining to bid for which totals £1.17m. The whole amount has been included in this bid to reflect the whole budget as it remains part of the CAF funding package. During the FBC revisions process, a proposal was put forward by one operator wishing to put the retrofitting budget towards the purchase of new vehicles, which is deemed by some to be more cost effective. The data is still being considered for this, which could equate to 14% of the current bid for retrofitting. All existing retrofitting expressions of interest will be progressed whilst agreement on the purchase of new vehicles is being considered.

6.3 Infrastructure; Legible signage

The CAZ project will work with Bristol Legible City (BLC) Team to create direction signs, on street information panels and city / area maps and visitor information all relating to the CAZ; raising awareness whilst also promoting existing resources such as cycling and walking routes.

This provision will be crucial in supporting visitors and residents to make the change to more sustainable modes of movement.

Established in 1996 Bristol Legible City is a unique concept to improve people's understanding and experience of the city through the implementation of identity, information, and transportation projects. Bristol Legible City projects include direction signs, on-street information panels with city and area maps, printed walking maps, visitor information, identity, and arts projects.

<https://www.bristollegiblecity.info/>

BLC is widely recognised as an innovative project and has since been replicated in cities and towns across the UK and internationally.

6.3.1 Delivery Plan

BCC has experience of managing legible signage and are seeking funding for additional team support to manage this measure. The new member of the team will work alongside staff who have a wealth of experience, contacts and established methods that offer best practice. This will nicely align with other planned legibility work for the city in the coming few years. This could be put into practice as soon as funding is awarded.

6.3.2 Supporting the CAZ

Building on Bristol's reputation as a walkable city and encouraging more residents and visitors to choose to walk in the central area will be a key contributor to the city meeting its clean air goals. To enable this change will require investment in assets and resources to help people find their way about the city in a way that is comfortable, intuitive and that reveals Bristol's unique offer. Fortunately, the city has a history on investing in helping people find their way about on foot through its investment in the BLC project. It is proposed that CAZ investment should build on this excellent legacy.

To support Bristol in reducing car use and becoming a more walkable city BLC will further extend and develop two projects designed to help residents and visitors make better informed choices in making their way around the city. These two projects are:

- Smart monoliths (Figure 6-2 and street furniture)
- PopMap: User-defined digital mapping platform

Smart monoliths



Figure 6-2: A BLC Monolith at Bristol Temple Meads)

BLC provides on-street map monoliths throughout Bristol’s central area. These units are designed to provide intuitive and user-friendly mapping information for users to orientate themselves and plan their onward journey. The units are located prominently in public spaces and at key decision points.

The BLC team have been working with Toshiba’s Bristol Research and Innovation Laboratory and The University of the West of England’s Computer Science Research Centre to develop a project to upgrade these monoliths to be able to sense environmental conditions and to be able to communicate with users in making decisions on which route to take.

The upgraded units will contain a suite of low energy / passive environmental sensors that will be collect data on conditions including noise, air quality, temperature, and vibration. This information will be communicated back to the council and displayed to users via a digital mapping app allowing visitors and residents to make decisions about routing, Figure 6-3.

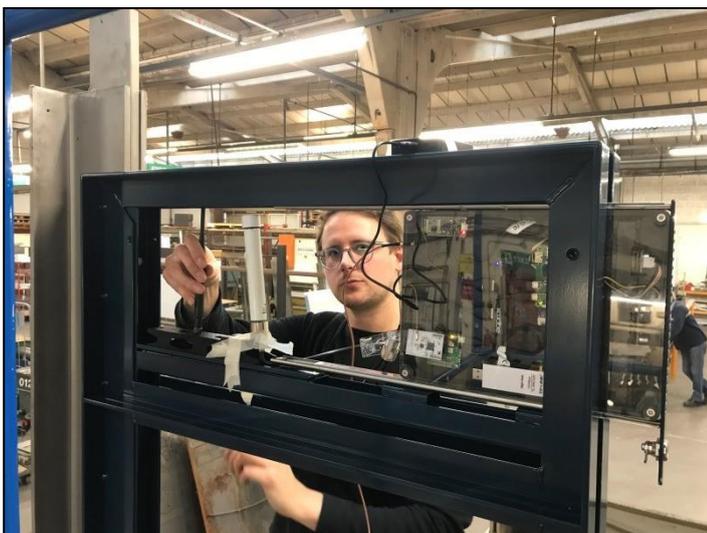


Figure 6-3: Early design testing work on sensor array

In addition to this, research had recently been undertaken to confirm user needs and to identify and gaps in the current system. This work demonstrated that the on-street provision is still used and trusted by visitors and

residents and that there is a desire from local businesses to expand the system to support visitors in getting Bristol’s major destinations and smaller independent businesses. The gap analysis identified 38 new sites for on-street provision.

The monoliths are designed to a very high spec and have lasted for two decades in the urban environment. They are adaptable, updatable, reconfigurable and of a very high design standard in terms of their physical design, information design, and cartography. They feature as points in a connected and integrated walking system for the city – a system and approach that started in Bristol and has since been replicated across the world by the way; London and New York are two good examples.

At present there are no cycling specific monoliths in place. However, the legible city monoliths include cycling information and are used by cyclists. There has also been work undertaken to develop a model for cycling drawing on similar work in London (Olympics) and New York.

The proposal is to install new monoliths at 20 key sites within the central area to support the CAZ.

PopMap

During lockdown and subsequent Covid-19 related restrictions in 2020 work on BLC was shifted to the development of the project’s digital mapping resources. This work included the production of a royalty-free, GIS enabled digital map of the city that can be used to display useful data such as venue information, public space access, and walking and cycling access, an extract can be seen in Figure 6-4.

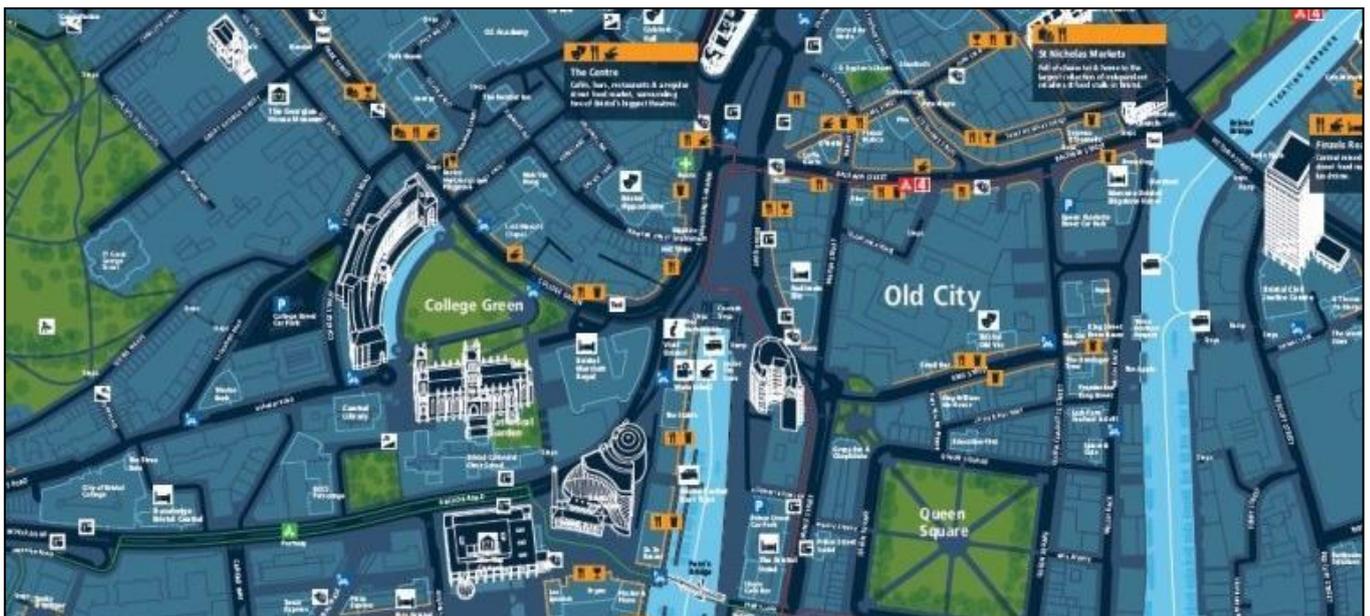


Figure 6-4: BLC Mapping

BLC, working in partnership with City ID and Calvium on a Bristol & Bath Creative R&D Pathfinder – details here – has seen the implementation of the project’s digital mapping in the production of the PopMap project. PopMap is a novel user-centred mapping app that allows the resident or visitor to access a real time view of the city based on their preferences and location, see screenshots in Figure 6-5. The app works as a geo-located, hyper-local search tool. Providing information on what is happening where and when and relative to the user. The app is supported with an accessible Content Management System (CMS) that allows real-time updates to the mapping by partners i.e. local businesses and other stakeholders. The app provides the potential to display data based on a wide range of specific user preferences based on preferred activities or user-needs e.g. accessing museums/galleries via flat, cobble-free routes.

A standout feature of the app unlike other digital routing apps which are based on car-based routing, PopMap has been built up using the public realm as the ground to its routing. This fundamentally changes the focus from driving to walking and re-centres the city’s public realm as a place for active travel.

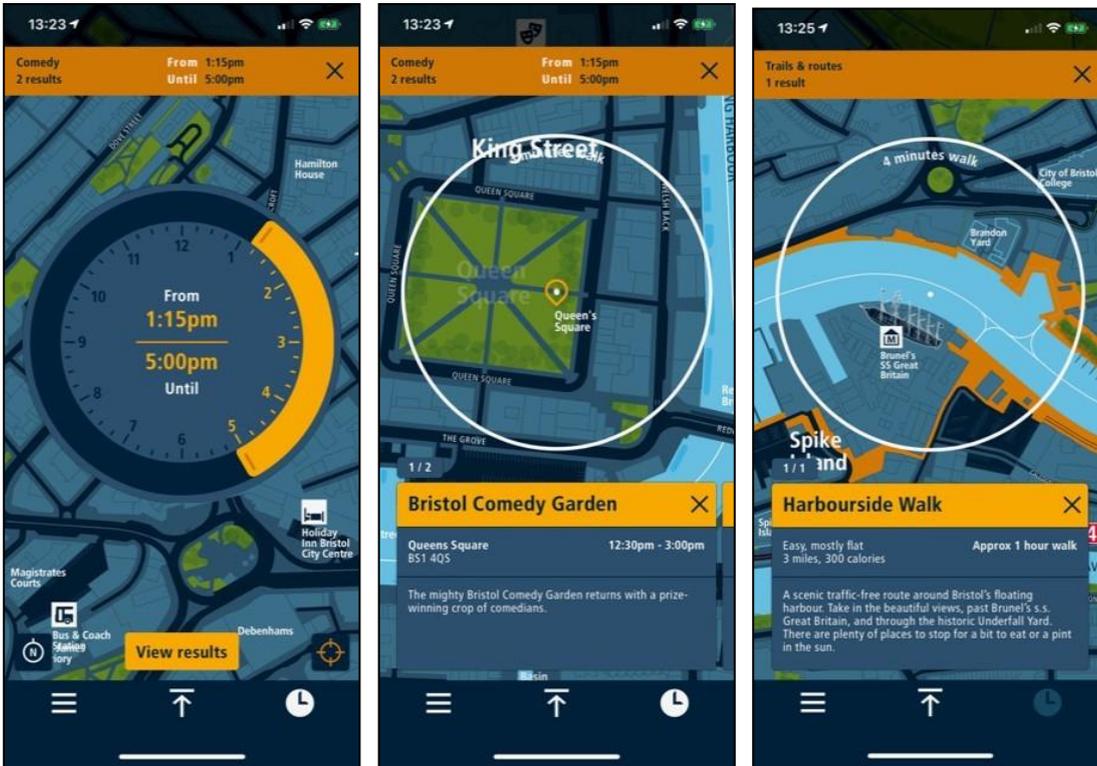


Figure 6-5: Sample screen grabs from PopMap prototype

Furthermore, the BLC team are particularly interested in how PopMap can be put into use as a critical tool in Covid-19 recovery, signposting people to local businesses and providing live information on any restrictions.

At present the PopMap app is a working prototype. The proposal is to further develop and extend the app to fully support walking and cycling in the city. There are many other apps available. None of which do what PopMap does to the same level of local detail and, importantly, most are designed for car-based journeys, unlike PopMap which is built from public realm and walking data providing a completely different view of the city.

6.3.3 Supporting case

Recent research undertaken by Mace & Menter has demonstrated the value of the BLC project in supporting visitors and residents in making their way around Bristol. The surveys undertaken in support of this research show that the majority of visitors to Bristol prefer to explore the city on foot when they arrive. There is recognition that this “walking economy” is a significant contributor to local economic and cultural activity and local business support the extension and development of the city’s pedestrian wayfinding system to build on this.

In further extending the BLC on-street provision and deploying and extending coverage of the PopMap app the following benefits will be realised:

- Filling the gaps in the pedestrian wayfinding system and improving user-confidence in finding their way about Bristol on foot or bike.
- Revealing Bristol’s full “walking economy” offer thereby encouraging residents and visitors to spend more time exploring and enjoying the city’s public spaces, venues, and neighbourhoods.
- Providing an access for all information system for the city allowing users with mobility or sensory impairments a means to plan their journey confidently.
- Incentivising users to get out of their cars and make full use of all that Bristol has to offer.

Recent research commissioned by BLC shows that visitors come to Bristol with the intention of exploring on foot and are attracted here by the city's independent businesses and creative reputation. BLC proposes to use the opportunity offered by the introduction of a clean air zone, to build on this existing situation and investment by further supporting visitors and residents to explore the city on foot and by bike by providing excellent, up to date and locally relevant navigation assets.

The project has a growing body of recent survey and research against which enhancements and expansion can be measured to provide evidence of impact.

6.3.4 Outline of proposed investment

Measures included in the bid:

- Extension of project to fill gaps and extend coverage – particularly around major transport locations and new development areas including Temple Meads Masterplan Area. 20 new smart monolith units providing mapping and sensing and connected to the city's BNET cable network.

20 x £15k = £300k

- Further development and extension of the PopMap application to aid walking and cycling and support Covid-19 recovery. Development with PopMap project partners including City ID, Calvium and the Bristol & Bath Design R&D Partnership.
- Engagement, testing and deployment.

£100k

- Project Management support to enable smooth roll-out of project and delivery of procurement framework.

£50k

- Promotion and research.

£50k

Total bid: £0.5m

In summary £300k is for hardware and £200k is for the informational products - £200k is an outline figure for all of the work that is not the physical fabrication and installation of the monoliths i.e. digital products, map orientation and production. Each time a new monolith is produced we need to produce the artwork that will be displayed on that unit. This work includes updating the mapping, preparing map cuts that fit the location as well as artwork for the header panels. The app is work in progress so this will need investment to ensure that it meets that it fully supports behaviour change from private vehicle to foot and bike. This means undertaking some development and testing, making sure the digital mapping coverage is sufficient and up to date.

6.3.5 CAF Objectives:

This resource meets the objectives of the CAF by offering "*community-wide measures such as road layout changes, changes to cycling or walking infrastructure, improved public transport, park and ride schemes, promoting car clubs, vehicle retrofit; or better travel planning services*".

Furthermore, the objectives state that "*measures aimed directly at supporting individuals or businesses such as local travel discounts (which could be linked to smart ticketing), cycle to work schemes, local scrappage schemes or support for upgrading to a new vehicle (including ultra- low emission vehicles)*". This proposal will support other schemes by making it easier to travel using alternative modes.

As part of the CAZ scheme we are encouraging the upgrade of existing vehicles and a move towards there being more compliant vehicles on the road network. However, the CAZ is equally about promoting and encouraging the use of alternative modes as well cycling, walking, e-scooters etc. We plan to utilise the resources of the Sustainable Travel Team as noted below to achieve this. To support this, there needs to be a comprehensive system in place to best support the navigation around the city, be that by bike or on foot or using another mode. This element of

the bid provides confidence that when we encourage the use of alternative modes, there is a network available to facilitate that modal shift.

6.3.6 Value for Money Assessment

The mitigation measure does not generate any direct, monetisable benefits. However, through its ability to unlock the following wider, non-quantifiable benefits, the mitigation measure is considered critical to unlocking and maximising the full potential of the other mitigation measures proposed as part of this CAF bid:

- It will maintain Bristol as a location that is attractive to local businesses, ensuring that consumers continue to have choice, and help maintain the vitality and viability of Bristol City Centre.
- Could lead to the promotion of more active and healthier lifestyles through support for active mode alternatives including walking and cycling.
- Will assist the leisure and tourism industry in promoting the City Centre of Bristol as a destination that is attractive to visit and easy to navigate to attractions without recourse to a car.

6.4 Old Market Gap Cycle Scheme

We were advised some time ago to remove the cycling schemes, of which there were 3, from our original CAF bid. We were advised that they were measures not previously funded through CAF. Some of the reasoning behind this was the feeling that obtaining evidence required, as stated in the CAZ Framework, would be difficult and therefore hard to be justified as mitigation measures. Given the strong cycling focus in Bristol, based on a longstanding history of delivering cycle schemes leading to behaviour change, it was felt that cycling needed to play a part in the scheme.

The schemes were reviewed again following the change of zones to a small CAZ D. It was decided that one scheme in the zone could be included as part of implementation. The Old Market Gap was chosen as being the best fit with the CAZ. With previous successes in achieving behaviour change through cycling-based projects, it was felt that this would be strong enough to aid reaching compliance in the shortest possible time.

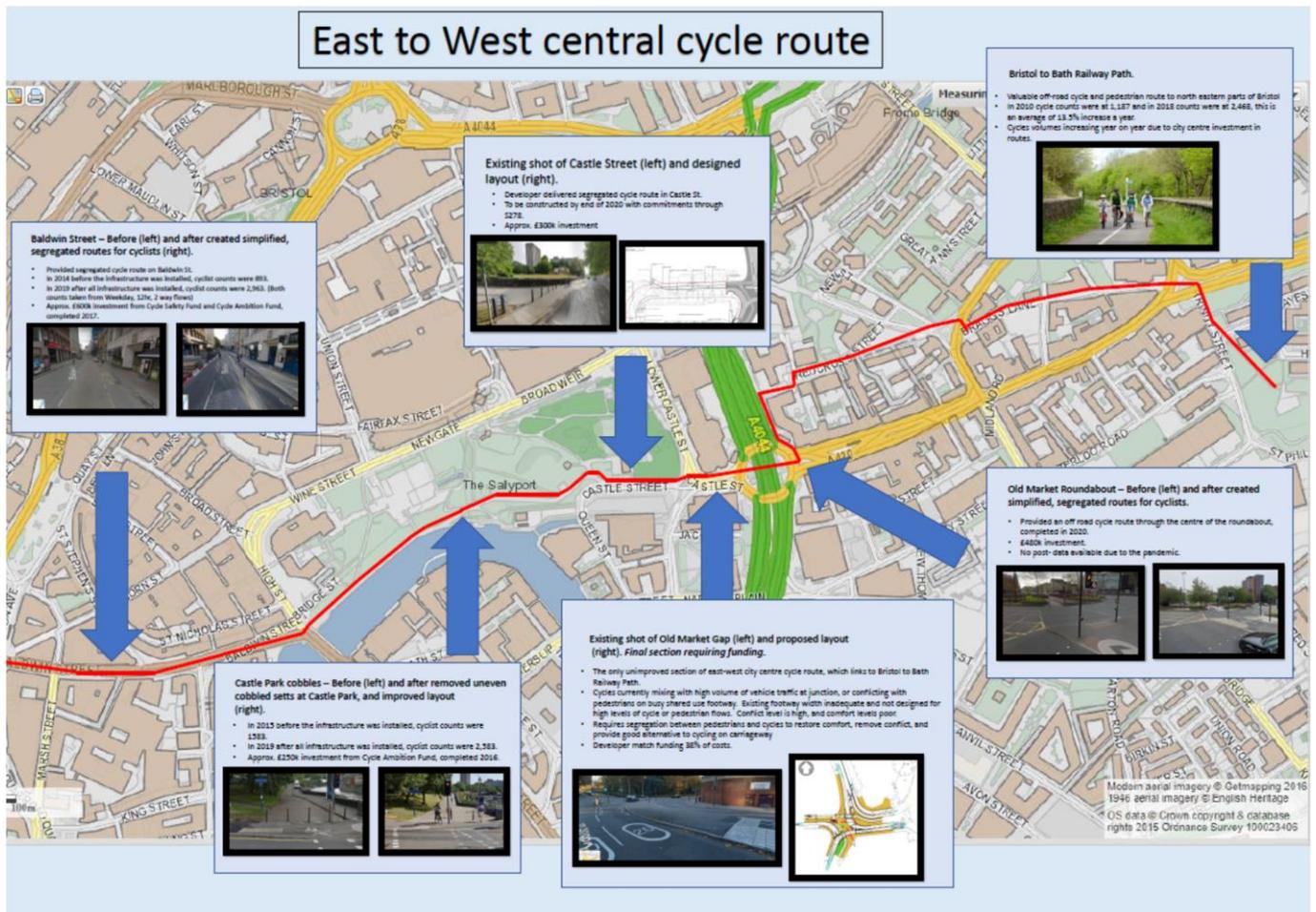
However, following the FBC submission and comments received it became clear that we could not justify the cycle scheme, through the use of modelling, as being vital to reach compliance in the timescales we had. We therefore removed it from Implementation and put it back in the CAF Bid.

6.4.1 Outline of proposed investment

The scheme we are proposing to fund through the CAF bid would complete the only unimproved section of East - West city centre cycle route, which provides a link to the Bristol to Bath Railway Path which is a key commuting corridor for cyclists.

Below is plan of the East - West cycle route and other cycling based projects which indicates that we have had a very healthy level of cycle volume increase every time we've invested in the infrastructure required.

Figure 6-6: East to West Central Cycle Route



We are not in a position to have everything tendered in time for the FBC submission, this is explained further in the Commercial Case. The current programme shows that we have made great progress with design work to date. We are confident we can deliver this scheme in full by the end of the 2023/ 2024 financial year at the very latest and potentially sooner if we can get the funding approved as soon as possible. This timescale is for the entire project to be completed including surrounding greening of the area, the cycle scheme itself is aimed to be completed and able to be used in the 2022/2023 financial year.

The West of England Local Cycling and Walking Infrastructure Plan 2020- 2036 shows that the proposed scheme is in accordance with policy to achieve modal shift. The project will complete the final gap in the city centre East-West cycle route, enabling cycles to easily access the traffic-free Bristol to Bath Railway path. The project would remove a significant conflict point between pedestrians, cycles and traffic in the city, which lies right on the CAZ boundary. Street greening and an extension to the bus lane is also incorporated in the designs.

Following discussions with the developer, we have confirmation that they will contribute £447,701 towards the cost of the project which equates to 38% of the total scheme. The legal agreement of this contribution is being drafted by both parties now and is due to be sealed shortly. BCC is therefore seeking £720,726 from the CAF bid to complete this vital central link.

The project has passed through Stage Two of Bristol City Council’s Quality Assurance Process, which means that the preliminary design is agreed by all internal stakeholders across the Council, and has permission to proceed to stage Three (attached are both the signed off Quality Assurance 2 form and drawing).

While we cannot tender the works yet, we have high confidence in the level of funding we are proposing to include in the CAF bid. Every 4 years BCC conducts a procurement exercise to procure a list of contractors to deliver Highways and Associated Works under £150,000, and the calculated costs for this scheme are derived from the schedule of rates, which has already been tendered for. Whilst the civils cost for this project will be greater than £150,000, it does provide a market tested indication for the potential tender costs received once put out to tender.

This scheme offers not only an opportunity to complete a vital cross city link, but it aims to further increase cycling levels resulting in a modal shift away from reliance upon the private car. This all supports our aim of improving air quality in the central area. In order to encourage people from their cars we need to provide viable alternatives. The CAZ will have an impact on the citizens of Bristol, this will be a positive way to help mitigate that impact whilst at the same time reducing air pollution.

CAF Objectives

This measure meets the objectives of the CAF by offering "community-wide measures such as road layout changes, changes to cycling or walking infrastructure, improved public transport, park and ride schemes, promoting car clubs, vehicle retrofit; or better travel planning services".

Furthermore, the objectives state that "measures aimed directly at supporting individuals or businesses such as local travel discounts (which could be linked to smart ticketing), cycle to work schemes, local scrappage schemes or support for upgrading to a new vehicle (including ultra- low emission vehicles). This proposal will support other schemes by making it easier to travel using alternative modes.

The CAZ is heavily focused on promoting and encouraging the use of alternative modes as well cycling, walking, e-scooters etc. This measure will complete a much needed gap and mean that people commuting into the central area, who may have non-compliant vehicles and be unable to afford the charges or don't qualify for financial support, can consider commuting by bike instead. We are offering support in terms of trying / buying a new bike, having cycling lessons etc. so this completes that package. This route is one of the main commuting corridors and it's vital we secure this funding now to complete it, avoiding any further delays caused by the need to carry on bidding elsewhere.

Value for money assessment

This mitigation measure also does not generate any direct, monetisable benefits. However, through its ability to unlock the following wider, non-quantifiable benefits, the mitigation measure is considered critical to unlocking and maximising the full potential of the other mitigation measures proposed as part of this CAF bid:

- It will maintain Bristol as a location that is attractive to cycle to work in, encouraging more commuting by bike
- Could lead to the promotion of more active and healthier lifestyles through support for active mode alternatives including walking and cycling
- Will assist the leisure and tourism industry in promoting the City Centre of Bristol as a destination that is attractive to visit and easy to navigate to attractions without recourse to a car

6.5 Sustainable Travel Team

The Sustainable Travel Team was established in 2009 as part of the Cycling City Project. The team was originally set up to engage with businesses and schools, raising awareness of the support available to review their cycling facilities. This was all with a view to encouraging cycling to work as a viable transport mode. It stretched to schools and the community too, encouraging the use of cycle buddy schemes and the provision of cycle training.

Over the years the team have been continually supported by various grant funded pots including the Access Fund more recently. The team have evolved and now have a wealth of experience and success behind them, leading the way with best practice which is now being rolled out in other authorities. The team is made up of transport engagement officers, roadshow, and Active Travel officers.

For 2021/22 DfT have allocated the Capability Fund. This is the post Access fund that has been allocated to the West of England Combined Authority for distribution to BCC and the other two local authorities. It has been designed to support behaviour change activities within each local authority and to develop local cycling and walking infrastructure plans (LCWIP).

This is a one-year funding allocation and although the overall funding pot has increased country wide, some local authorities have been given a significantly reduced allocation received in previous years under the Access fund. BCC has seen a 60-70% reduction in funding and the focus for the funding is very specific in that all the activities must support local capital infrastructure plans developed under the LCWIP. However, this funding will complement the offer outlined below for the CAZ implementation as it focuses on behaviour change work to encourage people across the whole city to walk and cycle more. It will also focus on certain locations where capital infrastructure projects are being implemented to help with scheme design through engagement and the co-design process.

The work outlined within the CAF bid under the Sustainable Travel Team will therefore target businesses within the CAZ zone and individuals travelling into and out of the zone. This work has been split into four workstreams:

- Financial package support (signposting and checking eligibility)
- Awareness raising / Mobility credits (grants, walking and cycling offers etc.)
- Travel planning (both for businesses and individuals including workplace audits)
- CAF scheme promotion (Bus retrofit, legible city and micro-consolidation for freight)

Financial package support

The team will raise awareness of the financial package support available across the affected businesses and communities. The telemarketing team working with businesses within the zone will send through referrals and the roadshow officers will check eligibility criteria and if applicable will organise the telematics and refer to the finance and loan companies. The roadshow officers will also work within communities to ensure residents in the zone and those on low incomes travelling into and out of the zone are signposted to the support. They will check their eligibility via telematics and will refer those applicable to the loans and grants.

Awareness raising / Mobility Credits

The team will raise awareness of the CAZ using business roadshows targeting SMEs and those businesses within the zone. These will be the priority and support will expand to include businesses that will be entering and leaving the zone for business purposes. Community roadshows will be used to target the residents within the CAZ area and travelling into and out of the zone. These will be used to get people to check they are compliant and to educate people on the 'why' and what they can do to help improve air quality and to encourage behaviour change.

The mobility credits as detailed in the table below will be used to encourage behaviour change in travel patterns and will be administered and coordinated by the team. The officers have a wealth of experience delivering these types of mobility credits which have proven essential to encourage modal shift for both business and leisure trips. These will be split into three areas focusing on businesses, wheels to work (those on low incomes of benefits seeking work, skills, training etc.) and communities. There is also information on the marketing and communications support in the table that shows how the information will be disseminated online and includes campaigns that can help engage people to reduce air pollution e.g. No Idling campaign, Clean Air Challenge etc.

Travel Planning

The team will provide travel planning support to businesses and residents. Businesses will benefit from workplace travel audits, postcode plotting, travel champions helping to provide equipment and peer support to staff wishing to change travel mode and the creation of travel plans. The mobility credits will link in this work to help businesses achieve their travel plan targets and provide facilities to enable employees to travel more sustainably.

Individual travel planning will be offered via roadshows and through door knocking in targeted areas designed to encourage the uptake of mobility credits and the use of journey planning tools. These can include the Go Jauntly app concentrating on walking routes, BetterbyBike focusing on cycling and the Travelwest journey planner which specialises on public transport.

CAF scheme promotion

The team will use the roadshows, targeted door knocking and engagement materials to promote the CAF schemes. For example, the team will administer the bus retrofit grants to the companies who have already expressed an interest in the support. The team will work with colleagues leading on the roll out of legible city signage which will complement the journey planning tools and signpost businesses via the travel planning and mobility credit work to the micro-consolidation for freight.

The offer for the CAZ is for the roadshow officers to raise awareness of the offers and support available across the affected businesses and communities. Whilst the Transport Engagement officers liaise with the telemarketing team and coordinate / administer the mobility credits such as mobility grants, business travel audits for SMEs, walking and cycling offers, Electric vehicle offers etc.

The CAZ support will work alongside the Capability fund which has recently replaced the Access Fund and which Bristol have submitted a bid for funding from. The idea is that we will be doing all of this work independently of each other as they have different audiences. Capability Fund targets general behaviour change and LCWIP projects audiences whereas CAZ targets low income individuals, CAZ residents, businesses particularly SMEs and the self-employed etc. and those on the boundary of the CAZ area. There are however potentially cost saving efficiencies between the two work programmes for year 1, for example where we are doing a behaviour change campaign which will benefit both audiences such as Love to Ride this can be paid from both pots. If we get Capability funding which may cover years 2 and 3 of the CAZ funding, then we could do the same and reduce the overall costs, but this is not known at the time of this bid.

6.5.1 Delivery Plan

The team are established, mobilised and ready to begin this work once funding is awarded. They will utilise existing contacts, experience, and knowhow to plan this work, begin EOIs and working alongside the comms team to get more information about the offers of support available out to those most in need.

Below, in Table 6-5, is a summary of the mobility credits that are included as part of the behaviour change work that the team offer including the 'how' the team will raise awareness and deliver the offers through both the business and community workstreams over a 3 year period (not an exhaustive list):

Table 6-5: Summary of behaviour change work

Business workstream	Mode	Details / targets over 3 years	Justification / case studies	Delivery / Channels
<p>Roadshow and Events at businesses (both virtual and face to face)</p> <p>These are often accompanied by Dr Bike providing bike maintenance for new cyclists and existing riders.</p>	All modes	<p>Deliver 150 targeted business engagement events for employers across the region to raise awareness of the CAZ and educate them on how they might be affected and what options are available to them. This will include conversations about exemptions, loans, grants, and the mobility credits.</p> <p>The mitigation offers and signing people up to them are for example, getting businesses to implement showers and changing facilities through a</p>	<p>We delivered 150 travel roadshow events for employers from 2017 to 2020 for general transport behaviour change.</p> <p>This will help employees change travel mode and help employers provide the correct environment to break down barriers.</p> <p>The 'hook' for this workstream is the introduction of CAZ and the need to raise awareness, getting people engaged and thinking about what changes they need to make.</p>	<p>Use existing resources and promote via websites, social media and all tranches and partnerships</p> <p>Audience – all businesses with a focus on SMEs, business parks, organisations with large fleets and businesses in the CAZ zone</p> <p>Focus is specifically on the businesses who are likely to be directly affected by CAZ introduction following on</p>

Business workstream	Mode	Details / targets over 3 years	Justification / case studies	Delivery / Channels
		business grant, uptake of e bikes or e cargo bikes for fleet journeys, PTP for employees and get them to transfer to wfh or cycling to work.		from the consultation engagement networks.
<p>Business Engagement</p> <p>The roadshow / events described above are the 'how' we get the message out.</p> <p>The business engagement at these events and through the network meetings are about signing employees up to the key offers/ mobility credits.</p> <p>The Transport Engagement officers lead on network meetings and deliver the key offers to the business representatives.</p>	All modes	<p>Provide walking and cycling information and support to 5000 employees</p> <p>Provide a travel support service (i.e. loan bike, cycle training referral, personalised travel planning, Dr Bike session, lunchtime walks, walking maps/ app, electric bikes, scooter hire, e-cargo bikes, car sharing & car club memberships) to 1000 employees</p> <p>Targeting sustainable travel behaviour change over >50% for those who receive a support service through the business engagement work.</p>	<p>Between 2017 and 2020, provided staff with information, incentives, and support to encourage sustainable commuting habits.</p> <p>Across the 17-20 programme our Roadshow team provided cycling and walking information to over 9000 employees and provided travel support service to over 1500 employees.</p> <p>The team set up and manage a network of businesses (sole traders to larger employers) providing a range of physical support and networking opportunities for sustainable travel. The forums include the Bristol Workplace Travel network, Temple Quarter Travel Forum, Hengrove Travel Forum and partner with two additional area forums – SeverNet and North Bristol Suscom.</p> <p>These offer more than 200 big, medium, and small businesses across the city the opportunity to share best practice and link in with mobility credits to increase sustainable travel of staff and visitors to their site. Membership includes some of the top employers e.g. both universities, hospital trusts, HMRC, DAC Beachcroft, BIDs etc.</p>	<p>Use existing resources and promote via websites, social media and all tranches and partnerships</p> <p>Audience – all businesses with a focus on SMEs, business parks, organisations with large fleets and businesses in the CAZ zone</p>
<p>Match funded Grants</p> <p>The grants are available for initiatives that improve sustainable travel provision in businesses.</p> <p>This includes the implementation of physical measures, promotional events or any other measure that will encourage mode change amongst staff.</p>	All modes	<p>Deliver 50 match-funded business grants over the course of the project through a competitive application process. Providing access to new or improved facilities to over 50,000 staff</p> <p>Grants can be used for improving sustainable travel modes such as providing new or improved cycle parking or storage facilities, parking management facilities, signage of cycling routes, provision of pool bikes, improvement of pedestrian access to and within the site, provision of car sharing</p>	<p>Between 2017 and 2020, delivered over 80 grants and received a match of over £300k and benefitted over 50,000 staff.</p> <p>The grant scheme offers small and large grants to help boost sustainable travel. A BID group ran a cycle breakfast to encourage people to cycle to work. They also purchased Sheffield stands and drying room lockers.</p> <p>Larger grants focus on bigger employers such as where the University of Bristol converted 15 parking spaces and two motorbikes spaces in the lower ground car park into 321 secure covered cycle</p>	<p>Use existing resources and promote via websites, social media and all tranches and partnerships</p> <p>Audience – all businesses with a focus on SMEs, business parks, organisations with large fleets and businesses in the CAZ zone</p> <p>Audience</p>

Business workstream	Mode	Details / targets over 3 years	Justification / case studies	Delivery / Channels
		<p>bays in staff car parks, electric vehicle charge points, promotion of car sharing and events to promote walking and cycling.</p>	<p>spaces which is used by the 5000 staff and 20,000 students attending the site.</p> <p>The team have also helped Good Sixty who is a food and veg business delivery their produce using 2 e cargo bikes. The bikes replaced a van and do around 32 deliveries a day to customers.</p>	
<p>Active Travel Champions</p> <p>These are people based within organisations whose purpose is to get more people walking or cycling to work through peer lead support.</p>	<p>All Modes</p>	<p>Grow membership of Active Travel Champions by 100 across the city.</p> <p>Research has shown that 'nudge support' from peers has more influence over our own behaviour than messages about the environment, economy, and social responsibility.</p> <p>Champions are provided with support and toolkits to help them persuade colleagues including Emergency Cycle Repair Kits. Champions can share knowledge of key offers, organise roadshows, bicycle maintenance, Dr Bike sessions, promote travel challenges and annual survey, arrange loan of an electric pool bike or EV vehicle for business travel, improve business facilities, set up walking groups and lead walks etc.</p>	<p>In 20/21 the team have increased the champion network which in turn has encouraged nearly 400 people to take up active travel modes.</p> <p>A good example of this is at DAC Beachcroft where the champion ran their own workplace challenge to encourage active travel like walk to work challenge. They even had an inter site challenge which covered sites all over the UK.</p>	<p>Use existing resources and promote via websites, social media and all tranches and partnerships</p> <p>Audience – all businesses with a focus on SMEs, business parks, organisations with large fleets and businesses in the CAZ zone</p> <p>Audience</p>
<p>Annual Travel Challenge</p> <p>The challenge is a way to encourage travel behaviour change by providing an element of competition and to incentivise and drive behaviour change through rewards and prizes.</p>	<p>All modes</p>	<p>1500 participants per year.</p> <p>Replace 10,000 car trips over the 3 challenges. 10,000 trips to be replaced by walking, running, scooting and cycling to work or working from home.</p> <p>To develop a habit takes between 4 and 6 weeks which is why the challenge runs for this period. The challenge records the amount of car journeys that are replaced by sustainable modes of travel.</p> <p>The businesses who win prizes for the most active participants are followed up to ensure that employees have enough support to continue with these behaviour changes.</p>	<p>Between 2017 and 2020, nearly 2000 people participated in Bristol per year and nearly 10,000 car trips were replaced by sustainable modes to work.</p> <p>In 2020 during the October challenge over 13,654 journeys were logged and over 60,000 miles were travelled with estimated CO2 saved of 3368kg.</p> <p>39% of participants switched from single occupancy vehicles and 2413 journeys were logged that replaced the car.</p>	<p>Use existing resources and promote via websites, social media and all tranches and partnerships</p> <p>Audience – all businesses with a focus on SMEs, business parks, organisations with large fleets and businesses in the CAZ zone</p> <p>Audience</p>

Business workstream	Mode	Details / targets over 3 years	Justification / case studies	Delivery / Channels
<p>Annual Travel to Work Survey</p> <p>The team offers support for businesses that are looking to better understand their workforce’s travel behaviour and implement improvements. A healthier and active workforce leads to increase performance and productivity and reduce costs on physical measures such as parking.</p>	All modes	<p>Average 5,000 participants in our travel to work survey per year</p> <p>The survey provides a consistent source of data which can track travel behaviour. However, the team use it as travel planning tool and another way to engage businesses.</p>	<p>In 2020 we had over 10,000 participants within the region with half of these from Bristol.</p> <p>In the survey employees are asked about their businesses and what improvements they would like to see to help them make a change in travel mode. The team provide reports to each business that has taken part with a review of the feedback left by employees. The business is offered a free workplace travel audit as a follow up to help implement the improvements required.</p>	<p>Use existing resources and promote via websites, social media and all tranches and partnerships</p> <p>Audience – all businesses with a focus on SMEs, business parks, organisations with large fleets and businesses in the CAZ zone</p> <p>Audience</p>
Wheels to work				
<p>Discounted bus tickets</p>	Bus	<p>5,000 people seeking access to work, skills, training, apprenticeships, or education to benefit through one of the schemes resources</p> <p>These on lower incomes may be adversely affected by the introduction of CAZ as they are more likely to have older cars that may not be compliant. This group are not going to be able to upgrade to compliant vehicles and this support will help them find alternatives to travelling to work and to education.</p>	<p>Between 2017 and 2020, over 5000 people have benefitted from one of the schemes.</p> <p>The teamwork with around 50 partner organisations such as the job centres, housing associations, youth service, salvation army etc to encourage their clients to travel sustainable when seeking employment and educational opportunities. The team currently have 3 key partners who offer the bike offer and work with all bus operators in the area.</p> <p>The mobility credits include free taster bus tickets, discounted bikes, free loan bikes, free bicycle maintenance workshops, adult cycle training and accompanied rides, journey and route planning and bike servicing.</p>	<p>Use existing resources and promote via websites, social media and all tranches and partnerships</p> <p>Audience – low income employment, unemployed, students.</p>
<p>Discounted bike loans/ sales</p> <p>This is for people on low incomes or seeking work and skills across the city to ensure they are supported and encourage to travel sustainably.</p>	Cycling			
Travel planning (Business and Community Workstreams)				
<p>Travel planning for businesses and residents</p> <p>Creation and development of travel plans aimed at managing the transport needs of a site whether this is a business development or residential site.</p>	All modes	<p>Provide travel planning support to 100 businesses and 5000 residents.</p> <p>The team offer support to businesses that are looking to establish a travel plan that is aimed at managing the transport needs of the organisation.</p> <p>The team also work with residents living and working with</p>	<p>Minimise the impact of new developments on the highway network by developing, implementing, and auditing the travel plans.</p> <p>Moving home is a transition point where behaviour change can be achieved particularly with regards travel habits. The Malago housing development is a good case study of where the team have begun the</p>	<p>Use existing resources and promote through the DM Team, developers, and consultants.</p> <p>Audience – new and existing residents, new and existing employees located in the city affected by the CAZ.</p>

Business workstream	Mode	Details / targets over 3 years	Justification / case studies	Delivery / Channels
		the city to encourage behaviour change. This can include new and existing developments.	rollout of the travel plan which includes measures such as free mobility credits for residents. The team have also worked with relocation of businesses. When HMRC relocated to centre of Bristol the team developed a travel plan for them and provided support for their welsh employees of which some were relocating from Cardiff and required travel planning assistance.	
Marcomms				
CAZ webpage	All modes	Ensure information on loans, grants and mobility credits including pre eligibility information is up to date	Referrals from tele marketing team and sign posting from Travelwest and BBB websites	Use existing websites, social media channels and all tranches Audience – everyone who could be affected by the implementation of CAZ. Specific focus on businesses and deprived communities Overall estimate for marcomms is £130k p.a. which includes citywide campaigns on comms and development of websites and apps that help plan journeys.
Supporting campaigns	All modes	Launch campaigns for offers and support	Ensure wide reach of audiences to assistance available	
Travelwest	All modes	Improve the TravelWest website to support customisable route planning tool and travel disruption alerts bespoke to employers and individuals Businesses could use their postcode plotting that the team will have completed for them from the workplace travel audit and employees could work out how best they can get to work. Does anyone live nearby and travel at the same time to share journeys? Are they able to combine train and scooter journeys? Get alerts if buses are late and need to find a different way home etc.	Travelwest is the no.1 portal for travel information in the West of England	
Travelwest Journey Planner	All modes			
Personalised travel tools	All modes			
Better By Bike (BBB)	Cycling	Improve our better by bike website to support customisable cycle trip planning tool	BBB receives over 10,000 hits per month	
BBB journey planner	Cycling	This would combine all types of cycle routes eg segregated, on road etc. If the customer was as an inexperienced cyclist, they may choose to cycle on a quiet route and not along a main road so when planning the journey, they may want to know what is involved.		

Business workstream	Mode	Details / targets over 3 years	Justification / case studies	Delivery / Channels
Communities Workstream				
<p>Roadshow, Door knocking and events within the community (both virtual and face to face)</p> <p>These are often accompanied by Dr Bike providing bike maintenance for new cyclists and existing riders.</p>	All modes	<p>Deliver 150 community events and roadshows for individuals and community groups across the city.</p> <p>Door knocking on 10,000 HHs within targeted deprived wards affected by CAZ.</p> <p>The aim is to raise awareness of the CAZ and to educate them on how they might be affected and what options are available to them. How else can they travel into city for social events, schools, seeing people etc. all about linked trips. This will include conversations about exemptions, loans, grants and the mobility credits.</p>	<p>In 17/20 we delivered just over 200 roadshows and events for residents and community groups.</p> <p>The 'hook' for this workstream is the introduction of CAZ and the need to raise awareness, getting people engaged and thinking about what changes they need to make.</p> <p>Door knocking was carried out for the Filwood Green cycle path to promote the new facility and encourage behaviour change. The door knocking was combined with community events in key community locations.</p>	<p>Use existing roadshow officers and promote through Travelwest, BBB and all other tranches</p> <p>Audience – low income residents, deprived wards, people with disabilities, young and old people, new residents, visitors and community groups</p>
<p>Community Engagement</p> <p>The roadshow / door knocking and events described above are the 'how' we get the message out.</p> <p>The community engagement at these events and through the door knocking are about signing people up to the key offers/ mobility credits.</p> <p>The Transport Engagement officers lead on community meetings with key champions and influencers to deliver the key offers.</p>	All modes	<p>Provide walking and cycling information to 5000 residents</p> <p>Provide travel support to 1000 residents and target behaviour change to 50% or more of all those who received support.</p> <p>For targeted residents the team will provide free support to get people travelling more sustainably. The offers include personal travel planning, borrow a bicycle for free and try cycling before you buy includes electric bikes, free cycle training, free basic bicycle maintenance, accompanied cycle ride, free taster bus tickets, walking maps and walking groups, car club membership discounts, car sharing app information, electric vehicles advice etc.</p>	<p>Between 2017 and 2020, the officers provided residents with information, incentives and support to encourage sustainable commuting habits.</p> <p>Over 4000 residents received information about walking and cycling and just over 1000 were provided with travel support.</p> <p>The team already work with community stakeholders including faith groups, walking groups, cycling groups, educational facilities etc to encourage sustainable travel.</p> <p>Through voluntary and community sector networks the team can offer community travel grants to residents and groups to set up sustainable travel initiatives such as the Cycling Sister project in Easton aimed at Muslim women to build confidence in cycling.</p>	<p>Use existing roadshow officers and promote through Travelwest, BBB and all other tranches</p> <p>Audience – low income residents, deprived wards, people with disabilities, young and old people, new residents, visitors, and community groups</p>
<p>Loan Bike (including electric)</p>	Cycling	<p>Deliver 800 2-4-week bike loans</p> <p>This is where the team loan a bike to an individual to encourage them to take up cycling. The clients are fitted to the bikes and shown how to operate them particularly important with e bikes. Storage and security are included in the tutorial. Lights are also provided.</p>	<p>Between 2017 and 2020, we have administered nearly 700 loan bikes to encourage new and returning cyclists</p> <p>As part of the evaluation process clients are asked to fill in a follow up survey 6 to 12 weeks after the intervention and over 50% who responded are cycling more than before the loan of a bike.</p>	<p>Use existing assets and promote through multiple channels such as BetterByBike, Travelwest, Bristol Cycle Centre, Roadshow officers, Businesses and Schools</p>

Business workstream	Mode	Details / targets over 3 years	Justification / case studies	Delivery / Channels
Dr Bikes/ Bike maintenance sessions	Cycling	<p>Deliver 300 Dr Bike / Bike Maintenance sessions</p> <p>By developing these new skills at maintenance sessions people can keep their bikes in working order.</p>	<p>Average of nearly 300 completed in previous years</p> <p>This not only encourages new cyclists, but it also maintains the level of cycling to ensure people don't stop if their bike get a puncture and they revert back to the car.</p>	<p>Use existing contracts and resource and promote through Travelwest, BBB and all other tranches</p>
Cycle Training	Cycling	<p>Provide 2000 people with cycle training sessions</p> <p>One to one cycle training on or off road where the instructor will come to your house or place of work and will provide advice and support on where and how to cycle safely. This can be provided in a traffic free environment at the Bristol Cycle Centre or on road.</p> <p>The cycle trainer will help with manoeuvres on the road, balance and co-ordination required for riding a bike. The trainer will also ask about your experience to ensure the session is adapted to the client.</p>	<p>In 17/18 provided nearly 1500 cycle training sessions</p> <p>As part of the evaluation process clients are asked about their cycling habits before the session and after. In 2017 those who responded to survey noted that 43% were cycling between 30min to 1 hour 30 mins per week after the sessions compared with 14% before.</p>	<p>Use existing staff and partners to provide this offer at Bristol Cycle Centre and on street.</p>
Accompanied / group rides	Cycling	<p>Deliver 225 accompanied / group rides</p> <p>These rides will be focusing on helping individuals build confidence when learning to ride around the city particularly for work journeys.</p>	<p>Average nearly 50 over in a year</p> <p>The clients are asked about their cycling habits after the session and we now have links with cycling clubs where some people have wanted to progress onto cycling as a sport.</p>	<p>Use existing partners to provide this offer and promote through Roadshow team, Travelwest and BBB and all other tranches</p>

The level of staff to deliver the above following the end of the Access Funding will be:

- Senior CAZ officer – 1 FTE staff focused on coordination of all the CAZ engagement work
- Communities – 3 FTE staff focussed on support for people earning lower incomes, residents, disabled people, elderly residents, young people, and new residential developments etc.
- Businesses – 4 FTE staff focussed on support for SMEs, all businesses, buses, taxis, commuters into the zone and out of the zone for work or education purposes, coaches etc.
- Travel Planning – 1 FTE staff focussed on new residents, new businesses, new other developments etc.
- Marcomms – 0.5 FTE staff focussed on the website, journey planner, PTP tools, Better By Bike etc.
- Roadshow officers – 0.5 FTE co-ordinator, 0.8 FTE senior officer, 1 FTE officer and 14 Travel Advisors

Total staff resource required – 15 staff and 14 TAs costing £826,357.00 for year one

6.5.2 Outline of proposed investment:

Operational budgets of approximately £1m required per year to deliver the programme above made up of and staff budget of approximately £826k for year one then falling to £636k for year 2 and £644k for year 3, as shown in Table 6-6.

Table 6-6: Operational and staff costs over a 3-year period

Workstream	Operational costs			Staff costs		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Business budget	£375k	£375k	£375k	£222k	£222k	£222k
Wheels to work budget	£140k	£150k	£150k	£47.8k	£59k	£59k
Communities budget	£230k	£230k	£230k	£212k	£125k	£125k
Roadshow budget	£125k	£155k	£155k	£282k	£221k	£223k
Marketing budget	£90k	£90k	£90k	£28.6k	£28.6k	£28.6k
Total	£1,077m	£1,120m	£1,120m	£796k	£636k	£644k

Total bid of £1.90m for year 1, £1.96m for year 2 and £1.96m for year 3 = approximately £5.8m.

6.5.3 CAF Objectives:

- This resource meets the objectives of the CAF by offering “community-wide measures such as road layout changes, changes to cycling or walking infrastructure, improved public transport, park and ride schemes, promoting car clubs, vehicle retrofit; or better travel planning services”.
- Furthermore, these measures will reduce transport costs for people fitting in with the CAF Guidance as being; “measures aimed directly at supporting individuals or businesses such as local travel discounts (which could be linked to smart ticketing), cycle to work schemes, local scrappage schemes or support for upgrading to a new vehicle (including ultra- low emission vehicles)”.
- The Access Fund support will run out once the CAZ goes live; this resource is urgently required in advance of that so that we do not experience a gap in service which could result in the loss of staff to other jobs and a loss of momentum. Initially the resource will overlap with the existing services with the CAZ added on, ultimately the team will be just focussing on addressing the impacts of the CAZ and the need to encourage and promote opportunities for individuals to use other modes.

6.5.4 Value for Money Assessment

The mitigation measure does not generate any direct, monetisable benefits. However, through its ability to unlock the following wider, non-quantifiable benefits, the mitigation measure is considered critical to unlocking and maximising the full potential of the other mitigation measures proposed as part of this CAF bid:

- As a result, could prevent job losses amongst people in Bristol and its neighbouring authorities, by for example ensuring awareness of the availability of financial support for vehicles to be upgraded. It will also maintain Bristol as a location that is attractive to local businesses, ensuring that consumers continue to have choice.
- Could lead to the promotion of more active and healthier lifestyles through support for active mode alternatives including walking and cycling.

- Allows independent businesses (e.g. retail) to be more proactive in their response to the Clean Air Plan. This could help safeguard the delivery of stock on a reliable basis. This will help prevent job losses and help maintain the vitality and viability of Bristol City Centre.
- Most businesses across all sectors are reliant to some extent on freight or delivery services or trades people. Any CAZ charge would likely be passed on to end consumers. By raising awareness and encouraging travel planning, the amount of non-compliant vehicles entering the CAZ zone could be reduced, thereby minimising pass-through of CAZ costs to end consumers.
- Will ensure the leisure and tourism industry is aware of opportunities to access support in dealing with the transition to the Clean Air Plan.

6.6 Freight Consolidation

6.6.1 Previous projects – DHL

There is not actually an existing Bristol freight consolidation scheme at Avonmouth. DHL had in the past received funding to set up a large-scale freight consolidation centre that utilised an existing out of town storage facility based at Avonmouth Docks. The pilot was deemed a success as there was a 78% reduction in journey movements for those businesses participating in the scheme. However, the high level of overheads resulted in high service charges which proved to be a barrier to participation, which affected the numbers applying and led to the conclusions that the model was not sustainable. Anecdotally though, DHL continue to operate a reduced scale freight consolidation scheme at Avonmouth, but not using electric vehicles. They did not engage in the GULW grant opportunity covered below.

6.6.2 Delivery Plan

BCC has a wealth of experience working on freight consolidation and are already discussing options to work alongside f given their inclusion of freight measures in their CAZ plans. Having recently awarded the GULW grant, there is recent experience of tendering for this type of project as well as expertise within existing teams to be able to take on this additional work once funding is awarded.

We have considered some possible locations, a very rough mock up attached (Gmaps link), for Urban and Micro centres (rail added as well, there has been discussions with rail logistics suppliers). The market will dictate location and they have the logistics experience, this can be agreed once funding is approved and tender exercises can be carried out. At present, this work is only required as part of the CAZ and is dependent on funding being approved. For this bid, costs from the recent tender exercise have been included to provide robust cost estimates and a realistic scope.

A draft programme has been drawn up, based on recent tender exercise for this type of scheme. This shows that the tender could be awarded relatively quickly and awarded prior to the go live date for the CAZ, ensuring that benefits are being realised alongside the other mitigation measures at the point of the charges being introduced.

Once funding is awarded, the EOI will take place and discussions will take place with Zedify to get their most recent data and lessons learnt. Liaison with B&NES has been ongoing but with their data as well, we can work together to finalise scope and consider other options for example alternatives such as funding a consortium of small businesses as detailed below in the funding scope.

6.6.3 Existing projects – Go Ultra Low West (GULW)

Overview

The GULW £100k grant awarded to Bristol in late 2020 is due to begin in January 2021 and run for 12 months. Initial results are very encouraging for a new company which began with one member of staff in difficult year and supports the small grants to small businesses model.

Bristol defines freight consolidation as being: 'where many suppliers have goods delivered to a consolidation centre or equivalent where they are stored, and then when needed are combined into a single load for the onward journey to the delivery point. One supplier consolidating deliveries, would not count towards this definition of freight consolidation'.

This also applies in reverse, to collections back into the hub, reverse logistics. Examples include collecting batteries or other recycling that gets consolidated at a depot for collection by a larger vehicle. Also, collection of first mile items for on forwarding by a 3PL such as DHL etc.

Freight consolidation improves air quality by reducing petrol and diesel vehicle trips. There is also more potential for the last part of the journey to be completed by a low or no emission vehicle such as an electric van or a cargo bike.

In terms of benefits, this type of measure is aimed at mitigating the impacts of the scheme. For businesses, according to the DEIA, the impact is likely to be felt most strongly by LGV / HGV reliant businesses: 'There are potential direct impacts on costs for LGV/ HGV reliant businesses. Though trips by non-compliant LGV/ HGV reliant businesses are reasonably spread around the city, those making trips related to the CAZ area will be affected; the CAZ area is reasonably small but covers most of the city centre'. This measure will support the businesses by reducing costs associated with deliveries and moving stock etc. and also reduces the need for LGV / HGV trips in and around the zone benefiting not only the business in not having to pay the charges but also helping to improve air quality.

Other benefits for Bristol in general include:

- Fewer freight vehicles moving through the city leading to improved air quality and less congestion
- Reduced noise pollution
- Less wear and tear on road surfaces
- Improved safety for pedestrians and cyclists

Expressions of interest in applying for the GULW grant were received from 9 companies; this is very encouraging and reflects the recent focus on improving the environmental impact of business deliveries. Zedify have been awarded the GULW grant and will be setting up a brand-new centre - not add to existing facility.

The grant is capital only – this was highlighted as a barrier to applicants. It was requested future funding also included a revenue allowance. Companies who are not in or near Bristol, early stage start-ups or pre-revenue were at a disadvantage.

Transport will be zero tailpipe emissions so will include EVs as well as cargo freight bikes. Starting fleet includes 3 x Icen trikes, 2 x Urban Arrows and 1 x Nissan ENV200 (total budget around £50k)

It is unlikely we can partner CAF funding with GULW. There are potential financial implications with that option and it is extremely likely to be challenged by unsuccessful GULW applicants. However, we want to build on the project and align with B&NESs scheme to build on and enhance the work that Zedify begin over the next year.

Zedify proposed services are as follows:

- Last mile

Businesses drop off their deliveries at their depot where they are consolidated and transferred to vehicles optimised for the urban environment. In Bristol they will use their existing partnerships to bring volume deliveries from major overnight carriers to backstop the operation and provide a robust framework on which to build. They will also target small businesses such as veg box schemes situated out of the city, but with a requirement to deliver within Bristol's Air Quality Management Area (AQMA) and so potential Clean Air Zone (CAZ).

- Only mile

For businesses located within the city we offer same day dedicated collection and delivery rounds consolidated at their depot. They've partnered with Click It Local ([https:// www.clickitlocal.co.uk/](https://www.clickitlocal.co.uk/)) to offer consolidated deliveries from high street shops.

- First mile

Zedify offer businesses within urban areas the opportunity to send national and international parcels with a choice of national carriers. Collecting goods from businesses by bike and consolidating them at our depot on the edge of the city for onward distribution dramatically reduces the number of vans in Bristol's AQMA and potential CAZ. They will also provide a consolidation point for reverse logistics needs.

6.6.4 Outline of proposed investment:

It is estimated that an initial financial input of £250-300k is required to set up a centre, as is detailed in Table 6-7. (Source: Zedify, the successful GULW applicant, this would be a small centre initially).

Table 6-7: Summary of operational and capital costs (year 1)

Operational Costs Year 1	
Marketing/ Sale	£3,900
Personnel	£65,269
Premises	£34,920
Insurance	£2,488
Tech fees	£16,696
Accounting & professional	£400
Fleet servicing & costs	£1,300
General expenses	£1,800
Total	£126,773

Capital Costs Year 1	
Iceni trikes	£70,000
Urban Arrow XL	£14,000
Nissan ENV200	£20,000
Desktop computer	£800
Mobile phones for riders	£960
Office furniture	£500
Other set up costs	£1,000
Total	£107,260
Total	£234,033

CAF Funding Scope - £2m bid

- Follow the GULW example and award as grants via a competitive bidding process
- EOI could be pursued once the FBC is approved and funding is certain. This project is only being planned as part of the CAZ mitigation and would not otherwise be taking place, therefore without CAF funding it will not be progressed unless other funding sources can be sought in future.
- £2m would ideally be split into a number of smaller grants to enable multiple companies to start up, enter the Bristol market, or add to existing centres. However, we are open to considering alternative options such as funding a consortium of small businesses which would provide benefits including shared resources, consolidating deliveries and furthermore supports a group most affected by the introduction of a charging CAZ, SMEs. There are also other opportunities to be explored. This will be best managed by taking into account the learning from existing services and releasing an EOI to inform the tender process once we have funding awarded. We can't undertake any more detailed work until funding is more certain.
- Expand freight definition to include waste consolidation. There are successful case study examples of waste consolidation. This would increase the potential bidding take up

- Definition of freight consolidation will be re-examined with the Policy Team to increase take up. For example, one supplier consolidating deliveries would not count towards the BCC definition of freight consolidation. By reviewing this, we could again open- up applications to a much broader range of businesses
- Collaboration with BaNES
- Grant application will be led by the Access Engagement team who are very experienced in engaging, marketing, and processing grants
- Further support only mile delivery by complimenting the scheme with a rebate or voucher scheme to bring costs in line with postage costs (in line with BaNES paper)
- Add on a concierge service for shoppers to Bristol City Centre

Following the tender put out as part of GULW, we are confident that we have a number of businesses who would likely apply - as demonstrated by GULW applications received. Having the ability for multiple companies to receive funding will increase the outputs and the move to zero emission will be quicker and more widespread in the AQMA. It will kick- start a culture of zero emission delivery in the centre as companies start to compete with each other using zero emission as a selling feature. Customers will request, and be sold on, zero emission delivery as an easy win to hit their own strategic sustainability goals. It also spreads the risk across suppliers.

6.6.5 CAF Objectives:

This bid meets the objectives of the Clean Air Fund as a way of mitigating the impact of a CAZ being implemented, as covered in the extracts from the CAF Guidance document below:

"B) By enabling the local authority to implement local plans that collectively impact on fewer people. For example if a local authority identified the following two approaches that achieve compliance equally as quickly: a) implementing a class C1 charging Clean Air Zone; or b) implementing a class B2 charging Clean Air Zone³ and additional measures (for instance a freight consolidation centre). Option b) would impact less people as vans would no longer be in scope for charging but has an additional cost to fund the additional measures - the Clean Air Fund could potentially support these additional measures.

HGVs/Freight drivers and companies

15. Potential air quality measures such as charging zones or access restrictions could also impact the freight and heavy-duty sector. Potential measures to support freight operators to upgrade their vehicle or change their current patterns could include: freight consolidation centres; improving freight deliveries e.g. by changing mode, time of delivery or route; investing in alternative fuel refuelling; or HGV retrofit.

Case Study: West of England Partnership – freight consolidation

The Department of Transport's Local Sustainable Travel Fund enabled the expansion of a pre-existing freight consolidation centre for Bristol and Bath, operated by DHL. During 2014/15, the freight consolidation scheme served 133 retailers in Bristol and Bath, preventing over 2,074 delivery trips to the two city centres, and saving carbon dioxide emissions estimated at over 23,000 tonnes. In 2016, the annual NOx emission reductions in Bristol was 358.62kg. Electric vehicles have been used until recently, but these vehicles are no longer in operation. They will be replaced by new electric vehicles. The Clean Air Fund could support measures such as a freight consolidation centre where a local authority's plan impacts on the freight sector. Support could result in fewer vehicles having to enter a Clean Air Zone where a charge may apply".

6.6.6 Value for Money Assessment

6.6.6.1 Quantifiable Impacts

The freight and waste consolidation proposals will remove non-compliant freight traffic associated with businesses in Bristol City Centre from the highway network, including both LGV and HGV freight traffic that currently service these businesses on a daily basis. Last mile delivery elements will allow businesses to deliver or collect goods from storage depots, alleviating the need for non-compliant freight vehicles to enter the CAZ and risk passing any CAZ charge incurred onto the businesses they are servicing.

Whilst the air quality and transport benefits of removing non-compliant LGVs and HGVs from the network are likely to be positive, they cannot be assessed in the absence of formal modelling. It is possible to monetise the impact of removing non-compliant freight traffic on business operational costs, if it is assumed that non-compliant freight traffic will pass on the cost of entering the CAZ to the businesses they are delivering to. Hence, it is possible to estimate the reduction in costs incurred by those businesses who may avoid the pass-through cost of entering the CAZ for non-compliant freight traffic. However, given the competitive basis of funding awards proposed, it is not possible to accurately estimate the numbers of vehicles removed, as the scale of the eventual operations will depend on individual proposals and take-up. To illustrate the potential benefits, the principal of the assessment is to calculate the impact of CAZ charges that would otherwise be passed onto individual businesses.

For instance, interrogation of ANPR data relating to frequency of journeys into the CAZ area indicates that almost 8,000 LGVs enter the area every day, of which over 3,300 are non-compliant. Many make regular journeys, with almost half doing so 2 or more days per week, and around 6% do so on 5 or more days (these proportions are similar for compliant and non-compliant LGVs). Fewer HGVs enter the area, at around 1,500 per day, of which around 350 are non-compliant (again, similar proportions are observed making the journey regularly, on 2 or 5 or more days per week, and likewise comparing compliant and non-compliant vehicle movements). Hence, if it assumed that broadly 20% of the more regular non-compliant vehicles could be removed, this would imply around 100 LGVs and 20 HGVs per day would be a realistic target. Removal of these non-compliant trips within the CAZ area could result in avoided costs of £2,900 per day for local businesses (based on the £9 LGV CAZ charge and £100 HGV CAZ charge per day). Assuming that these movements would otherwise occur six days a week, the daily figure can be annualised to £904,800 of avoided costs for local businesses.

Set against a scheme cost of £2 million, these economic benefits could generate an indicative BCR of over 1.0 within its second year of operation. If impacts are extrapolated across the ten-year appraisal period, the scale of benefits is likely to increase. Also note that it has not been possible to estimate the additional economic benefits that might arise due to reduced traffic and improved air quality as a result of fewer non-compliant freight trips.

6.6.6.2 Additional Non-Quantifiable Impacts

Through its ability to unlock the following wider, non-quantifiable benefits, the mitigation measure is considered critical to unlocking and maximising the full potential of the other mitigation measures proposed as part of this CAF bid. The measure will also support the following wider impacts:

- Promotes more active and healthier lifestyles through support for active mode alternatives via the electric delivery bike infrastructure.
- Supports dependent businesses such as retail. The mitigation measure safeguards the delivery of stock on a reliable basis. This will help prevent job losses and help maintain the vitality and viability of Bristol City Centre.
- Most businesses across all sectors are reliant to some extent on freight or delivery services. If non-compliant vehicles continued to enter the CAZ, any associated charge would likely be passed on to end consumers. Provision of delivery and servicing plans as well as alternatives to LGV access to the city centre could reduce the amount of non-compliant freight vehicles entering the CAZ zone and therefore helps to minimise pass-through of CAZ costs to end consumers.
- Protects local freight businesses and traders by providing support for alternatives to non-compliant LGV use. This is particularly important for SMEs and sole traders, who may struggle to identify these opportunities alone.

Appendix A. Research into vehicle valuation

This appendix presents the research into vehicle valuation, this informed discussion with JAQU on this matter, and has now been superseded by the values presented in Section 6.

LGVs

The cost of a new LGV was calculated from the Publication by Road Haulage Association on the LGV and HGV operating costs, 2018, linked below:

http://www.transportengineer.org.uk/article-images/166209/Out_of_our_hands.pdf. See Table A.1.

Table A.1: LGV and HGV 2018 New Vehicle Costs

Detailed vehicle type	2018 Cost
Car derivative vans – diesel	£14,244
Vans of 3.5 tonnes gvw – diesel	£26,186
Average	£20,215

Upgrade costs for each vehicle type and Euro Standard were calculated using the depreciated vehicle values, comparing the resale cost of a non-compliant vehicle and the cost of purchasing a compliant vehicle (see FBC-26 'Primary Behavioural Response Calculation Methodology').

Table A.2 then goes on to calculate the average upgrade cost for LGVs.

It was necessary to also account for 'secondary' behavioural responses within these calculations, to estimate the proportion of vehicles replaced by new or used vehicles, and the switch between diesel and petrol cars. In the absence of more accurate/ local information, JAQU's assumptions from paragraph 3.3 of the Evidence Package, were used, and are as follows:

- 25% of those with a non-compliant vehicle who upgrade will buy a brand-new vehicle of the same fuel type.
- The other 75% will replace their vehicle with a second-hand compliant vehicle. Of these, 75% of diesels owners will switch to petrol with the remainder keeping the same fuel type.

The cost of resale was based on the lowest value of that vehicle type and euro standard. The cost of a compliant vehicle was calculated using on the secondary behavioural responses outlined above, and also based on an assumption that the lowest cost second-hand compliant vehicle will be purchased.

Table A.2: Upgrade Costs (Source: FBC-26 'Primary Behavioural Response Calculation Methodology')

Vehicle type	Euro Class	Resale cost	Cost of compliant vehicle	Cost to upgrade per vehicle
LGV	Euro 0	£0	£8,772	£8,772
	Euro 1	£159	£8,772	£8,613
	Euro 2	£380	£8,772	£8,392
	Euro 3	£642	£8,772	£8,131
	Euro 4	£1,534	£8,772	£7,238
	Euro 5	£4,367	£8,772	£4,405
Weighted Average				£5,864.65

HGVs

The cost of a new rigid HGV and artic HGV was calculated from the Publication by Road Haulage Association on the LGV and HGV operating costs, 2018, linked below:

http://www.transportengineer.org.uk/article-images/166209/Out_of_our_hands.pdf

Upgrade costs for each vehicle type and Euro Standard were calculated using the depreciated vehicle values, comparing the resale cost of a non-compliant vehicle and the cost of purchasing a compliant vehicle (see FBC-26 'Primary Behavioural Response Calculation Methodology').

Table A.3 then goes on to calculate the average upgrade cost for LGVs.

It was necessary to also account for 'secondary' behavioural responses within these calculations, to estimate the proportion of vehicles replaced by new or used vehicles, and the switch between diesel and petrol cars. In the absence of more accurate/ local information, JAQU's assumptions from paragraph 3.3 of the Evidence Package, have been used, and are as follows:

- 25% of those with a non-compliant vehicle who upgrade will buy a brand-new vehicle of the same fuel type.
- The other 75% will replace their vehicle with a second-hand complaint vehicle. Of these, 75% of diesels owners will switch to petrol with the remainder keeping the same fuel type.

The cost of resale is based on the lowest value of that vehicle type and euro standard. The cost of a compliant vehicle was calculated using on the secondary behavioural responses outlined above, and also based on an assumption that the lowest cost second-hand compliant vehicle will be purchased.

Table A.3: Upgraded Costs (Source: FBC-26 'Primary Behavioural Response Calculation Methodology')

Vehicletype	Euro Class	Resale cost	Cost of compliant vehicle	Cost to upgrade per vehicle
HGV Rigid	Euro 0	£0	£29,621	£29,621
	Euro 1	£309	£29,621	£29,313
	Euro 2	£832	£29,621	£28,789
	Euro 3	£1,509	£29,621	£28,112
	Euro 4	£4,071	£29,621	£25,550
	Euro 5	£13,392	£29,621	£16,229
Weighted average				£20,528
HGV Artic	Euro 0	£0	£35,618	£35,618
	Euro 1	£371	£35,618	£35,247
	Euro 2	£1,001	£35,618	£34,617
	Euro 3	£1,815	£35,618	£33,803
	Euro 4	£4,896	£35,618	£30,722
	Euro 5	£16,104	£35,618	£19,514
Weighted average				£22,496

Coaches

Data on Coach upgrade costs and methodology has been used from the Bath Clean Air Plan: Clean Air Fund Report, as outlined below. Please also see the Retrofitting section below for additional data.

Using the data obtained from the ANPR survey within Bath and Carweb, it was possible to identify the most common coach makes and models within Bath. These were identified as the Mercedes Tourismo, Volvo B Series, Irizar I Series and Scania K Series. It should be noted these makes and models are fairly broad to capture as many coaches in the estimate as possible to improve its accuracy.

To calculate the average cost of upgrading from a non-compliant to a compliant second-hand coach of these makes and models, research was undertaken into the cost of coaches of different Euro Classes. To obtain the data a combination of the following sites was used: Plaxton Coach Sales, Odyssey Coach Sales and John Hill Coach Sales. It should be noted that used vehicle sales sites have been used to calculate the cost as it prices an upgrade to a compliant 2nd hand vehicle, the minimum that is required, maximising the number of vehicles that can be supported.

Table A.4 below, shows the average cost of used coaches, of each of the makes and models listed above of each of the Euro-classes 3, 4, 5 and 6. Table A.5 then calculates the average cost of upgrading each coach make and model or each non-compliant Euro-class, to a compliant coach of the same make and model. As shown, this leaves an average upgrade cost of £70,341.

Table A.4: Average cost of used coach models

Euro-Class		Coach Model			
		Mercedes Tourismo	Volvo B Series	Irizar I Series	Scania K Series
Non-Compliant	Euro 3 Diesel	N/A	£33,088	N/A	£37,678
	Euro 4 Diesel	N/A	£80,244	N/A	£57,171
	Euro 5 Diesel	£90,088	£131,696	£126,116	£95,145
Compliant	Euro 6 Diesel	£153,461	£176,680	£162,960	£149,475

Table A.5: Average cost of upgrading to a compliant used coach of the same make and model

Euro-Class	Coach Model				Upgrade Cost
	Mercedes Tourismo	Volvo B Series	Irizar I Series	Scania K Series	Average
Euro 3 Diesel	N/A	£143,593	N/A	£111,797	£127,695
Euro 4 Diesel	N/A	£96,436	N/A	£92,304	£94,370
Euro 5 Diesel	£63,374	£44,984	£36,844	£54,330	£49,883
Average	£63,374	£95,004	£36,844	£86,144	£70,341

Taxis/PHVs

Data on Taxi and PHV upgrade costs and methodology was used from the Bath Clean Air Plan: Clean Air Fund Report, as outlined below.

Using the data obtained from the ANPR survey within Bath and Carweb, it was possible to identify the most common vehicle types registered as Taxis that travelled into Bath City Centre. These were identified as the Seat Toledo, Skoda Octavia, Mercedes E-Class and Ford Galaxy and show a good overview of the types of Taxi found in B&NES.

Parkers.co.uk was then used to look up the average prices of both compliant and non-compliant models of the vehicle. This data was then in turn used to calculate an average upgrade cost as well as an overall average for Taxis of £9,000, as shown in Table A.6 It should be noted that Parkers.co.uk is used to calculate the cost to upgrade to a compliant second-hand vehicle, the least that is required, maximising the number of vehicles that could be supported through this scheme.

Table A.6: Average upgrade costs for taxis

Vehicle	Average Cost of Non-Compliant Vehicle	Average Cost of Compliant Vehicle	Upgrade Cost
Seat Toledo	£7,500	£13,000	£5,500
Skoda Octavia	£9,750	£17,250	£7,500
Mercedes E-Class	£12,750	£26,000	£13,250
Ford Galaxy	£11,750	£21,500	£9,750
		Average	£9,000

Cars

The cost of a new car was calculated by determining the most popular car models in the local area. A national list was obtained from the www.smmr.co.uk website, which is comparable with the most popular car models identified from the Bristol Automatic Number Plate Registration (ANPR) data. Prices for Petrol and Diesel models of the list of popular cars were extracted from the Parkers database for new car prices. Table A.7 shows the new car prices for the most popular cars.

Table A.7: New Car Prices based on most Popular Cars (Source: FBC-26 'Primary Behavioural Response Calculation Methodology')

Model	New					
	Petrol			Diesel		
	High	Low	Ave	High	Low	Ave
Ford Fiesta	£20,000	£13,200	£16,600	£19,000	£14,200	£16,600
Ford Focus	£22,400	£17,600	£20,000	£22,500	£19,100	£20,800
Vauxhall Corsa	£19,300	£11,800	£15,550	£17,500	£13,500	£15,500
Vauxhall Astra	£23,400	£14,500	£18,950	£21,900	£16,100	£19,000
Volkswagen Golf	£25,000	£18,500	£21,750	£24,500	£19,100	£21,800
BMW 3 Series	£29,000	£22,900	£25,950	£32,500	£24,500	£28,500
MINI	£15,905	£20,635	£18,270	£ -	£ -	£ -
Volkswagen Polo	£17,500	£15,500	£16,500	£17,400	£15,800	£16,600
Renault Clio	£15,000	£11,000	£13,000	£15,500	£12,500	£14,000
Audi A3	£33,500	£20,500	£27,000	£31,000	£20,500	£25,750
Toyota Yaris	£14,500	£12,500	£13,500	£ -	£ -	£ -
Mercedes C Class	£35,500	£26,000	£30,750	£38,000	£27,000	£32,500
Average	£22,584	£17,053	£19,818	£23,980	£18,230	£17,588

Note: Values based on Clean Air Fund Report (Bath & North East Somerset Council) issued January 2020

It was necessary to also account for 'secondary' behavioural responses within these calculations, to estimate the proportion of vehicles replaced by new or used vehicles, and the switch between diesel and petrol cars. In the

absence of more accurate/ local information, JAQU’s assumptions from paragraph 3.3 of the Evidence Package, have been used, and are as follows:

- 25% of those with a non-compliant vehicle who upgrade will buy a brand-new vehicle of the same fuel type.
- The other 75% will replace their vehicle with a second-hand compliant vehicle. Of these, 75% of diesels owners will switch to petrol with the remainder keeping the same fuel type.

Table A.8 shows the weighted upgrade cost calculations for Cars (Petrol and Diesel), LGV and HGVs (Rigid and Artic). The cost of resale is based on the lowest value of that vehicle type and euro standard. The cost of a compliant vehicle was calculated using on the secondary behavioural responses outlined above, and also based on an assumption that the lowest cost second-hand compliant vehicle will be purchased.

Table A.8: Weighted upgrade costs (Source: FBC-26 ‘Primary Behavioural Response Calculation Methodology’)

Vehicle type	Euro Class	Resale cost	Cost of compliant vehicle	Cost to upgrade per vehicle
Car (Petrol)	Euro 0	£0	£6297	£6298
	Euro 1	£156	£6297	£6142
	Euro 2	£373	£6297	£5925
	Euro 3	£629	£6297	£5669
Weighted average				£5732
Car (Diesel)	Euro 0	£0	£6835	£6835
	Euro 1	£138	£6835	£6697
	Euro 2	£331	£6835	£6504
	Euro 3	£558	£6835	£6277
	Euro 4	£1335	£6835	£5500
	Euro 5	£3800	£6835	£3035
Weighted average				£4431
Weighted average car				£4884

Appendix B. Loan/Grant Package Assumptions

B.1 Upper Upgrade Estimate

Funding Required	Grants		Finance		tot.veh	Summary totals
	Number	Funding	Number	Funding		
Cars	784	£ 1,723,732	107	£ 106,843	891	Excluding cars £ 30,440,942
PHV	523	£ 902,580	65	£ 116,424	588	Cars £ 1,830,575
Hackney	240	£ 1,188,000	90	£ 162,000	330	£ 32,271,517
LGVs	3315	£ 15,578,994	2983	£ 9,546,277	3149	
HGVs	77	£ 1,232,000	19	£ 99,840	96	20% Finance contingency
Coaches	91	£ 1,456,000	23	£ 158,828	114	
Sub Totals	5030	£ 22,081,306	3287	£ 10,190,212	5168	
Grand Total	8317	£ 32,271,517				
		£ 34,309,559	<<< including 20% contingency on Finance			

Scheme Variables	
CAZ Scheme	Small CAZ D
Income Model	Individual

Private Car	Total Uptake	100%	Grants		Finance	
Requirements:			Replacement	Mobility Credits	Loan	
Days/Week in CAZ	2	890	£ 2,000		£ 5,000	
Individual Income	£27,000	44.3%				
			Incentive Uptake	88%		12%

Taxis	Total Uptake	100%	PHV			Hackney		
			Petrol	Hybrid	EV/Long Range	LPG	EV	E6d
Non Compliant PHV	588							
Non Compliant Hackney	330							
Grant			£ 1,500	£ 1,500	£ 1,500	£ 4,000	£ 4,000	£ 4,000
Uptake			19%	35%	35%	18%	9%	45%
Finance			£ 9,000	£ 9,000	£ 9,000	£ 9,000	£ 9,000	£ 9,000
Uptake			1%	5%	5%	9%	9%	9%

LGVs	Total Uptake	190%	Requirements:			
Days/Week in CAZ	2	3315	Free charge	BEV	E6	E6d+
Grant			£ 4,500	£ 4,500	£ 4,500	£ 4,500
Uptake			20%	40%	0%	40%
Finance			£ 16,000	£ 16,000	£ 16,000	£ 16,000
Uptake			18%	36%	0%	36%

HGVs	Total Uptake	100%	Requirements:	
Days/Week in CAZ	4	96	Grant	Finance
Incentive			£ 16,000	£ 26,000
Uptake			80%	20%

Coaches	Total Uptake	100%	Requirements:	
Days/Month in CAZ	2	113	Grant	Finance
Incentive			£ 16,000	£ 35,000
Uptake			80%	20%

Coaches	Total Uptake	100%	Requirements:	
Days/Week in CAZ	2	44	Grant	Finance
Incentive			£ 16,000	£ 35,000
Uptake			80%	20%

B.2 Middle Upgrade Estimate

Funding Required	Grants		Finance		tot.veh	Summary totals
	Number	Funding	Number	Funding		
Cars	359	£ 789,476	90	£ 89,713	449	Excluding cars £ 13,923,137
PHV	523	£ 902,580	65	£ 116,424	588	Cars £ 879,189
Hackney	240	£ 1,188,000	90	£ 162,000	330	£ 14,802,326
LGVs	1274	£ 5,988,017	1147	£ 3,669,253	1210	
HGVs	43	£ 688,000	11	£ 55,772	54	20% Finance contingency
Coaches	65	£ 1,040,000	16	£ 113,092	81	
Sub Totals	2504	£ 10,596,072	1419	£ 4,206,254	2712	
Grand Total	3923	£ 14,802,326				
		£ 15,643,577	<<< including 20% contingency on Finance			

Scheme Variables	
CAZ Scheme	Small CAZ D
Income Model	Individual

Private Car	Total Uptake	100%		
Requirements:			Grants	Finance
Days/Week in CAZ	3.5	449	Replacement	Mobility Credits
Individual Income	£27,000	44.3%	£ 2,000	£ 5,000
			Incentive Uptake	80%

Taxis			PHV			Hackney		
Non Compliant PHV	588		Petrol	Hybrid	EV/Long Range	LPG	EV	E6d
Non Compliant Hackney	330		£ 1,500	£ 1,500	£ 1,500	£ 4,000	£ 4,000	£ 4,000
			Uptake	19%	35%	35%	18%	9%
			Finance	£ 9,000	£ 9,000	£ 9,000	£ 9,000	£ 9,000
			Uptake	1%	5%	5%	9%	9%

LGVs	Total Uptake	190%		
Requirements:			Free charge	BEV
Days/Week in CAZ	3.5	1274	£ 4,500	£ 4,500
			Uptake	20%
			Finance	£ 16,000
			Uptake	18%

HGVs	Total Uptake	100%		
Requirements:			Grant	Finance
Days/Week in CAZ	4.5	54	£ 16,000	£ 26,000
			Incentive Uptake	80%

Coaches	Total Uptake	100%		
Requirements:			Grant	Finance
Days/Month in CAZ	4	81	£ 16,000	£ 35,000
			Incentive Uptake	80%

Coaches	Total Uptake	100%		
Requirements:			Grant	Finance
Days/Week in CAZ	3.5	17	£ 16,000	£ 35,000
			Incentive Uptake	80%

B.3 Lower Upgrade Estimate

Funding Required	Grants		Finance		tot.veh	Summary totals	
	Number	Funding	Number	Funding		Excluding cars	Cars
Cars	173	£ 380,296	43	£ 43,215	216	£ 5,762,113	
PHV	523	£ 902,580	65	£ 116,424	588	£ 423,511	
Hackney	240	£ 1,188,000	90	£ 162,000	330		
LGVs	285	£ 1,339,754	257	£ 820,956	271		
HGVs	21	£ 336,000	5	£ 27,619	26		20% Finance contingency
Coaches	49	£ 784,000	12	£ 84,779	61		
Sub Totals	1291	£ 4,930,630	472	£ 1,254,994	1492		
Grand Total	1763	£ 6,185,624					
		£ 6,436,622	<<< including 20% contingency on Finance				

Scheme Variables	
CAZ Scheme	Small CAZ D
Income Model	Individual

Private Car	Total Uptake	100%		
Requirements:			Grants	Finance
Days/Week in CAZ	5	216	Replacement	Mobility Credits
Individual Income	£27,000	44.3%	£ 2,000	£ 5,000
			Incentive Uptake	80%

Taxis			PHV			Hackney		
Non Compliant PHV	588		Petrol	Hybrid	EV/Long Range	LPG	EV	E6d
Non Compliant Hackney	330		£ 1,500	£ 1,500	£ 1,500	£ 4,000	£ 4,000	£ 4,000
			Uptake	19%	35%	35%	18%	9%
			Finance	£ 9,000	£ 9,000	£ 9,000	£ 9,000	£ 9,000
			Uptake	1%	5%	5%	9%	9%

LGVs	Total Uptake	190%		
Requirements:			Free charge	BEV
Days/Week in CAZ	5	285	£ 4,500	£ 4,500
			Uptake	20%
			Finance	£ 16,000
			Uptake	18%

HGVs	Total Uptake	100%		
Requirements:			Grant	Finance
Days/Week in CAZ	5	27	£ 16,000	£ 26,000
			Incentive Uptake	80%

Coaches	Total Uptake	100%		
Requirements:			Grant	Finance
Days/Month in CAZ	6	61	£ 16,000	£ 35,000
			Incentive Uptake	80%

Coaches	Total Uptake	100%		
Requirements:			Grant	Finance
Days/Week in CAZ	5	5	£ 16,000	£ 35,000
			Incentive Uptake	80%



Bristol City Council Clean Air Plan
Economic Assessment Methodology Report E1

FBC-29 | 3

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 Author: GW

Jacobs

The West Wing
 One Glass Wharf
 Bristol BS2 0EL
 United Kingdom

www.jacobs.com

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1. Introduction

1.1 Clean Air Zone Context

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 Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the COVID-19 pandemic. Recent research suggests that poor air quality may be correlated with higher death / infection rates from COVID-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill², to ensure that certain standards of air quality continue to be met, by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. 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 Bristol. 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 has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), an Outline Business Case (November 2019 and updated between April and June 2020) and a Full Business Case (February 2021).

1.2 Purpose of this Report

This Economic Appraisal Methodology Report (EAMR) is written to support the FBC and outlines the overarching framework and detailed analysis that underpins the economic appraisal of the preferred option for the Bristol Clean Air Plan, i.e. Small CAZ D. It presents the key assumptions, approach and structure of the economic modelling that drives the cost-benefit analysis presented in the Economic Case of the Full Business Case (FBC).

Within this context, the EAMR should be reviewed alongside the Economic Case presented in the main FBC document. The Economic Case itself outlines the results of the economic appraisal, whilst this appendix presents the methodological underpinnings of the analyses.

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 Environment Bill 2019-21 <https://services.parliament.uk/bills/2019-21/environment.html>

Earlier versions of this report were published in January 2019, October 2019, June 2020 and February 2021 in support of the developing economic cases.

This document reflects the updated Bristol Clean Air Zone modelling, including the modelled impacts of the Bristol Street Space Schemes on the Bristol highway network and Small CAZ D.

The Street Space Schemes have been incorporated in an updated Baseline model which has helped refine the Bristol Clean Air Zone scheme presented in the Outline Business Case submission, prior to the Full Business Case submission.

2. Analytical Framework

2.1 Overarching Framework

The overarching framework for assessing the economic impacts of the preferred intervention for Bristol's Clean Air Plan is outlined in Figure 2.1 (at end of report). The flowchart presents a complex and interlinked series of inputs, processes and calculations that drive the economic model. Key inputs into the economic model can be split into three broad categories that are summarised as follows:

- Jacobs technical modelling processes (blue) and their outputs (purple), as required by JAQU's Evidence Package and pivoting from:
 - Stated preference surveys – commissioned specifically for this study, which determine behavioural responses to implementation of the Clean Air Zone;
 - Transport modelling – utilising local traffic survey data which, building on the stated preference surveys, provides data on traffic patterns with and without implementation of the Clean Air Plan;
 - Air quality modelling – utilising local air quality monitoring data which, building on the transport modelling, provides emissions data with and without implementation of the Clean Air Plan;
- Benchmark data recommended by JAQU (green), including:
 - Carbon prices, sourced from BEIS Carbon Tables;
 - Depreciation rates, informed by JAQU's National Data Inputs for Local Economic Models;
 - Vehicle prices, informed by ANPR data to identify the most common car types in Bristol, www.parkers.co.uk, www.Which.com and discussion with local bus and fleet operators;
 - Transaction costs by vehicle type and Euro Standard, informed by JAQU's National Data Inputs for Local Economic Models;
 - Damage costs, sourced from DEFRA's Air Quality Damage Cost Appraisal Toolkit;
- Jacobs economic modelling processes (yellow) that sit outside, but provide inputs to, the core Local Economic Model:
 - Transport user benefits assessment – which estimates the transport economic impacts associated with implementing the Clean Air Plan (based on Transport Economic Efficiency tables);
 - Cost modelling – which provides capital and operational cost data associated with implementing the Clean Air Plan;
 - Active Mode Appraisal Toolkit – which estimates the economic impacts associated with changes in the number of walking and cycling trips as a result of implementing the Clean Air Plan; and
 - CoBALT analysis – which estimates the economic impacts associated with changes in the frequency and severity of accidents as a result of implementing the Clean Air Plan.

The various inputs listed above feed into the calculation of the economic impacts (black) for the intervention, split into a range of categories that are consistent with the impact categories listed in JAQU's Option Appraisal Guidance. The economic impacts are monetised at this stage, before being aggregated into a holistic Net Present Value (NPV), which act as the key output of the economic model (orange).

2.2 Guidance, Data Sources and Key Assumptions

The economic analysis is underpinned by the following JAQU and cross-governmental guidance documents:

- JAQU Options Appraisal Guidance (2017)
- JAQU UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations (2017)
- HMT Green Book (updated 2020)
- DfT Transport Analysis Guidance (TAG) framework (updated October 2019)

The following data sources were also utilised within the economic model to derive key assumptions:

- Transport model outputs (Jacobs internal analysis)
- Air Quality model outputs (Jacobs internal analysis)
- JAQU National Data Inputs for Local Economic Models (2017)
- Bristol ANPR data (2017)
- Bristol taxi licensing data (2018)
- Bristol public transport data on fleet size, age and value based on discussion with local bus operators (2018)
- Department for Business, Energy and Industrial Strategy's Carbon Tables (2019)
- Vehicle prices, informed by ANPR data on most common car types in Bristol, www.parkers.co.uk, www.Which.com and discussion with local bus and fleet operators.
- DEFRA's Air Quality Damage Cost Appraisal Toolkit

Other key assumptions adopted within the model include:

- Opening year of 2022 to reflect assumed scheme opening
- Appraisal period of ten years (2022-2031), in line with JAQU guidance
- Presentation of monetised impacts in 2018 prices and values in line with JAQU guidance
- Adoption of a 3.5% discount rate per annum over the appraisal period, in line with HM Treasury Green Book Guidance
- Inflation adjustments in line with the HM Treasury's GDP Deflator (2020)

Additional impact-specific assumptions and parameters are presented in the relevant sections below. However, note that whilst this report provides a brief summary of the key behavioural, transport and air quality assumptions that drive the economic analysis, it does not attempt to re-state the methodological foundations or key outputs of any technical modelling. The following reports submitted as part of the FBC should be consulted for further details on these key data sources and assumptions:

- Behavioural Responses – FBC-28 'Stated Preference Survey', Appendix F and FBC-26 'Response Rates' within Appendix E of the FBC.
- Air Quality Technical Workstream – FBC-18 'AQ2 Methodology Report' and FBC-19 'AQ3 Modelling Report' within Appendix D of the FBC.
- Traffic Modelling Technical Workstream – FBC-22 'T2 Model Validation Report', FBC-23 'T3 Methodology Report', FBC-24 'ANPR Summary TN', FBC-25 'LGV and HGV Validation TN', FBC-26 'Response Rates' and FBC-27 'T4 Model Forecast Report' within Appendix E of the FBC.

2.3 Structure of this Report

This report provides a step-by-step guide to the approach adopted to assess each of the economic impact categories defined in Figure 2.1 and listed below:

- Health and Environmental Impacts
 - Greenhouse Gas Emissions – an assessment of the change in CO₂ emissions resulting from implementation of the intervention scheme.
 - PM/NO_x Emissions – an assessment of the change in PM and NO₂ emissions resulting from implementation of the intervention scheme.
- Impacts on Transport Users
 - Transaction Costs - an assessment of time costs associated with looking for and purchasing new/replacement vehicles as a result of implementation of the intervention scheme.
 - Consumer Welfare Loss – an assessment of reduction in consumer surplus resulting from the earlier purchase of new/replacement vehicles or the decision to change travel behaviour in response to implementation of the intervention scheme.
 - Scrappage Costs – an assessment of the loss in asset value for vehicles that are scrapped earlier as a result of implementation of the intervention scheme.
 - Journey Time/Vehicle Operating Costs – an assessment of the change in travel times and vehicle-use costs as a result of implementation of the intervention scheme. The vehicle operating cost element is assumed to implicitly include fuel switch costs.
 - Accident Impacts – an assessment of the change in frequency and severity of accidents as a result of implementation of the intervention scheme.
 - Walking/Cycling Impacts – an assessment of the change in number of individuals travelling by active modes as a result of implementation of the intervention scheme.
- Costs to Local/Central Government – an analysis of the cost to set-up and operate the intervention scheme.
 - Set-Up (Implementation) Costs – an assessment of the capital expenditure required to deliver the intervention scheme.
 - Running (Operational) Costs – an assessment of the ongoing operational expenditure required to deliver the intervention scheme.
- Note that financial impacts associated with CAZ charging have an overall net neutral impact from an economic perspective. This is because the CAZ charge acts an economic benefit to local/central government (in the form of revenue generation), but an economic cost to non-compliant vehicle users. The scale of the respective costs and benefits are equal therefore the impacts cancel each other out within the net present value analysis and are therefore discounted from consideration.

The following sections detail the analytical approach to each economic impact category in turn, supported by targeted versions of Figure 2.1 that isolate the methodology utilised for each type of impact.

2.4 Options Assessed

The economic analysis presented in this report considers the following scenarios:

- Baseline case – 2022-2031 scenario without a Clean Air Plan
- Preferred intervention scheme – 2022-2031 scenario with the following measures in place:
 - Small Area Class D CAZ charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs;
 - Holding back traffic to the city centre through the use of existing signals; and

- Changes to the boundary at Cabot Circus so vehicles can enter / exit Cabot Circus car park via Houlton St access without going through the CAZ.

This intervention scheme also includes Fast Track measures, some of which have been included in the revised Baseline (e.g closure of Cumberland Rd inbound and other measures such as additional cycle provision in the zone, additional air quality monitors etc). The M32 P&R and bus lane are not included as it cannot be delivered within the study programme, so do not form part of this option.

Note that the assessment is predicated on a 1st June 2022 switch-on date for the intervention option. As such, the economic analysis presented in the economic case reflects intervention impacts in 2022 accruing for a portion of the year only, rather than the full year. A pro-rata approach was adopted to account for the scheme being partially in place in 2022, based on numbers of days per month from start of June through to end of December compared to total days per year. This resulted in an adjustment factor of c. 59% being applied to 2022 economic analysis. This factor was validated against historic annual count data for BCC and more up to date 2019 count data at M32 (both of which demonstrate June-December traffic also represents 59% of annual traffic), which demonstrates excellent alignment with the pro-rata factor.

Also, in light of the change in opening year, resultant shift in economic appraisal period from 2021-30 to 2022-31 and the availability of traffic and air quality modelling data for 2021, 2023 and 2031 only, the approach to interpolation has been updated. In particular, the following key elements of the interpolation process that are worth noting are:

- 'Pre-CAZ' data for 2020 is no longer required; 2021 modelled baseline data provides the revised 'pre-CAZ' data.
- In the absence of 2022 modelled data, the opening year data for the baseline and intervention scenarios has been estimated via interpolation of 2021 and 2023 modelled data.
- Data for 2023-2031 reliant on same interpolation processes as utilised previously.

3. Vehicle Fleet Composition

3.1 Base and Baseline Vehicle Fleet

Based on 2021 model outputs, the compositional split of the 2021 baseline vehicle fleet between compliant and non-compliant vehicles is outlined in Table 3.1. For the purposes of the Table 3.1, vehicle compliance is defined as follows:

- Petrol vehicle compliance based on Euro 4+ for all vehicles;
- Diesel vehicle compliance (including all HGVs, buses/coaches) based on Euro 6+ for all vehicles.

Table 3.1: Base Vehicle Trips (AADT) in 2021

Euro Standard	Cars/Taxis (Petrol)	Cars/Taxis (Diesel)	LGV (Petrol)	LGV (Diesel)	HGV Rigid	HGV Artic	Buses/Coaches
Compliant	108,456	42,681	107	25,186	5,067	1,626	679
Non-Compliant	12,178	41,923	89	16,100	1,910	253	295

Source: Jacobs Transport Modelling

The 2021 baseline vehicle fleet composition is adopted as the key starting point for determining the change in vehicle fleet composition over the appraisal period.

3.2 Behavioural Response

The behavioural responses to the proposed scheme were derived through a stated preference survey undertaken in Spring 2018 (see FBC-28 'Stated Preference Survey Report' Appendix F of this FBC for more detail). The key primary behavioural response rates derived from the survey are replicated in Table 3.2.

Table 3.2: Primary Behavioural Response Rates

Response	Cars	LGV	HGV rigid	HGV artic	Buses	Coaches	Taxis
Pay Charge/ Excluded	10.4%	15.9%	8.8%	8.8%	0.0%	17.8%	4.1%
Avoid Zone	19.0%	19.2%	4.3%	4.3%	0.0%	0.0%	0.0%
Cancel Journey/ Change Mode	20.4%	2.6%	4.3%	4.3%	6.4%	11.4%	0.0%
Replace Vehicle/ Upgrade	50.3%	62.2%	82.6%	82.6%	93.6%	70.8%	95.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Jacobs Transport Modelling

Note that the bus response rates listed in Table 3.2 were artificially adjusted within the model to reflect feedback received by local bus operators in Bristol, which demonstrated that all buses would be compliant by 2021 in the baseline. Hence, the intervention scheme is assumed to have no effect on buses.

In relation to the replace vehicle/upgrade behavioural choice, a secondary behavioural response assumption was adopted in line with JAQU guidance. Table 3.3 outlines the standard proportion of people replacing existing vehicles with new vehicles versus people replacing with used (same fuel) and used (switched fuel) vehicles.

Table 3.3: Secondary Behavioural Response Rates (Source JAQU Guidance)

Response	Fuel Type		Upgrade Type	
	Keep Same	Switch	Used	New
Car (Petrol)	100%	0%	75%	25%
Car (Diesel)	25%	75%	75%	25%
LGVs	100%	0%	100%	0%
Buses	100%	0%	0%	100%
HGV Rigid	100%	0%	100%	0%
HGV artic	100%	0%	100%	0%
Coaches	100%	0%	100%	0%
Taxis (Petrol)	100%	0%	75%	25%
Taxis (Diesel)	25%	75%	75%	25%

3.3 Upgrade in Vehicle Fleet

Future composition of the vehicle fleet was determined by applying the behavioural responses to the 2021 baseline vehicle fleet composition. Based on the behavioural responses outlined above, the vehicle fleet is expected to upgrade at an accelerated rate in the intervention case relative to the baseline.

These behavioural responses were incorporated into the traffic modelling to forecast the scale of vehicle movements across the cordons in 2021, 2023 and 2031 under the intervention scenario. The rate of upgrading and consequent forecast for the scale of vehicle movement in the baseline across the same horizon years was estimated according to the EFT Toolkit outputs. The composition of the vehicle fleet in the years 2022 and 2031 is presented in Tables 3.4 to 3.7. Note that cars and taxis have been separated into discrete vehicle types within the analysis below based on the proportion of the car fleet that are taxis according to the traffic modelling analysis. Private hire vehicles are not differentiated from taxis or cars in the quantitative economic analysis below because there is no differentiation between charge rates for these vehicle types. Also note that there is no information on buses in the tables below, because bus operators in Bristol have confirmed that the bus fleet will be fully compliant by 2021 in the baseline.

Table 3.4: Vehicle Fleet (AADT) in 2022, Baseline

Euro Standard	Cars (Petrol)	Cars (Diesel)	LGV (Petrol)	LGV (Diesel)	HGV Rigid	HGV Artic	Taxis (Petrol)	Taxis (Diesel)	Coaches
1	0	0	1	0	0	0	0	0	0
2	698	52	22	162	9	1	52	4	13
3	5,243	1,871	49	683	102	18	389	142	76
4	10,364	5,315	5	2,909	236	11	105	404	38
5	34,282	28,128	46	8,935	1,083	154	346	2,138	100
6	63,135	46,115	85	29,168	5,551	1,697	637	6,622	749
Compliant	107,781	46,115	137	29,168	5,551	1,697	1,087	6,622	749
Non-Compliant	5,941	35,367	71	12,689	1,431	183	441	2,688	226

Source: Jacobs Transport Modelling

Table 3.5: Vehicle Fleet (AADT) in 2022, Intervention Case

Euro Standard	Cars (Petrol)	Cars (Diesel)	LGV (Petrol)	LGV (Diesel)	HGV Rigid	HGV Artic	Taxis (Petrol)	Taxis (Diesel)	Coaches
1	0	0	1	0	0	0	0	0	0
2	583	41	13	119	9	0	2	0	10
3	4,079	1,189	29	461	68	11	16	8	46
4	10,902	3,089	5	1,869	149	7	145	20	23
5	36,634	13,230	53	5,186	621	93	488	85	62
6	68,616	49,299	100	33,495	6,054	1,846	914	9,387	829
Compliant	116,152	49,299	158	33,495	6,054	1,846	1,547	9,387	829
Non-Compliant	4,662	17,549	42	7,635	847	112	19	112	141

Source: Jacobs Transport Modelling

Table 3.6: Vehicle Fleet (AADT) in 2031 Baseline

Euro Standard	Cars (Petrol)	Cars (Diesel)	LGV (Petrol)	LGV (Diesel)	HGV Rigid	HGV Artic	Taxis (Petrol)	Taxis (Diesel)	Coaches
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	149	81	0	107	6	0	3	0	0
5	6,028	3,585	2	1,170	83	10	119	0	0
6	116,705	54,759	119	46,010	7,094	1,918	2,310	8,602	1,009
Compliant	122,883	54,759	121	46,010	7,094	1,918	2,432	8,602	1,009
Non-Compliant	0	3,666	0	1,277	90	10	0	0	0

Source: Jacobs Transport Modelling

Table 3.7: Vehicle Fleet (AADT) in 2031, Intervention Case

Euro Standard	Cars (Petrol)	Cars (Diesel)	LGV (Petrol)	LGV (Diesel)	HGV Rigid	HGV Artic	Taxis (Petrol)	Taxis (Diesel)	Coaches
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	152	6	0	16	1	0	3	0	0
5	6,153	266	2	175	7	1	120	0	0
6	119,122	55,873	114	44,027	6,999	1,892	2,328	8,671	985
Compliant	125,427	55,873	116	44,027	6,999	1,892	2,452	8,671	985

Euro Standard	Cars (Petrol)	Cars (Diesel)	LGV (Petrol)	LGV (Diesel)	HGV Rigid	HGV Artic	Taxis (Petrol)	Taxis (Diesel)	Coaches
Non-Compliant	0	272	0	191	8	1	0	0	0

Source: Jacobs Transport Modelling

For the intervening years between 2023 and 2031, interpolation was undertaken to estimate the annual change in the vehicle fleet. Traffic flows for years between 2023 and 2031 were calculated using interpolation factors derived from traffic growth forecasts from TemPRO. To calculate the required vehicle and fuel types and euro standards the flows were split by a series of factors. Car and LGV compliant and non-compliant fuel splits were derived by adjusting WebTAG databook forecasts to account for locally observed ANPR data, the fuel splits for the intermediate years between 2023 and 2031 were taken directly from this process. Intermediate year splits between rigid and articulated for compliant and non-compliant HGVs were assumed to be a linear progression between the established 2023 and 2031 values. Euro standard splits were taken by utilising the fleet projection from observed ANPR data mechanism in the EFT for each year from 2023 to 2031.

Prior to 2022, a simplifying assumption is that the vehicle fleet composition is identical in both the baseline and intervention cases.

Based on this approach, the percentage reduction in non-compliant vehicle trips in the baseline and intervention scenarios is outlined in Table 3.8. The table clearly demonstrates that the number of non-compliant trips reduces at much quicker rate in the intervention case relative to the baseline.

Table 3.8: Percentage Reduction in Non-Compliant Trips in the Baseline (Relative to 2020)

Scenario	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Baseline	18%	31%	39%	47%	55%	63%	70%	78%	86%	93%
Intervention	92%	94%	94%	95%	96%	97%	97%	98%	99%	99%

Source: Jacobs Transport Modelling

4. Health and Environmental Impacts

4.1 Greenhouse Gas Emissions

By changing travel behaviours (including number of trips, trip mode and vehicle type), the Plan may influence the quantum of Greenhouse Gas (GHG) emissions generated by road transport. A change in GHG emissions, and CO₂ emissions in particular, could generate variable effects on climate change processes.

The approach to estimating the economic impact of GHG emissions utilised the following data:

- Vehicle kilometres output from the traffic model.
- Euro splits as estimated by ANPR.
- Behavioural responses estimated in the traffic model.
- CO₂ emissions per kilometre, by vehicle class, as provided by JAQU.

This data was processed as part of the air quality modelling technical workstream to estimate the change in CO₂ emissions across the appraisal period for both the baseline and intervention scenarios (Table 4.1). Model data was interpolated between modelled outputs for 2021 and 2023 for the opening year (2022). Explicit modelled data was utilised for the interim/compliance year (2023) and future year (2031). Linear interpolation was undertaken for intervening years between 2023 and 2031, for both the baseline and intervention scenarios.

The difference in emissions under the two scenarios was then calculated to determine the change in CO₂ emissions attributable to the interventions across the appraisal period.

Table 4.1: Temporal Change in CO₂ Emissions (tonnes)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Baseline	167,702	285,193	284,683	284,172	283,662	283,151	282,641	282,130	281,620	281,109
Intervention	165,457	282,149	282,496	282,843	283,190	283,537	283,884	284,231	284,578	284,925
Difference	2,245	3,044	2,187	1,329	472	-386	-1,243	-2,101	-2,958	-3,816

Source: Jacobs Air Quality Modelling

The difference in emissions was then multiplied by relevant carbon prices across the appraisal period (see Table 4.2, replicated from £/tCO₂e values in BEIS' Carbon Tables).

Table 4.2: Carbon Prices (£ per Tonne of CO₂ Emissions)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
£/tCO₂e	£71.59	£72.74	£73.90	£75.05	£76.21	£77.36	£78.52	£79.67	£80.83	£88.33

Source: BEIS Carbon Tables (2018 prices)

The approach to analysis of GHG emissions is outlined in Figure 4.1 (see end of report).

4.2 Air Quality (PM/NO₂) Emissions

Poor air quality can have significant negative health impacts on human health. Specific impacts relating to NO₂ include³:

- High concentrations can lead to inflammation of the airways.

³ [Ambient \(Outdoor\) Air Quality and Health Fact Sheet](#). World Health Organisation (2016). Accessed February 2018.

- Long-term exposure can increase symptoms of bronchitis in asthmatic children and reduced lung development and function.

More generally, a range of other public health issues are linked to poor air quality, as detailed below. These issues are believed to disproportionately affect 'at-risk' groups such as older people, children and people with pre-existing respiratory and cardiovascular conditions⁴.

- Long-term exposure to air pollution is linked to increases in premature death, associated with lung, heart and circulatory conditions.
- Short term exposure can contribute to adverse health effects including exacerbation of asthma, effects on lung function and increases in hospital admissions.
- Other adverse health effects including diabetes, cognitive decline and dementia, and effects on the unborn child⁵ are also linked to air pollution exposure.
- Exposure can exacerbate lung and heart disease in older people⁶.
- Approximately 40,000 deaths can be attributed to NO₂ and fine particulate matter pollution in England every year⁷.

In light of the causal link between poor air quality and poor public health, health experts believe that improvements in air quality can lead to a range of public health benefits, including:

- Reduced morbidity, leading to a reduction in public health expenditure (associated with hospital admissions and health care) and increased productivity through reduced work absenteeism; and
- Reduced mortality, leading to a reduction in lost output and human costs.

In addition, an improvement in air quality can also lead to positive externalities associated with the natural and built environment, including:

- Reduced impact on ecosystems (nature conservation and green spaces in Bristol) through a reduction in emissions of NO₂;
- Reduced impact on climate change through a reduction in NO_x; and
- Reduced damage to townscape and the built environment, leading to a reduction in surface cleaning costs and amenity costs for residential, historical and cultural assets.

Within this context, the health and environmental impact associated with changes in PM/NO₂ emissions were estimated using the Damage Cost approach. The Damage Cost approach estimates the average societal costs associated with marginal changes in pollution emissions based on the range of potential impacts highlighted above. By changing travel behaviours (including number of trips, trip mode and vehicle type), the Plan may alter the scale of PM/NO₂ emissions generated by road transport.

The approach to estimating the economic impact of PM/NO₂ emissions utilised the following data:

- Vehicle fleet data and vehicle kilometres outputs from the traffic model.
- Euro splits as estimated by ANPR.
- Behavioural responses estimated in the traffic model.
- PM and NO₂ emissions per kilometre, by vehicle class, as provided by JAQU.

This data was processed as part of the air quality modelling technical workstream to estimate the change in PM/NO₂ emissions across the appraisal period for both the baseline and intervention scenarios as shown in Table

⁴ World Health Organization (2013) *Review of evidence on health aspects of air pollution – REVIHAAP Project*. <http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2013/review-of-evidence-on-health-aspects-of-air-pollution-revihaap-project-final-technical-report>

⁵ Royal College of Physicians (2016) *'Every breath we take: the lifelong impact of air pollution'*, 2016 www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution

⁶ Simoni et al., Adverse effects of outdoor pollution in the elderly, *Journal of Thoracic Disease*, January 2015 (URL:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4311079/>)

⁷ Royal College of Physicians (2016) *'Every breath we take: the lifelong impact of air pollution'*. 2016

4.3. Model data was interpolated between modelled outputs for 2021 and 2023 for the opening year (2022). Explicit modelled data was utilised for the interim/compliance year (2023) and future year (2031). Linear interpolation was undertaken for intervening years between 2023 and 2031, for both the baseline and intervention scenarios.

The difference in emissions under the two scenarios was then calculated to determine the change in PM/NO₂ emissions attributable to the interventions across the appraisal period

Table 4.3: Temporal Change in PM/NO₂ Emissions (tonnes)

NO ₂	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Baseline	302.4	476.4	448.9	421.4	393.8	366.3	338.8	311.3	283.7	256.2
Intervention	271.7	432.5	411.2	389.9	368.6	347.3	326.0	304.7	283.4	262.1
Difference	30.7	43.9	37.7	31.5	25.2	19.0	12.8	6.6	0.3	-5.9
PM	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Baseline	18.42	31.00	30.99	30.98	30.96	30.95	30.94	30.93	30.91	30.90
Intervention	17.89	30.30	30.38	30.45	30.53	30.60	30.68	30.75	30.83	30.90
Difference	0.53	0.70	0.61	0.53	0.44	0.35	0.26	0.18	0.09	0.00

Source: Jacobs Air Quality Modelling

The difference in emissions was then multiplied by relevant damage costs across the appraisal period (see Table 4.4, replicated from DEFRA's Air Quality Damage Cost Appraisal Toolkit). Bristol falls within the 'Urban Big' area type according to DfT's classification system, therefore the damage cost relevant to 'Urban Big' setting was utilised.

Table 4.4: Damage Costs (£ per Tonne)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
NO₂	£17,353	£17,700	£18,054	£18,415	£18,783	£19,159	£19,542	£19,933	£20,332	£20,738
PM	£324,500	£330,990	£337,610	£344,362	£351,249	£358,274	£365,440	£372,749	£380,204	£387,808

Source: DEFRA's Air Quality Damage Cost Appraisal Toolkit

The approach to analysis of PM/NO₂ emissions is outlined in Figure 4.2 (see end of report).

5. Impacts on Transport Users

5.1 Fuel Switch Costs

As road users upgrade to compliant vehicles and switch fuel types between petrol and diesel, individuals could face varying fuel costs in the intervention case relative to the baseline scenario. The change in fuel switch costs is reflected in the change in vehicle operating costs to the user, captured as part of the DfT's Transport User Benefits Assessment (TUBA) presented in Section 5.4. No additional or separate analysis is provided here.

5.2 Consumer Welfare Loss

The intervention option will change consumers behaviour by inducing a change in travel behaviours (e.g. through upgrading vehicles, using alternative modes, cancelling journeys etc). However, because consumers would have preferred their original action in the baseline, this change in behaviour leads to a consumer welfare impact. Two elements of analysis have been identified to estimate aggregate consumer welfare loss as a result of intervention:

- Welfare loss associated with individuals upgrading or replacing their vehicles earlier; and
- Welfare loss associated with changing travel patterns or behaviours (i.e. mode shift, cancelled journeys, diverted journeys).

5.2.1 Replacing Vehicles

As noted above, the intervention case leads to accelerated reduction in non-compliant trips which is indicative of an acceleration of vehicle replacement (see Table 3.8). By accelerating the vehicle replacement process, the proposed scheme will impose a financial cost on vehicle owners driven by the impact of depreciation on replacement and replaced vehicles. Depreciation affects two components of the vehicle replacement process in the intervention case:

- Additional cost of compliant vehicles bought earlier than otherwise intended; and
- Additional value of non-compliant vehicle sold.

The difference between these two values and the extent to which this difference diminishes over time, act as a proxy for consumer welfare change as a result of the proposed scheme. The net difference is driven by changes in depreciation rates over time, as highlighted in Table 5.1.

Table 5.1: Depreciation Rates by Year

Vehicle type	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Petrol cars	37%	18%	16%	16%	16%	16%	16%	16%	16%	16%
Diesel cars	37%	18%	16%	16%	16%	16%	16%	16%	16%	16%
Petrol vans	37%	18%	16%	16%	16%	16%	16%	16%	16%	16%
Diesel vans	37%	18%	16%	16%	16%	16%	16%	16%	16%	16%
Rigid HGVs	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Articulated HGVs	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Buses	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Taxis	37%	18%	16%	16%	16%	16%	16%	16%	16%	16%
Coaches	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%

Source: JAQU's National Data Inputs for Local Economic Models

As depreciation rates are higher in earlier years, depreciation acts to narrow the gap between the value of compliant vehicles purchased and non-compliant vehicles sold over time. This means vehicle owners induced to replace their vehicle earlier experience greater welfare loss as the net difference in value of replacement and replaced vehicles is higher, thus implying a higher cost of upgrading. As a result, the cost of upgrading is expected to be greater in the intervention scenario, as vehicle owners upgrade sooner than in the baseline.

The total number of vehicle owners who replace their vehicle in response to intervention is a function of the frequency of trips made by each vehicle owner. Vehicles that make regular trips into the CAZ zone are more likely to be replaced than vehicles who rarely enter the zone, as the cumulative cost of CAZ charges resulting from frequent trips into the CAZ becomes more expensive than the average cost to upgrade to a compliant vehicle.

For the intervention case, in order to determine the number of vehicles that upgrade, the daily frequency of non-compliant vehicle entries into the CAZ or exclusion zone in 2022 under the baseline scenario was estimated by adjusting 2017 ANPR data. The frequency data was converted to number of trips by multiplying the number of vehicles by their frequency of entry according to ANPR data. The analysis, pivoting from ANPR data captured over a two-month period, was assumed to be representative of annual trip patterns.

Based on the response rates noted in Table 3.2, the number of trips upgrading was converted to a number of vehicles that upgrade by assuming that those vehicles that enter the CAZ or exclusion zone with the highest frequency (i.e. those vehicles that make the most trips on separate days over the two month period) are the first to upgrade. The first vehicles to upgrade are those entering the CAZ or exclusion zone with the highest frequency because these vehicles would incur the CAZ charge most regularly or most disruption to day-to-day activities. As such, from a financial and utilitarian perspective, regular entrants would rationally upgrade earlier than irregular entrants. This approach estimated the number of vehicles that upgrade, relative to the number of vehicle trips that upgrade, as outlined in Table 5.2.

Table 5.2: Vehicle Upgrade Response Rate Estimates

Vehicle type	Small CAZ D	
	Trips	Vehicles
Car	50%	9%
LGV	62%	15%
Rigid HGV	83%	32%
Artic HGV	83%	47%
Taxi	96%	74%
Coach	71%	18%

Source: Jacobs Economic Modelling

Based on the 'vehicles' response rates outlined in Table 5.2 and the interpolation approach described in Section 3.3, the number and timing of vehicle upgrades that are directly attributable to the intervention scenario is outlined in Table 5.3.

Table 5.3: Rate of Vehicle Upgrading

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Car Petrol	966	24	4	3	3	2	2	3	0	0
Car Diesel	3,318	18	23	24	24	24	25	25	25	25
Taxi Petrol	584	8	1	1	1	1	1	1	0	0
Taxi Diesel	2,032	4	10	10	10	10	10	10	10	10

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
LGV petrol	11	0	0	0	0	0	2	0	0	0
LGV diesel	2,080	58	28	28	28	27	27	27	26	26
Rigid HGV	567	10	4	4	4	3	3	4	4	4
Artic HGV	112	2	1	1	1	1	1	1	1	1
Coaches	46	2	1	1	1	1	1	1	1	1
Total	9,717	126	71	71	71	69	70	69	67	67

Source: Jacobs Economic Modelling

The average cost of replacing a vehicle by vehicle type and year is estimated by calculating the cost differential between upgrading in 2022 and all other years in the appraisal period, based on the residual value of replacement and replaced vehicles in each year (informed by the depreciation rates presented in Table 5.3). Values for the replacement and replaced vehicles reflect 2018 market prices sourced at that time from industry databases, weighted by:

- The popularity of certain brands/models in Bristol (based on ANPR data); and,
- JAQU-defined depreciation rates to capture the reduction in value over time.

These values were assumed to remain consistent in 2022, with all residual values for older cars pivoting from the value of the new vehicles listed in Table 5.4 and the appropriate depreciation rate.

Table 5.4: Market Value of New Vehicles

Market Value of New Vehicle		Source
Cars (Petrol)	19,818	ANPR data on most popular models combined with https://www.which.co.uk/reviews/new-and-used-cars/article/petrol-vs-diesel-cars-which-is-better
Cars (Diesel)	17,588	ANPR data on most popular models combined with https://www.which.co.uk/reviews/new-and-used-cars/article/petrol-vs-diesel-cars-which-is-better
PHV Petrol	£19,818	Taxi and PHV costs in line with car prices
PHV Diesel	£17,588	Taxi and PHV costs in line with car prices
Taxi Petrol	£19,818	Taxi and PHV costs in line with car prices
Taxi Diesel	£17,588	Taxi and PHV costs in line with car prices
LGV petrol	20,215	Road Haulage Association on the LGV and HGV operating costs, 2018
LGV diesel	20,215	Road Haulage Association on the LGV and HGV operating costs, 2018
Rigid HGV	67,774	Road Haulage Association on the LGV and HGV operating costs, 2018
Artic HGV	81,495	Road Haulage Association on the LGV and HGV operating costs, 2018
Buses/Coaches	186,667	Cost for new bus vehicle averaged across single-deck, double deck and midi types (source: Table 4 – Rudimentary funding costs (Early Measures Fund for Local NO2 Compliance Report))

Source: Jacobs Transport Modelling

This cost differential for upgrading was then multiplied by the differential proportion of vehicles assumed to upgrade in each year (taken from Table 3.8). A factor of 50%⁸ was also applied to arrive at a cost differential for upgrading for each vehicle type and Euro Standard for every year of the appraisal period. The annual values were then summed. The summed values for each Euro Standard were then converted to a weighted average upgrade cost differential covering all Euro Standards, using the Euro Standard mix of the non-compliant component of the vehicle fleet (as set out in Table 5.5).

Table 5.5: Euro Standard of Non-Compliant Components of Fleet

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6
Car Petrol	0%	12%	88%			
Car Diesel	0%	0%	5%	15%	80%	
LGV petrol	1%	31%	68%			
LGV diesel	0%	1%	5%	23%	70%	
Rigid HGV	0%	8%	92%			
Artic HGV	0%	0%	10%	6%	84%	
Buses	0%	6%	34%	17%	44%	
Taxis Petrol	0%	12%	88%			
Taxis Diesel	0%	0%	5%	15%	80%	

⁸ The factor reflects half of the difference between the market value of the replaced and replacement vehicle, assuming a linear demand curve for upgraders and no more detailed knowledge on the value specific individuals place on new or replacement vehicles

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6
Coaches	0%	6%	34%	17%	44%	

Source: Jacobs Transport Modelling

NB: some rows may not sum to 100% due to rounding

Three weighted average upgrade cost differentials were derived, reflecting the three types of vehicular upgrades noted in Table 3.3. Following JAQU's Guidance, 25% of vehicle owners upgrading were assumed to upgrade to new vehicles.

For the 75% of vehicle owners upgrading to second-hand vehicles, these individuals were expected to replace their vehicles with the cheapest (i.e. lowest Euro Standard) compliant vehicle that is at least one Euro Standard higher than their current vehicle. Of the 75% of vehicle owners replacing their vehicles with second-hand vehicles, 25% are expected to switch fuel from diesel to petrol with the remaining 75% expected to retain the same fuel.

In light of the above, the weighted average replacement vehicle differential value for vehicle owners upgrading to new and used (same fuel/switch fuel) vehicles are listed in Table 5.6:

Table 5.6: Weighted Replace Vehicle Value Differential (£)

	New	Used (Same Fuel)	Used (Switch Fuel)
Car Petrol	£2,543	£95	£0
Car Diesel	£2,585	£456	£450
Taxi Petrol	£2,661	£100	£0
Taxi Diesel	£2,183	£419	£414
LGV petrol	£1,691	£68	£0
LGV diesel	£2,606	£480	£0
Rigid HGV	£9,664	£2,228	£0
Artic HGV	£10,550	£1,712	£0
Coaches	£27,377	£5,461	£0

Source: Jacobs Economic Modelling

The weighted average upgrade cost differentials were combined with the number of vehicles upgrading in each year in the intervention scenario to generate aggregate consumer welfare loss from upgrading.

5.2.2 Changing Travel Patterns and Behaviours

A loss of consumer welfare resulting from changing travel patterns and behaviours was captured by noting the number of trips in the baseline that would be cancelled, subjected to changing modes or that would avoid the CAZ or exclusion zone in response to the proposed scheme. Diverted trips were not included in the consumer welfare analysis as any economic impact was assumed to be captured within the journey time savings/vehicle operating cost analysis below.

Table 3.4 highlights the number of non-compliant vehicle trips in AADT terms in the 2022 baseline and Table 3.8 highlights the reduction in non-compliant vehicles in the baseline. Meanwhile Table 3.2 demonstrates the proportion of trips that would be cancelled, change mode or avoid the zone. In light of these assumptions, the annualised number of trips cancelled/changed mode/avoiding the zone as a result of the scheme are outlined in Table 5.7.

Table 5.7: Trips with Changed Travel Patterns/Behaviours

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Car Petrol	500,519	338,448	261,105	193,746	136,370	90,813	54,398	0	0	0
Car Diesel	2,979,700	4,715,458	4,215,799	3,702,064	3,185,633	2,664,360	2,137,907	1,605,967	1,069,322	526,751
Taxi Petrol	0	0	0	0	0	0	0	0	0	0
Taxi Diesel	0	0	0	0	0	0	0	0	0	0
LGV petrol	3,340	4,721	5,719	6,330	6,555	6,409	0	0	0	0
LGV diesel	592,918	819,457	725,958	632,845	540,119	451,749	363,733	276,071	188,762	101,807
Rigid HGV	26,328	34,296	30,286	26,266	22,237	18,371	14,496	10,612	6,719	2,816
Artic HGV	3,366	4,196	3,663	3,140	2,627	2,146	1,674	1,211	758	314
Coaches	5,534	7,419	6,466	5,513	4,560	3,648	2,736	1,824	912	0
Total	4,111,706	5,923,993	5,248,996	4,569,904	3,898,100	3,237,496	2,574,943	1,895,684	1,266,472	631,687

Source: Jacobs Economic Modelling

The approach to monetising consumer welfare loss relating to changing travel patterns and behaviours assumes that a change is made where the cost of the action is less than the cost of the respective charge for entering the boundary, otherwise the rational economic choice would be to pay the charge. Whilst consumers often consider factors beyond financial cost, this qualifying assumption is adopted for simplicity, as per JAQU's option appraisal guidance. As the incurred consumer welfare loss could fall anywhere between zero and the CAZ charge, the average mid-point CAZ charge¹⁰ is adopted as the consumer welfare loss value. Effectively, the overall cost of changing travel patterns and behaviours is equal to the total number of trips that are changed, multiplied by half of the CAZ charge.

However, it should be noted that not all trips are assumed to experience a consumer welfare loss in the intervention scenario relative to the baseline scenario. The ANPR survey in 2017 revealed that only approximately 31% of daily non-compliant vehicle trips into the CAZ were made by unique non-compliant vehicles. Hence only 31% of non-compliant vehicle trips would be charged for entering the boundary as all other trips would be repeat trips by vehicles that had already entered the boundary. Applying consumer welfare loss to multiple trips by the same vehicle on a single day would overestimate the aggregate welfare loss as the charge is only incurred once.

The approach to analysis of consumer welfare loss is outlined in Figure 5.2 (see end of report).

5.3 Scrappage Costs

Pivoting from JAQU Guidance, the number of vehicles being scrapped is assumed to be equal to the number of new vehicles being purchased through the upgrading process (i.e. 25% of all upgraded vehicles). The intervention case is assumed to bring forward the replacement (and therefore scrappage) of vehicles, meaning that vehicles are scrapped earlier and with higher residual values than they would have been under the baseline scenario. As a result, the intervention case leads to a greater loss of residual asset value.

¹⁰ £4.50 for cars and LGVs (all fuel types), £50 for HGV (all types) and buses/coaches

The value of scrapped vehicles is estimated by identifying the age of scrapped vehicles (inferred from Euro Standards) and estimating their residual value taking into account JAQU's recommended depreciation rates, in line with the vehicle upgrading analysis described above. As the intervention case is assumed to accelerate scrappage, scrapped vehicles in the intervention case have a higher residual value than in the baseline case where vehicles are scrapped later. This is because additional depreciation can occur where scrappage occurs at a later date (i.e. in the baseline).

The methodology for calculating the differential between residual asset value in the baseline and intervention case was aligned with the approach adopted in the vehicle upgrading analysis described above, i.e.:

- Established the asset value of vehicles to be scrapped based on age and depreciation rates
- Subtracted the asset value of vehicles to be scrapped in each year of the appraisal period from the 2022 value to establish an asset value differential per vehicle scrapped earlier than intended, across all years
- Used the interpolation rates to determine the proportion of vehicles scrapped each year in the intervention case, and applied the proportion to the asset value differential per vehicle identified above
- Summed the asset value differential across all years and Euro Standards to arrive at a weighted average asset value differential to act as a proxy for scrappage cost change between the baseline and intervention case (Table 5.8)

Table 5.8: Weighted Average Scrappage Costs (£)

Vehicle Type	Small CAZ D
Car Petrol	£193
Car Diesel	£903
Taxi Petrol	£201
Taxi Diesel	£829
LGV petrol	£124
LGV diesel	£887
Rigid HGV	£415
Artic HGV	£3,383
Coach	£5,502

Source: Jacobs Economic Modelling

The values above were then applied to the profile of vehicle upgrades in the intervention case. The profile is outlined in Table 5.9, based on Table 5.3 above and pivoting from the relevant behaviour response rates and interpolation data presented above.

Table 5.9: Rate of Vehicle Upgrading to New Vehicles

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Car Petrol	241	6	1	1	1	1	0	1	0	0
Car Diesel	830	4	6	6	6	6	6	6	6	6
Taxi Petrol	146	2	0	0	0	0	0	0	0	0
Taxi Diesel	508	1	2	2	2	2	2	2	3	3
LGV petrol	0	0	0	0	0	0	0	0	0	0
LGV diesel	0	0	0	0	0	0	0	0	0	0
Rigid HGV	0	0	0	0	0	0	0	0	0	0
Artic HGV	0	0	0	0	0	0	0	0	0	0
Coach	0	0	0	0	0	0	0	0	0	0
Total	1,725	14	10	10	9	9	9	9	9	9

Source: Jacobs Economic Modelling

The approach to analysis of scrappage costs is outlined in Figure 5.3 (see end of report).

5.4 Journey Time/Vehicle Operating Costs

The proposed scheme could also have an impact on transport economic efficiency (TEE), measured in terms of changes to journey time savings and vehicle operating costs. Transport user benefits were assessed using TUBA 1.9.14.4. The key assumptions adopted include:

- Model outputs from the transport modelling workstream;
- Modelled years: 2021, 2023 and 2031;
- Appraisal period: 10 years;
- Price base year for discounting: 2010;
- Discount rate as per Green book guidance of 3.5% for first 10 years;
- Vehicle Classes: Bus/Coach, HGV, LGV and Car;
- Annualisation factors: AM 682, PM 701, Inter-Peak 1518;
- Value of Time: TAG Databook v1.13.1 July 2020; and
- A TUBA v1.9.14.4 sensitivity test with *Economics_TAG_db1_14_0* as economics file was undertaken.

In addition to the key assumptions outlined above, the key TUBA Inputs are:

- a standard economics file which includes the latest transport economics values in accordance with TAG guidance (July 2020 parameters were used);
- trip and skim matrices from the GBATS4 model; and
- scheme file detailing all aspects of the scheme including input matrices and annualisation factors.

Trip matrices, distance and time skims and cost matrices for the opening and design years of the scheme options have been obtained from the SATURN GBATS4 models for the baseline and intervention scenarios.

The annualisation factors applied to TUBA have been calculated based on the one-hour period as modelled in each defined period, therefore the skims have been multiplied by the standard annual TUBA figure of 253 and the period factor to give the annualisation factors as detailed in Table 5.10 below.

Table 5.10: TUBA Annualisation Factors Applied to Model Outputs

Period	Modelled Duration (minutes)	Annual Factor	Period Factor	Overall Annualisation Factor
Morning peak	60	253	2.7	682
Inter peak	60	253	6	1,518
Evening peak	60	253	2.77	701

Source: Jacobs Economic Modelling

Outputs from the two peak periods and the inter-peak period models have been used for the TUBA assessment. It is considered that these models do not constitute an appropriate base for assessing either the weekend or off-peak periods and their relative level of benefits. Therefore, the benefits for these periods will not be assessed.

The TEE benefits were calculated from changes in travel time and distance for the affected vehicles. Reduced travel time is usually associated with a reduction in congestion leading to increased speeds. The speed of the vehicle affects the vehicle operating costs associated with that journey.

The following adjustments have been applied to the GBATS model output files, to assure compliance with standard TUBA process:

- TAG advice that the economic assessment should be performed over ten-year period. Hence, the outputs have been adjusted to apply to 2022 to 2031.
- Do Something origin-destination matrices have been applied to both the Do Minimum and the Do Something scenarios.
- GBATS model matrices are split between compliant and non-compliant vehicles and the TUBA assessment has been performed separately and added at a final stage of the assessment.
- HGV and Buses are coded as PCUs in the GBATS model. Hence, the relevant factors (1/2.3 and 1/2.5) have been applied to HGV and Bus matrices to convert to vehicles.
- The Clifton Suspension Bridge Toll is modelled as 50 p in GBATS. Since the current toll on the bridge is £1, the cost has been factored by 2.
- Buses were split into two user classes, Bus (driver) and Bus (passenger). TUBA default occupancy levels (12.2 passengers/bus) was applied to the Bus (passenger) user class to capture benefits from coach users.
- The GBATS model does not have purpose defined user classes, so a default factor of typical purpose distribution has been applied to the user classes in TUBA.
- As the opening date for BCC CAZ is planned for June 2022, a seasonality factor of 585 was applied to 2022 benefits in order to exclude the first five months of 2022 (as per discussion in Section 2.4).

See table 5.11 for further detail of the user classes applied.

Table 5.11 User Classes in TUBA

User Class	Description	Vehicle/Sub mode	Purpose	Person type
1	Cars Low Income	Car	Default split	Default split
2	Cars Medium Income	Car	Default split	Default split
3	Cars High Income	Car	Default split	Default split
4	Cars EMP	Car	Default split	Default split
5	Taxis	Car	Default split	Default split

User Class	Description	Vehicle/Sub mode	Purpose	Person type
6	LGV	LGV freight	Business	Default split
7	HGV	OGV1	Business	Default split
8	Coach	Bus	Business	Driver
9	Coach	Bus	Default split	Passenger

5.5 Transaction Costs

The intervention case could accelerate the rate at which vehicle owners' purchase or upgrade to compliant vehicles. As well as financial costs associated with each transaction (the economic impact of which is discussed under Sections 5.3 and 5.3), each transaction also incurs time costs for vehicle owners relating to identifying and buying a compliant vehicle.

Based on the upgrade data outlined above, Table 5.12 outlines the number of vehicles induced to upgrade earlier than they otherwise planned to, as a result of intervention.

Table 5.12: Upgraded Fleet by Vehicle Type and Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6
Car Petrol	0	118	888	0	0	0
Car Diesel	0	5	187	531	2,810	0
Taxi Petrol	0	70	528	0	0	0
Taxi Diesel	0	3	112	318	1,683	0
LGV petrol	0	4	9	0	0	0
LGV diesel	0	30	127	540	1,659	0
Rigid HGV	0	47	558	0	0	0
Artic HGV	0	0	12	7	100	0
Coaches	0	3	18	9	23	0

Source: Jacobs Transport Modelling

The vehicle type and Euro Standard-specific transaction costs applied to this mix of upgraded vehicles is presented in Table 5.13.

Table 5.13: Weighted Transaction Costs by Euro Standard

Euro Standard	Weighted Transaction Costs		
	Car/Taxi	LGV	HGV
Euro 5	£6	£10	£7
Euro 4	£3	£8	£8
Euro 3	£3	£10	£7
Euro 2	£6	£12	£6
Euro 1	£6	£12	£6

Source: JAQU's National Data Inputs for Local Economic Models

The approach to analysis of transaction costs is outlined in Figure 5.1 (see end of report).

5.6 Accident Impacts

An accident analysis was undertaken using DfT's CoBALT software. See FBC-30 'COBALT – accident impact assessment' Appendix Giii of this FBC for further details.

The analysis estimates the change in accident/casualty frequency and severity attributable to the scheme and can be used to derive a monetary value associated with this change. Over the appraisal period 2022-31, a reduction of 72 accidents is anticipated through intervention, as outlined in Table 5.14.

Table 5.14: Change in Accidents and Casualties

Accident Summary	Small CAZ D
Baseline Accidents	7,607
Intervention Accidents	7,536
Accident Reduction Due to Scheme	71

Source: Jacobs Transport Modelling

5.7 Walking/Cycling Impacts

By inducing mode shift for non-compliant vehicle owners, the intervention case could promote a simultaneous uplift in use of active transport modes (i.e. walking and cycling). By switching to active modes, there is a societal economic benefit driven primarily by increased health and reduced absenteeism from work. To assess the scale of the impact attributable to the proposed scheme, DfT's Active Mode Appraisal Toolkit (AMAT) was utilised.

Key inputs to the toolkit include forecasts of the number of additional walkers/cyclists generated by the scheme. This was estimated by taking the change mode component of the 'Cancel Journey/ Change Mode' behavioural response and applying that proportion to the number of non-compliant vehicle trips forecast to change travel patterns or behaviour.

A further adjustment was made to forecast the scale of mode shift from non-compliant vehicles to walking and cycling specifically, by applying the relevant abstraction rates from car trips to walking (13.75%) and cycling (7.5%) according to Dunkerley et al's (2018) 'Bus fare and journey time elasticities and diversion factors for all modes'¹². The resulting forecast for number of additional walking and cycling trips each year converted from non-compliant vehicle trips is outlined in Table 5.15.

Table 5.15: Additional Walking and Cycling Trips Converted from Non-Compliant Vehicle Trips in the Baseline

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Walking	70,771	102,749	91,019	79,206	67,541	56,019	44,574	32,658	21,748	10,718
Cycling	129,746	188,373	166,868	145,211	123,825	102,702	81,719	59,873	39,871	19,649
Total	200,517	291,121	257,887	224,417	191,366	158,721	126,294	92,531	61,619	30,367

Source: Jacobs Economic Modelling

The annual number of active mode trips were converted to daily trips and inputted into the Active Mode Toolkit. No assumptions were made about the quality or service level of any infrastructure that active mode users would utilise. Default National Travel Survey and DfT WebTAG values were utilised to estimate proportion of return

¹² Derived from Table 27 'Recommended diversion factor values of an intervention on car' in Dunkerley et al (2018) 'Bus fare and journey time elasticities and diversion factors for all modes'. Based on 6% (cycling) and 11% (walking) of 80% of trips that switch to another mode, pro-rated up to 100% (i.e. ignoring the proportion who do not travel according to the research – already captured via 'cancel' journey response in the current analysis.)

journeys, journey length, speed of travel and other trip characteristic data. An independent assessment was run for each year in the appraisal period.

Note that the analysis ignores mode shift to other, non-active modes (i.e. bus, rail, other). Mode shift to these other modes is not monetised beyond the consumer welfare loss induced by switching mode in response to the intervention (where relevant).

6. Costs to Local/Central Government

The capital and operational costs incurred by local and central government are considered in detail as part of FBC-41 'Finance Report' Appendix Q of this FBC. Unlike in the financial analysis, optimism bias has been applied to intervention option costs adopted in the economic case in line with the HM Treasury Green Book benchmark values. These are summarised in Table 6.1.

Where tender prices were available or BCC framework unit rate-based cost estimates were derived, the lower bound optimism bias value was adopted. The upper bound value, which represents the average historic optimism bias found at the outline business case stage for traditionally procured projects, was applied where tender prices or detailed, evidenced-backed cost estimates¹⁴ do not currently exist and there is therefore more uncertainty in costs.

The costs used in the economic assessment are based on an earlier estimate to the final costs presented in FBC-33, the Scheme Costs Report. Detail of the development of the scheme cost is presented in FBC-33.

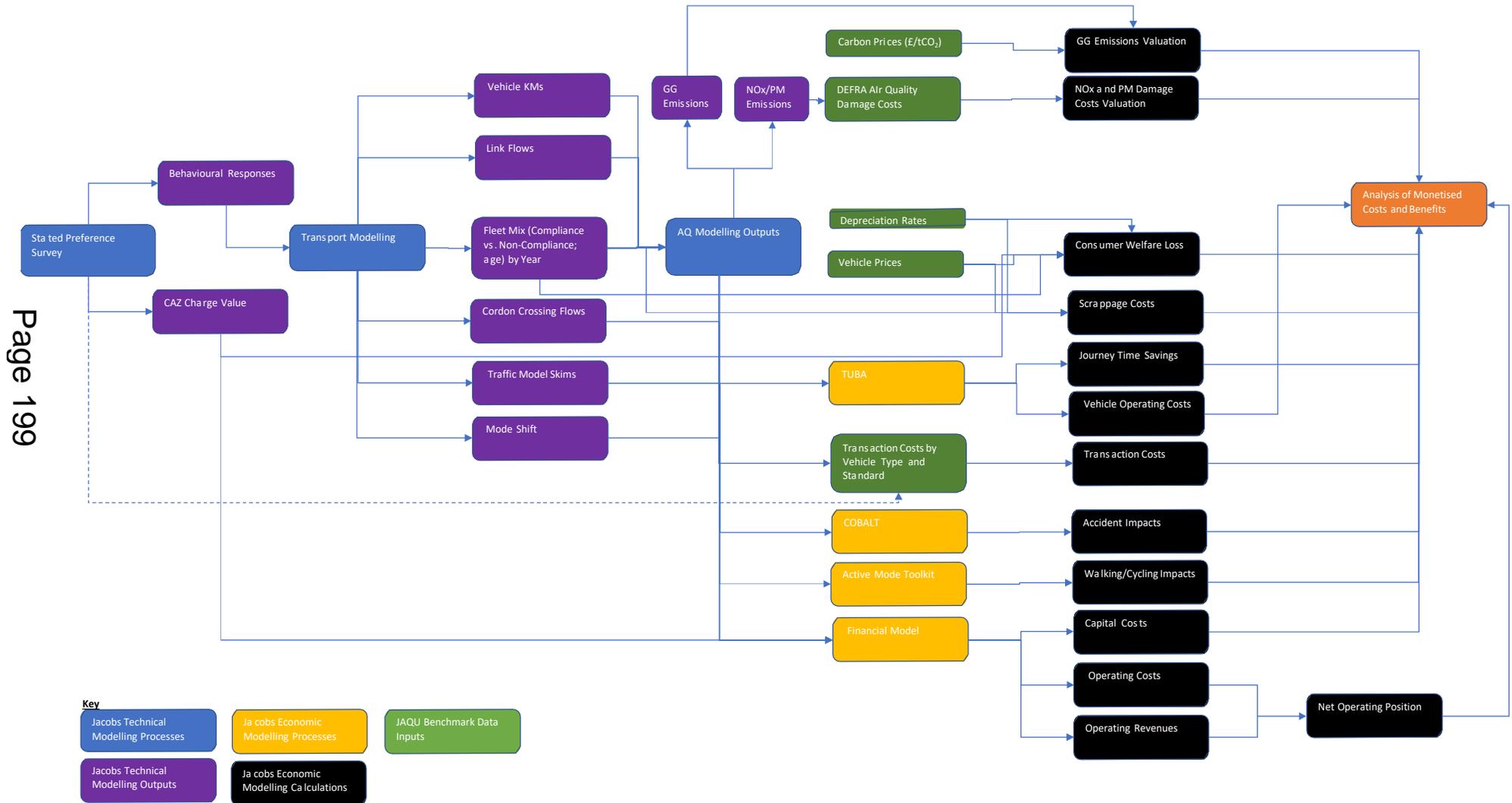
Table 6.1: Optimism Bias (OB) Adjustments to Costs

Activity	Upper Bound OB	Lower Bound OB	Use
Standard Civil Engineering	44%	3%	For OPEX/CAPEX relating to Highway Works, Decommissioning, Monitoring and Evaluation Activities and Installations, Utilities and all non-charging measures (lower bound, as either tender prices or detailed cost estimates)
Equipment/Development	200%	10%	For OPEX/CAPEX relating to IT/Systems (lower bound, as based on tender responses), Revenue Payments, PCN Production, CAZ publicity and advertising (lower bound, as either tender prices or detailed cost estimates)
Outsourcing	41%	0%	For any OPEX/CAPEX requiring external support e.g. Delivery Phase Management, Additional permit contractors, back office support, monitoring and evaluation staff (lower bound, as either tender prices or detailed cost estimates for nearly all items, except Programme Director staff role, to which the upper bound was applied).
N/A	0%	0%	For most BCC staff costs during delivery and operational phase, as costs based on fixed salary rates.

Source: Jacobs Economic Modelling

¹⁴ At this stage, these circumstances only apply to one cost item, namely the Programme Director staff role

Figure 2.1: Overarching Methodological Framework for Economic Analysis



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Figure 4.1: Approach to Assessing Economic Impacts of Greenhouse Gas Emissions

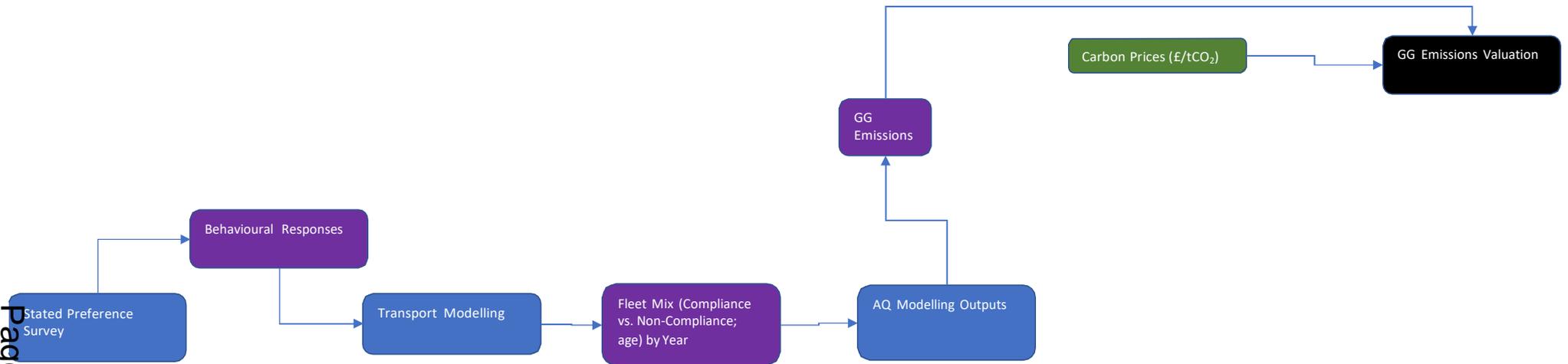


Figure 4.2: Approach to Assessing Economic Impacts of PM/NO₂ Emissions

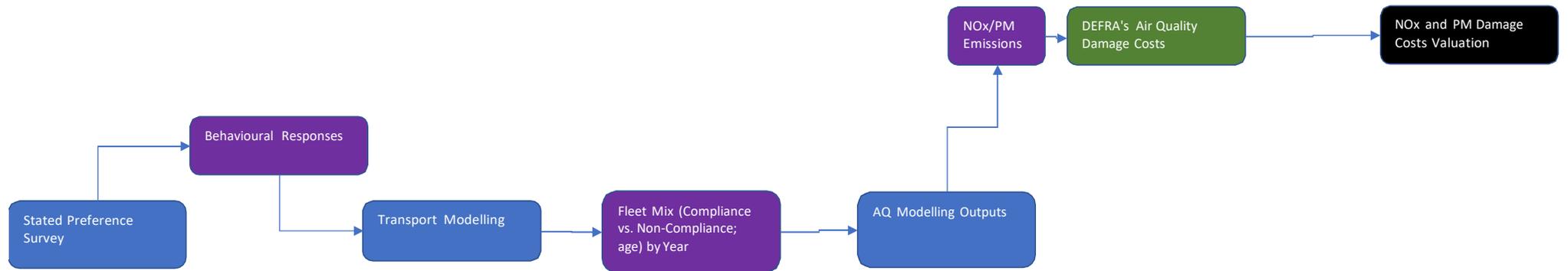
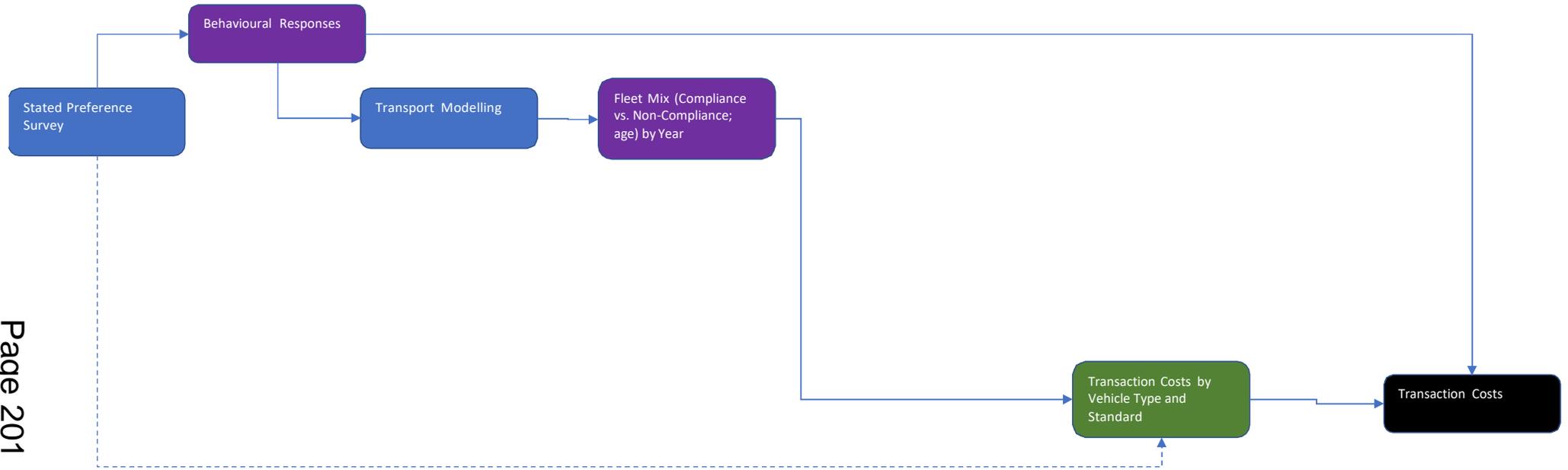


Figure 5.1: Approach to Assessing Economic Impacts of Transaction Costs



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Figure 5.2: Approach to Assessing Economic Impacts of Consumer Welfare Loss

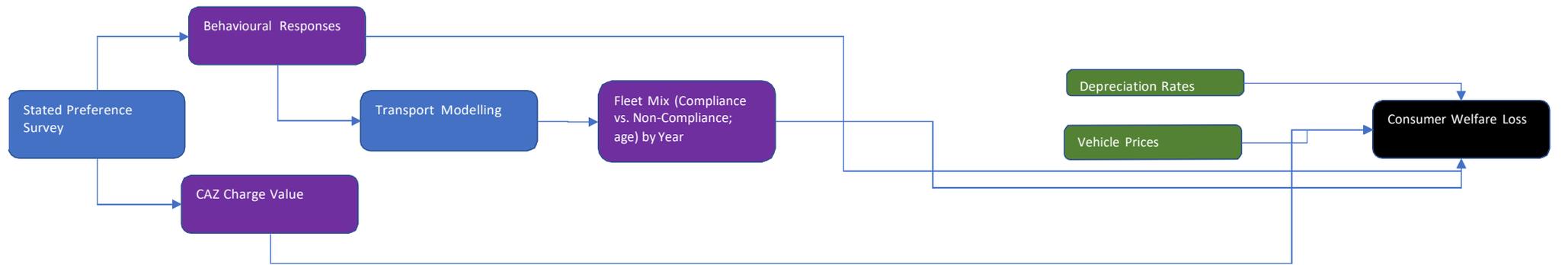


Figure 5.3: Approach to Assessing Economic Impacts of Vehicle Scrappage



Bristol City Council Clean Air Plan

Full Business Case Procurement Strategy

Document: FBC-32

July 2021

Bristol City Council

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Procurement Strategy

Bristol City Council Clean Air Plan

Document Title: Procurement Strategy

Document No.: FBC-32

Date: July 2021

Author: BCC

1. Introduction

This strategy supports the FBC Commercial Case, providing more detail and context. The detail herein is commercially sensitive due to the naming of suppliers, particularly where tenders are live, and for that reason is only briefly referenced / not named within associated documents. The strategy covers procurement methods available and used, measures procured, soft market testing and contract management.

2. Details on the Overarching Procurement Strategy

Bristol City Council (BCC) has identified the most efficient routes to market for three key work packages; Approved Devices, Back Office system and Non-Illuminated Signs, in order to meet the tight timescales of the project. Compliance with PCR2015 and achieving value for money remain key objectives for the project.

By using pre-existing contracts and frameworks where they are available and suitable, the procurement timescales will be reduced with as much of the procurement activities having taken place as possible without the funding having been approved. Options for work packages which require tailored procurement exercises are detailed throughout this strategy.

BCC are currently undergoing tender evaluation of the submitted bids for the BHAM&AWF Framework which currently runs to October 2021. This will be explained further in this strategy document. The existing framework can be used post October 2021 where agreements are already in place. It is therefore possible that this project will utilize both the existing and new frameworks.

Furthermore, since the FBC was submitted in February 2021, the term contractor has been re-tendered and 'BCC Term Service Contract in relation to Maintenance and Installation of Highways Electrical Assets 2021-2025' was recently awarded to Centregreat Ltd.

The existing contracts and frameworks that BCC are intending to use have all been competitively tendered for via OJEU in line with the Council's procurement rules. Regular benchmarking and close contract management of each contract assures BCC that these are still the most effective arrangements offering value for money and so full market testing and compliance is assured for the CAZ project. It is not expected that the OJEU process will be needed for CAZ, but if BCC were to need to undertake a competitive process through the OJEU, the Open procedure would be used to enable award of contract within the shortest timeframes, whilst maintaining compliance and achieving the desired result on the Most Economically Advantageous Tender (MEAT criteria).

Contract Models for each of the frameworks and contracts identified to deliver the works and services, mandate the use of the NEC3 or NEC4 suite of contracts (the new BHAM&AWF Framework 2021-25 is NEC4). Where an alternative route to market is required the most appropriate contract will be used which may be the NEC3 contracts or Bristol City Council's suite of contracts depending on the requirement type.

We still have a small number of requirements that we need to meet; citizen facing design/access to payment portal etc. Now that the tender has been awarded the contractor can be engaged, and the first kick-off meeting is scheduled for 8th July. We will work with System Engineering Assessments Ltd (SEA) to check if they can do the work before we commission BCC in-house services which will likely take longer and be more costly.

3. Summary of services required

3.1 Design – including specification

The BCC project team have completed the preliminary design work and detailed designs have been commenced. BCC used the Professional Services Framework which it set up in January 2016, via a competitive OJEU procedure, to commission part of the design team, working alongside designers commissioned from the internal BCC design and delivery teams.

The detailed design work on the approved device designs and locations will largely be carried out by the recently appointed contractor System Engineering Assessments Ltd (SEA). BCC Engineering Design Team have already completed some preliminary work on the boundary and advanced warning sign designs as well as the provisional potential approved device locations. BCC Highway Electrical Asset Management Team have begun some preliminary work on the lighting column structural assessment and electrical designs required to mount the approved devices onto to mitigate impacts of delays. BCC intends to use the most effective route to market and the most appropriate contract terms to provide the design elements of the CAZ project and confirmation of this is fully detailed in this report following market engagement. The detailed design and procurement of the signage on the M32 is likely to be commissioned through the WECA Professional Services Framework and works carried out by a Highways England approved contractor.

3.2 Approved Device (ANPR, data Connectivity and Back Office System)

BCC considered several options to deliver the purchase, installation and maintenance of the Approved Devices.

Since publishing the OBC in November 2019, BCC continued to research the most effective procurement route from the options available and have determined that the Traffic Management Technology II framework (Lot 2) is the most appropriate route to market for the Approved Devices.

The other option considered was a current BCC contract:

- The Supply, Installation and Maintenance of Equipment and Infrastructure for the Control and Management of Traffic and Related Services contract, has a specific provision for the supply, installation and maintenance of ANPR Approved Devices. This includes the provision of electrical and data connections and street furniture where required. The contract (Traffic signal maintenance/install - Dynniq) was awarded following a tender in the OJEU in June 2014 and runs until June 2022. Further investigation found that the contract would not allow for the direct award of the supply, installation and maintenance of Approved Devices and as such this option was discounted.

The CCS framework has been reviewed and we will be using the following:

- Traffic Management Technology 2 framework which has 15 lots was tendered by CCS in October 2016 and work can be awarded to suppliers through this agreement until October 2020, but any call off contracts in place before that date can be let for the required duration of the project in order to deliver the goods or services. The lots that are most relevant to BCC's requirement are:
 - Lot 2 – Traffic Monitoring, Traffic Enforcement Approved Devices and Security Body Worn Approved Devices
 - Lot 7 Urban Traffic Management Control and Common Database Systems
 - Lot 11 Traffic Management Communications
 - Lot 12 Traffic Management Professional Services
 - Lot 13 Ancillary Roadside Equipment

These Lots can be used in isolation or in any combination to achieve the best outcomes, required by BCC to provide the CAZ for Bristol. Lots 2, 7 and 11 could provide the elements of the Approved Device. Lot 12 could provide the VCA certification and Lot 13 any data cabinets or power supply cables that may be required.

It was decided following the OBC submission that Lot 2 of the framework is the most appropriate route to market in terms of Value for Money (the national framework has the collaborative spend of the whole public sector behind it and we will test this further with BCC specific requirements at mini-competition stage), Technology Specification (the end to end Approved devices can be procured from a single vendor in order to achieve the VCA approvals that BCC require), timescales and programme (the framework has already undertaken the Selection stage and Contract negotiations which will reduce the procurement times and we will also be able to ensure that the delivery programme meets BCC's project deadlines).

Further design work has highlighted that the Approved Devices will be mounted on lighting columns wherever possible. This has opened up the use of recently awarded 'BCC Term Service Contract in relation to Maintenance and Installation of Highways Electrical Assets 2021-2025' with Centregreat Ltd as the new supplier. This will reduce timescales as BCC will be able to engage with Centregreat Ltd very quickly and we intend to appoint them to the role of Principal Contractor. Their contracted schedule of rates will be used to confirm the budget requirement for the installation of new columns and the management of the Approved Device installations. Due to the nature of this procurement until the contract for the Approved Device supplier has been signed and a co-design phase can begin to finalise the scheme detail, for the purposes of FBC we have submitted two pricing options for the lighting column work package. The design phase will establish on a site by site basis the type of Approved Device and data connection type required. This will have an impact on the column specification required e.g. due to the weight of the Approved Device and bracket required and whether a mobile or hardwired data connection is most appropriate.

3.2.1 Mobile Enforcement Vehicles

BCC intends to have one mobile enforcement vehicle to assist with the enforcement of the CAZ within the zone. The Approved Device equipment required for this vehicle will be procured at the same time as the fixed Approved Devices and the awarded supplier will be expected to fit out the vehicle as per the BCC specification. The vehicle will be purchased by the council's Fleet Team, a full EV, and will most likely be fitted with a telematics device.

3.2.2 Bus Lane Enforcement Approved devices:

BCC explored the opportunity to combine procurement of the CAZ Approved Devices with the Bus Lane Enforcement project (to upgrade BCC's current BLE Approved Device stock), so that a single procurement exercise would deliver a contract to cover both requirements.

As with the above work, an initial tender exercise was undertaken for the CAZ provision in November 2019. This was subsequently abandoned because of Covid-19 and the uncertainty of the effects this would have on the baseline and existing proposals. A formal report was undertaken to review how the Council should proceed. Following this period of review, a new and revised tender exercise was approved that aligned more with the current and emerging situation.

Due to the tight deadlines as per the legal direction to reach compliance in the shortest possible time, a 2nd procurement exercise was undertaken and published via the same framework set out above in November 2021. Three submissions were received from System Engineering Assessments Ltd, Neology UK Ltd and Siemens. Tender letters were issued but subsequently Bristol decided not to proceed with the award as a result of a challenge. Instead the bids were re-evaluated in April 2021 and tender letters have again been issued and the contract awarded to System Engineering Assessment Ltd.

3.2.3 Infrastructure – On Road

Non-Illuminated Signage:

Set up by BCC in October 2017, the Bristol Highway Asset Management and Associated Works Framework (BHAM&AWF) 2017-21 can be utilised until October 2021, with any purchase orders raised before that date valid until the goods/services are provided. The current BHAM&AWF framework is due to be replaced by a similar framework running from 2021 to 2025, this new framework 'Bristol Highway Asset Management and Associated Works Framework (BHAM&AWF 2021-25)' will operate in accordance with NEC4 guidelines and is currently undergoing tender evaluation of the submitted bids. Both frameworks have multiple lots which can be used to provide the relevant requirements and it is envisaged that Lot 6 (5 for the new framework) - Highway works < £150k or Lot 7 (6 for the new framework) - Highway works > £150k will be used to deliver the Non-Illuminated signage.

BCC has extensive experience of using a framework contract to deliver major road schemes and is utilizing this learning for the CAZ planning, implementation and delivery.

The table below shows the suppliers awarded to those BHAM&AWF 2017-21 Lots:

Lot 6 (a single supplier Lot with ETM as the single preferred supplier. If ETM cannot provide the service and turns down the work then and only then it would be open to the next listed supplier).	Highway works < £150k	ETM Contractors Ltd
		Eurovia Infrastructure Ltd
		Alun Griffiths (Contractors) Ltd
		North Midland Construction PLC
		South Gloucestershire Council Design and Operations
Lot 7 (mini tendercontract)	Highway Works > £150k	ETM Contractors Ltd
		Eurovia Infrastructure Ltd
		Alun Griffiths (Contractors) Ltd
		North Midland Construction PLC
		Dyer & Butler Ltd

To enable call off from the BHAM&AWF, BCC has several options available to it. The following excerpt is from the 2017-2021 Framework Agreement describing those options (which will be similar for the new framework):

"This Selection and Quotation Procedure sets out how a contractor is selected to provide a Work Package. There are three methods of selecting a contractor to carry out a Works Package.

The Council will in its sole discretion decide:

- which method to use to select a contractor for each work package;
- the appropriate works to include in each work package and size of each work package; and
- from which Lot to procure each work package

Method A (selection by Schedule of Rates)

This will be for works which the Customer considers are standard and the Customer considers are adequately described in the Generic Pricing and Works Information and to be carried out in usual circumstances without unusual constraints.

Method AA (selection by Limited Mini-Competition)

This will be for works which involve items not listed in the Schedule of Rates and/or with limited constraints but which the Customer considers are otherwise adequately described in the Generic Pricing and Works Information.

Method B (selection by Mini-Competition)

This will be for major works or packages which are non-standard or which the Customer considers to be carried out in unusual circumstances or with unusual constraints"

Lot 6 is used to procure Highways works under £150,000. ETM is the first placed supplier and under the call off terms of the framework is the single preferred supplier. If ETM cannot provide the service and turns down the work BCC would open the opportunity to the other suppliers on the lot.

Or; Lot 7 is used to procure Highways works over £150,000 and is accessed by re-opening competition for the individual requirements to all of the five suppliers awarded a place on this lot, which is the method BCC have chosen for the non-illuminated signs procurement.

Under the new framework new BHAM&AWF 2021-2025 has a similar arrangement of:

Lot 5 is used to procure Highways works under £150,000. There will be a yet to be awarded first placed supplier X and under the call off terms of the framework is the single preferred supplier. If X cannot provide the service and turns down the work BCC would open the opportunity to the other suppliers on the lot.

Or; Lot 6 is used to procure Highways works over £150,000 and is accessed by re-opening competition for the individual requirements to all of the five suppliers awarded a place on this lot, which is the method BCC have chosen for the reissue of the non-illuminated signs procurement.

A notable change is that the new BHAM&AWF Lot 6 will have only 4 (four) 'approved contractors' who will be given the opportunity to mini tender for each Work Package under that lot (the existing framework has 5, but only runs to Oct 2021 for new work package contract awards).

Illuminated Signs: There is a package of work required to remove or relocate a number of existing illuminated highway signs that currently occupy the highway space that to be cleared to install the CAZ signage. This work package will be let through the new 'BCC Term Service Contract in relation to Maintenance and installation of Highway Electrical Assets 2021-2025' with the awarded supplier Centregreat Ltd which runs from 1st of August 2021. This will enable BCC to engage with the supplier swiftly whilst also providing assurances that value for money has already been tested with the supplier.

The original mini tender for the non-illuminated sign provision was run alongside the initial abandoned tender for a BLE and CAZ solution. It was never awarded as delays extended outside its award period and the scope of work significantly changed. Since that point BCC have issued another tender based on the confirmed Small CAZ-D proposal. This had to be delayed whilst awaiting confirmation of the agreed CAZ approach and unfortunately, no Contractors submitted tenders owing to the full BCC BHAM&AW Framework tender also requiring resource during the same time period. The intention is therefore to prepare and issue revised work packages for a sectional delivery under either the old or new framework to suit the updated delivery proposals and programme.

Following confirmation of the agreed Small CAZ-D proposal it is now necessary to procure at least one sign on the high-speed section of the M32 within Highways England jurisdiction. There has been ongoing discussions with Highways England has required Bristol City Council to procure this sign through a separate tender to the contractors approved for the local 'Highways England Construction Works Framework'. The detailed design, procurement and supervision of this sign work will be undertaken by the relevant consultant appointed by BCC through the WECA Professional Services Framework.

3.3 Cumberland Road Closure

The proposal is to close Cumberland Road for inbound general traffic only, excluding buses, taxis and motorcycle. The scheme involves the removal of existing traffic signals at end of the existing bus lane and replacement of those signals with a signed bus gate and associated entry treatments. This work will be undertaken through the BHAM&AWF.

3.4 Enforcement

BCC has an existing 'Provision of SiDem Suite Support' contract with Conduent for the provision of an enforcement management system (SiDem). Once we move to the managed hosted system (go-live scheduled for 14th July 2021) we will be paying annual costs for the hosting, support and maintenance and licenses. The current support and maintenance agreement expires in March 2023 and we will need to re-tender then.

BCC are currently in discussion with Conduent to develop the enforcement interface with CAZ once the upgrade to the hosted system has been completed. Quotes have been received and procurement are now engaged with the project team to determine the most appropriate procurement route i.e. contract variation or direct award. BCC aim to have awarded and scoped out the work by August 2021.

3.5 Telemarketing Team

To cover a gap in the experience of the internal comms and engagement teams, we will need to run a large-scale cold calling exercise. We have worked with BaNES and have a copy of their procurement and project documents related to the tender exercise they undertook for the same service provision. We are adapting the paperwork to be Bristol focused and have already engaged in some light market testing to get an idea of the sort of support available. The Telemarketing Team will bridge a vital gap in contacting local businesses, understanding the potential issues being faced, mitigation required and creating a detailed database of contacts. A Procurement Request Form (PRF) has been submitted and approved by BCC Procurement. We already have a team member allocated and on hand to help us with the tender process which will be a mini-competition tender seeking 3 quotes. We know from bath that there are suppliers in the local area which are capable of meeting the needs of the project and with local experience of the Bath CAZ. The cost assumptions are very robust as BaNES procured exactly the same work so we are confident with our bid assumptions.

3.6 Infrastructure

There are several schemes which BCC propose as additional measures to support the CAZ for Bristol. Listed below are those measures which can all be procured using the BCC BHAM&AWF 2021-25. This framework is the compliant, market tested and robust framework put in place by BCC for similar projects. BCC has a long history of successfully delivering transport schemes with DfT funding e.g. MetroBus, Cycling Ambition Fund, Better by Bus Area Fund etc.

- Increase, Improve, update Legible City Signage – part of the CAF Bid to mitigate the impact of the scheme
- Purchase of additional air quality monitoring units – part of implementation of the scheme
- Old Market Gap cycle route – part of the CAF Bid.

Each work package will be procured through the BHM&AWF 2021-25 either Lot 5 or 6 as appropriate, following the prescribed call off procedure in line with the complexity of each specification, once drawn up.

Lot 5 (a single supplier Lot with the first place Contractor as the single preferred supplier. If they cannot provide the service and turn down the work then, and only then, it would be open to the next listed supplier).	Highway works < £150k	Contractor 1 – Details subject to award
		Contractor 2 – Details subject to award
		Contractor 3 – Details subject to award
		Contractor 4 – Details subject to award
Lot 6 (mini tender contract)	Highway Works > £150k	Contractor A – Details subject to award
		Contractor B – Details subject to award
		Contractor C – Details subject to award
		Contractor D – Details subject to award

3.6.1 Provision of Additional Measures – Mitigation Measures

- Provision of loans and grants for taxi, private hire, LGV and HGV drivers to upgrade and / or retrofit their vehicles. BCC will outsource the provision of administering the grants, using the agreement set up by Bath and North Somerset Councils (B&NES) in support of their own CAZ provision, within which Bristol City Council are named as an authority permitted to use the agreement. B&NES invested both resource and budget into ensuring that the agreement was fit for purpose, was in line with all relevant regulatory requirements and that other Authorities could use the agreement to leverage best value. As this agreement is available to BCC and our Legal and Commercial teams have reviewed and approved its use, the complexity of running our own procurement would have few if any advantages over the B&NES agreement.
- Provision of a loan scheme to assist businesses and members of the public meeting certain criteria to replace their vehicles. BCC will outsource the provision of administering the grants for this purpose to a third party. BCC intend to procure this via the framework set up by Bath and North Somerset Councils (B&NES) in support of their own CAZ provision, as noted above, within which Bristol City Council are named as an authority permitted to use the agreement. B&NES invested both resource and budget into ensuring that the agreement was fit for purpose, was in line with all relevant regulatory requirements and that other Authorities could use the agreement to leverage best value. As this agreement is available to BCC and our Legal and Commercial teams have reviewed and approved its use, the complexity of running our own procurement would have few if any advantages over the B&NES agreement.

For the financial assistance scheme we have been unable to enter into agreements or fully promote the scheme until such a time that funding is approved. Given that these measures are not BAU and are only being proposed to mitigate the CAZ scheme, we are not able to sign agreements until funding is confirmed. We are however ready to sign the Participation agreement, are having meetings with the finance companies listed in the framework and have fully developed a plan for delivery. This includes enlisting the services from a telemarketing team, this will be part of the Implementation Bid for the BCC CAZ scheme.

- Provision of a grant for scheduled bus services to retrofit their vehicles - funding for this element of the scheme has now been awarded following an initial submission of the FBC in February 2021. The grants will be administered by the Transport Engagement Team, using their extensive experience of administering grants to the business community. Grants have also been administered by BCC for bus retrofitting in the past so that experience will also be utilized in managing this latest round of funding.

- The provision of a Micro-consolidation unit with cargo freight bikes. The Office of Low Emissions Go Ultra Low West (GULW) project, which BCC are running alongside development of the CAZ project, will provide a grant for the provision of a trial hub for the purposes of 'last mile' and "only mile" deliveries to addresses within the CAZ area. This was awarded to Zedify and is producing some positive data for the early stages of the project.

If the service model proposed proves successful BCC intends to use lessons learned from this trial along with further market engagement to fully understand the complexity of offering such a hub. This will inform the specification to roll this out to other locations and will outsource this provision by way of a concessions contract. Calculations are still being validated, however, this which will be advertised in line with the Concessions Contracts Regulations 2016 (CCR16) as an open competition, if expected turnover from the concession is >£4.1M over the term of the concession. If the turnover is estimated to be <£4.1M then internal BCC procurement regulations will be adhered to. BCC terms and conditions for the provision of a concession will be adapted to provide a robust contractual position and ensure that the deliverables are met to the satisfaction of BCC. As above, we are unable to enter into any agreements or tender exercises at this time given the CAZ specific nature of the measures proposed. Given the previous experience and understanding of procuring such resources, this will be able to progress as soon as funding is approved.

- Mobility credits and/or subsidised bus travel for certain demographic or income groups. Business support including personalised travel planning, targeted door knocking and roadshows, travel plan support and CAF scheme promotional publicity. This will again be a scheme managed and administered by the Transport Engagement Team putting their experiences to good use for CAZ, the work this team will lead on is covered more comprehensively in the revised CAF Bid.

3.7 Detailed Requirements

Each procurement item will be managed depending on the requirement, value and length of contract in line with existing BCC procurement rules and policy. The two tables below show what is being sought, staffing plans and interfaces with existing council policy, strategies and contracts. The first is for all infrastructure items and the second covers all remaining items to be procured.

Item	Description	Lead Team/Resource Pressure	Risks and impacts	Mitigation
1	Non- illuminated signs (CAZ D boundary, advanced signs, and repeater Approved Device signs – Supply and installation)	BCC internal Engineering Design Team/BHAM&AWF Contractors	Timescale changes to tendered works and limited site investigations. Subject to specifications, approvals and permissions to work on neighbouring authorities. Uncertainty of Contractor interest.	Undertaken CAT surveys and trial holes – proposals to install NAL sockets in advance to reduce risk Client negotiations to continue with North Somerset to achieve agreement Sectional delivery proposals and clearly defined work packages to reduce contractor risk and widen options for Contractor involvement

Procurement Strategy

Item	Description	Lead Team/Resource Pressure	Risks and impacts	Mitigation
2	<p>Non illuminated signs (Advanced signs on Highways England Network)</p> <p>- Design, procurement and supervision</p>	WECA Professional Services Designer/HE	<p>Timescale for required approvals.</p> <p>Lot 5 is used to procure the Road Markings and Method A will be used as this lot has a single supplier awarded to it - Glamorgan (there are another 4 successful contractors if Glamorgan turn down the job).</p> <p>The schedule of rates within the agreement will be used when submitting the quotation for the works required.</p> <p>-Designer resource.</p>	<p>Continued HE engagement and clarifying processes and timescales</p> <p>BCC commission through WECA framework</p>
3	<p>Non illuminated signs (Advanced signs)- Supply and installation on Motorway Network.</p>	HE Construction Works Framework Contractor	<p>-Timescales for tenders and materials availability</p> <p>-Contractor resource.</p>	<p>WECA designer to progress approvals and tender in suitable timescale.</p> <p>Tender to all suitable contractors on HE CW framework</p>
4	<p>Provisional item for connection of Approved Devices to BCC BNET Network - trenching, BNET ducting, feeder pillars and reinstatement for Approved Devices (if 4G signal not sufficient).</p>	<p>Appointed Approved Device contractor</p> <p>BNET Service Delivery Manager and term contractor.</p>	<p>Lack of signal requiring hard wired connection</p> <p>Limited or no site investigations.</p>	<p>needs to carry out early assessment of WIFI signal strength.</p> <p>BCC have already carried out a pre-assessment and identified problem areas</p> <p>Re-engage BNET service and contractor to deliver</p> <p>Trial pits where anticipate problems.</p>

Procurement Strategy

Item	Description	Lead Team/Resource Pressure	Risks and impacts	Mitigation
5	Removal / relocation of existing illuminated signs – trenching, electrical ducting and reinstatement.	Bristol Highways Electrical Asset Team / Centregreat Ltd	-Timescale and changes to tendered works. -Limited or no site investigations.	Separation of ducting for BNET and CAZ C signs.
6	Structural assessment and testing of lighting columns which Approved Devices are to be erected on.	Bristol Highways Electrical Asset Team / Centregreat Ltd	Higher than anticipated failure rate.	Early engagement after appointment of Approved Device provider BCC currently carrying out pre-assessment
7	Replacement of lighting columns if required following assessment (above).	Bristol Highways Electrical Asset Team / Centregreat Ltd	-Designer and contractor resource. -Materials supply lead in for Lighting columns (currently 20 weeks) -Timescale and changes to tendered works.	Early engagement after appointment of Approved Device provider Advance ordering of Columns for store
8	Electrical - transfers, disconnections and connections.	Bristol Highways Electrical Asset Team / Centregreat Ltd	-Designer and contractor resource. -Timescale and changes to tendered works.	Early engagement after appointment of Approved Device provider
9	Enforcement Approved devices, brackets and connection to lamp column or other agreed platform. Include maintenance and decommissioning if required.	Procurement team Competition via the TMT II Framework.	-Timescale and changes to tendered works. -Approvals process.	Completed, awaiting award.
10	Enforcement Approved Devices – erection of masts.	Bristol Highways Electrical Asset Team / Centregreat Ltd	-Designer and contractor resource. -Timescale and changes to tendered works.	Early engagement after appointment of Approved Device provider

Procurement Strategy

Item	Description	Lead Team/Resource Pressure	Risks and impacts	Mitigation
11	Enforcement Approved Devices – erection of oversized signal poles at junctions.	BCC Signal Term Contractor (Dynniq)	-Designer and contractor resource. -Timescale and changes to tendered works	Early engagement after appointment of Approved Device provider
12	Back office systems for Approved Devices	Included as part of the Approved Device procurement the TMT II		Tender completed and waiting award
13	Decommissioning of existing Approved Device locations	Network Management. To be included in the Approved Device tender	5 years hence – estimate.	Tender completed and awaiting award
14	4G multi-network Approved Device cards (Every 100 Approved Devices cost circa £180,000 for 5 years).	Procurement team Included as part of the Approved Device procurement through TMT II	Timescale and changes to tendered works.	Tender completed and awaiting award
15	VMS signs replacement and installation.	BCC Traffic Signals and UTC and specialist contractor	-Designer and contractor resource. -Timescale and changes to tendered works.	Early engagement
16	Temporary signage for launch – including VMS.	BCC Engineering Design Team and Network Management	Minimal risk	Use existing VMSs and frameworks to deliver
17	Non illuminated signs - Decommissioning at project end.	BCC Engineering Design Team	Available resource	
18	Approved devices - Decommissioning at project end.	Bristol Highways Electrical Asset Team / Centregreat Ltd and SEA	Available resource	
19	Cumberland Road closure	BHAM&AWF Contractors	Available resource	Early engagement

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	Details	Staffing and stakeholders	Consents and interfaces.
CAZ System and Implementation	Enforcement	Staff already in place to deliver this. Liaison with the Police and other agencies utilizing the Approved Device system and processes will be required	The enforcement will be combined and managed alongside the bus lane enforcement as a standalone project complete with project team
	CAZ Systems	we have recruited a dedicated Test Manager and will be recruiting a Test Analyst nearer the time	
	Operations (staff)	In House provision using BCC existing resource and contracts as required / appropriate. Existing BCC recruitment policies in place and able to be utilized to get in the level of staff required to deliver the scheme	
	Communications and Engagement	In House provision working with the Transport Engagement Team existing, and new resource as per the CAF Bid, and contracts as required / appropriate, additional staff already recruited due to the requirement to engage early	This project will need to align with other related projects being planned and delivered across the city. This has been made a top council priority which is being aligned with existing systems and resources
	New air quality monitoring units	In House provision using BCC existing resource and contracts as required	
	Telemarketing Team	To be tendered for using BaNES paperwork adapted for Bristol. The Transport Engagement Team will work with the telemarketing team to oversee that work and align the teams	PRF form already submitted to Procurement and a Procurement lead assigned to assist with the tender process

	Details	Staffing and stakeholders	Consents and interfaces.
Additional Measures	Provision of grants and loans for taxi, private hire, HGV and LGV drivers to upgrade and / or retrofit their vehicles (CAF)	B&NES have established an agreement which has been approved for use by BCC legal and Commercial teams	Early liaison with the licensing team has already been taking place to ensure alignment with existing and new policies as required
	A loan and grant scheme to assist businesses and the public meeting certain criteria to replace their vehicles (CAF)	B&NES have established an agreement which has been approved for use by BCC legal and Commercial teams	BCC finance team and legal will continue to be involved in how we set this scheme up based on previous experience and ongoing planning for this
	Provision of a grant for scheduled bus services to retrofit their vehicles (CAF)	In House provision using BCC existing resource from the Transport Engagement Team and use of existing contracts as required / appropriate, additional staff already recruited due to the requirement to engage early	This has already been awarded so the Transport Engagement Team are gearing up for promotion, delivery and management of this measure ahead of the CAZ going live
	Increase, Improve, update Legible City Signage (CAF)	BCC Highways framework (BHAM&AWF)	As above. The existing Legible Cities Team has capability and experience required to take this element of the mitigation forward. Bristol have set the standard for wayfinding and are used as example of best practice. The team will continue to develop this project for a CAZ specific purpose
	Old Market Gap cycle scheme (CAF)	BCC Highways framework (BHAM&AWF)	The BHAM&AWF has already been through a procurement and tendering process. The BCC cycling and walking team will lead this project and have extensive experience of delivering similar schemes. There is already a contractor lined up to deliver the scheme and finance provision for the bulk of the scheme. The missing link is yet to be funded though and CAZ would enable completion of a vital commuting corridor for cyclists

4. Other considerations

4.1 Payment mechanism

Through the Public Contract Regulations 2015, public sector buyers must include 30-day payment terms in their contracts; and require that this payment term be passed down the supply chain. BCC fully adheres to this regulation and all procurement routes under consideration comply with this requirement.

The support and maintenance of current software such as Sidem is paid annually in advance as per the existing contract terms.

Where appropriate, stage payments will be included within the works required to allow suppliers to manage their cash flow and for BCC to forecast committed spend within the project budgets. For example:

The NEC3 contract suite, which is in place for the BCC BHAM&AWF and CCS TMT2 frameworks, provides options on payment mechanism (Option A to F). Due to the programme being a key driver and challenge due to the diverse deliverables being provided by various contractors, payment options which foster a partnership approach will be considered, for example incentivisation models, such as:

- Milestone incentives – Contractors can be incentivised for meeting key dates of the programme.
- As a new contract let following a competition via the TMT11 framework, the Approved Devices contract has stage payments tied to key milestones in the delivery.

The payment mechanism in place for the BCC BHAM&AWF is as follows:

- The Contractor submits a first programme for acceptance in accordance with the NEC contract data part 1. The assessment interval is one calendar month until the assessment date following the issue of the completion certificate. The period for payment is 35 days
- The Contractor submits an application for payment on or within seven days before the assessment date. The NEC Project Manager considers the Contractor's application in assessing the amount due. The NEC Project Manager gives the Contractor details of how the amount due has been assessed.

The payment mechanism for the NEC4 Term Service Contract in relation to Maintenance and installation of Highway Electrical Assets is as follows:

- The Contractor submits a plan for acceptance in accordance with the NEC contract data part 1
- The payment interval is 3 weeks
- The Contractor submits an application for payment on or within seven days before the assessment date. The NEC Project Manager considers the Contractor's application in assessing the amount due. The NEC Project Manager gives the Contractor details of how the amount due has been assessed.

The payment mechanism for the framework for the Mobile Enforcement Vehicles is as follows:

- After award, an order for the requirement will be raised.
- An invoice from the supplier (referencing the order no.) will be issued after delivery of the vehicle(s).
- The 30 days cycle would then start upon receipt of this official invoice.

4.2 Programming and interdependencies

Procurement for:	Proposed Procurement Route:	Indicative Days to Complete:
Design (including specification)	BCC Framework – Direct Award	45
Approved Device	BCC Contract – Direct Award	60
Infrastructure (on road)	BCC Framework – Direct Award	60
Traffic Management	Framework – Direct Award	45
Additional Measures – Infrastructure	BCC Framework – Direct Award	60
Additional Measures – Mitigation Measures	B&NES Framework – Direct Award	45

The stages of procurement for a direct award through a framework follow the call off procedures set out in each of the frameworks BCC intends to utilize. It will include the identification of the most appropriate supplier, which may be the top ranked supplier from the original tender process.

The majority of tenders are now underway or have been fully thought out and planned. However, if BCC consider that running a competition under the framework is more appropriate then the same steps will be followed as with the direct award procedure above, but will involve all of the suppliers on the lot/framework. Evaluation of the submissions will follow a robust and pre-published set of criteria and will be overseen and managed by a member of the BCC procurement team. Following the evaluation, the bidders will be informed of the outcome and BCC will adhere to the discretionary ten-day standstill period before awarding the contract.

With a direct award, there needs to be confidence that the supplier being awarded can deliver what is required from the specification and commercial terms. Sometimes that isn't possible as the BCC specification may have non- standard requests included. In that case, BCC will open competition to 'test' that the suppliers can deliver the request.

For work packages which, following further clarity on the requirements to be met, will require an Open tender process via the OJEU, the full regulated process will be followed, however it is not expected that this will be necessary for any of the contracts required for the CAZ Programme.

4.3 Risk Allocation and Transfer

As with any procurement agreement, there is always risk. BCC have identified where these risks can be mitigated by the procurement approach and/or by the contractual terms applied to the agreements. Using existing contracts or established frameworks provides mitigation.

Procurement Risk	Likelihood	Impact	Mitigation
Delays in procuring approved ICT hardware, e.g. secure managed network switches leading to a delay in go live and potential impact on other aspect of the programme leading to delays	M	M	Agreed scope early with BCC ICT. Use existing approved hardware where possible. Try to avoid 'gold plating' the solution This risk is 80% owned by the project team and 20% owned by BCC ICT

Procurement Risk	Likelihood	Impact	Mitigation
Procurement of signs for neighbouring local authorities / HE – not covered by the BCC Framework which could lead to delays in the programme due to their policy and procedures	M	H	Continue to engage with HE and neighbouring LAs to agree procurement routes. Considering all viable options well in advance. Could use temporary signage. This risk is 80% owned by BCC, 10% owned by HE and 10% owned by North Somerset Council
Steel and cement are in short supply due to Covid and therefore cost will have increased threefold by end of this year	H	M	Conversations taking regarding purchasing these materials earlier that required to avoid and delay in delivery and increased costs. This risk is owned by the Principal Designer.
Requirement for BNET (Bristol’s fibre network) due to poor network coverage for approved devices to capture images	M	M	We have already carried out an initial assessment and determined 10 sites that may potentially require BNET. The BNET team and supplier are engaged. This risk is owned by the Project Team

4.4 Risks due to Covid-19

BCC have engaged with all suppliers to understand the impacts of Covid-19 on their business and what measures, risks and mitigations need to be considered to enable contracts to be fulfilled both safely and without untenable interruption to delivery. Once award decisions are published the CAZ specific contracts can be reviewed to ensure that any measures put in place will continue to deliver best value and are reasonable and acceptable to both parties.

4.5 Soft market testing

BCC will be utilizing current frameworks and contracts to deliver the CAZ for Bristol, wherever appropriate. Soft market testing has been undertaken for all of these at their inception. CCS frameworks are put in place following extensive soft market testing to ensure that the framework is suitable for both public sector buyers but also to confirm that the market is able to supply the requirements. For the Approved Devices competition the framework suppliers were sent an RFI to enable the specification to be written in a market facing format whilst ensuring that JAQU guidelines would be met.

Where new BCC contracts and frameworks are used, a similar process is undertaken to fully understand the market position and offerings available to ensure a healthy competition between bidders and the right outcome for BCC is achieved.

4.6 TUPE

There have been no TUPE implications identified for any of the deliverables.

4.7 Social value

Social Value is a key strategic aim / outcome for the city of Bristol and is very high on the Mayor’s agenda. Social value is about maximising the impact of public expenditure to get the best possible outcomes: improving the economic, social and environmental wellbeing of the area.

BCC have developed a social value toolkit in association with city partners, councillors, and organisations representing small businesses, micro businesses and the voluntary community sector.

The toolkit:

Procurement Strategy

- makes sure the processes used to award grants or contracts recognise the contribution the organisation will make to Bristol, particularly for disadvantaged groups or communities
- helps organisations make social value part of their procurement and management processes and bids for funding
- will be used to measure and report on the social value of activity and the contracts and grants that we award
- will be used in future commissioning activity

All new procurement activities provide for Social Value within the evaluation criteria with a target weighting of 20% of the overall tender score. BCC have partnered with The Social Value Portal which is an on-line solution that allows us to measure and manage the contribution that BCC and our supply chain makes to society, according to the principles laid out within the Public Services (Social Value) Act 2012. This solution allows BCC to report both non-financial and financial data and rewards organisations for doing "more good" in our community.

Awarded suppliers on current frameworks such as CCS, TMT2 have been evaluated for social value policies and opening competition, where appropriate for this project, will allow for BCC to re-test this with Bristol specifically in mind during the performance of the contract.

4.8 Contract Management

BCC have a new contract management team in place following a service restructure. Procurement has been split resulting in there now being a Strategic Procurement Team and a Strategic Supplier Relations Team. The Strategic Supplier Relations Service will be developing tools and governance to support contract owners and contract managers manage their contracts. SSRM will support the development of a contract management plan (CMP) which will document all the key information about the contract, how it must be managed and what the reporting requirements will be.

The CAZ Team are already working with the SSRM to ensure effective management of all of the contracts involved in the delivery of the CAZ for Bristol. Individual project managers working on discrete work packages will report to the CAZ programme manager who will maintain overall responsibility. The contractors' performance will be monitored and reported on using Key Performance Indicators (KPIs), where appropriate, to ensure any issues are highlighted early and can be remedied before effecting dependent work-packages. These KPIs' were pre-agreed in order for suppliers to access the framework.

Where BCC are using NEC3 and NEC 4 contracts there are a number of roles to help administer the contract. The team already includes members who specialize in managing construction contracts. It is acknowledged that the NEC Project Manager role is key to managing these objectives. There is also a Supervisor role to check that the works are delivered in accordance with the contract and in line with CDM guidance. Unless we are bound by a framework, we will look at either NEC 3 or 4 if they are appropriate. However, we may also use a different form of contract if we think that appropriate.

The contract management support runs right through to contract award, management of the contract and KPIs and on to the handover to BAU.

4.9 Outstanding Contracts

There are a number of procurement exercises outstanding. These are namely the call off projects linked to the main Approved Device Enabling Technology contract as noted above.

Where there are other contracts still to be tendered, this is largely due to the uncertainty around funding. We have the internal resource required to undertake the tenders, but this work would not ordinarily be taking place, so confirmation of funding is required as a first step. For example:

Telemarketing Team – as noted in the Procurement Route table above, there is a gap in the experience of the internal comms and engagement teams to run a large-scale cold calling exercise. We have worked with BaNES and have a copy of their procurement and project documents related to the tender exercise they undertook for

the same service provision. We are adapting the paperwork to be Bristol focused and have already engaged in some light market testing to get an idea of the sort of support available. The Telemarketing Team will bridge a vital gap in contacting local businesses, understanding the potential issues being faced, mitigation required and creating a detailed database of contacts. This work would not be required if the CAZ was not taking place, so with no guarantees of funding, we will procure this as soon as we have funding approved. The procurement team are already on hand to help us with the tender. The cost assumptions are very robust as BaNES procured exactly the same work so we are confident with our bid.

Cycle scheme – the scheme is fully developed and costed with a developer lined up to deliver the majority of the scheme, with one section missing. It's this 'missing link' that we wish to fund through CAF. There may be scope to bring this section forward, but we can't have those conversations until we have lined up the contractor to undertake this work. The costs in the CAF bid are based on many years of experience using schedules of rates from the frameworks and other schemes. The design has progressed to an advanced stage which provides an additional level of confidence in the plans included in the CAF Bid. BCC has a wealth of experience of delivering this type of project and there is a team member on standby to take this project through to delivery as soon as funding is awarded (more details of this are held in the CAF Bid, FBC 17).

VMS Strategy (Fast Track Measure) – this is a set of measures based around one central strategy aimed at being able to control areas which suffer from congestion and therefore poor air quality. This is a scheme designed purely for the CAZ Project, without it there is no funding to progress it. The experienced Traffic Operations Team have used existing framework costs and experience from other projects to put a proposal forward. This involves procurement of new software and traffic modelling to manipulate signals, moving traffic in a more controlled way around the city. There is no budget or resource to progress the proposal into a more robust scoping plan until we have the funding agreed. The expertise of the team has provided a 'best guess' forecast of the work involved and the potential benefits. We have some key corridors such as Marlborough St, where we have tried the majority of more traditional traffic management tools, but we still have exceedances. This scheme would focus on the most congested and polluted corridors first, seeking to use advanced and innovative technology / methods to approach a long-standing issue.

4.10 Accounting treatment

The CAZ Implementation costs are deemed to be Capital expenditure and will be treated as creating an asset which will be depreciated in accordance with the Councils accounting policies.

The grant will be held on balance sheet. It will be used as financing the capital cost similar to deferred grants but charged straight to the Capital Adjustment Account as part of financing the capital programme. Note Service areas will receive the budget for depreciation charges.

The CAZ schemes Operating costs will be offset against revenue generated from the CAZ charges and any revenue generated from Penalty charge notices, and any potential surplus generated will be allocated to a designated account similar to a PPRA and will be ring-fenced for use towards, offsetting future year deficits, funding the Decommissioning costs, to fund any mitigation measures against realised risks, as well as fund transport related initiatives including those that support the CAZ objectives.

A specific reserve will be created to cover the cost of decommissioning the scheme after 10 years, as well as mitigating any potential risks during operation. The cost of decommissioning has been estimated as £0.56m and it is deemed that a year of operational cost (£2m) will provide adequate provision for potential risk (allowing for a full year of costs with no offsetting Revenue, which could be the case in extreme cases like a pandemic year). The Council will decide how to build up such a reserve within the early years of the scheme.

Clean Air Fund (CAF)

For all the CAF mitigations measures, the Council will treat the expenditure as "Revenue Expenditure" applying a statutory exemption available for "Revenue Expenditure Funded by Capital Under Statute" (REFCUS). This allows items that commonly require revenue funding to be funded through a capital grant. Capital funded items will use REFCUS to be expensed in the year of expenditure although they are capital funded, as they will not be creating an asset on the Council's balance sheet. Expenditure can only be treated as capital expenditure if the authority

Procurement Strategy

grant funding to a third party towards expenditure which would, if incurred by the authority, be capital expenditure.

Any CAF Grant received will be held in a designated account and disbursed within the year of receipt. Any balance at year-end will be carried forward and disbursed in subsequent year or used to enable other mitigation measures in line with the terms of the grant conditions or returned to JAQU if it is agreed to be surplus to requirement.



Bristol City Council Clean Air Plan - Full Business Case
Evaluation, Monitoring and Benefits Realisation Plan

FBC-38 | 5

June 2021

Bristol City Council

Bristol City Council Clean Air Plan Full Business Case

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Jacobs Consultancy Ltd.
 The West Wing
 One Glass Wharf
 Bristol, BS2 0EL
 United Kingdom
 www.jacobs.com

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Acronyms and Abbreviations

ANPR	Automatic Number Plate Recognition
AQO	Air Quality Objective
BCC	Bristol City Council
CAZ	Clean Air Zone
CSF	Critical Success Factor
Defra	Department for Environment, Food & Rural Affairs
DfT	Department for Transport
EU	European Union
EV	Electric Vehicle
FBC	Full Business Case
GDP	Gross Domestic Product
HGV	Heavy Goods Vehicle
ITS	Institute of Transport Studies
JAQU	Joint Air Quality Unit
JSA	Job Seekers Allowance
LEP	Local Enterprise Partnership
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
NO _x	Nitrogen Oxides
NO ₂	Nitrogen Dioxide
OBC	Outline Business Case
ONS	Office for National Statistics
PCM	Pollution Climate Mapping
PHV	Private Hire Vehicle
PM	Particulate Matter
ROAMEF	Rationale, Objectives, Appraisal, Monitoring, Evaluation and Feedback
SME	Small to Medium Enterprise
SOC	Strategic Outline Case
VMS	Variable Message Sign

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 Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the COVID-19 pandemic. Recent research suggests that poor air quality may be correlated with higher death / infection rates from COVID-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill², to ensure that certain standards of air quality continue to be met, by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. 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 Bristol. 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 has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), and an Outline Business Case (November 2019 and updated between April and June 2020).

In line with Government guidance BCC is considering implementation of the 'Small CAZ D Option' which includes a charging scheme for non-compliant buses, taxis, HGVs and LGVs and cars alongside a number of other measures.

A Full Business Case (FBC) was been produced 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 Bristol. The FBC proposed a preferred option including details of delivery. The FBC formed a bid to central government for funding to implement the CAP.

This document is written to support the 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 JAQU in 2017 (and updated in 2020), and the HM Treasury Green Book.

The objective of the scheme is to deliver an option including a package of measures which will be most likely to bring about compliance with the Limit Value for annual mean NO₂ in the shortest time possible in Bristol and reducing human exposure as quickly as possible. To understand whether the scheme meets this objective, it is

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 Environment Bill 2019-21 <https://services.parliament.uk/bills/2019-21/environment.html>

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 report sets out the evaluation strategy and benefits realisation plan for the BCC Clean Air Plan 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.

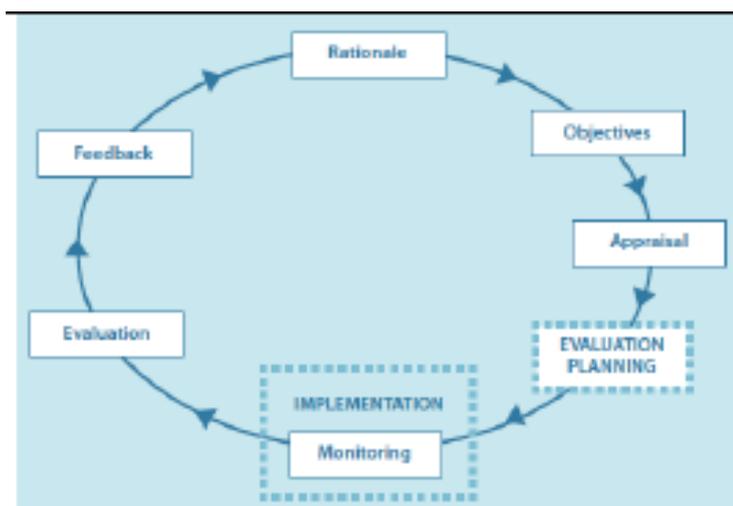


Figure 1-1: The ROAMEF cycle

In addition to local monitoring and evaluation of the BCC CAZ Scheme, JAQU are undertaking a central evaluation which will take place over two to three years by a separate organisation, with certain local authorities selected as a case study for a more detailed assessment. The central evaluation will provide BCC 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 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 focusing on the processes by which the scheme was undertaken and the latter focusing on whether the desired impacts of the scheme were realised.

Based on DfT monitoring and evaluation guidance, and the requirement to undertake 'standard evaluation' for this scheme, the key types of questions to be addressed through this process are:

- How was the scheme delivered?
- What difference did the scheme make?
- Did the benefits justify the costs?

To enable evaluation to take place, a monitoring framework needs to be in place. The requirements of the "Standard Monitoring" outlined in the September 2012 DfT guidance have been used as a guide. The requirements are:

- Scheme Build
- Delivered scheme
- 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.

The primary purpose of the scheme is to improve air quality within Bristol. Therefore, air quality will also be monitored, despite not being included within the 'standard monitoring' requirements.

The plan is defined in two parts, with the first part (process evaluation) covering the first three areas listed above (scheme build, delivery and costs) and the second area 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.

Figure 1-2 illustrates the stages involved within the evaluation strategy and benefits realisation process. This process includes the following stages:

- Desired Impacts – These are based on the project's Critical Success Factors and reflect the intended effects of the scheme. These impacts are defined within Section 3.11 (listed as D1-D6).
- Monitoring Outputs – These include datasets that are likely to be impacted by the scheme. They are summarised within Section 3.2 (listed as M1-M8).
- Outcomes – These relate to the wider consequences of the scheme on society and the economy and are closely linked to the desired impacts. These outcomes are defined in Section 3.4 Outcome Analysis (listed as O1-O3).

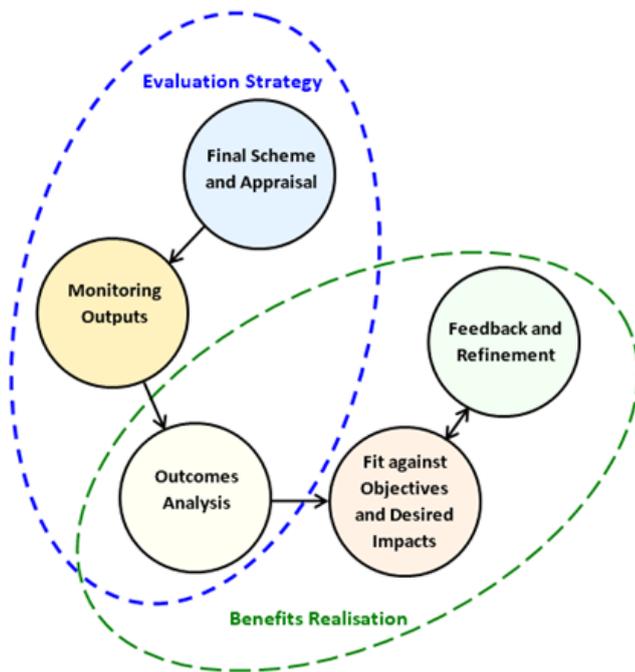


Figure 1-2: Flow diagram for Evaluation and Benefits Realisation Strategy

1.2 Scope of the scheme

The United Kingdom (UK) has in place air quality legislation, passed down from the European Union (EU), to ensure that certain standards of air quality are met. The legal limit for concentrations of NO₂ is 40 µg/m³ as an annual mean. This legal limit is breached across a number of cities in the UK, including at several locations in Bristol.

BCC, along with 27 other local authorities, has been directed to produce a Clean Air Plan (CAP) to achieve air quality improvements in Bristol in the shortest possible time.

After detailed analysis, the 'Small area CAZ D' was selected as the preferred scheme to comply with government guidance (see the FBC Options Assessment report for more detail on this process). This option is expected to achieve compliance by 2023. These measures aim to reduce NO₂ levels within Bristol to legal limits within the shortest possible timeframe.

- The Small CAZ D Option applicable to specific zones of operation shown in Figure 1-3 includes: Small Area Class D (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs);
- Fast Track Measures:
 - Closure of Cumberland Road inbound to general traffic
 - A detailed VMS (Variable Message Sign) Strategy which includes the use of existing transport infrastructure such as traffic signals and modelling

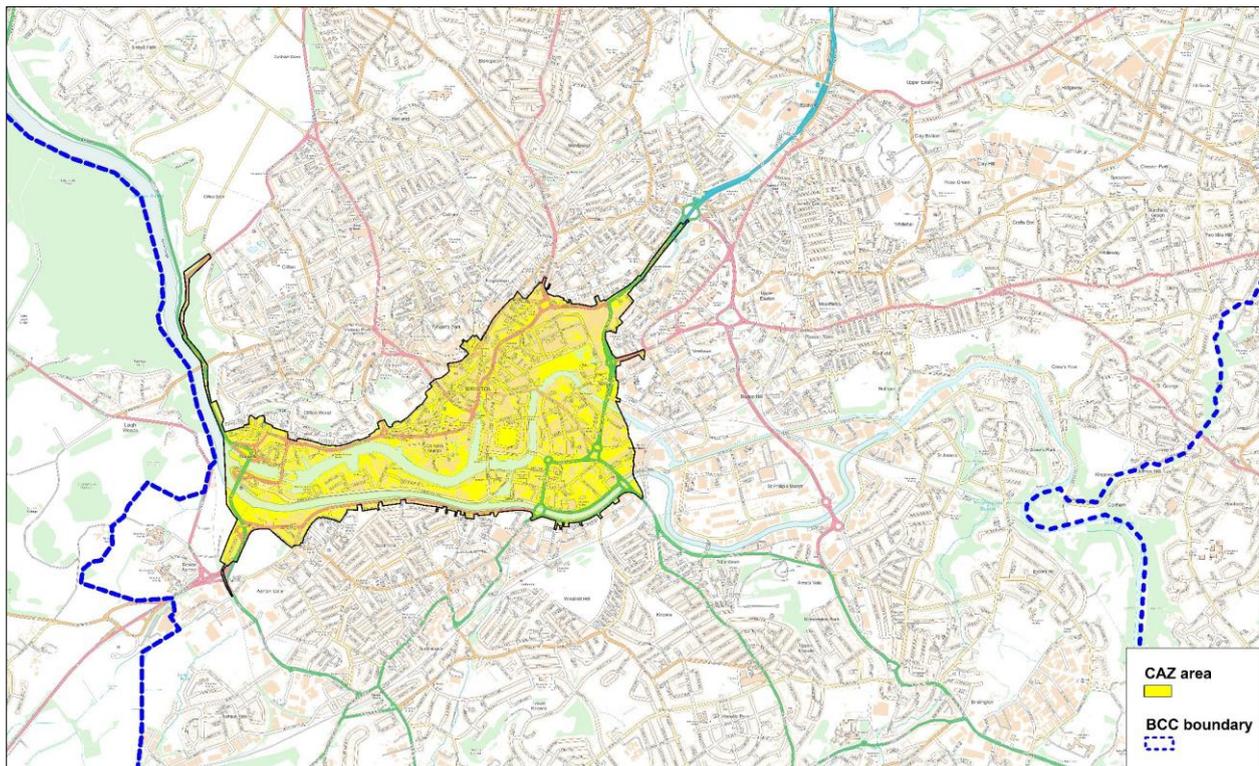


Figure 1-3: Bristol Small area CAZ D boundary

The Small CAZ D Option measures described above, would be delivered through funding from the Implementation Fund and Clean Air Fund, provided by central government. The Implementation Fund provides funding to deliver measures required to achieve compliance with air quality standards in the shortest possible time. The Clean Air Fund provides funding via a competitive bid process, to deliver measures that aim to mitigate and adverse impacts which are expected fall upon disadvantaged groups. Additional schemes and mitigation measures could potentially be funded by any net revenue produced from the charging zone, although this revenue is not guaranteed.

The ongoing base revenue cost for the CAZ to operate along with all other associated measures was estimated at £8.1 million over the three-year period in which the CAZ is expected to operate before compliance is achieved. The total base capital cost for the proposed CAZ was estimated at £46.6 million.

Timescales for delivery include:

- Scheme opening – 2022
- Modelled year of NO₂ compliance – 2023

2. Process Evaluation

Process evaluation seeks to answer the question 'How was the scheme delivered?'. This involves the assessment of whether a scheme is being implemented as intended, by monitoring the intervention's processes, timelines and budget throughout the implementation phase. This information will be used to inform the case for similar schemes across the UK.

The three areas of monitoring, evaluation and reporting will be:

- **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 measure taken to minimise any identified negative impacts during implementation.
- **Outturn costs** – These will be compared to forecasts covering capital and on-going operating and maintenance costs, ensuring the scheme financial performance is in line with the business case.

These three aspects of the scheme will be reported one year before scheme opening, as well as annually from 1 to 5 years after scheme opening.

3. Impact Evaluation

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

3.1 Scheme Critical Success Factors

A number of Critical Success Factors (CSF) have been developed for the scheme in order to assess each scheme option. The CSFs summarise the desired impacts of the intervention and it is necessary to understand these intended effects before assessing and evaluating the changes caused by the scheme. The following CSFs were used for the current scheme:

Primary Critical Success Factor

- Deliver compliance with NO₂ air quality Limit Values³ and Air Quality Objectives⁴ in the shortest possible timescales

Secondary Critical Success Factors

- **Strategic**
 - Provide equity across different vehicle type and trip purpose
 - Compliance with Defra Draft CAZ framework, including minimum requirements
- **Economic**
 - Mitigate financial impact on low income households
 - Improve health of low-income households
 - Maximise positive effects on the economy, whilst minimising any negative impacts
 - Improve public health across Bristol
- **Commercial**
 - Delivery timescale risks of procurement
- **Financial**
 - Likelihood of revenue equating to implementation/operational costs⁵
 - Upfront capital required for scheme
 - Risk of financial penalty to the Council/s
- **Management**
 - Public acceptability which could impact on the option's deliverability
 - Political acceptability which could impact on the option's deliverability

3.1.1 Desired Impacts to Monitor

A number of desired impacts have been identified based on the scheme CSFs. These impacts will be monitored and assessed in order to feed into the benefits realisation plan and are considered appropriate to evaluate the outcomes of the proposed scheme. These desired impacts include:

Implementation Fund Scheme:

- D1 – Deliver compliance with NO₂ air quality Limit Value in the shortest possible time
- D2 – Deliver compliance with NO₂ Air Quality Objective in the shortest possible time

³ (EU NO₂ concentration Limit Values)

⁴ (LAQM air quality Objectives for NO₂ as set out in the Air Quality (England) Regulations (SI2000/928 as amended))

⁵ Complying with the legal test which was set out by the High Court in November 2016 in R (ClientEarth) (NO₂) V Secretary of State for Environment Food and Rural Affairs [2016] EWHC 2740 (Admin), only shortlisted options which achieve compliance with the NO₂ Limit Value in the shortest possible time, are appraised across this criterion. The relevant analysis is presented in the Financial Case chapter of the Strategic Outline Case.

Clean Air Fund Scheme:

- D3 – Minimise the negative impacts and maximise the benefits of the scheme on local businesses
- D4 – Minimise adverse impacts on traffic
- D5 - Facilitate use of public transport and sustainable travel
- D6 - Minimise the impacts of the scheme on residents, particularly low-income households

One of the main aims of the scheme is to improve public health across the city, and to ensure that low income households also benefit from any health impacts. However, the public health benefits of improved air quality are long term (over lifetimes) and therefore would not be appropriate to include as a desired impact, as they could not be adequately assessed within a short period of scheme delivery. Improvements to air quality have been shown to produce beneficial impacts on public health ⁶, therefore the public health aims of this scheme should be achieved if the air quality objectives and EU NO₂ Limit Values are met.

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:

- What impact have Local Plans had on air quality, NO₂ emissions and health?
- How have Local Plans affected behaviours of car owners, public transport users, local businesses? Have behaviours changed in expected or unexpected ways?
- How has the impact of the Local Plans varied for different local groups, including more vulnerable residents or transport users?
- How have external factors influenced the effectiveness of the Local Plans?
- 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, with certain local authorities selected as a case study for a more detailed assessment. BCC will submit quarterly reports to JAQU for central evaluation, covering air quality and traffic data.

3.3 Monitoring Plan

In order to assess whether the impacts of the scheme are as predicted, a monitoring plan has been produced, outlining the programme of data collection and information collation tasks for the scheme.

Key questions which the monitoring plan seeks to answer include:

- Was the scheme delivered to costs and timescale?
- Has the scheme delivered the desired impacts and benefits as forecast?
- Has the scheme shown out-turn value for money as predicted?
- What lessons can be learnt to help shape air quality strategies for Bristol?
- Has the scheme had any unpredicted impacts?

Where possible, methods of data collection have been selected which are completed as part of ongoing air quality and transport monitoring, in order to minimise additional costs whilst maximising the data available to identify scheme impacts.

The area to be monitored includes those parts of the city within the proposed charging zone, but also those areas neighbouring the zones and across the wider city, as appropriate.

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>

Further details of the proposed ANPR camera locations, which will be used to monitor data as well as enforcing the charging zone, are available within the FBC.

Table 3-1 lists the data to be collected and collated as part of the monitoring plan, with information on the method and frequency of data collection and rationale for its inclusion.

The areas of data collection include:

- M1: Air quality data
- M2: Vehicular fleet information
- M3: Traffic flows
- M4: Jobs seekers allowance information
- M5: UK business count data
- M6: Retail/business/office space vacancy figures
- M7: Walking and cycling counts
- M8: Stakeholder feedback from council user group forums

Table 3-1 Data Collection and Collation

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 within the BCC area.	To understand changes in air quality (particularly NO ₂ concentrations).	Diffusion tubes and real time monitoring	Baseline (pre-scheme) and then ongoing monitoring.
M2: Vehicular fleet information	Number of compliant/non-compliant vehicles driving within the BCC charging zone.	To understand how the type of vehicles travelling in Bristol changes over time	ANPR cordon, cross-referencing with DVLA vehicle database	Baseline (pre-scheme) and then continuously through permanent ATCs (analysed quarterly)
M3: Traffic flows	Traffic flows within the charging zone as well as across the wider city	To understand how the scheme impacts on traffic flows and speeds along key routes within the highway network	ANPR cordon Permanent Automatic Traffic Counts (ATCs) SCOOT Loop Data	At least 2 weeks during baseline monitoring (pre-scheme) and then continuously through permanent ATCs (analysed quarterly)
M4: Job seekers allowance (JSA) information	ONS data from NOMIS web, relating to JSA benefits claimants in BCC	To understand any changes in the number of individuals applying for JSA within BCC, in	Publicly available data. Will be compared against other similar cities to help isolate the	Baseline (pre-scheme) and then annually for five years

Measure	Data to be used	Rationale for inclusion	Data collection methods	Frequency of data collection
		order to assess impacts on the local labour market and economy.	impact of the scheme from other unconnected variables.	after scheme opening
M5: UK Business Count Data	ONS data from NOMIS web, relating to business demography	To understand changes in the number and type of businesses operating in Bristol in order to assess economic impacts.	Publicly available data. Will be compared against other similar cities to help isolate the impact of the scheme from other unconnected variables.	Baseline (pre-scheme) and then annually for five years after scheme opening
M6: Retail/business/office space vacancy figures	Vacancy statistics from internal council data. Market data from property consultants.	In order to understand economic impacts of the scheme in terms of changes to the number of businesses operating within Bristol.	Internal data collection as part of ongoing process. Regular property market reports published by property consultants in the public domain could also be used.	Baseline (pre-scheme) and then annually for five years after scheme opening
M7: Walking and cycling counts	Pedestrian and cycle counts on key routes within the city	To understand changes to the number of people walking and cycling along key routes within Bristol	Commissioning of new surveys Use of survey data from Street Space Scheme monitoring	Baseline (pre-scheme) and then annually for five years after scheme opening
M8: Stakeholder feedback from council user group forums	Stakeholder feedback covering relevant elected members, stakeholder groups, the LEP.	To understand the opinions of stakeholders on scheme delivery and impacts. To understand some of the less quantified impacts such as package effects.	Part of the on-going consultation process for transport strategies in the City.	1, 3, 5 years after scheme opening

Data that seeks to identify behavioural changes as a result of the CAZ will be collected within areas of Bristol beyond the CAZ boundary as well as for areas of the city within the boundary. This will help identify whether any

behavioural changes within the CAZ are due to the implementation of the scheme or because of other external factors taking place within the city and nationally.

3.3.1 Job seekers and business data

The number of individuals applying for Job seekers allowance will be collected across BCC (M4). This data will be used to assess the impacts of the CAZ on the local labour market and economy. In addition, UK Business Count data (M5) and Retail/business/office space vacancy figures (M6) will be collected to identify whether there are any changes to the type and number of businesses operating within BCC.

Data for these three measures will be compared for areas within and outside of the CAZ as well as against other comparator cities. This seeks to identify whether the CAZ has impacted on the unemployment rate and local economy within the city or whether any changes to the local economy are due to other local and national factors. This will be used to assess whether Outcome O3 (overall neutral or benefit to the local economy) has been achieved. This will have been considered to be achieved if patterns in the number of people applying for job seekers allowance and the number of businesses operating within Bristol (both within and outside of the CAZ) reflect similar trends to those seen within comparator cities.

3.3.2 Air Quality and Traffic Data Collection

Modelling indicates that the Small CAZ D Option will achieve compliance of the NO₂ Limit Value in 2023 compared to a modelled natural compliance year of 2027. Additional air quality monitoring will be focused on the effectiveness of the Small CAZ D Option.

Location and number of monitoring sites for air quality and traffic flows have been established based on the work completed within the OBC stage. Monitoring has begun at these sites and the data collected will provide information for the pre-scheme situation and the impacts of the scheme once measures are implemented.

In total, 95 additional diffusion tubes will be installed as part of the CAZ scheme. Additionally, a new continuous NO_x air quality monitoring site will be established on Marlborough Street, a key corridor where compliance is predicted to be late.

This data will be collected prior to implementation up until 2028 (i.e. one-year post 2027 the likely year of natural compliance). Existing BCC monitoring sites were used if they were suitable for air quality monitoring. This will provide data on measure M1 (air quality data).

ANPR surveys will be used to collect traffic data. These surveys will take place for one week prior to implementation, 2023, 2025 at 48 locations that have been identified as showing compliance issues in the OBC baseline 2024 model. This will provide data for monitoring of measures M2 and M3 (vehicular fleet information and traffic flows). A number of permanent traffic data collection sites will be established at points of interest within Bristol, this data will feed into JAQU's central evaluation process.

Maps and shapefiles of air quality and traffic monitoring sites are available at BCC's open data website⁷.

Baseline Data

Data has already been collected and is scheduled to be collected as part of the monitoring of other BCC transport schemes as well as to monitor the impacts of the COVID-19 pandemic on traffic and air quality. Data collected from these sources will be used to monitor the effects of the Small CAZ D Option, as well as the situation prior to implementation. Through the use of existing data sources, the need for new surveys and data collection will be minimised.

Traffic flow data has already been collected from February 2019 to November 2020 at key locations around the city. This data can be used to form a baseline of traffic for the CAZ scheme. Key traffic count locations, where monitoring took place, include the following:

⁷ Bristol City Council's open data website for air quality and traffic counts available through the following links:

<https://opendata.bristol.gov.uk/explore/dataset/air-quality-monitoring-sites/export/?disjunctive.pollutants&refine.current=True&location=12,51.46855,-2.60889&basemap=jawq.streets> and <https://opendata.bristol.gov.uk/explore/dataset/dim-traffic-counters/export/?disjunctive.countdevicedescription&disjunctive.link>

- St Michaels Hill (Southbound)
- Lower Maudlin Street (Westbound at Lewins Mead)
- Marlborough Street (Westbound at Dighton Street)
- Newfoundland Street (Inbound)
- Newfoundland Street (Outbound)
- Perry Road (Eastbound)/ Colston Street

In addition, daily count data has been collected for working days from the 3rd February to the 4th December 2020 to assess the changes in traffic due to COVID-19.

As part of the monitoring of the Street Space Scheme measures, vehicle counts are also due to take place at the following locations in 2021:

- Park Row/Marlborough Street Junction
- Lewins Mead/Haymarket Junction
- St Michael's Hill Junction

Air quality data has already been collected from around the City during the period 25th March 2019-1st November 2019 and 24th March 2020-31st October 2020. This data will be used to create a baseline for the CAZ scheme.

These Monitoring sites were situated at the following locations:

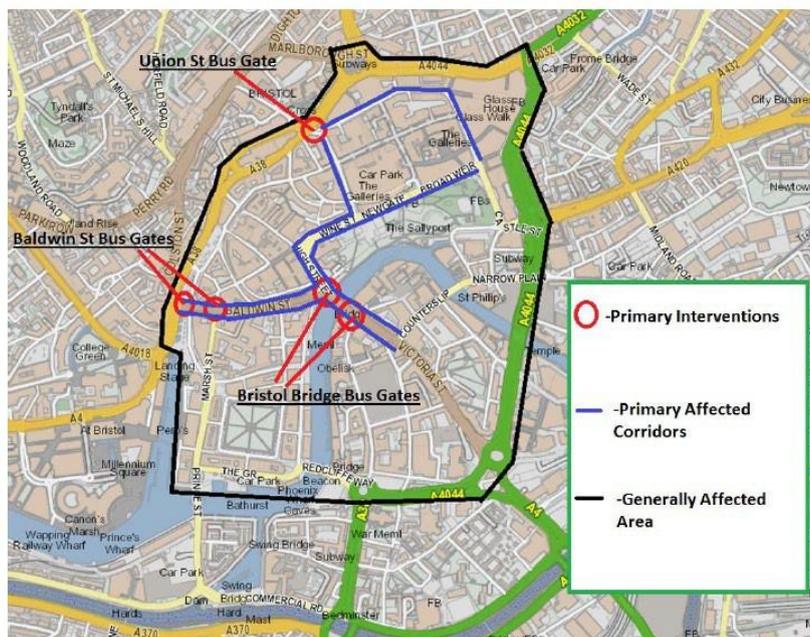
- Temple Way
- Colston Avenue

During the COVID-19 pandemic a number of Street Space Schemes were proposed within Bristol in order to free up road space, which would normally be used by traffic and parking, for the use of public transport, cyclists and pedestrians. One of these Street Space Schemes included measures surrounding Bristol Bridge. Monitoring is due to take place within the area shown in Figure 3-1 below, this includes the following:

- Vehicle counts and journey time information sourced from SCOOT loops and ANPR cameras
- Pedestrian and cycle counts sourced from manual counts and Vivacity Traffic Sensors
- Air quality levels sourced from diffusion tube data.

This data will be used to establish baseline data for the CAZ Scheme.

Figure 3-1: Areas to be monitored by Bristol Bridge scheme



3.4 Monitoring Outputs and Desired Impacts

Table 3-2 summarises the links between Monitoring Outputs and Desired Impacts.

Table 3-2: Monitoring Outputs for Assessing Desired Impacts (primary links only)

Monitoring Outputs (M) by Desired Impacts (D)	D1: Deliver compliance with NO ₂ air quality Limit Values	D2: Deliver compliance with NO ₂ Air Quality Objectives	D3: Minimise the negative impacts and maximise the benefits of the scheme on local businesses	D4: Minimise adverse impacts on traffic	D5: Facilitate use of public transport and sustainable travel	D6: Minimise the impacts on residents, particularly low-income households
M1: Air quality data						
M2: Vehicular fleet information						
M3: Traffic flows						
M4: Job seekers allowance (JSA) information						
M5: Changes in business numbers						
M6: Retail/business/office space vacancy figures						
M7: Walking and cycling counts						
M8: Stakeholder feedback from council user group forums						

3.5 Outcome Analysis

Outcome analysis investigates the wider longer-term benefits of the scheme on the city and will be assessed based on data collected as part of the scheme monitoring outcomes (M1-M8). These outcomes are strongly linked to the desired impacts of the scheme (D1-D6) and are listed below:

- O1: Deliver compliance with NO₂ air quality Limit Values and Air Quality Objectives in Bristol
- O2: Minimise financial impacts of the scheme on low income households within Bristol
- O3: Overall neutral or benefit to the local economy

Figure 1-2 illustrates how monitoring outputs are used to feed into the outcome analysis and benefit realisation process. Table 3-3 maps how each monitoring output (M1-M8) will be used to evaluate the outcome analysis (O1-O3) and therefore contribute to the assessment of benefits realisation.

Table 3-3: Mapping of Monitoring Outputs and Outcomes Analysis (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 Bristol	O2: Minimise financial impacts of the scheme on low income households within Bristol	O3: Overall neutral or benefit to the local economy
M1: Air quality data			
M2: Vehicular fleet information			
M3: Traffic flows			
M4: Job seekers allowance (JSA) information			
M5: Changes in business numbers			
M6: Retail/business/office space vacancy figures			
M7: Walking and cycling counts			
M8: Stakeholder feedback from council user group forums			

3.6 Benefits Realisation

The data collected as part of this Monitoring and Evaluation Plan will be used to demonstrate the realisation of the scheme benefits and objectives.

Table 3-4 summarises the relationships between the desired impacts of the scheme (D1-D6) and the scheme outcomes (O1-O3). Alongside Table 3-2 and Table 3-3, this identifies the links between the data outputs collected as part of the monitoring process (M1-M8), the desired impacts (D1-D6) and outcomes (O1-O3) which form part of the benefits realisation. The process of monitoring and benefits realisation can be refined as necessary to allow optimisation of benefits and assessment of all objectives and desired impacts.

3.6.1 Benefits Profile

BCC was instructed to reduce NO₂ concentrations within the city to legal levels in the shortest time possible. Modelling of the preferred Small CAZ D Option indicate that this primary CSF should be achieved by 2023. Therefore, benefits to air quality produced by the Clean Air Plan are likely to be realised in a reasonably short timeframe from implementation. Monitoring of scheme outcomes and impacts will continue for five years after scheme opening, in order to assess the realisation of air quality benefits. This will take place alongside monitoring of impacts to the economy and transport within the city, in order to assess how these factors develop over the

course of the scheme. A monitoring period of five years is recommended within the guidance⁸ and this should provide an appropriate timescale to assess the wider impacts and benefits of the scheme.

Table 3-4: Mapping of Desired Impacts and Outcome Analysis (primary links only)

Outcome Analysis (O) by Desired Impacts (D)	O1: Deliver compliance with NO₂ air quality Limit Values and Air Quality Objectives in Bristol	O2: Minimise financial impacts of the scheme on low income households within Bristol	O3: Overall neutral or benefit to the local economy
D1: Deliver compliance with NO₂ air quality Limit Values			
D2: Deliver compliance with NO₂ Air Quality Objectives			
D3: Minimise the negative impacts and maximise the benefits of the scheme on local businesses			
D4: Minimise adverse impacts on traffic			
D5: Facilitate use of public transport and sustainable travel			
D6: Minimise the impacts of the scheme on residents, particularly low-income households			

⁸ DfT's 'Monitoring and Evaluation Framework for Local Authority Major Schemes' (September 2012)

4. Delivery of the Monitoring & Evaluation and Benefits Realisation Plan

4.1 Costs

The costs associated with the evaluation, monitoring and benefits realisation analyses are outlined within this section.

A total cost of £410,018 will be required for monitoring, evaluation and benefits realisation. This estimate is 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. Costs are as outlined in Table 4-1 to Table 4-3.

A sum has also been included within the scheme costs for the provision of BCC staff to undertake ongoing monitoring of the scheme during the period from scheme opening until 2028. An estimate of £20,000 was included for 1FTE staff member for this role. Air quality monitoring (installations) forms part of the scheme capital costs, and the air quality ongoing monitoring will be included within operational costs. Both air quality monitoring and traffic monitoring will be carried out during the period from one year prior to scheme opening until 2028.

CAPEX air quality monitoring costs were upfront scheme costs, before the FBC funding was awarded.

Table 4-1: Scheme costs over monitoring and evaluation period

Activity	Cost per unit	No. required	Duration (years)	Total Cost
CAPEX				
Air Quality Monitoring (Installations) (Including Infrastructure at Marlborough Street, staff costs and site decommission)	£20,149	1	1	£20,149
OPEX				
Air Quality Monitoring (ongoing monitoring)⁹ (Including costs for Marlborough Street site)	£33,734	1	8	£269,869
Traffic Levels Monitoring (ongoing monitoring)	£50,000	1	1	£50,000
Economic Indicators (ongoing monitoring)	£25,000	1	1	£25,000
Active Modes (ongoing monitoring)	£25,000	1	1	£25,000
Staff (ongoing monitoring)	£54,587	0.37	1	£20,000
Sub-total monitoring and evaluation OPEX (for monitoring period)				£389,869

⁹ These costs include air quality monitoring up to and including one full year post the date of natural compliance.

Table 4-2: Air Quality Monitoring Revenue Costs

Year	Revenue cost
2021	£30,348.52
2022	£31,258.97
2023	£32,196.74
2024	£33,162.64
2025	£34,157.52
2026	£35,182.25
2027	£36,237.71
2028	£37,324.85

Table 4-3: Air quality monitoring costs (capital and revenue)

Item	Number	Cost Capital	Cost Revenue (pcm)
Marlborough Street continuous monitor and works	1	£14,027.00	
Replacement aircon at 4 years	1	£2,350.88	
Establish diffusion tubes	1	£1,885.63	
Decommission diffusion tubes	1	£1,885.63	
Change tubes and calibrate monitor	93		£942.82
Tube analysis	93		£306.90
Continuous analyser service contract	1		£250.00
Reporting and analysis	1		£935.67
Calibration gas	1		£20.00
Totals		£20,149.14	£2,455.38
Total to 2028		£20,149.14	£269,869.20

4.2 Timescales

A summary of data collection timescales is presented below:

- Stage 1 – Before opening– surveys pre-implementation
- Stage 2 – 1 year after full opening of the scheme – surveys in 2023
- Stage 3 – Ongoing monitoring until a year after natural compliance 2028

Air quality data and traffic flow, composition and speed data will be collected quarterly during stages 2 and 3.

4.3 Reporting

The evaluation and benefits realisation strategy and reporting will be managed by the BCC Project Manager, with support from relevant officers. They will ensure the plan is successfully completed in accordance with the quality assurance defined by BCC.

Central evaluation has been set up by JAQU in order to gain a better understanding of which schemes and policies work best in reducing nitrogen dioxide (NO₂) within England in the shortest possible time. JAQU has commissioned Ispos MORI, the Institute of Transport Studies (ITS), Enviro Technology Services and Air Quality Data Management in order to undertake the central evaluation.

Air quality data and traffic flow, composition and speed data will be shared with JAQU on a quarterly basis (at the end of March, June, September and December). Air Quality data will include information from real time monitoring and diffusion tubes, which will be provided to the central evaluation team. If available, historical data ATC and speed data (from 2015 or earlier) will also be submitted to the ITS within the first submission. This will include any historical air quality, ATC or traffic speed data. Air quality data will be submitted to JAQU in the format of the 'Air Quality Monitoring reporting template' provided within the guidance. ANPR data, alongside other traffic data including vehicular fleet information and walking and cycling counts, will be provided to the ITS.

Data and reports submitted to the central evaluation and ITS will be used by JAQU and BCC to adapt and improve their approach to the scheme and also will be used to assess how effectively Local Plans have been in meeting their aims. The findings of the central evaluation will be reported back to BCC through a quarterly newsletter to all Local Authorities, annual reports and individual reports from deep-dive and rapid-assessment case studies to Local Authorities. These reports are intended for internal use only. Learning from the central evaluation will be shared with other Local Authorities by JAQU.

BCC will also submit a report to JAQU outlining programme management factors including information on activity undertaken, financial spend, review of programme risks and performance against key indicators. These reports will be submitted quarterly.

BCC monitoring reports will be made available to stakeholders via the CleanAirforBristol.org website.

4.4 Governance

The evaluation and benefits realisation strategy and reporting will be managed in accordance with the management strategy and quality assurance defined by BCC within the FBC Management Case.

4.5 Risks and Mitigations

There are a number of risks associated with the completion of the monitoring and benefits realisation plan. These risks include:

- It is assumed that data from third parties will be available for use by BCC. For example, information from private companies (e.g. First data on bus patronage) and from other local authorities may not be made available by these organisations.
- Some publicly available data is only available with a minimum one-year lag. This could lead to some delay in the assessment when using data available in the public domain.

- Many of the variables being monitored within this plan are impacted by a large number of external factors. This is particularly true of economic factors such as retail footfall, which are likely to be affected by wider national and international policies and economic performance. To try to isolate and measure the explicit impact of the CAP, a benchmarking exercise will be undertaken to compare economic performance in Bristol against other comparable cities such as Cardiff and Manchester.
- It is assumed that the current BCC programme of air quality monitoring will be continued for the evaluation and benefits realisation period.
- Diffusion tubes are used by BCC to monitor air quality data; however, this method generally produces lower quality measurements than automatic monitors. This could reduce the accuracy of the air quality data collected

4.6 New Data Collection

This plan has been developed in a way that minimises additional data collection. Where possible, data has been sourced from data sets which are already collected as part of BCC and third-party organisation's ongoing operations. Efforts have been made to use monitoring outputs which can be used to assess multiple impacts and outcomes. Information on how data will be provided for each monitoring output (M1-M8) and whether new data surveys are required, is summarised in Table 4-4.

Table 4-4: Summary of new and existing data sets required for monitoring

Monitoring Outputs (M)	Stage 1 – before opening	Stage 2 – 1 year after opening	Stage 3 – 2-5 years after opening
M1 (Air Quality Data)	This data will be collected by BCC through a network of automatic and passive (diffusion tube) monitoring locations.	This data will be collected by BCC through a network of automatic and passive (diffusion tube) monitoring locations.	This data will be collected by BCC through a network of automatic and passive (diffusion tube) monitoring locations.
M2: Vehicular fleet information	Data available from ANPR survey undertaken as part of business case preparation	ANPR cameras installed to enforce the diesel ban and charging zones will provide this information	ANPR cameras installed to enforce the diesel ban and charging zones will provide this information
M3: Traffic flows	New traffic surveys will be required Data available through monitoring of Street Space Scheme Measures and existing traffic counts (see Section 3.3.1)	Data on traffic flows will be available from ANPR cameras installed to enforce the diesel ban and charging zones, alongside new traffic surveys in areas outside of these zones.	Data on traffic flows will be available from ANPR cameras installed to enforce the diesel ban and charging zones, alongside new traffic surveys in areas outside of these zones.
M4: Job seekers allowance information	Publicly available Job Seekers Allowance data will be available from NOMIS (ONS)	Publicly available Job Seekers Allowance data will be available from NOMIS (ONS)	Publicly available Job Seekers Allowance data will be available from NOMIS (ONS)
M5: UK business council data about changes in business	Publicly available business demography data from ONS	Publicly available business demography data from ONS	Publicly available business demography data from ONS

Monitoring Outputs (M)	Stage 1 – before opening	Stage 2 – 1 year after opening	Stage 3 – 2-5 years after opening
M6: Retail/business/office space vacancy figures	Data collected by BCC and property consultants as part of on-going processes.	Data collected by BCC and property consultants as part of on-going processes.	Data collected by BCC and property consultants as part of on-going processes.
M7: Walking and cycling counts	New surveys required Data collected as part of monitoring of Bristol Bridge Scheme will be used	New surveys required	New surveys required
M8: Stakeholder feedback from Council user group forums	Collected as part of BCC existing on-going consultation process	Collected as part of BCC existing on-going consultation process	Collected as part of BCC existing on-going consultation process

As summarised above, new data collection will only be required for monitoring outputs M1, M2, M3 and M7. Further details of transport and air quality data collection is set out below.

It is proposed that the following Air Quality data is collected:

- Air quality monitoring at 95 additional diffusion tube sites. Data will be collected pre implementation up until 2028.
- Establishment of a new continuous NOx air quality monitoring site on Marlborough Street, a key corridor where compliance is predicted to be late.
- Use of some existing BCC sites if locations are suitable

It is proposed that the following Traffic Data is collected:

- Repeat ANPR surveys for one-week pre-implementation, 2023, 2025.
- Additional ANPR surveys at 48 locations (those showing compliance issues in the OBC baseline in 2024) for one-week pre-implementation, 2023, 2025.

4.7 Benefits Register

A copy of the benefits register for the project can be found in Appendix A to this report.

Appendix A. Benefits Register

Name of scheme:		Bristol Clean Air Plan	Description of scheme:	Scheme to deliver compliance with NO2 air quality Limit Values within Bristol			Date Produced:	30/06/2021		Contact:	Name: Abigail Smith		Role: BCC Project Manager			
Benefit ID	Benefit Title and Description	Requestor	State	Link to Objectives (Project, Business, Strategic)	Benefit Owner	Planned Outcome	Stakeholders and Beneficiaries	Program/Project ID and/or Name	Measure Description & Expected Result	Baseline Measure	Measure Frequency	Actual Measures	Status	Expected Realisation Date	Actual Realisation Date	Benefit Action (if required)
D1	Deliver compliance with NO2 air quality Limit Values	BCC/JAQU	Active	Contributes to O1: Deliver compliance with NO2 air quality Limit Values and Air Quality Objectives in Bristol	SRO - Nicki Beardmore	NO2 will become compliant with legal limits within BCC	Individuals living or working within Bristol CAZ	Bristol Clean Air Plan	Measurement: M1 air quality data; M2 Vehicular fleet information; M3 traffic flows Expected result: NO2 value lower than 40µm/m3 within Bristol	Baseline measurement before scheme implemented	Baseline (pre-scheme) and then ongoing monitoring.	Pre-scheme	On Track	2023		
D2	Deliver compliance with NO2 Air Quality Objectives	BCC/JAQU	Active	Contributes to O1: Deliver compliance with NO2 air quality Limit Values and Air Quality Objectives in Bristol	SRO - Nicki Beardmore	NO2 will become compliant with legal limits within BCC	Individuals living or working within Bristol CAZ	Bristol Clean Air Plan	Measurement: M1 air quality data; M2 Vehicular fleet information; M3 traffic flows Expected result: NO2 value lower than 40µm/m3 within Bristol	Baseline measurement before scheme implemented	Baseline (pre-scheme) and then ongoing monitoring.	Pre-scheme	On Track	2023		
	Minimise the negative impacts and maximise the benefits of the scheme on local businesses	BCC/JAQU	Active	Contributes to O3: Overall neutral or benefit to the local economy	SRO - Nicki Beardmore	The local economy will perform as well as or better than comparator cities	Local businesses operating within Bristol	Bristol Clean Air Plan	Measurement: M4 job seekers allowance; M5 changes in business numbers; Retail/business/office space vacancy figures; M8 stakeholder feedback from council user group forums Expected result: measurements for Bristol follow similar trends as comparator cities	Baseline measurement before scheme implemented	Baseline (pre-scheme) and then annually for five years after scheme opening	Pre-scheme	On Track	2023		
D4	Minimise adverse impacts on traffic	BCC/JAQU	Active	Contributes to O1: Deliver compliance with NO2 air quality Limit Values and Air Quality Objectives in Bristol and O3: Overall neutral or benefit to the local economy	SRO - Nicki Beardmore	There will be minimal adverse impacts on traffic flows and congestion	Highway users within Bristol	Bristol Clean Air Plan	Measurement: M3 traffic flows; M8 stakeholder feedback from council user group forums Expected result: Traffic flows and congestion does not become significantly worse in certain locations compared to the expected situation without the CAZ	Baseline measurement before scheme implemented	At least 2 weeks during baseline monitoring (pre-scheme) and then continuously through permanent ATCs (analysed quarterly)	Pre-scheme	On Track	2023		
D5	Facilitate use of public transport and sustainable travel	BCC/JAQU	Active	Contributes to O1: Deliver compliance with NO2 air quality Limit Values and Air Quality Objectives in Bristol; O2: Minimise financial impacts of the scheme on low income households within Bristol; and O3: Overall neutral or benefit to the local economy	SRO - Nicki Beardmore	There will be increases in the number of individuals using public transport	Active transport and public transport users within Bristol	Bristol Clean Air Plan	Measurement: M7 walking and cycling counts; M8 stakeholder feedback from council user group forums Expected result: increases in the number of individuals using public/sustainable transport across the city	Baseline measurement before scheme implemented	Baseline (pre-scheme) and then annually for five years after scheme opening	Pre-scheme	On Track	2023		

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Bristol City Council Clean Air Plan

Analytical Assurance Statement

FBC-46 | 10

July 2021

Bristol City Council

Bristol City Council Clean Air Plan

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Jacobs

1 The Square, Temple Quay
 2nd Floor
 Bristol, BS1 6DG
 United Kingdom
 T +44 (0)117 910 2580

www.jacobs.com

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5	11/06/2020	Revised Draft	HO	CB/KT	HO	
6	12/02/2021	Revised Draft	HO	CB/KT	HO	
7	23/02/2021	Revised Draft	HO	CB/KT	HO	
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9	29/06/2021 v2	Revised Draft	HO	CB/KT	HO	
10	2/07/2021	Revised Draft	HO	CB/KT	HO	

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1. Overview

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 Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the COVID-19 pandemic. Recent research suggests that poor air quality may be correlated with higher death / infection rates from COVID-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill², to ensure that certain standards of air quality continue to be met, by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. 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 Bristol. 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 has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), and an Outline Business Case (November 2019 and updated between April and June 2020).

Following the submission of the BCC CAZ Revised OBC, further work was undertaken to develop the Full Business Case (FBC) and develop a new option, the Small Area CAZ D option. This work, and the option development work undertaken as part of the FBC is presented in an updated Option Assessment Report (Appendix C FBC-16).

Jacobs supported BCC produce a Full Business Case for the delivery of the Clean Air Plan (CAP). The FBC provides an assessment of the Small Area CAZ D Option, which includes the following measures:

- Small Area Class D (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs);
- Fast Track Measures:
 - Closure of Cumberland Road inbound to general traffic; and
 - Holding back traffic to the city centre through the use of existing signals.

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 Environment Bill 2019-21 <https://services.parliament.uk/bills/2019-21/environment.html>

The option modelling reflects the new baseline (with inclusion of Street Space schemes) as well as the Small CAZ D Option.

This Analytical Assurance Statement has been prepared in accordance with the requirements set out in the Joint Air Quality Units (JAQU) Evidence package of guidance. It considers the development of the base and baseline models, and the assessment of the shortlisted options. This version of the Analytical Assurance Statement is written to address issues raised by JAQU as part of their FBC review.

2. Limitations of the Analysis

2.1 **Has the analysis been constrained by time or cost, meaning further proportionate analysis has not been undertaken? Could this further analysis lead to a substantive change in the conclusions?**

Timescales for the project have been minimised as much as possible in order to comply with the Ministerial Directives, however this has not been at the expense of the quality of the traffic and air quality modelling. All modelling produced complies with JAQU guidance. In addition, the air quality modelling is compliant with Technical Guidance TG16, and the traffic modelling is largely compliant with TAG.

The air quality modelling has a greater level of detail in central Bristol where there are exceedances of the objective and at locations where there is the greatest traffic impact of the scheme. Outside of this area the model has a lower level of detail to reduce model run times to a manageable level. It is not anticipated that this assumption would substantially alter the outcome of the analysis.

The transport models used to assess the schemes were developed prior to the option development work, and in fact years before the study itself. If a modelling suite were developed for the sole purpose of assessing the options in the OBC and FBC, the models could have been structured to better reflect vehicle fuel types and CAZ vehicle compliance. However, using data collected during the study it has been possible to disaggregate the model in order to reflect vehicle fuel types and CAZ compliance in such a way that model validation has not been materially affected.

It is not anticipated that the assumptions outlined above regarding the modelling methodology will substantially alter the outcome of the analysis.

2.2 **Does the analysis rely on appropriate sources of evidence and underpinning assumptions?**

The project has made best use of data sources available at the time of assessment. The key data sources are discussed below, and a rating is provided to indicate the quality of the data source.

Since March 2020, there has been a reduction in traffic levels due to the COVID-19 lockdown restrictions. There are associated uncertainties about the impact of this on air quality in the future; for example, in terms of fleet renewal, levels of home working, use of public transport, etc. During the assessment more indications of the impacts of COVID-19 were available, but the full impact is unclear as the pandemic continues to influence transport, society and the economy. The impacts of COVID-19 have been considered in the following narrative about the evidence and assumptions.

2.2.1 **ANPR surveys**

The local fleet has been established from ANPR surveys, undertaken from 18th to 24th July 2017 . The survey covered all major routes into the city and captured traffic movements both into and out of 3 different cordons. Unfortunately, due to programme pressures at the time it was not possible to undertake the surveys during a neutral period. However, Bristol City Council has a number of permanent cameras located across the city. Data from the same period as the additional ANPR survey (July) and from a neutral period (June) has been analysed and found that the differences in fleet mix between the neutral and unneutral periods are minimal. As such, the ANPR survey data is considered to be reliable evidence of the fleet composition within Bristol. The ANPR data collected in 2017 is still considered a reasonable representation of the travel patterns at the time.

Rating: HIGH reliability rating

2.2.2 **Age of the transport base model**

The original 2013 base year traffic model was developed with, and validated against, a comprehensive set of traffic surveys conducted in 2013 in accordance with TAG criteria. This model has been used, combined with the development and highway changes, to develop a 2015 model for use in this study. The modelling work for the

OBC commenced in 2018, and during scheme development the model has become more dated. Due to the age of the model, checks were undertaken on traffic flows and speeds at locations where air quality was considered to be poor based on local monitoring data (i.e. critical locations). This is considered to be good modelling practice. Because of the discrepancies identified, adjustment factors were applied to the 2021 transport model outputs, and to subsequent modelled years, i.e. 2023 and 2031. This is considered to make best use of the modelling tools available. Traffic models in general have inherent inaccuracies but application of specific correction factors is considered to improve the accuracy of the results. This work is documented in the FBC-23, the transport modelling methodology report (T3). A check of model fit against traffic data was also undertaken for Church Road since this was identified as a critical location outside the scheme area. It has not been possible to take into account the correction factors at other locations on the network. However, it is noted that since the factors had the effect of bringing forward the compliance year then if corresponding adjustments were made elsewhere they would not be expected to give rise to a worsening of predicted concentration levels and therefore would not be expected to affect the conclusions of the study. Whilst it is recognised that the model is over 6 years old, the additional adjustments applied are considered to be reliable evidence for use in the study.

Rating: MODERATE reliability rating (when localised adjustments have been applied).

2.2.3 Transport model forecast assumptions

The transport model forecasts use information from the Emissions Factor Toolkit (which is discussed below) and local/regional growth assumptions. All sources of information that were used to prepare the forecast models (2021, 2023 etc) were done so without the inclusion of the impacts of COVID-19.

Bristol City Council have collated traffic and air quality data to consider the impact of the COVID-19 pandemic. This work is detailed in the Clean Air Zone Board Report – Traffic Behaviour 2019-2020 (Appendix S of the Option Assessment Report). Combining the evidence base available for both traffic volumes and air quality before, during and post lockdowns, the work concluded that the evidence shows a decline in traffic volumes and improvements to air quality during the first lockdown in particular. The second lockdown however, was less restrictive than the first and as such didn't lead to such a steep decline in traffic volumes. Following lockdown 2 and a subsequent transition between tiers 2 and 3, traffic numbers appeared to have returned to that of a similar pattern to pre-lockdown and a worsening of air quality in some parts of the city.

For comparative purposes, data from October 2019 and October 2020 was considered, as October 2020 was the key period when traffic had most chance to return to normal levels; before the lockdown 2 and Christmas period changed things again. This showed that traffic in the critical locations during October 2020 was 82% of that same time the previous year.

Taking everything into consideration, it was concluded that with some areas of the city back to near normal traffic levels (although not all), that compliance will not be achieved at a small number of key sites by non-charging measures alone and therefore this means that annual compliance will not be met.

In addition to the matters set out above, the forecasting work assumes that the scheme will be implemented in October 2021. It is likely that this will move to summer 2022 resulting in the exemptions being in operation in the first part of 2023. Mitigation measures will be offered in advance of the go live date, reducing the likelihood of compliance being impacted.

Rating: LOW reliability rating

2.2.4 Fleet projections (fuel split and Euro standard split)

The best available evidence has been used, as specified by JAQU. Both the traffic model/emissions and air quality model meet the quality criteria provided by JAQU. Local fleet composition data were derived from an analysis of ANPR data across the study area.

One of the sensitivity tests undertaken integrated a one-year delay in the fleet improvement to simulate one possible post-COVID-19 / lockdown scenario whereby the vehicle fleet does not upgrade as quickly as anticipated. The results of this indicated that compliance would not be achieved in 2023 on Rupert Street or

Marlborough Street. It should be noted though, that this model scenario does not take potential decline in traffic volumes into account, which may offset the impact on air quality of the delay to fleet improvement to some extent.

Emerging national evidence suggests that the fleet turnover is slower than the 1 year delay sensitivity test, and thus:

Rating: LOW reliability rating

2.2.5 Traffic speeds

Speed data is taken from the traffic model. Alternative sources of speed data are available for the base year, for example Traffic Master or surveys, but such sources would not provide speed data for forecast years or for option assessments. Journey times within the traffic model have been validated, giving some confidence in the modelled speeds, however this validation necessarily covers a limited number of routes. A comparison between modelled speeds and TrafficMaster data was undertaken as described in the section relating to the "Age of the model" Rating: MODERATE reliability rating.

2.2.6 Stated Preference Surveys

A local Stated Preference survey was undertaken to establish the response rates of Cars and partially inform the response rates of other vehicle classes. The survey was undertaken by an online market research panel and targeted at a demographically representative sample of panel members in Bristol and the surrounding area. 1160 questionnaires were completed, and the data provided good coverage in terms of ages, trip travel purposes and origins. Stated Preference surveys do have limitations in that they rely on participants to make predictions about their future behavioural responses and there is often some difference in these predictions and how people actually respond. However, without these surveys, the analysis would have relied on stated preference work undertaken for London which has a number of differences to Bristol in terms of demographics, travel patterns and travel options. Therefore, the use of locally collected data is considered more appropriate.

For HGVs, local information regarding responses to a charging CAZ was not available hence the analysis used responses identified in the JAQU Evidence Package. This introduces some uncertainty regarding how well the JAQU data relates to local responses for Bristol. However, it can be seen that there is reasonable agreement between the evidence package responses and the Stated Preference results for cars and LGVs, providing increased assurance of the applicability of the JAQU data for HGVs.

The Stated Preference survey results do not differentiate between responses for LGV respondents who own the vehicle versus LGV respondents who operate the vehicles on behalf of large companies.

The Stated Preference surveys were conducted before the COVID-19 pandemic and therefore do not reflect the changes in attitude towards financial ability to upgrade vehicles, public transport provision, the perception of the safety of public transport and opportunities to work at home.

Rating: LOW reliability rating

2.2.7 Emissions Modelling

Emissions modelling was undertaken following guidance provided in the JAQU Evidence Package. The Emissions Factor Toolkit (EFT) used throughout the life of this project is version v8.0.1.a, which was the most up to date version when the modelling work started. Since then, versions 9 and 10 of the EFT have been released. The Air Quality Team applied the EFT to generate emissions rates using emission functions which have been consistent through subsequent versions of the tool. User defined fleets were compiled by the transport team using EFT version 9. These updated fleets were then pasted and applied to EFT v8.0.1.a. To summarise;

1. Traffic information was provided as compliant and non-compliant flows and fleet proportions based on EFT version 9.1b. The flows were AADT.

2. The data were pre-processed to the precise EFT format and then copied into the EFT (both flows and euro proportions)
3. EFTs were then run and then gradient factors applied to the compliant and non-compliant outputs.
4. The output NO_x emission rates from (3) were then post processed to derive NO₂ annual mean concentrations using the Jacobs bespoke rapid dispersion modelling technique

Rating: MODERATE reliability rating

2.2.8 Air Quality Model

The air quality modelling has been undertaken using ADMS Roads v4.1 and v4.2 (a precursor to v5). The ADMS Roads model is widely used for air quality modelling and assessment, particularly in relation to planning applications within the UK. Use of this model is in line with JAQU guidance.

The base year air quality models rely on Defra's EFT, and other Defra tools to provide background concentrations, convert NO_x to NO₂, and incorporate location specific primary NO₂ fractions. As a result of the 2015 verification year, the tools used all had to be compatible with the 2015 background maps. These are industry standard tools, and usage of them follows best practice as well as recommendations within the JAQU guidance.

The model contains assumptions concerning the following:

- Canyon effects
- Air turbulence caused by vehicles
- Meteorological data

Modelling was undertaken at a number of receptors in a range of environments, reflecting the risk assessment of achieving compliance with the AAQD. The approach utilised an ADMS output which produced a result for each source receptor combination. This facility was embedded into a new processing tool providing rapid NO_x concentrations at each receptor based on the change in emission rates for any given scenario. The process was equally replicated for verification purposes to include dispersion model performance. Although the version of ADMS BCC used had the new canyon tool, BCC factored the canyon results into the processing tool to account for this change, so we're effectively still using ADMS Roads v4's canyon tool.

Rating: Overall MODERATE reliability rating

2.2.9 Use of 2015 air quality data

The base year air quality model also relies heavily on the 2015 air quality monitoring data which is used to verify the ADMS model. This data is collected across the city, in accordance with procedures outlined in LAQM TG16, with diffusion tubes bias adjusted in line with current guidance. The level of confidence in the verification process is necessarily enhanced when data from a number of automatic analysers have been used, as was the case in this assessment. It is therefore considered to be reliable evidence. Rating: HIGH reliability rating.

2.2.10 Summary

A comprehensive assessment of the evidence and underpinning assumptions has been undertaken by the project team in order to establish the quality of the base/baseline modelling and to consider the sensitivity tests which may be appropriate within the Full Business Case. The table below summarises the key assumptions which relate to the base and baseline modelling, along with a rating of reliability.

Assumption	Source	Reliability Rating
Base year fleet composition	ANPR data	High
Base year traffic flows	GBATs traffic model	Moderate (with localised adjustments)

Assumption	Source	Reliability Rating
Fleet projections (fuel split and Euro standard split)	EFT projections applied to ANPR data	Low/Moderate
Growth in traffic flows	TEMPRO v7.2 and other sources	Low/Moderate
Traffic speeds	GBATs traffic model	Moderate
Behavioural response to CAZ	SP and JAQU data sources	Low
Background concentrations	Defra maps (modelled) adjusted with local monitoring	Moderate
Measured concentrations	Diffusion tube and real-time monitoring sites	Moderate
Canyon effects	ADMS canyon definition (latest module)	Moderate/Low
Road widths	OS mapping	High
Gradients	Lidar	Moderate
Primary NO ₂ Fraction	EFT	Moderate
Meteorological data (2015)	Meteorological office (via a supplier)	Moderate/Low

3. Risk of Error / Robustness of Analysis

3.1 Has there been sufficient time and space for proportionate levels of quality assurance to be undertaken? Have sufficient checks been made on the analysis to ensure absence of errors in calculations?

Quality Assurance (QA) plays an essential part in any analytical project and allowing sufficient time for appropriate quality assurance processes has been a priority within the project team. Effective QA ensures that decisions are made with an appropriate understanding of evidence and risks, and helps analysts ensure the integrity of the analytical output. Jacobs have a robust QA System certified under ISO9001.

Extensive QA has been undertaken on the traffic and air quality models by staff who are independent of the model development team. The models for this project are complex and include thousands of individual road-links. As such, there is a large amount of data and in order to check individual links a series of flags are incorporated into the process. These flags include predetermined thresholds. Whilst not full proof it does allow specific results to be highlighted for re-examination. In addition, checks have focused on methodologies, model set-up, model calculations, consistency of inputs using sample data at key locations, and sense checks of model outputs using sample data at key locations. Checking has covered all model inputs and outputs.

Wherever anomalies have been identified both from manual and automatic processes further checks have been undertaken to explore for errors in the data or calculations. The study team produced a series of technical notes required to ensure that the approach reflects guidance issued by JAQU.

This system is proportionate to the time and budget available, and the decisions been made based upon the model outputs. As such, the accuracy of the model results is expected to be reasonable and consistent. However, it is not an absolute guarantee that there are no errors within the model.

3.2 Have sufficiently skilled staff been responsible for producing the analysis?

All members of staff used in all aspects of the modelling are suitably qualified, the majority being senior consultants and above, reflecting the complexity of the modelling and the need for robustness of outcomes. The project has oversight from senior members of staff in all areas (traffic modelling, air quality modelling and economics) who are able to call on their extensive modelling and project experiences to guide the assessment process.

4. Uncertainty

4.1 Is the level of uncertainty proportionate to the decision being made at the time of the Full Business Case?

There are many components that contribute to the uncertainty of modelling predictions. The dispersion model used in this assessment is dependent upon the traffic data that have been used to calculate emission rates, which will have inherent uncertainties associated with them. There are then additional uncertainties, as models (both traffic and air quality) are required to simplify real-world conditions into a series of algorithms.

However, these uncertainties are not specific to this project, and are inherent in any traffic and/or air quality modelling project. The development of the base and baseline models has followed government guidance and best practice throughout in order to minimise the level of remaining uncertainty.

The base year modelling, both traffic and air quality, has been verified against recent and reliable observed/monitored data, providing reasonable confidence in the 2015 model. Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions.

For air quality the dispersion modelling output in the base year 2015 was compared with 80 diffusion tube monitoring sites and 5 automatic monitoring sites. It is always useful to examine whether the dispersion model performs differently depending on spatial or physical attributes (e.g. certain road types or traffic situations). The preference is to apply a global adjustment so that the certainty in the performance of the model is not unduly biased geographically. In other words, there is a fair spatial distribution in over and underperforming receptors. The performance of the Bristol model was found to be reasonably good with global adjustment applied.

The level of uncertainty within the base and baseline modelling has been minimised as far as possible and is suitable for decision making in the Bristol Clean Air Plan. However, it is recognised that COVID-19 results in some new uncertainty in the forecasted impacts.

To assess the uncertainty further, a series of sensitivity tests were undertaken on both the models of the baseline and preferred option as part of the Outline Business Case submitted to JAQU in October 2019 and May 2020, as reported below.

Full details of this assessment are provided in FBC-31 'Sensitivity Test report' appended to this report. A summary of the key results of the FBC sensitivity tests is provided below.

Test	Section Number	Summary	Key Results
October 2019 tests			
Uncertainties in the Traffic Modelling			
HGV adjustment factors	2.2.1	HGV flow adjustments were made on links with significant differences in modelled flows compared to observed counts. These adjustments were carried through to future years for both the baseline and Core scenario.	The statistics indicated that removing HGV adjustment factors had a negligible impact on NO ₂ concentrations at reportable receptors. The maximum NO ₂ concentration increased by one tenth of a microgram resulting in the gap between exceeding the Limit Value narrowing slightly.

Test	Section Number	Summary	Key Results
HGV adjustment factors	2.2.1	HGV flow adjustments were made on links with significant differences in modelled flows compared to observed counts. These adjustments were carried through to future years for both the baseline and Core scenario.	The statistics indicated that removing HGV adjustment factors had a negligible impact on NO ₂ concentrations at reportable receptors. The maximum NO ₂ concentration increased by one tenth of a microgram resulting in the gap between exceeding the Limit Value narrowing slightly.
Fleet Composition: Splits by Fuel Type	2.2.2	A test to examine the differences in annual mean NO ₂ concentrations between the Core Scenario modelled using fuel splits derived from the TAG Databook and new information provided in the EFT v9.1b	If the EFT V9.1b fuel splits are used then the 2027 Core scheme would be compliant by a greater margin (-2 µg/m ³), with a maximum exceedance of 38.0 µg/m ³ . The revised fuel splits are considered to be more robust than the TAG Data Book
Behavioural Responses to Charging	2.3.1	Defined pessimistic and optimistic response rates based on confidence intervals of SP survey statistical modelling and adjusted assumptions for other vehicle types. Compared NO ₂ concentrations to Core scenario.	The results for the high and low scenarios are very similar and overall, the 'Central' scenario is most representative. The conclusion of compliance is thus considered appropriate.
Uncertainties in the Air Quality Modelling			
Euro 6 Vehicles	3.1.1	The EFT is based on COPERT 5 which predicts different NO _x emissions from Euro 6 diesel vehicles registered in different years (based on the expectation that Euro 6 emissions will reduce over time). Sensitivity test outlined in JAQU's 'Supplementary Note on Sensitivity Testing' has been run.	The results indicate that the central case assumption represents with reasonable certainty the range of expectant Euro 6 variance of NO _x emissions from diesel light duty vehicles.
Emissions at Low Speeds	3.2.1	JAQU has set out a methodology to assess the uncertainty of emissions from vehicles travelling at low speeds in their 'Supplementary Note on Sensitivity Testing' which involves using a polynomial equation provided by JAQU which is based on using the COPERT emissions functions beyond their intended speed ranges.	There is little or no difference between the 'High' and 'Central' predictions, with a difference of -1.3% as a maximum percentage gap from compliance. The 'Low' scenario also predicts similar concentrations. In all three scenarios, the 2027 Core scenario is compliant.
Background Concentrations	3.3	To test the sensitivity of results to calibration adjustments made to the 2015 Defra modelled background concentrations (these being based on COPERT5 emission factors) compared with local NO ₂ monitoring results.	Without a local calibration factor being applied to Defra's national pollution background maps, the predicted concentrations are generally lower than if backgrounds are calibrated, receptors remain compliant.
Model Verification	3.4	The model verification for road NO _x and subsequent NO ₂ on roads adjacent to monitoring sites was thoroughly tested and included comparing a zoned with a global approach. The verification factor applied to all receptors was 2.28 and was based on 85 sites. The zonal approach considered non-gradient roads, gradient roads and Rupert Street which has very specific air quality issues.	There was no justification for sensitivity testing the verification for any other parameters.

Test	Section Number	Summary	Key Results
Gradients	3.5.1	JAQU has set out a methodology to assess the uncertainty of vehicles travelling on gradients in their 'Supplementary Note on Sensitivity Testing' and suggest that LAs run a sensitivity test around gradient-based emission factors by removing the impact of modelling gradients if gradients were modelled in the 'central' scenario.	The results of the sensitivity tests for a 2027 Core scenario indicate that overall gradient has little impact on the results. Clearly, were specific links to be analysed where gradients are evident the results would show greater differences. There was a slight reduction in the mean and the maximum annual mean NO ₂ concentrations, all receptors remained compliant
Primary NO ₂ Fraction	3.6.1	There is emerging evidence that the average primary NO ₂ fraction (f-NO ₂) in exhaust emissions from road vehicles has begun to decrease in recent years. This is not taken into account within the EFT, as used for the air quality modelling. To account for this, JAQU suggest that a sensitivity test be carried out whereby the f-NO ₂ values are reduced by 40% in the future projected year.	If the f-NO ₂ values are reduced by 40% then the predicted concentrations are slightly lower, with the maximum predicted concentration being 4 µg/m ³ lower than the 'Central' scenario. This suggests that an earlier year to the predicted 2027 could be compliant if f-NO ₂ values decrease in accordance with this assumption. On this basis, the 'Central' scenario with a 2027 compliant year is considered to be robust.
May 2020 tests			
Behavioural Responses to Charging	4.2	Defined pessimistic response rates based on confidence intervals of SP survey statistical modelling and adjusted assumptions for other vehicle types. Compared NO ₂ concentrations to Medium C + Small D scenario.	Air quality is likely to be adversely affected with the mean concentration increasing by 0.2µg/m ³ and the maximum by 0.5 µg/m ³ . In terms of the compliance year, the 'pessimistic' scenario puts compliance back to 2024 from the 2023 Core estimate
P&R Decremental Test *	4.3	Removal of the M32 P&R but retained bus lane. Compared NO ₂ concentrations to Medium C + Small D scenario.	Air quality would be adversely affected with the mean concentration increasing by 0.1µg/m ³ and the maximum by 0.4 µg/m ³ . In terms of the compliance year, the 'decremental' scenario would put compliance back to 2024 from the 2023 Core estimate
Age of Transport Model	4.4	Traffic flow and speed adjustments were made on critical links in terms of Air Quality. Compared NO ₂ concentrations to Medium C + Small D scenario.	Air quality is likely to improve slightly. However, across the study area these changes were marginal as shown by the mean remaining the same as the Core scenario. The maximum concentration is reduced by 1.4 µg/m ³ . In terms of the compliance year, the 'speed and flow' scenario brought compliance forward to 2022 from the 2023 Core estimate.
Revised Boundary around St Philips Causeway *	4.5	Changes made to the Medium CAZ boundary to exclude St Philips Causeway. Compared NO ₂ concentrations to Medium C + Small D scenario.	Air quality is likely to improve very slightly. The change in concentration across the range of statistics was approximately 0.1µg/m ³ . In terms of the compliance year, the 'revised boundary' scenario had no effect on the compliance year.

Test	Section Number	Summary	Key Results
Diesel Car Ban Test	4.6	Defined adjusted response rates related to linked trip and time of day assumptions. Compared NO ₂ concentrations to the Revised Hybrid	For this test, air quality improved very slightly. The change in the annual mean concentration across remained the same however the maximum concentration reduced by 0.7 µg/m ³ . In terms of the compliance year, the 'diesel ban sensitivity' scenario pushed the compliance back to 2024 from the Core scenario at Marlborough and Baldwin Street.
Uncertainties in the Air Quality Modelling			
Euro 6 Vehicles	3.1.1	The EFT is based on COPERT 5 which predicts different NO _x emissions from Euro 6 diesel vehicles registered in different years (based on the expectation that Euro 6 emissions will reduce over time). Sensitivity test outlined in JAQU's 'Supplementary Note on Sensitivity Testing' has been run.	The optimistic Euro 6 scenario was predicted to reduce the maximum concentration by approximately 3 µg/m ³ , whereas the Euro 6 pessimistic scenario predicted a near 4 µg/m ³ increase. In terms of the compliance year, the 'Euro 6 pessimistic' scenario pushed the compliance year back beyond 2025 at the Marlborough Street and Baldwin Street critical locations and forward to 2021 from 2023 at 5 critical locations...The results indicate that the central case results are sensitive to the optimistic and pessimistic assumptions made for changes to Euro NO _x emissions standards expected from diesel light duty vehicles.

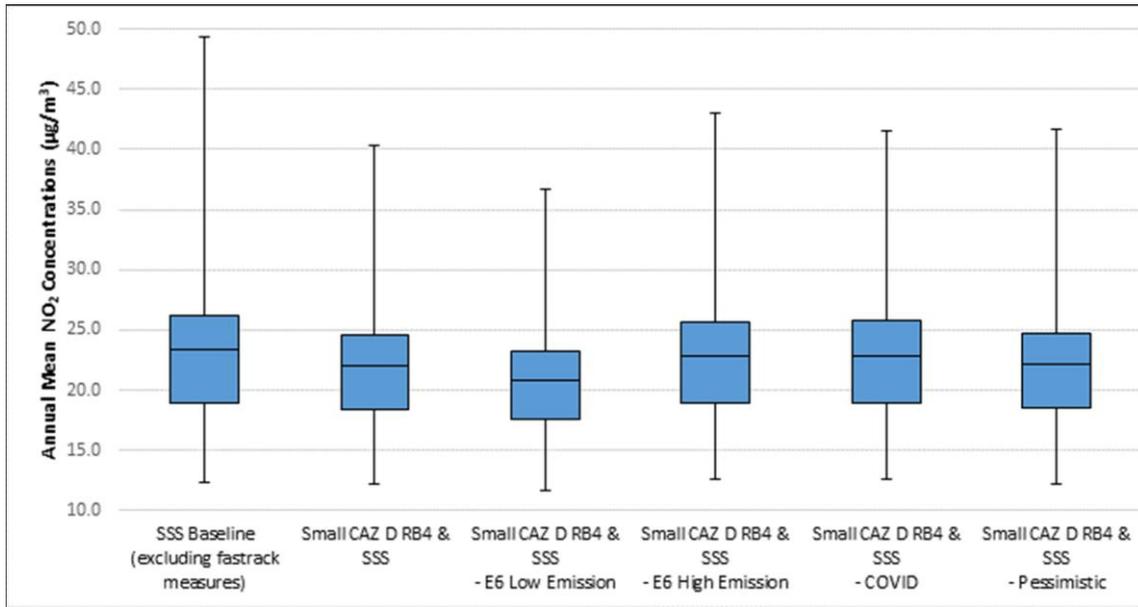
*These tests are not applicable to the Small CAZ D option

In summary, a wide range of sensitivity testing were undertaken which showed both compliance and non-compliance with the Ambient Air Quality Directive limit value. Whilst this demonstrates that there was some variability within the results (as would be expected in any modelling process), the likelihood of compliance and non-compliance occurring was fairly similar, even when taking into account cumulative aspects. There was emerging evidence that the average primary nitrogen dioxide fraction (f-NO₂) in exhaust emissions from road vehicles has begun to decrease in recent years, and the sensitivity testing has demonstrated that this may result in lower concentrations in some locations; this assumption was a noticeable uncertainty associated with the modelling.

Following the submission of the BCC CAZ Revised OBC in April/June 2020, further work was undertaken to develop the scheme, and this work resulted in the development of a new option, the Small area CAZ D option. This work, and the option development work undertaken as part of the FBC is presented in an updated Option Assessment Report (Appendix C FBC-16). The results of sensitivity testing work supporting this new option is summarised below.

Test	Section Number	Summary	Key Results
Behavioural Responses to Charging	4.2	Defined pessimistic response rates based on confidence intervals of SP survey statistical modelling and adjusted assumptions for other vehicle types. Compared NO ₂ concentrations to Small D scenario.	Air quality is likely to be adversely affected with the mean concentration increasing by 0.1 µg/m ³ and the maximum by 1.3 µg/m ³ . The compliance year is pushed back beyond 2023. This test illustrates the "breaking point" of the scheme as it shows that adjusting the response rates based on the Stated Preference survey confidence limits will delay the scheme compliance beyond 2023.
One Year Fleet Delay Test	4.3	One-year fleet renewal delay undertaken as a sensitivity test due to the potential effects of COVID-19 on the natural fleet turnover through time.	Air quality is likely to be adversely affected across the whole model domain, with the mean concentration increasing by 0.8 µg/m ³ and the maximum by 1.2 µg/m ³ . The compliance year is pushed back beyond 2023.
Uncertainties in the Air Quality Modelling			
Euro 6 Vehicles	3.1.1	The EFT is based on COPERT 5 which predicts different NO _x emissions from Euro 6 diesel vehicles registered in different years (based on the expectation that Euro 6 emissions will reduce over time). Sensitivity test outlined in JAQU's 'Supplementary Note on Sensitivity Testing' has been run.	The Low Emission Euro 6 scenario was predicted to reduce the maximum concentration by 3.6 µg/m ³ , whereas the Euro 6 High Emission scenario predicted a 2.7 µg/m ³ increase. In terms of the compliance year, the High Emission scenario pushed the compliance year back beyond 2023 at the Marlborough Street critical location. The Low Emission scenario may have brought the compliance year forward from 2023, although without other modelled years for this scenario, it is not possible to tell. The results indicate that the central case results are sensitive to changes in Euro 6, 6c and 6d proportions and the associated NO _x emissions standards expected from diesel light duty vehicles.

Further to the information presented in the sensitivity test report, the figure below provides an overview of performance resulting from each of the sensitivity tests considered. Results should be compared against the box plot second from the left. Box plots are a simple way of representing several statistical parameters simultaneously (i.e. minimum, maximum, average/median, first quartile, and third quartile.). The number of observations upon which these statistics are based equal 1399 receptors. The plots indicate range of concentrations, the average represented by the horizontal line in the blue box and the difference between the average, Q1 and Q3 is represented by the extents of blue box. The number of observations within quartiles are the same across all scenarios because the receptors remain the same. The statistics indicate that the high Euro 6 and COVID response increases the overall annual mean NO₂ concentration (i.e. max and minimum). The mean minus Q1 and Q3 are largely unaffected. In general, the statistics assured that the range of likely behaviour response to affect the compliance year compared to the core scenario are likely.



5. Use of Analysis

5.1 Does the evidence provided support the business case? Is there evidence the agreed target will be achieved?

5.1.1 'Bristol CAZ Air Quality Modelling Review' undertaken for the OBC by AQC

Air Quality Consultants Ltd (AQC) were commissioned to undertake a high-level review of air quality modelling for the Bristol CAZ. The review considered:

- Modelling methodology and Quality Assurance procedures (with specific reference to the appropriateness of the dispersion modelling methodology);
- Model setup, focusing on areas driving compliance, the factors behind this and whether factors are specific to Bristol or caused by model setup or assumptions; and
- Provide general comments on air quality aspect of the work undertaken.

In its review of the verification process, AQC noted that there is no evidence that an overall bias exists in the modelling setup that results in over- or under-predicting of impacts, notwithstanding that the model uses a single adjustment factor derived from all the monitoring sites together to control its base concentrations. Model simplifications do cause the model to over- and under-predict in some locations, but there is no systematic bias either way. Advice for future modelling is to ensure that model parameters such as specific details of receptors and locations (e.g. canyon dimensions), are correct.

Some of the key links that had either monitored or modelled high concentrations of NO₂ were subject to specific consideration and review of how monitoring and modelling results relate to each other and are subject to uncertainty feeding through to assessments. This is summarised below.

Location	AQC comments	AQC recommendations
A420 Church Road in St George	2015 modelled concentrations worse than measured, and considered over-estimates – in general, measured concentrations are compliant Set up of canyons potentially important Modelled traffic more than published counts (though counts not considered definitive)	No specific changes recommended, but consider canyon impacts Diffusion-tube monitoring of A420 to check measured concentrations Run a sensitivity test with different traffic figures, potentially changing canyon parameters at the same time
Marlborough Road (past Bristol Royal Infirmary and Children's Hospital)	Both monitoring and modelling show exceedances No particular concerns about modelling as this is a location where high concentrations would be expected	No modelling issues Marlborough Road is a particular issue that will need resolving
Park Street	No monitoring nearby to compare with modelling, but results seem higher than might be expected Traffic speeds were considered too slow and canyon effects are particularly important in driving results (as canyons may be too high)	No immediate recommendations, but canyon heights should be reviewed and a sensitivity test with lower heights considered
A38 Parson Street	Modelling is under-predicting compared to monitoring at two diffusion tubes However, nothing was identified that would cause this differential (traffic data, gradients and speeds are reasonable, though canyons would be more accurately represented)	No specific recommendations for modelling improvements, other than potentially to review canyon details Investigate impacts of the scheme at monitored locations which modelling under-predicts, to see whether reductions predicted by the model would bring monitored concentrations into compliance And careful consideration of future monitoring data also suggested

Location	AQC comments	AQC recommendations
Lower Ashley Road	Location where monitors are measuring exceedance and modelling under-predicts No obvious modelling causes for this identified, though canyons could be considered in more detail	No particular action, but careful consideration of future monitoring data suggested

The review also identified some receptors that were modelled to have large changes in concentrations between 2015 and 2021 baselines, which were not necessarily expected. Most of these resulted from either mis-matches of link IDs between the traffic and air quality models or changes in road layout (in turn affecting link IDs). Large changes in traffic volume were also causes of commensurately large changes in concentrations; notable locations were on the A4174 and Park Street (though at the latter no conclusive reasons were identified as to why this resulted in a disproportionate increase in concentrations). No locations were deemed critical to the outcomes of testing, so no actions are recommended, but changes could be made if the model is improved in future. Park Street is an exception in that it is a notable location for comparison between monitoring and modelling, and hence also discussed in the table above.

The interpolation process (between 2021 and 2031 model years) was queried, as linear interpolation has been employed to date. The review concluded that a non-linear approach could suggest an earlier compliance year. This was not considered to necessarily change the definitive assessment of compliance year, but moreover to steer the modelling team to an interim modelled year of 2025.

In summary, AQC's overall conclusions were that:

- Assessment of the compliance year for Bristol CAZ could be conservative (based on specific locations and interpolation as noted above);
- There is no overall bias in modelling (to over- or under-predict concentrations), though some specific locations will need particular reference and comparison between modelled and monitored results, and care should be taken in using this information for identifying location-specific measures accordingly (further modelling and/or monitoring is recommended at Church Road, Park Street and Parson Street);
- An interim model year of 2025 (between 2021 and 2031) should be employed to assess compliance (largely as a result of conservative linear interpolation previously being employed); and
- Also noted that Defra uses 40.4 $\mu\text{g}/\text{m}^3$ as compliant with the Limit Value when reporting to the European Commission, and that this could be used (instead of the 39.9 $\mu\text{g}/\text{m}^3$ limit currently used).

5.1.2 Air Quality Modelling Results for the Small CAZ option

The aim of the Bristol Clean Air Plan is to achieve compliance with the annual mean NO₂ EU Limit Value in the shortest possible timeframe, which is in line with Guidance provided by the JAQU. To this aim, the Small Area CAZ D (and fast track measures) scenario reported in this assessment is evidence based and has evolved over time with a focus on where improvements were needed most.

The main focus areas preventing earlier compliance were Marlborough Street, Upper Maudlin Street and Baldwin Street. The Small Area CAZ D achieves compliance on Marlborough Street in 2023. Compliance on Upper Maudlin Street is estimated to be 2021. Street space schemes in place on Baldwin street alone achieve compliance at this location by 2021. Overall, this scenario achieves compliance by 2023 across the whole of BCC.

With regards to individual receptors, the Small Area CAZ D improves annual mean NO₂ concentrations at 1,153 and 1,059 of the reportable receptors within Bristol in 2021 and 2023 respectively, whilst increasing concentrations at 9 and 7 receptors respectively in these years. The number of receptors that modelled improvements vastly outweighs the number that modelled disbenefits and the disbenefits do not push back the compliance year. By 2031, there are a larger number of disbenefits (76) predicted, which is attributable to the net disbenefit of the fast track measures and other non-charging measures over a largely redundant Small CAZ D by this year. However, these are not anticipated to result in non-compliance with the EU Limit Value. Uncertainty in

the modelling was approximately $7 \mu\text{g}/\text{m}^3$ and hence caution is recommended in terms of the anticipated outcomes of this study.

Overall, the Small Area CAZ D scenario is the most successful scenario assessed to date and aims to achieve compliance across BCC by 2023.

6. Summary

This Analytical Assurance Statement for the Bristol Clean Air Plan outlines the main limitations, risks, uncertainties within the assessments undertaken, and the suitability for use. All questions set out by JAQU in the Evidence Package of guidance have been answered comprehensively within this document.

The assessments for the Clean Air Plan have been undertaken with appropriate sources of data, and any limitations and risks with the data sources or methodologies have been identified. A full range of sensitivity testing was completed for the Full Business Case to assess the impact of altering key assumptions on the outcomes of the modelling.

The Small CAZ D modelling and sensitivity work shows:

- The scheme has a modelled compliance year of 2023;
- If the behavioural response to charging is not as great as anticipated, compliance is less likely to be achieved in 2023;
- If there is a one-year delay in fleet improvement, compliance is less likely to be achieved in 2023; and
- The modelling is sensitive to changes in Euro 6 / 6c / 6d proportions and associated emissions. Should the emissions be higher than anticipated, compliance is less likely to be achieved by 2023. On the other hand, if the emissions are lower than anticipated, compliance by 2023 would be more likely, or even brought forward to earlier 2023.

The COVID-19 pandemic has affected the reliability of a number of the sources of information that were used in the transport forecasting work. The validity of the Stated Preference surveys will be affected by the transport and socio-economic changes associated with the pandemic. Furthermore the EFT forecasts of fleet changes will also be impacted by the pandemic. Both underpin the analysis and the uncertainty is likely to affect the compliance year of the Small CAZ D option.

Appendix A - FBC-31 'Sensitivity Test report'



Bristol City Council Clean Air Plan Final Business Case

Sensitivity Testing Report

FBC 39

February 2021

Bristol City Council

Sensitivity Testing Report

Bristol City Council Clean Air Plan Final Business Case

Project No: 673846.ER.20
 Document Title: Sensitivity Testing Report
 Document No.: FBC-39
 Revision: 7
 Date: February 2021
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 Project Manager: HO
 Author: KW&KT

Jacobs

1 The Square, Temple Quay
 2nd Floor
 Bristol, BS1 6DG
 United Kingdom
 T +44 (0)117 910 2580
 F +44 (0)117 910 2581
www.jacobs.com

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Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
1	11.10.2019	Initial OBC draft for comment	KT / KW	CB	HO	HO
2	27.10.19	OBC draft	KT / KW	CB	HO	HO
3	28.10.19	OBC draft	KT / KW	CB	HO	HO
4	18.05.20	FBC draft	KT / KW	CB	HO	HO
5	19.05.20	FBC draft	KT / KW	CB	HO	HO
6	11.2.21	FBC Draft	DW / KW	CB/KT	HO	HO
7	17.2.21	FBC Draft	DW / KW	CB/KT	HO	HO

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Acronyms and Abbreviations

ANPR	Automatic Number Plate Recognition
BCC	Bristol City Council
CAZ(s)	Clean Air Zone(s)
CAP	Clean Air Plan
CO ₂	Carbon Dioxide
Defra	Department for Environment Food & Rural Affairs
DfT	Department for Transport
EFT	Emissions Factors Toolkit
Euro	European
FBC	Full Business Case
HGV	Heavy Goods Vehicle
JAQU	Joint Air Quality Unit
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
HGV	Heavy Goods Vehicle
NO _x	Nitrous Oxides
NO ₂	Nitrogen Dioxide
OBC	Outline Business Case
OS	Ordnance Survey
PM	Particulate Matter
RSI	Roadside Interview
SP	Stated Preference
(Web)TAG	Transport Analysis Guidance

1. Introduction

1.1 Context

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 Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the COVID-19 pandemic. Recent research suggests that poor air quality may be correlated with higher death / infection rates from COVID-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill², to ensure that certain standards of air quality continue to be met, by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. 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 Bristol. 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 has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), and an Outline Business Case (November 2019 and updated between April and June 2020).

Following the submission of the OBC, further work was undertaken to develop the scheme, which resulted in the development of a new option - the Small area CAZ D. This work, and the option development work undertaken as part of the OBC, is presented in an updated Option Assessment Report (Appendix C FBC-16). The OBC version of this report is appended to the updated Option Assessment Report.

This report provides details of the following sensitivity tests on the Small CAZ D scenario:

- Behavioural response to charging;
- Fleet renewal delay by one year; and
- Euro 6 Vehicles (Low and High Emission scenarios).

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 Environment Bill 2019-21 <https://services.parliament.uk/bills/2019-21/environment.html>

A summary of all sensitivity tests and key findings in this report is provided in section 6.

1.2 Scheme description

The Small CAZ D scheme includes the following components:

- Small Area Class D – (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs);
- Closure of Cumberland Road inbound to general traffic; and
- Holding back traffic to the city centre through the use of existing signals.

Full details of the modelling methodology for this scheme can be found in FBC-23 Local Plan Transport Modelling Methodology Report (T3) and transport model results can be found in FBC-27 Local Plan Transport Model Forecasting Report (T4).

2. Previous Sensitivity Testing

Sensitivity testing has been carried out on previous scenarios, the Hybrid Option and the Medium area CAZ C/Small area CAZ D option in October 2019 and May 2020 respectively. The outcomes of these various sensitivity tests carried out on the options are shown in FBC-39 Sensitivity Testing Report submitted in May 2020.

3. Consideration of tests to be undertaken at the FBC stage

Following the submission of the BCC CAZ OBC, further work was undertaken to develop the scheme, and this work resulted in the development of a new option, Small CAZ D option. This work, and the option development work undertaken as part of the FBC is presented in an updated Option Assessment Report (Appendix C FBC-16). Further to this, JAQU have provided feedback on the OBC from the T-IRP.

Consideration has been given to the choice of sensitivity tests to support the FBC. A list of the sensitivity tests undertaken for the FBC are set out in Table 3.1.

Table 3-1: Sensitivity tests supporting this FBC

Source	Description	Recommended to be undertaken for the FBC
OBC sensitivity test	Behavioural response to charging	Yes – previous pessimistic test showed slightly higher mean NO ₂ when compared to the previous core scenario (Medium CAZ C/Small CAZ D) – so redo this test
OBC sensitivity test	Euro 6 vehicles	Yes – previous high emissions test showed slightly higher mean NO ₂ when compared to the previous central case – so redo this test
JAQU	One-year fleet renewal delay	Yes – as COVID-19 may have an impact of the natural uptake of newer/cleaner vehicles.

In deriving the list above, consideration was given to other potential sensitivity tests, the rationale for not undertaking these tests is set out in Table 3-2.

Table 3-2: Justification for not undertaking further sensitivity tests in this FBC

Description	Justification for not undertaking the sensitivity test in the FBC
Age of transport model	Adjustments made to the model to account for the age of the model have been included in the core scenario.
Fleet splits by fuel type: ANPR vs.NAEI (EFT)	Latest Core Scenario uses EFT splits
HGV adjustment factors	Previous test showed slightly lower mean NO ₂ when compared to a previous core scenario (the hybrid)
Emissions at low speeds	Previous high emissions test shows no difference in the mean NO ₂ compared to the previous central case
Background concentrations	Assessment showed that without a local calibration factor being applied to Defras national pollution background maps, the predicted concentrations are generally lower than if backgrounds are calibrated, receptors remain compliant.
Air Quality model verification	No evidence to justify test in the OBC
Gradient	Previous test without gradients test showed slightly lower mean NO ₂ when compared to the previous with gradients test
Primary NO ₂ factor	Previous low test showed lower mean NO ₂ when compared to the previous central case

4. Traffic Modelling

4.1 Overview

In estimating the effects of the Core Scenario, the air quality predictions are dependent upon the traffic data used in the modelling. These data are a combination of national predictions, JAQU guidance, consultations with BCC, and local studies. The data sources used in the traffic modelling have been selected to give the best possible representation of the effects of the CAZ. Like all predictions, this methodology has several uncertainties associated with it. A detailed account of the forecasting methodology and core scenario assumptions can be found in FBC-27 Transport Model Forecasting Report (T4). In this section, a series of sensitivity tests have been developed based on known uncertainties in these assumptions.

Section 4.2 considers uncertainties in the predicted behavioural response to charging by developing and analysing the most likely 'pessimistic' alternative scenario. Section 4.4 considers a fleet renewal delay of one year. These four variations are modelled using the Small CAZ D option. When appropriate, air quality testing has been performed to estimate the emissions, NO₂ concentrations, and compliance of the test scenarios and compare the results to the core scenario. Air quality modelling indicates that the Small CAZ D will achieve total compliance in 2023.

4.2 Behavioural Response to Charging

The success of the Clean Air Zone depends largely on how it influences the behaviour of drivers in the region. The drivers of non-car vehicles are expected to respond to the charging Small area CAZ D by either avoiding the area, changing their travel mode, or changing to a compliant vehicle, all of which will help to improve NO₂ pollution in Bristol. However, some drivers will decide to pay the CAZ charge instead of changing their behaviour.

For the Core scenario, the behavioural response to charging CAZ D was predicted using a variety of sources. A stated preference (SP) survey was conducted on drivers in Bristol and the surrounding areas to determine how they would respond, and how likely they would be to upgrade their vehicle based on various CAZ charges and upgrade costs. The final response rates were based on statistical models from the SP survey and predicted costs for upgrading to a compliant vehicle. For non-compliant light goods vehicle, responses for 'vans' from the stated preference surveys were used. A full report of the SP survey and statistical modelling is provided in FBC-28 Stated Preference Surveys Report. For coaches and HGVs, the proportions from 'Table 2 – Behavioural responses to charging Clean Air Zones' within the JAQU Evidence package have been used. Bus and Taxi responses are based on talks with Bristol City Council and the service providers.

The final Core scenario response rates for the Small CAZ D option are provided in Table 4.1. A detailed report on the methodology for calculating these response rates is available in FBC-26 Response Rates Technical Note Appendix E of the FBC.

Table 4-1: Core Scenario Primary Behavioural Response Rates – Small CAZ D

Response	Cars Low Income	Cars Medium Income	Cars High Income	Cars Employers Business	Taxis	LGVs	HGVs	Buses	Coaches
Pay Charge	4.3%	10.4%	5.4%	6.8%	4.1%	15.9%	8.8%	0.0%	17.8%
Avoid Zone	15.6%	19.0%	15.7%	7.7%	0.0%	19.2%	4.3%	0.0%	0.0%
Cancel Journey / Change Mode	39.8%	20.4%	14.2%	30.7%	0.0%	2.6%	4.3%	6.4%	11.4%
Replace Vehicle	40.4%	50.3%	64.6%	54.8%	95.9%	62.2%	82.6%	93.6%	70.8%

4.2.1 Development of Pessimistic Scenario

Non-Car Vehicle Types

To account for uncertainties in the Core scenario response rates, an alternative scenario was developed assuming pessimistic driver responses in terms of expected air quality impacts. The pessimistic scenario accounts for the most-likely uncertainties that would cause more drivers to pay the CAZ D charge than in the Core scenario. In this case, there would be a smaller behavioural response to charging and therefore a smaller improvement to the NO₂ pollution in Bristol city centre. To develop a pessimistic scenario for the charging non-car vehicle types, the replace vehicle response was decreased by 20% for taxis, HGVs and Coaches and the change in the replace vehicle response was compensated for by a change in the pay charge response.

For LGVs, the parameters of the SP survey statistical models were adjusted to the bottom end of their 95% confidence intervals so that more drivers would pay the charge over replacing their vehicles over a 24-hour time-period. The pessimistic response rates for the non-car vehicle types are given in Table 4-2.

Table 4-2: Pessimistic Scenario Primary Response Rates– Non-Car Vehicle Types

Response	Taxis	LGVs	HGVs	Buses	Coaches
Pay Charge	23.3%	27.2%	25.3%	0.0% *	31.9%
Avoid Zone	0.0%	19.2%	4.3%	0.0%	0.0%
Cancel Journey / Change Mode	0.0%	2.6%	4.3%	6.4%	11.4%
Replace Vehicle	76.7%	51.0%	66.1%	93.6%	56.7%

* This value was 0.0% in core scenario, so a percent change cannot be calculated.

Cars

For the Small CAZ D, where cars are also charged over the Small CAZ area, the parameters of the Stated Preference survey statistical models were adjusted to the top or bottom end of their 95% confidence intervals so that more drivers would pay the charge over the replace their vehicles over a 24-hour time-period. The pessimistic response rates for the Small CAZ D are given in Table 4-3.

Table 4-3: Pessimistic Scenario Primary Response Rates – Small CAZ D

Response	Cars Low Income	Cars Medium Income	Cars High Income	Cars Employers Business
Pay Charge	10.0%	19.8%	13.6%	8.8%
Avoid Zone	15.6%	19.0%	15.7%	7.7%
Cancel Journey / Change Mode	39.8%	20.4%	14.2%	30.7%
Replace Vehicle	35%	41%	56%	53%

4.2.2 Results from Air Quality Testing

The air quality summary statistics for the 'pessimistic' scenario are presented in Table 4-4 and as distributional box plots in Figure 4-1. In each case, results are presented for the 2023 reference case, central case for the Core scenario (i.e. Small Area CAZ D) and the sensitivity test. Generally, as expected air quality was adversely affected with the mean NO₂ concentration increasing by 0.1 µg/m³ and the maximum by 1.3 µg/m³.

The maximum modelled annual mean NO₂ concentration was 41.6 µg/m³, indicating that a compliance year of 2023 would not be achieved in this scenario. However, as 2023 was the only modelled year for this scenario, it is not possible to discern the anticipated compliance year. The model results at critical locations are presented in Table 4-5.

Table 4-4 Simple Summary Statistics for Sensitivity Testing of the pessimistic scenario ($\mu\text{g}/\text{m}^3$) – 2023 Annual mean NO_2 concentrations

Statistic	Reference Case	Central Case	Pessimistic scenario
Mean	23.3	22.0	22.1
Median	22.1	21.2	21.3
Maximum	49.4	40.3	41.6
Minimum	12.3	12.2	12.2
Upper Quartile	26.2	24.6	24.7
Lower Quartile	18.9	18.4	18.5
Standard Deviation	6.2	5.2	5.3
Range	37.1	28.1	29.4

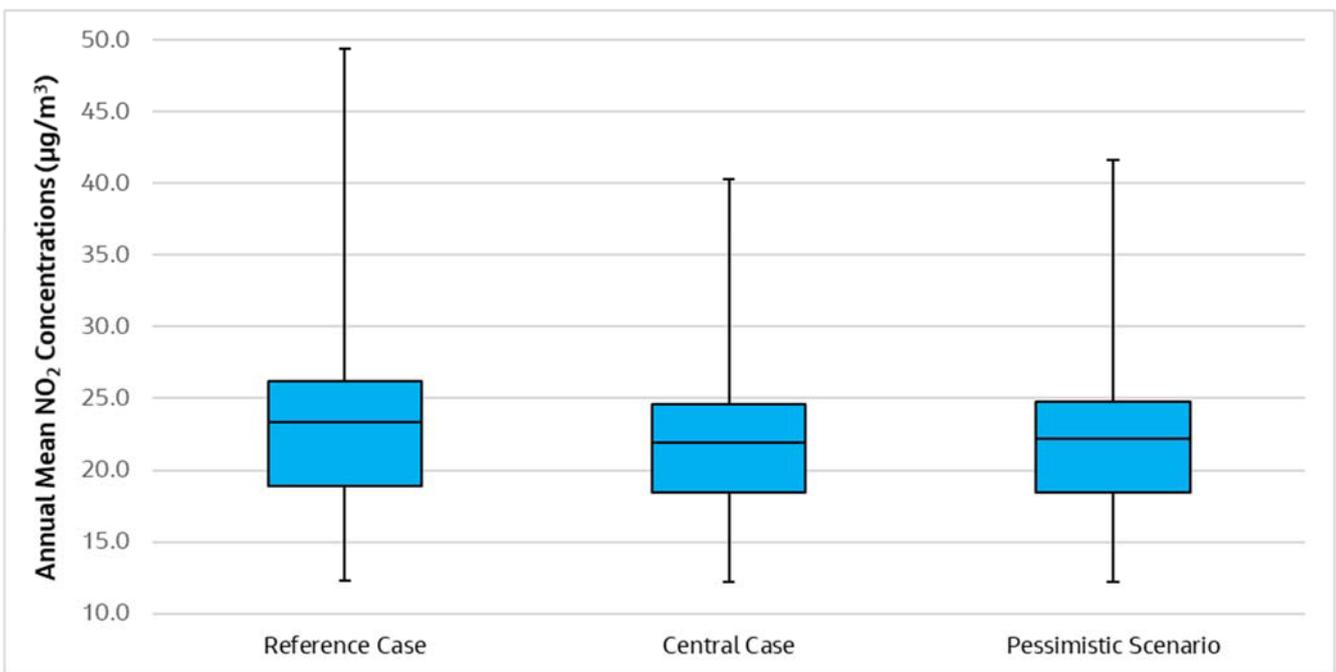


Figure 4-1 Distribution of 2023 Annual Mean NO_2 Concentrations for Sensitivity Testing of the pessimistic scenario

Table 4-5 2023 Modelled Annual Mean NO₂ Results for Sensitivity Testing of the Pessimistic Scenario

	Rupert Street	Marlborough Street	Upper Maudlin Street	Park Row	Park Street	Queen's Road	College Green	Cheltenham Road	Newfoundland Way	Church Road	Baldwin Street
Receptor ID (Reference Case Max)	15160	12649	12636	12014	6925	7098	11949	12708	13742	24587	11589
2023 Modelled Annual Mean NO₂ Results (µg/m³)											
Reference Case (Baseline)	46.0	49.4	42.1	38.9	32.4	30.1	35.2	37.0	43.9	37.9	23.7
Central Case (Small Area CAZ D)	39.8	40.3	34.6	32.7	26.5	25.8	29.7	35.5	36.3	36.5	22.2
Pessimistic scenario	40.6	41.6	35.4	33.5	27.3	26.2	30.5	35.7	37.1	36.7	22.3
Difference (Sens Test – Central Case)	0.8	1.3	0.8	0.8	0.8	0.4	0.8	0.2	0.8	0.2	0.1

4.3 One-Year Fleet Delay

JAQU requested that a one-year fleet renewal delay be undertaken as a sensitivity test. The test was assumed to represent the potential effect of COVID-19 on the natural fleet turnover. Therefore, the 2023 vehicle compliance splits and fuel type splits have been replaced with 2022 values.

The fleet projection tool within the EFT v9.1b was used to project the euro standard splits from the 2017 ANPR data to the Baseline compliance splits. The forecast compliance splits by vehicle type for 2022 are summarised in Table 4-6. These were used for the one-year fleet delay sensitivity test from which the Small CAZ D core response rates were applied. The core response rates are shown in Table 4-1.

Table 4-6: 2022 Compliance Splits by Time Period

Vehicle Category	AM		IP		PM	
	Compliant	Non-compliant	Compliant	Non-compliant	Compliant	Non-compliant
Cars	78.5%	21.5%	77.4%	22.6%	78.0%	22.0%
LGV	66.4%	33.6%	71.0%	29.0%	66.5%	33.5%
HGV rigid	79.9%	20.1%	78.7%	21.3%	73.9%	26.1%
HGV artic	89.4%	10.6%	90.0%	10.0%	89.0%	11.0%
HGV	82.2%	17.8%	81.4%	18.6%	78.9%	21.1%
Taxi	68.8%	31.2%	68.8%	31.2%	68.8%	31.2%
Bus	100.0%	0.0%	100.0%	0.0%	100.0%	0.0%
Coach	75.9%	24.1%	76.5%	23.5%	77.4%	22.6%
Total	76.7%	23.3%	76.8%	23.2%	76.9%	23.1%

The EFT v9.1b has been used for the fuel splits for 2022. An additional adjustment has been made to car fuel splits due to identification by BCC of an increase in petrol taxis replacing diesel. These were applied to the traffic link data extracted from the model runs via post-processing before input to the EFT. Table 4-7 shows the fuel type splits from the 2022 and 2031 EFT v9.1b with taxi adjustment.

Table 4-7: Fuel Type Splits (2022)

Vehicle Category	2022		
	Petrol	Diesel	Electric
Cars	61.02%	37.98%	1.00%
LGVs	0.46%	99.32%	0.22%

4.3.1 Results from Air Quality Testing

The air quality summary statistics for the One-Year Fleet Delay for the Core scenario are presented in Table 4-8 and as distributional box plots in Figure 4-2. In each case results are presented for the 2023 reference case, central case for the Core scenario and the sensitivity test. For this test, air quality is likely to worsen to a greater extent than the Pessimistic scenario, as indicated by the increase in the mean of modelled values of $0.8 \mu\text{g}/\text{m}^3$. This is because the Pessimistic scenario focusses predominantly on trips associated with the CAZ area and

immediate surroundings, whereas assumptions in the One-Year Fleet Delay scenario affect the whole model domain. The maximum value increased by 1.2 $\mu\text{g}/\text{m}^3$, which is actually slightly less than the Pessimistic scenario.

As with the Pessimistic scenario, the compliance year is likely to be after 2023, but it is not possible to calculate when it is likely to occur.

Table 4-8 Simple Summary Statistics for Sensitivity Testing of the One-Year Fleet Delay scenario ($\mu\text{g}/\text{m}^3$) – 2023 Annual mean NO_2 concentrations.

Statistic	Reference Case	Central Case	One-Year Fleet Delay scenario
Mean	23.3	22.0	22.8
Median	22.1	21.2	21.9
Maximum	49.4	40.3	41.5
Minimum	12.3	12.2	12.6
Upper Quartile	26.2	24.6	25.8
Lower Quartile	18.9	18.4	19.0
Standard Deviation	6.2	5.2	5.6
Range	37.1	28.1	28.9

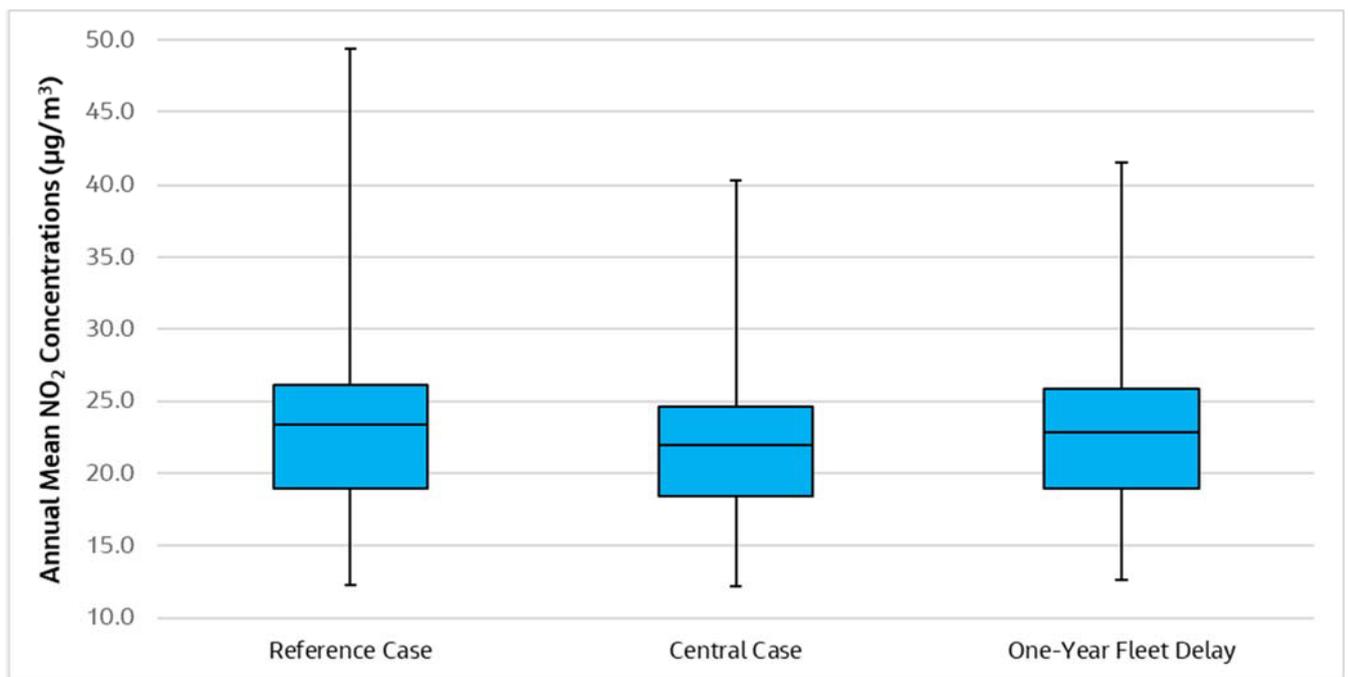


Figure 4-2 Distribution of NO_2 Concentrations for Sensitivity Testing of Speed and Flow adjusted

Table 4-9 2023 Modelled Annual Mean NO₂ Results for Sensitivity Testing of the One-Year Fleet Delay Scenario

	Rupert Street	Marlborough Street	Upper Maudlin Street	Park Row	Park Street	Queen's Road	College Green	Cheltenham Road	Newfoundland Way	Church Road	Baldwin Street
Receptor ID (Reference Case Max)	15160	12649	12636	12014	6925	7098	11949	12708	13742	24587	11589
2023 Modelled Annual Mean NO₂ Results (µg/m³)											
Reference Case (Baseline)	46.0	49.4	42.1	38.9	32.4	30.1	35.2	37.0	43.9	37.9	23.7
Central Case (Small Area CAZ D)	39.8	40.3	34.6	32.7	26.5	25.8	29.7	35.5	36.3	36.5	22.2
One-Year Fleet Delay scenario	41.4	41.5	36.1	34.0	27.4	26.6	30.9	37.0	38.1	39.0	22.6
Difference (Sens Test – Central Case)	1.6	1.2	1.5	1.3	0.9	0.8	1.2	1.5	1.8	2.5	0.4

5. Air Quality Sensitivity Test Results

5.1 Vehicle-Specific Emission Factors – Euro 6 Diesel Vehicles

The EFT includes NO_x speed-emission coefficients taken from the European Environment Agency COPERT 5 emission calculation tool³, and fleet and fuel compositions in line with Department for Transport projections. COPERT 5 predicts different NO_x emissions from Euro 6 diesel vehicles registered in different years. This is based on a general expectation that emissions from these vehicles will reduce over time. Over a similar timeframe, new aspects of the Euro 6 emissions standards will come into force, but it is important to recognize that the Euro 6 emissions reductions assumed within COPERT 5 do not, and were not intended to, coincide precisely with specific iterations of the Euro 6 emissions standards themselves. Thus, for example, COPERT 5 does not contain emissions factors specific to Euro 6d-temp vehicles.

The JAQU suggest that local authorities run a 'low emissions' and 'high emissions' scenario for the future emissions standards in their projected reference year and 'with measures' model runs. The JAQU suggest that an appropriate 'low emissions' scenario would be to assume that Euro 6c diesel cars and LGVs achieve the same emissions level as Euro 6d vehicles. This can simply be achieved by moving the proportion of diesel cars and LGVs in the Euro 6c category of the EFT into the Euro 6d category.

For the 'high emissions' scenario the JAQU recommended that Euro 6c cars and LGVs achieve emissions halfway between Euro 6 and Euro 6c and that Euro 6d cars and LGVs achieve emissions halfway between Euro 6c and Euro 6d. This can be achieved by moving 50% of the cars and LGVs in the Euro 6c category of the EFT into the Euro 6 (non-RDE) category and moving 50% of the cars and LGVs in the Euro 6d category of the EFT into the Euro 6c category.

Table 5-1 and Figure 5-1 provide the summary statistics requested in JAQU's 'Supplementary Note on Sensitivity Testing'. Table 5-1 then presents the modelled annual mean NO₂ concentrations at the critical locations for each of these scenarios, as well as the 'Central' case. These sensitivity tests demonstrate that the potential effect of the assumed uncertainty in future Euro 6 diesel vehicles is relatively high. The Low Emission Euro 6 scenario was predicted to reduce the maximum concentration by 3.6 µg/m³, whereas the High Emission Euro 6 scenario predicted a 2.7 µg/m³ increase. The mean concentration changed by approximately -0.8 and +1.2 µg/m³ for the Low Emission and High Emission scenarios respectively.

The results indicate that the central case is particularly sensitive to the assumptions around the categorisation of Euro 6 light duty vehicles.

With just the 2023 results, it is not possible to calculate specific compliance years for these sensitivity tests, although it is clear that the High Emission scenario does not achieve compliance in 2023. Given the large decrease in maximum modelled values in the Low Emission scenario, it is possible to speculate that this scenario may bring overall compliance forward to an earlier year than 2023. The modelled results at the critical locations are presented in Table 5-2.

Table 5-1 Simple Summary Statistics for Sensitivity Testing of Euro 6 Diesel Vehicle Emissions (µg/m³) – Annual mean NO₂ concentration.

Statistic	Reference Case	Euro 6 – High Emission	Central Case	Euro 6 – Low Emission
Mean	23.3	22.8	22.0	20.8
Median	22.1	21.9	21.2	20.1
Maximum	49.4	43.0	40.3	36.7
Minimum	12.3	12.6	12.2	11.7
Upper Quartile	26.2	25.7	24.6	23.2
Lower Quartile	18.9	18.9	18.4	17.6
Standard Deviation	6.2	5.6	5.2	4.6
Range	37.1	30.4	28.1	25.0

³ <http://copert.emisia.com>

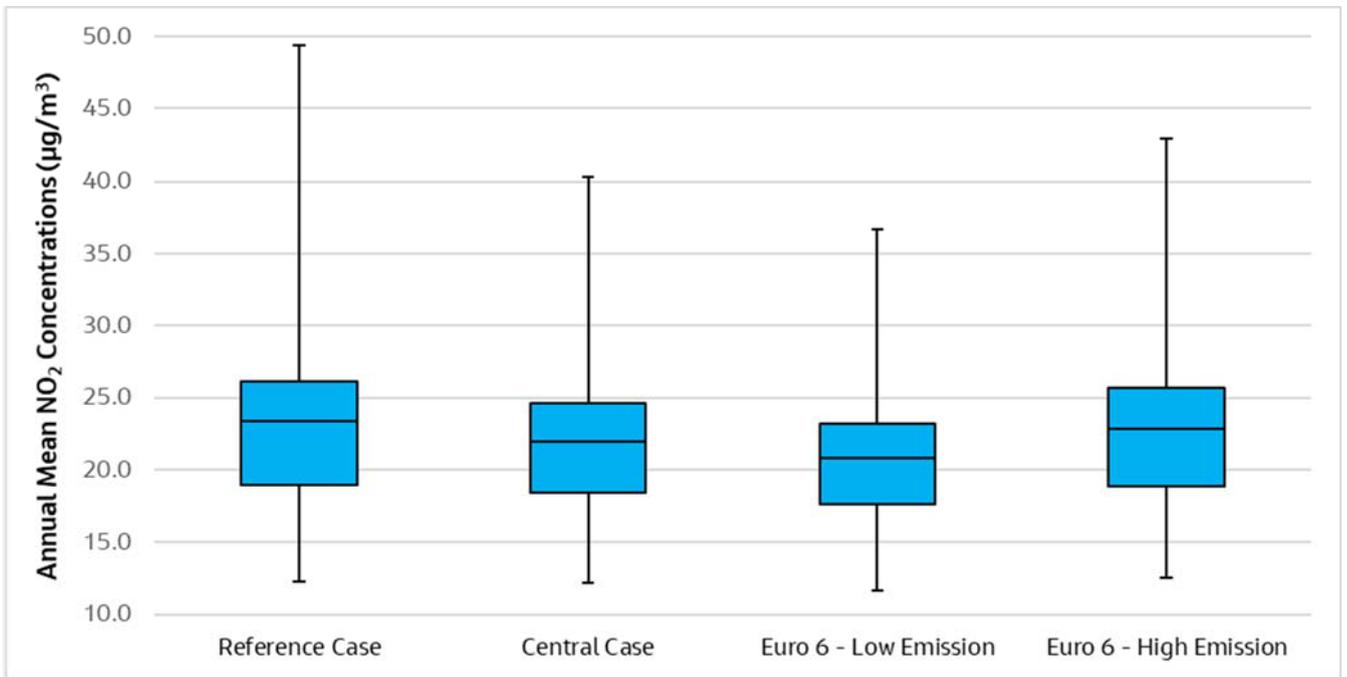


Figure 5-1 Distribution of NO₂ Concentrations for Sensitivity Testing of Euro 6 Diesel Vehicle Emissions

Table 5-2 2023 Modelled Annual Mean NO₂ Results for Sensitivity Testing of Euro 6 Diesel Vehicle Emissions

	Rupert Street	Marlborough Street	Upper Maudlin Street	Park Row	Park Street	Queen's Road	College Green	Cheltenham Road	Newfoundland Way	Church Road	Baldwin Street
Receptor ID (Reference Case Max)	15160	12649	12636	12014	6925	7098	11949	12708	13742	24587	11589
2023 Modelled Annual Mean NO₂ Results (µg/m³)											
Reference Case (Baseline)	46.0	49.4	42.1	38.9	32.4	30.1	35.2	37.0	43.9	37.9	23.7
Central Case (Small Area CAZ D)	39.8	40.3	34.6	32.7	26.5	25.8	29.7	35.5	36.3	36.5	22.2
Euro6 – High Emission scenario	42.2	43.0	37.1	35.1	27.7	27.1	31.4	37.1	39.2	38.6	22.7
Difference (High Em. Scenario – Central Case)	2.4	2.7	2.5	2.4	1.2	1.3	1.7	1.6	2.9	2.1	0.5
Euro6 – Low Emission scenario	36.6	36.7	31.3	29.6	24.8	24.0	27.5	33.4	32.5	33.7	21.4
Difference (Low Em. Scenario – Central Case)	-3.2	-3.6	-3.3	-3.1	-1.7	-1.8	-2.2	-2.1	-3.8	-2.8	-0.8

6. Results Summary Table

For all sensitivity tests, a summary and key results is provided in Table 6-1 below:

Table 6-1 Summary of sensitivity analysis

Test	Section Number	Summary	Key Results
Transport Modelling Based Sensitivity Tests			
Behavioural Responses to Charging	4.2	Defined pessimistic response rates based on confidence intervals of SP survey statistical modelling and adjusted assumptions for other vehicle types. Compared NO ₂ concentrations to Small D scenario.	Air quality is likely to be adversely affected with the mean concentration increasing by 0.1 $\mu\text{g}/\text{m}^3$ and the maximum by 1.3 $\mu\text{g}/\text{m}^3$. The compliance year is pushed back beyond 2023. This test illustrates the "breaking point" of the scheme as it shows that adjusting the response rates based on the Stated Preference survey confidence limits will delay the scheme compliance beyond 2023.
One Year Fleet Delay Test	4.3	One-year fleet renewal delay undertaken as a sensitivity test due to the potential effects of COVID-19 on the natural fleet turnover through time.	Air quality is likely to be adversely affected across the whole model domain, with the mean concentration increasing by 0.8 $\mu\text{g}/\text{m}^3$ and the maximum by 1.2 $\mu\text{g}/\text{m}^3$. The compliance year is pushed back beyond 2023.
Air Quality Modelling Based Sensitivity Tests			
Euro 6 Vehicles (Low and High Emission scenarios)	5.1	The EFT is based on COPERT 5 which predicts different NO _x emissions from Euro 6 diesel vehicles registered in different years (based on the expectation that Euro 6 emissions will reduce over time). Sensitivity test outlined in JAQU's 'Supplementary Note on Sensitivity Testing' has been run.	The Low Emission Euro 6 scenario was predicted to reduce the maximum concentration by 3.6 $\mu\text{g}/\text{m}^3$, whereas the Euro 6 High Emission scenario predicted a 2.7 $\mu\text{g}/\text{m}^3$ increase. In terms of the compliance year, the High Emission scenario pushed the compliance year back beyond 2023 at the Marlborough Street critical location. The Low Emission scenario may have brought the compliance year forward from 2023, although without other modelled years for this scenario, it is not possible to tell. The results indicate that the central case results are sensitive to changes in Euro 6, 6c and 6d proportions and the associated NO _x emissions standards expected from diesel light duty vehicles.



**Bristol City Council Clean Air Plan
Full Business Case**

Finance Report

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Jacobs
 The West Wing
 One Glass Wharf
 Bristol, BS2 0EL
 United Kingdom

www.jacobs.com

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1. Introduction

1.1 Disclaimer

The financial case sets out the anticipated costs of the scheme based on the current scheme design (including both charging and non-charging measures) as of June 30th 2021. It will set out the current understanding of the financial situation and outline the resources available for the project including all available funding sources (the primary sources of funding considered in the financial model are the Clean Air Fund and Implementation Fund).

A financial model was prepared to profile the scheme costs (capital and operational) against the funding sources and revenue from the CAZ. This model provides an approximation of the level of revenue that could be accumulated from the CAZ. The financial model is based on the traffic and air quality modelling outputs, and so the accuracy will be no greater than the accuracy of the transport and air quality models, which contain a number of limitations. Further, the financial model is predicated on key operational assumptions provided by BCC based on their experience of administering similar projects (in particular, parking and bus lane enforcement). The financial model is suitable to indicate whether the revenue from the CAZ is likely to be sufficient to cover the operating costs based on these key assumptions, but it does not give an accurate forecast of the revenue from the scheme. Jacobs does not therefore take responsibility for the accuracy of this financial model.

1.2 Background and Context

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 Bristol City Council (BCC). The Mayor of Bristol has often cited Bristol's 'moral and legal duty' to improve air quality in the city and the administration recognises that achieving improved air quality is not solely a transport issue. Notwithstanding the Council's work on a Clean Air Zone, efforts have been made to make citizens more aware of – and take personal responsibility for – various sources of air pollution, from traffic fumes to solid fuel burning. The Mayor has articulated a 'call to action' for local people, businesses and organisations to consider how small changes can make a significant difference in cutting toxic fumes across the city. BCC has monitored and endeavoured to address air quality in Bristol for decades and declared its first Air Quality Management Area in 2001. Despite this, Bristol has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until around 2027 without intervention.

The added context is that of the COVID-19 pandemic. Recent research suggests that poor air quality may be correlated with higher death / infection rates from COVID-19. This is further compounded by growing evidence that suggests that those from black, Asian and minority ethnic communities are more at risk of catching and dying from the virus and the fact that individuals from these communities are more likely to live in areas where air quality is poor. The challenge of maintaining public health and supporting economic recovery while also achieving legal air quality levels after lockdown restrictions are lifted will remain live and intersecting issues for the foreseeable future.

The UK Government continue to transpose European Union law into its Environment Bill², to ensure that certain standards of air quality continue to be met, by setting air quality assessment levels (AQALs) on the concentrations of specific air pollutants. It's very unlikely that these AQALs will differ to EU Limit Values prescribed by the European Union's Air Quality Directive and transcribed in the UK's Air Quality Standards Regulation 2010. Therefore, these Limit Values will remain in enforcement post-Brexit. 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 Bristol. 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 has published a UK Air Quality Plan and a Clean Air Zone Framework, both originally published in 2017 (noting there have been subsequent revisions). The latter document provides the expected approach for local authorities when implementing and operating a Clean Air Zone (CAZ). The following business cases have been submitted to JAQU for the Clean Air Plan; Strategic Outline Case (April 2018), and an Outline Business Case (November 2019 and updated between April and June 2020). The Full Business Case (FBC) was submitted in February 2021.

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 Environment Bill 2019-21 <https://services.parliament.uk/bills/2019-21/environment.html>

1.3 Purpose of this Report

This document is written to support the updated Full Business Case and acts as a detailed appendix to the financial case presented in the main FBC document. It outlines the funding and expenditure requirements for the CAP, as well as outlining wider financial impacts and consequences of the proposed arrangement for BCC and Government. It is underpinned by a financial model (appended to this report), which profiles the scale and sources of proposed funding alongside the timing of expenditure. Explicitly, it details the revenue and capital needs (and associated profile) to deliver the project, within the context of the BCC's wider financial situation.

Earlier versions of this report were published in January 2019, October 2019 and June 2020 in support of the developing economic case published as part of the Strategic Outline Case, Outline Business Case, Revised Outline Business Case and draft Full Business Case.

This document reflects the updated Bristol Clean Air Zone modelling, including the modelled impacts of the Bristol Street Space Schemes on the Bristol highway network and Small CAZ D.

2. General Structure and Assumptions

2.1 Model Structure

In line with the Defra/DfT Joint Air Quality Unit (JAQU) Guidance³, the financial model comprises the following elements:

- Funding Profile – outlining the profile for capital and revenue funding requirements, split by funding source (including Implementation Fund, Clean Air Fund, BCC and other funding opportunities).
- Capital Expenditure Summary – providing detail on the cost and spending profile for capital assets delivered as part of Clean Air Plan implementation, split by funding source (as above).
- Operational Summary – providing detail on the cost and spending profile for ongoing operation of the Clean Air Plan, set against any revenues generated by the scheme elements to arrive at a net cash flow position.
- Impact on BCC Accounts – assessing the impact of the Clean Air Plan on BCC' income and expenditure account and balance sheet.

In addition to these standard financial model components, the model also contains a detailed Bill of Quantities (BoQ), which drives the cost estimates for CAPEX and OPEX. The BoQ is underpinned by the cost estimates provided in FBC33 'Project Costs' in Appendix J of the FBC. Further, the model provides detailed analysis around the costs associated with enforcing CAZ regulations and dealing with any contraventions, based on BCC advice and experience on similar projects (e.g. car parking/bus lane enforcement). Detailed consideration of these issues is required due to the convoluted and potentially costly nature of enforcement, particularly related to the Penalty Charge Notice (PCN) process for individuals in contravention of the Clean Air Plan's proposed regulations. More detail on this analysis is provided below.

2.2 Approach to Analysis

A financial model was developed for the preferred intervention option, i.e.

- Small Area Class D CAZ (charging non-compliant cars, buses, coaches, taxis, HGVs and LGVs);
- Fast Track measures;
 - a) Closure of Cumberland Road inbound to general traffic; and
 - b) Holding back traffic to the city centre through the use of existing signals.

The financial modelling for the operational phase of the CAP assumes that the CAZ scheme is in operation over two horizons:

- Short operational period from June 2022 to December 2024⁴; and
- Ten year operation from June 2022 to May 2031 (i.e. end of appraisal period).

The shorter operational period recognises that the CAP is anticipated to reduce the annual mean concentrations of NO₂ to below the EU limit value threshold by 2023. Continuing the scheme until September 2024 will allow a further period of consolidation of NO₂ concentrations, supporting a stabilised, long-run concentration level within the EU limit values. The longer operational period is also considered to reflect the potential for the CAP to be extended into a long-term programme and to ensure steady-state compliance with EU limit values. This longer operational period could provide transport operators with a more stable environment in which to make investment decisions.

With reference to the longer term operational period in particular, it is acknowledged that the schemes are forecast to achieved compliance well before 2030. Hence, the scale of revenues and costs are both expected to diminish towards the end of the appraisal period.

³ Outline Business Case Workshop, May 2018

⁴ Given that compliance is assumed to be achieved by end of 2023, the shorter operational period is defined as June 2022 to December 2024 (i.e. 'compliance year + 1')

3. Capital Expenditure Summary

A central estimate for scheme implementation cost is £53.2 million (2021 prices). Given some capital expenditure (CAPEX) is expected to take place in 2022, a minor inflation adjustments is made to this estimated cost to generate outturn costs of £54.1 million⁵. Note that around 12% of the capital funding request will be targeted towards the Implementation Fund. The remainder will be targeted towards the Clean Air Fund.

Tables 3.1 and 3.2 present a summary of how the CAPEX estimate is built up, split by broad theme and funding source. A more detailed breakdown of CAPEX costs is provided in BoQ format in FBC33: Project Costs, which forms Appendix J of the FBC.

Table 3-1: CAPEX by broad theme and funding source (£2021 prices)

CAPEX Item	Implementation Fund	Clean Air Fund	Total
Enforcement System	773,521		773,521
Street Works	1,932,939		1,932,939
CAZ Project Delivery and Ongoing Operational Management Team (staff resources)	1,552,881		1,552,881
CAZ Publicity and Advertising	462,200		462,200
Other CAPEX	20,149		20,149
Non-Charging Measures - Implementation Fund	630,250		630,250
Non-Charging Measures – Clean Air Fund		46,629,169	46,629,169
QRA (P80)	1,225,000		1,225,000
Total	6,596,940	46,629,169	53,226,109

Table 3-2: CAPEX by broad theme and funding source (£outturn prices)

CAPEX Item	Implementation Fund	Clean Air Fund	Total
Enforcement System	787,058		787,058
Street Works	1,966,766		1,966,766
CAZ Project Delivery and Ongoing Operational Management Team (staff resources)	1,575,398		1,575,398
CAZ Publicity and Advertising	470,289		470,289
Other CAPEX	20,502		20,502
Non-Charging Measures - Implementation Fund	641,279		641,279
Non-Charging Measures – Clean Air Fund		47,445,180	47,445,180
QRA (P80)	1,225,000		1,225,000
Total	6,686,290	47,445,180	54,131,470

The scale and profile of expenditure is outlined in Table 3-3 which provides a more comprehensive Capital Expenditure Summary for the project. Further detail on cost estimation is provided in FBC33 which forms Appendix J of the FBC.

⁵ CAPEX inflation is estimated at 3.5% per calendar year, based on 2015 tender price forecasts

4. Operational Summary

The operational summary reconciles the revenue generating potential of the project with the cost of ongoing operation and enforcement of the CAZ and maintenance of capital assets.

4.1 Strategic Assumptions

The operational model is underpinned by key assumptions that are presented throughout the subsequent operational summary section below. However, for ease of reference, the key assumptions are also consolidated into the following list:

- Non-compliant buses, coaches, taxis, private hire vehicles (PHVs), HGVs, LGVs and cars are all charged for travel into/through the small area CAZ boundary. CAZ charges are imposed as follows:
 - £9 for cars, taxis, PHVs and LGVs;
 - £100 for buses, coaches and HGVs
- No change in CAZ charges are assumed over the appraisal period. The current CAZ charges proposed are kept constant for the entire appraisal period. In contrast, operational costs are assumed to increase at the prevailing rate for general operational costs (2.9% per annum⁶) and staff costs (2.9% per annum⁷)
- Operational phase begins in June 2022. The forecast number of non-compliant vehicles in 2021 are used as a proxy for non-compliant vehicles in 2022. Further, 2023 and 2031 volumes of non-compliant vehicles are adopted directly from transport modelling outputs, with non-compliant vehicles forecasts for intervening years based on interpolation also undertaken as part of transport modelling. Note that given the traffic modelling outputs provide average annual daily flows, the 2022 non-compliant vehicles are profiled from June 1st to December 31st only, rather than for the full year.
- To reflect the introduction of exemptions from CAZ charges, some 11% of unique non-compliant cars that would otherwise be expected to pay the CAZ charge are exempt in the first year of operation (June 2022-May 2023). Informed by traffic modelling, this reflects the proportion of non-compliant cars registered to low income households that are interacting with the CAZ for work/education purposes and residents of the CAZ that travel out of the zone for work⁸.
- To reflect the anticipated roll out of the financial assistance schemes as part of the CAF bid, the following further adjustments are made to the basic non-compliant vehicle forecast for the duration of the appraisal:
 - 19% reduction in non-compliant cars
 - 95% reduction in non-compliant taxis
 - 48% reduction in non-compliant LGVs
 - 79% reduction in non-compliant buses/coaches
 - 18% reduction in HGVs
- A contravention rate of 5% is applied to capture non-compliant vehicles that do not pay the charge and are instead issued with a penalty charge notice (PCN). The contravention rate remains static across the appraisal period. This assumption reflects BCC's experience of contravention of other schemes (e.g. car parking, bus lane enforcement), but also the wider national experience provided by contravention of schemes such as ULEZ and Dartford Crossing.
- Based on BCC's experience of the contravention and resulting PCN process, some 65% of vehicles issued with a PCN are assumed to pay the resulting charge. The vast majority pay at the discount rate (92% at £60, plus

⁶ As per retail price index published by OBR

⁷ As per retail price index published by OBR

⁸ It is accepted that the proposed exemptions are more far-reaching than the two specific exemptions factored into the analysis here. However, due to a lack of data, it is not possible to accurately forecast the potential impact of exemptions on other user groups. The analysis therefore presents a conservative view on the potential reduction in non-compliant vehicles paying the CAZ charge in the first year of operation due to the introduction of exemptions.

the original CAZ charge), with the residual contraveners paying at the full rate (8% at £120, plus the original CAZ charge). Of the 35% of contraveners that do not pay the charge, the following outcomes are anticipated:

- 46% of PCNs cancelled; no charge incurred
 - 6% issued with a Charge Certificate (50% increase on full PCN rate)
 - 15% followed up with Traffic Enforcement Centre (TEC) proceedings (at full PCN rate)
 - 34% of PCNs written off
- First time offenders are not charged or issued with PCNs. Instead, individuals are issued with a warning letter only.
 - All charge and PCN income is assumed to be accrued in the same month that the non-compliant vehicle enters the CAZ. No delay or deferment of charge or PCN income is assumed⁹.
 - As advised by BCC, PCN operations incur costs of £0.30 per PCN for Traffic Penalty Tribunal (TPT) charges, £1.43 per PCN for stationary and supplies and £0.85 per PCN for postage. A multiplier of 1.35 is applied to postage costs to reflect additional communication efforts resulting from unresponsive contraveners.
 - Further, BCC advised that staff costs to manage PCN operations include civil enforcement officers (CEOs, c. £54,587 per annum per role) and appeals officers (c. £54,587 per annum per role). Based on current operations, BCC indicated that 50,000 PCNs per annum necessitated 2 CEOs and 3 Appeals Officers, suggesting a ratio of 1 CEO per 25,000 PCNs and 1 Appeals Officer per c. 17,000 PCNs. BCC will be monitoring closely the volumes of contraventions from Bath & Birmingham, and will respond accordingly, if it concludes that the levels of contravention and the staffing resources are significantly different to what has been modelled.
 - A proportion of revenue secured through CAZ charge payments are transferred to JAQU. Although the exact figure has not been determined at this stage, a 10% and 20% transfer of CAZ charge revenue is considered.

This range of assumptions to shape the base scenario and resulting core scenario for operational analysis outlined below.

4.2 Revenue Generation

4.2.1 Overview

The Clean Air Zone Framework states that local authorities should not set the level of charge as a revenue raising measure. The Transport Act 2000 requires any excess revenue that may arise from charges above the costs of operation to be re-invested to facilitate the achievement of local transport policies. These should aim to improve air quality and support the delivery of the ambitions of the zone. The revenue re-investment reserve described below provides a mechanism for utilising any excess revenue generated within these parameters.

In this context the project is expected to lead to some revenue generation in the early years as a result of the CAZ-related charges levied on non-compliant vehicles. Revenue generation is a function of two interconnected components:

- The number of non-compliant vehicles entering the CAZ and paying the respective charge based on vehicle type.
- The number of non-compliant vehicles entering the CAZ, not paying the respective charge based on vehicle type and instead facing a fine via the PCN process.

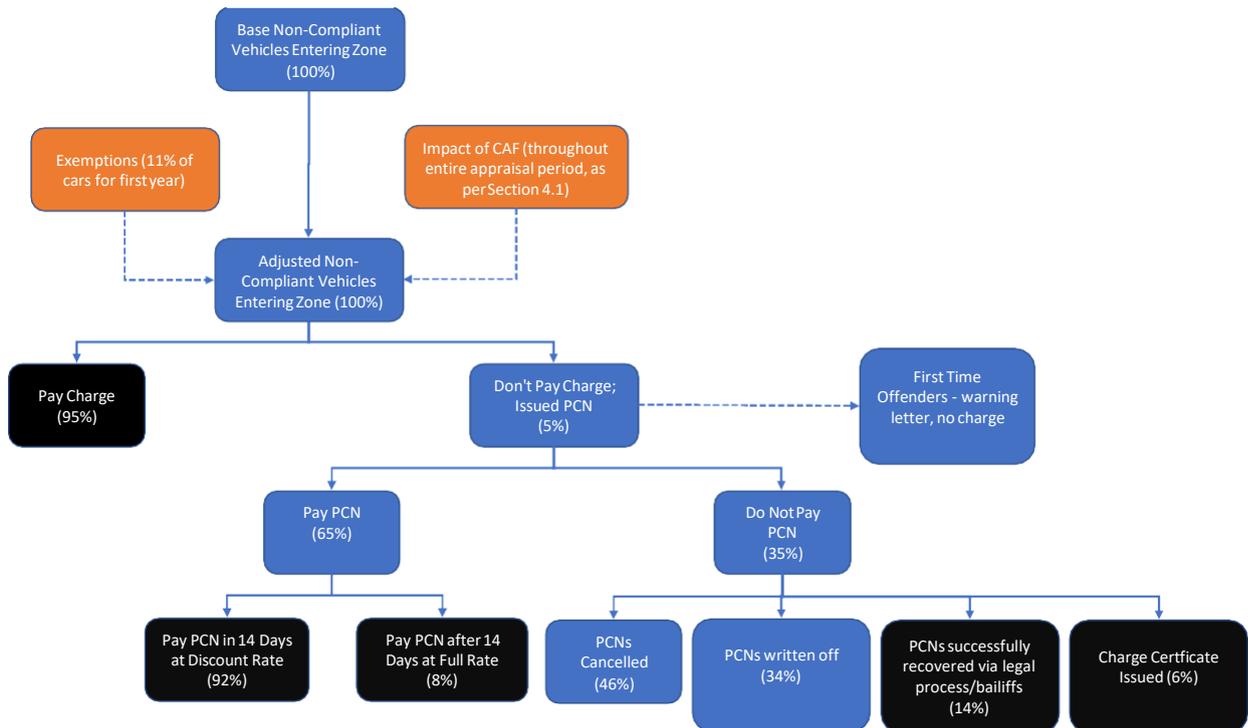
The overarching framework for revenue generation as a result of CAZ is underpinned by the assumptions specified in Section 4.1 and outlined in Figure 4.1. The various revenue generating streams emanating from the starting

⁹ It is accepted that this approach to profiling revenue represents a simplification of the charge and fine payment process. However, in the absence of detailed evidence regarding the extent of deferment or delay in payments, including potentially lengthy delays related to tribunal and legal activity associated with some PCN payments, a simplified approach to revenue forecasting was considered most robust.

position of the number of non-compliant vehicles are discussed within this chapter, including further explanation of key assumptions in this calculation.

An initial estimate is made here based on reasonable estimates of key assumptions, established through benchmarking against other local schemes (e.g. bus lane enforcement and parking charge experience in Bristol) and wider experience. However, it should be noted that there is a considerable level of uncertainty in these assumptions since a CAZ scheme that involves charging non-compliant vehicles has not yet been implemented within the UK. Hence, a number of sensitivity scenarios are in development which will consider variations in key assumptions. These sensitivity tests will need to be considered in detail to understand the range of potential range of revenue generation.

Figure 4.1: CAZ Revenue Generation Framework



4.2.2 Non-Compliant Vehicles Entering the Zone

The profile of non-compliant vehicles entering the CAZ zone is outlined in Table 4.1, based on outputs from traffic modelling. These figures account for all anticipated behavioural responses to the proposed scheme, including altering route to avoid the zone, cancelling a trip entirely, and switching the mode of transport used for the journey. The analysis demonstrates that the volume of non-compliant traffic falls quickly from project implementation in 2022.

Whilst the traffic and air quality modelling indicate that compliance with air quality is achieved in 2023, the ten-year operation component of Table 4-1 demonstrates that a significant number of non-compliant trips persist throughout the appraisal period. This provides further justification for ongoing consideration of a ten year operational period, alongside the short operational period within which NO₂ concentrations are expected to fall within EU limit values.

Table 4-1: Base Non-Compliant Vehicle Trips Subject to CAZ Charge

Number of Non-Compliant Vehicle Trips Subject to CAZ Charge											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Cars	383,081	430,915	381,529	0	0	0	0	0	0	0	1,195,526
Taxis	1,420	1,833	1,598	0	0	0	0	0	0	0	4,850
LGV	254,225	276,156	244,869	0	0	0	0	0	0	0	775,250
HGV rigid	25,870	24,909	21,970	0	0	0	0	0	0	0	72,750
Buses	7,912	8,057	7,022	0	0	0	0	0	0	0	22,991
Total	672,508	741,871	656,989	0	0	0	0	0	0	0	2,071,368
Ten Year Operation											
Cars	383,081	430,915	381,529	331,793	282,680	234,164	185,986	135,796	89,865	17,965	2,473,774
Taxis	1,420	1,833	1,598	1,362	1,127	901	676	451	225	0	9,592
LGV	254,225	276,156	244,869	213,583	182,296	152,357	120,468	90,824	61,299	13,195	1,609,271
HGV rigid	25,870	24,909	21,970	19,032	16,093	13,280	10,468	7,656	4,843	840	144,961
Buses	7,912	8,057	7,022	5,987	4,952	3,962	2,971	1,981	990	0	43,834
Total	672,508	741,871	656,989	571,756	487,147	404,664	320,569	236,706	157,223	32,000	4,281,433

4.2.3 CAZ Charge

The drivers of the non-compliant vehicles presented in Table 4-1 are, until the CAZ is removed, liable to pay a variable charge depending on type of vehicle. The charging schedule for the scheme is outlined in Table 4-2. It is set at the minimum level that is expected to induce changes in travel behaviour (i.e. a shift away from use of non-compliant vehicles) to the extent that concentrations of NO₂ comply with the EU Limit Values as quickly as possible. The process for determining the appropriate charging level was informed by the Stated Preference Survey outlined in Appendix F.

Table 4-2: Charging Schedule

Vehicle Type	Charge
Cars/PHVs/Taxis	£9.00
LGVs	£9.00
Buses/Coaches	£100.00
HGVs	£100.00

4.2.4 CAZ Charge Payment

Case study evidence of road-charging operations and enforcement reveals that not all individuals pay the required charge and are therefore in contravention of the scheme. As there is no direct precedent for the CAZ in the UK, it is not possible to estimate the contravention rates from an existing CAZ scheme. In the absence of a direct comparison, BCC is of the view that current patterns of contravention relating to bus lane enforcement and car parking, combined with wider evidence from charging schemes in other locations (e.g. ULEZ/Dartford Crossing) represent the best proxies to apply to potential CAZ contravention. Such evidence based on local and wider traveller behaviour suggests that a contravention rates of 5% could apply to CAZ charging. This assumption is considered to be robust, prudent and comparable to assumptions made for CAZ schemes in other locations. In line with historic patterns of contravention, this contravention rate is assumed to remain stable across the appraisal period.

Based on the contravention rate assumptions discussed above, Table 4-3 outlines the number of vehicles anticipated to pay the appropriate CAZ charge, pivoting from the base number of non-compliant vehicles subject to the CAZ charge outlined in Table 4-1. As noted in Section 4.1, some 11% of car traffic is expected to be exempt from CAZ charges in the first year of operation. This will reduce the volume of non-compliant vehicles paying the CAZ charge, as outlined in Table 4-4. Further, the CAF-based financial assistance schemes intended to support the upgrading of non-compliant vehicles to compliant vehicles will also reduce the scale of vehicles paying the CAZ charge suggested in Table 4-3. Table 4-5 provides an adjusted estimate of vehicles paying the CAZ charge, taking into account the impact of both exemptions and the CAF-based financial assistance schemes. The exemptions and CAF-adjusted approach to estimating the operational position of the CAP is adopted as the 'core' scenario presented in the remainder of Section 4. This is considered a conservative view of potential revenue generation from the CAZ, given that it significantly reduces the potential scale of non-compliant vehicles through exemptions and financial assistance schemes. Nevertheless, the base non-compliant data and the exemptions-adjusted data (i.e. without further adjustments for the impact of CAF) underpin two of the sensitivity tests presented in Section 4.5.

Pivoting from the derived 'core' scenario, the resulting number of vehicles in contravention of the CAZ regulations and issued with a PCN is outlined in Table 4-6. Note that the number of vehicles contravening the CAZ regulations and issued with a PCN in Table 4-6 reflects the proposed BCC policy to waive any fine associated with an issued PCN for first time contravention offences. Instead, first time offenders will be issued with a warning letter only. Hence the 5% non-payment rate in Table 4-6 accounts for first-time offenders, and all figures relating to the number of PCNs paid or avoided reported in subsequent tables is also net of first-time offenders.

Table 4-3: Base Number of Vehicle Trips Paying the CAZ Charge

Number of Vehicle Trips Paying the CAZ Charge											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Payment Rate	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	
Cars	363,927	409,370	362,453	0	0	0	0	0	0	0	1,135,750
Taxis	1,349	1,741	1,518	0	0	0	0	0	0	0	4,608
LGV	241,514	262,348	232,626	0	0	0	0	0	0	0	736,488
HGV	24,577	23,664	20,872	0	0	0	0	0	0	0	69,113
Bus/Coaches	7,516	7,654	6,671	0	0	0	0	0	0	0	21,841
Total	638,882	704,778	624,139	0	0	0	0	0	0	0	1,967,799
Ten Year Operation											
Payment Rate	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	
Cars	363,927	409,370	362,453	315,203	268,546	222,456	176,687	129,006	85,371	17,067	2,350,086
Taxis	1,349	1,741	1,518	1,294	1,070	856	642	428	214	0	9,113
LGV	241,514	262,348	232,626	202,903	173,181	144,739	114,444	86,282	58,234	12,535	1,528,808
HGV	24,577	23,664	20,872	18,080	15,288	12,616	9,944	7,273	4,601	798	137,713
Bus/Coaches	7,516	7,654	6,671	5,688	4,704	3,764	2,823	1,882	941	0	41,642
Total	638,882	704,778	624,139	543,168	462,790	384,431	304,540	224,871	149,362	30,400	4,067,361

Table 4-4: Exemptions-Adjusted Number of Vehicle Trips Paying the Charge

Number of Vehicle Trips Paying the CAZ Charge											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Payment Rate	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	
Cars	324,134	390,852	362,453	0	0	0	0	0	0	0	1,077,438
Taxis	1,349	1,741	1,518	0	0	0	0	0	0	0	4,608
LGV	241,514	262,348	232,626	0	0	0	0	0	0	0	736,488
HGV	24,577	23,664	20,872	0	0	0	0	0	0	0	69,113
Bus/Coaches	7,516	7,654	6,671	0	0	0	0	0	0	0	21,841
Total	599,089	686,259	624,139	0	0	0	0	0	0	0	1,909,488
Ten Year Operation											
Payment Rate	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	
Cars	324,134	390,852	362,453	315,203	268,546	222,456	176,687	129,006	85,371	17,067	2,291,774
Taxis	1,349	1,741	1,518	1,294	1,070	856	642	428	214	0	9,113
LGV	241,514	262,348	232,626	202,903	173,181	144,739	114,444	86,282	58,234	12,535	1,528,808
HGV	24,577	23,664	20,872	18,080	15,288	12,616	9,944	7,273	4,601	798	137,713
Bus/Coaches	7,516	7,654	6,671	5,688	4,704	3,764	2,823	1,882	941	0	41,642
Total	599,089	686,259	624,139	543,168	462,790	384,431	304,540	224,871	149,362	30,400	4,009,050

Table 4-5: Exemptions and CAF-Adjusted Number of Vehicle Trips Paying the Charge

Number of Vehicle Trips Paying the CAZ Charge											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Payment Rate	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	
Cars	263,333	317,536	294,464	0	0	0	0	0	0	0	875,332
Taxis	68	87	76	0	0	0	0	0	0	0	231
LGV	126,406	137,311	121,754	0	0	0	0	0	0	0	385,472
HGV	20,153	19,405	17,115	0	0	0	0	0	0	0	56,672
Bus/Coaches	1,588	1,618	1,410	0	0	0	0	0	0	0	4,616
Total	411,548	475,956	434,819	0	0	0	0	0	0	0	1,322,323
Ten Year Operation											
Payment Rate	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	
Cars	263,333	317,536	294,464	256,077	218,172	180,727	143,544	104,807	69,357	13,865	1,861,883
Taxis	68	87	76	65	54	43	32	21	11	0	456
LGV	126,406	137,311	121,754	106,198	90,642	75,755	59,899	45,160	30,479	6,561	800,165
HGV	20,153	19,405	17,115	14,826	12,536	10,345	8,154	5,964	3,773	654	112,925
Bus/Coaches	1,588	1,618	1,410	1,202	994	795	597	398	199	0	8,800
Total	411,548	475,956	434,819	378,368	322,398	267,666	212,226	156,349	103,819	21,081	2,784,229

Table 4-6: Number of Vehicle Trips in Contravention of CAZ Regulations and Issued with PCN (net of first time offenders)

Number of Vehicle Trips in Contravention of CAZ Regulations											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Payment Rate	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	
Cars	12,912	15,570	14,439	0	0	0	0	0	0	0	42,921
Taxis	3	4	4	0	0	0	0	0	0	0	12
LGV	5,706	6,198	5,496	0	0	0	0	0	0	0	17,399
HGV	849	817	721	0	0	0	0	0	0	0	2,386
Bus/Coaches	69	70	61	0	0	0	0	0	0	0	200
Total	19,539	22,660	20,720	0	0	0	0	0	0	0	62,919
Ten Year Operation											
Payment Rate	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	
Cars	12,912	15,570	14,439	12,557	10,698	8,862	7,039	5,139	3,401	680	91,296
Taxis	3	4	4	3	3	2	2	1	1	0	23
LGV	5,706	6,198	5,496	4,793	4,091	3,419	2,704	2,038	1,376	296	36,117
HGV	849	817	721	624	528	436	343	251	159	28	4,755
Bus/Coaches	69	70	61	52	43	34	26	17	9	0	382
Total	19,539	22,660	20,720	18,030	15,363	12,754	10,113	7,447	4,945	1,004	132,573

4.2.5 CAZ Charge Income

Combining the CAZ charges in Table 4-2 with the number of vehicles paying the CAZ charge under the 'core' scenario in Table 4-5 and reprofiling the analysis to reflect financial years rather than calendar years demonstrates that the CAZ charge could generate a stream of revenue over the appraisal period that amounts to £17.5 million at the end of a short operational period, or £36.1 million in 2031 across the ten year operational period. Note that for the longer operational period in particular, the scale of CAZ charge income declines rapidly over time from £7.2 million in the first year of operation (2022/23) to £0.1 million at the end of the appraisal period (2031/32).

Table 4-7: Direct CAZ Income – From CAZ Charge Payments (£'000s)

Direct CAZ Income											
Vehicle Type	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Short Operation											
Total	7,163	6,097	4,219	0	0	0	0	0	0	0	17,478
Ten Year Operation											
Total	7,163	6,097	5,418	4,684	3,958	3,246	2,529	1,816	1,125	101	36,135

4.2.6 CAZ Charge Contravention – PCN Process

Those vehicles that contravene the CAZ payment process will be issued with a PCN that levies a fine in line with the charging order. In line with The Road User Charging Schemes (Penalty Charges, Adjudication and Enforcement) (England) Regulations 2013, the charging order will specify a fine of £120 per vehicle (reduced to £60 if paid within fourteen days), plus the initial CAZ charge. In theory, all vehicles in contravention of the CAZ payment process will be subject to the PCN fine. However, BCC experience of the PCN process for other fining mechanisms (in particular car parking and bus lane enforcement) reveals that the PCN payment rate is around 65%. Adopting this benchmark, the number of vehicles expected to pay the PCN is outlined in Table 4-8.

Of the 65% of vehicles that pay the PCN, BCC experience also suggests that 92% pay at the reduced payment rate (i.e. within fourteen days, £60 plus initial CAZ charge). The residual 8% of payments are at the full payment rate (i.e. after the fourteen-day window, £120 plus the initial CAZ charge). The number of vehicles paying at the reduced and full PCN payment rate are outlined in Table 4-9 and Table 4-10 respectively.

As only 65% of people receiving a PCN are expected to pay the fine levied against them, the residual 35% of PCN recipients make representations against the PCN and have it cancelled, written off or are referred to the Traffic Penalty Tribunal (TPT) System. BCC experience suggests that:

- 46% of all non-paid PCNs are cancelled after a successful representation which results in no revenue generation for BCC.
- 34% of all non-paid PCNs are not recovered and are written off instead, which results in no revenue generation for BCC
- 14% of all non-paid PCNs are recovered via the TEC process or other legal action (e.g. bailiffs).
- 6% of all non-paid PCNs are followed by a charge certificate, which adds 50% to the fine levied.

Within this context, Table 4-11 presents the number of non-paid PCNs expected to be cancelled or written off and Table 4-12 outlines the number of non-paid PCNs successfully recovered via the TPT, other legal processes or through issuance of a charge certificate.

4.2.7 CAZ Contravention Income

Combining the number of reduced fine PCN payments (Table 4-9) the number of full fine PCN payments (Table 4-10 and Table 4-12 [including the 50% premium fine on Charge Certificates where appropriate]) and the associated fine levels (£60 plus initial CAZ charge for reduced fines and £120 plus initial charge for full fines), it is possible to estimate indirect CAZ income related to PCN payments. Reprofiled to reflect financial years rather than calendar years, Table 4-13 demonstrates that the PCN process could generate a stream of revenue over the appraisal period that amounts to £3.8 million at the end of a short operational period, or £8.0 million in 2031 across the ten year operational period. Note that for the longer operational period in particular, the scale of PCN income declines rapidly over time from £1.5 million in the first year of operation (2022/23) to £0.02 million at the end of the appraisal period (2031/32).

4.2.8 CAZ Revenue Generation

Combining the direct CAZ income with the indirect CAZ income the CAZ could gross £21.3 million at the end of a short operational period, or £44.2 million in 2031 across the ten year operational period, as set out in Table 4-14. Note that for the longer operational period in particular, the scale of total income generation declines rapidly over time from £8.7 million in the first year of operation (2022/23) to £0.1 million at the end of the appraisal period (2031/32).

It should be noted that the revenue generation predicted in Table 4-14 is reliant on a number of key assumptions which are not certain. BCC have made reasonable attempts to estimate these assumptions based on similar schemes administered locally, but since a CAZ of this type has not yet been implemented or has only yielded a

small sample of data¹⁰, the available evidence is limited and hence the forecasts are uncertain. As noted above, a range of detailed sensitivity tests are presented in Section 4.5 to help understand the impact of amending key assumptions on the forecast revenue generation.

¹⁰ E.g. Bath and Birmingham CAZ schemes have been operational for a few months only

Table 4-8: Number of Vehicle Trips Paying the PCN

Number of Vehicle Trips Paying the PCN											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Cars	8,393	10,121	9,385	0	0	0	0	0	0	0	27,899
Taxis	2	3	3	0	0	0	0	0	0	0	8
LGV	3,709	4,029	3,572	0	0	0	0	0	0	0	11,309
HGV	552	531	468	0	0	0	0	0	0	0	1,551
Bus/Coaches	45	46	40	0	0	0	0	0	0	0	130
Total	12,700	14,729	13,468	0	0	0	0	0	0	0	40,897
Ten Year Operation											
Cars	8,393	10,121	9,385	8,162	6,954	5,760	4,575	3,340	2,211	442	59,343
Taxis	2	3	3	2	2	1	1	1	0	0	15
LGV	3,709	4,029	3,572	3,116	2,659	2,223	1,757	1,325	894	192	23,476
HGV	552	531	468	406	343	283	223	163	103	18	3,091
Bus/Coaches	45	46	40	34	28	22	17	11	6	0	248
Total	12,700	14,729	13,468	11,719	9,986	8,290	6,574	4,841	3,214	652	86,173

Table 4-9: Number of Vehicle Trips Paying the Reduced PCN Fine

Number of Vehicle Trips Paying the Reduced Rate PCN											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Cars	7,747	9,342	8,663	0	0	0	0	0	0	0	25,753
Taxis	2	3	2	0	0	0	0	0	0	0	7
LGV	3,423	3,719	3,297	0	0	0	0	0	0	0	10,439
HGV	509	490	432	0	0	0	0	0	0	0	1,432
Bus/Coaches	41	42	37	0	0	0	0	0	0	0	120
Total	11,723	13,596	12,432	0	0	0	0	0	0	0	37,751
Ten Year Operation											
Cars	7,747	9,342	8,663	7,534	6,419	5,317	4,223	3,083	2,041	408	54,778
Taxis	2	3	2	2	2	1	1	1	0	0	14
LGV	3,423	3,719	3,297	2,876	2,455	2,052	1,622	1,223	825	178	21,670
HGV	509	490	432	375	317	261	206	151	95	17	2,853
Bus/Coaches	41	42	37	31	26	21	16	10	5	0	229
Total	11,723	13,596	12,432	10,818	9,218	7,652	6,068	4,468	2,967	602	79,544

Table 4-10: Number of Vehicle Trips Paying the Full PCN Fine

Number of Vehicle Trips Paying the Full Rate PCN											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Cars	646	779	722	0	0	0	0	0	0	0	2,146
Taxis	0	0	0	0	0	0	0	0	0	0	1
LGV	285	310	275	0	0	0	0	0	0	0	870
HGV	42	41	36	0	0	0	0	0	0	0	119
Bus/Coaches	3	4	3	0	0	0	0	0	0	0	10
Total	977	1,133	1,036	0	0	0	0	0	0	0	3,146
Ten Year Operation											
Cars	646	779	722	628	535	443	352	257	170	34	4,565
Taxis	0	0	0	0	0	0	0	0	0	0	1
LGV	285	310	275	240	205	171	135	102	69	15	1,806
HGV	42	41	36	31	26	22	17	13	8	1	238
Bus/Coaches	3	4	3	3	2	2	1	1	0	0	19
Total	977	1,133	1,036	901	768	638	506	372	247	50	6,629

Table 4-11: Number of Non-Paid PCNs Cancelled or Written Off

Number of Non-Paid PCNs Cancelled or Written Off											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Cars	3,615	4,360	4,043	0	0	0	0	0	0	0	12,018
Taxis	1	1	1	0	0	0	0	0	0	0	3
LGV	1,598	1,735	1,539	0	0	0	0	0	0	0	4,872
HGV	238	229	202	0	0	0	0	0	0	0	668
Bus/Coaches	19	20	17	0	0	0	0	0	0	0	56
Total	5,471	6,345	5,802	0	0	0	0	0	0	0	17,617
Ten Year Operation											
Cars	3,615	4,360	4,043	3,516	2,995	2,481	1,971	1,439	952	190	25,563
Taxis	1	1	1	1	1	1	0	0	0	0	7
LGV	1,598	1,735	1,539	1,342	1,146	957	757	571	385	83	10,113
HGV	238	229	202	175	148	122	96	70	44	8	1,331
Bus/Coaches	19	20	17	15	12	10	7	5	2	0	107
Total	5,471	6,345	5,802	5,048	4,302	3,571	2,832	2,085	1,385	281	37,121

Table 4-12: Number of Non-Paid PCNs Ordered to Pay Full Fine Through TPT, other legal processes or Charge Certificate

Number of Non-Paid PCNs Recovered											
Vehicle Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Short Operation											
Cars	904	1,090	1,011	0	0	0	0	0	0	0	3,004
Taxis	0	0	0	0	0	0	0	0	0	0	1
LGV	399	434	385	0	0	0	0	0	0	0	1,218
HGV	59	57	50	0	0	0	0	0	0	0	167
Bus/Coaches	5	5	4	0	0	0	0	0	0	0	14
Total	1,368	1,586	1,450	0	0	0	0	0	0	0	4,404
Ten Year Operation											
Cars	904	1,090	1,011	879	749	620	493	360	238	48	6,391
Taxis	0	0	0	0	0	0	0	0	0	0	2
LGV	399	434	385	336	286	239	189	143	96	21	2,528
HGV	59	57	50	44	37	30	24	18	11	2	333
Bus/Coaches	5	5	4	4	3	2	2	1	1	0	27
Total	1,368	1,586	1,450	1,262	1,075	893	708	521	346	70	9,280

Table 4-13: Indirect CAZ Income – From PCN Fine Payments

Indirect CAZ Income											
Vehicle Type	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Short Operation											
Total	1,518,804	1,359,697	945,286	0	0	0	0	0	0	0	3,823,787
Ten Year Operation											
Total	1,518,804	1,359,697	1,214,420	1,051,591	890,691	732,083	571,751	412,638	260,459	24,276	8,036,410

Table 4-14: Total CAZ Income

Total CAZ Income											
Vehicle Type	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Short Operation											
Total	8,681,807	7,456,297	5,163,808	0	0	0	0	0	0	0	21,301,912
Ten Year Operation											
Total	8,681,807	7,456,297	6,632,238	5,735,165	4,848,449	3,978,225	3,100,506	2,228,467	1,385,321	124,980	44,171,454

4.3 Operational Costs

4.3.1 Overview

Operational costs will be incurred by BCC across a range of activities:

- Systems operations and maintenance
- Camera, communications, signage and buildings maintenance
- CAZ delivery and ongoing operational management
- Monitoring and evaluation
- Decommissioning
- PCN production
- CAZ publicity and advertising

The majority of these operational costs are accrued on either a fixed, annual basis for the lifecycle of the project or as one-off costs. However, some cost items relating to PCN production activities and systems operations and management are contingent on variations in vehicle non-compliance and contravention as outlined in the section above and are therefore worthy of more detailed discussion.

4.3.2 PCN Administration Costs

The non-compliance and contravention rate estimates presented above demonstrate that large volumes of vehicles could enter the CAZ and avoid paying the relevant charge in a single year. This volume of contraventions would require a significant administrative effort to process and enforce the charging order. For example, every PCN generated by vehicles in contravention of the charging order generates workload in terms of civil enforcement, reviewing ANPR footage, preparing and distributing correspondence.

In terms of PCN preparation, the CAZ-related PCN process could necessitate significant recruitment of administrative staff, potentially on short-term and temporary contracts to reflect the sharp decline in contravention rates Table 4.4. Based on BCC's existing PCN processes (for issuing parking and bus lane enforcement fines), the following staffing requirements would be generated by the significant PCN process:

- 2 civil enforcement officer (CEO) per 50,000 PCNs
- 3 appeals officer per 50,000 PCNs

Applying these benchmarks to the forecast number of PCN's required as a result of the project will indicate the number of full-time equivalent administrative roles that would need to be filled across the CAZ operation period. The bulk of these roles would be obsolete over time as vehicular compliance improves, hence the potential focus on short-term and temporary contracts.

Further, a permanent TPT senior officer would be required across the operation of the CAZ. Applying BCC average staff costs for these roles (including salary and direct overheads), the council could incur additional wage costs of £0.8 million under the short operational period, rising to £2.2 million over the longer operational period.

Administration costs will also arise from BCC's obligation to make a financial contribution to the TPT process, stationery and supplies (processing) and PCN postage (distribution) of each PCN. BCC advise that benchmark costs for these activities (based on car parking and bus lane enforcement experience) are:

- PCN Generation - £0.30 per PCN towards the ongoing existence of this independent panel
- Stationery and Supplies - £1.43 per PCN for printing and processing
- PCN postage - £0.85 per PCN for distribution

Note that an additional multiplier of 1.35 is applied to the PCN postage costs to reflect the need for follow-up communications on some individual cases. Adopting these benchmarks, the number of PCNs issued would lead to additional costs of between £0.2 million (shorter operational period) and £0.5 million (longer operational period) (Table 4-15).

4.3.3 Summary

Inclusive of the variable staffing and PCN process costs outlined above, the core estimate for the scheme's operational costs including all cost items is between £6.8 million (shorter operational period) and £17.7 million (longer operational period) (2021 prices). This estimate increases to between £7.2 million and £20.1 million taking into account inflation (labour costs inflated at 2.9% per annum and other operating costs inflated at 2.9%, both in line with OBR's retail price index growth forecast). Table 4-16 presents a summary of how this OPEX estimate is built up, split by broad theme.

A more detailed breakdown of OPEX costs is provided in BoQ format in Appendix J. The timing of expenditure is outlined in Table 4-17, which provides a more comprehensive Operational Expenditure Summary for the project.

Table 4-15: Additional Costs Arising from PCN Process (Outturn Prices)

Type of Additional Cost	Administration Costs Arising from PCN Process (£s)										
	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Short Operation											
PCN Generation	8,561	7,928	5,636	0	0	0	0	0	0	0	22,124
Stationery and supplies	40,806	37,788	26,864	0	0	0	0	0	0	0	105,459
PCN postage	32,745	30,323	21,557	0	0	0	0	0	0	0	84,625
Total	82,112	76,039	54,058	0	0	0	0	0	0	0	212,208
Ten Year Operation											
PCN Generation	8,561	7,928	7,287	6,494	5,662	4,789	3,849	2,861	1,861	179	49,472
Stationery and supplies	40,806	37,788	34,737	30,957	26,988	22,829	18,348	13,636	8,873	853	235,814
PCN postage	32,745	30,323	27,874	24,841	21,656	18,319	14,723	10,942	7,120	685	189,229
Total	82,112	76,039	69,899	62,293	54,305	45,938	36,920	27,439	17,855	1,717	474,515

Table 4-16: OPEX by broad theme and funding source (£)

OPEX Item	Short Operation		Ten Year Operation	
	2021 Prices (£)	Outturn Costs (£)	2021 Prices (£)	Outturn Costs (£)
Systems Operations and Maintenance	4,906,104	5,104,390	13,604,620	15,247,748
Camera, Comms, Signage and Building Maintenance and Operation - OPEX	789,138	839,634	2,749,256	3,218,776
Monitoring and Evaluation	389,869	449,713	389,869	449,713
Decommissioning at Scheme End - OPEX	554,924	622,150	554,924	738,562
PCN Production	200,262	212,208	421,664	474,515
Total	6,840,297	7,228,095	17,720,333	20,129,314

Table 4-17: Operational Expenditure Summary

Short Operation

	2021 Prices										Total	Forecast Outturn Prices										Total
	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32		2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	
Systems Operations and Maintenance	1,797,406	1,818,479	1,290,219	0	0	0	0	0	0	0	4,906,104	1,837,910	1,898,502	1,367,979	0	0	0	0	0	0	0	5,104,390
Camera, Comms, Signage and Building Maintenance and Operation - OPEX	254,561	305,473	229,105	0	0	0	0	0	0	0	789,138	264,222	325,792	249,620	0	0	0	0	0	0	0	839,634
Monitoring and Evaluation	40,611	48,734	48,734	48,734	48,734	48,734	48,734	48,734	8,122	0	389,869	42,153	51,975	53,483	55,034	56,630	58,272	59,962	61,701	10,505	0	449,713
Decommissioning at Scheme End - OPEX	0	0	554,924	0	0	0	0	0	0	0	554,924	0	0	622,150	0	0	0	0	0	0	0	622,150
PCN Production	79,305	71,342	49,615	0	0	0	0	0	0	0	200,262	82,112	76,039	54,058	0	0	0	0	0	0	0	212,208
Total	2,171,883	2,244,028	2,172,596	48,734	48,734	48,734	48,734	48,734	8,122	0	6,840,297	2,226,396	2,352,308	2,347,289	55,034	56,630	58,272	59,962	61,701	10,505	0	7,228,095

Ten Year Operation

	2021 Prices										Total	Forecast Outturn Prices										Total
	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32		2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	
Systems Operations and Maintenance	1,797,406	1,818,479	1,690,630	1,597,066	1,499,151	1,377,166	1,295,428	1,214,226	1,135,660	179,409	13,604,620	1,837,910	1,898,502	1,802,500	1,742,895	1,677,511	1,583,102	1,535,558	1,488,922	1,445,402	235,447	15,247,748
Camera, Comms, Signage and Building Maintenance and Operation - OPEX	254,561	305,473	305,473	305,473	305,473	305,473	305,473	305,473	305,473	50,912	2,749,256	264,222	325,792	335,240	344,962	354,966	365,260	375,853	386,752	397,968	67,760	3,218,776
Monitoring and Evaluation	40,611	48,734	48,734	48,734	48,734	48,734	48,734	48,734	8,122	0	389,869	42,153	51,975	53,483	55,034	56,630	58,272	59,962	61,701	10,505	0	449,713
Decommissioning at Scheme End - OPEX	0	0	0	0	0	0	0	0	0	554,924	554,924	0	0	0	0	0	0	0	0	0	0	738,562
PCN Production	79,305	71,342	63,744	55,213	46,782	38,467	30,054	21,717	13,749	1,290	421,664	82,112	76,039	69,899	62,293	54,305	45,938	36,920	27,439	17,855	1,717	474,515
Total	2,171,883	2,244,028	2,108,581	2,006,485	1,900,140	1,769,839	1,679,689	1,590,150	1,463,004	786,534	17,720,333	2,226,396	2,352,308	2,261,122	2,205,183	2,143,412	2,052,571	2,008,292	1,964,814	1,871,730	1,043,486	20,129,314

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4.4 Net Operational Position

In line with JAQU guidance, the intention – as far as it is possible – is to cover all operating costs (i.e. those related to running and administering the CAZ itself) through revenue generated by the scheme.

Based on the scale and timing of revenue generation and operational costs reported in Table 4-14 and 4-16 respectively, Table 4.18 outlines the net operational cashflow associated with the Clean Air Plan, under the core scenario for each intervention option. The analysis indicates that cumulatively, revenue generation will exceed operational costs, resulting in a net operational surplus of between £14.1 million (short operation, outturn costs) and £24.0 million (ten year operation, outturn costs) across the appraisal periods.

However, the scheme is forecast to generate a net operational deficit in later years of the project's operation. For the short appraisal period, a deficit relates to ongoing costs associated with an eight-year monitoring and evaluation period. For the ten year appraisal period, a deficit is incurred in the final years of operation as most vehicles become compliant but high fixed costs of operation are retained. It is intended that the net operational deficit identified in the later years of the appraisal period can be covered by the anticipated net operational surplus identified above.

Table 4-18: Net Cash Flow Position: Core Scenario (Outturn Prices)

Net Cash Flow Position (£'000s)													
Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Short Operation													
Operational Income	0	0	8,682	7,456	5,164	0	0	0	0	0	0	0	21,302
CAZ-Related OPEX ¹¹	0	0	2,226	2,352	2,347	55	57	58	60	62	11	0	7,228
Net Operating Position	0	0	6,455	5,104	2,817	-55	-57	-58	-60	-62	-11	0	14,074
Ten Year Operation													
Operational Income	0	0	8,682	7,456	6,632	5,735	4,848	3,978	3,101	2,228	1,385	125	44,171
CAZ-Related OPEX	0	0	2,226	2,352	2,261	2,205	2,143	2,053	2,008	1,965	1,872	1,043	20,129
Net Operating Position	0	0	6,455	5,104	4,371	3,530	2,705	1,926	1,092	264	-486	-919	24,042

¹¹ Note that although the CAZ is assumed to switch off after one year after compliance is achieved (i.e. December 2024), ongoing monitoring and evaluation costs will persist for eight years, hence the ongoing OPEX after December 2024.

Table 4.18 represents the current best estimate for operational revenues and costs. However, acknowledging that Clean Air Plans are a nascent concept and that there is no longstanding precedent or direct benchmark for the timing and scale of revenues in particular¹², a significant degree of uncertainty can be attached to the above analysis (see Section 4.5 Sensitivity Testing).

Notwithstanding this uncertainty, the core analysis demonstrates that the CAZ revenue is sufficient to cover operational costs of the scheme under both operational period scenarios. In fact, the proposed Clean Air Plan is forecast to generate a considerable positive cash flow over the appraisal period. Any cashflow surplus associated with the scheme will be ringfenced for the following purposes, in order of priority:

- Deficit coverage for ongoing and long-term operational expenditure, particularly in latter years of operation when the various schemes are anticipated to face an operational deficit, as well as decommissioning.
- Creation of a reinvestment reserve to support:
 - Any underestimation of operational costs.
 - Delivery of BCC's 'Liveable Neighbourhoods' aspirations (estimated cost range £45m to £283m);
 - Supplementary schemes to the CAF measures, as well providing an opportunity to further invest in engagement with businesses and local residents affected by the schemes. For example, this funding source would support or extend some of the following measures which may form part of the CAF bid:
- Increase, improve, update Legible City Signage on key radials and in city centre; and
- An 'unintended consequences' fund for minor local implementations such as one-ways; and
- Support for additional buses to the Bristol Royal Infirmary.

Within this context, the residual cash position for the CAP in Bristol is expected to be neutral throughout the appraisal periods, as demonstrated in Tables 4.19 and 4.20.

¹² Noting that the Bath and Birmingham CAZ schemes are still in their infancy; and in any case have different specifications in terms of geographic scale and/or vehicular coverage compared to the Bristol CAX.

Table 4-19: Residual Cash Flow Position – Short Operation (£'000s)

Net Cash Flow Position (£'000s) Outturn Values													
Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Net Cashflow	0	0	6,455	5,104	2,817	-55	-57	-58	-60	-62	-11	0	14,074
Deficit Coverage ¹³	0	0	302	0	0	0	0	0	0	0	0	0	302
Reinvestment Reserve (residual monies)	0	0	6,153	5,104	2,817	0	0	0	0	0	0	0	14,074
Residual Cash Position	0												

Table 4-20: Residual Cash Flow Position – Ten Year Operation (£'000s)

Net Cash Flow Position (£'000s) Outturn Values													
Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Net Cashflow	0	0	6,455	5,104	4,371	3,530	2,705	1,926	1,092	264	-486	-919	24,042
Deficit Coverage	0	0	1,405	0	0	0	0	0	0	0	0	0	1,405
Reinvestment Reserve (residual monies)	0	0	5,050	5,104	4,371	3,530	2,705	1,926	1,092	264	0	0	24,042
Residual Cash Position	0												

¹³ To cover ongoing and long-term operational expenditure, particularly in latter years of operation when the various schemes are anticipated to face an operational deficit, as well as decommissioning.

4.5 Sensitivity Testing

In light of the significant uncertainty and lack of precedent regarding operation of Clean Air Plan's, extensive sensitivity testing is being undertaken to better understand the potential range of net operating positions for the project, based on variance in key assumptions. The following key sensitivities are considered:

- Base Non-Compliant Traffic Analysis: no consideration of exemptions or CAF impacts on base traffic flows.
- Base + Exemptions Non-Compliant Traffic Analysis: consideration of exemptions but not CAF impacts on base traffic flows.
- Sensitivity Test 1: As per 'core' scenario, but with 20% JAQU revenue payment instead of 10%
- Sensitivity Test 2: As per 'core' scenario, but increase in contravention rate from 5% to 20%
- Sensitivity Test 3: As per 'core' scenario, but reduction in CAZ and PCN Charges by 50%
- Sensitivity Test 4: As per 'core' scenario, but reduction in non-compliant traffic flows by 25% compared to core scenario
- Sensitivity Test 5: As per 'core' scenario, but increase in non-compliant traffic flows by 25% compared to core scenario
- Sensitivity Test 6: As per 'core' scenario, but exponential profile of non-compliant traffic flow reduction rather than more gradual profile suggested by traffic modelling
- Sensitivity Test 7: Combination of Sensitivity Tests 3, 4 and 6, plus an assumption that the contravention rate declines at an exponential rate rather than stabilising at 5% across the appraisal period, representing a worst-case revenue generating scenario that has:
 - 20% JAQU revenue payment instead of 10%
 - Reduction in CAZ and PCN Charges by 50%
 - Reduction in non-compliant traffic flows by 25% compared to core scenario
 - Exponential profile of non-compliant traffic flow reduction rather than more gradual profile suggested by traffic modelling
- Sensitivity Test 8: As per 'core' scenario, but reduction in non-compliant traffic flows to 82% of 'core' scenario levels, reflecting traffic patterns for Bristol in wake of COVID19 pandemic. Details of the changes in traffic levels associated with COVID-19 are reported in the Clean Air Zone Board Report – Traffic Behaviour 2019-2020 (Appendix S of the Option Assessment Report)
- Sensitivity Test 9: As per 'core' scenario, but with an increase in CAZ & contravention charges of 25% to reflect the possibility of increase the charges if the level of compliance is not achieved.

The outputs of these sensitivity tests in terms of outturn cashflow is presented in the following table. The outputs demonstrate that a change in the profile of non-compliant traffic reduction and the value of the CAZ/PCN charges are the key drivers of net operating position. In particular, any acceleration in the reduction of non-compliant traffic over time (as modelled through Sensitivity Test 6 and captured as part of Sensitivity Test 7) has a particularly significant impact on operating position.

Table 4-21: Sensitivity Test Outputs (Outturn Values, £'000s)

Option/ Scenario	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Short Operation												
Base	0	10,495	8,111	4,792	-55	-57	-58	-60	-62	-11	0	23,095
Base + Exemptions	0	9,956	8,032	4,792	-55	-57	-58	-60	-62	-11	0	22,477
Core Scenario	0	6,455	5,104	2,817	-55	-57	-58	-60	-62	-11	0	14,074
Sensitivity Test 1	0	5,739	4,494	2,395	-55	-57	-58	-60	-62	-11	0	12,326
Sensitivity Test 2	0	9,254	7,652	4,589	-55	-57	-58	-60	-62	-11	0	21,193
Sensitivity Test 3	0	2,473	1,681	446	-55	-57	-58	-60	-62	-11	0	4,297
Sensitivity Test 4	0	4,556	3,477	1,661	-55	-57	-58	-60	-62	-11	0	9,392
Sensitivity Test 5	0	8,402	6,759	3,928	-55	-57	-58	-60	-62	-11	0	18,787
Sensitivity Test 6	0	3,760	595	-1,117	-55	-57	-58	-60	-62	-11	0	2,936
Sensitivity Test 7	0	503	-799	-1,556	-55	-57	-58	-60	-62	-11	0	-2,154
Sensitivity Test 8	0	5,101	3,945	1,984	-55	-57	-58	-60	-62	-11	0	10,728
Sensitivity Test 9	0	7,951	6,474	3,768	-55	-57	-58	-60	-62	-11	0	17,891
Ten Year Operation												
Base	0	10,495	8,111	6,916	5,768	4,612	3,447	2,305	1,127	34	-875	41,942
Base + Exemptions	0	9,956	8,032	6,916	5,768	4,612	3,447	2,305	1,127	34	-875	41,323
Core Scenario	0	6,455	5,104	4,371	3,530	2,705	1,926	1,092	264	-486	-919	24,042
Sensitivity Test 1	0	5,739	4,494	3,829	3,062	2,309	1,601	839	82	-599	-929	20,429
Sensitivity Test 2	0	9,254	7,652	6,644	5,490	4,345	3,238	2,143	994	32	-865	38,927
Sensitivity Test 3	0	2,473	1,681	1,326	897	479	99	-332	-760	-1,123	-976	3,763
Sensitivity Test 4	0	4,556	3,477	2,902	2,309	1,669	1,037	401	-233	-795	-946	14,377
Sensitivity Test 5	0	8,402	6,759	5,796	4,767	3,772	2,765	1,784	760	-178	-891	33,737
Sensitivity Test 6	0	3,760	595	-736	-1,255	-1,477	-1,589	-1,661	-1,718	-1,718	-1,029	-6,829

Table 4-21: Sensitivity Test Outputs (Outturn Values, £'000s)

Option/ Scenario	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Sensitivity Test 7	0	503	-799	-1,260	-1,449	-1,549	-1,615	-1,670	-1,722	-1,720	-1,030	-12,311
Sensitivity Test 8	0	5,101	3,945	3,318	2,668	1,972	1,286	594	-94	-708	-939	17,143
Sensitivity Test 9	0	7,951	6,474	5,593	4,585	3,595	2,653	1,655	663	-243	-897	32,028

5. Financial Statements

The budget, funding and cashflow statements for the core scenario of the preferred option are outlined in Table 5-1 to Table 5-3 for the short operational period scenario and Table 5-4 to Table 5-6 for the longer operational period scenario. The key findings of the financial statements are (in forecast outturn prices):

- The budget statement demonstrates that the aggregate net operating income is in surplus across both appraisal period, leading to the development of a revenue reinvestment reserve amounting to between £14.1 million (short operational period) and £24.0 million (ten-year operational period).
- The funding statement demonstrates that the implementation and operation of the preferred option will require £54.1 million in external capital funding. The Implementation Fund (£6.7 million) and Clean Air Fund (£47.4 million) are the proposed central government funding streams.
- The cashflow statement demonstrates that the net cashflow is positive at an aggregate level over the appraisal period

Table 5-1: Budget Statement – Short Operation (Outturn Values)

Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Operating Income													
Operating Revenue	0	0	8,682	7,456	5,164	0	0	0	0	0	0	0	21,302
Operating Grant	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating Expenses													
Operating Costs	0	0	2,226	2,352	1,725	55	57	58	60	62	11	0	6,606
Decommissioning	0	0	0	0	622	0	0	0	0	0	0	0	622
Total	0	0	2,226	2,352	2,347	55	57	58	60	62	11	0	7,228
Net Operating Income	0	0	6,455	5,104	2,817	-55	-57	-58	-60	-62	-11	0	14,074
Use of Net Income													
Deficit Coverage	0	0	302	0	0	0	0	0	0	0	0	0	302
Reinvestment Reserve	0	0	6,153	5,104	2,817	0	0	0	0	0	0	0	14,074
Residual Cash Position	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5-2: Funding Statement – Short Operation (Outturn Values)

Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Implementation Fund													
Capital	0	4,992	1,694	0	0	0	0	0	0	0	0	0	6,686
Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	4,992	1,694	0	0	0	0	0	0	0	0	0	6,686
Clean Air Fund													
Capital	0	35,380	12,065	0	0	0	0	0	0	0	0	0	47,445
Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	35,380	12,065	0	0	0	0	0	0	0	0	0	47,445
Total													

Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Capital	0	40,372	13,759	0	0	0	0	0	0	0	0	0	54,131
Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	40,372	13,759	0	0	0	0	0	0	0	0	0	54,131

Table 5-3: Cashflow Statement – Short Operation (Outturn Values)

Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Capital Grant from IF/CAF	0	40,372	13,759	0	0	0	0	0	0	0	0	0	54,131
Operating Revenue	0	0	8,682	7,456	5,164	0	0	0	0	0	0	0	21,302
Revenue Grant from IF/CAF	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital Costs	0	40,372	13,759	0	0	0	0	0	0	0	0	0	54,131
Operating Costs	0	0	2,226	2,352	1,725	55	57	58	60	62	11	0	6,606
Decommissioning	0	0	0	0	622	0	0	0	0	0	0	0	622
Net Cashflow	0	0	6,455	5,104	2,817	-55	-57	-58	-60	-62	-11	0	14,074

Table 5-4: Budget Statement – Ten Year Operation (Outturn Values)

Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Operating Income													
Operating Revenue	0	0	8,682	7,456	6,632	5,735	4,848	3,978	3,101	2,228	1,385	125	44,171
Operating Grant	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating Expenses													
Operating Costs	0	0	2,226	2,352	2,261	2,205	2,143	2,053	2,008	1,965	1,872	305	19,391
Decommissioning	0	0	0	0	0	0	0	0	0	0	0	739	739
Total	0	0	2,226	2,352	2,261	2,205	2,143	2,053	2,008	1,965	1,872	1,043	20,129
Net Operating Income	0	0	6,455	5,104	4,371	3,530	2,705	1,926	1,092	264	-486	-919	24,042
Use of Net Income													

Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Deficit Coverage	0	0	1,405	0	0	0	0	0	0	0	0	0	1,405
Reinvestment Reserve	0	0	5,050	5,104	4,371	3,530	2,705	1,926	1,092	264	0	0	24,042
Residual Cash Position	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5-5: Funding Statement – Ten Year Operation (Outturn Values)

Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Implementation Fund													
Capital	0	4,992	1,694	0	0	0	0	0	0	0	0	0	6,686
Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	4,992	1,694	0	0	0	0	0	0	0	0	0	6,686
Clean Air Fund													
Capital	0	35,380	12,065	0	0	0	0	0	0	0	0	0	47,445
Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	35,380	12,065	0	0	0	0	0	0	0	0	0	47,445
Total													
Capital	0	40,372	13,759	0	0	0	0	0	0	0	0	0	54,131
Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	40,372	13,759	0	0	0	0	0	0	0	0	0	54,131

Table 5-6: Cashflow Statement – Ten Year Operation (Outturn Values)

Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Capital Grant from IF/CAF	0	40,372	13,759	0	0	0	0	0	0	0	0	0	54,131
Operating Revenue	0	0	8,682	7,456	6,632	5,735	4,848	3,978	3,101	2,228	1,385	125	44,171
Revenue Grant from IF/CAF	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital Costs	0	40,372	13,759	0	0	0	0	0	0	0	0	0	54,131
Operating Costs	0	0	2,226	2,352	2,261	2,205	2,143	2,053	2,008	1,965	1,872	305	19,391

Operational Item	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	Total
Decommissioning	0	0	0	0	0	0	0	0	0	0	0	739	739
Net Cashflow	0	0	6,455	5,104	4,371	3,530	2,705	1,926	1,092	264	-486	-919	24,042

6. Summary and Conclusions

The financial analysis of the Clean Air Plan options demonstrates that the capital cost of implementation will amount to £54.1 million (outturn values). BCC is requesting 12% of this funding from the Implementation Fund to support capital expenditure. BCC is requesting the residual funding from the Clean Air Fund to support capital expenditure on mitigation measures.

From an operational perspective, the financial analysis demonstrates that CAZ revenue is sufficient to cover operational costs for all Clean Air Plan options based on core scenario analysis. However, there is significant uncertainty around the timing, profile and scale of CAZ revenue generation. Sensitivity testing demonstrates that changes to profiling of the reduction in non-compliant traffic have the largest impact on the operational position of the Clean Air Plan. For example, significant acceleration in the reduction of non-compliant vehicles (e.g. because the rate of vehicle upgrading or behavioural choices towards non-car travel materialise faster than forecast) could significantly reduce CAZ income and transform any operational surplus into an operational deficit.

In summary, the total request to central government for the delivery of the Clean Air Plan can be summarised as follows:

- £54.1 million in capital grant funding, of which:
 - £6.7 million from the Implementation Fund
 - £47.4 million from the Clean Air Fund

Under the core scenario for financial modelling, both operational period scenarios can achieve a net operational surplus of between c. £14.1 million and c. £24.0 million over the appraisal period. It is intended that any surplus can be used for the following purposes, in order of priority:

- Deficit coverage for ongoing and long-term operational expenditure, particularly in latter years of operation when the various schemes are anticipated to face an operational deficit, as well as decommissioning.
- Creation of a reinvestment reserve to support:
 - Any underestimation of operational costs.
 - Delivery of BCC's 'Liveable Neighbourhoods' aspirations (estimated cost range £45m to £283m);
 - Supplementary schemes to the CAF measures, as well providing an opportunity to further invest in engagement with businesses and local residents affected by the schemes. For example, this funding source would support or extend some of the following measures which may form part of the CAF bid:
- Increase, Improve, update Legible City Signage on key radials and in city centre;
- An 'unintended consequences' fund for minor local implementations such as one-ways; and
- Support for additional buses to the Bristol Royal Infirmary.