



Bristol City Council Clean Air Plan

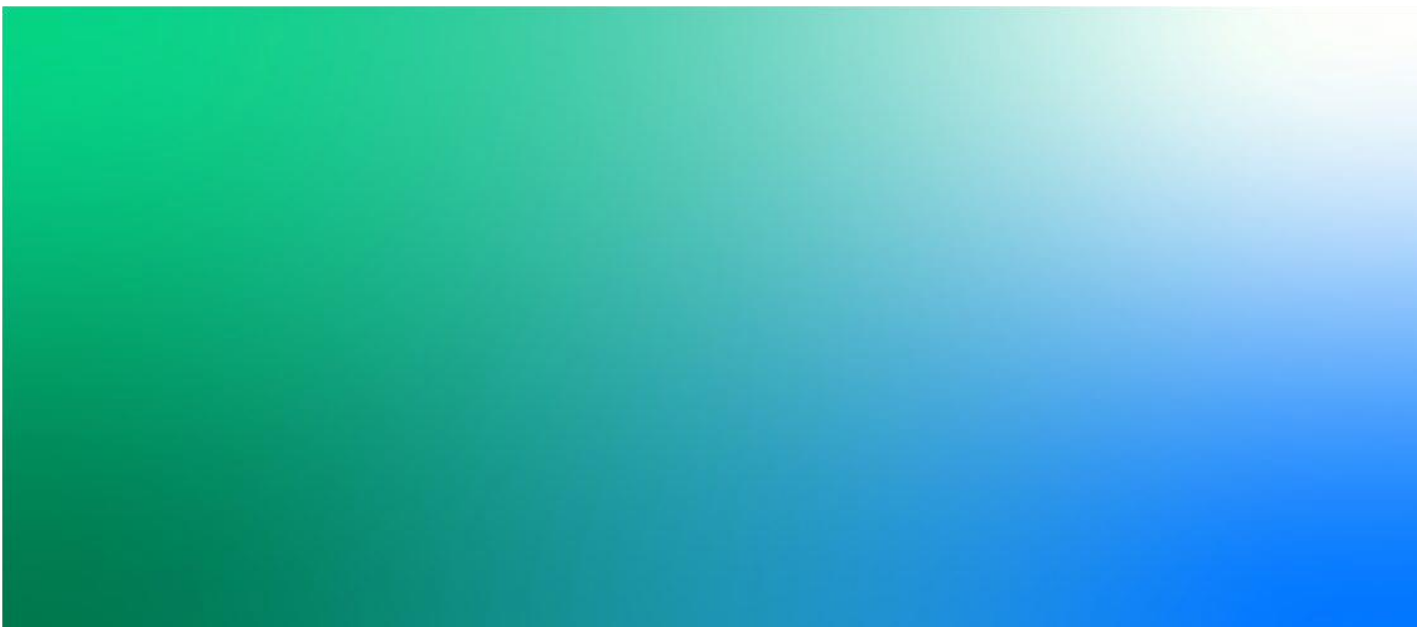
Full Business Case

Strategic Case

FBC-4 | 5

July 2021

Bristol City Council



Contents

Acronyms and Abbreviations	iii
2. Strategic Case	1
2.1 Introduction	1
2.1.1 Clean Air Zone Context	1
2.2 Update since October 2019 OBC	1
2.3 Air Quality: Background and Context	2
2.3.1 European requirements	3
2.3.2 UK Government requirements	3
2.3.3 Local Assessment	4
2.3.4 Local Health Impacts	5
2.4 Transport, Business and Air Quality: Policy Context	5
2.4.1 Policy Context	5
2.4.1.1 Links between Transport, Business and Air Quality	5
2.4.1.2 Sub-regional Policy and Strategy	5
2.4.1.3 Local Policy and Strategy	6
2.4.1.4 National policy landscape	7
2.5 Assessment of Baseline Air Quality and Transport Conditions	12
2.5.1 Original Baseline	12
2.5.2 Updated Baseline	12
2.5.3 Consideration of recent traffic volume and air quality data	13
2.5.4 Air Quality in Bristol	13
2.5.5 Monitoring data in Bristol	13
2.5.6 Source Apportionment	16
2.5.6.1 Baseline Results –2021	17
2.5.7 AQMAs	18
2.5.8 Summary of problems identified	18
2.6 Spending objectives and success factors	19
2.7 Case for Change	20
2.8 Optioneering Process	20
2.8.1 SOC Options Analysis	20
2.8.2 Options Developed: OBC Consideration	21
2.8.2.1 Development of Variant 1	21
2.8.2.2 New Option 1	22
2.8.2.3 New Option 2	22
2.8.2.4 New Benchmark Option: Medium CAZ D with New Option 1 components (private cars charged)	22
2.8.2.5 Hybrid Option of New Option 1 and New Option 2	23
2.8.3 Further Option Development	24
2.8.3.1 Church Road Adjustment	24

2.8.3.2 2025 Modelling	24
2.8.3.3 Medium CAZ C and Small CAZ D Option	24
2.8.3.4 Update to Baseline and Small CAZ D Option	25
2.9 Benefits, Risks, Constraints & Dependencies	25
2.9.1 Benefits	25
2.9.1.1 Public health and the environment.....	25
2.9.1.2 Transport	26
2.9.1.3 Financial Revenue Streams	26
2.9.2 Risks	26
2.9.2.1 Carbon	26
2.9.2.2 Particulate Matter	27
2.9.2.3 Economic impacts.....	27
2.9.2.4 Resource Demand	27
2.9.2.5 Vulnerable Groups	28
2.9.3 Constraints.....	29
2.9.3.1 Legal	29
2.9.3.2 Planning/Consenting.....	30
2.9.3.3 Resources	30
2.9.3.4 Social acceptability	30
2.9.4 Dependencies	30
2.9.4.1 Highways England	30
2.9.4.2 Low Emissions Vehicles	31
2.9.4.3 West of England Combined Authorities	31
2.9.4.4 Neighbouring Authorities	31
2.10 Stakeholder and Public Engagement	31
2.10.1 Communications Plan	31
2.10.2 CAZ Consultation (July/August 2019)	32
2.10.3 Second CAZ Consultation (October to December 2020)	34
2.10.4 Scrutiny Meetings	34
2.11 Logic Map	34
2.12 Conclusions	35

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.

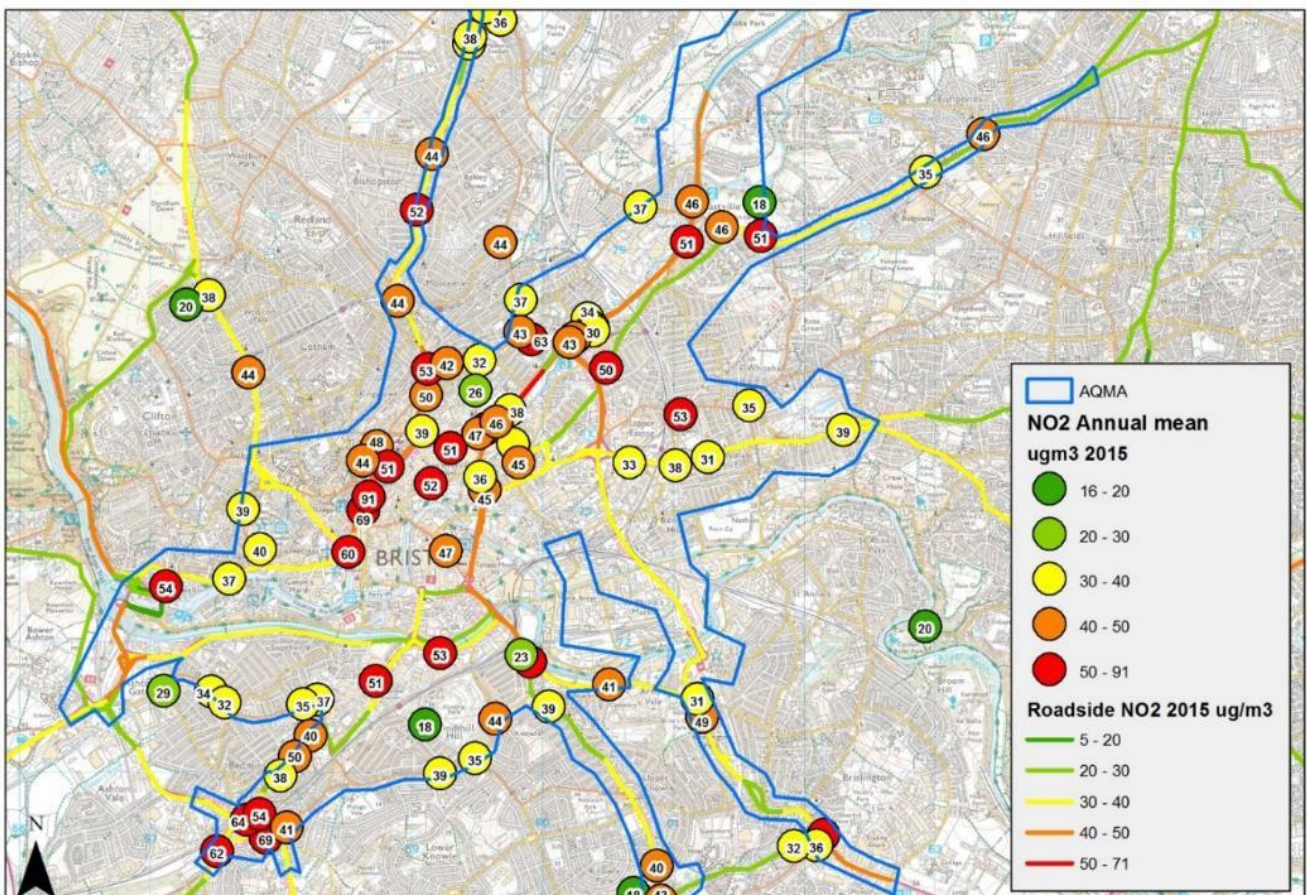


Figure 2.1: Comparison of Annual Nitrogen Dioxide Concentrations Measured at Monitoring Sites in Bristol and Estimated by the PCM Model

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>

Strategic Case

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 	

Strategic Case

		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	
--	--	--	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

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.

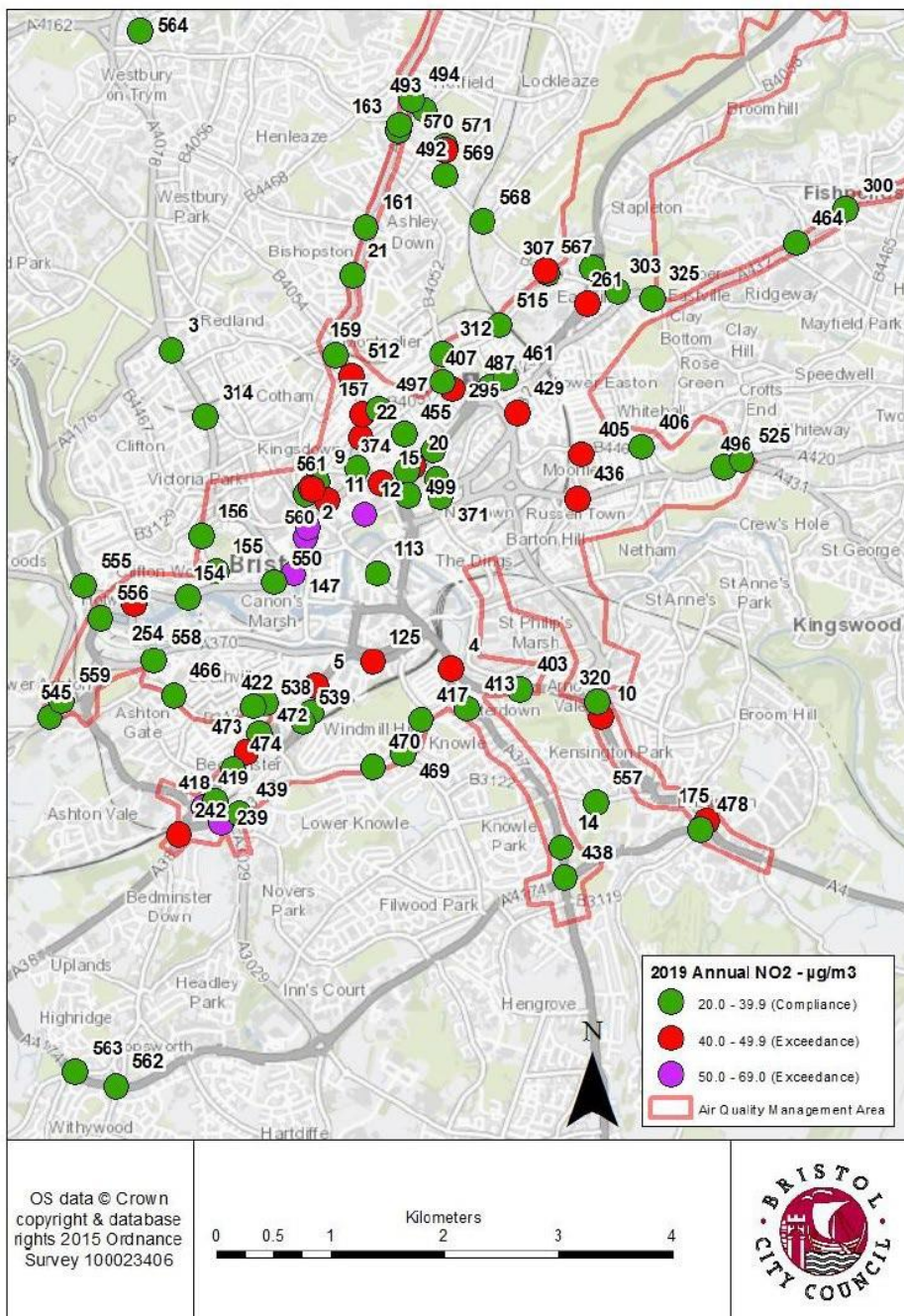


Figure 2.2: Annual mean NO₂ concentrations across the Bristol Urban Area in 2019 (taken from BCC's Air Quality Annual Status Report, 2020)

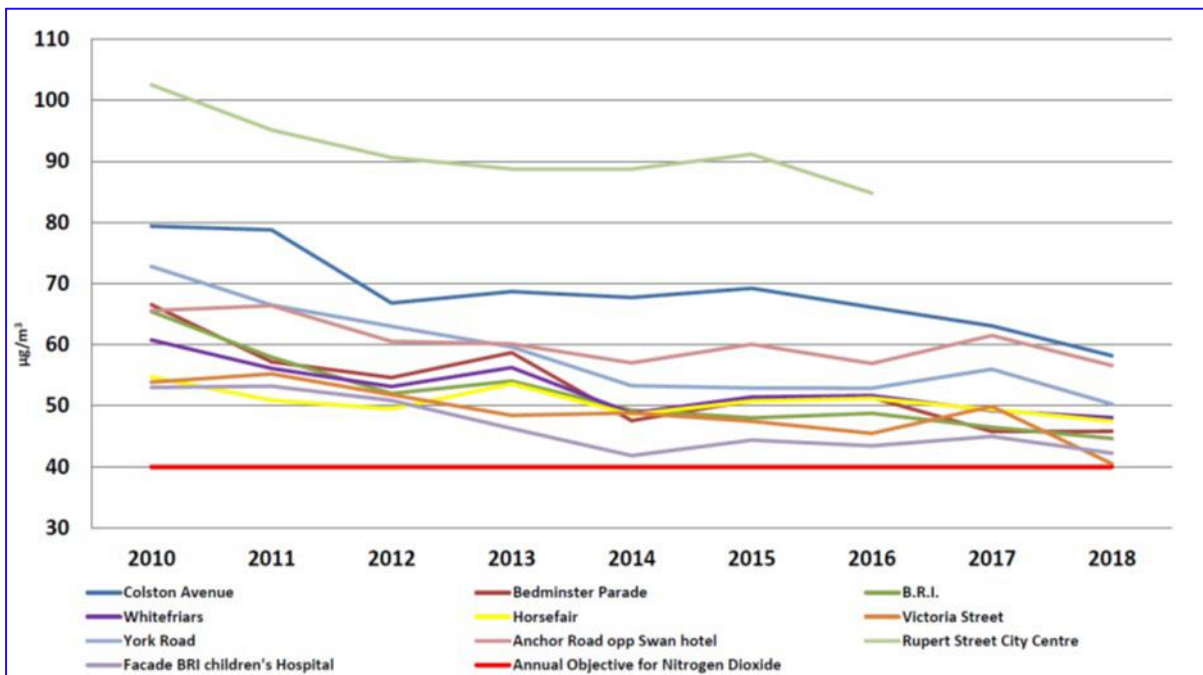


Figure 2.3: Trends in Annual NO₂ at City Centre Sites (2010-2018) A (taken from BCC's Air Quality Annual Status Report, 2019)

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)

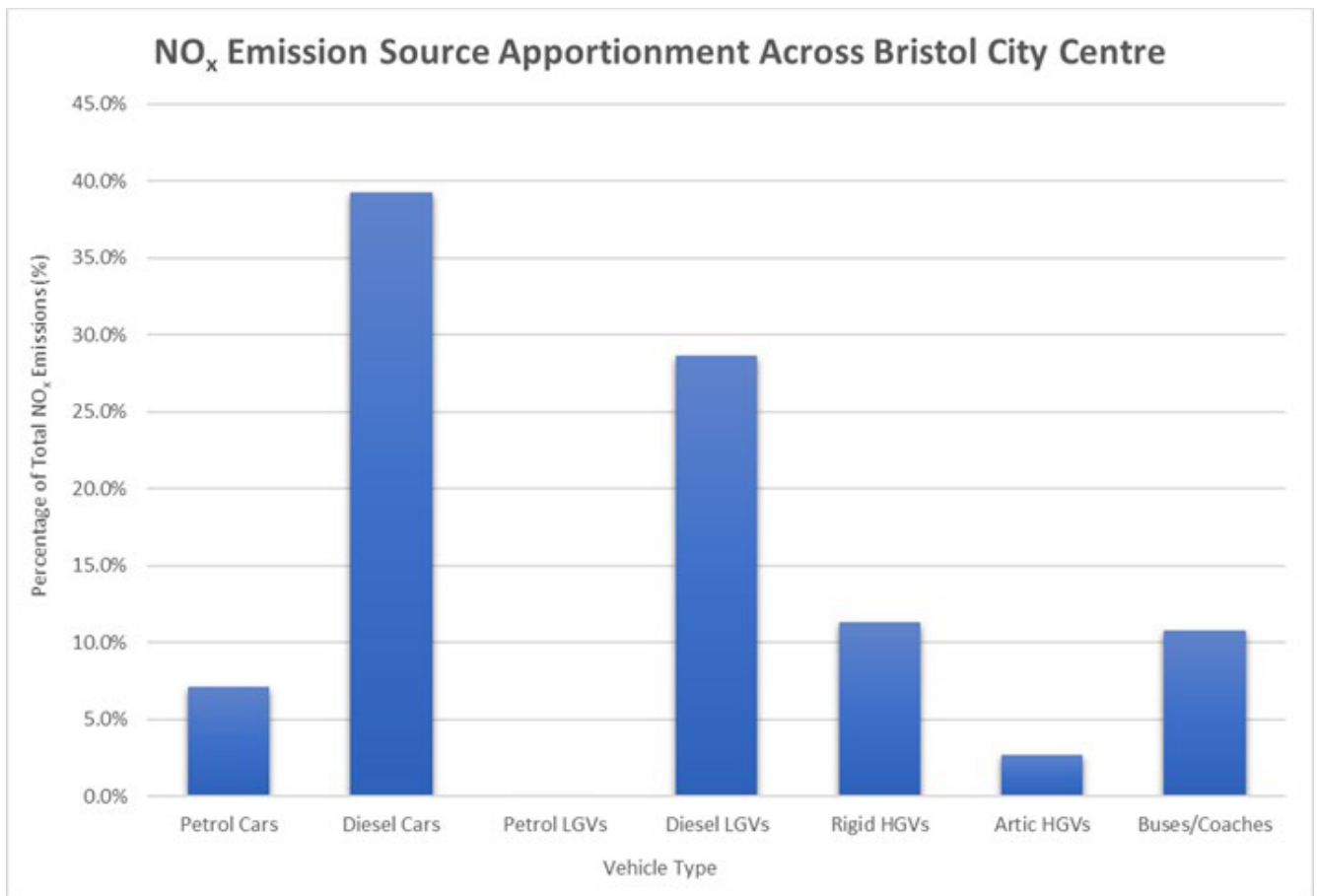


Figure 2.4: NO_x source apportionment by vehicle category across Bristol City Centre (%) – 2021 baseline.
Source: Option Assessment Report, appended to the FBC. Air Quality Model Specification

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.

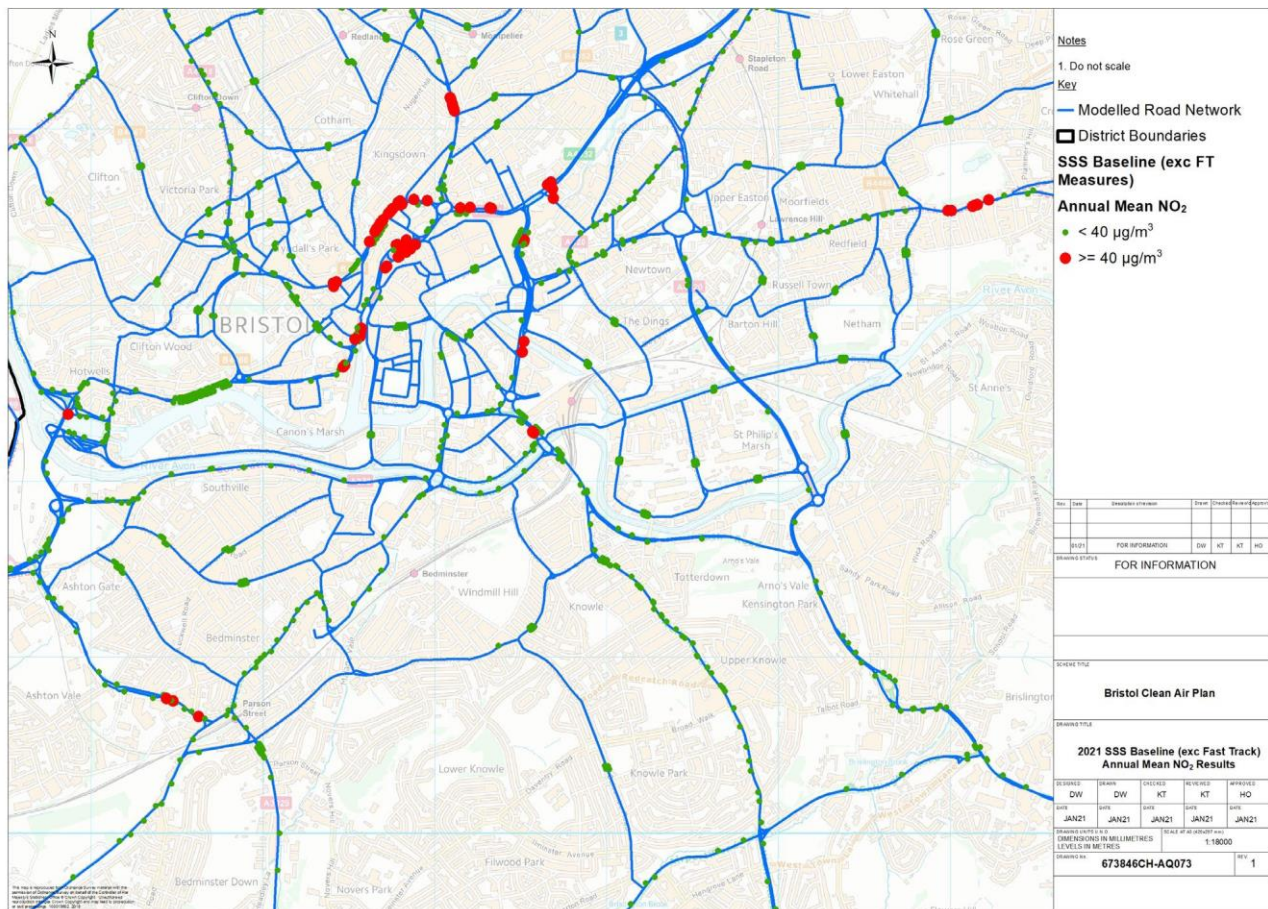


Figure 2.5: 2021 Street Space Schemes Baseline scenario modelled annual mean NO₂ results

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)

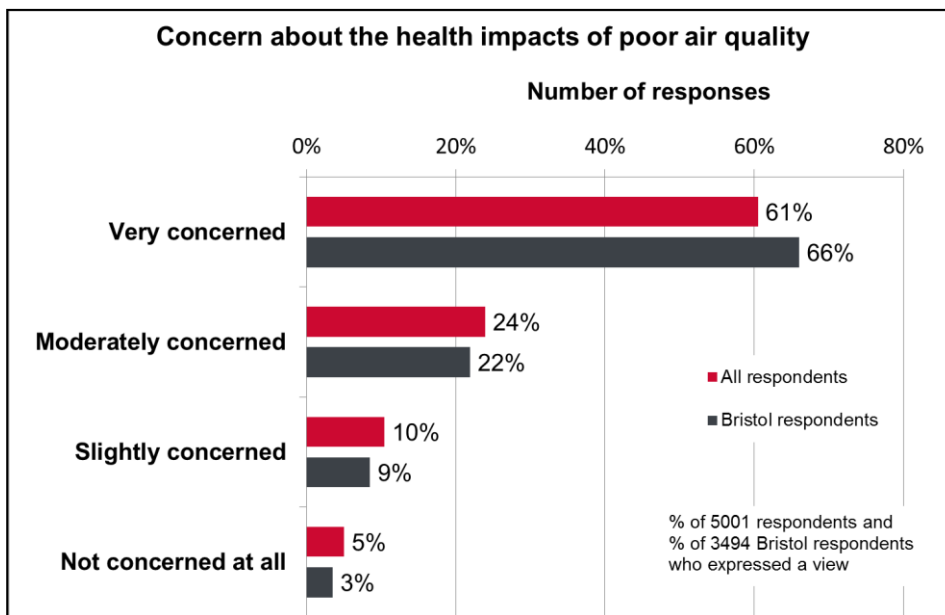
Bristol City Council undertook a six-week consultation from 1 July to 12 August 2019 on the original options 1 and 2. Engagement as part of the consultation included:

- 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.