AGENDA FOR

CABINET

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To: All Members of Cabinet

Councillors: R Shori (Leader and Cabinet Member for Business Engagement and Regeneration (Chair)), A Simpson (Deputy Leader and Cabinet Member Health and Wellbeing), S Briggs (Cabinet Member for Children and Families), J Kelly (Cabinet Member Corporate Affairs and Regulatory Services), E O'Brien (Cabinet Member Finance and Housing), A Quinn (Cabinet Member for Environment) and T Tariq (Cabinet Member for Communities)

Dear Member/Colleague

Cabinet

You are invited to attend a meeting of the Cabinet which will be held as follows:-

Date:	Tuesday, 12 March 2019
Place:	Meeting Rooms A&B, Knowsley Street, Bury Town Hall
Time:	6.00 pm
Briefing Facilities:	If Opposition Members and Co-opted Members require briefing on any particular item on the Agenda, the appropriate Director/Senior Officer originating the related report should be contacted.
Notes:	

AGENDA

1 APOLOGIES FOR ABSENCE

2 DECLARATIONS OF INTEREST

Members of Cabinet are asked to consider whether they have an interest in any of the matters of the Agenda, and if so, to formally declare that interest.

3 MINUTES *(Pages 1 - 4)*

Minutes of the meeting held on 20th February 2019 are attached.

4 PUBLIC QUESTION TIME

Questions are invited from members of the public present at the meeting about the work of the Council and the Council's services.

Approximately 30 minutes will be set aside for Public Question Time, if required.

5 HIGHWAY SAFETY INSPECTION POLICY *(Pages 5 - 20)*

A report from the Cabinet Member for the Environment is attached.

6 GM CLEAN AIR PLAN OUTLINE BUSINESS CASE *(Pages 21 - 914)*

The Cabinet Member for the Environment will report at the meeting. Reports and appendices attached.

7 MUTUALLY BINDING AGREEMENT *(Pages 915 - 964)*

The Cabinet Member for Health and Wellbeing and Deputy Leader will report at the meeting. Report attached.

8 APPOINTMENT OF MAYOR 2019/2020

The Leader of the Council, Councillor Rishi Shori will report at the meeting.

9 URGENT BUSINESS

Any other business which by reason of special circumstances the Chair agrees may be considered as a matter of urgency.

10 FOR INFORMATION ****MINUTES OF ASSOCIATION OF GREATER MANCHESTER AUTHORITIES / GREATER MANCHESTER COMBINED AUTHORITY *(Pages 965 - 984)*

To consider the minutes of meetings of the AGMA Executive Board and Greater Manchester Combined Authority held on 15th February 2019.

11 EXCLUSION OF PRESS AND PUBLIC

To consider passing the appropriate resolution under Section 100 (A)(4), Schedule 12(A) of the Local Government Act 1972, that the press and public be excluded from the meeting for the reason that the following business involves the disclosure of exempt information as detailed against the item.

12 STRATEGIC INVESTMENT (MCR AIRPORT) *(Pages 985 - 992)*

The Leader of the Council, Councillor Rishi Shori will report at the meeting. Report attached.

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Agenda Item 3

Minutes of: **CABINET**

Date of Meeting: 20 February 2019

Present: Councillor R Shori (in the Chair)
Councillors K S Briggs, J Kelly, E O'Brien. A Quinn, A Simpson and T. Tariq

Also in Attendance Councillor J Daly

Apologies: Councillor T Pickstone

Public attendance: 1 member of the public was in attendance.

CA. DECLARATIONS OF INTEREST

There were no declarations of interest made at the meeting.

CA. PUBLIC QUESTION TIME

No questions were asked under the item.

CA. MINUTES

Delegated decision:

That the minutes of the meeting held on 30th January 2019 be approved as a correct record and signed by the Chair.

CA. MONTH 9 CORPORATE FINANCIAL MONITORING REPORT

The Cabinet Member for Finance and Housing submitted a report which informed Cabinet of the financial position of the Council for the period April 2018 to December 2018 and projects the estimated outturn at the end of 2018/19. The Report also includes Prudential Indicators in accordance with CIPFAs Code of Practice.

Delegated decision:

That the financial position of the Council as at 31 December 2018 be noted.

Reasons for the decision:

Budget Monitoring falls within the appropriate statutory duties and powers and is a requirement of the Council's Financial Regulations.

Other option considered and rejected:
To reject the recommendations.

CA. HOUSING REVENUE ACCOUNT 2019-2020

The Cabinet Member for Finance and Housing submitted a report detailing the proposed Housing Revenue Account (HRA) for 2019/20. The report is prepared on the basis of the Government's requirement for a decrease in

dwelling rents of 1% for 2019/20 for General Needs and Sheltered/Extra Care properties. Members are reminded that any decrease more than this level would result in a reduction in rental income which will impact on future years and could jeopardise the financial viability of the HRA and the sustainability of the business plan.

Delegated decisions:

1. That the report be noted.
2. That Council be requested to consider all matters relating to the Housing Revenue Account 2019/2020, the increase in Council House and garage rents and changes to other charges.

Recommendations to Council:

(a) Approve the Housing Revenue Account estimates set out in Appendix 1.
(b) Decrease the Rents for all HRA dwellings by 1% from the first rent week in April.
(c) Approve that the first week of 2019/20 be an additional non-collection week as 2019/20 is a 53 week year.
(d) Increase Garage rents by 3.4% from the first rent week in April.
(e) Increase Sheltered Management and Amenity Charges by 3.4% from the first rent week in April.
(f) Approve that sheltered support charges remain unchanged from the first rent week in April.
(g) Reduce sheltered heating charges by between 5% to 15% on an individual scheme basis as set out in section 3.4; reduced charges to apply from the first rent week in April.
(h) Reduce Furnished Tenancy charges by 10% from the first rent week in April.
(i) Increase pitch fees at the Fernhill Caravan Site by 3.4% from the first rent week in April.

CA. REVENUE BUDGET 2019/2020

The Cabinet Member for Finance and Housing submitted the budget report. The report provides Members with details of the 2019/20 revenue budget and outlines;

- the Local Government Finance Settlement for 2019/20
- Forecast outturn for 2018/19
- The budget strategy for 2019/20 and the approach to balancing the budget in future years

It also examines the robustness of the assumptions behind the budget forecast and it contains an assessment of the adequacy of the Council's balances.

The Budget report is supported by the following documents;

- Departmental Budget Reports
- Capital Strategy 2019/20 – 2023/24
- Capital Programme 2019/20 – 2021/22
- Dedicated Schools Grant (DSG) 2019/20

Delegated decisions:

1. That Cabinet approves the recommendations set out in the individual Directorate reports and Dedicated Schools Grant.
2. Cabinet notes the Budget Report 2019/20 and requests that the Council consider and determine all matters relating to the Budget, and the level of the Council Tax for 2019/2020, at its meeting on 20th February 2019.
3. Cabinet notes and approves, for onward submission to Council the Capital Programme for 2019/2020 and future years.
4. Cabinet approves, for onward submission to Council, the Capital Strategy for 2019/20 to 2021/22.

Reasons for the decision:

The Council has a legal obligation to pass its budget and Council Tax resolutions by March 2019. The Cabinet have full authority to implement the budget within the budget framework set by Council and they have wide discretion in doing so.

Other options considered and rejected:
To reject the recommendations.

CA. TREASURY MANAGEMENT STRATEGY AND PRUDENTIAL INDICATORS 2019/20

The Cabinet Member for Finance and Housing submitted the Treasury Management Strategy and Prudential Indicators. The report sets out the suggested Strategy for 2019/2020 in respect of the following aspects of the Treasury Management function. It is based upon the Treasury officers' views on interest rates, supplemented with leading market forecasts provided by the Council's treasury advisor. The Strategy covers:

- Capital plans and prudential indicators;
- the minimum revenue provision policy;
- the current treasury position;
- treasury limits in force which will limit the treasury risk and activities of the Council;
- prospects for interest rates;
- the borrowing strategy;
- policy on borrowing in advance of need
- debt rescheduling;
- the investment strategy;
- creditworthiness policy; and
- policy on use of external service providers

The primary objective of the Council's treasury management function will continue to be the minimisation of financing costs whilst ensuring the stability of the Authority's long term financial position by borrowing at the lowest rates of interest and by investing surplus cash to earn maximum interest, all at an acceptable level of risk.

The overall strategy for 2019/20 will be to finance capital expenditure by running down cash/investment balances and using short term temporary borrowing rather than more expensive longer term loans. The taking out of longer term loans (1 to 10 years) to finance capital spending will only then be considered if required by the Council's underlying cash flow needs. Some long term loans (over 10 years) may be undertaken to replace debt which matures in the year. With the reduction of cash balances the level of short term investments will fall. Given that investment returns are likely to remain low (say) 0.75% for the financial year 2019/20, then savings will be made from

running down investments rather than taking out more expensive long term loans.

All prospects for rescheduling debt will be considered, in order to generate savings by switching from high costing long term debt to lower costing shorter term debt.

Delegated decision:

Cabinet approves, for onward submission to Council, the:

- Prudential Indicators forecast for 3 years
- Treasury Management Strategy for 2019/20
- Schemes of Delegation and Responsibility attached at Appendices 2 and 6

Recommendation to Council:

That approval be given to the recommendations made in the report.

Reasons for the decision:
It is a requirement of the CIPFA Code that the Council receives an annual treasury management strategy report.

Other options considered and rejected:
To reject the recommendations.

COUNCILLOR R SHORI
Chair (Note: The meeting started at 17.30pm and ended at 17.43pm)

Agenda Item 5

REPORT FOR DECISION

DECISION MAKER:	**CABINET**
DATE:	**12th March 2019**
SUBJECT:	**Bury Council Policy for Highway Safety Inspection.**
REPORT FROM:	**Cllr Alan Quinn – Cabinet Member, Environment**
CONTACT OFFICER:	**Pete Stokes, Head of Streetscene Maintenance**
TYPE OF DECISION:	***CABINET* (KEY DECISION)**
FREEDOM OF INFORMATION/STATUS:	This paper is within the public domain
SUMMARY:	As a Highway Authority, the Council is responsible for maintaining most of the roads in the Borough. This report recommends the adoption of a new Highway Safety Inspection Policy to improve highway maintenance in Bury. A new national code of practice (CoP) 'Well-managed Highway Infrastructure' includes recommendations on highway safety inspection and repair, and was implemented by 29th October 2018. In recognition of this change GM districts and TfGM have collaborated in the development of an overarching GM Highway Safety Inspection Framework. Individual districts are able wholly rely on the GM Framework or produce their own Highway Safety Inspection policies, based on its overarching principals. Bury Council does not currently have a formally adopted Policy for Highway Safety Inspection. **The Highway Safety Inspection Policy, Version 1.1 is attached as an Appendix to this report.**
OPTIONS & RECOMMENDED OPTION	**Option 1 (Recommended Option)** That members approve the Highway Safety Inspection Policy for adoption.

	Option 2 That members seek revisions to the proposed contents of the Highway Safety Inspection Policy prior to adoption. Members to specify the nature of any revisions to be sought.

IMPLICATIONS:	
Corporate Aims/Policy Framework:	Do the proposals accord with the Policy Framework? Yes
Statement by the S151 Officer: **Financial Implications and Risk Considerations:**	This revised policy will inform the deployment of highways resources, assist with the defence of insurance claims, and ultimately lead to improved standards of highway maintenance.
Statement by Executive Director of Resources:	There are no wider resource implications
Equality/Diversity implications:	No An initial screening has been undertaken and as there are no negative impacts identified for affected groups, there is no requirement to proceed to a Full Impact Assessment. Adoption of this policy is likely to have a positive impact on residents with disabilities.
Considered by Monitoring Officer:	Yes JH The Council has a duty to maintain the highways defined by statute as maintainable at the public expense or adopted in accordance with statutory adoption procedures. The Policy recommended for adoption will cover highway inspection practices, frequency of inspection and response times for repair, to secure a well managed highway infrastructure.
Wards Affected:	All
Scrutiny Interest:	

TRACKING/PROCESS
INTERIM DIRECTOR: STEVE KENYON – RES & REG

Chief Executive/ Strategic Leadership Team	Cabinet Member/Chair	Ward Members	Partners
Scrutiny Committee	Cabinet/Committee	Council	

1.0 BACKGROUND

1.1 Under the Section 41 of the Highways Act 1980, Bury Council, as Highway Authority (HA), has a statutory duty to maintain the highway network that is maintainable at public expense.

1.2 The national CoP 'Well-managed highway infrastructure' (WmHI) supersedes the previous Codes 'Well-maintained Highways' (WmH), 'Well-lit Highways' and 'Management of Highway Structures'. This was published on 28 October 2016 and was implemented on 29th October 2018.

1.3 In recognition of the change in CoP GM districts and TfGM collaborated in the development of an overarching GM Highway Safety Inspection Framework, with input from legal and insurance partners specialising in the subject of highway claims. This Framework document was published April 2018.

1.4 Historically Bury Council has not had a formally adopted policy for Highway Safety Inspections. The Policy for Highway Safety Inspection attached at Appendix 1 of this report will bridge this gap in policy.

1.5 This Policy seeks to set out Bury Council's practices in terms of network hierarchy, investigatory levels, frequency of inspection and response times to repair the Highway, based on the overarching principals of the GM Framework.

2.0 ISSUES

2.1 WmHI and the resultant GM Framework for Highway Safety Inspection moves from a reliance on specific guidance and recommendations of the previous Codes to a risk-based approach.

2.2 This shift places a greater onus on the knowledge and skills of highway inspection teams. In recognition of this training in the Code is mandatory for highway inspectors and mangers. For consistency all GM highway inspectors will be City and Guilds accredited. It is hoped that this will place

a greater emphasis on the testimony of highway inspectors and managers in court.

2.3 Cognisant of the shift to a risk-based approach the GM Framework consciously follows many of the standards historically adopted from WmH. This, in part, is in recognition of how successful districts have been in defending highway insurance claims using existing policies.

2.4 Bury implemented the changes to working practices for highway safety inspection set out in the WmHI and the GM Framework on 29th October 2018.

2.5 The Policy for Highway Safety Inspection attached at Appendix 1 details the methodology and standards to be adopted by Bury Council in the application of a risk-based approach to highway safety inspection.

2.6 In order to defend against claims for a breach of this duty, Bury Council, as HA, must prove that it has taken such care as in all the circumstances was reasonably required to secure that the part of the highway was not dangerous for traffic. This statutory defence is provided by Section 58 of the Highways Act 1980 and is usually proved by the HA having a reasonable system of routine scheduled highway safety inspection and repair in place.

3.0 CONCLUSION

3.1 Adoption and implementation of The Highway Safety Inspection Policy will improve highway maintenance in Bury.

3.2 The Highway Safety Inspection Policy provides direction to those officers involved in undertaking highway safety inspections, in order that they may carry out their duties with consistency and to clear recognised and understood criteria.

List of Background Papers:

- Greater Manchester Highway Safety Inspection Framework

Contact Details:

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Highway Safety Inspection Policy

Version 1.1

Contents

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1. Introduction

Section 41 of the Highways Act 1980 places a statutory duty on all Highway Authorities (HA) to maintain the highway network under their control. For there to be a breach of section 41 there must have been a failure to maintain or a failure to repair.

Bury Council in complying with this duty to maintain, carries out highway safety inspections in accordance with this policy document in order to provide a special defence by virtue of Section 58 of the Highways Act 1980 in an action against the Council for an alleged breach of Section 41.

Highway Authorities (HA's) need to prove that they have taken such care as in all the circumstances was reasonably required to secure that the part of the highway was not dangerous for traffic. This is usually proved by the Council having a reasonable system of routine scheduled highway safety inspections in place, having regard to various factors set out within section 58 of the Highways Act 1980

2. Overview

This policy document has been developed with the primary aim of providing direction to those officers involved in undertaking highways safety inspections, that they may carry out their duties with consistency and to clear recognised and understood criteria.

The information contained within this policy document sets out the practices in terms of network hierarchy, investigatory levels, frequency of inspection and response times to repair for Bury Council as Highway Authority.

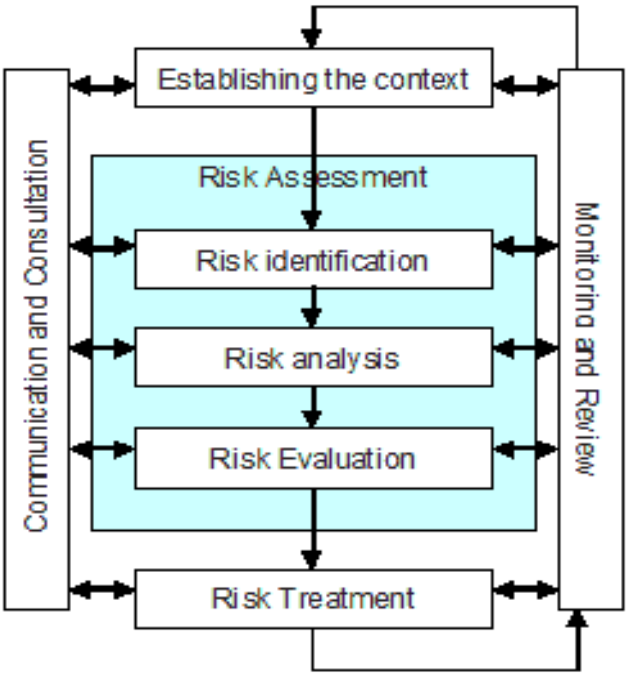
This policy document has been developed in compliance with the Greater Manchester Highway Safety Inspection Framework and has adopted the guidance that reflects the recommendations from the Code of Practice, Well managed Highway Infrastructure (WmHI), published on 28th October 2016.

Bury Council is an active participant in GM Highway Claims Benchmarking Group which is tasked with continually reviewing the GM Highway Safety Inspection Framework. Participation in this group will ensure that this policy document evolves in line with the GM Framework.

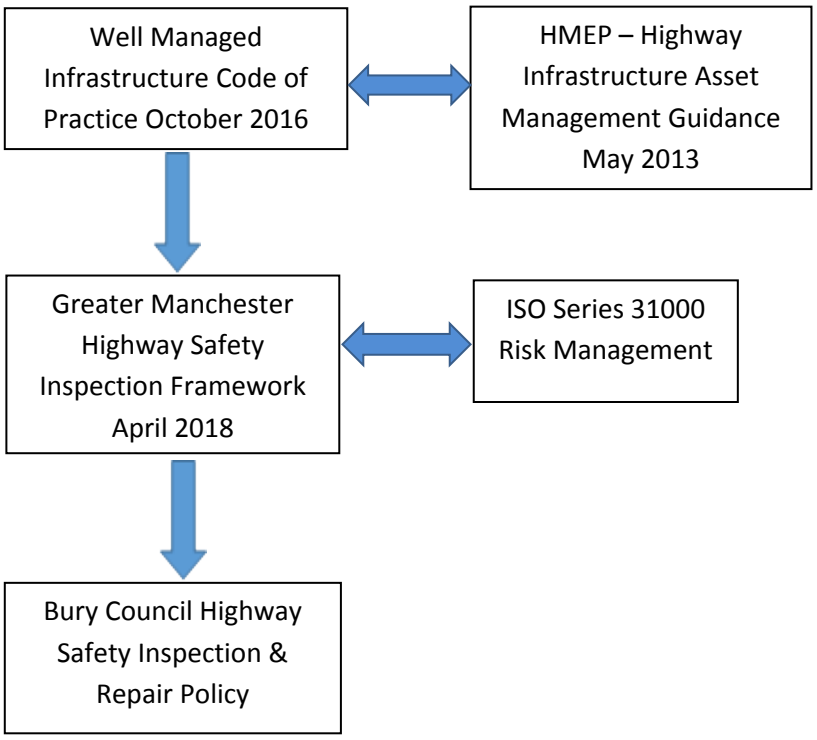
WmHI Code of Practice recommends changing from reliance on specific guidance and recommendations in the previous codes to a risk-based approach determined by each highway authority. The council's frequency of inspection and specific investigatory levels are based on the appropriate risk, functionality or usage of the highway. It further recommends adopting standards set out in ISO 31000.

ISO 31000 is a series of standards relating to risk management codified by the International Organization for Standardization. The purpose of ISO 31000: 2009 is to provide principles and generic guidelines on risk management.

Example Risk Management Process to ISO 31000



Relationship between guidance documents, CoP, Framework and Policy.



3. Types of Highway Inspections

This policy document deals specifically with highway safety inspections and repairs.

Bury Council's methodology is to undertake safety inspections as one process to enable inspectors to focus specifically on defects which if not repaired, are likely to become a potential danger to road users and pedestrians.

Highway safety Inspections are derived from two main sources, these are;

- Planned cyclic safety inspections to identify potential dangers; and
- Ad hoc reactive safety inspections following enquiries in respect of the condition of the highway.

4. Hierarchy and Frequency

All the adopted highways have been assigned a carriageway, footway and cycleway hierarchy in accordance with WmHI Code of Practice.

Table 1 below details examples of hierarchy determining factors to be considered when assigning network hierarchies. Other factors may also be pertinent.

Table 1

Road classification	Strategic network, A,B,C, unclassified network
Characteristics of street	Schools, shops, hospitals, areas of large employment located adjacent to the highway
Condition data	Highway Inspector local knowledge
Wider policy or operational considerations.	Enquiries, complaints data

The highway inspection team will records streets worthy of a hierarchy classification review within the highway asset management system, during the course of their routine highway safety inspections. This dynamic approach will enable network hierarchy classifications to react more responsively to changes in the road network.

The council's frequency of inspections is based on the appropriate risk, functionality or usage of the highway and the subsequent hierarchy assigned. The road category within the hierarchy, will be the main determinant of inspection frequency.

Table 2 below shows the inspection hierarchy and frequency of inspections although site specific factors may merit a decision to temporarily or permanently increase or reduce the frequency in a specific location (for example to mitigate the risk of unusually high defect levels).

Table 2

Feature	Category	Reference	Frequency
Carriageways	Strategic Route	2	1 month
	Main Distributor	3(a)	1month
	Secondary Distributor	3(b)	1month
	Link Road	4(a)	3 months
	Local Access Road Minor Roads	4(b) 4(b)	1 year 1 year
Footways	Prestige Walking Zones	1(a)	1 month
	Primary Walking Routes	1	1 month
	Secondary Walking Routes	2	3 months
	Link Footways	3	6 months
	Local Access Footways Minor Footways	4	1 year 1 year
Cycle ways	Part of Carriageway	A	As for Roads
	Cycle Track, Shared Cycle/Footway – a route for cyclists not contiguous with the public footway or carriageway or a shared cycle/pedestrian path	B	As for footway/Annually

5. Highway Safety Inspections

Highway safety inspections are carried out to specified frequencies. During the inspection, defects which are identified using the risk matrix criteria outlined within this policy document, are recorded and processed for repair.

Inspection Methodology

All footways will have a walked inspection at the assigned frequency determined by the hierarchy, and the carriageway will also be inspected during these walked inspections.

When, in accordance with the hierarchy, it is only the carriageway to be inspected, then the inspection can be by means of a driven or walked inspection.

Walked Highway Safety Inspections

Safety inspections will be recorded using handheld devices noting:

- The street name; and
- Current date

The inspector shall position themselves in a safe location on the footway, in such a position that it enables him/her to view the full width of the footway and carriageway to the centre line including the carriageway channel areas.

When the inspector encounters parked vehicles they shall take reasonable steps where appropriate so as to view the area obstructed by the vehicle.

The inspector shall proceed along the footway, identifying defects that meet the investigatory levels set out in table 3. The inspector identifies defects and then undertakes a risk based approach on assessing the danger of the defect

Any defect which falls at or outside these levels that the inspector identifies, would be assigned a score from table 4 and then a response time from table 5. These will be recorded on their handheld device, or by any other means during periods of IT system down time. On completing the inspection of one side of the street, the inspector shall apply the same process to the opposite side of the road.

Driven Carriageway Safety Inspection

The vast majority of highway safety inspections will be walked, however should there be a specific identified need to carry out driven inspections the following process will apply.

The purpose of these carriageway safety inspections is to identify defects that are likely to pose a risk or serious inconvenience to users of the network or the wider community and to arrange for their remedy.

Before commencing the Driven Safety Inspection, the inspector shall note the following information;

- The street name; and
- Current date

Driven carriageway inspections shall be carried out utilising a driver (albeit more often than not they will be a trained highway inspector) and a highway inspector. The driver shall be responsible for driving and the highway inspector will be responsible for carrying out the safety inspection.

The Inspector shall have due regard to their personal safety and in particular from moving traffic either on the main highway or at junctions and crossings. On no account must he/she put himself/herself in any hazardous situation.

Driven inspections will not be carried out on high speed roads.

Inspection Vehicle

The inspection vehicle used for the driven highway safety inspections will be an appropriate vehicle for the task. The vehicle will ideally be equipped with all the necessary livery, flashing beacons, advisory LED vehicle mounted display signage etc., so can be driven safely at low speeds to facilitate a driven visual inspection of the highway having due regard to minimising inconvenience to other road users.

6. Defect Investigatory Levels

This section of the policy document sets out the investigatory levels and operational processes that are considered to be appropriate and responsible, taking into account the safety of highway users.

Table 3 below lists the Defect Investigatory levels that would trigger the risk assessment using the matrix.

Table 3

Footway investigatory level	25mm
Carriageway Investigatory level	40mm
Carriageway investigatory level at pedestrian crossing points	25mm
Kerb defects	50mm or over displacement of a kerb

7. Repair Response Times

During safety inspections, all observed defects that provide a potential risk to users are recorded and the level of response determined on the basis of an onsite risk assessment.

This policy defines defects in two categories, which are;

- **Category 1** - those that require prompt attention because they represent an immediate hazard; and

• **Category 2** - all other defects.

Category 1

These defects will be corrected or made safe at the time of the inspection, if reasonably practicable. In this context, making safe may constitute displaying warning notices, coning-off or fencing-off to protect the public from the defect or other suitable action. If the inspection team cannot make safe the defect at the time of inspection then they will instigate the relevant emergency response to ensure appropriate resources are mobilised to make the defect safe. These procedures aim to ensure initial attendance to the defect within 2 or 24 hours of the defect being identified.

Category 2

These defects are those which are deemed not to represent an immediate hazard and which can be repaired within longer timescales. Category 2 defects are categorised according to priority with response times defined within Table 5 below.

8. Defect Risk Assessment

The principles of a system of defect risk assessment for application to safety inspections are set out below. Any item with a defect level which corresponds to, or is in excess of, the minimum investigatory level, is to be assessed using the risk assessment matrix in table 4 below.

Risk Factor

The risk factor for a particular risk is calculated by;

- Risk Factor = Likelihood score x Consequence score.

It is this factor that identifies the overall seriousness of the risk and consequently the appropriateness of the speed of response to remedy the defect.

Having identified a particular risk, assessed its Likelihood and Consequence thus calculating the risk factor, the category and the timescale to rectify the defect is either defined as a Category 1 response, or allocated to one of the Category 2 defect types (Low, Medium or High).

Likelihood of Event Occurring
This is the inspector's assessment of the likelihood of the defect affecting the safe passage of vehicles along the highway, or affecting the structural integrity of the highway. It follows an assessment of the highway hierarchy and the location of the defect within the highway.

Consequence of Event Occurring This is the impact/severity and is quantified by assessing the extent of damage likely to be caused should the risk be realised. The main consideration of impact/severity is the magnitude or dimension of the defect. However, other variables such as road speed may also affect the likely impact

The risk assessment matrix detailed below will be the prime document used by the Highway Inspectors during the course of their inspections. The matrix will be used to determine the defect categorisation and response.

Table 4 – Risk Matrix (Taken from Institute of Highway Engineers)

Likelihood of Event Occurring	Consequence of Event Occurring				
	Negligible	Low	Medium	High	Severe
Negligible	1	2	3	4	5
Very Low	2	4	6	8	10
Low	3	6	9	12	15
Medium	4	8	12	16	20
High	5	10	15	20	25
Key to Risks					
Low		Medium		High	

Priority Responses defined by colour

Table 5

Risk factor	Defect Category	Priority Response
25	1	1
15 to 25	1	2
9 to 12	2	3
5 to 8	2	4
2 to 4	2	5
1	2	6

Priority	Response (Calendar days)
1	2Hr
2	24Hr
3	14 Days
4	28 Days
5	Considered For Planned Maintenance
6	Review At Next Inspection

Minimum Investigatory Levels

It is recognised that on any highway network, a multitude of minor defects will exist which do not pose any risk to either the safety or the integrity of the highway and for which it may be impractical and inefficient to expend limited resources to undertake repairs. Any defects which do not meet the minimum investigatory levels can be recorded should the Inspector deem this appropriate using his/her discretion (for example, where a cluster of such defects may form a potential preventative maintenance scheme in the future). Where such defects are recorded, they will be recorded as Cat 2 defects but assigned a planned maintenance response time, defined in the risk matrix priority responses

9. Enquiries

Where necessary customer enquiries will prompt an ad-hoc highway inspection which will be recorded should action be required. Ordinarily customers will not receive feedback on the enquiry unless it is expressly requested, however our systems will be updated detailing action/findings.

10. Training

All staff that are employed to undertake highway safety inspections are trained to Highway Safety Inspection Qualification City and Guilds 6033 – Units 301 and 311.

Any new highway inspector will shadow a colleague within the inspection team for a period of time prior to being allowed to undertake inspections alone, and then is subject to close monitoring and supervision.

Induction training will be undertaken for any new employees.

The appropriate line manager / supervisor will undertake periodic follow-up checks in the way of on-site staff appraisals with each inspector which is then recorded and signed by both the supervisor and inspector as a true record.

Each team member is provided with this policy document together with Bury Council Safety Inspection Manual.

Regular highway inspection team meetings are held which enables issues in relation to the inspection and repair process to be continually reviewed.

Make up of training to include;

- Manager Introduction & Briefing;
- Work shadowing;
- Highway related training modules contained within the City & Guilds training scheme; Units 301 and 311;
- On-site staff appraisals/work monitoring (line manager);
- Regular team meetings;
- Staff Development Reviews (Annually);
- Any other external courses of relevance to post; and
- Documents relating to relevant Codes of Practice.

Agenda Item 6

REPORT FOR DECISION

DECISION OF:	**CABINET**
DATE:	**12th March 2019**
SUBJECT:	**Greater Manchester's Clean Air Plan – Tackling Nitrogen Dioxide Exceedances at the Roadside – Outline Business Case (OBC)**
REPORT FROM:	**Councillor Alan Quinn**
CONTACT OFFICER:	Lorraine Chamberlin l.chamberlin@bury.gov.uk Chris Horth c.horth@bury.gov.uk
TYPE OF DECISION:	**CABINET KEY Decision**
FREEDOM OF INFORMATION/STATUS:	This paper is within the public domain
SUMMARY:	Bury Council is mandated by Government to tackle Nitrogen dioxide exceedances in the borough in the shortest possible time. Consequently Bury Council has been working collectively with all Greater Manchester local authorities and the GMCA coordinated by TfGM, to produce a feasibility study for a GM Clean Air Plan in accordance with Government direction. This report summarises the key features of this feasibility study so far and includes the outline business case which if adopted by Bury Council can be then be submitted to Government for approval; leading to further stakeholder engagement, consultation and completion of a final business case.
OPTIONS & RECOMMENDED OPTION	Bury Council 's Cabinet **is** recommended to: • Note that the Council is legally obliged to produce a feasibility study to identify the option which will deliver compliance with the requirement to meet legal limits for nitrogen dioxide following the Secretary of State issuing a direction under the Environment Act 1995; • Adopt the feasibility study undertaken to date; • Note that further stakeholder engagement and

	public consultation is an essential part of the process to help inform and refine ongoing work to produce a Full Business Case by the end of the calendar year; • Approve the OBC (for submission to the government's Joint Air Quality Unit); • Require government to provide the financial support necessary to enable the Council to meet its legal limits for nitrogen dioxide; • Note that despite this council being required to address nitrogen oxide exceedances the government has not yet addressed this issue for its own assets, including Highways England and the motorway network; • Approve the commencement of the public conversation and engagement activity from 15 May 2019; • Note that further reports will be submitted to [Executive/Cabinet] on: o the proposals for statutory consultation, informed by the outcome of the public conversation and engagement. o formal approval of the Full Business Case. • Agree that TfGM continue with the activity to produce the Full Business Case on their behalf under the direction of the Greater Manchester Clean Air Steering Group; and • Delegate to the Interim Executive Director, Communities and Wellbeing or nominated officer, in consultation with Councillor Alan Quinn Cabinet Member for Environment, the approval of submission of supplementary information.

IMPLICATIONS:	
Corporate Aims/Policy Framework:	Do the proposals accord with the Policy Framework? Yes
Statement by the S151 Officer: Financial Implications and Risk Considerations:	In developing the OBC, it has been assumed that JAQU Implementation and Clean Air Funds will fund all costs relating to scheme implementation, and that DEFRA/JAQU will underwrite any net operational deficit, as may be necessary, over the life of the scheme until compliance is achieved. If scheme operations generate any net surplus, this would be re-invested back into achieving Local Transport Plan (2040 Greater Manchester Transport Strategy) objectives, as required by the Transport Act 2000. There is a considerable amount of uncertainty in the assumptions around revenue generation, since there is no CAZ currently in operation in the UK. Therefore, the forecasts included in the financial model are indicative at this stage.
Health and Safety	

Statement by Executive Director of Resources:	
Equality/Diversity implications:	Yes No (see paragraph below)
Considered by Monitoring Officer:	Yes Comments This report and recommendations form part of ongoing work by AGMA, GMCA and TFGM pursuant to the government mandate to comply with legislative requirements on air quality. This mandate is to individual, but not all, AGMA authorities and places specific responsibilities upon Bury Council to ensure compliance. If the Council decides not to adopt the approach recommended it will have to produce and present its own case to the government. Further work will be required by the Council and other authorities going forward and reports to Cabinet in due course
Wards Affected:	**All Wards**
Scrutiny Interest:	**Overview and Scrutiny**

TRACKING/PROCESS **DIRECTOR:**

Chief Executive/ Strategic Leadership Team	Cabinet Member/Chair	Ward Members	Partners
Scrutiny Committee	Committee	Council	

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1 CONTEXT AND BACKGROUND

1.1 Taking action on air quality is not optional. The severe and long lasting health implications of poor air quality as well as the legal obligations placed on Greater Manchester local authorities means that authorities need to act decisively and swiftly to reduce harmful air pollutants, and nitrogen oxides in particular.

1.2 Greater Manchester authorities in deciding to work together to respond to this vital issue are demonstrating collective leadership, which is essential to help clean the air for our

combined population of nearly three million residents. Analysis reveals that locations of damaging roadside nitrogen dioxide concentrations can be found in every district.

1.3 Given that air pollution does not respect boundaries, this coordinated approach is also the most effective way to deal with a problem that affects all parts of Greater Manchester, and cannot be remedied on a site by site or district by district basis.

1.4 The ten authorities, supported by Transport for Greater Manchester, have now developed a draft package of co-ordinated and robust measures in a very short period of time that complies with the highly prescriptive Government guidance for tackling NOx emissions.

1.5 However, much more work is required to flesh out some of the measures to ensure that they achieve their intended purpose, and to ensure that the measures proposed to support affected businesses and individuals are fair and effective, and that the socio-economic impacts of measures are understood and can be mitigated.

1.6 This is why further engagement with stakeholders and affected parties to refine the measures, in addition to full public consultation, are vital next steps in the process toward developing the Full Business Case by the end of the year.

1.7 The Greater Manchester approach, set out below, will require significant government funding. Without full financial support, the package of measures which was devised in the context of guidance that identified Implementation Funding and Clean Air Plan funding is unlikely to deliver the intended results. In a scenario of inadequate government support, the most obvious outcomes are a failure to reduce exceedances as quickly as required, and economic damage, for example to local businesses who are left unsupported but required to upgrade their vehicle fleet.

1.8 By taking a combined approach, Greater Manchester's bid for the substantial funding required to deal with this key public health priority can only be strengthened.

2. INTRODUCTION

2.1 Previous reports as well as briefings to members have set out the health challenge presented by poor air quality, the legal context and the tightly specified approach that Government has directed local authorities to follow within very tight timescales in order to address predicted nitrogen dioxide (NO_2) exceedances in the shortest possible time.

2.2 These are summarised below, followed by a description of the feasibility study and the resulting OBC that has been developed by the GM Steering Group, following government guidance.

2.3 The OBC document itself is attached as an Annex to this report.

3. AIR QUALITY AND HEALTH

3.1 Poor air quality is the largest environmental risk to the public's health. Taking action to improve air quality is crucial to improve population health.

3.2 Whilst air quality has been generally improving over time, particular pollutants remain a serious concern in many urban areas. These are oxides of nitrogen (NOx) and its harmful form nitrogen dioxide (NO_2), and particulate matter (PM).

3.3 In Greater Manchester road transport is responsible for approximately 80% of NO_2 concentrations at roadside, of which diesel vehicles are the largest source.

3.4 Long-term exposure to elevated levels of particulate matter (PM2.5, PM10) and NO_2 may contribute to the development of cardiovascular or respiratory disease, and may reduce life expectancy[1]. The youngest, the oldest, those living in areas of deprivation, and those with existing respiratory or cardiovascular disease are most likely to develop symptoms due to exposure to air pollution[2,3].

3.5 Public Health England estimate the health and social care costs across England due to exposure to air pollution will be £5.3 billion by 2035 for diseases where there is a strong association with air pollution, or £18.6 billion for all diseases with evidence of an association with air pollution[4].

4. LEGAL BACKGROUND

4.1 Because of their harm to human health, legal Limit Values[5] for concentrations of certain pollutants in ambient air have been established. The European Ambient Air Quality

[1] Air Quality – A Briefing for Directors of Public Health (2017), https://www.local.gov.uk/air-quality-briefing-directors-public-health
[2] Air Quality – A Briefing for Directors of Public Health (2017), https://www.local.gov.uk/air-quality-briefing-directors-public-health
[3] RCP and RCPCH London, Every breath we take lifelong impact of air pollution (2016), https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution
[4] https://www.gov.uk/government/news/new-tool-calculates-nhs-and-social-care-costs-of-air-pollution
[5] European Union Limit Value regarding levels of NO_2 in major urban areas (40 micrograms per cubic metre ($\mu g/m^3$)) set by the European Ambient Air Quality Directive (2008/50/EC) as implemented into UK law by the 2010 Air Quality Standards Regulations (SI. 2010 No. 1001)

Directive (2008/50/EC) incorporates many of the World Health Organisation (WHO)' air quality standards into European Law, which was transposed into English law by the 2010 Air Quality Standards Regulations (SI. 2010 No. 1001).

4.2 The 2010 regulations set legally binding limits for concentrations of major air pollutants that affect human health, including NO_2 and particulates. Regulation 26 of the 2010 Regulations requires the Secretary of State to draw up and implement a national air quality plan so as to achieve the relevant limit or target value within the "shortest possible time".

4.3 Since 2010, the UK has been in breach of legal Limit Values for NO_2 concentrations in major urban areas.

4.4 The Greater Manchester Urban Area Zone is one of 37 reporting zones across the UK where the Department for the Environment, Food and Rural Affairs (Defra) modelling of annual mean NO_2 concentrations predicts levels that exceed statutory Limit Values.

4.5 Whilst Greater Manchester currently meets Limit Values for other pollutants, the 2016 Greater Manchester Low Emission Strategy and Air Quality Action Plan set out a co-ordinated approach for reducing all air pollutants, including particulates, as well as carbon dioxide.

5. GOVERNMENT'S UK AIR QUALITY PLANS

5.1 Since 2010, Government has produced three successive Air Quality Plans to reduce NO_2 emissions in line with Limit Values. Environmental campaigning law organisation ClientEarth successfully challenged these Air Quality Plans in the High and Supreme Courts for failing to include actions necessary to achieve NO_2 Limit Values "in the shortest possible time".[6]

5.2 Each successful legal challenge increased the number of local authorities directed by Government to take action. Over 60 local authorities are now under Direction:

- 2015: Birmingham Derby, Leeds, Nottingham and Southampton.
- 2017: 23 local authorities – including Bolton, Bury, Manchester, Salford, Stockport, Tameside and Trafford.
- 2018: 33 further local authorities, including Oldham.

5.3 In July 2017 Government served a Direction[7] on seven Greater Manchester local authorities requiring them to produce a feasibility study, in accordance with the HM Treasury's Green Book, in which they must identify the option which will deliver compliance with legal limits for nitrogen dioxide in the area for which the authority is responsible in the "shortest possible time".

[6] *R (on the application of **ClientEarth**) (Appellant) v. Secretary of State for Environment, Food and Rural Affairs* [**2015**] UKSC 28.

[7] Environment Act 1995 (Feasibility Study for Nitrogen Dioxide Compliance) Air Quality Direction 2017

5.4 This Direction was supplemented by guidance issued by the Department for Transport (DfT), including the 'Clean Air Zone Framework'[8] and the 'UK plan for tackling roadside nitrogen dioxide concentrations'[9].

5.5 Government also established the Joint Air Quality Unit (JAQU) to help deliver the National Plan by closely guiding local authorities.

5.6 Government has allocated £255 million for Implementation Funding and £220 million for a Clean Air Fund. Local authorities will be allocated Implementation Funding based on their Final Business Case. Local authorities will bid to the Clean Air Fund for support to help local people, businesses and other groups to switch to cleaner vehicles or make alternative travel choices.

5.7 The proposals put forward will therefore be conditional upon sufficient funding being provided by Government.

5.8 Oldham Council are under a separate Direction[10] which they complied with by the production of their feasibility study submitted to JAQU in July 2018. No further Direction was issued to Oldham as Government acknowledged in its supplemental plan that the exceedance identified in Oldham was being considered as part of the Greater Manchester plan.

5.9 Whilst Rochdale and Wigan Councils were not compelled to act through a ministerial Direction, they are participating in the Greater Manchester-wide approach as they are required to address the exceedances that have been identified within their boundaries during the Target Determination exercise (see further detail in Section 7). This revealed 250 points of exceedance across 152 road links and all ten districts in 2021.

5.10 On this basis, Greater Manchester's collective approach to develop a city-region wide Clean Air Plan has been accepted by government, and consequently no further ministerial Directions have been issued. A letter from the Minister in January 2019 requires GM's OBC to be submitted by end of March 2019.

5.11 Government officials have subsequently confirmed the following

> "we are content with the baseline modelling. In line with our guidance, as your local model has identified NO_2 exceedances on roads within the PCM network beyond those modelled nationally, these should be addressed in your air quality plan. This means your plan should address the exceedances identified in all 10 authorities, in line with the approach you are already taking.
>
> Following submission of your Outline Business Case by 31 March we anticipate, subject to a review of the plan you submit, that Ministers will direct local authorities to proceed to continue to develop an FBC and to start implementing plans, together with appropriate funding. It is likely this stage this would entail directing all 10 Greater Manchester authorities."

5.12 If a local authority chose to not approve the OBC for submission to the government's Joint Air Quality Unit, this could, without an alternative plan to reduce NO_2 emissions in the shortest possible time, lead to a potential legal challenge against the said local authority.

[8] https://www.gov.uk/government/publications/air-quality-clean-air-zone-framework-for-england.
[9] https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017.
[10] Environment Act 1995 (Feasibility Study for Nitrogen Dioxide Compliance) Air Quality Direction 2018)

5.13 The government Directives referred to above relate only to the roads that local authorities are responsible for, and does not direct local authorities to assess or act to reduce NO_2 concentrations on the Strategic Road Network (SRN, typically motorways) managed by Highways England (a government owned company).

5.14 This is a significant issue in the context of the 120 km of SRN that stretches across the conurbation, often through urban areas. Motorway traffic, where the carriageway runs close to a local road can contribute up to 50% more pollution than local roads. Between 30 - 40% of east-west HGV traffic does not exit the SRN in Greater Manchester, but travels through it.

5.15 In addition there are locations where high levels of pollution measured close to residential properties are the result of the flows of tens of thousands of vehicles per day, including approximately 13,000 HGV's, on the SRN and not as a result of traffic on the local highway network.

5.16 Greater Manchester is working with Highways England to ensure that they play a much more active role in developing measures which will effectively complement those set out below, and these will need to be clearly identified in the Full Business Case.

6. GREATER MANCHESTER FEASIBILITY STUDY

6.1 A Greater Manchester Senior Leadership Steering Group (Steering Group) is responsible for guiding the feasibility study. Members include Directors or Assistant Directors from each local authority and senior representatives from Highways England, Public Health England, AGMA, Local Partnerships and Transport for Greater Manchester (TfGM) and JAQU.

6.2 The purpose of taking a Greater Manchester-wide approach is to avoid introducing measures in one part of the conurbation that simply displace pollution to other locations, and to ensure that (as far as possible) the eventual agreed package of measures complements other Greater Manchester strategies.

6.3 TfGM has been coordinating the GM feasibility study on behalf of the ten Greater Manchester local authorities, who remain legally responsible for reducing NO_2 to legal Limit Values.

6.4 The feasibility study process comprises a series of steps and processes, namely: Strategic Outline Case, Initial Evidence and Target Determination, Outline Business Case and Full Business Case. These are outlined below.

7. INITIAL EVIDENCE AND TARGET DETERMINATION

7.1 In their National Plan, Government identified eleven areas of road, within seven Greater Manchester local authorities, where the national Pollution Climate Mapping (PCM) model predicted NO_2 concentrations are likely to exceed the statutory NO_2 annual mean EU Limit Value beyond 2020. Oldham was added in a later supplement to the National Plan (March 2018).

7.2 The predictions in the national model were based on national scale assumptions and datasets, and were required to be verified against local evidence.

7.3 More informed local analysis revealed a bigger problem than that identified by Government. It predicts a greater spatial distribution of NO_2 exceedances across roads in all Greater Manchester districts and typically higher concentrations of NO_2 in specific locations.

7.4 Local modelling identified 152 stretches of road (road links) where concentrations of NO_2 are forecast to exceed the legal Limit Value (40 $\mu g/m^3$) beyond 2020. 112 of these road links are on the national PCM model, which have the highest car use and heavy freight flows. 40 of these are shorter stretches of local roads, often around town centres across Greater Manchester where there is greater bus, taxi and van usage.

7.5 Local modelling also predicts higher concentrations of NO_2 in locations across Greater Manchester. This means the concentration of NO_2 in the air at roadside is worse than originally predicted by Government.[11]

7.6 Some of the reasons for this are that vehicles using Greater Manchester's roads are typically older than the national average (especially buses and taxis); that local traffic data showed that in some areas vehicles are moving more slowly than the national modelling anticipated; and because local modelling also showed higher background concentrations of NO_2 than the national modelling.

7.7 The outcome of the local modelling is an agreement, referred to as Target Determination, of the NO_2 exceedances that Greater Manchester must resolve when developing possible solutions. The Greater Manchester modelling has now been agreed by Government, meaning that all the illegal exceedances in all ten GM local authority areas need to be addressed.

8. STRATEGIC OUTLINE CASE

8.1 The Strategic Outline Case (SOC) was submitted to Government in March 2018. This document identified a long-list of 96 measures, which was then sifted to a shortlist of 14, based on Government's Primary Success Criteria (defined as reduction of NO_2 concentrations in the "shortest possible time").

8.2 The SOC recognised that as locations of exceedances identified by Government covered areas across Greater Manchester, no single measure was likely to deliver legal compliance on its own.

[11] Modelling of air quality can be presented in two different ways: a point along a road which has a certain concentration of NO_2 or the stretch of road which has a certain concentration of NO_2. Presenting point data provides more specific and detailed information on the air quality problem, as it allows an understanding of how concentrations of NO_2 vary at different locations on the road. The OBC modelling presents emissions information on the basis of point data.

8.3 **Table 1. Shortlisted Measures in the Strategic Outline Case**

Shortlisted measure	Details
Retrofit/upgrade public transport fleet	Retrofit or upgrade vehicles to a higher Euro standard.
Retrofit/upgrade local authority fleets	Retrofit or upgrade to a higher Euro standard (procurement).
Increase public transport capacity	Identify specific routes where most impact will be made, with a particular focus on the role that an attractive bus system would need to play in achieving significant additional modal shift in the near term.
Switch Bus/HGV/LGV/GM fleet to GtL	Using cleaner alternative fuels, e.g. Gas-to-Liquid (GtL).
Electric vehicle (EV) incentivisation	Increase EV uptake through expanding the charging network or financial incentives.
Differential parking charges	E.g. different charges for times of day, vehicle type, car-sharers and could include a workplace parking levy.
Congestion Deal – increase capacity	Review existing junction improvement plans – assess impact and identify opportunities to accelerate.
Congestion Deal – encouraging alternatives	Encouraging alternative travel choices through road space reallocation.
Congestion Deal – network management	Changing traffic signal timing to optimise flows, reducing congestion.
Private hire and taxi alternative fuels	Incentivise change to EV/Ultra-Low-Emission vehicles, increase EV infrastructure for taxis, retrofitting and increasing LPG refuelling infrastructure for taxis.
Communications campaigns	Increase awareness of health and cost benefits for public and of different modes of transport or around particular communities/schools.
Sustainable travel engagement	Work with employers and individuals to encourage sustainable travel choices.
Active travel programme – infrastructure	Expand and improve cycling and walking infrastructure.
Clean Air Zones – Class B, C or D	Different classifications/time restriction and geographical areas to be modelled for their impact on NO_2 and timescale of any impact.

8.4 Government guidance sets out charging Clean Air Zones (CAZ) as the measure most likely to achieve legal Limit Values for NO_2 in the shortest possible time. A charging CAZ places a penalty on the most polluting vehicles moving within a designated area. Government guidance specifies that local authorities must consider charging CAZ as their benchmark measure.

8.5 Government specifies four classes of charging CAZ that apply penalties to different types of vehicle that are classified as non-compliant because they fall below particular European Commission emission standards. Cleaner, compliant vehicles are not charged.

- Class A: Buses, coaches, taxis and private hire vehicles.

- Class B: Buses, coaches, heavy goods vehicles (HGVs) taxis and private hire vehicles.
- Class C: Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and private hire vehicles.
- Class D: Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and private hire, cars, motorcycles/mopeds.

8.6 The associated emissions standards are as follows:

- Euro 3 for motorcycles, mopeds, motorised tricycles and quadricycles.
- Euro 4 for petrol cars, vans, minibuses and other specialist vehicles.
- Euro 6 for diesel cars, vans and minibuses and other specialist vehicles.
- Euro VI for lorries, buses and coaches and other specialist heavy vehicles.

8.7 It is important to recognise the clear differences between Clean Air Zones and Congestion Charging systems, not least in terms of their very different objectives and time-spans. The objective of any penalty in a CAZ is for all vehicles which drive within the area in a Clean Air Zone to have engines which comply with emissions standards. Unlike Congestion Charging, a CAZ does not seek to reduce the number of vehicles on roads. This means that over time and as vehicles are upgraded, the number of penalties levied reduces. CAZs are therefore relatively short-term, only apply to non-compliant vehicles and will operate at a loss once vehicles become cleaner. Under a Congestion Charge however, the requirement to pay applies to all vehicles, is enduring, and creates a long-term revenue stream. In contrast a CAZ in its later years should not generate surpluses as vehicles become cleaner.

8.8 GMCA has ruled out congestion charging.

9. ASSESSING THE OPTIONS FOR GREATER MANCHESTER

9.1 Following the issue of the SOC in March 2018, a process of refining the shortlisted measures and developing a range of options that combine the measures in different ways has been undertaken. This was overseen by the GM Steering Group, to understand the type and scale of intervention needed to reduce NO_2 to within legal Limit Values in the "shortest possible time" across Greater Manchester.

9.2 A best performing option is recommended within the OBC for further consideration and discussion with stakeholders and the public to aid the development of the Full Business Case.

9.3 The core goal of the GM Clean Air Plan is to address the legal requirement to remove ALL exceedances of concentrations of NO2 that have been forecasted to exceed the legal Limit Value (40 $\mu g/m^3$) identified through the target determination process in the "shortest possible time" in line with with Government guidance and legal rulings.

9.4 Options have been assessed against the UK Government's Primary Critical Success Factors:

- **Reduction in NO_2 emissions:** likelihood that the measure/option will contribute significantly to a reduction in NO_2 concentrations to achieve compliance with the EU Limit Values
- **Feasibility:** likelihood of measure being implemented in time to deliver desired NO_2 reduction and achieve compliance.

9.5 Where modelled options deliver compliance in the same year they have been further assessed against Government's Secondary Critical Success Factors, as set out in the SOC:

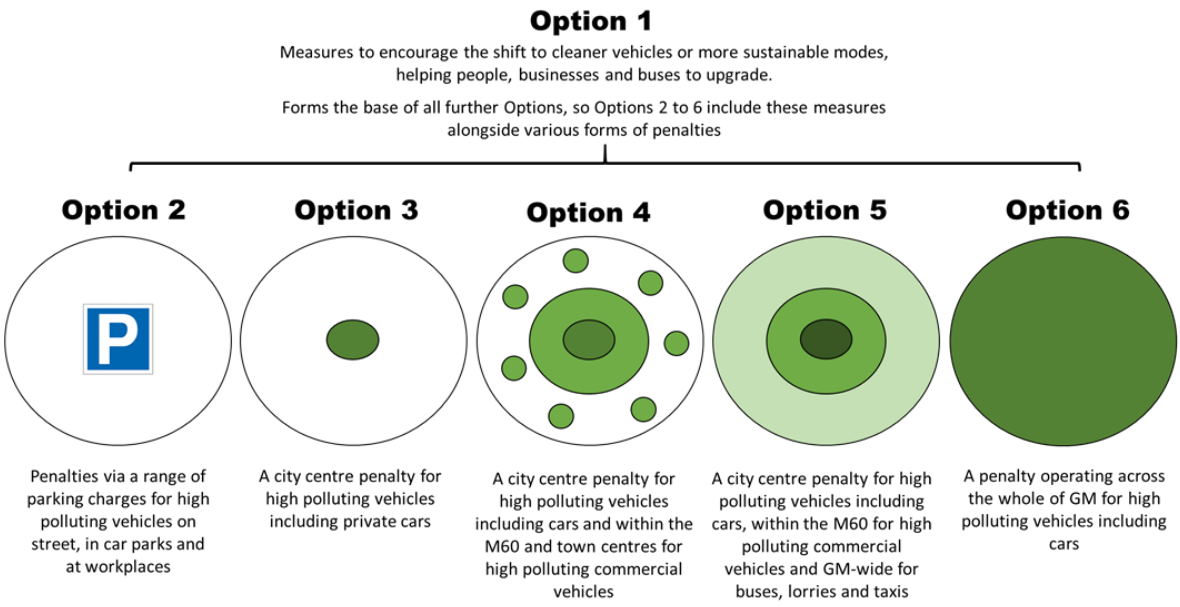
- **Strategic fit with local strategies and plans:** ensuring the alignment of the option with longer term economic, social and environmental goals and that the risk of unintended consequences is minimised.
- **Value for money:** a high-level indication of the costs and benefits of each option.
- **Distributional impact:** in order to understand the potential impacts, both positive and negative on different groups within society, with a particular focus on the most vulnerable. It is of vital importance that the plan does not result in disproportionately negative economic or social impacts for the region or those living, working or doing business within it.
- **Deliverability** of the options, in terms of the affordability of the cost of implementation, the supply-side capacity and capability to deliver the measures outlined in the options, and the achievability of delivering the option.

9.6 The SOC identified that the fundamental causes of the exceedances were variable in terms of the source of emissions and that these sites were interconnected in complex ways. Therefore, any effective proposals would need to comprise of a package of measures, able to tackle the overall problem holistically.

9.7 A series of six options comprising of different packages of measures was developed initially in response to the problem as revealed by local modelling. These measures have been assessed and refined further from the shortlist in Table 1.

9.8 The assessment process involved further modelling and analysis of the effectiveness of measures, both individually and as a package; this included engagement with stakeholders and professional experts, and the use of a Multi-Criteria Analysis (MCA) tool to assess the performance of each option against the success factors and relative to each other. In this way, the measures and packages of options have been assessed and refined into a preferred option that best secures the required objectives.

9.9 **Figure 1. Summary of six options for initial appraisal**



9.10 Following the initial appraisal of the six options, three were discounted (see section 9) and three developed as the 'best performing' options to be subject to a more detailed appraisal process.

9.11 These three options were derived from options 4 and 5 above and have been adapted to reflect a deeper level of understanding of the issues that emerged throughout the options appraisal process. As such, they are considered more likely to deliver effective reductions in NOx emissions and greater compliance than the options initially specified.

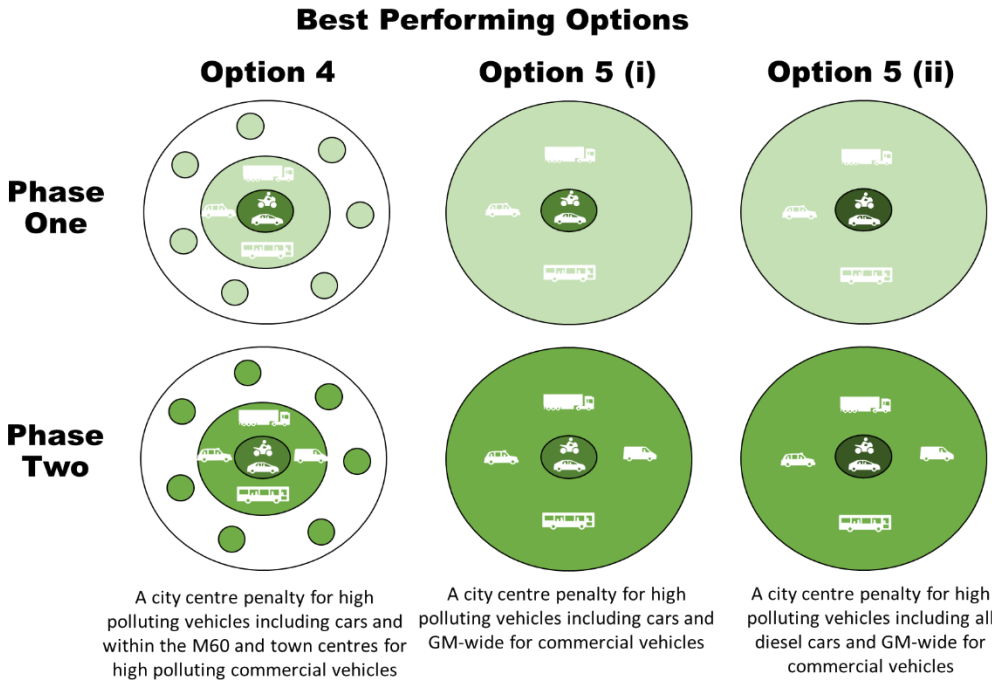
9.12 In particular, the following changes have been made:

- Various incentives measures were judged to be ineffective for the specific requirements set by Government for a NOx plan (e.g.: public transport improvements beyond the existing programme and GTL conversion for HGVs) or undeliverable in the timescale/ with existing powers and have been excluded.
- Vehicle Renewal Schemes to help businesses and residents upgrade their vehicle have been included.
- The initial assessment suggested that the second-hand van market would not be sufficiently mature by 2021 to support a large-scale CAZ for vans – a lack of available, affordable and compliant vehicles could result in a higher than predicted proportion of vehicles 'staying and paying' rather than upgrading and create substantial risk of economic damage. Therefore, implementation of the city region scheme has been divided into two phases: Phase 1 would involve a CAZ B encompassing buses, hackney cabs and PHVs, HGVs and coaches; and Phase 2 would extend to a CAZ C including vans and minibuses at a later date.
- Finally, and related to the point above, the M60 boundary in Option 5 has been dropped, with the schemes only reviewed for possible application within the Inner Relief Route or at GM-wide instead. Applying an additional boundary adds cost and complexity to the scheme, and risks customer confusion. Further analysis showed that the M60 boundary does not reflect where the outstanding locations of non-

compliance remain post-2021, many of which are outside this zone. Therefore, it does not make sense in terms of delivering compliance in the shortest possible time to implement a second phase solely in this zone.

- Two variants of option 5 were explored, one including a CAZ D within the IRR (Option 5(i)) and one where the CAZ D was enhanced so that all diesel cars and PHVs were considered non-compliant (Option 5(ii)).

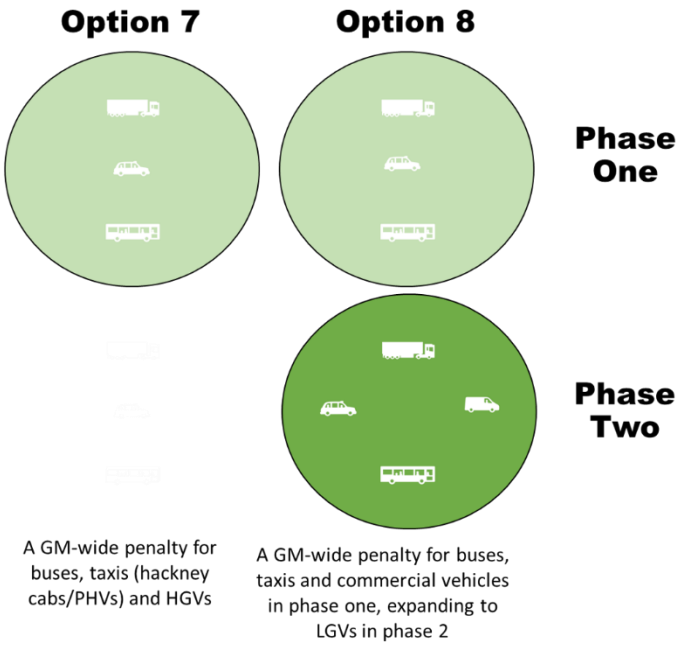
9.13 **Figure 2 – Summary of three best performing options for detailed appraisal**



9.14 Discussions with the local authorities raised two significant concerns: that the risk of unintended socio-economic consequences is not sufficiently understood; and that other options had not been explored in sufficient depth to be ruled out.

9.15 As a result, further work was undertaken to address these concerns. This involved additional analysis of the socio-economic impacts, and assessment of two new options, following the same process as utilised to date.

9.16 **Figure 3 – Further options assessed**



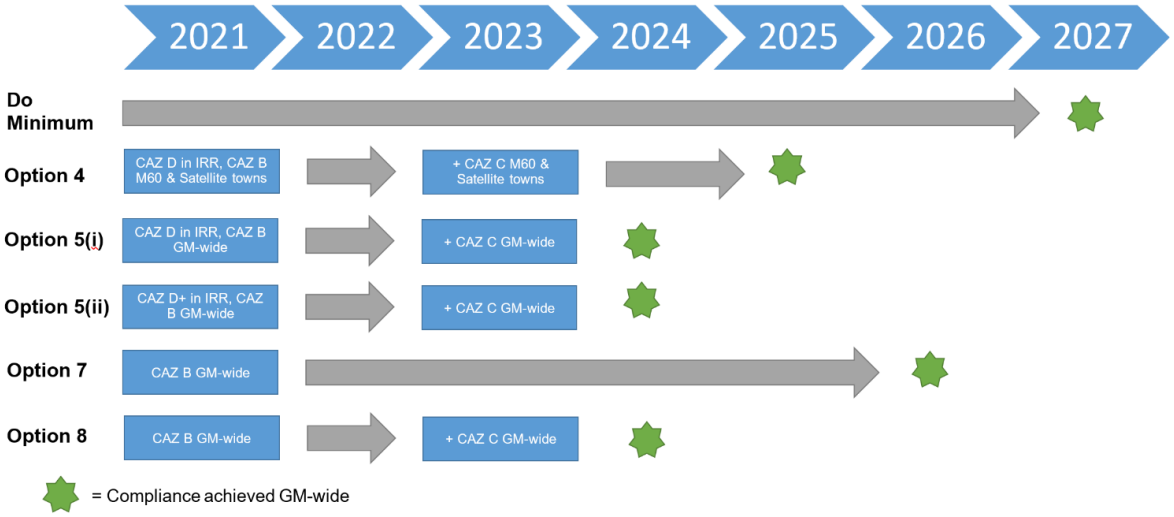
9.17 Modelling has indicated that:

- Option 4 is predicted to deliver compliance (so that all sites have concentrations below the Limit Value) by 2025,
- Options; 5(i), 5(ii) and 8 are all predicted to deliver compliance one year earlier, in 2024.
- Option 7 was not likely to be sufficient, delivering lower emissions benefits in each year, than Option 8 and reaching compliance two years later, in 2026

9.18 Options 4 and 7 were therefore ruled out of further consideration, because options 5(i), 5(/ii) and 8 deliver compliance earliest.

9.19 Further information on how each option performs in terms of the compliance date is set out in Annex 1.

9.20 **Figure 4 – Assessment of compliance of options**



9.21 Options 5(i), 5(ii) and 8, as the most promising options, have been considered in terms of their performance against the Primary and Secondary Success Factors. A table summarising this assessment are included in Annex 2.

10. WHY OPTIONS 2, 3 AND 6 WERE DISCOUNTED

10.1 Options 2, 3 and 6 were ruled out as they did not deliver compliance in the shortest possible time:

10.2 Option 2 – Parking measures have a limited effect on the heaviest and dirtiest vehicles, such as HGVs and buses. They only affect those cars or vans that need to park in an area and not those passing through, or those with uncontrolled or off-street parking available. A Workplace Parking Levy has been shown to be effective in deterring car travel and supporting investment in more sustainable modes in the only UK example (in Nottingham), but the implementation timeframe is slow and the measure is poorly targeted in terms of its effect on the dirtiest vehicles. There are very few controlled parking zones or residents' parking permit schemes in place across the city-region and thus it would be difficult and expensive to deliver differential parking on-street. Off street public parking is managed through contracts owned by the ten districts, running to different timescales and with limited flexibility in the short term. In summary, using parking as the constraint measure was deemed challenging to implement, poorly targeted and not likely to deliver compliance in the shortest possible time.

10.3 Option 3 – A city centre penalty for high polluting vehicles would have effect in the city centre and on the key radial routes into to the city centre. However, air quality modelling has shown that a city centre CAZ D, with no further CAZ measures across the remainder of GM, would leave around 200 sites non-compliant within the wider region in 2021, including some sites of non-compliance within the city centre itself. It has therefore been demonstrated that the option does not deliver compliance in the shortest possible time and has been rejected.

10.4 Option 6 – A GM-wide CAZ D was developed to understand whether compliance could be achieved under any scenario by 2021. The 'all or nothing' nature of this proposal presented a risk that no real improvements to air quality would be achieved for quite some time, and the time to compliance would be highly uncertain.

10.5 Specifically, with regard to option 6;

- The assessment assumed that all of the options can be delivered by 2021. It is very unlikely that all aspects of the scheme, from the technical work required to design the scheme, to the scale of the infrastructure provision and customer service offer required to deliver it, could be delivered in that timescale.
- The scale of the intervention across the whole of GM is considered to be potentially undeliverable in physical terms.
- The modelling also forecasts substantial mode shift from car to public transport, but for many of the diverse trips across the wider city-region there is simply not a viable public transport alternative available (at this time) and this mode shift is not likely to materialise and it would not be possible in the required timescales to deliver transformative public transport improvements to facilitate this mode shift. This would therefore significantly delay compliance.
- A scheme on this scale would raise very significant issues in terms of the economic and social impact on the region, and widespread mitigation measures would be required that are not likely to be feasible.

10.6 In summary, Option 6 would not deliver compliance in the shortest possible time, and would not perform effectively in terms of reducing human exposure due to long periods where non-compliant vehicles continue to be used.

11. DETERMINING THE PREFERRED OPTION

11.1 Options 5(i), 5(ii) and 8, include a package of Measures, designed to ensure local people and businesses are fully informed about clean air and know how they can reduce their contribution to poor air quality; to encourage the uptake of the cleanest vehicles; and most significantly, to support local businesses to upgrade their fleets as quickly as possible.

11.2 In addition, all three options propose a region-wide CAZ, starting at Category B from 2021 and expanding to a Category C in a later phase, assumed to be 2023. This large scale scheme is challenging to implement, in terms of: the need for substantial funding and support from Government; as well as the need for considerable collaboration between the ten districts; and the demand generated for compliant vehicles from a range of suppliers. Nevertheless, it is clear from the analysis carried out to date that a smaller scale scheme would not be sufficient to deliver compliance in the shortest possible time.

11.3 The full implementation of a CAZ C is proposed for 2023 rather than 2021 due to the assessment which suggested that the second-hand compliant van market would not be sufficiently mature by 2021 to provide compliant upgrade options and support the implementation of large-scale CAZ for vans. Crucially, this does not delay the year of achieving compliance and reduces the risk of socio-economic damage. Modelling indicates that a GM-wide CAZ C cannot deliver compliance in 2021 or earlier than 2024 regardless of when it is implemented.

11.4 It is however vital to support local businesses, residents and operators to upgrade their vehicles, not least as Greater Manchester has an older than average fleet and an economy dominated by small businesses. There is a risk that without these supporting Measures, the CAZ will be ineffective because businesses cannot afford to upgrade or the effect of the scheme will cause unacceptable economic damage.

11.5 Furthermore, there is a risk that a CAZ implemented without financial support could damage the public and accessible transport offer in the region. At present, most buses and nearly all hackney cabs and many private hire vehicles in the region are non-compliant, with the oldest vehicles typically owned by small local businesses or sole traders. There is a risk that without support, bus operators may choose to reduce bus services rather than upgrade their fleets, that hackney cab drivers switch to driving compliant but less accessible private hire vehicles, and that the private hire trade is potentially impacted by the financial cost of upgrading a non-compliant vehicles.

11.6 Therefore, the Clean Vehicle Funds to be demanded of Government, are an essential and common component to achieve compliance. They add to the cost and complexity of delivery, and there is concern over the ability to supply sufficient compliant vehicles to meet demand.

11.7 Options 5(i) and 5(ii) would require further and additional financial support to help private car drivers upgrade their vehicle. Such an approach could be considered high risk, as a viable and value-for-money private car scrappage-type model has not been identified that would satisfy HM Treasury, and none have been developed and tested in the UK to date. Further, the analysis indicates that a city centre penalty for private cars, a feature shared by options 5(i) and 5(ii), does not bring forward compliance any earlier when compared to option 8, primarily as the city centre zone is relatively compact and therefore its effects are modest in terms of stimulating compliance.

11.8 Option 8 carries less risk in this regard, can be delivered at a lower cost (to Government), and is thus more affordable.

11.9 As the option that delivers compliance in the shortest possible time, and at the lowest cost, option 8 is also considered the ‘benchmark CAZ’ for the purposes of comparison.

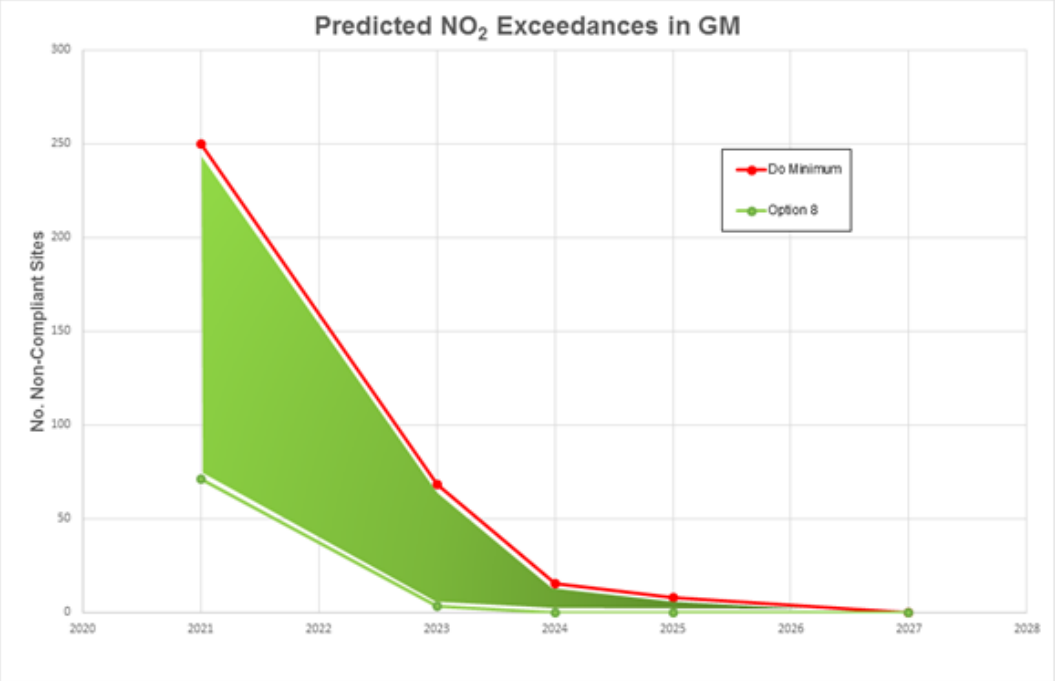
11.10 Whilst option 8 presents many delivery challenges, it is more feasible and achievable than options 5(i) and 5(ii) and thus offers greater confidence that compliance can be achieved in the shortest possible time.

11.11 Further, it is considered that options 5(i) and 5(ii) may cause unacceptable and significant unintended consequences to distributional impacts, particularly in terms of the impact on the affordability for residents, the impact on the local economy, and the impact on health and the quality of life of local residents. There are particular concerns in terms of the potential impacts on low income car-dependent workers, small businesses, and city centre retail. Option 8 delivers compliance in the same year without the same potential risk of damaging economic impacts.

11.12 On balance, therefore, it is considered that option 8, whilst remaining a substantial and complex undertaking, is the surest way of delivering compliance in the shortest possible time; providing considerable health benefits at the lowest cost to society and the economy of the three options.

11.13 Option 8 delivers considerable health benefits between 2021 and 2023, as the chart below indicates.

- Significant reductions in NO_2 concentrations in early years bring real health benefits
- Compliance achieved 3 years earlier than Do Minimum



11.14 Option 8 is recommended as the option that delivers compliance in the shortest possible time, at the lowest cost, least risk and with the least negative impacts.

11.15 M*odelling shows that with the collective action outlined above GM's authorities gradually achieve compliance between 2021 and 2024.*

- *Wigan and Trafford in 2021*
- *Bolton, Bury, Oldham, Rochdale, Salford, Stockport and Tameside by 2023*
- *Manchester in 2024*

Modelled sites of non-compliance by authority, 2021, 2023, 2025

	2021		*2023*		*2025*	
	Do min	*Option 8*	*Do min*	*Option 8*	*Do min*	*Option 8*
Bolton	*19*	*6*	*3*	*0*	*0*	*0*
Bury	*23*	*9*	*12*	*0*	*4*	*0*
Manchester	*88*	*28*	*29*	*3*	*2*	*0*
Oldham	*15*	*4*	*3*	*0*	*1*	*0*
Rochdale	*10*	*2*	*2*	*0*	*0*	*0*
Salford	*36*	*11*	*10*	*0*	*1*	*0*
Stockport	*30*	*5*	*5*	*0*	*0*	*0*
Tameside	*16*	*6*	*4*	*0*	*0*	*0*
Trafford	*10*	*0*	*0*	*0*	*0*	*0*
Wigan	*3*	*0*	*0*	*0*	*0*	*0*
GM Total	*250*	*71*	*68*	*3*	*8*	*0*

11.16 However, concerns remain about the socio-economic impacts, therefore more work is required for the Full Business Case to ensure that proposed mitigations are effective.

11.17 An indicative Equality Impact Assessment (EQIA) has also been completed and will form part of the OBC. However it is noted that further and fuller assessment of economic and equalities impacts will be required at FBC stage.

11.18 There remains much we do not know about the possible impacts of the proposals, for example on low income workers, key business sectors such as retail and leisure, transport and distribution and on small local businesses. A programme of research, analysis, public and stakeholder engagement and a thorough integrated impact assessment has commenced and will be continued throughout 2019.

12. MODELLING ASSUMPTIONS AND UNCERTAINTIES

12.1 The analysis underpinning the GM Clean Air Plan has been produced in line with JAQU guidance using the best data and tools available, and localised to Greater Manchester where possible.

12.2 However, the nature of the air quality challenge means that there are many sources of uncertainty in the modelling, and further sensitivity testing is underway.

12.3 In addition, it is important to acknowledge that there are some key assumptions that will need testing at the Full Business Case stage. This will include bus/taxi/PHV compliance, the behavioural responses of drivers, and the impact of measures such as vehicle renewal funds.

12.4 Assumptions made in the context of advice from JAQU includes that by 2021 that the majority of vehicles in scope will be compliant or upgrade to a compliant vehicle (for example buses and taxis) and the remaining non-compliant:

- HGV's are assumed to stay and pay, upgrade or cancel their trip;
- PHV's are assumed to stay and pay or upgrade;
- LGVs are assumed to stay and pay, change mode or cancel their trip.

12.5 The regional scale of the options also means that assumptions should continue to be tested.

12.6 Engagement to date, for example with bus operators, the local taxi and private hire trade and the freight industry has been invaluable in helping develop the measures, and further engagement at local level will be undertaken as part of the process to develop a Full Business Case.

13. COMMERCIAL, FINANCIAL AND MANAGEMENT ASSUMPTIONS

Commercial assumptions

13.1 The procurement of all goods and services will use TfGM's established procurement processes.

Financial assumptions

13.2 In developing the OBC, it has been assumed that JAQU Implementation and Clean Air Funds will provide funding for all costs relating to scheme's implementation, and that DEFRA/JAQU will underwrite any net operational deficit, as may be necessary, over the life of the scheme until compliance is achieved.

13.3 If scheme operations generate any net surplus, this would be re-invested back into achieving Local Transport Plan (2040 Greater Manchester Transport Strategy) objectives, as required by the Transport Act 2000.

13.4 There is a considerable amount of uncertainty in the assumptions around revenue generation, since there is no CAZ currently in operation in the UK. Therefore, the forecasts included in the financial model are indicative at this stage.

13.5 Greater Manchester will be submitting the OBC as an application to the Implementation Fund on the assumption that all the measures outlined in the case are required to bring forward compliance in the shortest possible time frame.

13.6 In the financial business case, it is assumed that:

- the CAZ penalties are a daily charge and set at different levels for different vehicle types, to reflect their emissions. The aim is that non-compliant vehicles with the highest emissions are incentivised to respond to comply with the standard.
- the CAZ daily charges remain constant in nominal prices, and therefore they reduce in real terms.
- any GM CAZ will operate on a daily basis and, therefore, non-compliant vehicles that enter or move within the area of the CAZ will only pay once each day.

13.7 **Table 2 – CAZ Penalties as assumed for modelling purposes**

Vehicle Type	CAZ Penalty
Taxi / PHV	£7.50
LGV	£7.50
HGV	£100
Bus/Coach	£100

Management Assumptions

13.8 TfGM will continue to co-ordinate delivery from OBC to FBC. Decisions with regard to which organisation will operate any CAZ will be developed between OBC and FBC.

14. CLEAN VEHICLE FUNDS

14.1 An essential component of the OBC is a package of support for businesses affected by the best performing option. This comprises a number of schemes that will be further refined through ongoing engagement with businesses and stakeholders and inform the FBC. Current proposals include the following:

Clean Freight Fund - covering LGVs, Minibuses, HGVs, Coaches (£59 million)

14.2 Support for local small businesses, sole traders and the voluntary sector, registered in GM in the form of a discount on the purchase of a compliant commercial vehicle when scrapping a non-compliant vehicle or retrofitting to make compliant.

14.3 Priority for funding will be based primarily on air quality impact such that the most polluting vehicles can be targeted.

Clean Taxi Fund – covering Taxis and Private Hire Vehicles (£28 million)

14.4 Support to upgrade non-compliant taxi and private hire vehicles by offering a contribution towards the purchase of a compliant vehicle from an approved supplier when trading in a non-compliant vehicle.

14.5 It will also provide part funding for the retrofitting of taxis.

14.6 This funding opportunity also recognises the work currently being undertaken to develop some common minimum licensing standards for Taxis and Private Hire across Greater Manchester. This work will ensure that there is clarity for the trade and drivers about vehicle standards that meet both proposed CAZ requirements and any Greater Manchester minimum standards, that will be consulted on later in the year.

Clean Bus Fund (£29 million)

14.7 Provide support to retrofit the majority of existing Euro IV and V buses with flexibility for the move to an EV bus network, via financial assistance towards charging infrastructure, prioritised on Air Quality benefits and commercial contribution.

14.8 Across all the Clean Vehicle Funds, further work is required between OBC and FBC to develop the assumption on the value per vehicle, criteria for access to the funding by vehicle owners, and the impact on specific groups of businesses affected by the introduction of the CAZ.

14.9 Through the 2040 Transport Strategy and the 2014 Devolution Agreement, the Combined Authority is progressing its reform programme utilising the provisions within the Bus Services Act, and as with other modes care is being taken to ensure complementarity in policy development.

Loan Finance (£TBC)

14.10 Work is also underway to explore the possibility of defining and providing a supporting measure to provide loans at preferential rates for those who are taking advantage of the Clean Vehicle Funding. The exact design and criteria would have to be determined at FBC stage following further engagement and consultation.

14.11 So far there have been three key groups for engagement – taxis & PHVs, bus operators and freight/ local business – to understand their concerns, obtain information about their fleets and seek their early feedback on proposals

14.12 The taxi and PHV trade highlighted that subsidies and low interest rate loans would be beneficial as would other incentives through licensing and traffic flow. EV charging infrastructure was key to take up of electric vehicles, but they noted a limited choice for electric taxis, and that timescales for implementation were tight.

14.13 Business groups and freight representative bodies provided information about their fleets, to inform the development of the Clean Vehicle Fund measure. They have also advised that certainty around compliant vehicles and timescales for implementing the plan are essential to business planning.

14.14 Bus operators raised concerns around the capacity to retrofit vehicles and timescales for implementation.

14.15 Stakeholder dialogue will continue throughout development of the GM CAP to support the detailed design of the packages of measures.

15. CONSISTENCY WITH OTHER GM POLICIES, PLANS AND STRATEGIES

15.1 Greater Manchester has a longstanding track record in taking a balanced approach to policy development to promote sustainability, inclusion and growth.

15.2 The GM approach is unique insofar as it utilises existing governance and administrative arrangements to bring together ten local authorities and their highway networks, permitting the development and the implementation of a co-ordinated plan to reduce roadside NO_2 concentrations that will benefit nearly three million people. Such a joined-up approach provides the potential for the most effective and swift reduction in emissions in areas across the whole of the city region.

15.3 Improving air quality is a key policy priority for Greater Manchester. The Greater Manchester Strategy[12] states that Greater Manchester should be 'a place at the forefront of action on climate change with clean air and a flourishing natural environment' including by 'reducing congestion and improving air quality'.

15.4 Air Quality is also a key focus of the Greater Manchester Transport Strategy 2040 ("2040 Strategy"), which is Greater Manchester's current statutory Local Transport Plan, prepared by TfGM on behalf of the GMCA and the Greater Manchester Local Enterprise Partnership (GMLEP).

[12] https://www.greatermanchester-ca.gov.uk/ourpeopleourplace 2017

15.5 The 2040 Strategy is accompanied by 5-year delivery plans, which set out the city-region's short term delivery priorities. A draft updated 5-year Delivery Plan for 2020 to 2025[13] was published in January 2019, and includes a range of recommendations for delivering Greater Manchester's clean air and carbon reduction ambitions, building on from the Air Quality Action Plan 2016-2021 and Low Emission Strategy (GMCA, 2016). These include investment in the Greater Manchester Electric Vehicle (EV) charging network; ambitions to deliver a zero-emission bus fleet by 2040; transformation of cycling and walking infrastructure (including £160m investment in the next few years); and measures to reduce freight emissions.

15.6 In common with longstanding policy, further work continues on improving the public transport network and in particular its closer integration across modes. Greater Manchester has consistently used its available transport funding to improve public transport and enhance active travel options, thereby encouraging people to leave their car at home or at park and rides and travel more sustainably. Greater Manchester works to maximise all opportunities to access funding for the region to make it easier to travel by public transport, bike or on foot.

15.7 This Plan will ensure that Greater Manchester can address the nearer term issue of NO_2 exceedances in existing urban areas. Members will recognise that this is a crucial component in safeguarding our urban areas as the strategic focus for future development, as set out in the revised draft Greater Manchester Spatial Framework. Without this continued focus, Greater Manchester would risk excessive dispersed development that would undermine both the existing air pollution challenge and longer-term carbon reduction objectives.

[13] Greater Manchester Transport Strategy 2040 Draft Delivery Plan (2020-2025) (2019), TfGM

16. NEXT STEPS

16.1 Subject to the governance approval of each of the ten GM local authorities, the OBC will be submitted to Government within the required deadline of 31 March 2019. Government's response is expected 6 – 8 weeks after submission.

16.2 A public 'conversation' is proposed to run between early May and mid-June (for six weeks) to help further inform the work, and this will supplement the more targeted stakeholder engagement that is ongoing with affected businesses. In addition, further deliberative research is proposed to take place during March and April. These forms of engagement and dialogue will all inform the further development and detailed design of the measures identified in the OBC, to refine the proposals that will comprise the Full Business Case.

16.3 As required by Transport Act 2000, a statutory consultation relating to the proposed introduction of a charging Clean Air Zone is proposed to run between August and October 2019.

16.4 Further work to refine the assumptions and look in detail at 2023 exceedances, including further socio-economic work will be undertaken.

16.5 This will enable the development of a Full Business Case for further consideration by GMCA and constituent local authorities prior to submission to Government by the end of 2019.

17.0 ISSUES

- Equality and Diversity
  - An indicative Equality impact assessment has been completed by TfGM in the OBC but further and fuller assessment locally in Bury will be required at the Full Business Case stage

- Consultations
  - Stakeholder engagement ongoing
  - Public conversation Early May to mid June
  - Statutory consultation to introduce a Clean Air Zone August to October 2019

18. RECOMMENDATIONS

Recommendations are set out at the front of this report

Enclosures –
Annex 1. More detailed assessment of options by compliance date

Annex 2. Assessment of options by success criteria

Annex 3. GM Clean Air Plan Outline Business case –

Annex 4. Bury's Compliance as modelled as part of the whole GM plan

List of Background Papers:-

- 11 January 2019, report to GMCA/AGMA: Clean Air Update
- 14 December 2018, report to GMCA: Clean Air Update
- 30 November 2018, report to GMCA: Clean Air Plan Update
- 26 October 2018, report to GMCA: GM Clean Air Plan Update on Local Air Quality Monitoring
- 15 November 2018, report to HPEOS Committee: Clean Air Update
- 16 August 2018, report to HPEOS Committee: GM Clean Air Plan Update
- 5th February 2018, report to Bury SLT Cabinet – Greater Manchester Clean Air Plan – Strategic Outline Case
- 10th April 2018, report to Bury Overview and Scrutiny - Air Quality Update
- UK plan for tackling roadside nitrogen dioxide concentrations, Defra and DfT, July 2017

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Annex 1 – More detailed assessment of options by compliance date

Road Classification	Compliant sites		Non-compliant sites			
	Very compliant (below 35 µg/m^3)	Compliant but close (35 to 40µg/m^3)	Non-compliant (40 to 45µg/m^3)	Very non-compliant (45 to 50µg/m^3)	Extremely non-compliant (> 50µg/m^3)	Total non-compliant (> 40µg/m^3)
2021						
Do minimum	16,281	603	175	62	13	250
Option 4	16,820	250	56	8	0	34
Option 5(i)	16,879	200	50	5	0	55
Option 5(ii)	16,892	193	44	5	0	49
Option 7	16,830	233	61	10	0	71
Option 8	16,836	227	62	9	0	71
2023						
Do minimum	16,856	210	58	10	0	68
Option 4	17,056	69	9	0	0	9
Option 5(i)	17,081	51	2	0	0	2
Option 5(ii)	17,087	46	1	0	0	1
Option 7	17,037	85	12	0	0	12
Option 8	17,072	59	3	0	0	3
2025						
Do minimum	17,068	58	8	0	0	8
Do Something 8	Options 5(i), 5(ii) and 8 are fully compliant by 2024, Option 4 by 2025 and Option 7 by 2026.					

Annex 2 – Assessment of options by success criteria

Success Factor	Option 5(i) 2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	Option 5(ii) 2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	Option 8 2021: CAZ B GM-wide, 2023: CAZ C GM-wide	Summary
Compliance in the shortest possible time Which option reduces to zero the number of locations predicted to be in exceedance of the legal limits of NO_2 concentrations in the shortest time?	Yes	Yes	Yes	All Options deliver compliance in 2024, considered to be the shortest possible time for achieving compliance in GM.
Reduction in NO_2 emissions Which option delivers… The greatest reduction in the number of locations in exceedance (presumed to represent human exposure) in each year?				All Options deliver significant reductions in the number of locations in exceedance of 70-80% in 2021, with Option 5(ii) predicted to marginally deliver the greatest reductions in each year prior to compliance being achieved.
The greatest reduction in NO2 concentrations at the roadside in each year prior to compliance being achieved?				All Options deliver reductions in mass emissions across GM of between 20-30% in 2021, with the greatest reductions forecast to be delivered by Option 5(ii).
Compliance without putting other sites closer to exceedance (defined as concentrations of 38-40µg/m3) than without action?				All Options are forecast to deliver compliance without putting other sites closer to exceedance, risk that Option 5(ii) leads to more re-routing than forecast.
Feasibility Are the measures proposed within the legal powers of the Greater Manchester Local Authorities?				The measures proposed in all Options are within the legal powers of the authorities.
Can a governance route be developed to enable timely local government joint working as required for delivery?				GM has proposed a governance route that facilitates the local government co-operation required for delivery. The complex vehicle change requirements nature of Option 5(ii) is likely to make approvals more difficult.
What is the likelihood of the measures being effective?				Clean Air Zones are presumed to be effective, but there is considerable uncertainty about how drivers will respond within the local context and to a scheme on a region-wide scale. Option 5(ii) is more complex and thus more uncertain.
Is delivery of the option subject to significant risks that make achieving compliance in the shortest possible time less likely?				If the full CAP cannot be delivered or funded, compliance may be delayed e.g. if there is not sufficient time or funds to achieve a clean hackney cab or bus fleet. The Plan is subject to risks in terms of the need for multiple approvals from different bodies; the political sensitivity of the proposals; and the need to run activities in parallel. Option 8 involves one rather than two CAZ schemes so is subject to less risk.
Strategic fit with local strategies and plans Air quality and climate change				All Options deliver improvements in NO_2 concentrations, and also reduce PM and greenhouse gas emissions.
Transport				All options act to promote sustainable travel and will deliver a cleaner, newer bus and taxi fleet for GM passengers.
Growth				Risk that the city centre CAZ schemes deter housing and employment development; which could impact on the delivery of the Greater Manchester Spatial Framework. Option 8 delivers clean air without this risk.
Economy				Risk that the city centre CAZ schemes affect economic performance. Option 8 delivers clean air without this risk In all Options, CAZs will impose costs on local businesses.
Value for money Estimated value for money of the option compared to the risk of inaction				It would be more cost effective to deliver the changes more slowly; however this is a public health emergency so action is vital. Option 8 delivers compliance at the lowest imposed cost.
Distributional impact Health benefits				All groups will experience health benefits. Those living in areas with the worst air quality and those most vulnerable to the effects of poor air quality will benefit the most.
Accessibility (in terms of journey time and connectivity to opportunities and services)				The scheme brings improved accessibility in terms of small reductions in journey times for road traffic. Option 8 does not impose costs on private cars.
Affordability (for users)				Options 5(i/ii) impose costs affecting low income car drivers, with more vehicles in scope for charges in Option 5(ii). Option 8 delivers clean air without this risk but still imposes costs on small businesses and sole traders.
Impact on the local economy – considering low income workers, small businesses, town centres and key sectors				All Options impose costs on small businesses and low income professional drivers; proposals to support fleet upgrade mitigate this somewhat. Options 5(i/ii) risk impacts on the city centre economy avoided in Option 8.
Impact on the quality of life of local residents and on equalities				Options 5(i/ii) may affect the quality of life of low income car drivers. Option 8 delivers clean air without this risk. Low income professional drivers may be affected by all Options.
Deliverability The Affordability of the cost of implementation (for the public sector)				Option 8 is the lowest cost option and is thus the most affordable for the public sector.
The Supply-side capacity and capability to deliver the measures outlined in the option				There are concerns about supply side capacity e.g. the availability of specialist compliant vehicles such as hackney cabs, and retrofitting capacity and risks of delays.
The Achievability of delivering the option, considering issues such as difficulty with scale or obtaining resources to implement and operate a measure/option				The scale of the region-wide CAZ, supporting programme and associated cost, and the need for cross-district collaboration, creates delivery risk. This risk is even greater for a city centre CAZ D scheme.

Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Executive Summary

DRAFT FOR APPROVAL

Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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1 Why is Greater Manchester producing this plan?

1.1 Poor air quality is the largest environmental risk to the public's health. Taking action to improve air quality is crucial to improve the health of the general population. Whilst air quality has been generally improving over time, particular pollutants remain a serious concern in many urban areas including across Greater Manchester.

1.2 Long-term exposure to elevated levels of Nitrogen Dioxide (NO_2) and microscopic particles of matter suspended in the air we breathe, may contribute to the development of cardiovascular or respiratory disease and may reduce life expectancy[1]. The youngest, the oldest, those living in areas of deprivation, and those with existing respiratory or cardiovascular disease are most likely to develop symptoms due to exposure to air pollution[2,3].

1.3 Public Health England estimates the health and social care costs across England due to exposure to air pollution will be £5.3 billion by 2035 for diseases where there is a strong association with air pollution, or £18.6 billion for all diseases with evidence of an association with air pollution[4].

1.4 Taking action on air quality is not optional. The severe and long-lasting health implications of poor air quality mean that authorities need to act decisively and swiftly to reduce harmful air pollutants, and nitrogen oxides in particular.

1.5 Since 2010, the UK has been in breach of the legal limits of levels of NO_2 in major urban areas. The Air Quality Standards Regulations 2010 set legally binding limits for concentrations of major air pollutants that affect human health, including NO_2 and particulates, and require the Secretary of State to draw up and implement a national air quality plan so as to achieve the relevant limit within the 'shortest possible time'.

1.6 By 2015, compliance with the legal limits of levels of NO_2 had still not been achieved. The UK Government was held to be in breach of its legal obligations and was required to take action by the UK Supreme Court.[5]

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[1] Air Quality – A Briefing for Directors of Public Health (2017), https://www.local.gov.uk/air-quality-briefing-directors-public-health

[2] Air Quality – A Briefing for Directors of Public Health (2017), https://www.local.gov.uk/air-quality-briefing-directors-public-health

[3] RCP and RCPCH London, Every breath we take lifelong impact of air pollution (2016), https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution

[4] https://www.gov.uk/government/news/new-tool-calculates-nhs-and-social-care-costs-of-air-pollution

[5] *R (on the application of ClientEarth) (Appellant) v Secretary of State for the Environment, Food and Rural Affairs (Respondent)* 2015] UKSC 28 & [2013] UKSC 25.

DRAFT FOR APPROVAL

1.7 In Greater Manchester, road transport is responsible for approximately 80% of roadside concentrations of NO_2, of which diesel vehicles are the largest source.

1.8 Eight Greater Manchester authorities were identified by the Government as having roads which are expected to continue to exceed the maximum legal limits of NO_2 in 2021. They were directed by Government to undertake feasibility studies to identify measures for reducing NO_2 concentrations to compliant levels in the 'shortest possible time'.

1.9 These studies must produce a series of business cases for assessing and implementing the relevant measures to address the problem. The Government has allocated £255 million for Implementation Funding and £220 million to a Clean Air Fund to finance such measures nationally.

1.10 Local air quality modelling has indicated that without action, it is predicted that there will be 250 points of exceedance across 152 road links and in all ten local authority areas in 2021, including those not initially identified by the Government. The results of the Greater Manchester modelling have now been agreed by Government, meaning that all the exceedances of legal limits of NO_2 in all ten Greater Manchester local authority areas need to be addressed.

1.11 Greater Manchester has a longstanding track record in taking a balanced approach to policy development to promote sustainability, inclusion and growth. The ten Greater Manchester authorities have decided to work together to respond to this vital issue, demonstrating collective leadership, which is essential to help clean the air for our combined population of nearly three million residents.

1.12 Given that air pollution does not respect boundaries, and the problem cannot be remedied on a site-by-site or authority-by-authority basis, this coordinated approach is the most effective way to deal with a problem that affects all parts of Greater Manchester.

1.13 The ten authorities, supported by Transport for Greater Manchester, have now developed a draft package of coordinated and robust measures that complies with the highly prescriptive Government guidance for tackling NO_2 pollutants.

1.14 In accordance with Government guidance, the output of this work is set out here as an Outline Business Case (OBC), following the HM Treasury's Green Book guidance. This means it comprises five cases - Strategic, Economic, Financial, Commercial and Management - which are interdependent and must be considered as a whole.

1.15 To tackle the issue, Greater Manchester has undertaken a thorough transport, economic and air quality modelling appraisal of options. The OBC represents a major milestone on the journey to developing a Full Business Case, which we must submit to Government by the end of 2019.

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1.16 Some of the reasons for the higher levels of NO_2 pollution across Greater Manchester are that vehicles using Greater Manchester's roads, particularly buses and taxis, are typically older than the national average. Additionally local traffic in some areas is moving more slowly than average.

1.17 Greater Manchester has also sought to develop interventions that align with our wider strategic goals and do not undermine the Greater Manchester Combined Authority's and ten local authorities' other statutory and legal duties. This approach will minimise the risk of significant unintended negative economic, social or environmental consequences.

2 The proposal

2.1 Greater Manchester is proposing the following package of measures that delivers compliance in the shortest possible time, at the lowest cost, least risk and with the least negative impacts. They are:

- A charging Clean Air Zone which will target the most polluting commercial vehicles including older heavy goods vehicles, buses, coaches, taxis and private hire vehicles from the summer of 2021, and older polluting light goods vehicles from 2023. It has been assumed at OBC stage that the Clean Air Zone Charge would be £7.50 per day for taxis, private hire vehicles and light goods vehicles and £100 per day for heavy goods vehicles, buses and coaches. Vehicles subjected to the charge who do not pay would be issued with a Penalty Charge Notice and would be required to pay both that and the original charge.

Buses, coaches and HGVs	£100 (from 2021)
Taxis and private hire vehicles	£7.50 (from 2021)
Vans and minibuses	£7.50 (from 2023)

- A Clean Freight Fund to provide financial support for the upgrade of light and heavy goods vehicles, minibuses and coaches, which will be targeted to support small local businesses, sole traders and the voluntary sector, registered in Greater Manchester. Initial work suggests that circa £59m Government funding will be required to support this fund.
- A Clean Taxi Fund, to support the upgrade of non-compliant Greater Manchester Licensed taxi and private hire vehicles. Initial work suggests that circa £28m Government funding will be required to support this fund.
- A Clean Bus Fund to provide, where possible, the retrofit of older engine standards to the less polluting Euro VI standard for those buses registered to run services across Greater Manchester. Initial work suggests that circa £30m Government funding will be required to support this fund.

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- A fund to complete the upgrade of local authority owned vehicles to compliant engine standards. Initial work suggests that circa £21m Government funding will be required to support this fund.
- At least £25m investment in an additional 600 Electric Vehicle charging points.
- A dedicated programme of support and advice for businesses and communities to help them plan more sustainable and less polluting types of travel, including cycling and walking and public transport as part of their operating patterns and lifestyles.
- The potential establishment of Financial Conduct Authority regulated loans for those taking advantage of the Clean Vehicle Funds to support the management of near-term vehicle change costs and promote the longer-term savings that low emission vehicles can offer over time.

2.2 With full Government funding of the package of measures identified, our modelling anticipates that Greater Manchester will achieve compliance with the legal limits for NO_2 in 2024.

2.3 It is important to understand that the proposals outlined in the OBC are based upon the implementation of ***all*** measures identified. Should any of the measures not be funded, then Greater Manchester would be unable to meet the expected 2024 date of compliance.

2.4 Given the scale of the air pollution challenge, the impact of our proposals on residents will be positive; they will experience improved air quality and related health benefits. The measures will also contribute to wider policies to improve the performance of the Greater Manchester road network. Under the proposed measures residents would benefit from investment in Electric Vehicle charging infrastructure and promotion, programmes to support sustainable journeys, and from a newer, cleaner bus and taxi fleet.

2.5 The plan set out here does recognise that, if not managed as part of an overall programme, costs of complying with the Air Quality Standards Regulations would fall largely on businesses, sole traders and the public sector. This is a crucial consideration and has shaped the proposals for significant financial support to businesses to upgrade non-compliant vehicles. These proposals will now become the subject of intensive engagement and refinement with the business community to ensure that they support change in a manner that both promotes cost-effective operations and meets the primary objectives of reducing NO_2 emissions.

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Euro 6 engine (2013 onwards)	Buses, coaches and HGVs
Diesel Euro 6 (2015 onwards) Petrol Euro 4 (2005 onwards)	Taxis and private hire vehicles
Euro 6 (2016 onwards)	Vans and minibuses

2.6 The proposals set out in this OBC present the best solution to addressing the reduction of NO_2 levels in the 'shortest possible time'", based on the evidence available to date. They will be refined through further work that is programmed to develop a more detailed understanding of the possible impact of the proposals on a range of groups, including low income workers, key business sectors such as retail and leisure, transport and distribution, and on small local businesses. More detailed engagement with Highways England is also required to ensure compliance across the Greater Manchester motorway network. A programme of research, analysis, public and stakeholder engagement and a thorough integrated impact assessment has commenced and will continue throughout 2019.

3 Financial Implications

3.1 The Greater Manchester authorities do not have the funding available to support the additional expenditure needed to address the NO_2 challenge. Therefore, the Government is required to fully fund all aspects of the Clean Air Plan including any shortfall in the operating costs.

3.2 In developing the OBC, it has been assumed that the Government's Implementation and Clean Air Fund will provide funding for all costs relating to the Clean Air Programme's implementation, and that the Government will underwrite any net operational deficit, as may be necessary, over the life of the Programme until compliance is achieved.

3.3 There is a considerable amount of uncertainty in the assumptions around revenue generation, given the relatively new nature of such policies in the UK. Therefore, the Clean Air Zone charge, penalties and forecasts included in the financial model as set out in the OBC are indicative at this stage. In common with other aspects in this OBC, they will be refined and informed by the forward work programme to the end of 2019.

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4 Conclusion

4.1 Greater Manchester is taking a collaborative and collective approach to meet the Government's requirement to produce a feasibility study, identifying the measures that will deliver compliance with legal NO_2 limits in the shortest possible time. This approach will also provide wider benefits for the future sustainable growth, public health and local transport objectives set out in the Greater Manchester Strategy[6].

4.2 The proposed measures and the supporting transport, economic and air quality modelling need to be further developed. This along with the planned engagement will inform the detailed design of the measures and will help to refine the proposals.

4.3 This will enable the development of a Full Business Case for further consideration by Greater Manchester Combined Authority and constituent local authorities, prior to submission to Government by the end of 2019.

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[6] https://www.greatermanchester-ca.gov.uk/ourpeopleourplace

Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Commercial Case

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Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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3 Commercial Case

3.1 Outline Business Case Introduction

3.1.1 Since 2010 major urban areas in the UK, including the ten local authorities of Greater Manchester, have been in breach of the European Union Limit Values regarding levels of NO_2 as implemented through the Air Quality Standards Regulations (2010). These Regulations require the Secretary of State to develop and implement a national Air Quality Plan to achieve the relevant EU Limit Value within the "shortest possible time"[1].

3.1.2 As a result of the ClientEarth case in 2015, the UK Government was found to have produced inadequate plans and was directed by the UK Supreme Court to take action[2]. Subsequent defeats for the UK Government in the UK High Court on the basis of inadequate planning and action, in 2016[3] and 2018[4], have further emphasised the need for an improved approach.

3.1.3 Government Air Quality Plans[5] have subsequently required local authorities with persistent exceedances to undertake local action to consider the best option to achieve statutory NO_2 limit values in the "shortest possible time", and this Outline Business Case investigates the feasibility of possible interventions that form the Greater Manchester Clean Air Plan (GM CAP).

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[1] Department for Environment Food and Rural Affairs, Department for Transport, 'UK plan for tackling roadside nitrogen dioxide concentrations: Detailed plan: July 2017' (2017), available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017.

[2] *R (On the Application of Client Earth) v Secretary of State for the Environment, Food and Rural Affairs* [2015] UKSC 28.

[3] *R (On the Application of Client Earth (No 2)) v Secretary of State for the Environment, Food and Rural Affairs* [2016] EWHC 2740.

[4] *R (On the Application of Client Earth (No 3) v (1) Secretary of State for the Environment, Food and Rural Affairs (2) The Secretary of State for Transport and (3) Welsh Ministers* [2018] EWHC 315.

[5] Department for Environment Food and Rural Affairs, Department for Transport, 'UK plan for tackling roadside nitrogen dioxide concentrations: Detailed plan: July 2017' (2017), available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

3.1.4 It is vital to improve air quality because of the effect air pollution has on the health of people living, working and travelling in Greater Manchester. The Greater Manchester Strategy states that Greater Manchester should be '*a place at the forefront of action on climate change with clean air and a flourishing natural environment*' including by '*improving air quality*'[6]. Greater Manchester's ten local authorities have chosen to take a regional wide approach to producing a GM CAP to complement other GM-wide strategies such as the existing GM Air Quality Action Plan[7] and GM Low-Emission Strategy[8].

3.1.5 The proposed GM CAP is a package of measures to address the NO_2 levels in Greater Manchester aimed at and achieving compliance in the "shortest possible time". Each of these elements is integral to the successful delivery of the GM CAP and protecting the health of the Greater Manchester population, and therefore these measures must to be considered as a whole package if compliance is to be achieved. The package comprises the following:

- **Clean Air Zone across Greater Manchester**
  - Phase 1: (assumed from 2021) buses, taxis, Private Hire Vehicles and Heavy Goods Vehicles (Clean Air Zone Category B)
  - Phase 2: (assumed from 2023) expanding to Light Goods Vehicles and minibuses (Clean Air Zone Category C)
- **Vehicle Renewal Schemes** – to provide an affordable incentive to dispose/retrofit vehicles
  - Clean Freight Fund, Clean Taxi Fund, Clean Bus Fund, Loan Finance
- **Electric Vehicle Infrastructure and Promotion**
- **Sustainable Journeys** – an extensive behaviour change programme of travel planning with schools, workplaces and individuals
- Supported by Local Authority and Greater Manchester Fleet Upgrades, a review of Parking Standards and Bus Capacity Network Planning.

3.1.6 Improving air quality and reducing emissions harmful to health is a key policy priority for Greater Manchester, and the Measures proposed in the GM CAP will also be complemented by ongoing activity arising from existing investment decisions by TfGM to improve Greater Manchester's active travel and transport network.

[6] Greater Manchester Strategy: our people our place, available at: https://www.greatermanchester-ca.gov.uk/ourpeopleourplace

[7] Greater Manchester Air Quality Action Plan 2016-2021, available at https://www.greatermanchester-ca.gov.uk/media/1272/air-quality-action-plan-2016-21.pdf

[8] Greater Manchester Low-Emission Strategy, available at https://www.greatermanchester-ca.gov.uk/media/1276/low-emission-strategy-dec-2016.pdf

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3.2 Commercial Case Introduction

3.2.1 The Commercial Case for the GM CAP covers the required procurement and commercial arrangements relating to the services and infrastructure to implement all the proposed Measures of the GM CAP.

3.3 Legal Status of Greater Manchester Combined Authority (GMCA) and Transport for Greater Manchester (TfGM)

3.3.1 In accordance with the Greater Manchester Combined Authority (GMCA) Order 2011, the powers of the ten Greater Manchester Authorities (Manchester, Stockport, Tameside, Salford, Trafford, Bolton, Bury, Rochdale, Oldham and Wigan) in relation to specific sections only of the Environment Act 1995 are exercisable by GMCA concurrently with the ten authorities.

3.3.2 Section 101 of the Local Government Act 1972 and Section 19 of the Local Government Act 2000 (and Regulations made under it) are also applied with modifications to enable the GMCA to sub-delegate activity and decisions to Transport for Greater Manchester (TfGM).

3.3.3 Subject to the necessary approval and governance arrangements by the Greater Manchester local authorities, TfGM will be appointed to act as lead Contracting Authority for the Greater Manchester Clean Air Plan. This will allow for the efficient delivery of the Measures in order to satisfy the statutory duties and actions necessary to fulfil the Secretary of State's direction to reduce NO_2 exceedances and achieve compliance in the shortest possible time.

3.4 Development of Procurement Strategy

3.4.1 The Commercial Case outlines the proposed procurement and commercial activities required to implement a commercially viable scheme for the GM CAP that will be refined through the development of the Full Business Case (FBC) to ensure that the GM CAP delivers GM-wide compliance and Value for Money to the taxpayer, is attractive to the market place, can be procured and is commercially viable. It considers all Measures to be procured will be funded as detailed within the Financial Case and subsequently delivered, unless otherwise subsequently agreed, through a central programme team as outlined in the Management Case.

3.4.2 The procurement strategy will support the development and implementation of these Measures whilst recognising that the viability of a GM CAP will be subject to demonstrating that it meets the UK Government's Critical Success Factors.

3.4.3 The Primary Critical Success Factors are:

- Reduction in NO_2 emissions
- Feasibility: the likelihood of the Measure being implemented in time

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3.4.4 The Secondary Critical Success Factors will consider:

- Strategic fit with local strategies and plans
- Value for money
- Distributional Impacts: to understand the potential impacts on different groups within society
- A series of Measures assessing the deliverability of the options - in terms of the affordability, supply-side capacity and capability and achievability

3.4.5 Due to the requirement to further assess and define the Measures documented throughout the OBC, it will be necessary to engage with the market once the OBC has been delivered. The Commercial Case addresses key assumptions made during the development of a proposed programme of Measures as part of the GM CAP, recognising that both market and stakeholder engagement will be critical in refining the procurement strategy during 2019.

3.4.6 The procurement strategy outlines the routes to market and preferred options in the delivery of all the necessary activities in support of the Clean Air Zone (CAZ), plus the additional Measures of the GM CAP as set out in the Strategic Case.

3.5 General Commercial Assumptions

3.5.1 This procurement strategy has been developed on the basis that all the Measures within the GM CAP will be funded entirely through UK Government sources.

3.5.2 For the purposes of this Commercial Case it is assumed that the local authorities will delegate to the GMCA the necessary powers to act as the primary contracting entity, subject to appropriate governance arrangements as required by each local authority. This permits the GMCA to appoint a Delivery Body to propose a procurement strategy for the development and implementation of the proposed GM CAP.

3.5.3 The Delivery Body appointed will be able to satisfy the specific rules regarding procurement routes and any procurement activity undertaken by it will be as if acting as a public entity subject to public procurement regulations, including Public Contracting Regulations 2015 and appropriate EU procurement directives and those directives already implemented by statutory instruments in the UK. Subject to the necessary approval and governance arrangements, TfGM will act as the Delivery Body for the purposes of the GM CAP.

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3.5.4 Contracts may be procured centrally by TfGM for the delivery of the components of the CAP and these contracts may, if required, allow the ten Greater Manchester local authorities to contract directly with suppliers for any elements that are agreed to be delivered locally. Established contracts and public sector frameworks that fulfil all GM CAP procurement requirements will be the preferred route.

3.5.5 Procurement activities and the public consultation for a Charging Scheme Order (CSO) are scheduled to run in parallel, with tender documents released to market prior to full consultation being complete. All procurement activity and subsequent contracts required to implement the GM CAP Measures would only be awarded strictly subject to the outcome of the public consultation and funding approval from government.

3.5.6 Items excluded from being procured by TfGM for the proposed Measures, including the CAZ, include specifically those to be provided by the Joint Air Quality Unit (JAQU) to enable, in the required timescales, Greater Manchester to fulfil implementation of the Measures in the shortest time possible. It is assumed that the items below are being provided by JAQU and/or other parties and are therefore excluded from the services to be procured by TfGM.

3.5.7 **Central Charging Service**: Procurement of the central charging portal that is intended to be used by the specified authorities for the purposes of collecting the monies from the penalties incurred within the CAZ.

3.5.8 **Design of Traffic Signage for the CAZ**: The designs for the traffic signage to be used throughout the UK where CAZ schemes have been supplied by JAQU.

3.5.9 An Operating Body may be established for the maintenance and operation of the CAZ once implemented which may include the delivery of a customer services function.

3.5.10 The GM CAP will require access to data sets for consideration in respect of CAZ for assessment as to whether or not a vehicle is compliant. These are likely to include:

- Driver and Vehicle Licensing Agency (DVLA) data;
- Taxi data;
- Euro emission standards;
- registration of vehicles with retrofitted abatement technology; and
- commercial arrangements including the provision of personal data by DVLA which will need to be put in place by JAQU.

The above data will be required for the provision of a central government charging system.

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3.5.11 The Delivery Body will lead all centralised procurement and all activities which form the Programme will be delivered and operated by a combination of different Delivery and Operating Agents including TfGM, local authorities and other bodies. The Delivery and Operating Agents are detailed within the Management Case in the tables in section 5.12.

3.6 Procurement Requirements

3.6.1 A number of procurement activities will be required to deliver the proposed GM CAP. A full description of the Measures that comprise the GM CAP and the potential services are placed in Appendix 0.1.1 of the Management Case and those Measures requiring procurement activities are summarised in Table 3- 1 below. Table 3- 1 includes only a high-level description of the Measures and is provided as an indicative outline of types of activity at this stage.

Table 3- 1: GM CAP Measures

Clean Air Zone (CAZ)
Description
A Clean Air Zone is proposed to be implemented across the region in two phases as follows: Phase 1: (assumed from 2021) buses, coaches, taxis, private hire vehicles and Heavy Goods Vehicles (Clean Air Zone Category B). Phase 2: (assumed from 2023) expanding to Light Goods Vehicles and minibuses (Clean Air Zone Category C).
Outline of Works and Services to be procured
Technical, Design and Professional Services: • Scheme design specification of the CAZ, including all required elements, data collection and modelling to support design, appraisal and impact assessment. • Highway Infrastructure design including signage, road markings, changes to highway layout, survey data to determine exact locations of signage, Automatic Number Plate Recognition (ANPR), camera locations, poles, camera installation, power and data ducting. • Outline development of the customer-facing elements of the CAZ, such as developing the strategy for the management of any potential discounts and/or exemptions, managing queries and complaints and the issuing and enforcement of Penalty Charge Notices (PCN). • Development of the appropriate technology solution including but not limited to the specification for the ANPR cameras, power ducting, data transmission, software, hardware systems and interfaces with the JAQU-provided central charging portal. • Preparation of technical documents for establishing the exemptions listing for the database for charging for the CAZ scheme. • Services to support the ongoing stages of the project, during the tender period in preparation of the tender documents, construction management/supervision during the implementation stage and at the decommissioning stage. • Planning and traffic regulations support and advisory services.

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Programme/Project Management:

- Manage the core system delivery, risks and schedule

Communications:

- Develop the GM CAP communications plan, local media and advertising, direct engagement awareness, mail campaign, social media, website updates (https://cleanairgm.com/). It is to be noted that a communications and engagement programme will be undertaken to promote all elements of the GM CAP and not solely for the CAZ Measure.

Legal Services:

- TfGM will provide legal advice, drafting of the joint CSOs, Traffic Regulation Orders and support the public consultation process and drafting of the agreements with supplying organisations.

Information Systems and Communications Services:

- Detailed architecture and design of the technology, communications, and interface requirements for the delivery of the CAZ. This will include development or sourcing of software, hardware and installation of the technology solution, customer management systems development and integration with the JAQU central charging system. Testing, commissioning and obtaining the necessary certification of the systems and achieving readiness of the system for handover for operations and the fit out of the Operations Facility itself.

Civil Engineering works:

- Supply and installation of items such as signage, cameras, posts. Additional works include roadside marking, highway modifications and parking near public transport facilities.

Provision of Mobile Enforcement Vehicles:

- Mobile enforcement units and appropriate technology including mobile ANPR camera technology.

Provision of building facility for Operational Delivery:

- Potential leasing of building/floor space for the operational delivery of the CAZ if no suitable space is available across the GM Local Authority estate.

Operations of the installed/certified CAZ scheme:

- Services required to operate the ANPR Camera Network, mobile enforcement units, issue of the PCNs, monitor performance of the system, manage enforcement proceedings, communications with tribunals.

Maintenance of the installed CAZ systems:

- Fixing, repairing and replacement of defective ANPR cameras, signage and equipment.

Linked monitoring activities:

- CAZ scheme monitoring, air quality measurement and monitoring, assessment of traffic levels and economic performance of the scheme.

Decommissioning of the installed/certified CAZ scheme:

- Provision of the physical removal of the installations, cameras, signage etc. following the agreed date for sustained compliance.

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Vehicle Renewal Scheme - Clean Air Funds
Description
The Clean Air Fund comprises two funding mechanisms that propose to offer financial support to increase the number of compliant vehicles across Greater Manchester: Clean Freight Fund (Heavy Goods and Light Goods Vehicles): Offering local businesses a discount on the purchase of a compliant commercial vehicle from an approved supplier, when trading in (for disposal) a non-compliant vehicle. Priority given based primarily on air quality impact. Clean Taxi/Private Hire Fund: Offering GM-registered taxi and private hire driver's support to upgrade non-compliant vehicles.
Outline of Works and Services to be procured
Technical, Design and Professional Services: • Policy design for the scheme, including technical and economic elements, Information Systems (IS) (e.g. application services), customer services and any facilities required to implement the vehicle renewal scheme, and manage the scheme i.e. the applications to the fund. • Capability to administer and operate the fund. • Capability to take vehicles accepted by the renewal schemes and if necessary either dispose of the vehicle or redeploy. • Vehicle renewals partner. **Legal Services:** • Support to understand the legal risks associated with any proposed implementation of the schemes.
Vehicle Renewal Scheme - Loan Finance Fund
Description
In addition to a centrally funded vehicle renewal scheme which would be funded by JAQU, TfGM is looking at the possibility of a Measure which would provide loan facilities for vehicles or subsidy to lease plans. This scheme is to be determined at FBC stage and fully scoped out following consultation with stakeholders.
Outline of Works and Services to be procured
Professional Services: • Specialised professional services and advice required within a regulated Financial Conduct Authority (FCA) environment. • A third party will be required to administer loans covering activities from credit checks to recovering loan defaults and taking monthly payments.
Vehicle Renewal Scheme - Clean Bus Fund
Description
Offering grants: to retrofit existing Euro IV and V buses; and towards the purchase of the cleanest buses, electric buses and electric bus charging infrastructure, prioritising air quality impact (including the TfGM operated bus fleet).

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Outline of Works and Services to be procured
Technical, Design and Professional Services: • Design for the funding scheme, including technical and economic elements, administrative systems and processes development, engagement with bus operators and management of the scheme. • Capability to administer and operate the fund. **Legal Services:** • Support to understand the legal risks associated with any proposed implementation of the schemes. TfGM acting on behalf of the GMCA has been awarded £3 million under the Clean Bus Technology Fund 2017-19. TfGM currently administer these clean bus funds for retrofit – with the initial funding being awarded under two Phases. Tendering to market is done on criteria that include vehicle age, mileage and routes run, which focus on priority roads and exceedance levels.
Electric Vehicle (EV) Infrastructure and Promotion
Description
Delivery of 300 additional rapid charging points (Dual Headed) across Greater Manchester, including some exclusively for taxis/private hire vehicles. Offer and facilitate experience days to showcase the benefits of electric vehicles, highlight the support available and allow people to compare EVs from a range of suppliers, and 'try before you buy'.
Outline of Works and Services to be procured
Technical, Design and Professional Services: • Improve the design for charging locations, technology options analysis, commercial opportunity identification and business case. **Civils Works; and Operate and Maintain:** • To install, operate and maintain the electric vehicle charge points and various promotion activities.

3.6.2 The following Measures are integral to the delivery of the GM CAP and the best solution for delivery of these elements will be determined. However, in all cases external services that may be required can be procured through existing frameworks or low-value procurements. Additional personnel may need to be recruited to manage these procurements and services.

3.6.3 **Sustainable Journeys:** Travel planning and support to encourage sustainable travel options across different sectors of Greater Manchester to be delivered through advice and briefings. Engagement with schools is planned to be undertaken to promote reduction in travel during busy periods as a way to reduce congestion. These services may be procured through GM charities.

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3.6.4 **Local Authority and Greater Manchester Fleet Upgrade:** Upgrade of local authority fleets to become fully compliant, including all authority-operated cars/vans, refuse collection vehicles, HGVs, and contracted services. Engagement with authority fleet management teams to understand current purchase and leasing arrangements is underway.

3.6.5 **Parking Standards and Local Authority Parking:** Review of parking standards, conversion of long stay to short stay car parks and local authority and GMCA staff parking

3.6.6 **Bus Capacity:** Liaison with bus operators to understand which routes may have expected increase in demand to allow bus operators to plan increases in commercial services. Commitment to inform all bus operators through communication and marketing strategies.

3.6.7 **Ongoing Improvements:** A programme of investment in public transport and the highway network is already planned and underway. Coordination with ongoing projects, work packages and business as usual to ensure air quality benefits are maximised.

3.7 Procurement Models

3.7.1 A high-level options analysis has been undertaken to consider the viable routes to market and contracting mechanisms available to deliver the GM CAP in accordance with the UK Government's success criteria, principally in supporting compliance in the shortest possible time.

3.7.2 As a Greater Manchester-wide scheme, the consistency and standardisation in implementing the Measures within the GM CAP is considered essential and integral to the establishment of a procurement strategy to be adopted throughout all ten local authorities.

3.7.3 The procurement model to deliver the GM CAP will be through the GMCA via delegated powers and with TfGM as the appointed Delivery Body to deliver the works and services required for the GM CAP (as outlined in Section 3.5 General Commercial Assumptions).

3.7.4 It is intended that the local authorities will be responsible for the procurement of Measures that are delivered locally to their respective areas. It is considered that they are best placed to procure and oversee the successful implementation of the local Measures using existing relationships with relevant stakeholders in that community with any required oversight from GMCA/TfGM on communications and 'overall project oversight'.

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3.8 Enabling Procurements

3.8.1 To deliver a GM CAP in a coordinated and consistent approach throughout Greater Manchester, encompassing all Measures, it is recognised that the specialist support and services from a number of organisations will be required to advise on and manage a programme of works which are time-dependent and which have key interfaces. The roles currently identified as integral to delivering the GM CAP from a scheme-wide perspective are Lead Advisor and Legal Advisor.

Lead Advisor

3.8.2 TfGM developed the TPS (Transport Professional Services Framework) during 2016 to engage 40 consultancies and have successfully delivered large projects under this Framework. The Lead Advisor will be part of a multi-disciplinary team and appointed through the TPS Framework.

Table 3- 2: Lead Advisor Timeline

Invitation to Tender	December 2018
Tenders received from five bidders	January 2019
Tender evaluation	February 2019
Appointment of Lead Advisor	March 2019

3.8.3 The appointment of a Lead Advisor in the overseeing of the design elements of the Measures has a number of advantages for the GM CAP. Early engagement will allow for the design process to commence and for the outputs of outline design to best inform and facilitate the tendering of the works for delivering the Measures. This will give greater certainty of design throughout the procurement and FBC process.

3.8.4 Working with the TfGM Programme Sponsors, the role of the Lead Advisor will be to provide the strategic leadership and accountability for the development and delivery of significant elements of the proposed Measures for delivery of the GM CAP. Full accountability and progress reporting will be critical for this engagement. A summary of the core services to be undertaken is in the table below:

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Table 3- 3: Lead Advisor Core Services

Workstream	Description
Data, Evidence & Modelling	Commissioning and collection of additional data and further development of the underpinning information for the modelling of the preferred option. Building on the data and assumptions from the OBC stage to produce robust and defensible traffic, emissions and air quality modelling for the future case (using the Target Determination data). Updating and re-running of models to help optimise and determine the final scope of the Projects and Work Packages.
Project and Work Package Development	Continued development and detailed assessment of the programme of Measures against the Critical Success Factors. Coordination of development across various workstreams to optimise and determine the final scope and required outputs of the Projects and Work Packages. Development of appropriate assurance and gateway processes.
Programme and Project Business Case	Production of the Full Business Case for the Programme, Projects and Work Packages, to meet JAQU guidance.
Programme and Project Management	Programme and Project Management including project controls, risk management, cost management and document control. Adherence to TfGM's programme and project requirements, including development and drafting of Measures, monitoring and managing cost, schedule and quality. Coordinate/manage internal and external teams across the Programme, including the workstreams, Projects and Work Packages.

3.8.5 It is anticipated that the services above will be delivered by the Lead Advisor in order to meet the output of the scheme design from outline into detailed for all identified Measures through to the delivery of the FBC.

Legal Advisor

3.8.6 As outlined in section 5.6.7 in the Management Case, due to the complexity of the GM CAP, the procurement of external legal services will be undertaken to provide ongoing support for the following workstreams required to implement the proposed Measures, including, but not limited to:

- Advice regarding appointment of Operating Body
- Support and provision of legal advice in respect of the legal requirements for the programme, projects and work packages
- Ensuring the legal robustness of policies, procedures and the FBC
- Formulation of direct agreements with supplier organisations
- Drafting of the joint CSOs
- Supporting the public consultation activities
- Drafting of the Traffic Regulation Orders

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3.8.7 The framework for accessing the correct expertise and capability has been identified as the Legal Services Framework led by CENTRO which includes the following providers:

- Eversheds
- DWF
- Pannone
- Trowers & Hamlins
- Addleshaw Goddard
- Legal Services Alliance (Lead bidder Bircham Dyson Bell)
- Shoosmiths
- Pinsent Masons
- Winckworth Sherwood

3.8.8 The appointed Legal Advisor will be required to work across the complete GM CAP throughout the development of the scheme until FBC stage and into implementation. This will provide a consistent approach and accountable structure.

3.8.9 The procurement of the Lead and Legal Advisor roles, under existing frameworks, provides a simple route to market, cost transparency and engagement of knowledgeable professional service providers in the transport and environmental sectors.

3.9 Routes to Market

3.9.1 It is proposed that TfGM as the GM CAP Delivery Body will undertake the procurement requirements for the delivery of the Measures. In the event that there are discrete packages of work more appropriately coordinated and managed by individual local authorities, TfGM will work in conjunction with the local authorities in the provision of coordinated support and direction.

3.9.2 A Primary Critical Success Factor for delivery of the GM CAP is the feasibility in meeting the required timescales. TfGM and the local authorities have a number of existing frameworks that can provide a quicker and simpler route to market, including the key supplier base for a large number of the works and services required to deliver the GM CAP. Alongside the frameworks listed below in Table 3- 4 there are Crown Commercial Service (CCS) framework agreements and other public sector frameworks which are easily accessible.

3.9.3 There are currently a small number of procurements which, due to their relative complexity, would be inappropriate for a framework approach and TfGM propose utilising the Official Journal of the European Union (OJEU) tender process. No decision at this stage has been made as to which procedure under the procurement regulations would be most appropriate for the type of goods and services potentially being required.

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3.9.4 There is no defined route to market agreed and frameworks identified are subject to change dependent on the specification which emerges through the ongoing design process.

3.9.5 The following table outlines the key routes to market, which would be feasible for delivery of the GM CAP Measures as outlined in Table 3- 1.

Table 3- 4: Procurement Routes to Market

CAP Measure	Procurement Element	Potential Route to Market
Clean Air Zone (CAZ)	Signage	Design has been provided by JAQU TfGM Ducting and Minor Highway Works Framework (Ref.170601, April 2018)* (traffic signalling, CCTV and related services)
	Cameras (Fixed and Mobile)	The specification will be developed during the design stage. Approximate quantities have been identified but require additional modelling. Location maps and final requirements to be finalised. RM1089 - Traffic Management Technology 2*. Lot 2 Traffic Monitoring and Traffic Enforcement Cameras
	Civil Engineering Work	Ducting and Minor Highways Framework or North West Construction Hub (depending on value)*
	Information Systems	CCS Frameworks*: RM1089 – Traffic Management Technology 2 RM1043 – Digital Outcomes and Specialist RM1557 – G-Cloud RM1045 – Network Services RM3733 – Technology Products 2 Potential OJEU competitive tender
	Diffusion Tubes	Monitoring through diffusion tubes will form a key element of measuring the compliance of the GM CAP to the required nitrogen levels. As specialised equipment it would be potentially a competitive OJEU tender to market.
Clean Air Funds	Taxis LGVs HGVs	The Clean Air funds and the administration criteria for the process have yet to be clarified. Resource impact will be assessed through market engagement which will give clarity of the administrative and customer services resources required. A vehicle renewals partner will potentially be required to administer and manage the disposal and/or recycling of vehicles and materials rendered redundant through the administration of the Clean Air Funds.

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CAP Measure	Procurement Element	Potential Route to Market
		Potential remit for the Operating Body or operations to be undertaken by the Delivery Body (TfGM). Policy design for the funding scheme and operational elements will be a design output of the Lead Advisor.
	Loan Finance	Engagement with an FCA regulated supplier will be required and potential service outsourcing. Market sounding activity has commenced and the criteria and administration of the scheme will be defined with appointed supplier. Potential OJEU competitive tender.
Electric Vehicle Charging	Charging Infrastructure	The GMEV Electric Vehicle Charging Infrastructure (EVCI) Operations and Maintenance Agreement for the supply, Operations and Maintenance of Electric Vehicle Charging Infrastructure is currently being tendered. These agreements are considered to be a key enabling component of the TfGM Air Quality Measures programme supporting the achievement of the Greater Manchester 2040 Transport Strategy: Our Vision. There is an option to extend the scope for increased volume and capacity.

Existing Framework Approach

3.9.6 Recognising the number of procurement activities that will need to be undertaken and the programme time constraints, where possible, packages of work will be developed in order to approach the market under existing frameworks.

3.9.7 Table 3- 4 identifies a number of existing CCS frameworks which can be utilised; and by working closely with the CCS, initial reviews of the scope of works and services required have taken place, which will enable TfGM to approach the market with attractive tenders encouraging maximum participation throughout the supply chain. Early engagement and workshops will further define these packages of activity and allow for early contractor engagement throughout the process through to active supplier management once appointed.

3.9.8 Where it is found that the identified framework agreements do not cover the entire scope of works required, or the organisations on the framework agreement do not have the capacity to deliver, alternative procurement routes will be considered, including using alternative public sector framework agreements.

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3.9.9 Throughout the ten local authorities of Greater Manchester there are also a number of frameworks that have been/are undergoing development which may specifically support the GM CAP. The Alliance Street Scene involving the Highways Authority, utilities companies and contractors which is currently being tendered by STAR Procurement could prove to be of significant interest in delivery of a coordinated and consistent approach.

3.10 Potential OJEU Procurements

3.10.1 Table 3- 4 identifies three potential OJEU procurements for the delivery of the GM CAP being Civils, Information Systems (IS) and Loan Finance.

Civil Engineering

3.10.2 Design outputs managed by the Lead Advisor will inform the location, volume and placement of the cameras and signage throughout Greater Manchester. These works will potentially be for the installation of the CAZ equipment including the posts and highways modifications required. It is proposed that the nature of these works and capturing of a wider supplier market would be an OJEU-level exercise due to the potential value exceeding the relevant EU procurement threshold.

Information Systems Solution

3.10.3 The technology solutions architecture, IS and communications services will be critical for the implementation and operation of the CAZ. The high-level design will be led by the Lead Advisor in determining the required outputs to develop the IS Solution roadmap for GM CAP:

- Discovery Phase;
- detailed design and architecture of the solution;
- communications technology requirements; and
- interface requirements.

3.10.4 The IS solution will be defined during 2019 through the design outputs and market engagement with other cities who are delivering a similar CAZ scheme in different regions of the UK, alongside targeted market engagement with suppliers.

3.10.5 Several options exist including the external or internal development of the solution using Agile techniques or sourcing a pre-existing solution to be customised for GM CAP purposes. The complexity and value of the work may necessitate one or more OJEU-level tenders for contract(s) encompassing the following elements of a Develop and Maintain contract:

- Application Development Software;
- hosting (Cloud or on premises);
- installation of the technology solution;

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- testing, commissioning and obtaining the necessary certification of the systems and achieving readiness of the system for handover for operations;
- integration with the JAQU central charging system;
- IS fit out of the Operations facility; and
- supporting systems for the ANPR Cameras such as camera connectivity, CAZ control room, CAZ system back office, software licences, local and central back-up services.

Loan Finance

3.10.6 Due to the specialised nature of the scope of services, a competitive OJEU tendering process will be undertaken to secure a supplier operating within the FCA Regulatory environment to deliver this service.

3.10.7 A third party will be required to administer loans covering services from credit checks to recovering loan defaults and taking monthly payments. The service will also be required to cover the Operations and Maintenance requirements of any proposed Loan Finance scheme covering provision of loans at preferential rates for those who are taking advantage of any loan for vehicle or subsidy of a lease plan. This would have to be determined at FBC stage and via consultation with stakeholders.

3.10.8 The value of this scheme and complexities of the administration would require an OJEU-level procurement to secure a regulated fund administrator to contract directly with TfGM or GMCA.

Vehicle Renewals Partner

3.10.9 Through the administration of the Clean Air Funds there will potentially be a requirement to appoint a vehicle renewals partner to manage the process for disposal of vehicles rendered redundant. This would require a competitive OJEU procurement to secure a locally based service provider with a key focus on the integration and management of the process in alignment with the administrative and technical support for data and application processing. A key element of such a tendering exercise will be on the potential aspect of recycling materials where appropriate.

3.11 Standard Contract Terms and Conditions

3.11.1 All contracts entered into by TfGM as the Contracting Authority would incorporate standard clauses inclusive of the following provisions:

- standard payment terms (30 days standard);
- prohibiting money laundering;
- Modern Slavery Act 2015; and
- Social Value

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3.11.2 Any contract entered into would be subject to satisfactory credit checks through Company Watch during the evaluation stage and bespoke Key Performance Indicators (KPIs) would form part of robust contract management process, post mobilisation.

3.12 Future Operating Body

3.12.1 The established Delivery Body will be responsible for the procurement of the Measures required to support the timescales for the implementation of the GM CAP. The routes to market identified support reaching compliance in the "shortest possible time". The development of the FBC will include an options analysis for the delivery of a proposed Operating Body (or bodies) to operate and maintain the Measures through their lifetime to the future decommissioning phase once ongoing compliance is achieved.

3.12.2 The procurement strategy for the Operating Body will evolve from the design phase undertaken during 2019 and the analysis of market information required for the delivery and implementation of the GM CAP Measures. The required capability of the appointed Operating Body and resourcing requirements for the operational delivery will define the approach to market. The scope of services will include, but not be limited to:

- **Operational** – Customer services and helpline, payment irregularities and disputes, recovering of fines and general advisory services
- **Interface management** – Operational interface management with the JAQU payment portal and the management of the monetary flows. Interface requirements with third parties such as the vehicle renewals partner and Loan Finance body where required
- **Monitoring** – Performance of the CAZ and relevant service level agreements and key performance indicators. Air quality measurement and monitoring, assessment of traffic levels and economic performance of the scheme.
- **Maintenance** – Maintenance and repair of all CAZ equipment
- **Administrative** – Management of the administrative elements of the CAZ such as exemptions and the vehicles renewal scheme such as vehicle applications and allocation of funding against set criteria

3.12.3 A detailed analysis of the requirements of the Operating Body will be undertaken in 2019 as part of the development of the FBC and the commercial considerations of the implementation of the Operating Body will be undertaken as part of that work.

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3.13 Procurement Timescales

3.13.1 Due to the timescales for the Clean Air Programme and meeting compliance in the “shortest possible time”, the procurement activity will necessitate early engagement with suppliers and a number of tendering activities to be undertaken in tandem with the Conversation and Consultation during 2019. It is anticipated that early procurement activity will be closely aligned with the design for critical long lead time items.

3.13.2 This approach will be planned for elements such as the IS, defining the scope and undertaking market engagement on the Operating Body and analysing the requirements for the customer handling activity and management of the supporting Measures.

3.13.3 Resourcing will be mapped onto the procurement plan and it is envisaged that the Lead Advisor will work closely to mobilise required resourcing levels through all programme disciplines in order to fully support the development, design and implementation of the GM CAP as and when required. Internal TfGM resources will be deployed and provide dedicated expert support in managing each element of delivery alongside a number of independent consultants providing specialist support.

3.13.4 All components of the Programme will be managed through the allocation of a Lead Body as outlined in section 5.12, Delivery Strategy, of the Management Case. This method of delivering the Measures will give full visibility and accountability for resource management which will be supported through the procurement plan.

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3.14 Procurement Success Criteria

3.14.1 The UK Government set out a number of Primary and Secondary Critical Success Factors in the development of the GM CAP. The proposals for the procurement strategy are supportive of these success factors as tabulated below:

Table 3- 5: UK Government Success Criteria

Primary Critical Success Factors	
Criteria	**Commercial Case Proposed Methodology**
Reduction in NO2 emissions	Procurement activity to support implementation of GM CAP Measures to reach compliance with the EU Directive
Feasibility: the likelihood of the Measure being implemented in time	Utilisation of existing frameworks and early identification of OJEU activity on the programme critical path. This will be developed as part of the Programme Plan outlined in the Management Case.
Secondary Critical Success Factors	
Criteria	**Commercial Case Proposed Methodology**
Strategic fit with local strategies and plans	Existing frameworks with known supplier base and contracting terms both transparent and currently utilised. Delivery Body to manage all procurement activity consistently and transparently with local authorities to deliver local Measures where identified.
Value for Money	Existing frameworks with supplier rates that have been competitively tendered. Mini-competitions to be coordinated. OJEU procurements evaluated on both technical and commercial criteria.
Distributional Impacts: to understand the potential impacts on different groups within society	All tendering activity will be evaluated on a range of criteria including Social Value and the overall impact for Greater Manchester for local business, employment and planned delivery of procurement activity. The GMCA Social Value Policy will be applied to all procurement evaluations evidencing how Social Value will be demonstrated using standard weighted criteria.

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3.15 GM CAP Procurement Process

3.15.1 Procurement of the GM CAP Measures and the ongoing Operating Body services for Operations and Maintenance, will be delivered within a robust framework of contract management processes and governance which ensure that there is fairness, transparency and Value for Money, delivered for the taxpayer.

3.15.2 Greater Manchester will drive efficiencies and align the supply chain to deliver streamlined benefits for GM in terms of volume discounts and partnering proposals to deliver effective and specialised service offering commitment to long-term relationships within the industry.

3.15.3 The procurement team at TfGM is highly experienced in delivering and implementing procurement strategies for complex projects covering multiple local authorities and other stakeholders.

3.15.4 TfGM has developed a mature procurement approach and all procurement activity is subject to internal governance within TfGM and as appropriate, GMCA, to ensure that there is full transparency of all procurement activity. The procurement approach is a commitment to the delivery of required outputs by the most efficient methodology by working closely with project teams to deliver projects to time, on budget and demonstrating Value for Money.

3.15.5 All procurements with an anticipated value over £10,000 are subject to a rigorous approval process within TfGM which, in accordance with the TfGM Constitution, requires that commitments which exceed certain financial thresholds require approval from the Performance, Investment and Executive Boards and from the GMCA.

3.16 Contract Management

3.16.1 Contract management is the management of the obligations and mechanisms of a contract to effect the intended outcome and to mitigate the risk of failure.

3.16.2 TfGM has a successful track record of managing effective contracts both in terms of major capital projects such as the delivery of a major light rail (Metrolink) capital programme, rail and bus interchanges, transport infrastructure such as the Leigh to Ellenbrook Guided Busway and ongoing revenue services such as the contract with Keolis Amey for the operational delivery of the Greater Manchester Metrolink Light Rail System.

3.16.3 As part of the implementation and operational delivery of the GM CAP the approach and lessons from the management of these and other major contracts would be applied to the disparate elements of the GM CAP to ensure successful delivery post-procurement.

3.16.4 The following infographic highlights the key elements of Contract Management within the context of the CAP:

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Figure 3- 1: Contract Management Principles

3.17 Social Value

3.1.1 The Public Services (Social Value) Act 2012 requires bodies who commission public services to think about how they can also secure wider social, economic and environmental benefits.

3.1.2 The GMCA Social Value Policy outlines the approach of the Combined Authority in the pursuit of Social Value in the procurement and delivery of its contracts. The objectives of the policy are:

- promote employment and economic sustainability – tackle unemployment and facilitate the development of skills;
- raise the living standards of local residents – working towards living wage, maximising employee access to entitlements such as childcare and encouraging suppliers to source labour from within Greater Manchester;
- promote participation and citizen engagement – encourage resident participation and promote active citizenship;
- build the capacity and sustainability of the voluntary and community sector – practical support for local voluntary and community groups;
- promote equality and fairness – target effort towards those in the greatest need or facing the greatest disadvantage and tackle deprivation across Greater Manchester; and
- promote environmental sustainability – reduce wastage, limit energy consumption and procure materials from sustainable sources.

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3.1.3 As part of the procurement strategy for all of the procurement activity outlined in the GM CAP Commercial Case, Social Value will be a consideration in the evaluation of tenders with the aim of maximising the Social Value emanating from the investments made in delivering the CAP.

3.1.4 The appointment of the Lead Advisor will be made in alignment with the principles of the GM Social Value Policy and the proposed delivery methodology will be monitored against KPIs based on both measurement and evidence of success in delivering Social Value to Greater Manchester.

3.18 Stakeholder Engagement

3.1.5 The GM CAP encompasses ten local authorities and throughout the procurement process up until FBC and into the implementation phase it will be critical to engage all authorities in the decision making and implementation of the Measures through the GM CAP Steering Group and via District Chief Executives and Leaders. The success of the GM CAP resides in the alignment of the Measures implemented throughout Greater Manchester; and the success of the scheme requires adoption of consistent Measures within the local authorities.

3.1.6 Engagement with local authorities procurement teams commenced in early 2019. These foundations will be built by further engagement sessions at an individual local authority level; and this, in conjunction with the planned consultation process, will enable the GM CAP to be developed with all of the necessary commercial inputs and governance.

3.1.7 To support the required objectives of a GM CAP, which is to reduce NO_2 concentrations in Greater Manchester to below the EU Limit Value in the shortest possible time, through the adoption of a feasible procurement strategy that supports all of Greater Manchester, stakeholder engagement sessions will be incorporated into the procurement plan along with progress briefings which will be delivered to the Association of Greater Manchester Authorities Heads of Procurement group on a regular basis.

3.19 Commercial Risks

3.1.8 The risk profile of the GM CAP has been coordinated in a single Risk Management Plan (RMP) in Appendix E.4.2 to the Management Case.

3.1.9 A number of procurement risks have been identified along with mitigating Measures which have been allocated associated impact levels in line with TfGM Project Management standard procedure. The overall GM CAP risks will be centrally monitored within a dedicated TfGM risk management team and the impact of status change or the identification of new risks will be evaluated across the project.

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3.1.10 Specific procurement risks identified at a high level which will form the approach to the procurement strategy include the following:

- A lack of national frameworks will entail administering a number of existing frameworks potentially in isolation from other UK regions implementing a CAP and opportunities for synergies will be reduced
- Due to timescales, tenders could be returned which exceed the Cost Plan
- Due to procurement activity being commenced prior to funding being issued, tender prices could be inflated accounting for risk
- The scope of all of the procurement activity is yet to be fully defined and there could be potential that not all requirements will be captured by existing frameworks (where indicated to be the preferred route)
- TfGM requiring extra resource across disciplines and the capacity in the candidate market to fulfil requirements

3.19.1 A risk register is contained within Appendix E.5.2 of the Management Case which identifies risks, including the above, across all projects and work packages which reflect interdependencies and impacts. Mitigation activities are documented and monitored within the risk management team.

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Economic Case

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Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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2 Economic Case

2.1 Introducing the Economic Case

2.1.1 The purpose of the Economic Case is to: explore the change that is likely as a result of the proposed Greater Manchester Clean Air Plan (GM CAP); describe the costs and benefits of this change; and identify the possible impacts on the people, businesses and economy of Greater Manchester. Each Option examined here includes a set of measures that include a Clean Air Zone, the analysis has considered the full GM CAP as a combined holistic plan and therefore results presented consider the full impact of all the measures in each option combined. At present, the proposals are in a draft stage and the detailed design is yet to be developed. A 'conversation' followed by formal consultation with stakeholders and the public later in 2019, supplemented by new research, analysis and technical design work will provide a better understanding of how the proposals will work. This Economic Case indicates the benefits of action, and highlights issues that will need to be addressed in the detailed scheme design and Full Business Case (FBC) stage.

2.1.2 Usually, an Economic Case drives the decision-making process; the proposal with the strongest ratio of costs to benefits is the preferred option and a scheme which does not appear to 'add up' is less likely to proceed. Here, the imperative to act is different: poor air quality is a public health emergency in Greater Manchester. Some of the costs of this health crisis can be quantified, but many more cannot – the lifelong impact of chronic ill-health pervades all aspects of people's lives and wellbeing. The drive to action is to save lives. Eight of Greater Manchester's local authorities are under a legal directive (Directive 2008/50/EC) to produce a Clean Air Plan that delivers compliance with EU Limit Values in the 'shortest possible time'; this directive does not allow for a standard cost-benefit analysis but demands that **where we can act, we must do so**. As the key driver for the adoption of a Clean Air Plan (CAP) is NO_2 compliance in the shortest possible time, every other criterion is secondary in the decision-making process.

2.1.3 The results presented here illustrate the total economic cost to the UK economy as far as this can be quantified at this stage, as well as the net effect on the Greater Manchester area. For this purpose, some impacts are captured and presented that would not appear in a standard economic appraisal, in order to better understand the gains and losses at a local level. Beyond this, it is clear that more work will be required at FBC to properly understand the impacts of the proposals on the local economy and identify the mitigations necessary.

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2.1.4 It is vital that any action does not serve to worsen the prospects of Greater Manchester's poorest and most vulnerable residents. The proposed GM CAP should not worsen access to employment, or risk putting small local enterprises out of business. Where the appraisal presented here has identified causes for concern, action will be taken in the next phase of developing the proposals to identify what changes or mitigation Measures may be required. Greater Manchester's authorities will start a conversation with local residents and businesses to better understand how poor air quality affects them, how they view the Measures proposed, what impacts these Measures might have on them or their business, for example what support they need to help them upgrade their vehicles or change their behaviour.

2.1.5 A summary of the economic impacts is presented, followed by a high-level analysis of how these impacts will be felt across different groups in society (Distributional Impacts). The remainder of the chapter introduces the methodology underpinning the economic appraisal, as well as more detailed results, and concludes with key messages and next steps for refining the appraisal for the FBC.

2.2 Introduction

2.2.1 This chapter sets out the Economic Case for the preferred option and the economic appraisal undertaken for the three best-performing options to address NO_2 exceedances in Greater Manchester. As set out in the Strategic Case (Section 1.7), Option 8 has been assessed as delivering compliance with EU Limit Values in the same year as Options 5(i) and 5(ii), and imposes a lesser impact on businesses and people. Therefore, this Economic Case describes the costs and benefits of Option 8 as the proposed GM CAP and compares these to the other options that deliver compliance in the shortest possible time, Options 5(i) and 5(ii).

2.2.2 The Economic Case sets out how behaviour is likely to change as a result of the proposed GM CAP and what the impacts of this change could be on Greater Manchester's residents, workers and businesses. As the proposals are in an early stage of development, still subject to public consultation and considerable refinement, these impacts are not yet fully understood and should be considered as potential causes for concern which will be further investigated at FBC stage, with mitigations sought.

2.2.3 The Economic Case considers the likely impacts and costs of the GM CAP and includes appraisal of the following:

- distribution of air quality improvements across the Greater Manchester area;
- health and environmental benefits from the air quality improvements, and the distributional analysis of these, savings for health and social care services and the wider benefits of improved health;

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- environmental benefits of reduced greenhouse gas emissions;
- costs to the public sector and impact on revenues;
- travel time savings arising from reduced congestion and the Distributional Impacts of these;
- impacts of mode shift including welfare loss; and the health benefits from increased active travel;
- costs imposed by cancelled trips by people who decide not to travel rather than pay a charge;
- costs and benefits of upgrading the vehicle fleet;
- costs imposed by user charges and the Distributional Impacts on affordability for people and businesses; and
- positive and negative impacts on the local economy.

2.2.4 The GM CAP should be treated as one package as it is considered essential that all components are delivered. Different aspects of the GM CAP complement and enhance each other and so removing part of the scheme could negatively impact another part. This is reflected in the approach to assessing the proposals, where all aspects have been modelled as a package. Component Measures have not been assessed individually due to the critical inter-dependencies of the various Measures.

2.2.5 This Economic Case has been produced in line with the Joint Air Quality Unit's (JAQU) guidance. This approach differs from standard transport appraisal.

2.2.6 A positive Net Present Value (NPV) is difficult to achieve given the short appraisal period of just ten years, and the fact that it is easier to fully quantify the costs (such as the costs of vehicle upgrade) than the benefits which depend on complex relationships between NO_2 concentrations and health outcomes. With this in mind, the Economic Case has been structured in order to itemise, quantify and where possible, monetise the impacts of the best-performing options in the recognition that none of the best-performing options achieve a positive NPV.

2.2.7 The monetised cost and benefits of the options have been calculated to assess the NPV and cost-effectiveness of each option, based on a ten-year appraisal period. In all instances, costs and benefits are assessed against a baseline scenario in which no action beyond the funded plans is taken. However, this should not be considered a true 'Do Minimum' scenario. There is a legal imperative to act. Failure to act, or to act effectively in order to deliver compliance in the shortest possible time, will leave Greater Manchester's local authorities in breach of the Ministerial direction.

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2.2.8 A Distributional Impact (DI) appraisal of the GM CAP was undertaken to understand how positive and adverse impacts of the proposed GM CAP are distributed across specific social groups compared to the general population. An indicative Equality Impact Assessment (EQIA) has also been completed (see Appendix EX), however it is noted that further and fuller assessment of economic and equalities impacts will be required at FBC stage. There remains much we do not know about the possible impacts of the proposals, particularly on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. A programme of research, analysis, public and stakeholder engagement and a thorough integrated impact assessment has commenced and will be continued throughout 2019.

2.2.9 The economic and DI appraisals have been prepared in accordance with the JAQU Options Appraisal Guidance[1] (2017). However, the presentation and interpretation of results have been adapted to reflect local circumstances. A table showing where all the required components sit in the document is provided at the back of the Economic Case.

2.2.10 The remainder of this chapter is structured as follows:

- Section 2.3 sets out the purpose of the Economic Case;
- Section 2.4 describes the options being appraised as part of the Economic Case;
- Section 2.5 describes the behaviour change generated by the proposed GM CAP;
- Section 2.6 presents the economic impacts of the proposed GM CAP, including the Distributional Impacts analysis of the options;
- Section 2.7 provides summary tables of costs and benefits;
- Section 2.8 sets out the methodology applied in the quantification of economic impacts;
- Section 2.9 discusses the limitations of the analysis;
- Section 2.10 provides a summary of key conclusions and of the performance against the critical success factors.

2.3 Purpose of the Economic Case

2.3.1 The Economic Case serves two primary purposes. It supports the decision making for the preferred option from the three best performing options and identifies whether the preferred option offers Value for Money.

[1] Unpublished Guidance by JAQU to cities under Ministerial direction

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2.3.2 In addition, it provides the evidence to inform the assessment in the Strategic Case of best-performing options against the relevant Critical Success Factors as part of the overall process of identifying the best-performing option (see Section 1.7 of the Strategic Case).

2.3.3 The role of the economic appraisal is therefore to describe the proposed GM CAP in terms of the total air quality benefit, wider social and economic impacts and the extent to which it offers good Value for Money within the parameters considered, and to compare this with the rejected best-performing options.

2.3.4 At this stage, a further purpose of the Economic Case is to identify questions and issues to be investigated as part of the FBC and through continued engagement with stakeholders.

2.4 Options for appraisal in the Economic Case

2.4.1 As set out in the Strategic Case (see Section 1.6.21 and 1.6.24) the three best-performing options that were taken forward for full appraisal can be summarised as follows:

- **Option 5(i):** a Clean Air Zone (CAZ) Category D[2] within the Inner Relief Route (IRR) to be delivered in Phase 1 alongside a CAZ Category B across Greater Manchester. In Phase 2, the CAZ across Greater Manchester extends to a Category C. The CAZ proposals are included alongside required Measures to communicate the message, promote cleaner vehicles and help people, businesses and bus operators upgrade.
- **Option 5(ii):** An enhanced CAZ Category D+ within the IRR such that all diesel cars and private hire vehicles would be subject to a penalty as well as non-compliant petrol vehicles and larger diesel vehicles older than Euro VI reflecting that even compliant diesel cars have higher emissions affecting air quality than their petrol equivalents. To be delivered in Phase 1 alongside a CAZ Category B across Greater Manchester. In Phase 2, the CAZ across Greater Manchester extends to a Category C. The CAZ proposals are included alongside required Measures to communicate the message, promote cleaner vehicles and help people, businesses and bus operators upgrade.
- **Option 8:** A CAZ Category B across Greater Manchester implemented as Phase 1. In Phase 2, the CAZ across Greater Manchester extends to a Category C. The CAZ proposals are included alongside required Measures to communicate the message, promote cleaner vehicles and help businesses and bus operators upgrade.

[2] See 'What is a Clean Air Zone?' in Strategic Case for details of categories

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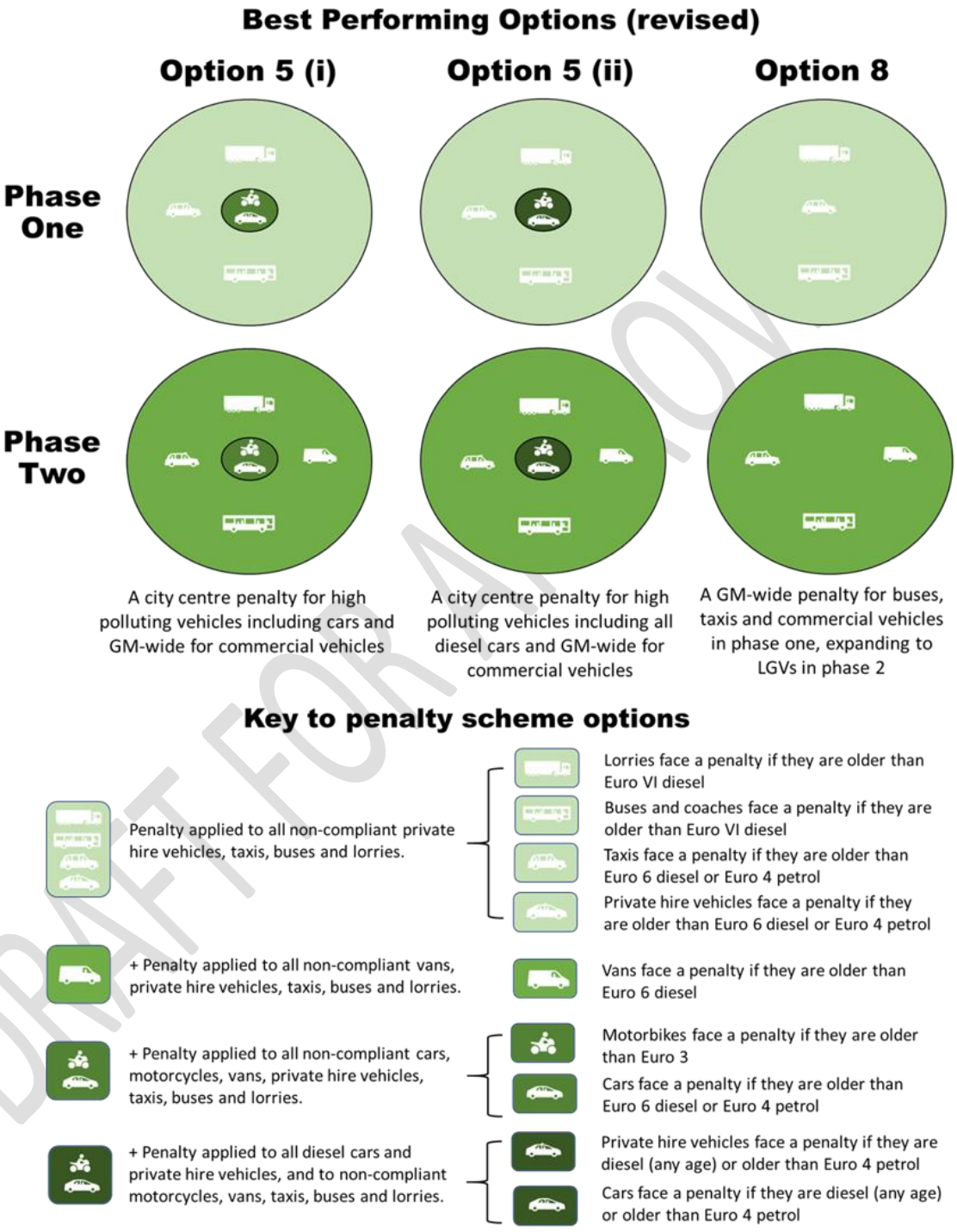
2.4.2 These are illustrated in Figure 2- 1 below.

Figure 2- 1: Best performing options included in full economic appraisal process



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2.4.3 The Measures contained in each of the best-performing options are shown in Table 2- 1 below.

Table 2- 1: Best-performing options: Measures included in each option

	Measure	Option 5(i)	Option 5(ii)	Option 8
Communicating the message	Communications	✓	✓	✓
	Sustainable Journeys programme	✓	✓	✓
Promoting cleaner vehicles	Provision of 300 dual-headed Electric Vehicle (EV) charging points GM wide	✓	✓	✓
	Promotion of EV	✓	✓	✓
Helping business and bus operators upgrade	Clean Air Funds Upgrade Car	✓	✓	
	Clean Air Funds Upgrade Freight / Commercial vehicles	✓	✓	✓
	Clean Air Funds Upgrade Taxis and Private Hire Vehicles (PHV)	✓	✓	✓
	Clean Air Funds Upgrade Buses	✓	✓	✓
	Loan Finance	✓	✓	✓
Clean Air Zones	City Centre CAZ D	✓		
	City Centre CAZ D+		✓	
	CAZ B/C across GM	✓	✓	✓
	Discounts and exemptions for CAZ	✓	✓	✓

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2.4.4 Modelling suggests that the earliest that compliance can be achieved is 2024, approximately three years earlier than would be expected without further action. All Options are predicted to deliver compliance in 2024 and will reduce human exposure to pollutants damaging to health over the lifetime of the Plan. It is also considered to be the most feasible and therefore the most likely to deliver these benefits at the lowest risk; and to incur the least economic cost. By not including any restrictions on cars in the CAZ and providing support to small businesses, sole traders and not-for-profit organisations, including taxi and private hire drivers, the risk of socioeconomic damage is significantly lower in Option 8 than the alternatives.

2.5 Behaviour change generated by the proposed GM CAP

2.5.1 This section describes how drivers are predicted to respond to the proposals in the GM CAP and what behaviour change is generated. To establish the impact of the proposed GM CAP on traffic, the fleet and therefore emissions, estimates were produced of the possible behavioural response of transport users. The methodology for deriving these estimates is set out in the associated Technical Supporting Document, T4.

2.5.2 The nature of the proposals means that some but not all vehicles will face a daily charge for travelling in parts of Greater Manchester. The modelling has assessed what proportion of vehicles are likely to be non-compliant, and therefore 'in scope' for a charge, and how they might respond. This analysis has taken account of the impact of other proposed Measures including the retrofit/upgrade of buses and taxis, increased uptake of electric vehicles arising from investment in charging points, and financial support for the upgrade of vans. Only limited account has been taken at this stage for the proposed financial support for upgrade of other vehicles. The possible impact of discounts and exemptions has not been modelled at this stage. This means that the number of vehicles 'in-scope' is likely to be an over-estimate as some would benefit from discounts or exemptions.

2.5.3 For those vehicles that are 'in scope' for a daily charge, there are a number of possible responses, described below and shown in Figure 2- 2

- Continue to travel into, within or through the CAZ and pay the charge ('stay and pay').
- Change their behaviour to avoid travelling into, within or through the CAZ for example by travelling by a different mode or cancelling their trip. Some 'cancelled' trips would in fact move to a different destination, but the available model does not allow us to consider that option in this analysis.

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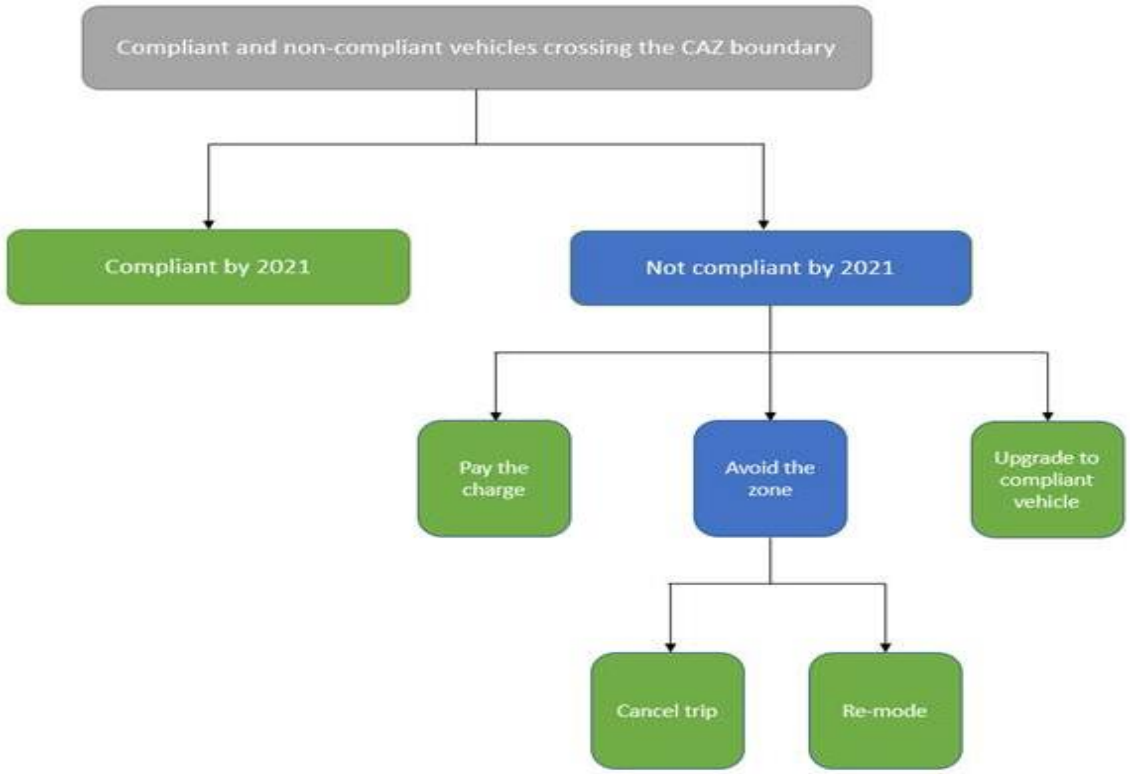
- Upgrade to a compliant vehicle – this is assumed to be a newly purchased vehicle but note that another possible response is to swap to a compliant vehicle already owned (e.g. another vehicle in the household or in a commercial fleet). Again, the modelling tools and data available do not allow us to quantify this option.

Figure 2- 2: Flowchart of decision making for compliant and non-compliant vehicle drivers



2.5.4 The choice to upgrade is dependent both on the charge level – with higher charges leading to more change – and on the frequency of travel. Those who need to travel frequently in a charged zone are more likely to choose to upgrade their vehicle as it is more cost effective for them; conversely, those who travel infrequently are more likely to 'stay and pay' as the cost of upgrade would outweigh the cost of the charge. Note that the choices made are more complex than can be allowed for in the modelling – for example, the presence of a CAZ may mean that people make different choices when replacing their vehicle than they would have done otherwise, even where they are not substantially affected by the scheme, simply due to increased awareness of emissions factors and to give themselves the freedom to travel without incurring charges.

2.5.5 There is considerable uncertainty about the behavioural responses assumed for the purposes of this analysis, which is due largely to limited research and datasets. They are based upon surveys carried out in Bristol, re-weighted to reflect local characteristics. More data collection and analysis is required at FBC stage to improve the certainty of these forecasts. A more detailed discussion of the methodology and uncertainty is provided in Appendix E1. The assumed behavioural responses under-pinning the analysis presented in the remainder of this section are shown in Table 2- 2 and a more detailed description of the basis for these assumptions is included in the associated Technical Report, T4. Not that for private hire vehicles, a revised set of assumptions was introduced removing the 'change mode' and 'cancel trip' options. This was because the responses did not appear plausible. The behavioural change summary presented below is based upon the revised assumptions, but the economic appraisal draws on the original analysis. It is not considered likely that this makes a material difference to the conclusions, but the behavioural responses on private hire vehicles will be further investigated at FBC and revisions made to the assumptions as necessary.

Table 2- 2: Behavioural response per trip to the GM CAP by vehicle type (%)

Behavioral Response	Cars	Taxis	Private Hire Vehicles (PHVs)	Light Goods Vehicles (LGVs)	Heavy Goods Vehicles (HGVs)	Buses/ Coaches
Pay Charge	6.7%	0%	24.2%	9.6%	9.4%	0%
Change Mode	12.8%	0%	18.9%	7.5%	0.0%	0%
Cancel Trip	15.1%	0%	18.7%	7.5%	4.2%	0%
Upgrade Vehicle	65.4%	100%	38.2%	75.4%	86.5%	100%

2.5.6 The series of Measures proposed in the GM CAP interact with one another, acting as a package to deliver compliance in the shortest possible time. The impacts of the Measures and how they interact is shown in Figure 2- 3.

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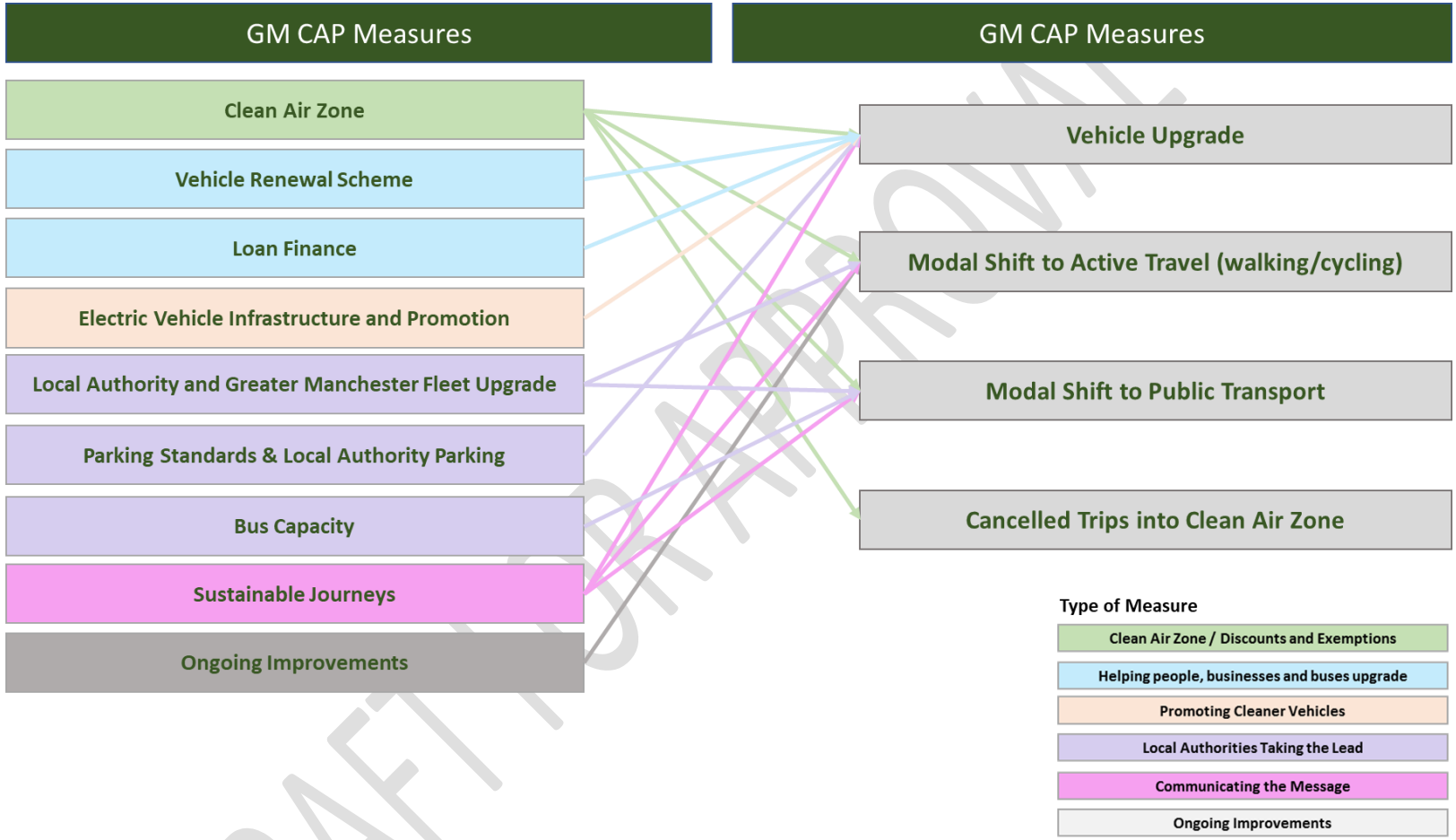
Figure 2- 3: Measures and Dependencies



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How clean the Greater Manchester vehicle fleet will be without action: private vehicles

2.5.7 By 2021, forecasting suggests that around three quarters of the private vehicle fleet seen on the Greater Manchester road network will be compliant, including around 80% of cars, 70% of HGVs and private hire vehicles, and 60% of LGVs. Over time, vehicles will be replaced and the oldest vehicles will be disposed of, so that the fleet will gradually become newer and more compliant. Therefore, without further action, by 2025, around nine in ten vehicles will be compliant with the CAZ standards, including more than 90% of cars, HGVs and private hire vehicles, and around 80% of LGVs. Figure 2- 4 shows changing compliance over time by vehicle type, based on transport model outputs, in a Do Minimum scenario.

2.5.8 As with any forecast, these estimates are based on a number of assumptions which have limitations. For example, there is some evidence that people are moving away from diesel cars, perhaps as a result of media coverage and changing tax rules. If diesel cars become less popular, the fleet may become cleaner and more compliant than expected. Conversely, however, sales of new vehicles have slowed, perhaps reflecting uncertain economic conditions. This could lead to slower fleet renewal than forecast, and thus an older, dirtier and less compliant fleet.

2.5.9 Furthermore, the forecasts do not take into account the impact of other clean air schemes nationwide. On an average day, the analysis suggests that around 20% of the non-compliant HGVs operating in Greater Manchester are from outside Greater Manchester. It has been assumed for analytical purposes that vehicles travelling longer distances (over 50 miles) will not change their behaviour as a result of the scheme and will always ‘stay and pay’. This effect is due to the smaller impact on the overall generalised cost of the charge to a longer journey[3]. The complex national picture, where other cities are considering implementing Clean Air Zones to similar timescales, may mean that we have under-estimated the compliance level in the national fleet and over-estimated the number of non-compliant vehicles travelling from elsewhere into Greater Manchester and paying the charge. This would lead to better-than-forecast emissions and lower-than-forecast revenues for any scheme.

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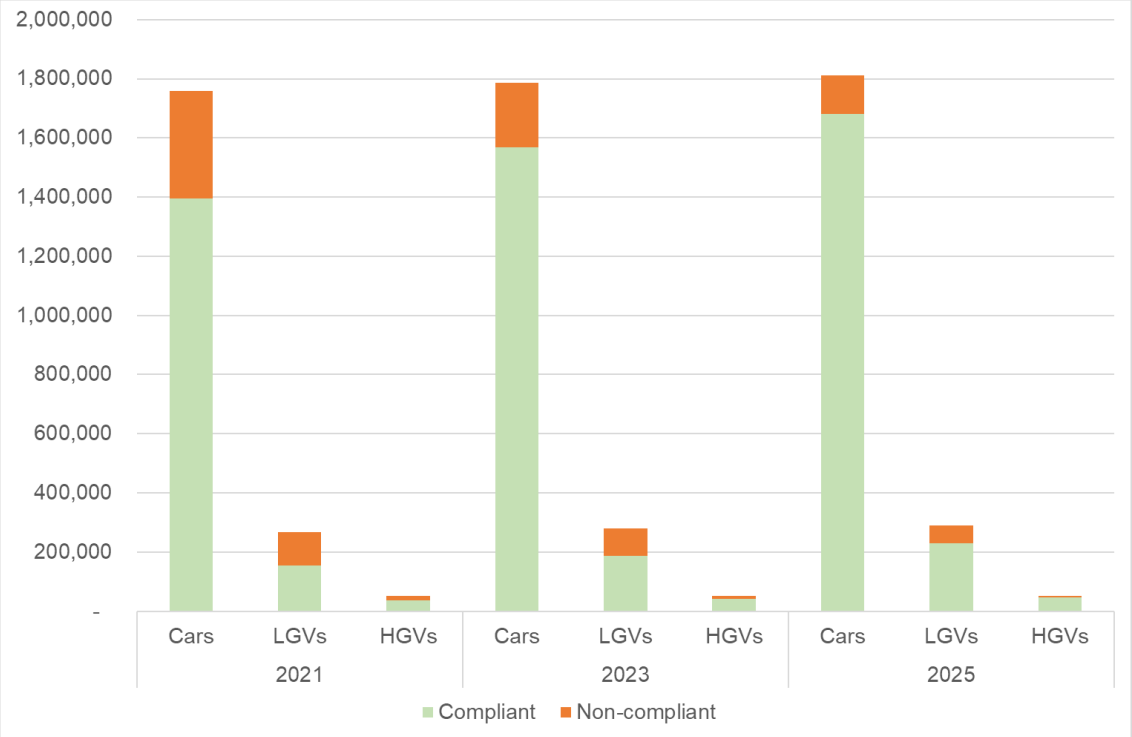
[3] See methodology report to Appendix T4 for further details

Figure 2- 4: Private vehicles in Greater Manchester by type and whether predicted to be compliant without implementation of GM CAP, by year



Impact of the GM-wide CAZ B in 2021 and CAZ C in 2023 on travel behaviour: private vehicles

2.5.10 Options 5(i), 5(ii) and 8 all propose a CAZ covering the whole of Greater Manchester, set at Category B in 2021 (including buses, taxis, HGVs and coaches) and expanding to Category C in 2023 (including LGVs and minibuses). This proposal would not affect cars. This section describes the impacts on vehicle ownership and trips of the GM-wide CAZ B/C in terms of private vehicles – cars (not subject to a charge), LGVs and HGVs.

2.5.11 Introducing a Category B CAZ across Greater Manchester from 2021 brings considerable benefits in terms of cleaning up the in-scope fleet, as shown in Figure 2- 5. In 2021, around 70% of the HGVs seen on Greater Manchester's roads are compliant without action; with the GM-wide CAZ B, a further quarter become compliant so that more than 95% of the HGVs travelling on Greater Manchester roads are predicted to be compliant with the GM-wide CAZ by 2021. In total, in 2021 just 3% of HGVs choose to stay and pay for their trip, with 1% cancelling their trip, as shown in Figure 2- 5. By 2025, the proportion of trips made by a non-compliant HGV and subject to a charge falls to just 1%. It is likely that most of those choosing to stay and pay are travelling in to the region infrequently from elsewhere, with local operators choosing to upgrade. Small local operators will be able to access support to upgrade through the proposed Clean Freight Fund.

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2.5.12 Light Goods Vehicles are not affected by the CAZ in the first year, but do benefit from early Measures to help them upgrade their vehicles in advance of the introduction of the CAZ C in 2023. This is estimated to result in an increase of around 2% of LGVs upgrading in 2021, bringing an early emissions benefit and helping to ready the fleet. By 2023, when the GM-wide CAZ C is implemented, it is predicted that around two thirds of LGVs will be compliant in the Do Minimum scenario, with the CAZ C and Clean Freight Fund delivering a further upgrade of around 30%, thus the scheme should see around 95% of LGVs becoming compliant. In total, it is estimated that around 4% of LGV trips will be made by a non-compliant vehicle (and be subject to the penalty), with around 2% changing mode and 2% choosing to cancel their trip. Not all trips made by van are made for work purposes, and it is possible that discretionary personal trips by van may be more likely to change mode (to car, public transport, walking or cycling) or cancel.

2.5.13 The GM-wide CAZ B in 2021 and CAZ C in 2023 does not affect cars. In 2021, it is anticipated that just under 80% of cars will be Euro 6 diesel or Euro 4 and newer petrol or low emission fuels, shown in Figure 2- 5. By 2023, this is expected to have increased to nearly 90% and by 2025 to nearly 95% with natural fleet renewal. Proposals to encourage sustainable travel choices and cleaner vehicles will provide additional benefits. It is anticipated that the Measures to promote electric vehicles could deliver an additional 75,000 electric cars and vans, delivering meaningful emissions reductions.

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Figure 2- 5: Compliance benefits of a GM-wide CAZ B in 2021 and CAZ C in 2023, private vehicles travelling on the GM network, 2021, 2023, 2025

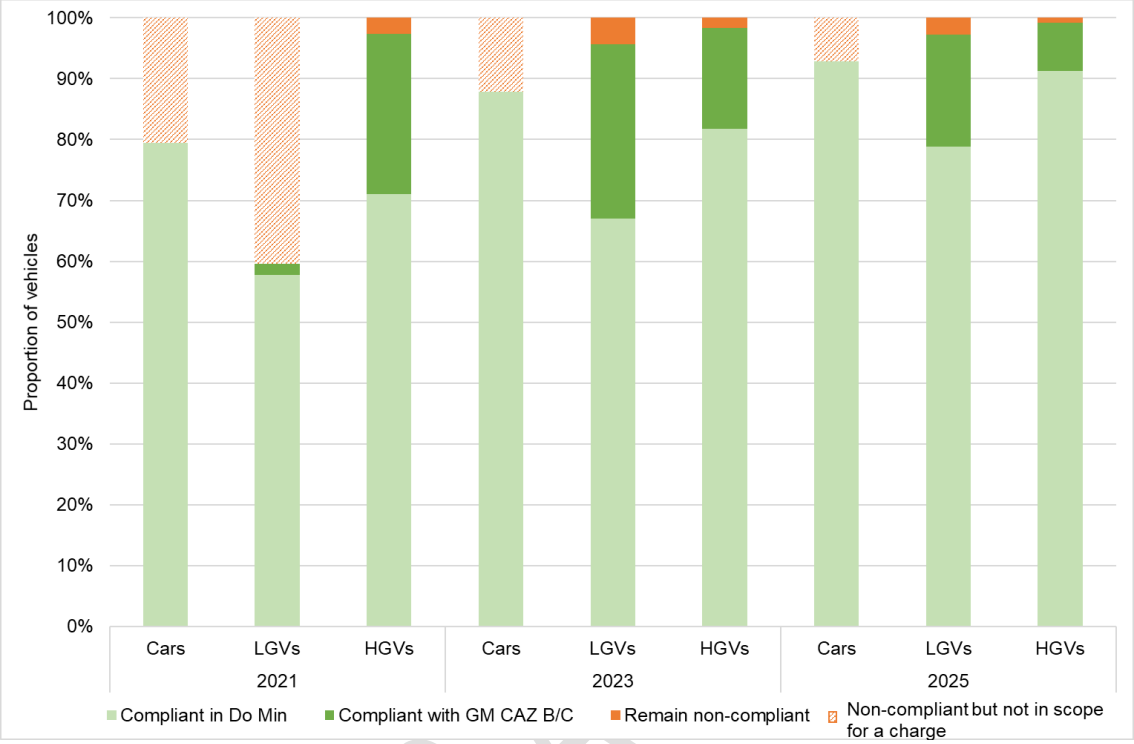
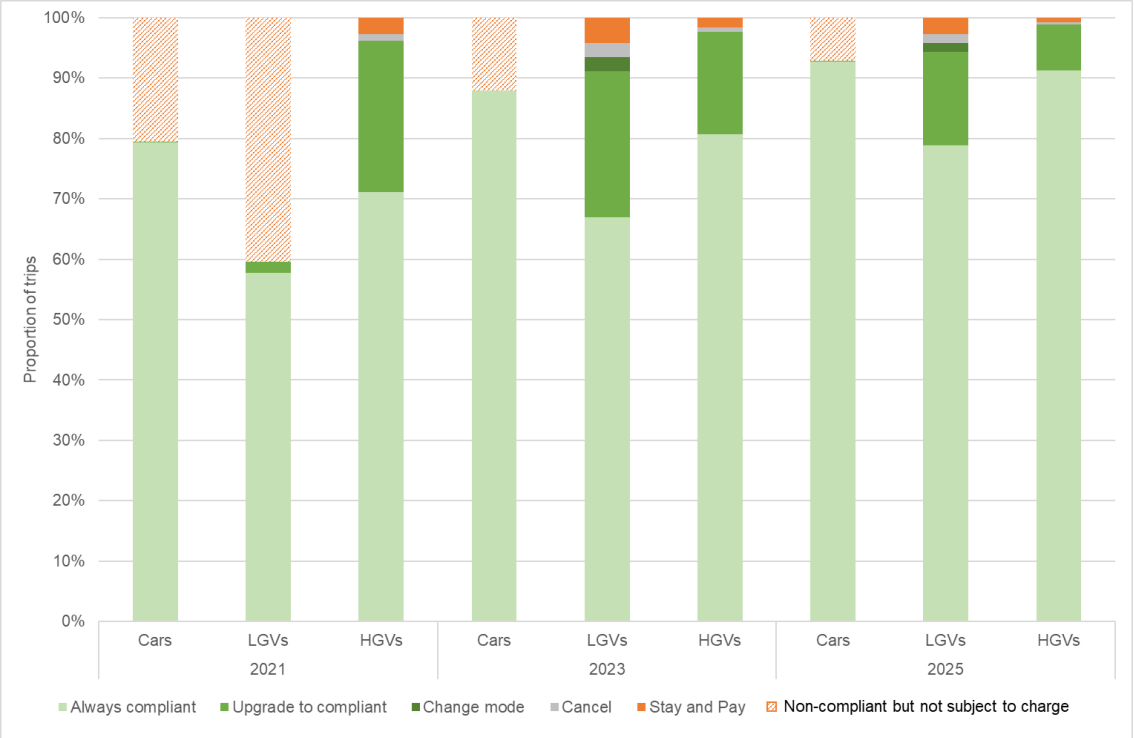


Figure 2- 6: Behaviour change resulting from a GM-wide CAZ B in 2021 and CAZ C in 2023, trips made on the GM network, 2021, 2023, 2025



2.5.14 A source of uncertainty in the assumptions made is the possibility that operators will choose to change to a different vehicle type in order to avoid the penalty. So, for example, in 2021 HGV operators could switch to using vans which are unaffected by the scheme. This could have the unintended consequence of increasing total travel, as one HGV load would need multiple vans to transport it. Similarly, in 2023, some van drivers may find that it is cheaper to switch to a large car than upgrade their van. This could have the unintended consequence of increasing travel by older, dirtier diesel cars, which are not in scope for the scheme. Further work is required at FBC to identify the possible extent of vehicle-type switching that could be expected and to identify any mitigating measures. This would be monitored once the CAZ is in effect.

2.5.15 The GM-wide CAZ B would also affect coaches and minibuses, with non-compliant vehicle users required to pay the charge, upgrade their vehicle or change their behaviour. Currently, coaches are not included in Greater Manchester's traffic model and there is no suitable source of data on the volume of coach traffic on the local road network. There is also little information about who owns minibuses and what they are used for. Stakeholder engagement with the coach industry and minibus operators is underway to improve knowledge and better understand the possible impacts of the proposals. This will be supported by further analysis and data collection to support the FBC.

How clean the GM vehicle fleet will be, without action: buses and taxis

2.5.16 There are currently around 2,200 buses operating in Greater Manchester and across the boundary. Of these, around 2,000 are non-compliant, consisting of around 1,200 at Euro V, 400 at Euro IV and a further 350 at Euro II and III. TfGM has secured funding to retrofit approximately 170 buses, bringing the total number of compliant buses to around 370. TfGM and other Greater Manchester operators have also successfully bid for funds from the Ultra Low Emission Bus Scheme that will allow for the purchase of 70 new electric buses. However, the vast majority of the fleet is expected to remain non-compliant without action as bus replacement happens very slowly, at an estimated rate of around 7% per year.

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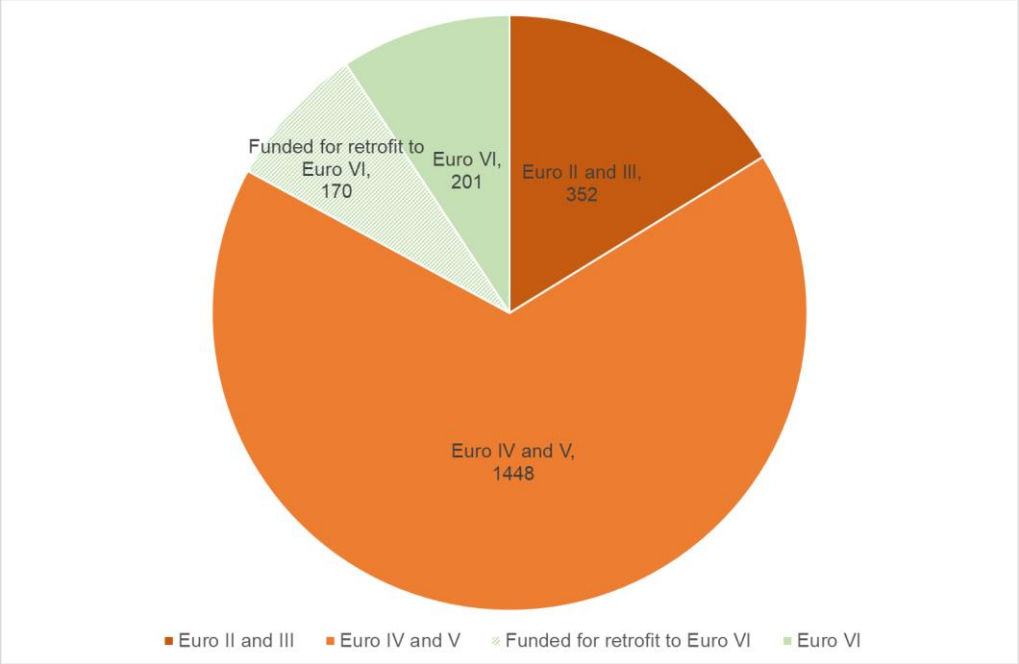
Figure 2- 7: Public buses operating in Greater Manchester by Euro Standard, 2018[4]



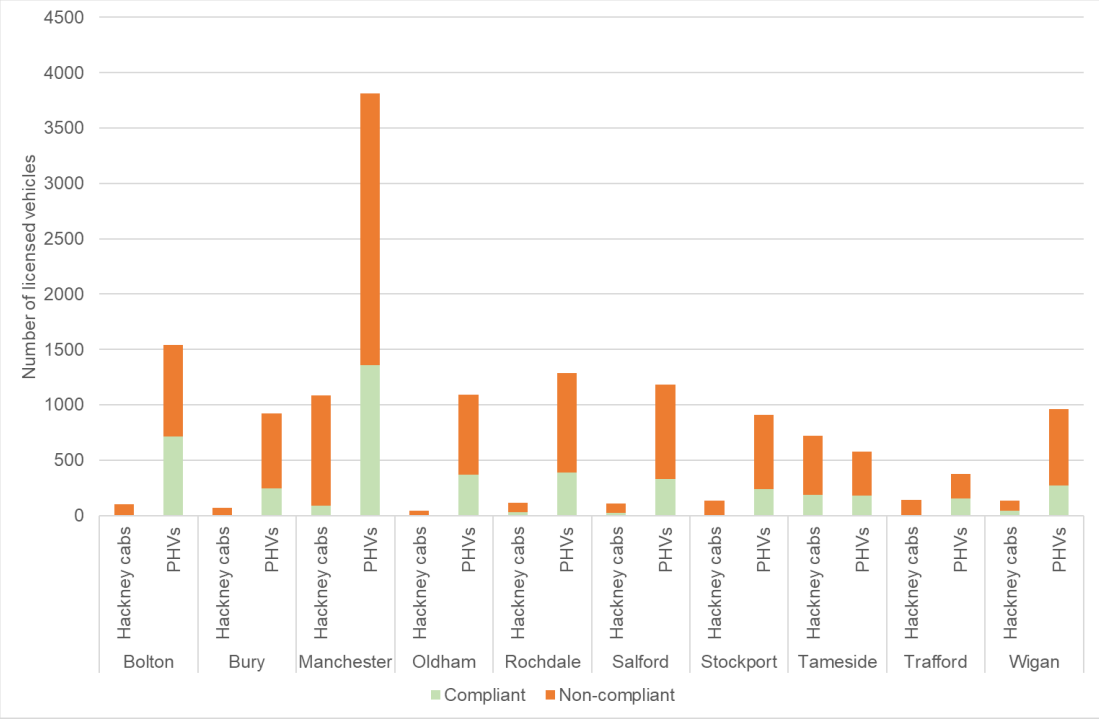
2.5.17 There are around 2,500 hackney carriages licensed in Greater Manchester (in 2018), of which the vast majority (85%) would not be compliant with the proposed GM-wide Clean Air Zone. In several authorities, the average age of a hackney carriage is approaching or over ten years old. Licensing rules vary across the region, with some authorities imposing age limits and some choosing not to do so; vehicle type requirements also vary across the region. By 2021, without the GM CAP, we could expect some natural fleet renewal but it is likely that most hackney carriages will remain non-compliant without action in 2021.

2.5.18 In 2018, there were just under 13,000 private hire vehicles licensed in Greater Manchester. Under current regulations, private hire vehicles are allowed to operate outside their licensed district and there is a growing trend of out-of-region licensing, with drivers choosing to license with authorities where standards may be less onerous and the licensing process is cheaper or easier for them. We do not have any information about the scale of the fleet that operates in Greater Manchester but is licensed elsewhere, or about the vehicles that they drive. It is proposed that any discounts and exemptions or financial support will only be offered to drivers and vehicles licensed with one of the ten authorities in the region.

[4] Data obtained via TfGM

2.5.19 Of the current private hire fleet licensed in Greater Manchester, around 8,500 vehicles were non-compliant in 2018, two thirds of the current licensed fleet. By 2021, it is estimated that just under three quarters of private hire vehicles seen on Greater Manchester's roads will be compliant, due to natural fleet renewal.

Figure 2- 8: Licensed hackney carriages and private hire vehicles in Greater Manchester, by compliance, 2018



Impact of the GM-wide CAZ B in 2021 and CAZ C in 2023 on travel behaviour: buses and taxis

2.5.20 The proposed GM CAP includes funds to retrofit or replace the Euro IV and V bus fleet and it is assumed that operators will upgrade the remaining older vehicles. As such, an assumption has been made for the purposes of modelling the scheme that all buses (100%) will be compliant by 2021 when the Greater Manchester-wide CAZ B goes live. Further work is required at FBC to better understand the feasibility of upgrading the bus fleet over this timescale. Efforts will be made to prioritise the programme such that vehicles operating in places with the highest concentrations are upgraded first where possible; although this is subject to co-operation from commercial bus operators and will not always be possible.

2.5.21 Similarly, the GM CAP includes funds to support hackney carriage drivers and operators to upgrade their vehicles, either through replacement or retrofit if possible. In the absence of better information, an assumption has been made that this support will be sufficient to ensure that all hackney carriages are compliant by 2021, when the CAZ B goes live. Further work is required at FBC to establish how realistic this assumption is, including stakeholder engagement with the taxi industry to understand what support would be required to help drivers and operators upgrade their vehicles. Upgrading a London-style hackney carriage is much more costly than upgrading a normal saloon car or people carrier so the cost implications will vary for drivers and operators across the region depending on the local licensing conditions.

2.5.22 For private hire vehicles, just under three quarters are expected to be compliant without action, and the GM-wide CAZ B adds a further 20%, so that just over 90% of private hire vehicles travelling on Greater Manchester's roads are predicted to be compliant by 2021 with the GM CAP (either Euro 6 diesel, Euro 4 or newer petrol, or low emission vehicles). The impact of the GM CAP on private hire vehicles in shown in Figure 2- 9.

2.5.23 The proportion choosing to stay and pay the charge for their trip is estimated at 8% in 2021, falling to just 1% by 2023. An assumption has been made that trips will not be cancelled, as the passenger demand remains, but this may conceal churn within the market as some drivers/operators may find that it is not effective to continue, whilst new drivers/operators enter the market.

2.5.24 The analysis is based on the assumption that support will be provided to private hire drivers and operators to help them upgrade their vehicles. Further analysis and stakeholder engagement with the private hire industry and its customers will be undertaken to better understand what support would be required to help more drivers upgrade their vehicles, and reduce the number choosing to 'stay and pay' in the first year. A goal of the proposed GM CAP is to clean up the fleet rather than force people and businesses to incur charges and therefore more refinement is required to ensure this proposal delivers its goal.

2.5.25 Note that following the initial modelling carried out in autumn 2018, a change was made to the assumed behavioural responses of private hire vehicles within the model, to remove the option of changing mode or cancelling a trip, which was producing implausible results. The analysis presented above refers to modelling conducted using this new assumption. The assessment of costs and benefits is based upon the earlier modelling; tests have been carried out and this is not considered to have a significant impact on the results or conclusions. More work is required at FBC to test the validity of the assumptions made and better understand the private hire market and operations.

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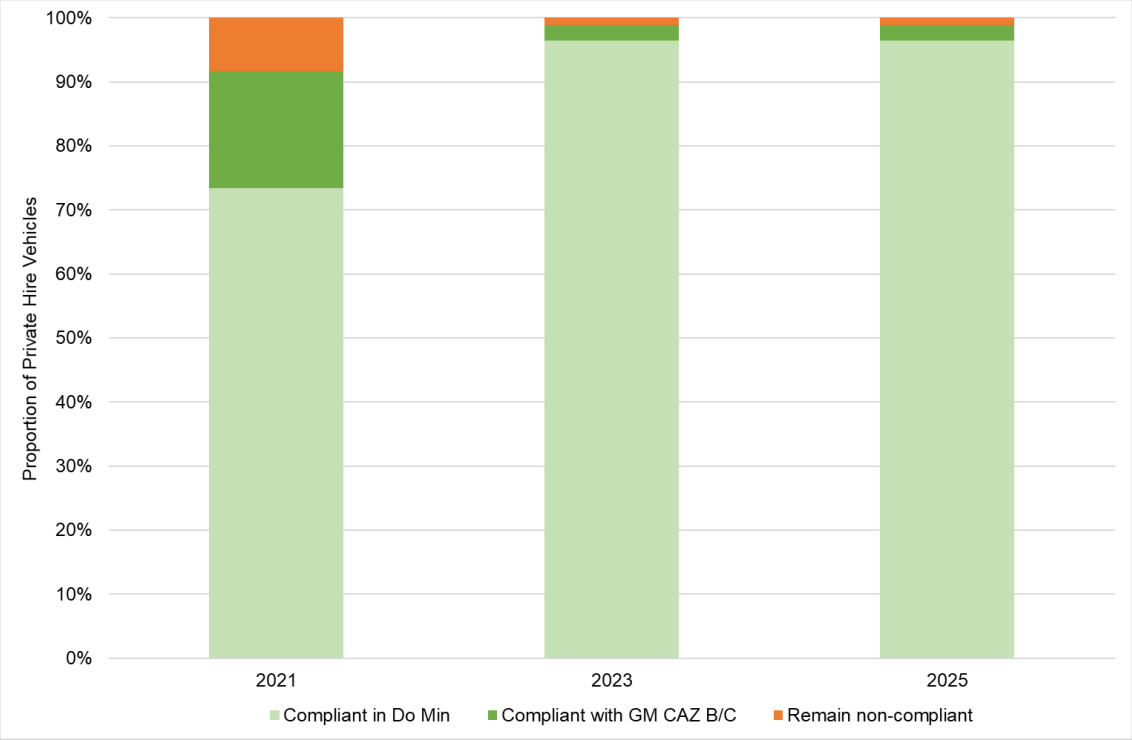
2.5.26 As stated earlier, a considerable source of uncertainty is that Private Hire Drivers can license themselves and their vehicles at a local authority outside of Greater Manchester, but operate wholly or mainly within Greater Manchester. Very little is known about how many people choose to do this at present and Greater Manchester understands that JAQU is currently producing a database of all licensed vehicles to support the implementation of CAZ schemes. Analysis of this database alongside local data will help illuminate this issue at FBC. It has been assumed that all support packages will only be available to drivers and operators licensed with a Greater Manchester local authority.

Figure 2- 9: Compliance benefits of a GM-wide CAZ B in 2021 and CAZ C in 2023, Private Hire Vehicles travelling on the GM network, 2021, 2023, 2025



Impact of a city centre CAZ D on travel behaviour: private vehicles

2.5.27 Options 5(i) and 5(ii) propose a CAZ within the IRR. In Option 5(i) this is a CAZ D to be implemented from 2021. In Option 5(ii), this is a CAZ D with all diesel cars and private hire vehicles considered non-compliant.

2.5.28 Note that the preferred Option for the GM CAP, Option 8, does not include any CAZ proposals that affect private cars.

2.5.29 The remainder of this section describes the impacts on vehicle ownership and trips of a CAZ D within the IRR in terms of private vehicles – cars, LGVs and HGVs. This is included for the purposes of comparison in the appraisal, in order to compare the impacts of Options 5(i) and 5(ii) and Option 8 on travel behaviour.

2.5.30 A CAZ D within the IRR would not bring any additional benefits in terms of the HGV fleet as all non-compliant HGVs are already in-scope for the region-wide scheme.

2.5.31 In 2021, LGVs are not in-scope for the region-wide scheme but would be in-scope for an IRR CAZ D in Options 5(i) and 5(ii).

2.5.32 Four percent of LGV trips in Greater Manchester have an origin and/or destination within the IRR and are in-scope for the CAZ D in 2021 under Options 5(i) and 5(ii). On an average day, it is estimated that around 29,000 van trips will be made in the IRR zone in 2021, 95% from within Greater Manchester. Of these, around four in ten (12,000) will be made by non-compliant vans without the GM CAP.

2.5.33 It is estimated that with a CAZ D, around 30% of van trips would upgrade, 3% would change mode, 3% would cancel their trips and around 5% would 'stay and pay' in 2021, with 60% already compliant and unaffected. This means that around 1,500 van trips into the IRR would incur a charge on an average day.

2.5.34 By 2023, all LGVs will be in scope for the GM-wide scheme.

2.5.35 Cars are not in scope for the region-wide scheme but would be affected by the CAZ D proposals in Options 5(i) and 5(ii). In total, there are around 1.1 million cars registered in Greater Manchester, based on DVLA data. Of these, it is estimated that around 200,000 (18%) will be non-compliant by 2021.

2.5.36 Around 4% of the c.4.5 million car trips in Greater Manchester on an average day have an origin and/or destination within the IRR and would be in-scope for a CAZ D in 2021 Options 5(i) and 5(ii). Around eight in ten will be compliant and able to travel unaffected.

2.5.37 It is estimated that with a CAZ D, around 12% of car trips would upgrade, 2% would change mode, 3% would cancel their trips and around 3% would 'stay and pay' in 2021, with 80% already compliant and unaffected. This means that around 5,000 car trips into the IRR would incur a charge on an average day.

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The analysis does not take account of the possible impact of any discounts and exemptions, for example for residents of the zone. It also only takes a limited account of the benefits of any vehicle renewal scheme for cars, which would be part of any package of measures that also included a CAZ D. The goal of a CAZ D would be to help drivers travel more sustainably, either by upgrading to a compliant vehicle or by switching to public transport, cycling or walking. It is to be expected that a proportion of drivers would choose to 'stay and pay', either because they travel to the area infrequently or because they prefer to pay than change their behaviour. If the decision was made to progress with a CAZ D, further work would be required to better understand the extent to which drivers may be forced to pay because they cannot afford to upgrade their vehicle, and to identify what mitigations would be required to limit the extent and impact of this. At present, a GM CAZ D is not included in the preferred Option for the GM CAP.

2.6 Economic Impacts of the Proposed GM CAP

2.6.1 This section describes the costs, benefits and Distributional Impacts of the proposed GM CAP as they are currently understood, compared to the other options considered that could deliver compliance in the shortest possible time. This analysis will be further refined and strengthened throughout 2019. Where unacceptable negative impacts have been identified, mitigations will be sought through scheme refinements, discounts and exemptions, or supporting measures. In particular, note that the mitigating impacts of the proposed vehicle renewal schemes (Clean Air Funds) and of the range of discounts and exemptions likely to be applied, have not been quantified here so this is a worst-case scenario.

Health and Environmental Benefits of air quality improvements

2.6.2 As shown in Section 1.7 of the Strategic Case, Option 8 is the proposed GM CAP and is forecast to deliver compliance in the shortest possible time. Section 1.7 in the Strategic Case sets out the benefits to air quality brought by the proposed GM CAP and demonstrates that it delivers a route to compliance which substantially reduces human exposure. The reductions in NO_2 and Particulate Matter (PM) emissions bring real and significant benefits to health. These are set out below. As well as health, the GM CAP will lead to environmental benefits such as a reduction in building soiling[5] and ecosystem damage.

[5] The soiling of buildings includes both residential dwellings and historic/cultural buildings and causes economic damages through cleaning costs and amenity costs.

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2.6.3 The quantified reduction in NO_2 and PM (tonnes) was monetised using JAQU's damage cost (converted from 2015 prices to 2018 prices) for NO_2 and PM and discounted using the 3.5% factor as recommended by the Government's Green Book. The monetised benefits of the GM CAP were extrapolated across the appraisal period, based on the proportion of non-compliant vehicles within the given year, relative to the opening year. The health and environmental benefits reduce year by year until 2030 to reflect the increasing rate of compliance. The damage costs capture the following monetised impacts:

- **Human health**: mortality, respiratory hospital admissions, cardiovascular hospital admissions, productivity losses
- **Environmental**: building soiling, ecosystem damage

2.6.4 Table 2- 3 presents the quantified and monetised benefits of the reduction in air pollution. The proposed GM CAP (Option 8) delivers monetised air quality benefits of £101m over the full appraisal period of 2021 – 2030.

Table 2- 3: Quantified and monetised air quality (AQ) benefits, £m, present value 2018 prices

	NO2 Tonnes Saved (2021)	NO2 Savings over Baseline (2021)	PM Tonnes Saved (2021)	PM Savings over Baseline (2021)	Monetised AQ Benefit (2021-2030)
Option 5(i)	1,491	20.1%	72	5.8%	£105m
Option 5(ii)	1,498	20.2%	72	5.8%	£106m
Option 8	1,419	18.6%	51	4.0%	£101m

2.6.5 Further analysis of the air quality impacts can be found in the Health and Environment Report which forms part of the Distributional Impacts full report (Appendix E3). In addition, the Distributional Impact analysis summarised in the next section provides an analysis of the key impacts including how air quality benefits are distributed across different social groups in Greater Manchester.

Air quality Distributional Impacts

2.6.6 The consideration of whether impacts are disproportionate is important to understand if one group is being unfairly disadvantaged or benefited by the option/package. In such cases it is necessary to understand how these impacts are occurring and whether it is acceptable or whether the option should be amended or mitigated. The following scale, as recommended by DfTs Transport Analysis Guidance (TAG) Unit A4-2 'Distributional Impact Appraisal' (DfT, 2015), is used in the reporting of the Distributional Impacts.

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2.6.7 As explained in the Distributional Impacts report, the WebTAG Distributional Impacts methodology refers only to 'winners' and 'losers', corresponding to improvements in, or worsening of air quality. Due to the nature of the Options proposed, all Options result in 'winners' exclusively across the study area (i.e. no Lower Layer Super Output Areas in Greater Manchester experiencing worsening air quality). The Distributional Impacts report provides a qualitative interpretation of these results, focussing on the areas with the 10% greatest improvements in air quality and the relation to key amenities of importance to the various social groups.

Table 2- 4: Distributional Impact Assessment Criteria

Assessment		Impact description
✓✓✓	Large beneficial	Beneficial and the population impacted is significantly greater than the proportion of the group in the total population
✓✓	Moderate beneficial	Beneficial and the population impacted is broadly in line6 with the proportion of the group in the total population
✓	Slight beneficial	Beneficial and the population impacted is smaller than the proportion of the group in the total population
-	Neutral	There are no significant benefits or disbenefits experienced by the group for the specified impact
×	Slight adverse	Adverse and the population impacted is smaller than the proportion of the population of the group in the total population
××	Moderate adverse	Adverse and the population impacted is broadly in line with the proportion of the population of the group in the total population
×××	Large adverse	Adverse and the population impacted is significantly greater than the proportion of the group in the total population

[6] For the purposes of this assessment, 'broadly in line' refers to +/- 5% threshold between the percentage of net winners/losers and the share of the resident population in each group.

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2.6.8 The analysis shows that, using the WebTAG methodology, moderate beneficial air quality impacts are distributed evenly across all income groups for both Option 5(i)/(ii) and Option 8. For children and the elderly, however, air quality benefits are not evenly distributed. For these two groups, air quality impacts favour residents in quintiles four and five (those with the lowest proportion of children/elderly people), where the impact is large beneficial. Those in quintile one (with the highest proportion of children/elderly), who may be considered the most vulnerable, experience slight beneficial air quality impacts.

2.6.9 A simplified methodology has been applied in the OBC process and a fuller analysis will be required at FBC. When these results are available, more work will be required to consider whether any additional Measures could be effective in enhancing the benefits in areas with high populations of children and older people.

Health and environmental benefits

2.6.10 This section presents the findings of the preliminary analysis of health and environmental DI for the proposed GM CAP. The analysis is based on outputs of Transport for Greater Manchester's EMIGMA (Emissions Inventory for Greater Manchester) software, which provides the change in emissions in tonnes for NO_2 and PM_{10} for a Do Minimum scenario (2021) compared to each of the best performing Options under analysis (Option 5(i), Option 5(ii), and Option 8).

2.6.11 A summary of this assessment for the Greater Manchester area is presented as follows:

- for Option 8, the monetised health and environmental benefits in Greater Manchester are estimated at £15.0 million in 2021 and £12.8 million in 2025;
- for Option 5(ii), the monetised health and environmental benefits in Greater Manchester are estimated at £17.9 million in 2021 and £12.7m in 2025; and
- for Option 5(i), the monetised health and environmental benefits in Greater Manchester are estimated at £17.8 million in 2021 and £12.7m in 2025.

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Health and social care savings

2.6.12 NO_2 and PM are known to cause harmful effects on human health, resulting in illnesses such as asthma, chronic heart disease and cardiovascular disease. In the context of health impact assessment, impacts are broadly divided into morbidity (living with a disease) and mortality (dying from a disease). Treating morbidities has knock-on effects for the National Health Service (NHS) and social care system through increased spending on inpatient visits, medication, General Practitioner (GP) costs etc. For instance, a chronic condition such as asthma requires multiple GP visits and/or hospital admissions.

2.6.13 It is not currently possible to quantify the scale of cost savings to health and social care services that would be delivered by the GM CAP, but it is reasonable to assume that these would be substantial.

Wider benefits of improved health: productivity and quality of life

2.6.14 Chronic ill health damages quality of life. The full effects of this on people's wellbeing cannot be meaningfully quantified but are clearly substantial and wide ranging. One example is that chronic ill health can lead to absences from work and education. The damage costs presented above to some extent capture productivity losses, thought to include workplace absence due to short-term episodic health events associated with cardiovascular and respiratory hospital admissions. However, the effect on children missing school days is not captured. There is evidence that school absences impact on pupils' attainment levels which result in long-term effects in terms of future earning potential.

Benefits of reduced greenhouse gas emissions

2.6.15 As well as air pollutants NO_2 and PM, the proposed GM CAP would also see a reduction in greenhouse gas (GHG) emissions primarily due to vehicles being upgraded to cleaner, more fuel-efficient models, and because some trips are cancelled or change mode to public transport or active travel in response to the schemes. There were concerns that measures to tackle Nitrogen Oxides (NO_x) emissions could cause GHG emissions to rise, by encouraging a shift from diesel to less efficient petrol engines. However, that concern has not materialised and all the preferred options in fact bring benefits in terms of reduced GHG emissions.

2.6.16 Table 2- 5 presents the total estimated reduction in GHG emissions and the total monetised benefits of reduced GHG emissions over the appraisal period. This was assessed based on the change in total vehicle kilometres driven, as well as the change in terms of fleet upgrades. The proposed GM CAP delivers £82m of benefits in terms of reduced GHG emissions.

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Table 2- 5: Quantified and monetised benefits of reduced GHG emissions, £m, present value 2018 prices (2021-2030)

Options	Tonnes CO2e avoided (2021-2030)	GHG emission impact, £m (2021-2030)
Option 5(i)	1,391,000	£81m
Option 5(ii)	1,395,000	£82m
Option 8	1,399,000	£82m

Costs to the Public Sector

2.6.17 GMCA is assuming Central Government, via the JAQU Implementation and Clean Air Funds, will fund all costs relating to scheme implementation and will underwrite any net operational deficit, in so much as there is one, over the life of the scheme. The proposed GM CAP will not result in reduced spending on any other public services in Greater Manchester, nor will it negatively affect existing delivery plans.

2.6.18 The implementation costs comprise all the costs associated with establishing the GM CAP. This includes the costs of setting up each of the CAP measures, whose primary cost drivers are elaborated in the Financial Case.

2.6.19 The operating and maintenance costs of the proposed CAP capture the ongoing cost of running the CAP over the appraisal period. Specifically, there are two Measures in the GM CAP that will incur operational and maintenance (O&M) costs post implementation: the CAZ, and EV infrastructure and promotion.

2.6.20 It is assumed that the CAZ infrastructure will be decommissioned two years after full compliance is forecast to be achieved in the Do Minimum scenario. This allows for an additional year of operations after the Do Minimum compliance date in 2027 and decommissioning in 2029.

2.6.21 The costs of the proposed GM CAP are presented in Table 2- 6. Note that costs have been discounted to present them in 2018 prices and are derived from those in the Financial Case. In total, the proposed GM CAP has an investment cost of £419m to support achieving compliance in the shortest possible time. More information about the costs of implementing, operating and maintaining the scheme can be found in the Financial Case.

2.6.22 Option 5(ii) is assumed for analytical purposes to be the same cost as 5(i). However, the costs of this option have not been developed in as much detail and it is anticipated to have higher costs than scheme 5(i). This is due to the implementation and operation of 5(ii) including the monitoring and processing of a vehicle Euro standard not included in JAQU's defined Clean Air Zone schemes.

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2.6.23 Scheme costs include Optimism Bias (OB), this is calculated separately for individual cost element. The weighted OB for capital costs is 15% and for operating costs is 31%. See the Financial Case for detailed costs breakdowns.

Table 2- 6: Implementation cost of the options, £m, present value 2018 prices, discounted

	Option 5(i)	Option 5(ii)	Option 8
Total Implementation cost	£316m	£316m	£270m
Total O&M cost	£153m	£153m	£148m
Total Cost	**£469m**	**£469m**	**£419m**

Public Sector Revenues

2.6.24 The user charge payments of non-compliant vehicles opting to continue their journey into the CAZ is in effect received by the public sector as a revenue. As the user charges are simply treated as a transfer to the public sector, the cost to transport users and revenue to the public sector offset each other. The proposed GM CAP may generate other sources of public sector revenue, including potentially from parking permits and enforcement and from increased public transport fares. These potential sources of revenue have yet to be quantified.

2.6.25 For more information on the revenue to the public sector generated by the user charges, please refer to the Financial Case.

Travel time savings arising from reduced congestion

2.6.26 The introduction of the proposed GM CAP will deliver small-scale traffic reductions across the road network, resulting in slightly faster journey times. Annual Average Daily Traffic (AADT) is a standard measure of the average

2.6.27 number of vehicle trips on a road per day. This has been calculated for each modelled link and used (along with link length) to calculate the annual average daily vehicle kilometres.

2.6.28 The implementation of the proposed GM CAP is anticipated to reduce the growth in vehicle kilometres by 0.5% over the period 2021 to 2025 (2021 without GM CAP compared to 2025 with GM CAP). This is equivalent to a network-wide reduction of 275,000 vehicle kilometres per day.

2.6.29 The implementation of the proposed GM CAP will have an impact on the road network over a wide geographic area. Ignoring the effects of rerouting, there will be slightly reduced traffic across almost all roads within Greater Manchester, which will lead to widespread (if moderate) congestion relief.

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2.6.30 In reality, traffic will reroute to take up the (newly available) road space, in order to reduce existing journey times. The benefits of this optimisation will be felt by almost all users (unlike in a traditional intervention where effects are typically localised). As such, it is anticipated that the implementation of the proposed GM CAP will have a positive impact on the current level of congestion felt along all key routes into Manchester, along with more modest benefits in other areas.

2.6.31 Whilst traffic and congestion are predicted to fall overall with the proposed GM CAP when compared to the without GM CAP (Do Minimum) scenario, for some users the choice to change their route to avoid the scheme may impose a cost on themselves and others. Changes in these costs have been estimated using Department for Transport's (DfT's) Transport User Benefit Appraisal (TUBA) software v1.9.11.

2.6.32 Table 2- 7 presents the travel time savings and vehicle operating costs for Options 5(i) and (ii), and Option 8. In total, the proposed GM CAP delivers travel time savings estimated at £136m in value, along with Vehicle Operating Cost (VOC) savings of £73m.

2.6.33 Please note, the travel time savings and VOC impact is assumed to be the same for Option 5(i) and Option 5(ii) as the transport model assumes the traffic network changes between the baseline (Do Minimum) and Do Something scenarios are the same. In reality, the Ultra-Low Emission Zone (ULEZ) within the IRR in Option 5(ii) would result in a higher number of trips cancelled or re-moded.

Table 2- 7: Travel time savings and VOC (from TUBA) £m, present value 2018 prices (2021-2030)

	Travel Time Savings	Vehicle Operating Costs	Total £m (2021-2030)
Option 5(i)	£210m	£89m	£300m
Option 5(ii)	£210m	£89m	£300m
Option 8	**£136m**	**£73m**	**£210m**

Distributional impact of accessibility improvements from faster journey times

2.6.34 Accessibility describes changes to the ability and ease of individuals or businesses to get to places of work, social networks and public amenities. This links with severance impacts which include barriers to accessibility and impacts on personal affordability which can also affect an individual's ability to access a key service or amenity.

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2.6.35 As recommended by JAQU, the method of appraisal follows the guidance set out in the DfTs Transport Analysis Guidance (TAG) Unit A4-2 'Distributional Impact Appraisal' (DfT, 2015), applying the concept of 'quintiles' To identify societal groups who could be 'disproportionately' impacted, the population within the study area was divided into quintiles. For example, to assess income deprivation, the population was first divided into five equal parts depending on the level of income: the first quintile contains the top fifth of the population on the scale (i.e. the 20% of the population with high levels of deprivation), the second quintile represents the second fifth (from 20% to 40%) and the fifth quintile represents the 20% of the population with the lowest level of income deprivation. Once the population has been divided into quintiles, it is then possible to see which groups receive the highest share of the benefits.

2.6.36 The key findings of the accessibility Distributional Impacts assessment are presented as follows:

- For low income households, results are comparable for Options 5(i)/(ii) and Option 8, although Option 8 provides slightly better opportunities for enhancement than Option 5(i)/(ii). For Option 5(i)/(ii), moderate benefits are experienced evenly across all quintiles for low income households. For Option 8, moderate benefits are experienced across the majority of the population, with large benefits experienced by the 20-40% most income-deprived households (quintile 2).
- For children (under 16s), results are comparable for Option 5(i)/(ii) and Option 8, although Option 5(i)/(ii) provides slightly better opportunities for enhancement than Option 8. For Option 5(i)/(ii), benefits are experienced by all under 16s, although the spread of benefits is uneven. Large benefits are experienced in quintile 1 and quintile 3, slight benefits in quintile 2, and moderate benefits in quintile 4 and quintile 5. For Option 8, benefits are experienced by all under 16s, with large benefits experienced by areas with the highest concentration of under 16s compared to other areas (quintile 1).
- For the elderly population, results are comparable for Option 5(i)/(ii) and Option 8, although the benefits are more evenly spread for Option 8. For Option 5(i)/(ii), the areas with relatively low levels of elderly residents (quintile 4) receive the greatest share of the benefits. For Option 8, moderate benefits are experienced evenly across all quintiles.
- For disabled people, results are comparable for Option 5(i)/(ii) and Option 8, although Option 5(i)/(ii) provides slightly better opportunities for enhancement than Option 8. For both options, the areas with the most disabled residents receive the greatest share of the benefits.

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- For women, results are comparable for Option 5(i)/(ii) and Option 8. For Option 5(i)/(ii), the areas with the fewest female residents (quintile 5) receive the greatest share of the benefits. For Option 8, moderate benefits are experienced across the majority of the population, with large benefits experienced by quintile 4.
- For Black, Asian and Minority Ethnic people, the results are the same for both options, with moderate benefits experienced evenly across all quintiles.

2.6.37 The appraisal of accessibility Distributional Impacts is supplemented by further analysis of potential severance effects, looking at community facilities along corridors and single roads that are expected to experience an increase in traffic flow. The key findings of the assessment of potential severance impacts are presented as follows:

- For Option 5(i)/(ii), the potential for community severance impacts has been identified along 96 roads/corridors. Along these roads/corridors, a total of 69 education facilities and 52 medical/healthcare facilities were identified.
- For Option 8, the potential for community severance impacts has been identified along 82 roads/corridors. Along these roads/corridors, a total of 63 education facilities and 47 medical/healthcare facilities were identified (Appendix E3).
- Results of Option 5 and Option 8 are broadly comparable, with slightly less potential severance effects anticipated for Option 8 compared to Option 5(i).
- Further monitoring of traffic flows at key education and healthcare locations would be recommended to ensure that any potential community severance effects can be properly managed.

Impact of Mode Shift: Welfare Loss

2.6.38 Greater Manchester aims to reduce car dependency and increase the sustainable travel mode share to 50% of all trips by 2040. Mode shift from the car to public transport and active travel is therefore in line with Greater Manchester's strategic goals and brings wider benefits for society.

2.6.39 Nevertheless, it is recognised that by imposing mode shift on drivers of non-compliant vehicles, those drivers are not able to travel by their preferred mode and there is some welfare loss associated with this. This is based on the assumption that the new action is less favoured than their current choice, otherwise they would have been doing it anyway. It may well be, however, that this loss is overstated. Habit is a strong driver of transport choices and some users may find that their alternative mode is in reality equally satisfactory or even better than the car.

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2.6.40 Table 2- 8 presents the monetised impacts of welfare losses for those switching their mode of travel, presented in present value 2018 prices. Further details of the methodology are in the EAMR (Appendix (E1). The proposed GM CAP causes an assumed consumer welfare cost impact estimated at £17m as a result of the mode shift generated.

2.6.41 Note that Option 8 does not affect cars. Therefore, the welfare costs described for Option 8 are those imposed on LGV drivers only. In comparison, Options 5(i) and 5(ii) impose welfare costs on LGV and car drivers.

Table 2- 8: Consumer welfare impact, £m, present value 2018 prices, discounted

Options	Welfare Impact* £m (2021-2030)
Option 5(i)	−£36m
Option 5(ii)	−£36m
Option 8	**−£17m**

** Negative value indicates disbenefit*

2.6.42 Please note, the appraisal assumes that the option of switching mode of travel is only applicable to cars, PHVs, and LGVs. It is assumed that HGVs are unable to switch mode. For the purpose of the appraisal it is assumed that 100% of taxis would be compliant and therefore no taxi journeys change mode.

2.6.43 Changing mode from car to public transport would change the costs of travel for users, spending less on car travel and potentially more on public transport fares. It is not possible to determine at this stage whether the net effect would represent an increase or reduction in the cost to transport users.

Impact of Mode Shift: public transport supply and crowding

2.6.44 Mode shift generated by Option 5(i) has been modelled on the committed 2025 public transport network. The modelling has been carried out by adding predicted extra public transport trips to the 2025 NTEM forecast demand, with the increased demand in each modelled time period being as follows:

- AM Peak: 1.8%
- Interpeak: 2.4%
- PM Peak: 1.7%

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2.6.45 On the rail network, the proposed GM CAP is predicted to increase boardings by 2% in the morning peak (which has the highest demand), tipping one service from just under 'crush capacity' to just over. Note that the modelling assumes that services operate with capacities as scheduled, and therefore the real-world impacts of this increased demand would be more severe if trains run less frequently or with lower capacities than timetabled.

2.6.46 On Metrolink, the proposed GM CAP is predicted to increase boardings by 1.3% in the morning peak but this will not cause any further services to reach crush capacity. The model tests include extra capacity due to the introduction of 27 additional trams, due to be introduced between 2020 and 2021.

2.6.47 On the bus network, the proposed GM CAP is predicted to increase boardings by 2.2% in the morning peak hour, but this is not expected to cause crowding problems. The increased demand for bus services may encourage operators to increase service provision on some routes and may improve the viability of other routes thus protecting service provision.

2.6.48 Increased demand for public transport services will increase revenues which can be invested in service improvements.

Impact of Mode Shift: Health Benefits from travelling more actively

2.6.49 The modal shift of non-compliant vehicle owners from private car, LGV and PHV use to walking or cycling will improve the general health of those making active travel choices. The increased health benefits as a result of the induced modal shift was estimated using the World Health Organisation's Health Economic Assessment Tool[7], presented in Table 2- 9.

2.6.50 The proposed GM CAP delivers health benefits of £18m PV 2018 prices over the appraisal period. Trips by public transport also typically involve more walking than car trips and research shows that active and public transport commuters have a lower BMI than those who commute by car. Therefore, the full health benefits of mode shift from the car are likely to have been under-estimated here.

Table 2- 9: Active Travel Health Benefits, £m, present value 2018 prices, discounted

Options	Health Benefits £m (2021-2030)
Option 5(i)	£31m
Option (ii)	£31m
Option 8	**£18m**

[7] https://www.heatwalkingcycling.org/#homepage

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Costs Imposed by Cancelled Trips

2.6.51 Some users will choose not to travel, or to change the destination of their trip in order to avoid paying a charge. These users will incur a welfare loss, which to some extent can be quantified. In reality, it is difficult to distinguish between trips which represent a genuine loss – because the user is no longer able to do something they wanted or needed to do – compared to those trips which have been in some way re-organised or replaced with another equally satisfactory activity.

2.6.52 Table 2- 10 presents the monetised impacts of welfare losses for those cancelling trips, presented in present value 2018 prices. The proposed GM CAP imposes costs of £39m as a result of trips no longer made.

Table 2- 10: Consumer welfare impact, £m, present value 2018 prices

Options	Welfare Impact* £m (2021-2030)
Option 5(i)	−£59m
Option 5(ii)	−£59m
Option 8	**−£39m**

** Negative value indicates disbenefit*

2.6.53 Note that cancelled trips may well have a wider societal cost than to the individual, through lost economic activity or reduced social interaction. The wider risks and costs of trips being cancelled or moved to a different destination will be explored more fully in 2019. In reality, the effects of Option 8 are felt by businesses rather than private households and so the impact of cancelled trips may be a loss of economic opportunity.

Costs and Benefits of Upgrading the Vehicle Fleet

2.6.54 The cost of upgrading borne by a non-compliant vehicle owner is estimated through the consideration of the following:

- Cost of upgrade – Welfare loss estimated by multiplying the number of vehicles upgrading by the difference in depreciation with the new (or used) vehicle, using the Rule of Half.
- Loss of asset value – Loss of value estimated by considering the residual value of the vehicles assumed to be scrapped.
- Transaction Cost – The cost involved in searching for a new vehicle. Estimated by multiplying the number of vehicles upgrading by the weighted transaction cost (derived from the “National data inputs for Local Economic Models”).

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- Fuel Switch Cost or Saving – Estimated by multiplying the number of vehicles switching fuel type, by the fuel cost and the average annual mileage. Note that this does not currently take account of the shift to electric vehicles encouraged by the investment in electric charging infrastructure, which would lead to reduced fuel costs.

2.6.55 A more thorough explanation of the methodologies used is included in the Economic Appraisal Methodology Report (EAMR) (Appendix E1). These costs are offset against the benefits provided by the proposed vehicle renewal funds and the proposed Clean Bus Fund.

2.6.56 The number of vehicles forecast to upgrade due to the GM CAP has been estimated using the baseline fleet composition data, Automated Number Plate Recognition (ANPR) data and the upgrade response.

2.6.57 Table 2- 11 presents the impact of upgrades to vehicle owners. The proposed GM CAP imposes a total cost as a result of vehicle upgrades of £10m. This encompasses an imposed cost or disbenefit of £127m, mitigated by £117m of proposed funding to support the upgrade of vehicle fleets in Greater Manchester.

Table 2- 11: Impact of upgrade* for non-compliant vehicle owners, £m, present value 2018 prices (2021-2030)

Options	Welfare loss	Benefits from Vehicle Renewal Fund and Clean Bus Fund	Fuel switch	Transaction cost	Loss of asset value	Total
Option 5(i)	−£168m	£149m	−£13m	−£0.7m	−£85m	−£119m
Option 5(ii)	−£202m	£149m	−£106m	−£1.3m	−£85m	−£247m
Option 8	**−£87m**	**£117m**	**−£0.7m**	**−£0.1m**	**−£40m**	**−£10m**

** positive value indicates benefit, negative value indicates cost*

Benefits of a Cleaner Fleet of Buses and Taxis in Greater Manchester

2.6.58 A cleaner fleet of buses and taxis operating in Greater Manchester would deliver a cleaner, better quality environment and would be more appealing to users. This may promote mode shift and reduce dependency on the private car. The GM CAP may be considered as the 'catalyst' for bus and taxi operators to take a significant step in investing in cleaner, more fuel-efficient vehicles, and be the turning point for driving older and unsuitable vehicles out of the market altogether.

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Wider Benefits to Businesses of Upgrading their Fleet: Achieving Corporate Social Responsibility

2.6.59 A large number of businesses now include specific objectives and targets in relation to emissions levels and cleaner vehicle technology[8]. The proposed GM CAP offers an opportunity for businesses to manage their risk by operating in ways which are more environmentally friendly, supported by the public sector through a programme of sustainable travel initiatives and funds to help them upgrade their fleets.

Costs Imposed by User Charges

2.6.60 Although the proposed GM CAP aims to induce non-compliant vehicle owners to upgrade or alter their behaviour to meet compliance, some users will choose to 'stay and pay', making their journey as normal and paying the charge. The reasons that users choose to stay and pay will be diverse. For some, it will be a trip they make infrequently, and therefore it would not be worth considering upgrading their vehicle. For others, the charge will simply not be high enough in comparison with the wider cost or value of their trip to induce them to change. Others may have no option than to pay because they cannot afford to upgrade their vehicle, or because a compliant vehicle is not a viable option for some reason, or because they do not have an alternative option available.

2.6.61 The user charges and penalty charges incurred are considered a financial cost to transport users and as a revenue to the public sector. They are therefore not included in the Economic Appraisal and do not contribute to the NPV. They are shown here for context.

2.6.62 Table 2- 12 presents the forecast user charges over the appraisal period (2021 to 2030), based on the assumed set charges outlined in Table 2- 17 and converted to present value 2018 prices for economic appraisal purposes. The proposed GM CAP is predicted to generate user charges of £234m.

Table 2- 12: Total User Charges, £m, 2021-2030, discounted

	Option 5(i)	Option 5(ii)	Option 8
Total User Charges, £m	£249m	£249m	£234m

[8] Transport for Greater Manchester's Freight and Logistics Transport Strategy

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Distributional Analysis of the Affordability of Costs Imposed by the GM CAP on residents

2.6.63 The Distributional Analysis of Affordability considers:

- **Personal Affordability**: the cost of travel for local people commuting to a place of work or education and undertaking journeys for social or leisure purposes via private vehicle. For the GM CAP, changes to personal affordability are linked to the costs associated with either paying the clean air charge for non-compliant vehicles or upgrading to a compliant vehicle where required, and in operating a vehicle (such as fuel and oil consumption, mileage-related depreciation and tyre wear) that are considered critical to the decision of whether to undertake a journey.
- **User benefits**: the experience of people commuting to a place of work or education and undertaking journeys for social or leisure purposes via private vehicle associated with journey times, and the cost of operating a car as described above. In contrast to personal affordability, user benefits consider time and money costs that affect a person's experience when travelling, which are not likely to be critical to the decision of whether to undertake a journey.

2.6.64 Table 2- 12 presents an overview of the Distributional Impact Appraisal of Affordability. Colour coding in the table refers to the assessment matrix presented in Table 2- 4.

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Table 2- 13: Distributional Impact Appraisal of Affordability Matrix: Option 5(i)(ii

	1 (Most Deprived)	2	3	4	5 (Least Deprived)	Are the impacts distributed evenly?	Key impacts
Personal Affordability - Income deprivation (England and Wales)	✓✓	✓✓	✓✓	✓✓	✗✗✗	No	The share of increased user costs experienced by the lowest income households in quintiles 1, 2 and 3 is in line with the share of the population in these areas. When compared to the distribution across England and Wales, those in quintile 5 receive a score of large adverse, compared to slight beneficial when mapped in comparison to Greater Manchester only. Differences exist within quintile 4, which receives a score of moderate beneficial when mapped against England and Wales and a score of large beneficial when mapped in comparison to Greater Manchester only.
Personal Affordability - Income deprivation (Greater Manchester)	✓✓	✓✓	✓✓	✓✓✓	✓	No	
Personal affordability – Disabled	It is recognised that people with a disability are less likely to drive and more likely to be dependent on public transport (including taxis and PHVs), community transport that offers door to door usage, or lifts from family and friends ((DfT, 2018a)[9]. Similarly, disabled people typically have lower average household income and the cost of upgrading wheelchair-adapted private vehicles is higher, making them particularly vulnerable to increases in the costs of private transport services and private car travel (Crisp *et al*., 2018)[10].						
User benefits Income deprivation (England and Wales)	✓	✓✓	✓✓	✓✓	✓✓	No	

[9] DfT (2018a). The Inclusive Transport Strategy: achieving equal access for disabled people. Available from: https://www.gov.uk/government/publications/inclusive-transport-strategy/the-inclusive-transport-strategy-achieving-equal-access-for-disabled-people [Accessed 19/11/18].

[10] Crisp et al., (2018). Tackling transport-related barriers to employment in low-income neighbourhoods. Joseph Roundtree Foundation. Available at: https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods [Accessed 03/12/2018]

	1 (Most Deprived)	2	3	4	5 (Least Deprived)	Are the impacts distributed evenly?	Key impacts
User benefits Income deprivation (Greater Manchester)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	When compared to the distribution across Greater Manchester, user benefits are equally distributed across all income groups with all groups receiving a score of moderate beneficial. When compared to the distribution across England and Wales, those in quintile 1 receive a score of slight beneficial.
Business affordability – small and medium-sized enterprises	Business affordability impacts are assessed qualitatively.						
Business affordability – LGVs	Business affordability impacts are assessed qualitatively.						

Note: 1 = Most Deprived, 5 = Least Deprived

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Table 2- 14: Distributional Impact Appraisal of Affordability Matrix – Option 8

	1	2	3	4	5	Are the impacts distributed evenly?	Key impacts
Personal affordability – Income deprivation (England and Wales)	✓	✓✓	✓✓	✓✓✓	✓✓	No	When compared against the distribution across England and Wales, the share of decreased user costs (user benefit) experienced by the lowest income households in quintile one is in line with the share of the population in these areas. In quintile four, there is a large beneficial impact. When compared to the distribution across Greater Manchester, user benefits are equally distributed across all income groups (moderate beneficial impacts).
Personal affordability – Income deprivation (Greater Manchester)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	
Personal affordability – Disabled	It is recognised that people with a disability are less likely to drive and more likely to be dependent on public transport (including taxis and PHVs) and community transport. Disabled people typically have lower average household income making them particularly vulnerable to increases in the costs of private transport services and private car travel (Crisp *et al*., 2018)[11]. As there is no charging of private vehicles under the conditions of Option 8, there would be no requirement for wheelchair-adapted private vehicles to be upgraded. Similarly, disabled people receiving lifts from family and friends would not be affected.						
User benefits Income deprivation (England and Wales)	✓	✓✓	✓✓	✓✓	✓✓	No	

[11] Crisp et al., (2018). Tackling transport-related barriers to employment in low-income neighbourhoods. Joseph Rowntree Foundation. Available at: https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods [Accessed 03/12/2018]

	1	2	3	4	5	Are the impacts distributed evenly?	Key impacts
User benefits Income deprivation (Greater Manchester)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	When compared to the distribution across Greater Manchester, user benefits are equally distributed across all income groups with all groups receiving a score of moderate adverse. When compared to the distribution across England and Wales, those in quintile one receive a score of slight adverse.
Business affordability – small and medium-sized enterprises	Business affordability impacts are assessed qualitatively, described in the following section.						
Business affordability – LGVs	Business affordability impacts are assessed qualitatively, described in the following section.						

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Personal affordability

2.6.65 The personal affordability DI analysis considers the monetary cost of travel for local people commuting to a place of work or education, and/or undertaking journeys for social or leisure purposes, using their own private vehicle.

2.6.66 The analysis takes into account changes in VOC as well as any applicable CAZ charges. Where congestion reduction effects open up new routes this can lead to changes in driving distances or allow driving at more efficient speeds, resulting in decreased vehicle operating costs.

2.6.67 For Option 8 in 2021, user costs decrease for non-business car and LGV users across all income groups due to reductions in vehicle operating costs.

2.6.68 For Option 5(i)/(ii) the reductions in vehicle operating costs across Greater Manchester outweigh CAZ charges within the IRR for personal trips so that there is an overall decrease in user costs for all income groups.

User benefits

2.6.69 User benefits considers the travel time and vehicle operating cost savings for users. As the options considered would only have minimal impacts on re-routing, the distribution of impacts is expected to be broadly similar for both Option 5(i)/(ii) and Option 8. The analysis indicates moderate beneficial impacts for all income levels.

Impact on local businesses and the economy

2.6.70 The DI analysis also considers the impact on Business Affordability. The introduction of CAZs in Greater Manchester would impose direct costs on businesses through increased transportation costs associated with either paying the clean air emissions charge for non-compliant vehicles or upgrading to a compliant vehicle where required, and/or procurement costs. The analysis of business affordability focuses on impacts on small and medium-sized enterprises (SMEs) and LGVs.

Business Affordability of the GM CAP: SMEs

2.6.71 The business profile of Greater Manchester is broadly in line with the national averages for each business type: 84.6% micro, 12.4% small, 2.6% medium and 0.4% large. Businesses across Greater Manchester would experience adverse affordability impacts from the implementation of the GM CAP.

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2.6.72 For all Options, increased costs would be likely for those businesses that rely on HGVs and LGVs and for sole traders operating an in-scope vehicle. Freight vehicles registered to a private individual, rather than a company, are more likely to be non-compliant at present and the rate of fleet turnover is typically slower, meaning they will account for a higher proportion of non-compliant vehicles in 2021. These impacts will be mitigated to some extent by the proposed Clean Freight Fund and any loan finance scheme, which will offer financial support to help small businesses and sole traders upgrade their vehicles. The potential role of discounts and exemptions is also being explored, and will be investigated more fully at FBC and through stakeholder engagement.

2.6.73 Similarly, most taxi and private hire drivers and operators are sole traders or small businesses. It is unclear the extent to which drivers will be able to pass on the costs of the charge or of upgrade to their customers. The impacts will be mitigated to some extent by the proposed Clean Taxi Fund and any loan finance scheme, which will offer financial support to help upgrade or retrofit taxis and private hire vehicles. More support may be offered to those required to operate a London-style taxi and other specialist vehicles, reflecting the higher cost of these vehicles. The potential role of discounts and exemptions is also being explored, and all support measures will be investigated more fully at FBC and through stakeholder engagement.

2.6.74 Micro, small and medium businesses are less likely to own HGVs, but may rely on HGV services, which may become more expensive. It is unclear to what extent businesses in different sectors will be able to pass on the costs of any charges or upgrades to their customers, and therefore where the impacts are most likely to be felt. More work will be undertaken at FBC to explore this question.

Business Affordability of a CAZ D within the IRR: SMEs

2.6.75 Options 5(i) and 5(ii) impose additional costs on businesses, by bringing forward the implementation of charges for LGVs to 2021 within the IRR, and imposing a charge on non-compliant cars travelling into, within or through the IRR zone.

2.6.76 The number of LGVs registered within the IRR, relative to the number of SMEs, is only small, suggesting that only a small proportion of SMEs within the IRR own or have vehicles registered inside the charging zone. However, it is assumed that almost all businesses inside the IRR would be reliant on road transport and therefore the CAZ could increase the cost of doing business within the zone and make it more difficult to access suppliers.

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2.6.77 Options 5(i)/(ii) will also increase the cost of travel to work for those dependent on a car and unable to upgrade their vehicle. This could lead to the potential displacement of workers to outside of the IRR to avoid the charge. If SME employees within the IRR cannot afford to pay the charge, this could lead to a loss of workers for the company who would then face the cost of recruitment.

2.6.78 The proposed GM CAP, Option 8, does not affect cars and does not propose an IRR scheme, and therefore these impacts are avoided.

2.7 Summary Tables of Costs and Benefits

2.7.1 This section brings together all the quantified costs and benefits to calculate the Net Present Value (NPV) of the proposed GM CAP and the rejected best-performing options over the appraisal period (2021-2030). NPV is calculated as the Present Value Benefits (PVB) minus the Present Value Costs (PVC): (NPV = PVB – PVC). Table 2- 15 presents the summary of the monetised benefits and costs of the options.

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Table 2- 15: Summary of the total costs and benefits of the proposed GM CAP best-performing options, £m, present value 2018 prices

	Impact	Option 5(i)	Option 5(ii)	Option 8
Health and Environmental Impacts (positive value indicates a benefit, negative a disbenefit)	NO2 reduction	£52m	£52m	£52m
	PM reduction	£54m	£54m	£49m
	GHG emission reduction	£81m	£82m	£82m
User costs and benefits (positive value indicates a benefit, negative a disbenefit)	Health benefits of active travel	£31m	£31m	£18m
	Welfare loss (trips re-moded)	−£36m	−£36m	−£17m
	Welfare loss (trips cancelled)	−£59m	−£59m	−£39m
	Vehicle fleet upgrade Includes cost of upgrade, loss of asset value, transaction cost and fuel switch costs, less any financial subsidy from the funding measures	−£119m	−£247m	−£10m
	Congestion effects on travel time	£210m	£210m	£136m
	Congestion effects on vehicle operating costs	£89m	£89m	£73m
Present Value Benefits		**£304m**	**£176m**	**£344m**
Costs to the Public Sector (positive value indicates a cost, negative a saving)	Implementation Cost	£316m	£316m	£270m
	Operating and Maintenance	£153m	£153m	£148m
Present Value Costs		**£469m**	**£469m**	**£419m**
Net Present Value		**−£166m**	**−£293m**	**−£74m**

2.7.2 The outcome of the economic analysis shows that the NPV for all three options is negative, i.e. the costs outweigh the benefits. However, this is to be expected. There is a legal imperative to act and the analysis here clearly defines the option which is able to meet the requirements with the minimum adverse economic impact.

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2.7.3 Option 8, the proposed GM CAP, presents the best NPV of −£74m, followed by Option 5(i). The variance between Option 8 and Option 5(i) is primarily due to lower vehicle fleet upgrade costs in Option 8, while Option 8 is still able to generate comparable benefits in most areas. This vehicle fleet upgrade cost is discussed in more detail in section 2.6.

2.7.4 In terms of air quality benefits, all three options deliver very similar reductions. Whilst Option 5(ii) would be expected to deliver more air quality benefits than Option 5(i), the difference is somewhat underestimated in the results presented above due to model capability limitations, as further explained in Section 2.9.

2.7.5 For Options 5(i) and 5(ii) the largest economic disbenefit comes from the cost of vehicle upgrades. It should be noted that there is an underlying assumption that the GM CAP will include vehicle scrappage. This implies that some vehicle users will upgrade their non-compliant vehicles at an earlier date than would have otherwise happened. However, rather than trading in the vehicle (retaining the depreciated asset value), it is assumed that the vehicles are scrapped. This avoids displacing non-compliant, polluting vehicles to other areas of the UK and is therefore advantageous from an air quality perspective because it removes those vehicles from the roads altogether. However, it does result in high economic cost.

2.7.6 Removing the costs/revenue to the public sector, it is possible to explore the effects (benefits, disbenefits and costs) on the residents and businesses of Greater Manchester as well as the wider public[12], as presented in Table 2- 16 below.

2.7.7 This analysis helps to illustrate whether the GM CAP is achieving its goal at the lowest imposed cost and offering the greatest benefits. Option 8 achieves compliance in the shortest possible time, meeting the core requirement of the GM CAP. It does so while bringing £410m of quantified benefits to Greater Manchester, as well as the very significant unquantified benefits to health, and at the lowest imposed cost of the three options. In total, the GM CAP delivers at least £344m of net benefits to Greater Manchester's residents and businesses.

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[12] Impacts on the wider public include benefits, disbenefits and costs incurred by occasional visitors/those travelling from outside Greater Manchester.

Table 2- 16: Summary of the total costs and benefits incurred by Greater Manchester, present value 2018 prices

Impact	Option 5(i)	Option 5(ii)	Option 8
NO2 reduction	£52m	£52m	£52m
PM reduction	£54m	£54m	£49m
GHG emission reduction	£81m	£82m	£82m
Health benefits of active travel	£31m	£31m	£18m
Congestion effects on travel time	£210m	£210m	£136m
Congestion effects on vehicle operating cost	£89m	£89m	£73m
Total beneficial effects	£517m	£518m	£410m
Welfare loss (trips re-moded)	−£36m	−£36m	−£17m
Welfare loss (trips cancelled)	−£59m	−£59m	−£39m
Vehicle upgrade Includes cost of upgrade, loss of asset value, transaction cost and fuel switch costs, less any financial subsidy from the funding measures	−£119m	−£247m	−£10m
Total costs/disbenefits	−£214m	−£342m	−£66m
NPV	**£303m**	**£176m**	**£344m**

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2.7.8 Figure 2- 10 illustrates the costs and benefits of the preferred option (Option 8)

Figure 2- 10: Visual chart of the economic impact of Option 8, £m, present value 2018 prices

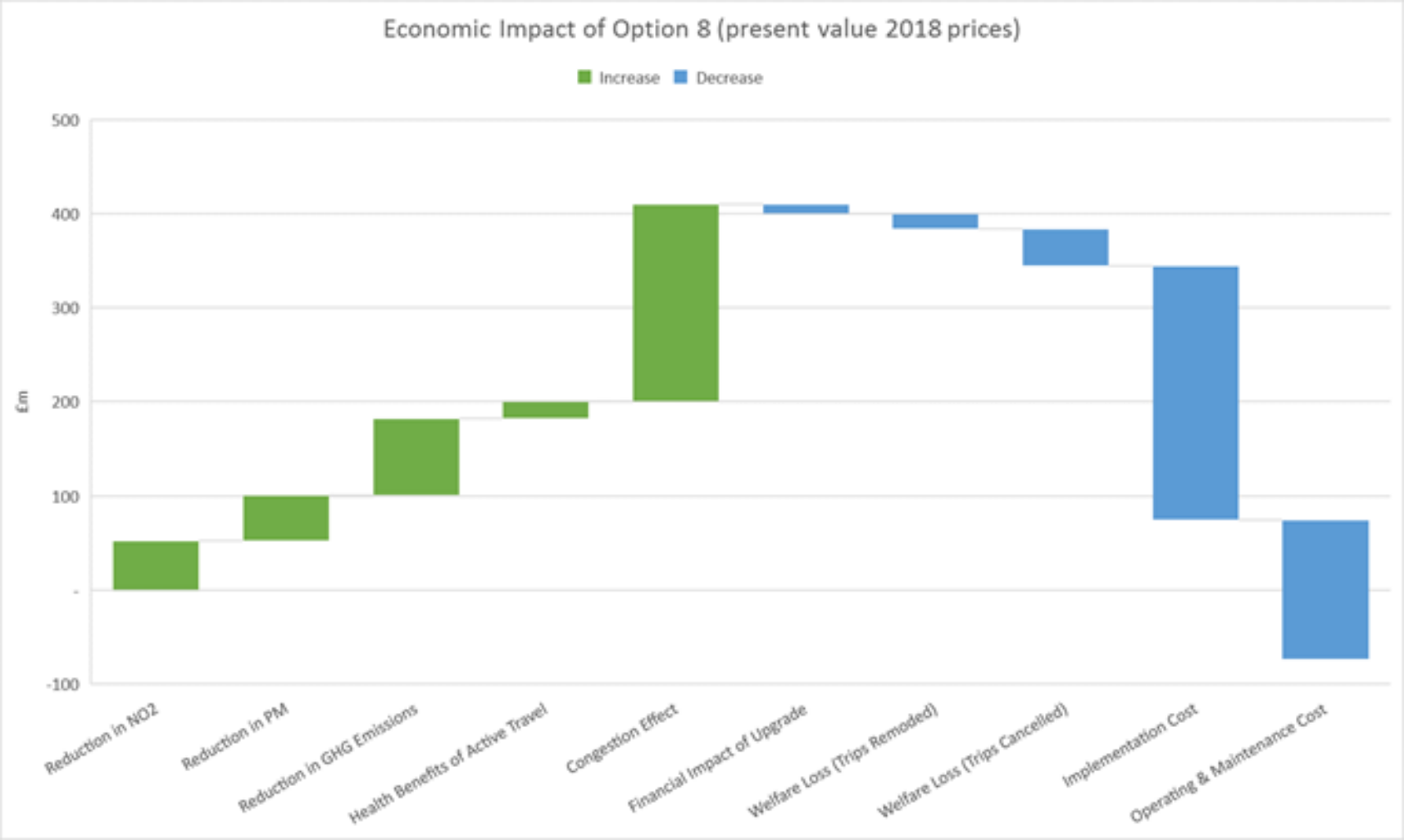

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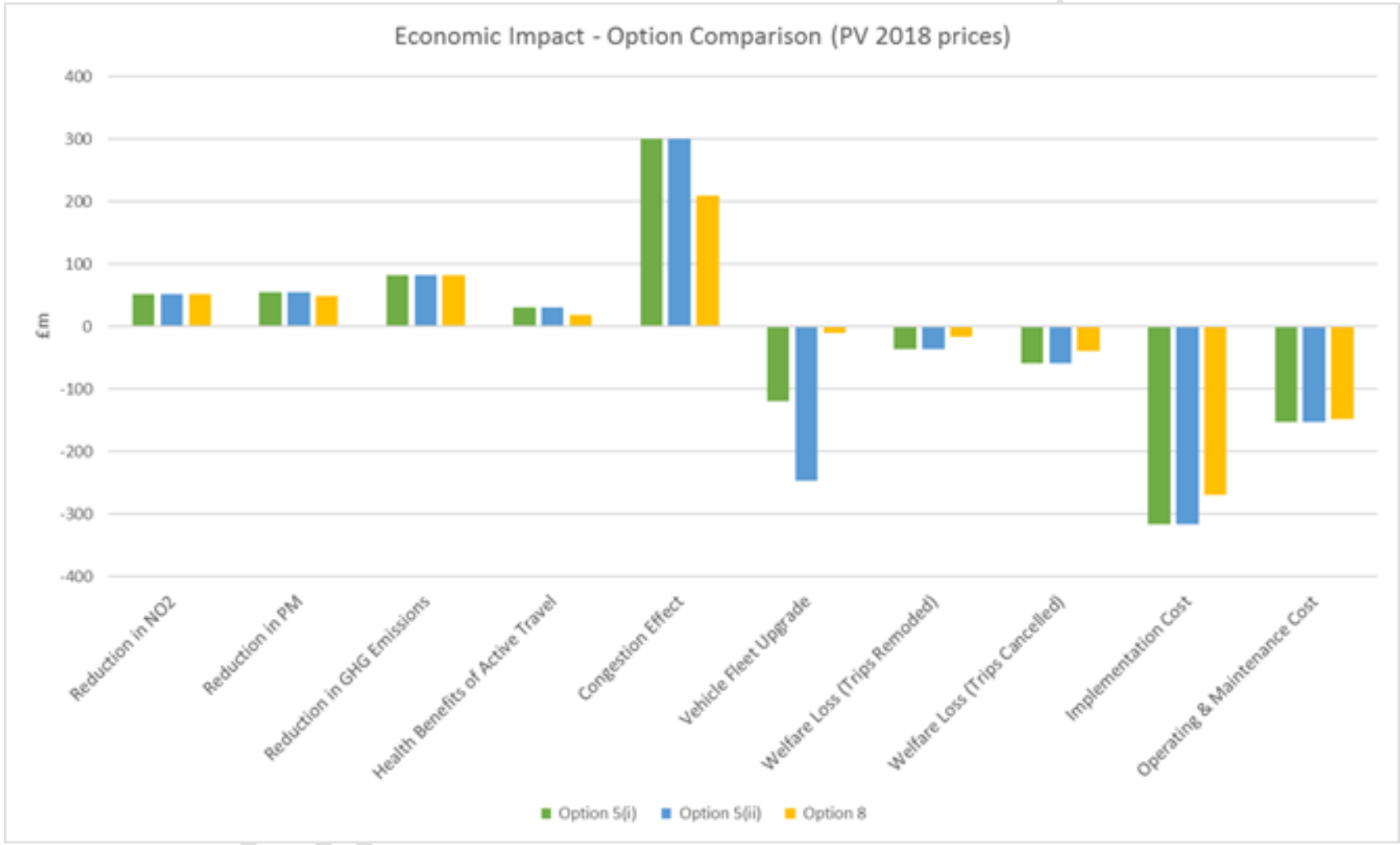
Figure 2- 11: Economic Impact of Options 5(i), 5(ii) and 8



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Non-monetised impacts

2.7.9 There are a number of impacts of the GM CAP that have not been monetised in the appraisal, either due to limitations in the valuation methodologies and/or to the availability of data to support the analysis. Some of these gaps are highlighted here in order to underline the strategic reasoning for the intervention.

2.7.10 As discussed in the Strategic Case, the impacts of air pollution are far-reaching. The damage costs used to value the reduction in NO2 and PM emissions, and the avoided health and social costs, attempt to capture productivity losses associated with episodic illness. This refers to the impact of lost work days on the economy. In children, however, episodes of ill health result in absence from school which is shown to reduce pupil attainment. Those children achieving lower qualifications will go on to have lower earning potential with subsequent reductions in economic productivity.

2.7.11 The avoided health costs also do not capture the wider health impacts of poor air quality; for example, those who live and work in areas with poor air quality are less likely to spend time outside. This contributes to physical health (reducing opportunities for physical exercise) as well as mental health.

2.7.12 It should also be noted that the costs and benefits of changes in travel behaviour associated with the GM CAP are only partially captured. They do not cover the change in (real) costs to the transport user in switching from car to public transport, nor do they capture the public transport revenue from those trips re-moded.

2.7.13 The scale of these non-monetised impacts is unknown; however, it is likely that these additional impacts not captured could have a material effect on the NPV results.

2.7.14 The Distributional Impacts report includes a non-monetised qualitative analysis of the impacts on accessibility, air quality and affordability on different social and business groups including children, the elderly, disabled people, low income families, SMEs, LGVs and taxi operators.

2.8 Methodology of the Economic Appraisal

2.8.1 This section sets out an overview of the methodology adopted for the economic appraisal, the core assumptions applied, and the key impacts assessed. A full explanation of the methodology is in the Economic Appraisal Methodology Report (EAMR) (Appendix E1).

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Monetised Costs and Benefits

2.8.2 The economic appraisal incorporates many of the key costs and benefits associated with the proposed GM CAP options within the available timeframe and modelling capabilities. There are a number of impacts which remained unquantified at this stage; a description of these and a discussion of the likely scale is presented in Section 2.7.

2.8.3 Table 2- 17 presents the scope of the monetised costs and benefits and how they have been assessed. For further detail on the methodology underpinning the appraisal, refer to the EAMR (Appendix E1)

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Table 2- 17: Monetised Economic Impacts of the GM CAP

Impact	Benefits/Cost	Description	Methodology
Health and environmental impacts	Air quality (NO2 and PM)	The impact of the reduction in NO2 and PM emissions in terms of avoided health and environmental damage.	The change in emissions (tonnes) of NO2 and PM is modelled using outputs from the transport model to provide an indication of the level of change across Greater Manchester. The NO2 and PM savings are then monetised using damage costs (per tonne saved) recommended by JAQU.
	GHG emissions	The impact on GHG emissions as a result of the change in vehicle fleet and network effects.	The change in CO2 emissions is estimated based on the difference in total vehicle kilometres, extracted from the transport model. The change in emissions is then monetised using the CO2 non-traded values from the DfT WebTAG.
Changes in travel behaviour	Health benefits	The health benefits gained from those switching from cars to walking and cycling.	The health benefits associated with increased walking/cycling are calculated using the World Health Organisation's Health Economic Assessment Tool. For more details of the methodology, please refer to https://www.heatwalkingcycling.org/#homepage
	Welfare loss (trips re-moded)	The welfare loss of those opting to re-mode their trips, i.e. switching from car travel to public transport and/or active travel.	This impact assumes that there is a disbenefit to users in choosing an alternative to their original course of action. The loss of welfare from changing travel behaviour is estimated using the Rule of Half for trips foregone (cancelled), and trips re-moded (i.e. change to public transport). This implies that the value of the disbenefit falls somewhere between £0 and the price of the charge (or else users would have simply paid the charge and made their original journey as planned). The midpoint is taken to be the average disbenefit and multiplied by the number of trips foregone, or re-moded, to determine the overall welfare loss.
	Welfare loss (trips cancelled)	The welfare loss of those opting to cancel their trip altogether.	

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Impact	Benefits/Cost	Description	Methodology
Vehicle fleet upgrade	Welfare loss	The welfare loss of having to purchase a new/used compliant vehicle earlier than planned.	The welfare loss associated with vehicle upgrade induced by the GM CAP is estimated based on the difference between the purchase price of a compliant vehicle and the deprecation value of the non-compliant vehicle that is traded in. The Rule of Half is applied to account for the consumer welfare loss to account for the fact that the user will experience some benefit in having a newer vehicle beyond the fact that it is merely compliant.
	Loss of asset value	The loss in asset value for those choosing to scrap (End of Life) as opposed to trade in their older, non-compliant vehicles.	Based on the estimated number of vehicles being scrapped, the average loss of asset value (after the GM CAP implementation) of each vehicle type and Euro standards have been estimated using JAQU's depreciation rate assumption.
	Transaction cost	Vehicle owners choosing to upgrade their non-compliant vehicle earlier than planned, are likely to incur a cost in having to locate a vehicle to their taste.	The transaction cost has been estimated using JAQU's average transaction cost per vehicle type and Euro standards.
	Fuel switch cost	Vehicle owners upgrading to a compliant vehicle may choose to upgrade to a different fuel type, for example a diesel car owner could upgrade to a compliant petrol car. The switch in fuel type leads to a change in running costs.	The total vehicle kilometres by non-compliant vehicle owners upgrading to a different fuel type is estimated based on the average vehicle kilometres travelled per vehicle. The average fuel consumption (of petrol vs diesel) is calculated, based on values provided by DfT WebTAG, and then the total fuel cost is estimated based on the average fuel price per litre consumed. The fuel switch cost is estimated by subtracting the Do Something fuel cost (i.e. the fuel type they switch to) from the Do Minimum fuel cost (i.e. the original fuel type).

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Impact	Benefits/Cost	Description	Methodology
	Financial subsidy	Non-compliant vehicle owners choosing to upgrade early may receive financial support via the proposed Vehicle Renewal Fund (Car, Freight and Taxi Funds) and the Clean Bus Fund. This would offset some of the welfare loss from upgrading.	The financial relief which offsets the welfare loss associated with upgrading was estimated by the financial model, taking into the account the number of vehicles upgrading and the maximum financial subsidy offered per applicant via the funding measures, Vehicle Renewal Fund and and Clean Bus Fund.
User charges	Financial cost of paying the CAZ emissions penalty	The cost to non-compliant vehicle owners opting to continue travelling into the CAZ and pay the daily emissions penalty.	The number of individual vehicles paying the charge was estimated based on the number of trips forecast to pay the charge by the traffic model, and the average number of trips per vehicle. The proposed CAZ charges are then assigned to each individual vehicle forecast for each year of the appraisal period. It should be noted that the user charges assumed were for the purpose of modelling only and are subject to change following stakeholder consultation.
Congestion effect	Travel time impact	Due to the nature of the GM CAP, there may be an impact on traffic flow. For example, if more non-compliant vehicle owners opt to avoid the CAZ boundary, this may result in fewer vehicles crossing and moving within the CAZ boundary, leading to travel time savings.	The congestion effects are modelled using DfT's TUBA software. The input of TUBA is generated by the transport model.

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Impact	Benefits/Cost	Description	Methodology
	Changes in vehicle operating cost	Vehicles may see a difference in vehicle operating costs as a result of travel time savings or costs and an increase or decrease in fuel consumption	
Cost to the public sector	Implementation cost	The up-front cost of implementing the GM CAP.	Assumptions on the implementation costs and how they were derived can be found in the Financial Case.
	O&M	The ongoing cost of operating and maintaining the GM CAP.	Assumptions on the O&M costs and how they were derived can be found in the Financial Case.
	Revenue	Revenue generated by the CAZ charge payments.	The user charges which are incurred as a cost to transport users are reflected as revenue (income stream) to the public sector.

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Behavioural Response

2.8.4 To best capture the behavioural response of vehicle owners in Greater Manchester, the approach adopted has deviated from the national behavioural responses provided by the JAQU guidance (with the exception of HGVs). The national assumptions are based on the London ULEZ scheme, whereas the assumptions incorporated here are based on the stated preference survey undertaken for the Bristol CAP and adjusted to better reflect the situation in Greater Manchester.

2.8.5 A stated preference survey may be required as part of the FBC stage aimed at Greater Manchester residents and businesses, which would then inform the modelling and economic appraisal for the FBC, improving the accuracy and reliability of the results.

Traffic Modelling

2.8.6 At the time of development, the traffic and air quality modelling were based on the fleet composition provided by the ANPR data over a one-week time period and therefore may not be representative of general travel patterns. One of the ways this could be improved is to incorporate the fleet composition based on registered vehicles in Greater Manchester sourced from the DVLA. This would provide a more reliable estimate of the number of compliant and non-compliant vehicles that are likely to make frequent journeys within Greater Manchester. New ANPR surveys are underway to validate these assumptions.

2.8.7 Additionally, the transport and air quality modelling is subject to further refinement, incorporating feedback from the planned public engagement, as well as further development of the measures. The assumptions underpinning the current model will be updated and refined, improving the reliability and accuracy of the modelling results. For example, for Option 5(ii), it has been assumed for modelling purposes that Euro 6 diesel car owners entering the IRR cordon would either pay the charge, or upgrade to a compliant vehicle (i.e. switch to petrol or an Ultra-Low Emission Vehicle (ULEV)). This assumption reflected what was possible with the tools and data available, but clearly in reality a more complex range of responses would occur. The implications of this are that both the costs and benefits are likely to have been under- or over-estimated.

Air Quality Modelling

2.8.8 The limited capacity of the air quality modelling to assess the complex nature of the proposed GM CAP in the time available means that changes in NO_2 and PM have been quantified using the damage cost approach which relies on the change in total (gross) emissions. This does not reflect the change in ambient concentration levels over the appraisal period which ultimately drive improved health outcomes.

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2.8.9 Further, the air quality benefits are likely to be significantly underestimated as they are based on traffic changes within the CAZ cordons. This means that the total NO_2 and PM savings are only calculated for trips wholly contained within the CAZ boundary and do not include trips which have an origin or destination outside of the CAZ.

2.8.10 Additionally, the air quality impact of Option 5(ii) is underestimated as the modelling does not assume any diesel Euro 6 car trips to be cancelled or re-moded. Realistically, we would expect to see a substantial proportion of diesel trips cancelled or re-moded, especially for those that do not enter the CAZ frequently and have reasonable accessibility to public transport.

Guidance

2.8.11 The methodology of the economic appraisal has been based on various guidance reports, mainly the JAQU Guidance for CAZ Options Appraisal (Defra 2017), the Greenbook: Central Government Guidance on Appraisal and Evaluation (HM Treasury, 2018) and DfT WebTAG (last updated May 2018).

2.8.12 Furthermore, Greater Manchester has taken a collaborative approach throughout the development of the CAP, seeking advice and guidance from JAQU and obtaining approval for methodological decisions throughout the project.

2.8.13 The economic appraisal is based on the JAQU guidance for CAZ Options Appraisal but, as recommended by JAQU, the approach and assumptions underpinning the appraisal have been adjusted specifically for Greater Manchester. The economic appraisal incorporates as many monetised costs and benefits associated with the GM CAP options as possible given the available timeframe and modelling capabilities.

Transport and Air Quality Modelling

2.8.14 The economic modelling undertaken is reliant on the traffic modelling and the air quality modelling. The traffic modelling was completed using the traffic assignment software - Simulation and Assignment of Traffic to Urban Road Networks (SATURN), which models the change in traffic assignment after the implementation of the GM CAP (i.e. Do Something scenario), compared to the baseline scenario (i.e. Do Minimum scenario). The SATURN output then feeds into the Air Dispersion Modelling System (ADMS) model, which calculates the change in concentration of the pollutants NO_x and PM across Greater Manchester. Aside from the opening year, the years 2023 and 2025 were modelled for the following purposes:

- Year 2023 – to model the impact of the CAZ transition for van/minibus from the IRR to Greater Manchester cordon; and
- Year 2025 – to confirm the year of compliance.

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2.8.15 However, given the restricted timeframe, the economic appraisal only incorporates the modelled years 2021 and 2025. The economic appraisal may be updated and could incorporate the modelled year 2023 at a later stage.

2.8.16 Going forward, the transport, air quality, and subsequently the economic, modelling will be modified and updated to incorporate the following:

- further development of the measures;
- feedback from the public and stakeholder engagement;
- DVLA data for improved accuracy and reliability of the baseline fleet composition used for the analysis; and
- general refinement and improvement of the models.

2.8.17 The modelling assumes charge levels of £100 a day for non-compliant HGVs, buses and coaches and £7.50 a day for all other in-scope vehicles. These charges are assumed for modelling purposes only; a decision about charge-levels will depend upon further analysis, stakeholder engagement and public consultation. It has been assumed that the charges do not differ across the different cordons and it has been assumed that a non-compliant vehicle will be charged once per day, regardless of how many times the CAZ boundary is crossed.

2.8.18 Note that the CAZ charges described in Table 2- 18 are assumptions applied for the purpose of economic modelling. The CAZ charges have not been determined and will be subject to public and stakeholder consultation, as well as further analysis.

Table 2- 18: Clean Air Zone Charges assumed for modelling purposes, £, 2021 prices

Vehicle Type	CAZ Charge assumed for modelling purposes, £
Car	£ 7.50
Taxis & PHVs	£ 7.50
Vans (LGV)	£ 7.50
HGVs, Buses & Coaches	£100.00

Economic Assumptions

2.8.19 The following economic assumptions were adopted for the option appraisal:

- opening year is 2021;
- modelled years are 2021 and 2025;
- appraisal period runs from 2021 to 2030;

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- all figures are presented in 2018 prices;
- economic impacts are adjusted to 2018 prices using the Gross Domestic Product (GDP) deflator series (source: DfT WebTAG Databook May 2018);
- number of working days is 253 days;
- discount rate is 3.5%, as recommended by DfT's TAG unit A1.1 Cost Benefit Analysis (November 2014); and
- optimism bias (OB) is applied to the implementation, operating and maintenance costs based on the Government Green Book Guidance (see the Financial Case for further detail).

2.9 Limitations of the Modelling and Recommended Further Analysis

2.9.1 In interpreting these results it is important to note the following:

- the analysis is limited by the impacts which are able to be quantified and monetised. There are multiple benefits associated with improving air quality that are only partially captured or not captured at all (see Section 2.7 for a discussion of non-monetised impacts); and
- the economic appraisal is driven in large part by the traffic modelling and the assumptions underpinning it, particularly around the assumed travel behaviours as a result of the CAP. This is subject to ongoing research and will be further refined at FBC stage.

Limitations and Caveats

2.9.2 In interpreting these results it is important to note the following:

- the analysis is limited by the impacts which are able to be quantified and monetised. There are multiple benefits associated with improving air quality that are only partially captured or not captured at all (see Section 2.7 for a discussion of non-monetised impacts); and
- the economic appraisal is driven in large part by the traffic modelling and the assumptions underpinning it, particularly around the assumed travel behaviours as a result of the CAP. This is subject to ongoing research and will be further refined at FBC stage.

2.9.3 The modelling includes a simplifying and conservative assumption that all LGV users are driving for non-business and commuting purposes. That is, they are making personal non-work-related journeys referred to in the modelling as 'other' journeys. This is clearly not the case but is conservative because the benefit of improved journey times would be larger if the business value of time was used. This assumption will be reviewed at FBC and may be revised in future if better data becomes available.

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2.9.4 The distributional impact analysis also ignores business users as it assumes their choices are not affected by the charge. In reality many of those paying the LGV charge in particular are likely to be small businesses or sole traders.

2.9.5 Default purpose splits are used for all vehicle types, which may over/underestimate the actual trip purposes on specific routes.

2.9.6 No income segregation is included with the assignment model, which may affect the calculation of the Distributional Impacts as it is not possible to see specific re-routing or affordability impacts for lower income groups.

2.10 Summary of the Economic Analysis

Conclusions

2.10.1 The economic appraisal of the GM CAP evaluates the economic costs and benefits of the three shortlisted options, Option 5(i), Option 5(ii) and Option 8. Option 8 is proposed as the GM CAP, as set out in Section 1.7 of the Strategic Case.

2.10.2 As the proposed GM CAP does not impose a charge on private cars, the impacts on private residents are positive: they will experience improved air quality and related health benefits. Residents will benefit from investment in electric vehicle charging infrastructure and promotion, programmes to support sustainable journeys, and from a newer, cleaner bus and taxi fleet.

2.10.3 In summary, the proposed GM CAP, Option 8, delivers a total quantified health, air quality and environmental benefit of £201m. Beyond the readily quantifiable benefits, the GM CAP would substantially reduce health and social care costs, reduce persistent absences from work and school, and improve the quality of life of those suffering from chronic conditions worsened by poor air quality. Residents in all parts of Greater Manchester will benefit from these improvements, with the greatest improvements found in those places where air quality is worst.

2.10.4 The GM CAP, Option 8, also delivers travel time savings valued at £136m, through small-scale but widespread reductions in traffic and congestion; alongside associated reductions in vehicle operating costs of £73m.

2.10.5 The costs of complying with the GM CAP fall largely on businesses, sole traders and the public sector. In total, the GM CAP imposes an estimated cost of £66m in terms of the costs of upgrading vehicles sooner than anticipated, and the welfare loss of changing mode or cancelling trips. This is a crucial consideration and has shaped the proposals for significant financial support to businesses to upgrade non-compliant vehicles.

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2.10.6 It is intended that the help to upgrade provided by the Clean Freight and Taxi Funds is targeted at smaller operators who would otherwise struggle to afford to upgrade their vehicles. The goal is to maximise fleet upgrade and minimise the number of local operators who 'stay and pay'. More work is required to fully define these schemes, but the aim is to provide an air quality benefit and limit the costs imposed on small businesses, taxi and private hire licence holders, and sole traders. Any discounts and exemptions are also likely to be targeted at this group, as well as at specialist vehicles, the emergency services and charitable and not-for-profit organisations.

2.10.7 Analysis and stakeholder engagement suggests that larger fleets tend to be made up of newer vehicles, with the oldest vehicles disproportionately likely to be privately owned, presumably by sole traders and very small operators. It is reasonable to assume that the business decisions, costs and benefits to the smallest businesses are more interwoven with family and household circumstances than those of larger enterprises. Thus the distinction between the impacts on businesses and residents is blurred. Residents who are self-employed or run a small business in affected industries may experience disbenefits beyond those captured here.

2.10.8 The cost to the public sector of implementing and operating the GM CAP is estimated at £419m. In summary, taking the benefits and imposed costs, and the cost to implement and operate the GM CAP into account, the Net Present Value of the GM CAP is −£74m. Whilst negative, Option 8 is the best performing of the three Options considered here by quite some way: the equivalent NPV is −£166m for Option 5(i) and −£293m for Option 5(ii).

2.10.9 If only the benefits and imposed costs are considered, ignoring the operational and implementation cost to the public sector, the GM CAP brings benefits valued at £410m to the residents and businesses of Greater Manchester, compared to imposed costs of £66m, a net benefit of £344m.

2.10.10 Fundamentally, the purpose of the Economic Case within a business case is to answer the question: is this the right thing to do? As discussed earlier, in this instance, inaction is not an option – there is a legal imperative to act, and specifically to take all action possible to deliver compliance in the shortest possible time. As established in the Strategic Case, the Option 8 delivers compliance in the shortest possible time, by 2024, and delivers considerable reductions in NO_x emissions and NO_2 concentrations prior to compliance being achieved. By proceeding with Option 8, Greater Manchester will meet the overarching objective of the Clean Air Plan process and meet its legal requirements.

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2.10.11 The analysis presented above demonstrates furthermore that Option 8 delivers:

- compliance in the shortest possible time and very similar monetised air quality and emissions benefits as the other Options;
- the highest net benefits to the people and businesses of Greater Manchester of any Option;
- the best NPV of any Option; and
- avoidance of negative Distributional Impacts on affordability, on low income workers dependent on a car, and on the city centre economy and particularly the retail and leisure sector that result from a CAZ D.

2.10.12 Some concerns remain about the impact on small businesses and sole traders, but a package of measures, discounts and exemptions is proposed to support this group and help them comply with the scheme. More work will be carried out at FBC to better understand the support needed and to target effort and funds where they can be most effective in delivering air quality benefits and mitigating socioeconomic impacts.

2.10.13 Whilst every effort has been made to use the best data and tools available in this assessment, there remains much that we don't know and many sources of uncertainty in the analysis and conclusions drawn. Sensitivity testing has been conducted to better understand the uncertainty inherent in this analysis, and the extent to which it affects the validity of the conclusions; this is described in the associated Sensitivity Testing Technical Report. Additional research, analysis and modelling will be conducted at FBC, supported by engagement with stakeholders and industry experts. This should ensure that a more certain and fuller assessment, including Economic and Equalities Impact Assessments, can be presented at FBC. A more detailed discussion of uncertainty and possible next steps is provided in the supporting Analytical Assurance Statement.

A discussion on Value for Money

2.10.14 Value for Money is normally assessed by considering the extent to which the monetised benefits (and unquantified benefits) outweigh the costs. The key decision in most cases is whether action is preferable to inaction, i.e. is this scheme worth doing? There are two key differences here. Firstly, inaction is not an option. There is a legal imperative to act where it is possible to do so, and that this action must be sufficient to achieve compliance in the shortest possible time. Therefore, the question is not 'is it worthwhile to act?' but 'is this the best course of action, of the options available?' This is a more complex question to answer as it is not possible or reasonable to assess every possible course of action, or combination of actions. GM has used the evidence and tools it had available to develop a series of ambitious but feasible packages that seek to use all the measures considered deliverable and effective within the timescale to achieve our goal. We believe the GM CAP represents the best course of action to achieve compliance in the region in the shortest possible time.

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2.10.15 The second key difference is that the quantified benefits used in appraisal are better suited to schemes designed to deliver transport benefits. The core purpose of the GM CAP is to improve human health. The substantial reductions in NO_2 concentrations sooner than would be experienced without action, as well as reduced particulate matter emissions, will deliver real benefits for the people of Greater Manchester. But it is very difficult to put a value on this saving. We cannot know for sure how many lives will be saved, or how many visits to hospital or absences from work or school avoided, but we know it is many. We cannot put a value on the misery prevented, but it has value. A cleaner, healthier Greater Manchester will be better for everyone, making the region a more appealing place to live, work, visit and do business, but we cannot meaningfully quantify this. So we are better able to quantify the costs than the benefits of our scheme and cannot properly describe whether it represents 'Value for Money' using traditional methods.

2.10.16 One alternative method that can be usefully employed is to consider the efficiency with which the money spent on the different options reduces the level of NO_2 – where a greater volume of NO_2 reduction per pound spent represents a more efficient outcome and better Value for Money.

2.10.17 The primary aim of the GM CAP is to achieve compliance whereby NO_2 concentrations are below the EU Limit Value. It would be possible to implement a CAP which delivers compliance in terms of concentration levels but does not result in a significant change in total emissions. Every tonne of NO_2 emitted is damaging; and so this sort of efficiency analysis should take into account the total emissions savings relative to the costs incurred in delivering those savings – not just the exceedances reduced.

2.10.18 Table 2- 19 presents the abatement cost of NO_2 (£ per tonne) across all of the best-performing options. Note that abatement cost here refers to financial costs (implementation, operation and maintenance costs) only. Although the financial costs would include revenue savings, for the purpose of the analysis, the revenue savings have been excluded, therefore the abatement cost of NO_2 is very likely to be underestimated.

Table 2- 19: Abatement costs of NO_2 per tonne, present value 2018 prices

Policy	Total NO2 savings (tonnes) 2021-2030	Total Cost/NO2 savings (Appraisal period discounted)
Option 5(i)	10,912	£43,000 per tonne
Option 5(ii)	10,973	£42,700 per tonne
Option 8	11,274	£37,200 per tonne

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2.10.19 Option 8 achieves an abatement cost of £37,200 per tonne. This can be compared to the marginal abatement costs for road transport interventions presented in *Abatement cost guidance for valuing changes in air quality*[13] (Defra, 2013) which presents values ranging from approx. £24,000 to £79,000 per tonne, with an average price of £47,000 per tonne (2011 prices – approximately 11% lower than current prices) depending on the intervention.

2.10.20 Based on these values all the potential interventions provide an efficiency greater than the average of the schemes presented, and so provide a greater than average Value for Money.

Appendices

Appendix E1 – Economic Appraisal Methodology Report (EAMR)
Appendix E2 – The Economic Model
Appendix E3 – Distributional Impacts Report
Appendix EX – Equality Impacts Statement (EQIA)

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13 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/197898/pb13912-airquality-abatement-cost-guide.pdf

Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Financial Case

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Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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4 Financial Case

4.1.1 Since 2010 major urban areas in the UK, including the ten local authorities of Greater Manchester, have been in breach of the European Union Limit Values regarding levels of NO_2 as implemented through the Air Quality Standards Regulations (2010). These Regulations require the Secretary of State to develop and implement a national Air Quality Plan to achieve the relevant EU Limit Value within the "shortest possible time"[1].

4.1.2 As a result of the ClientEarth case in 2015, the UK Government was found to have produced inadequate plans and was directed by the UK Supreme Court to take action[2]. Subsequent defeats for the UK Government in the UK High Court on the basis of inadequate planning and action, in 2016[3] and 2018[4], have further emphasised the need for an improved approach.

4.1.3 Government Air Quality Plans[5] have subsequently required local authorities with persistent exceedances to undertake local action to consider the best option to achieve statutory NO_2 limit values in the "shortest possible time", and this Outline Business Case investigates the feasibility of possible interventions that form the Greater Manchester Clean Air Plan (GM CAP).

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[1] Department for Environment Food and Rural Affairs, Department for Transport, 'UK plan for tackling roadside nitrogen dioxide concentrations: Detailed plan: July 2017' (2017), available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017.

[2] * *R (On the Application of Client Earth) v Secretary of State for the Environment, Food and Rural Affairs* [2015] UKSC 28.

[3] *R (On the Application of Client Earth (No 2)) v Secretary of State for the Environment, Food and Rural Affairs* [2016] EWHC 2740.

[4] *R (On the Application of Client Earth (No 3) v (1) Secretary of State for the Environment, Food and Rural Affairs (2) The Secretary of State for Transport and (3) Welsh Ministers* [2018] EWHC 315.

[5] Department for Environment Food and Rural Affairs, Department for Transport, 'UK plan for tackling roadside nitrogen dioxide concentrations: Detailed plan: July 2017' (2017), available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

4.1.4 It is vital to improve air quality because of the effect air pollution has on the health of people living, working and travelling in Greater Manchester. The Greater Manchester Strategy states that Greater Manchester should be '*a place at the forefront of action on climate change with clean air and a flourishing natural environment*' including by '*improving air quality*'[6]. Greater Manchester's ten local authorities have chosen to take a regional wide approach to producing a GM CAP to complement other GM-wide strategies such as the existing GM Air Quality Action Plan[7] and GM Low-Emission Strategy[8].

4.1.5 The proposed GM CAP is a package of measures to address the NO_2 levels in Greater Manchester aimed at and achieving compliance in the "shortest possible time". Each of these elements is integral to the successful delivery of the GM CAP and protecting the health of the Greater Manchester population, and therefore these measures must to be considered as a whole package if compliance is to be achieved. The package comprises the following:

- **Clean Air Zone across Greater Manchester**
  - Phase 1: (assumed from 2021) buses, taxis, Private Hire Vehicles and Heavy Goods Vehicles (Clean Air Zone Category B)
  - Phase 2: (assumed from 2023) expanding to Light Goods Vehicles and minibuses (Clean Air Zone Category C)
- **Vehicle Renewal Schemes** – to provide an affordable incentive to dispose/retrofit vehicles
  - Clean Freight Fund, Clean Taxi Fund, Clean Bus Fund, Loan Finance
- **Electric Vehicle Infrastructure and Promotion**
- **Sustainable Journeys** – an extensive behaviour change programme of travel planning with schools, workplaces and individuals
- Supported by Local Authority and Greater Manchester Fleet Upgrades, a review of Parking Standards and Bus Capacity Network Planning.

4.1.6 Improving air quality and reducing emissions harmful to health is a key policy priority for Greater Manchester, and the measures proposed in the GM CAP will also be complemented by ongoing activity arising from existing investment decisions by TfGM to improve Greater Manchester's active travel and transport network.

[6] Greater Manchester Strategy: our people our place, available at: https://www.greatermanchester-ca.gov.uk/ourpeopleourplace

[7] Greater Manchester Air Quality Action Plan 2016-2021, available at https://www.greatermanchester-ca.gov.uk/media/1272/air-quality-action-plan-2016-21.pdf

[8] Greater Manchester Low-Emission Strategy, available at https://www.greatermanchester-ca.gov.uk/media/1276/low-emission-strategy-dec-2016.pdf

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Table 4- 1: A Summary of the Measures in the GM CAP

CAP Measure	
Clean Air Zone	Phase 1 of the Clean Air Zone (CAZ) is a Category B across the boundary of Greater Manchester in 2021, leading to a phase 2 CAZ Category C in 2023.
Local Authority and Greater Manchester Fleet Upgrade	Upgrade to the Local Authority and Greater Manchester family fleets to the lowest emission possible. This will include Local Authority-operated vehicles not planned to be compliant by 2021, including cars/vans, refuse collection vehicles, HGVs, contracted services and the Transport for Greater Manchester (TfGM) provided bus fleet.
Clean Freight Fund	Vehicle renewal schemes offering owners of older non-compliant vehicles in Greater Manchester an affordable incentive to swap/retrofit their vehicles, including vans and minibuses, Heavy Goods Vehicles and coaches.
Clean Taxi Fund	Vehicle renewal schemes offering owners of older non-compliant Private Hire Vehicles (PHVs) and Taxis in Greater Manchester an affordable incentive to swap/retrofit their vehicles.
Loan Finance	Offering vehicle owners/businesses the opportunity to upgrade their non-compliant vehicles to compliant vehicles either through a loan or subsidised lease.
Clean Bus Fund	Offering subsidies to retrofit existing Euro IV and V buses and a contribution towards the purchase of the cleanest buses, electric buses and electric bus charging infrastructure, prioritised on Air Quality (AQ) impact and commercial contribution (including the TfGM operated bus fleet).
EV Infrastructure and Promotion	300 additional rapid charging points (Dual Headed) across all ten districts of GM, including some for taxis/PHVs only and supporting communications delivering events, such as experience days, to showcase the benefits of Electric Vehicles and highlight the support available.
Sustainable Journeys	Workplace, school and personal travel planning to help people and businesses understand how they will be affected by the CAP and how best they can adapt.

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Table 4- 2: Measures identified but no financial ask from Joint Air Quality Unit (JAQU)

Measure	
Parking Standards and Local Authority Parking	Review of parking standards, conversion of long stay to short stay car parks and Local Authority and Greater Manchester Combined Authority (GMCA) staff parking.
Bus Capacity	Liaison with Bus Operators to understand which routes may have expected increase in demand to allow Bus Operators to plan increases in commercial services. Commitment to inform all Bus Operators through communication and marketing strategies.
Ongoing Improvements	A programme of investment in public transport and the highway network is planned and is, to the extent that funding is available, underway. Co-ordination with ongoing projects, work packages and business as usual to ensure air quality benefits are maximised.

4.2 Financial Case Introduction

4.2.1 This section sets out the overall Financial Case for the Greater Manchester Clean Air Plan (GM CAP). It outlines the initial indicative cost estimates and funding requirements to implement the GM CAP as well as outlining the ongoing financial support required over the life of the GM CAP.

4.2.2 The purpose of this Financial Case is to support the application to the Department for Environment, Food and Rural Affairs (DEFRA)/Joint Air Quality Unit (JAQU) Implementation Fund for Clean Air Zones to fund the GM CAP.

4.2.3 The costs for the GM CAP include implementation costs for all the Measures and the costs of their ongoing operation and maintenance. The financial case for GM CAP is modelled through to 2029.

4.3 Financial Assumptions

General

4.3.1 GMCA is assuming Central Government, via the JAQU Implementation and Clean Air Funds, will fund all costs relating to scheme implementation and DEFRA/JAQU will underwrite any net operational deficit, in so much as there is one, over the life of the scheme until compliance is achieved.

4.3.2 All of the Measures and funding proposed are required to achieve compliance with the EU Directive in the shortest possible time. The Measures are designed to complement each other and all are required to achieve the Air Quality benefits outlined in the economic case. Any reduction in individual elements within the programme will impact on the benefits outlined in the business case.

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4.3.3 For the purposes of this Financial Case it is assumed that the Local Authorities will delegate to the GMCA the necessary powers to act as the lead Contracting Authority subject to appropriate governance arrangements as specified by the Local Authorities. This permits the GMCA to appoint a Delivery Body to propose a procurement strategy for the development and implementation of the proposed GM CAP.

4.3.4 The operations for the GM CAP will be delivered by an Operating Body which will be defined during the development of the Full Business Case.

4.3.5 GMCA and the Greater Manchester districts do not have any financial resources to fund the implementation costs or the ongoing operational, maintenance, renewal or decommissioning costs of the Greater Manchester Clean Air Plan and are not currently bidding for other funding sources to provide support for implementation or ongoing operation and maintenance costs.

4.3.6 The financial model assumes all VAT associated with the GM CAP is recoverable and that the CAZ daily charges and penalty notices will not be subject to VAT.

Costs

4.3.7 At this stage in the OBC, the current forecast costs reflect a high degree of estimation and a degree of uncertainty. Scheme costs are estimated based on assumptions derived for other similar schemes and from market intelligence and/or market data as far as it is available.

4.3.8 The costs will be refined through the procurement process and the GM CAP design and development activities as the scheme progresses through to Full Business Case (FBC).

4.3.9 Costs are indexed in line with their relevant WebTAG (Transport Analysis Guidance) defined indexations. Staff wage costs are indexed at Average Wage Earnings and all other cost items with the Retail Price Index.

4.3.10 It is assumed that the CAZ infrastructure will be decommissioned two years after full compliance is forecast to be achieved in the Do Minimum scenario, as described in the strategic case. This allows for an additional year of operations after the Do Minimum compliance date in 2027 and for decommissioning in 2029.

4.3.11 None of the schemes have a Quantified Risk Assessment (QRA) included in the costs, as agreed with JAQU for the submission of this OBC; instead, schemes have an overall level of Optimism Bias/contingency applied on top of the base cost.

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4.3.12 Optimism Bias (OB) has been assessed for each GM CAP Measure (implementation and operational costs) in order to apply an appropriate OB level reflecting the current uncertainty in underlying cost assumptions and estimates. Therefore, each Measure may have different levels of OB applied to certain cost elements within the Measure. As the Measures progress towards FBC it is anticipated that these figures will change, risk-specific allocations (QRA) will be identified and revised levels of contingency allowances will be quantified as more cost certainty is achieved.

Revenue

4.3.13 There are several assumptions that underpin the revenue generation. However, there is a considerable amount of uncertainty in the assumptions since there is no CAZ currently in operation in the UK and therefore, the forecasts included in the financial model are indicative.

4.3.14 Scheme revenues are calculated from traffic model outputs. The traffic model assumptions are taken from similar schemes and modified to the local context. Local user responses to the implementation of a CAZ may differ from the forecast values. A sensitivity analysis will be carried out to test the impact of altering underlying assumptions.

4.3.15 There is no connectivity assumed with other cities' CAZ schemes, therefore, if a vehicle enters another city's CAZ on the same day, it is still assumed to incur a charge when entering the GM CAP zone.

4.3.16 Indicative daily charges, including penalty notices, have been assumed for modelling the scheme. It is assumed that the charge levels remain constant in nominal prices (i.e. £7.50 in 2021 and £7.50 in 2028); and therefore they reduce in real terms. The assumption not to inflate the CAZ charge over the life of the scheme is not anticipated to have a significant impact on compliance dates.

4.3.17 This assumption does not rule out increasing (or decreasing if it is deemed not to affect the air quality compliance date) the charges over the life of the scheme, as this will be included in the Charging Order. The initial charge will be defined following the consultation and additional behavioural modelling.

4.3.18 The charge is planned as a daily capped charge, therefore, non-compliant vehicles that have entered the CAZ more than once on the same date will only pay once.

4.3.19 No revenue is currently included in relation to Electric Vehicle membership schemes, however, this does not discount a charging scheme being introduced in the future.

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Financial Summary

4.3.20 The table below summarises the current forecast implementation and operational costs over the life of the scheme:

Table 4- 3: GM CAP cashflow summary, £m nominal prices

	Total	Funding
Implementation Costs	(256)	JAQU Clean Air Implementation Fund
Operational Costs	(174)	Scheme revenue or JAQU Clean Air Implementation Fund
Total	**(430)**	

4.3.21 Revenues generated by the scheme are expected to cover the operational costs, but there are significant risks to both the operational costs and revenue figures; these uncertainties will be better understood through the process of developing the FBC in order to provide more refined estimates.

4.3.22 In accordance with the Transport Act 2000, if surplus revenues are generated over the life of the scheme they will be invested back into transport-related schemes within GM. GM is currently developing sustainable travel schemes within the GM 2040 strategy, where the surplus revenues could be used to fund relevant schemes if this scenario became a possibility.

4.3.23 In accordance with JAQU guidance any surplus funds can also be allocated to schemes to compensate those that have been disproportionately impacted by the CAZ scheme implementation.

Implementation Costs

4.3.24 The funding requirement from DEFRA/JAQU to implement the GM CAP is currently forecast to be £256 million. Table 4- 4 summarises the costs (including the OB by scheme) by Measure and key cost drivers for the Measures:

Table 4- 4: Implementation cost summary including OB/contingency, £m nominal prices, total 2021-28

CAP Measure	Implementation Cost £m	Cost Drivers
Clean Air Zone	78	• Signs, Automatic Number-Plate Recognition (ANPR) cameras and associated installation costs • IT systems to manage the scheme and Penalty Charge Notices (PCN) process

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CAP Measure	Implementation Cost £m	Cost Drivers
		• Detail design work and marketing campaigns prior to scheme launch • Mobilisation and recruitment costs for staffing the scheme
Local Authority and Greater Manchester Fleet Upgrade	27	• Upgrade of non-compliant vehicles owned by the Districts to lowest emission possible, including all Local Authority operated cars/vans, refuse collection vehicles, HGVs
Clean Freight Fund	59	• Population of non-compliant vehicles • Amount allocated per vehicle
Clean Taxi Fund	28	• Population of non-compliant taxis and PHVs • Amount allocated per vehicle
Clean Bus Fund	30	• Population of non-compliant buses in Greater Manchester • Cost to retrofit buses, where possible
EV Infrastructure and Promotion	25	• Cost to buy and install 300 dual head rapid chargers
Sustainable Journeys	9	• Resource to deliver interventions • Costs are profiled from 2019 to 2028
Loan Finance	TBC	• This Measure is yet to be further defined, however, a general assumption for cost to administer a loan scheme is c1% of the loan book value
Total	**256**	**Excludes Loan Finance Cost**

4.3.25 At the OBC stage there are a number of uncertainties around the cost estimates as outline design works and supplier engagement have not yet commenced. Additionally, no singular scheme currently exists to provide a basis for costing estimates.

4.3.26 Due to the current scheme design stage the cost forecasts use OB levels recommended by the Department for Transport's (DfT) WebTAG guidance to quantify risk and contingency allowances. As design and market engagement progresses, the levels of OB will be reduced and specific quantified risk allowances will be included as the confidence around cost assumptions increases.

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4.3.27 DfT's WebTAG guidance recommends OB levels for roads projects of 44% at the Strategic Outline Business Case stage and 15% at the Outline Business Case stage. For IT projects, 200% is recommended at SOBC stage with no specific recommendation for the OBC.

4.3.28 The above schemes include a level of OB/contingency depending on the certainty of the cost estimates. Table 4-5 summarises the level of OB/contingency applied by scheme, and the justification.

Table 4- 5: Implementation costs effective OB, £m nominal prices, total 2021-28

CAP Measure	OB Cost £m	Effective Rate	Justification
Clean Air Zone	23	41%	A blended rate to cover costs with more certainty such as recruitment, design feasibility at 15% and systems implementation uncertainty at 200% (this is in line with WebTAG for IT schemes at SOBC stage).
Local Authority and Greater Manchester Fleet Upgrade	1	15%	A blended rate to cover supplier costs and resource to implement the measure.
Clean Freight Fund	0	0%	OB contained within assumptions around cost per vehicle as opposed to overlaying a specific percentage across all costs.
Clean Taxi Fund	0	0%	OB contained within assumptions around cost per vehicle as opposed to overlaying a specific percentage across all costs.
Clean Bus Fund	4	15%	In line with DfT WebTAG for road schemes at OBC stage. Costs for retrofitting a bus are tendered prices from previous TfGM schemes.
EV Infrastructure and Promotion	3	15%	In line with DfT WebTAG for road schemes at OBC stage. Costs for installing infrastructure are prices from previous TfGM schemes.
Sustainable Journeys	1	15%	In line with DfT WebTAG for road schemes at OBC stage. Costs are mainly staff-related based on TfGM staff banding.
Total	**32**		

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4.4 Operational Costs

4.4.1 There are two Measures in the GM CAP that will incur operational and maintenance (O&M) costs post-implementation (this does not currently include the ongoing operational costs to administer a Loan Finance scheme):

- The CAZ; and
- EV Infrastructure and Promotion.

4.4.2 Based on initial indicative financial costings the table below summarises the operational costs to 2028 and the key cost drivers.

Table 4- 6: O&M cost summary including OB/contingency, £m nominal prices, total 2021-28

CAP Measure	Operational Cost £m	Cost Drivers
Clean Air Zone	163	• Staff to recover PCN charges • Office costs and IT systems • ANPR camera and sign maintenance • Mobile enforcement units • Decommissioning costs
EV Infrastructure and Promotion	11	• Ongoing maintenance of the charge points • Electricity costs are assumed to be recovered from user.
Total	**174**	

4.4.3 The table below summarises the level of OB/contingency applied to the operational costs by scheme and the justification.

Table 4- 7: Operations and maintenance effective OB

CAP Measure	OB Cost £m	Effective Rate	Justification
Clean Air Zone	39	32%	A blended rate to cover costs with more certainty such as recruitment, design feasibility at 15% and systems implementation uncertainty at 200% (this is in line with WebTAG SOBC).
EV Infrastructure and Promotion	1	15%	In line with DfT WebTAG for road schemes.
Total	**40**		

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Revenue

4.4.4 The Clean Air Zone Measure of the GM CAP is the only Measure assumed to generate revenue.

4.4.5 The value of the daily charges and PCNs will be finalised through the consultation, and therefore, the current forecast revenues presented here are subject to subsequent change as the business case develops.

4.4.6 Revenue will be generated as vehicles not complying with the minimum Euro Standard requirements defined in the respective Clean Air Zones, will have the daily charge levied on them.

4.4.7 Table 4-8 provides a summary of the current indicative estimates of CAZ Measure revenues by vehicle type using the current assumed charges (daily and PCN) per vehicle.

4.4.8 Indicative charges (daily and PCNs) have been assumed for modelling the scheme. The charging and penalty levels are assumed to stay constant in real terms and are not inflated with any indexation in the financial modelling (i.e. £7.50 in 2021 and £7.50 in 2028). The assumption not to inflate the CAZ charge over the life of the scheme is not anticipated to have a significant impact on compliance dates.

Table 4- 8: GM CAP revenue summary, £m nominal prices, total 2021-28

Vehicle Type	Standard CAZ Charge £m	Penalty Charge Notice £m	Total £m
LGV	48	19	67
HGV	141	11	152
Hackney Carriages and PHVs	30	12	42
Total	**219**	**42**	**261**

4.4.9 The implementation costs, as presented in Table 4- 3, are assumed to be fully funded by the Clean Air Zone Implementation Fund. The GM CAP operations are expected to generate a net surplus over the first six years, with the final two years operating at a net loss

4.4.10 A CAZ reserve fund will be established from the forecast surpluses in net revenues in the earlier years of the scheme to be ring-fenced to fund the later years' operating losses.

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4.4.11 If over the life of the scheme it generates an operational loss (i.e. cumulative net revenues are lower than cumulative operating costs), then it is assumed that DEFRA/JAQU via the Clean Air Zone Implementation Fund (or other relevant Central Government funding streams) will underwrite the net loss.

4.4.12 If the scheme generates an operational surplus (i.e. cumulative net revenues are higher than cumulative operating costs), then in accordance with the Transport Act 2000, these will be invested back into transport-related schemes within GM. GM is currently developing sustainable travel schemes within the GM 2040 strategy, where the surplus revenues could be used to fund relevant schemes if this scenario became a possibility.

4.4.13 In accordance with JAQU guidance any surplus funds can also be allocated to schemes to compensate those that have been disproportionately impacted by GM CAP implementation.

Overview of Scheme Measures

4.5 Clean Air Zone

Cost Assumptions

4.5.1 At this stage in the OBC, the current forecast costs reflect a high degree of estimation and are open to a degree of uncertainty; the costs will be further refined throughout the FBC process.

4.5.2 Where available, costs have been estimated using local information and local data. Some of the costs were derived from per item cost estimates and a forecast of the number of assets (including ANPR cameras, signage and mobile enforcement units) required, based on the estimated CAZ area.

4.5.3 Assumptions on how the major cost headings have been estimated are summarised in Table 4- 9

Table 4- 9: CAZ cost assumptions

Cost category	Description
Project management	• Staff to oversee the implementation of the scheme • An estimate of 10% of implementation costs was used for the project management costs. This is in line with other TfGM projects for schemes at this level of design and will be updated with a bottom up assessment as the scheme progresses towards FBC.
Mobilisation	• As part of the scheme mobilisation, staff will be recruited and trained to be ready for go-live date. • Some resources are assumed to be in place before the start of operations such as managers, supervisors, and junior officers.

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Cost category	Description
	• A recruitment cost, accounting for the costs of the recruitment process and IT supply, is included.
Signs	• An analysis of the road network was undertaken to assess sign placement. • The scheme assumes a number of signs are required on the key route network, A roads and B roads. The exact amount will be refined for the FBC. • Costs associated with sign implementation and maintenance from other schemes were used.
ANPR cameras	• An analysis of the road network was undertaken to assess camera placement required to capture all non-compliant vehicles. • Further detailed design work to understand the exact mix of fixed and mobile cameras will be completed for the FBC. • Cost associated with camera implementation and maintenance from other schemes was used. This high-level cost includes power supply and communications.
AQ monitoring implementation	• Based on JAQU guidance, the costs of the initial installation of additional AQ monitoring sites across Greater Manchester and their continual monitoring is costed. • A number of diffusion tubes will be placed on existing infrastructure. These low cost tubes will be replaced on a monthly basis. • Cost includes installation of tubes, collection and analysis.
Charge and PCN issuance	• JAQU has advised that a national backend system reviewing ANPR data for non-compliant vehicles will be provided. JAQU have requested that 5% of CAZ charge revenue is included as a proxy to estimate the cost for this service. This is yet to be agreed. • The CAZ operator will be responsible for the PCN process. This process will incur non-staff operational costs associated with matching vehicle registration to owner data and issuing penalty notices. Costs from other schemes have been used. • An IT backend system will also be required to administer this process. Implementation and operational cost have been forecast from estimates for other schemes. • There remains significant uncertainty surrounding the timing and cost interface of the CAZ system with JAQU's national backend system. Due to this level of uncertainty we have applied a figure of 200% OB against the development costs.
Staff costs	• The primary staff requirement is related to the PCN process. • Rates of handling PCN reviews, representations and appeals are assumed in defining the number of staff required. The staff estimates include managers and supervisors.

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Cost category	Description
Mobile enforcement	• Mobile enforcement units will be used to assist in enforcing the CAZ across Greater Manchester; as placing ANPR cameras on all roads throughout the zone is not currently considered to represent good value for money. • The mobile enforcement units will be staffed to run in shift patterns with gradually decreasing hours as the number of non-compliant vehicles in the Greater Manchester vehicle fleet decreases. • Capital and operational costs are currently forecast at a high level and will be refined with continued analysis.
Marketing and communications	• The TfGM marketing and communication teams have performed an assessment of the costs required for consultation, a pre-implementation campaign and continued operational marketing campaigns during the CAZ's operation.
Overhead	• Costs associated with back office functions such as HR, finance, legal and insurance are forecast using per employee figures sourced from other operations. • Office costs are assumed on a per employee level for serviced office space to allow for the flexibility of staff levels associated with the declining fleet proportion of non-compliant vehicles and the associated CAZ operations that they incur.
Decommissioning	• Cost forecasts from a per item cost build up, which includes sign and ANPR removal and IT system decommissioning.

Revenue Assumptions

4.5.4 Charging CAZ schemes are based on charging a fee to enter or move around within the zone for vehicles that do not meet the required emission standards.

4.5.5 It is currently assumed that the CAZ is the only Clean Air Plan Measure that may generate revenues. The GMCA recognises the DEFRA guidance noted below and has adhered to this principle when modelling the charge levels, both daily and PCNs.

"Local authorities should not set the level of charge as a revenue raising measure. The Transport Act 2000 requires any excess revenue that may arise from charges above the costs of operation to be re-invested to facilitate the achievement of local transport policies and these should aim to improve air quality and support the delivery of the ambitions of the zone, while ensuring this does not displace existing funding. Such charges may not be used as a form of taxation to raise revenue generally."

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4.5.6 The level of the charges modelled reflects the assumption of value required to change behaviours and **not** to generate revenue. The behavioural response of users' actions following the introduction of a charging CAZ was estimated based on a stated preference survey data modified to be applicable to the Manchester context.

4.5.7 The principal drivers of revenue will be:

- using a non-compliant vehicle within the GM boundary
- the daily charge for the non-compliant vehicle; and
- income received from PCNs due to non-payment of the daily charge.

4.5.8 To allow owners of non-compliant vehicles an opportunity to prepare for the introduction, a Clean Air Zone deferred ('sunset') period for LGVs will be applied to 2023, when a CAZ C will become operational across the GM boundary.

4.5.9 There will be some form of whitelisting criteria which will allow certain non-compliant vehicles to be exempt from the daily charge. This set of criteria is yet to be defined and therefore is not reflected in a reduction of the current forecast revenues.

4.5.10 Table 4- 10 details the proposed daily charges by vehicle type and the PCN by vehicle type. These are indicative charge levels which will be finalised after the consultation and in preparation for the FBC submission.

Table 4- 10: Non-compliant vehicle CAZ charges

	CAZ charge	Full PCN
Taxi	7.50	120.00
LGV	7.50	120.00
HGV	100.00	120.00
Bus/coach	100.00	120.00

4.5.11 A Penalty Charge Notice is a notice that offers an alleged offender the opportunity to pay a fine, in which case the matter is not prosecuted, saving time and expense. The alleged offender has the option to refuse and be charged with the offence. Penalty Charge Notices will be issued to users who do not pay the daily CAZ charge within a pre-determined timeframe. These users will be subject to a PCN, which if paid within 14 days will be subject to a 50% discount.

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4.5.12 In the financial business case it is assumed that all PCNs issued, whether paid within the discount period or after, will comprise payment of the original CAZ daily charge in addition to the PCN. For example, an HGV paying the PCN within 14 days will pay the discounted PCN of £60 **and** the original CAZ charge of £100.

4.5.13 The CAZ daily charges are set at different levels for different vehicle types to reflect the contribution each type of vehicle model contributes to air pollution. The aim is that vehicles with the highest emissions are incentivised to comply with the standard. For example, while LGVs make up the majority of the traffic, they make a smaller contribution to air pollution on a per vehicle basis, hence they have been allocated a lower charge level.

4.5.14 It is assumed that the CAZ daily charge levels remain constant in nominal prices (i.e. £7.50 in 2021 and £7.50 in 2028); and therefore they reduce in real terms.

4.5.15 The charge is planned as a daily capped charge, therefore, non-compliant vehicles that have entered the CAZ more than once on the same date will only pay once.

4.5.16 Based on data from other schemes, the OBC includes the following assumptions about penalty charges:

- rate of unpaid daily charges that receive a PCN is 5%;
- rate of PCN paid is 70%;
- rate of PCNs paid within discount time period is 80%; and
- 30% of PCNs go unpaid. Non-payment includes vehicles that do not have correct ownership details, as well as charges that successfully represent or appeal their case and have the penalty charge notice reversed. No revenue is assumed to be collected from either.

4.5.17 The table below summarises the overall operational cost (Opex) and revenue over the life of the CAZ.

Table 4- 11: Summary of Ongoing Financial Operations Over Life of CAP

	Opex £m	Revenue £m	Net Total £m
GM CAP	(174)	261	**87**

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Local Authority and Greater Manchester Fleet Upgrade

4.5.18 The Local Authority Fleet Upgrade will upgrade the Local Authority and Greater Manchester family fleets to the lowest emission possible. This will include all Local Authority operated cars/vans, refuse collection vehicles, HGVs, contracted services and the TfGM provided bus fleet.

Table 4- 12: Local Authority and GM Fleet Upgrade cost

CAP Measure	Implementation Capital Funding £m	Implementation Revenue Funding £m	Total Implementation Funding £m
Local Authority and Greater Manchester Fleet Upgrade	27	-	27

VEHICLE RENEWAL SCHEMES

Clean Freight Fund

4.5.19 The establishment of a Clean Freight Fund will offer local small and micro businesses, sole traders and the voluntary sector, registered in Greater Manchester, a contribution towards the cost of acquiring a compliant commercial vehicle when scrapping a non-compliant vehicle or towards the cost of retrofitting to make the vehicle compliant.

4.5.20 Priority for funding will be based primarily on air quality impact such that the most polluting vehicles can be targeted.

4.5.21 The vehicles to be covered by this fund are as follows:

- Light Goods Vehicles and minibuses
- Heavy Goods Vehicles and coaches

4.5.22 The fund is expected to target the most polluting vehicles from the roads and replace them with cleaner vehicles.

4.5.23 Depending on the vehicle, the fund will offer either a value for their current non-compliant vehicle to act as a contribution to upgrade to a compliant vehicle, or a contribution to installing a retrofitted solution to their current vehicle.

4.5.24 Further work is required between OBC and FBC to test the assumptions on the value per vehicle, the upgrade premium and the likely uptake of the Clean Freight Fund.

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4.5.25 Within each fund there is an assumption that 5% of the fund value is required to administer the process. The administration will cover staff, disposing of the non-compliant vehicles, IT systems to record and process payments, operational overheads and the cost of premises.

4.5.26 The OBC financial case assumes that the most polluting vehicles are targeted first whilst providing support to the most vulnerable groups.

Clean Taxi Fund

4.5.27 The Clean Taxi Fund will offer Greater Manchester Registered taxis and private hire drivers support to upgrade their non-compliant vehicles.

4.5.28 The establishment of a Clean Taxi Fund will offer taxi and private hire drivers a contribution to the purchase of a compliant vehicle from an approved supplier when trading in a non-compliant vehicle. It will also provide a contribution for the retrofitting of taxis.

4.5.29 The scheme will only be open to vehicles and drivers licensed within GM. Over the past three years, the number of licences has been falling; it is believed that this reflects the increasing tendency for drivers to license out of region but operate within the region. It is likely that the introduction of the Clean Air Zone – which will offer better terms including access to this vehicle renewal scheme – will reverse this trend.

4.5.30 Across all the Clean Taxi Fund, further work is required between OBC and FBC to test the assumption on the value per vehicle, the upgrade premium and the likely uptake of the Clean Taxi Fund.

Table 4- 13: Vehicle Renewal Schemes Cost Summary

CAP Measure	Implementation Capital Funding £m	Implementation Revenue Funding £m	Total Implementation Funding £m
Clean Freight Fund	-	59	59
Clean Taxi Fund	-	28	28
Vehicle Renewal Total	**-**	**87**	**87**

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Loan Finance

4.5.31 In order to further assist groups who may be adversely affected by the implementation of charging in the Clean Air Zone, a Loan Finance scheme is being developed. In the preferred option the groups who will be adversely affected will include:

- LGV operators wanting to upgrade to new compliant vehicles from recognised/approved dealers;
- HGV operators wanting to upgrade to new compliant vehicles from recognised/approved dealers;
- Private Hire Vehicle owners wanting to upgrade to an EV or compliant vehicle; and
- Hackney carriage owners wanting to upgrade to an EV or compliant vehicle.

4.5.32 In additional to centrally funded Clean Freight/Taxi funding, the GMCA in accordance with the GM Combined Authority Order 2011, is assessing the possibility of defining and providing a supporting Measure which will be to provide loans at preferential rates for those who are taking advantage of the Clean Freight/Taxi funding schemes. This could be through a loan for a vehicle, or subsidy of a lease plan. The exact design and criteria will have to be determined at FBC stage following consultation with those affected.

4.5.33 For the purpose of this draft Measure it is assumed that Bus Operators will be out of scope for any preferential loans as they will be eligible to apply for funding from the Clean Bus Fund scheme.

4.5.34 The key principles for this Measure are as follows:

- GMCA can borrow money at lower rates through organisations such as the Public Works Loan Board, and the Treasury, than banks accessing capital markets;
- if GMCA chooses to lend/subsidise the capital to people/businesses of GM it may become a financially attractive proposition to an individual or business;
- GMCA would underwrite the loans and therefore be exposed to risk of default;
- a Financial Conduct Authority regulated third party would be required to administer the scheme and make the loan to customer;
- the loan would be secured against the vehicle purchased or leased;
- the loan finance or an alternative arrangement would need to be compliant with Islamic Finance rules to ensure equality;

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- the expectation is that DEFRA/JAQU would fund the administration and arrangement fees; typical costs for this might be 1% of loan book value. This cost is **not** currently included in the funding request to JAQU.

4.5.35 The cost, delivery and operation of the Loan Finance scheme will be further developed throughout the process of the FBC.

Clean Bus Fund

4.5.36 There are currently around 2,000 buses in the Greater Manchester fleet. The Clean Bus Fund will offer subsidies to retrofit the majority of existing Euro IV and V buses with flexibility for the move to an EV bus network, via financial assistance towards charging infrastructure, prioritised on Air Quality benefits and commercial contribution. Buses that are not eligible for retrofit will require the market to identify a solution.

4.5.37 The cost to retrofit an individual bus is around £20,000 and it is estimated therefore that a fund of approximately £30 million is required to retrofit the bus fleet, including costs to administer the scheme.

4.5.38 Whilst the retrofit option is a relatively inexpensive way to achieve compliance, it does not fit with the Greater Manchester longer-term strategy or the 2040 ambition to have a zero emission bus fleet.

4.5.39 The table below summarises a range of options GM would like to discuss further in order to meet the 2040 ambition:

Table 4- 14: Potential Future Funding Requirements

Option Description	Value £m
Replace all non-compliant buses (Pre-Euro VI) with Electric Vehicles and upgrade essential infrastructure to maintain an electric fleet	725
To retrofit all non-compliant Euro V buses up to 10 years old (c.610 buses) and to purchase new Diesel Euro VI for the remainder (c.1,190 buses)	240
Replacing 700 buses (Euro III-IV) with Euro VI compliant diesel vehicles and retrofit the remaining (Euro V) c.900 buses	130

4.5.40 The Mayor of Greater Manchester has pledged that Greater Manchester will have a zero emission bus fleet as part of GM's ambition to meet greenhouse gas targets. Greater Manchester has also signed a declaration of intent to move to a zero emission bus fleet as soon as and wherever possible.

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Table 4- 15: Clean Bus Fund Measure cost

CAP Measure	Implementation Capital Funding £m	Implementation Revenue Funding £m	Total Implementation Funding £m
Clean Bus Fund	-	30	30

Electric Vehicle Infrastructure and Promotion

4.5.41 Funds that incentivise people and business to upgrade their vehicles will encourage consideration of less polluting vehicles. When deciding whether to purchase an Electric Vehicle, one of the considerations will be the practicality of being able to charge and park the vehicle. The Electric Vehicle Infrastructure and Promotion initiative will deliver 300 additional rapid charging points (Dual Headed) across Greater Manchester, including some for taxis/PHVs only.

4.5.42 Chargers will be deployed across all 10 districts of Greater Manchester to create a comprehensive network. This will provide 27 dual chargers in each district with an additional 30 dual chargers in the regional centre to account for use by taxis and increased travel demand.

4.5.43 The key implementation costs for this workstream are based on benchmarks from the Centre for Excellence for Low Carbon and Fuel Cell Technologies and from similar programmes that TfGM has delivered.

4.5.44 The implementation costs include the following:

- Purchase, installation and connectivity to the grid of the Electric Vehicle rapid chargers
- Traffic Regulation Orders and project costs to manage the implementation
- Communication and marketing campaigns will be used to highlight the benefits of Electric Vehicles and the support available to businesses and local residents. The costs for these are based on similar campaigns TfGM has delivered

4.5.45 Once the infrastructure is operational there will be annual costs of around £1 million per annum to cover the following:

- Maintenance and repairs of the infrastructure
- Staff costs to operate the infrastructure and engage with the customers

4.5.46 No revenue is currently included in relation to Electric Vehicle membership schemes, however, this does not discount a charging scheme being introduced in the future.

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Table 4- 16: EV infrastructure and promotion fund cost

CAP Measure	Implementation Capital Funding £m	Implementation Revenue Funding £m	Total Implementation Funding £m
EV Infrastructure and Promotion	24	1	25

Sustainable Journeys

4.5.47 The changes that will be made in Greater Manchester are likely to be disruptive for some people. Helping people and businesses to understand how they will be affected and how best they can adapt will be an important part of implementing a Clean Air Plan.

4.5.48 Key activities within this workstream are the provision of:

- Extensive support for sustainable travel plans that individuals and organisations will be given, through one-to-one contact. The cost for this is based on costs TfGM have incurred for smaller scale interventions.
- Specific grants to help businesses improve their sustainable modes of transport for employees, such as installing cycling infrastructure at the place of work. The actual amount of grants awarded will be different, business by business, depending on the scale of infrastructure required.
- Staff/other resources required to go directly to businesses to discuss and advise on sustainable freight practices; and staff/other resources required to go directly into schools and advise on sustainable interventions for students, parents and staff about their journeys to and from school.

Table 4- 17: Sustainable journey measure cost

CAP Measure	Implementation Capital Funding £m	Implementation Revenue Funding £m	Total Implementation Funding £m
Sustainable Journeys	-	9	9

Funding

4.5.49 There are three main funding sources for the implementation of Clean Air Zones. These are:

- A £255 million Implementation Fund - this is designed to support local authorities in the planning and delivery of targeted action to improve air quality.

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- A £220 million Clean Air Fund - an opportunity for local authorities to implement additional Measures tailored to their area which minimise the potential impact of local air quality plans - either by enabling the local authority to implement local plans that collectively impact on fewer people, or by providing direct support to those impacted.
- Revenue from CAZ charges - funding will become available from the charges that are applied to each CAZ. It is intended this will fund ongoing operations and the decommissioning cost at the end of the programme.

4.5.50 The Greater Manchester Clean Air Plan is submitting the OBC as an application to the Implementation Fund on the assumption that all of the Measures outlined in the case are required to bring forward compliance in the quickest possible time frame.

4.5.51 Any reduction in individual elements within the programme will impact on the benefits outlined in the business case.

Other Funding Sources Contributing to the Clean Air Plan

4.5.52 In addition to the funding request to JAQU within this business case, TfGM is in the process of bidding, or has secured other funding that will contribute to the GM CAP as follows:

- Early Measures Fund - this is expected to support small, ambitions and good value early Measures to improve air quality and start to reduce concentrations in Clean Air Zone. TfGM were successful in in being awarded £3 million to support the early roll-out of 25 Electric Vehicle rapid chargers.
- Ultra-Low Emission Bus Fund - TfGM were successful in securing £5 million for 23 electric buses and associated infrastructure.
- Transforming Cities Fund - £160 million has been secured to provide cycling and walking infrastructure to the standards outlined within the Cycling and Walking Commissioner's 'Made to Move' report.
- ULEV Taxi Infrastructure - TfGM has been successful in securing around £2 million to install 80 rapid chargers to encourage taxis to switch to Ultra-Low Emission Vehicles.
- ULEV Bus Fund - TfGM has been successful in securing around £4 million to support the electrification of buses, including infrastructure.
- Clean Bus Technology Fund - £3 million has been secured to retrofit approximately 170 buses.

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- Highways England Air Quality Designated Fund - TfGM will work with Highways England to make progress on reducing the Strategic Road Network's impact on air quality to support wider government initiatives through accessing this fund.

Key Sensitivities

4.5.53 A series of sensitivity tests has been run to test the scheme's financial stability. The assumptions that were tested were selected due to their relative uncertainty, their sensitivity to change and their ability to impact cash flows

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Table 4- 18: Sensitivity test results

Sensitivity test	Description	Impact
HGV daily charge reduced	HGV charges are initially proposed at £100 per day. It is noted that while other CAZs have initially proposed this figure they have subsequently lowered the HGV daily charge to £50. This lower charge level was tested.	As would be expected, lowering the HGV charge to £50 has a significant impact on scheme revenue, reducing the top line by £73m (28%). The lower revenue results in a greater operating loss in the final years of the scheme and would require an increased build up of the sinking fund during initial scheme years. CAZ daily charges are currently set to influence behavioural change and not generate revenue; these will be reviewed in line with the development of the FBC.
Capex and Opex increase	Cost estimates are currently in varied levels of certainty. Costs were increased by 20% to assess impacts on implementation and operating costs.	Capex increased by £34m, less than 15% overall as Clean Incentive Fund values were considered fixed. Opex also increased by £29m, resulting in operating margin reducing by 33% to £59m. The increase in opex will require a greater build-up of the sinking fund as operating losses in the final two years of operation exceed the forecast fund value by £4m.
Daily Charge Avoidance	A sensitivity on charge avoidance was undertaken to assess the impact on operating profit. It was assumed that 10% of non-compliant vehicles avoided the charge.	The impact of flexing Clean Air Zone charging compliance, reduced the operating margin by £19m to £67m. Although a substantial figure, this did not have a significant impact on the cash flow position to the extent that it would adversely impact the scheme as a going concern.
Combined low	The above scenarios were tested in multiple combinations to assess combined low scenarios.	The combined impact of lower HGV charges and higher operating cost, results in the scheme incurring a net operating loss over the forecast operational period. This scenario would require ongoing subsidy from JAQU for the scheme to remain operational post 2026.
Capex and Opex OB reduced	The OB levels were lowered to 15% for all cost items where they were in excess of this level. OB for the IT backend system was lowered from 200% to 100%.	The lowering of OB levels reduced implementation costs by £13m (5%) and operating costs by £20m (11%).

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4.5.54 The sensitivity tests indicate that the GM CAP would incur an operational loss if the implementation of a lower HGV CAZ charge is accompanied by moderate increases in operational cost. As the scheme progresses toward Full Business Case, vehicle CAZ charge and operational cost assumptions will mature. It is anticipated that these figures will be further tested throughout the development of the FBC.

4.5.55 The level of the charges modelled reflects the assumption of value required to change behaviours and **not** generate revenue. The behavioural response of users' actions following the introduction of a charging CAZ was estimated based on stated preference survey data modified to be applicable to the Manchester context.

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Management Case

Draft for Approval

Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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5 Management Case

5.1 Outline Business Case Introduction

5.1.1 Since 2010 major urban areas in the UK, including the ten local authorities of Greater Manchester, have been in breach of the European Union Limit Values regarding levels of NO2 as implemented through the Air Quality Standards Regulations (2010). These Regulations require the Secretary of State to develop and implement a national Air Quality Plan to achieve the relevant EU Limit Value within the "shortest possible time"1.

5.1.2 As a result of the ClientEarth case in 2015, the UK Government was found to have produced inadequate plans and was directed by the UK Supreme Court to take action[2]. Subsequent defeats for the UK Government in the UK High Court on the basis of inadequate planning and action, in 2016[3] and 2018[4], have further emphasised the need for an improved approach.

5.1.3 Government Air Quality Plans[5] have subsequently required local authorities with persistent exceedances to undertake local action to consider the best option to achieve statutory NO_2 limit values in the "shortest possible time", and this Outline Business Case investigates the feasibility of possible interventions that form the Greater Manchester Clean Air Plan (GM CAP).

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[1] Department for Environment Food and Rural Affairs, Department for Transport, 'UK plan for tackling roadside nitrogen dioxide concentrations: Detailed plan: July 2017' (2017), available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017.

[2] *R (On the Application of Client Earth) v Secretary of State for the Environment, Food and Rural Affairs* [2015] UKSC 28.

[3] *R (On the Application of Client Earth (No 2)) v Secretary of State for the Environment, Food and Rural Affairs* [2016] EWHC 2740.

[4] *R (On the Application of Client Earth (No 3) v (1) Secretary of State for the Environment, Food and Rural Affairs (2) The Secretary of State for Transport and (3) Welsh Ministers* [2018] EWHC 315.

[5] Department for Environment Food and Rural Affairs, Department for Transport, 'UK plan for tackling roadside nitrogen dioxide concentrations: Detailed plan: July 2017' (2017), available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

5.1.4 It is vital to improve air quality because of the effect air pollution has on the health of people living, working and travelling in Greater Manchester. The Greater Manchester Strategy states that Greater Manchester should be 'a place at the forefront of action on climate change with clean air and a flourishing natural environment' including by 'improving air quality'6. Greater Manchester's ten local authorities have chosen to take a regional wide approach to producing a GM CAP to complement other GM-wide strategies such as the existing GM Air Quality Action Plan7 and GM Low-Emission Strategy8.

5.1.5 The proposed GM CAP is a package of measures to address the NO2 levels in Greater Manchester aimed at and achieving compliance in the "shortest possible time". Each of these elements is integral to the successful delivery of the GM CAP and protecting the health of the Greater Manchester population, and therefore these measures must to be considered as a whole package if compliance is to be achieved. The package comprises the following:

- Clean Air Zone across Greater Manchester
  - Phase 1: (assumed from 2021) buses, taxis, Private Hire Vehicles and Heavy Goods Vehicles (Clean Air Zone Category B)
  - Phase 2: (assumed from 2023) expanding to Light Goods Vehicles and minibuses (Clean Air Zone Category C)
- **Vehicle Renewal Schemes** – to provide an affordable incentive to dispose/retrofit vehicles
  - Clean Freight Fund, Clean Taxi Fund, Clean Bus Fund, Loan Finance
- Electric Vehicle Infrastructure and Promotion
- **Sustainable Journeys –** an extensive behaviour change programme of travel planning with schools, workplaces and individuals
- Supported by Local Authority and Greater Manchester Fleet Upgrades, a review of Parking Standards and Bus Capacity Network Planning.

5.1.6 Improving air quality and reducing emissions harmful to health is a key policy priority for Greater Manchester, and the Measures proposed in the GM CAP will also be complemented by ongoing activity arising from existing investment decisions by TfGM to improve Greater Manchester's active travel and transport network.

6 Greater Manchester Strategy: our people our place, available at: https://www.greatermanchester-ca.gov.uk/ourpeopleourplace

7 Greater Manchester Air Quality Action Plan 2016-2021, available at https://www.greatermanchester-ca.gov.uk/media/1272/air-quality-action-plan-2016-21.pdf

8 Greater Manchester Low-Emission Strategy, available at https://www.greatermanchester-ca.gov.uk/media/1276/low-emission-strategy-dec-2016.pdf

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5.2 Management Case Introduction

5.2.1 This Management Case forms part of the Outline Business Case (OBC) and sets out the approach to the delivery of the proposed Greater Manchester Clean Air Plan (GM CAP). The purpose of the Management Case is to provide confidence that robust arrangements are in place for the delivery of the proposed GM CAP. In line with UK Government's Joint Air Quality Unit (JAQU) guidance[9], the Management Case builds on the Strategic Outline Case (SOC) by making recommendations about the optimal solutions relating to the following:

- governance structure;
- management arrangements;
- a project plan;
- arrangements for consultation and engagement with a wide range of stakeholders;
- risk management and mitigation; and
- a monitoring and evaluation plan

5.2.2 Transport for Greater Manchester (TfGM) has been co-ordinating the development of the proposed GM CAP on behalf of the ten Greater Manchester local authorities and the Greater Manchester Combined Authority (GMCA) under the statutory powers in relation to Air Quality and in accordance with the Greater Manchester Combined Authority Order 2011. Under the Greater Manchester Combined Authority Order, the powers of the ten Greater Manchester authorities in relation to specific sections only of the Environment Act 1995 are exercisable by the GMCA concurrently with the ten authorities. Section 101 of the Local Government Act 1972 and Section 19 of the Local Government Act 2000 enable the GMCA to sub-delegate activity and decisions to TfGM. The ten local authorities and TfGM have a history of collaboration across a range of policy areas and the delivery of major programmes. TfGM will be the central Delivery Body for the GM CAP throughout the development of the Full Business Case (FBC) and the delivery of the GM CAP, and will act as the contracting authority for any contracts required to be put in place. Further detail can be found in sections 5.3 and 5.12.

5.2.3 The development of the GM CAP has been directed by a Steering Group containing senior representatives from each of the ten local authorities, GMCA, Public Health England (PHE), Highways England and JAQU. This partnership working will continue throughout the detailed design, implementation and operation of the proposed GM CAP. TfGM has also worked closely with JAQU on behalf of the Steering Group to coordinate the activities to define and implement the GM CAP.

[9] Department for Environment Food and Rural Affairs, Department for Transport, *UK plan for tackling roadside nitrogen dioxide concentrations: Detailed plan: July 2017* (2017), available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

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5.2.4 The GM CAP Programme comprises a suite of projects and work packages that will be implemented across Greater Manchester that will endeavour to deliver changes in process, organisation, technology and information management, to achieve compliance for NO_2 reduction in line with the requirements of EU Limit Value contained in **Directive** 2008/50/EC[10]. This Programme will be delivered within TfGM's Air Quality and Environment Portfolio.

5.2.5 Further details of the projects and work packages which form the Programme including an overview of costs, risks and dependencies, are provided in Appendix O.1.1.

5.2.6 It is anticipated that the activities which form the Programme will be delivered and operated by a combination of different Delivery and Operating Agents including TfGM, local authorities and other bodies; further information is provided in the tables in section 5.12.

5.2.7 Given the wide-ranging nature of the Measures proposed in the GM CAP, it is essential that the views of people living, working and commuting in and around Greater Manchester, including businesses and other key stakeholders, are sought as part of the development of the interventions within the Programme. Meaningful consultation and engagement with a wide range of stakeholders will help to build awareness and visibility of the proposed GM CAP and its impacts and will support ongoing detailed design of the associated policies and Measures. Section 5.11 and Appendix E.4.1 provide further detail on the proposed approach for engaging with stakeholders.

5.3 Governance and Reporting

Project and Programme Governance

5.3.1 Figure 5- 1 (see also Appendix E.1.1) sets out the proposed programme governance.

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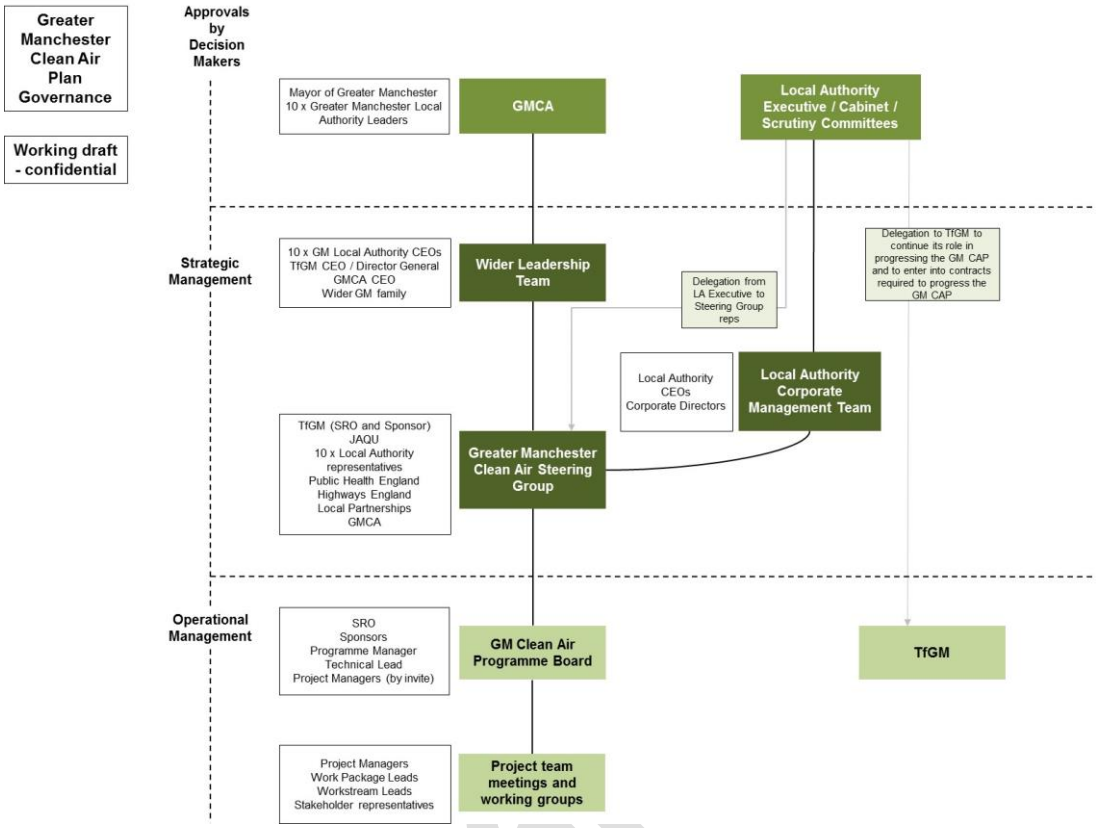
[10] **Directive** 2008/50/EC, available at https://eur-lex.europa.eu/eli/dir/2008/50/oj

Figure 5- 1: GM CAP Programme Governance



5.3.2 In order to progress the GM CAP, and to develop and deliver the Programme it is anticipated that the local authorities will delegate formal authority to TfGM in order for TfGM to fulfil its role as Delivery Body for the Programme on behalf of the ten local authorities. The detail of this will be discussed and agreed with the local authorities in developing the FBC. Delegations are in place for TfGM to act as lead contracting authority to undertake any procurement and enter into any contracts necessary to develop the Programme.

5.3.3 TfGM has been responsible for producing the OBC. The chart below sets out the review and approval process for the OBC.

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Figure 5- 2: OBC Review and Approval Process

5.3.4 Building on the OBC, TfGM will also be responsible for developing the FBC and it is envisaged that the review and approvals process would be broadly similar to the above. Additionally, it is proposed that TfGM is responsible for establishing the Operating Body as part of the operating model. This is described further in section 5.13.

5.3.5 TfGM has an excellent record of major programmes and operational improvements, both in its own right and on behalf of the GMCA. The delivery of the Programme has been delegated to TfGM by the local authorities. It is assumed that TfGM will also act as the contracting authority, and will be responsible for entering into any necessary contracts. Governance and approvals for entering into contracts will be in line with the levels of delegation set out in the constitutions of TfGM, GMCA and the ten local authorities and are likely to include approvals from TfGM's Executive Board dependent upon contract values.

5.3.6 The Steering Group has operated successfully throughout the development of the SOC and the OBC and is held on a monthly basis. It is chaired by the Senior Responsible Officer (SRO) and is attended by representatives from the 10 local authorities, representatives from Highways England, PHE and JAQU; delegations will be in place from the local authority executives to the Steering Group. The Steering Group structure is flexible and can change as required, as the Programme develops. The Steering Group will continue to guide and steer the direction of the Programme. Local authority Steering Group members will be responsible for liaison with officers and councillors within their respective authorities, to inform decisions being made at the Steering Group. The Terms of Reference for the Steering Group are attached at Appendix E.1.3.

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5.3.7 Project governance has been established and has been operating successfully throughout the development of the SOC and the OBC. Following approval of the OBC, it is planned to establish a Programme Board, and meetings will take place at a minimum of once each month. The Programme Board will report to the Steering Group and will also be chaired by the SRO. This group will be responsible for the day to day management and overall delivery of each project within the Programme. Key updates and details of decisions required will be escalated from the Programme Board to the Steering Group.

5.3.8 Project teams will hold regular team meetings and working groups as required, which will report to the Programme Board and Steering Group.

Reporting

5.3.9 To monitor overall progress, programme reports shall be issued monthly to the Programme Board and the Steering Group and will include updates on delivery against the agreed schedule, resources, budget, risks, issues, dependencies and opportunities. Deviations from agreed programme or project tolerances (quality, cost or time) and any suggested changes to the scope will be subject to TfGM's Change Control process.

5.3.10 Ahead of the Steering Group meetings, monthly reports will be prepared by the Project Managers and Programme Manager and these will be reviewed and challenged at the Project Reporting Review Meeting. These review sessions have been established to bring about a consistent level of scrutiny and rigour across all of TfGM's projects and programmes and encourage debate from colleagues.

5.3.11 In addition to formal reporting, updates will be made to key groups to keep them engaged as the Programme develops. It is proposed that Greater Manchester Highways Group is one of these groups, which is attended by TfGM, local authorities, Highways England and Greater Manchester Police. Further Greater Manchester groups which will be updated at appropriate stages include the Air Quality Group, Heads of Planning, Chief Legal Officers, Treasurers, and the Association of Greater Manchester Authorities (AGMA) Procurement Group. These groups have been briefed on this OBC, and will continue to be updated at relevant points throughout the Programme. In addition, updates will also be provided on a monthly basis to TfGM's Transport Strategy Functional Board.

5.4 Programme Structure

5.4.1 The Measures required to deliver compliance will be delivered through the proposed GM CAP Programme. A programme has been developed as this enables projects and work packages to be delivered at the earliest possible opportunity, delivering the associated health and environmental benefits as soon as possible, in line with the legal requirement of achieving compliance with EU Limit Level in the shortest possible time.

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5.4.2 This approach is essential in enabling the proposed Clean Air Zone (CAZ) to be launched in 2021. Without investment from 2019 onwards in upgrading the regional fleet and supporting businesses to respond to the scheme, it will not be possible to launch a region-wide charging scheme without unacceptable negative consequences. Core assumptions in our modelling predictions relating to when compliance will be achieved, such as the level of compliance of the bus and taxi fleet and the scale of Electric Vehicle (EV) uptake, are predicated on the programme approach and would need to be revised if this cannot be achieved. The programme approach is therefore fundamental to delivering compliance in the shortest possible time.

5.4.3 A programme approach provides a structured framework through which complexities, risk and interdependencies can be managed effectively and conflicting priorities resolved where they may arise. The central Programme team will facilitate the effective coordination, direction and implementation of the activities. This approach will also allow a more efficient use of resources. Additionally, programmes will allow sufficient flexibility to respond to any internal or external changes. The Programme will be assessed to ensure that it remains linked to the objectives.

5.4.4 The Measures within the GM CAP Programme have been grouped into projects and work packages to facilitate further development and delivery. These have been categorised in line with the definitions set out in the Government's Project Delivery Functional Standard[11] (August 2018), which are as follows:

- A portfolio comprises part or all of an organisation's investment required to achieve its objectives
- A programme is a temporary, flexible organisation created to co-ordinate, direct and oversee the implementation of a set of projects and other work components to deliver outcomes and benefits related to a set of strategic objectives
- A project is a temporary management arrangement undertaken in stages, created for the purpose of delivering one or more business products or outcomes
- Other work might include:
  - Support services (referred to in this Programme as workstreams, covered in section 5.6 below)
  - Ongoing improvement initiatives not run as projects, but using a defined approach
  - Service delivery, business as usual operations
- A work package is a set of information relevant to the creation of one or more deliverables or outputs. It comprises a description of the outputs required work plan and details of any constraints

11 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746400/Project_Delivery_Standard_1.2.pdf (August 2018)

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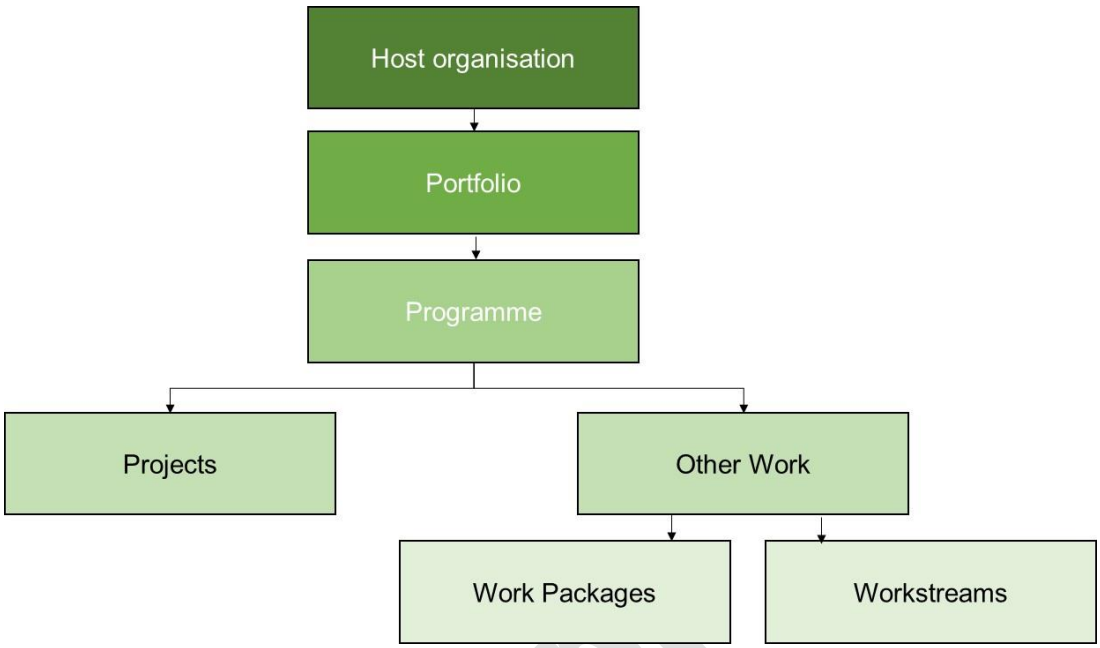
5.4.5 Figure 5- 3 is adapted from the Government's Standard and provides a high level overview of the structure of the proposed GM CAP Programme.

Figure 5- 3: Overview of the Proposed Programme Structure



5.4.6 An organogram showing the Programme structure is attached at Appendix E.1.2. The activities will deliver the required outputs and capability, and will transition them into operations to achieve the required outcomes and ultimately deliver the benefits.

5.4.7 It is proposed that the Programme is initiated following OBC approval and continues to run throughout the development, implementation and operational phases, until compliance is delivered and demonstrably maintained. It is proposed that the Programme will be closed out following the decommissioning phase.

5.4.8 Each individual project and work package requiring Implementation Funding will be developed in accordance with its own timescale to enable an FBC to be developed and subsequent funding to be released. The proposed approach will expedite delivery of these elements and support the strategic intent of delivering compliance as early as possible. Several of the work packages are extensions to existing initiatives being progressed across Greater Manchester, therefore they will be able to be developed more quickly than the more innovative projects requiring complex detailed design work.

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5.4.9 The Vehicle Renewal Schemes will be delivered as four projects:

1) Clean Freight Fund
2) Clean Bus Fund
3) Clean Taxi Fund
4) Loan Finance

5.4.10 For the purpose of effective management, the Parking Standards measure has been divided into three work packages:

1) Parking Standards
2) Short Stay Parking
3) Local Authority Staff Parking

5.4.11 A central team will be put in place to coordinate development and delivery of the Programme. The implementation and operation of the projects within the Programme will be undertaken by one or more Delivery or Operating Agents; further detail on this is provided in section 5.12.

5.5 Programme and Project Methodology

5.5.1 TfGM has a robust established governance structure for the delivery of programmes and projects, which provides the appropriate level of governance and management oversight through each phase of the programme and project life-cycle.

5.5.2 The TfGM Programme Management Procedures (ProgMP) and Project Management Procedures (PMP) are the established corporate approach to managing programmes and projects within the organisation. They provide a consistent standard to manage projects and programmes minimising unexpected variation such that delivery is to the desired standard, on time and within budget. The procedures are based on Association for Project Management methodology. The stages within the ProgMP and PMP are provided in Appendix E.2.1. It is proposed that the digital/Information Systems (IS) and business change elements of the Programme are delivered in an agile manner utilising TfGM's process which is broadly in line with Government Digital Service's procedures.

5.5.3 The TfGM ProgMP and PMP provide a scalable approach, and have been tried and tested on a wide variety of TfGM and local authority schemes. TfGM is the GMCA's Delivery Agent for transport schemes and has recently delivered similar types of programmes working closely with the local authorities to meet common objectives, including the Local Sustainable Transport Fund programme and the Growth Deal programmes (overall value c. £400 million), as well as large capital programmes and highway improvements such as the bus priority package (£122 million), a programme of park and ride projects, and many business change projects and projects requiring the implementation of IS infrastructure, such as the SMART ticketing programme and the introduction of zonal fares.

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5.5.4 Lessons learnt from these programmes will be applied to the GM CAP Programme where applicable. The table below shows some lessons learnt from previous programmes of a similar nature, and how they will be applied to the GM CAP Programme.

Table 5- 1:Lessons learnt from previous programmes

Lesson Learnt	Action to be taken for the GM CAP Programme
Governance arrangements have not always been proportionate to the value of delivery packages, which has impacted on the level of resources and timescales required to achieve Full Approval.	Review complexity of schemes within a programme and the proportionality of resources required to utilise Project/Programme Management Procedures in order to determine appropriate governance route. Risk Potential Assessment to be utilised at the outset in order to assist in informing proportionate governance routes.
Length of time required to draft, approve and update complex legal documentation ahead of scheme development/delivery has increased the risk of delays to key milestones.	Ensure that all parties involved in legal documentation are fully aware of milestones for the completion of documentation through proactive engagement. Resource to be procured at a programme level to support the progression of legal documentation.
Third party consultation and engagement requirements have differed across local authorities.	Ensure that consultation requirements are fully understood and build timescales into schedule. Resource to be utilised at a programme level to plan and undertake the Conversation and Consultation activities. Sufficient time to be allowed for the Steering Group to review Conversation and Consultation materials.
More parceling of delivery packages could lead to better economies of scale.	Consider how economies of scale may be achieved through the packaging of elements of works. Similar activities to be grouped together for procurement purposes, e.g. preparation of Traffic Regulation Orders (TROs) across the programme.
Steering Group became a secondary progress meeting once schemes entered the delivery phase.	Ensure Steering Group Terms of Reference are reviewed and updated throughout the programme lifecycle to ensure the Steering Group has a clear purpose.

5.5.5 Programme Execution Plans and Project Execution Plans will be developed following approval of the OBC updated as appropriate throughout the duration of the programme and projects.

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5.6 Programme Team

Programme and Project Roles

5.6.1 A core Programme team has already been established, with further roles anticipated for the development and delivery of the projects and work packages within the Programme.

5.6.2 The core Programme team will comprise the following roles:

- **Senior Responsible Officer (SRO) – a member of TfGM's Senior Leadership Team** – accountable for ensuring that the GM CAP Programme delivers its objectives and projected benefits within an agreed timeframe and cost parameters. The SRO will oversee all phases of the Programme.
- **Programme Sponsors –** responsible for mobilising and resourcing the delivery team, delivering the benefits proposed to be realised from this investment. They will provide the overall direction and leadership for the Programme. They will resolve major issues and escalate to the SRO as appropriate. They will be responsible for ensuring alignment with the Air Quality and Environment Portfolio.
- **Programme Management Team** – The roles within the Programme team will include the following key roles:
  - **Programme Manager** – responsible for leading the Programme and Project Management team. Responsible for identifying, managing and gaining agreement to Programme scope, objectives and constraints; completing the Programme documentation which sets out the overall programme scope, and expected outcomes, and identifies the key benefits and how these will be measured; and managing progress against the Programme Plan, in terms of quality, schedule and budget. They will support the individual members of the team in the delivery of their projects and responsibilities and ensure that the team works together to enable delivery of the Programme objectives, will manage the interfaces between projects and work packages within the programme. They will manage the workstreams across the Programme, will be responsible for the contract management of the Lead Advisor and any other services provided across the Programme, and will manage senior stakeholders at a programme level.
  - **Risk Manager** – responsible for developing the appropriate processes and tools to support risk and issue management. Will lead risk review sessions and update programme and project risk registers.

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  - **Project Control Engineer** – responsible for providing project control services to the Project Managers to support the delivery of the project to time, quality (standard) and budget. One of their key roles is to assist the Programme and Project Managers through the production and maintenance of timely reporting information on the schedule of tasks within the project plus all costs, planned and actuals.
  - **Project Coordinator –** responsible for providing project support and administration across the programme and projects.
  - **Project Information Manager/Controller** – responsible for ensuring all information is managed effectively, and providing document control support across the programme and projects.
  - **Commercial/Cost Engineer** – responsible for providing commercial support across the programme and projects.

- **Project Managers** – responsible for identifying project scope, objectives and constraints (working with technical specialists), and planning the projects. Responsible for managing the Lead Advisor and suppliers to ensure that the projects are being delivered to the required quality, time and budget. They will supply regular progress reports on funding and finance (in conjunction with finance representative), issues for escalation and general progress on each of the projects. They will be responsible for managing and engaging in communications and liaison between all stakeholders and ensuring that any issues that arise are dealt with in a timely manner and do not adversely impact on the project and programme deliverables; and for actively managing the project risk and issue registers.
- **Work Package Leads** – responsible for managing their work packages and activities to ensure delivery in line with Programme objectives, budget and timescales. Responsible for organising workload and resources within their areas of responsibility and reporting to the Programme Management team and Programme Board (refer to section 5.5 for further detail on the Programme Board).

5.6.3 It is proposed that Project Managers will be allocated to each project as appropriate; the level (Senior Project Manager, Project Manager, Assistant Project Manager) and quantity of project management resource required will be in line with the complexity and value of the projects. There is the possibility that some of the work packages will become projects in the future, depending on the outcome of the Risk Potential Assessment (RPA) and the policy design components. In order to ensure consistency of approach, some project management resource is also likely to be required across the work packages.

5.6.4 These roles will be supported by other functions and departments whose support and input will be required across the Programme. These are defined as workstreams and an overview of the responsibilities of each workstream is outlined below.

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Workstreams

5.6.5 To develop the OBC, eight workstreams were set up, which have supported and serviced the Programme to date. Each of these have terms of reference, aimed at monitoring progress, change, risks, opportunities, decisions and providing agreements to proceed.

5.6.6 The current workstreams have been modified and supplemented to reflect the requirements of managing the programme through to the FBC development and implementation. Workstream leads are accountable for ensuring that their workstream provides effective support to the Programme and Projects. The scope for each workstream is summarised in the table below.

Table 5- 2: Workstreams

Workstream	Description
Policy design	Manage the policy design requirements to support the design and appraisal activities for the programme, projects and work packages.
Data, evidence and modelling	Commissioning and collection of additional data and further development of the underpinning information for modelling the GM CAP. Building on the data and assumptions from the OBC stage to produce a refined and defensible traffic, emissions and air quality model for the future case (using the Target Determination data). Updating and re-running of models to help optimise and determine the final scope of the projects and work packages.
Project and work package development	Development and detailed assessment of the GM CAP against the Critical Success Factors (CSFs). Coordination of development across various workstreams to optimise and determine the final scope and required outputs of the projects and work packages in order to achieve compliance.
Programme and project business case	Production of the FBC for the programme, projects and work packages, to meet JAQU guidance.
Monitoring and evaluation	Development of the monitoring and evaluation requirements during the FBC stage, to align with the Central Evaluation Programme. Establishment of the baseline data and ongoing monitoring and evaluation through to the operational and decommissioning stages.
Marketing, communications, stakeholder engagement and consultation	Immediate and on-going communication and engagement with internal and external stakeholders to ensure consistent, timely and efficient delivery of information. Facilitation of views and input from stakeholders where required. Marketing, communications and events to promote the benefits of clean air, the impact of travel and vehicle choices on air quality, the nature of the preferred option and what people need to do to prepare themselves, and how to make choices that help clean up GM's air. Management and delivery of the Conversation and Consultation.

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Workstream	Description
Governance and policy	Manage the governance, policy and internal and external approval process for the Programme, projects and work packages.
Legal	Manage the legal requirements for the Programme, projects and work packages. Work across the Programme to ensure legal compliance. Update Chief Legal Officers on a regular basis.
Procurement	Manage the procurement requirements for the programme, projects and work packages.
Finance	Manage the financial requirements for the programme, projects and work packages.
Human resources	Manage the recruitment requirements for the programme, projects and work packages.
Audit and assurance	Risk Potential Assessments, Gateway Reviews and audits across the programme, projects and work packages.
Safety and compliance	Adherence to safety management systems and progressions through safety review committees for the programme, projects and work packages.
Customer	Manage the customer-facing components of the programme, projects and work packages, including customer interfaces, queries and complaints.

5.6.7 The workstreams will be reviewed by the Programme and Project Managers at key stages to ensure that appropriate support is provided to the Programme throughout the FBC, implementation, decommissioning and close-out phases. For example, input from the first four workstreams listed in the table above would be expected to reduce following the FBC stage, others, such as the finance workstream would be relevant throughout the Programme lifecycle and others, such as safety and compliance, would become more important in the implementation stage.

Use of Specialist Advisors and Third-Party Suppliers

5.6.8 To develop the Programme up to OBC, several specialist advisors have been engaged. This is due to the specialist nature of the requirements, and therefore the lack of capability in-house. These advisors are as follows:

- modelling, feasibility, technical advice, business case production - interim delivery partner;
- legal advice – Queen's Counsel; and
- specialist technical advice – Miscellaneous consultants.

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5.6.9 Due to the complexity of the GM CAP, external legal services will continue to be required to provide ongoing support to develop and implement the proposed Measures; this will include legal advice along with the drafting of Traffic Regulation Orders (TROs) and the Charging Scheme Order (CSO), support with the public consultation process and support to understand the legal risks associated with any proposed implementation of the Programme. Additionally it is envisaged that specialist technical advice will be an ongoing requirement.

5.6.10 Due to the evolving nature of the requirements, additional specialist advisors may be required and will be fully discussed with JAQU.

5.6.11 Through the FBC and early implementation stages, it is planned to engage the following specialist advisors:

- Lead Advisor (A multi-disciplinary consortium that can provide strategic leadership across the programme, and accountable for delivery of significant elements of the projects and work packages)
- Legal Advisor (to provide independent legal advice across the programme)
- Communications (consultation specialist)

5.6.12 The detail of the scope and the proposed procurement approach for each of these advisor roles is set out in the Commercial Case.

5.6.13 Additionally, it is expected that support will need to be provided by specific teams within the local authorities (for development of the design, gaining powers and consents, consultation etc.); these requirements will be further defined once the individual projects are initiated following approval of the OBC. This approach will benefit from utilising inherent knowledge of the authorities' processes and more local issues that can then facilitate the decision-making process and potentially expedite the delivery of the Programme.

Contract Management / Monitoring

5.6.14 Where the supply chain is commissioned, monitoring arrangements will be agreed on a contract by contract basis. Close contract management will be undertaken which will include regular reporting. Progress meetings will be held at pre-agreed intervals to ensure adherence to the Programme Plan, and costs and risks will be carefully monitored.

5.7 Assurance

5.7.1 TfGM has long established assurance and approval plans in place. At the core of the plans is the 'Four Lines of Defence' model, as shown in Appendix E.2.2. This is based around a multi-layered model of increasing assurance levels.

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5.7.2 The programme and projects will be aligned with TfGM's Integrated Assurance Strategy, which establishes an assurance framework across the TfGM portfolio. The RPA process is one of the tools which supports the Assurance Strategy and is applied to programmes and projects. To realise this, the RPA gives a standard set of high level criteria for assessing the strategic risk potential of projects and is based on the guidance of the Major Projects Authority.

5.7.3 The RPA is a process which draws the identified risk potential of a project to establish a suitable level of assurance and is enabled by assessing the following:

- Consequential impacts, comprising:
  - Political
  - Public
  - Financial
  - Operational business and commercial change
  - Dependencies
- Programme / project Complexity:
  - strategic profile – political, public, business performance and organisational objectives
  - delivery challenge – policy / legal, security, requirements for business change, technology development, commercial and supplier delivery, financial provision, governance, stakeholders, dependencies and change and implementation
  - capacity and capability – programme or project team, stakeholders and organisation, suppliers and strategic leadership and business culture
  - scale – time, budget, benefits and quality

5.7.4 This is used to define the level of assurance required by the project, inform key decisions and provide an understanding of the impact of any significant changes. An RPA has been undertaken for the GM CAP and the outcome was that the risk potential was deemed to be very high. The risk management approach is detailed further in section 5.7. The assurance approach is based on members of TfGM's Portfolio Office attending the Project Board and Steering Group meetings, and the production of an Integrated Assurance and Approvals Plan (IAAP) which documents all required assurance and approval activities. An IAAP will be produced for the Programme and for each project, which will set out the assurance and approval activities required throughout the project lifecycle, along with the responsibilities and planned timescales.

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5.7.5 Following approval of the OBC, the RPA process shall be followed for the Programme and each project and work package and repeated subsequently at key stages during the development of the projects to ensure the most appropriate assurance and reporting approach is applied. For example, projects that are identified as high risk are likely to require Full PMP, including Gateway Reviews and other assurance activities throughout the lifecycle, whereas for work packages which are extensions of current TfGM activities and are deemed to be lower risk, these may not require such stringent assurance activities, and reporting may be at Programme level.

5.7.6 A key process in the ProgMP and PMP is the Gateway Review Panel (GRP) which examines projects and programmes at key stages during their lifecycle to ensure they are being developed and delivered in accordance with the TfGM's established procedures, and submissions to this panel are mandatory for all major projects and programmes.

5.7.7 The criteria used for the GRP reviews are commensurate with the expected stage of development for the project. Each project/programme is reviewed by an independent third party reviewer, with relevant experience and a similar level of seniority as the project team member. The review panel may include specialist technical experts, as required.

5.7.8 The feedback from the reviews is compiled into a report and all outstanding recommendations form an Action Plan that is presented to the programme team for agreement/timely implementation. This assurance approach has been agreed by the Department for Transport (DfT) for the Growth Deal programmes, which had an overall value of c. £400 million.

5.7.9 Additionally, up to and including the FBC stage, the quality assurance process will be supported by both bespoke technical reviews and by JAQU's review panels; the Technical Independent Review Panel and Delivery Independent Review Panel.

5.8 Programme Plan

5.8.1 This Management Case focuses on ensuring the right governance, resources and plans are in place to implement the new arrangements in line with the programme plan. The critical path for the current programme has also been developed and will continue to be monitored to assess programme progress.

5.8.2 It is recognised that the required timescales for the delivery of the FBC and the GM CAP are challenging, and therefore the programme plan that has been developed demands a substantial amount of parallel working to expedite activities. It should be noted that there are risks associated with this method of working, for example, as design work is scheduled to be undertaken in parallel with public consultation activities, there is a risk that re-work will be required, dependent upon the outcome of the Conversation and Consultation processes, which may put the delivery of the plan in jeopardy.

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5.8.3 The plan on a page is attached at Appendix E.3.1 which covers the overall GM CAP Programme, the project which is on the critical path for delivery of the Programme (the Clean Air Zone project) and the other Measures.

5.8.4 The Programme FBC will be split in to two stages as follows:

- An Initial FBC that will be developed from the scheme design including feedback from the Conversation and the Consultation, to be submitted to JAQU in Winter 2019
- A Final FBC that will include updates following the conclusion of the procurement exercises for the implementation stage, to be submitted to JAQU in Summer 2020

5.8.5 The detailed delivery programme shall be further developed for the FBC and updated during the execution of the programme and projects. In summary the overall anticipated key milestones are set out in the table below.

Table 5- 3:Milestone Summary Table

Programme	Projects / Work Packages	Activity	Forecast Date (by)
Programme Approval	-	Strategic Business Case Approval Outline Business Case Approval	April 2018 (complete) Spring 2019
Funding Agreement	-	Initial Full Business Case Submission Full Business Case Approval	Winter 2019 Summer 2020
-	Sustainable Journeys Local Authority and Greater Manchester Fleet Upgrade Clean Bus Fund Electric Vehicle Infrastructure and Promotion Clean Freight Fund Clean Taxi Fund Clean Air Zone Loan Finance	Initial Full Business Case*	Winter 2019
Implementation	-	Implementation	Winter 2019 – Summer 2021

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Programme	Projects / Work Packages	Activity	Forecast Date (by)
Decommissioning	-	Operation ceases – decommissioning commences	One year post date of agreed compliance
Close Out	-		TBC

* Business case requirements to be agreed with JAQU

5.8.6 The supporting work packages (where funding is not being requested from JAQU) will be progressed at the relevant time and will be considered through appropriate local authority governance.

Interdependencies

5.8.7 The proposed projects and work packages have a number of internal, intra-, and external dependencies across the GM CAP programme. The detail of the dependencies relating to each project and work package can be found in the Appendix O.1.1. Following approval of the OBC, the interdependencies will be evaluated in detail and documented (e.g. type, source, specification, and timeline). The scope and timescales of each interdependency will be aligned and agreed to ensure clarity and complementary specifications and timings with the source of the interdependency.

5.8.8 The interdependencies will be monitored and controlled throughout the Programme lifecycle through regular updates of the programme and project plan which will be managed by the Programme Manager and Project Managers.

5.9 Powers and Consents

5.9.1 Under section 168 Transport Act 2000, a CSO is required to allow the development and operation of the proposed CAZ project. It is proposed that this is coordinated centrally and time has been factored into the schedule for local authorities to approve the draft scheme order and consultation materials ahead of the planned consultation. Several of the projects and work packages have been identified as requiring Traffic Regulation Orders (TROs) including the CAZ, EV infrastructure and short stay parking. Again, it is planned that the TROs are coordinated and developed centrally in conjunction with the relevant local authorities. The local authorities have the required powers as Highway Authorities to make the TROs, therefore the TROs will be subject to the local authorities' governance processes. Timescales for the TRO process have been factored into the programme and project plans.

5.9.2 It is also envisaged that highways and/or planning consents may be required in relation to infrastructure being placed on the highway or other land, e.g. CCTV and EV infrastructure; these consents will be dependent on the proposed locations for the infrastructure and will be considered during the next phase.

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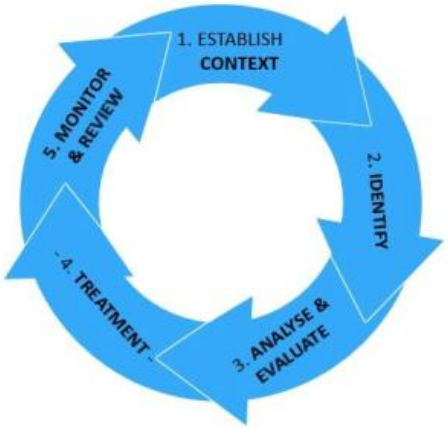
5.10 Risk and Contingency Management

Risk Management Plan

5.10.1 A Programme Risk Management Plan (RMP) has been developed which is attached at Appendix E.4.2. Each project will require an RMP which aligns with the programme and is tailored to the specific project requirements; it is envisaged that these project RMPs will be produced following initiation of the projects.

5.10.2 A multi-level approach to risk management will be required. This is summarised in the following table.

Table 5- 4: Risk Management Approach

Risk Management Plan Hierarchy	Plan Owner	Risk Management Process
Primary - Risk Potential Assessment	TfGM – Portfolio Office	
Secondary - Programme RMP	TfGM – Programme Manager	
Tertiary - TfGM Project RMP	TfGM – Project Manager	
Note: Risks related to Health and Safety are managed in accordance with the TfGM Integrated Management System (IMS).		

Risk Register and Key Risks

5.10.3 Programme and project delivery risks are managed throughout the lifecycle. For each project these are captured in the Project Risk Register, and these can also inform the Programme Risk Register as well as the Strategic Risk Register. This relationship is illustrated in the following diagram.

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Figure 5- 4: Risk Management Pyramid

5.10.4 TfGM maintains a central Risk Decisions Risk Management System (RMS), using Predict! Software which holds the information relating to its project and programme level risks. Each risk register is a live document and the inclusion of these documents within the OBC is a snap-shot in time.

5.10.5 TfGM's approach to risk management is proactive and focuses on avoidance, transfer or taking mitigating action, rather than solely making financial provision for risk impacts. Throughout the OBC stage, risks have been identified, recorded and actively managed. Risk owners have been allocated and tasked with eliminating risks or identifying mitigation measures for residual risks. This will continue through the FBC, implementation and operational stages of the programme/projects and any activities to facilitate risk avoidance, transfer or mitigation will be included within the planned activities and incorporated into the appropriate cost plans.

5.10.6 Risks are being and will continue to be actively managed. Risk review sessions will be held for the Programme and projects on a monthly basis, with wider stakeholder risk review sessions when required.

5.10.7 The current programme risk register is provided in Appendix E.5.1. This contains overarching risks which may impact the Programme as a whole. The top ten programme risks are set out in Table 5- 5.

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Table 5- 5: Programme Risk Register – Top Ten Risks

(For further details about these risks, including consequences, risk owners, pre- and post-mitigation scores and details of the mitigating actions, see the Programme Risk Register at Appendix E.5.1)

Risk ID	Risk Description	Risk Cause	Risk Consequence
Prog-44	Streamlining of the FBC schedule requires activities to be run in parallel.	Timescales for delivery of the GM CAP. (see related threat Prog-39 and the requirement to meet funding timescales).	AQ compliance not being achieved in the mandated timescales. Re-work and increased costs.
Prog-42	Inflation forecasts for 10 years are incorrect and this leads to increased operational costs.	Various, including uncertainty around Brexit.	Increased operational costs
Prog-53	Clean Air Funding is not adequately supported by the Government.	Funds not available to support the Programme.	AQ compliance not being achieved in the mandated timescales.
Prog-30	Some Local Authority exceedances may be attributable to emissions from the Strategic Road Network (SRN) (Highways England), where the exceedance is measured on the LA road but attributable to emissions from the SRN. Compliance cannot be delivered because emissions from the SRN cannot be reduced sufficiently.	Clarification/ confirmation from JAQU indicate that where some exceedances are on the Local Authority network and are partly attributable to SRN emissions, the expectation is that the Local Authority proposals will be expected to deliver compliance on that link.	AQ compliance not being achieved in the mandated timescales.
Prog-39	As per the schedule, Greater Manchester will be submitting an approved FBC for funding towards the end of the JAQU funding deadline.	Proposed scheme is complex to deliver and may not meet JAQU's expectations with regard to the FBC submission (the point at which funding is released).	AQ compliance not being achieved in the mandated timescales.
Prog-2	Ten Local Authorities with differing constitutional arrangements need to reach agreement on the preferred option.	Approval process, number of interfaces. New interventions being introduced by stakeholders.	Delays to decision making resulting in AQ compliance not being achieved in the mandated timescales. Additional legal advice may be required.
Prog-15	Additional research and evaluation of preferred option is required (and possibly at multiple stages), but may prove to be insufficient to support decision makers.	Insufficient information is available to make key decisions.	Delays to achieving AQ compliance. Further investigation and research required leading to delays and additional costs.
Prog-32	Early release of developing information to the public domain may impact plans for consultation, engagement, and reputation, leading to delays to GM CAP development or consultation plans.	Early release of developing information to public domain e.g. press, social media.	AQ compliance not being achieved in the mandated timescales.
Prog-50	Risk that the returned tenders are over the estimated Cost Plan or do not represent appropriate Value for Money (VfM).	Market forces/ demand. Procurement timescales for the implementation.	AQ compliance not being achieved in the desired timescales and impact on costing.
Prog-17	A Public Inquiry may be required during the development and implementation of the GM CAP.	Local Authority discretionary decision. Feedback by local resident groups, local businesses etc. identifying significant objection to proposed measures.	AQ compliance not being achieved in the mandated timescales. Cost/schedule implications

5.10.8 A risk register has been developed for the projects and work packages and is provided in Appendix E.5.2.

5.10.9 The top ten project risks are set out in Table 5- 6. These risks relate to specific projects and work packages and are considered to be the top risks across the projects and work packages, if all of the projects and work packages are progressed. It is envisaged that these risks will form the basis of the individual project risk registers and will be reviewed and updated once the projects have been formally initiated following OBC approval.

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Table 5- 6: Project Risk Register – Top Ten Risks

(For further details about these risks, including consequences, risk owners, pre- and post-mitigation scores and details of the mitigating actions, see the Project Risk Register at Appendix E.5.2)

Project Category	Risk ID	Risk Description	Risk Cause	Risk Consequence
Clean Air Zone (CAZ)	PROJ-1	Feedback on the proposed Greater Manchester Clean Air Plan (GM CAP) design during consultation(s) and through stakeholder/political engagement significantly impacts project costs and schedule	Feedback on the scheme results in revisions to the design	Scheme design revision Reputational challenges Delays to implementation Air Quality (AQ) compliance not achieved in desired timescales
Clean Bus Fund	PROJ-2	Some buses cannot be retrofitted due to the age of vehicles within the Greater Manchester bus fleet	The proposed age of vehicle which is valid for retrofit only applies to part of the total Greater Manchester bus fleet.	AQ compliance not achieved in desired timescales Reputational challenges Disruption to services/customers Potentially charges passed to customers
Clean Freight Fund	PROJ-3	Lack of availability for affordable second hand compliant LGVs	Affordability of new and second hand LGVs	AQ compliance not achieved in desired timescales Economic impact on businesses/ customers
Clean Bus Fund	PROJ-4	Greater Manchester Bus fleet cannot be retrofitted in desired timescales	Lack of market capacity to carry out retrofits on the Greater Manchester bus fleet within the required timescales	AQ compliance not achieved in desired timescales Disruption to services/customers Delays to schedule Reputational challenges
Clean Air Zone (CAZ)	PROJ-5	Interface between local system and Defra's Central Charging System (CCS) is unclear and therefore local system cannot be scoped	Uncertainty of scope from JAQU for FBC/Implementation with regard to IT infrastructure	AQ compliance not achieved in desired timescales Delays to schedule
Clean Taxi Fund	PROJ-6	Lack of compliant vehicle availability in second hand hackney carriage market. Vehicles entering second hand market drop in value.	Hackney manufacturers have stopped making Euro 6 vehicles - now focuses on Electric Vehicle (EVs)	AQ compliance not achieved in desired timescales Delays to schedule Increase in project costs
Loan Finance	PROJ-7	Unable to collect payments and cover costs associated with repaying capital	Payment stops from those who have taken out the loan	Increased operational costs
Clean Air Zone (CAZ)	PROJ-8	The scale of a proposed CAZ IS infrastructure is significant and causes unforeseen delays and additional costs associated with implementation.	Scale of proposed scheme to achieve compliance	AQ compliance not achieved in desired timescales Delays to implementation Increase in project costs
Electric Vehicle Infrastructure and Promotion	PROJ-9	Uptake of EV is lower than predicted in models	Lack of second hand market or attractiveness for vehicle users. Public perception of EV, results in reduced uptake	AQ compliance not achieved in desired timescales
Loan Finance	PROJ-10	Operational costs are not covered by scheme	Admin costs are higher than anticipated Unable to recover costs from those taking out the loan	Increased operational costs

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5.10.10 The programme and project risks are currently assessed qualitatively but will be assessed quantitatively once the projects have been formally initiated. The risks will be modelled using Monte Carlo Simulation[12] to provide a Quantified Cost Risk Analysis (QCRA) assessment of risk exposure on the programme and projects, and a measure of the capital risk allowance required.

5.10.11 In the interim, appropriate contingency and allowances for optimism bias have been made within the Financial Case of the OBC based on experience of delivery of similar schemes and the stage of development of the various projects and work packages.

5.11 Stakeholder Management

Approach and Objectives

5.11.1 The Measures proposed in the GM CAP take many forms, from a CAZ to other Measures such as Sustainable Journeys. As such, the supporting communications, engagement and consultation activities will operate at both the programme and project level.

5.11.2 The OASIS model[13] has been used for the planning and implementation of communications and stakeholder activity around the GM CAP. Cross-cutting objectives for the activity are to:

- build awareness and visibility of air pollution as a public health issue, and the actions that can be taken to tackle it;
- help the public and stakeholders understand the specific requirements of the GM CAP (aligned to Government guidance[14]);
- provide relevant and timely information and updates on the development of the GM CAP;
- provide meaningful opportunities for the public and stakeholders to share feedback and engage in dialogue in support of the GM CAP development; and
- support the public and stakeholders in understanding the potential impacts of the GM CAP and how they can positively respond.

5.11.3 As a public health issue, it is important that public communications about air pollution carry out the following:

- explain what air pollution is;
- help people understand how they can protect themselves;

[12] Monte Carlo method: https://en.wikipedia.org/wiki/Monte_Carlo_method

[13] OASIS campaigns guide: https://gcs.civilservice.gov.uk/wp-content/uploads/2015/09/OASIS-Campaigns-Guide-.pdf

[14] Clean Air Zone Framework: https://assets.publishing.service.gov.uk/government/.../clean-air-zone-framework.pdf

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- explain the health impacts;
- make it local;
- explain how individuals can make a difference; and
- demonstrate leadership and empower communities.

Communications and Stakeholder Approach

5.11.4 Communications and stakeholder activity will be aligned to the objectives set out in paragraph 5.11.2 above. A management process has been developed to support the effective delivery of coordinated public-facing communications and stakeholder engagement for the GM CAP, and is included at Appendix E.4.1. This reflects the GM-wide strategic approach that is being taken for the development of the FBC and is further supported through local communications and engagement plans.

5.11.5 Greater Manchester will utilise all appropriate communications channels to ensure targeted, timely and easy-to-understand information is promoted to a variety of audiences.

5.11.6 This includes strategies to best utilise:

- web – a new website, CleanAirGM.com, has been developed and launched as the public home for the Greater Manchester Clean Air Plan and wider air quality-related information. This includes
  - Real-time Greater Manchester air quality monitoring station readings
  - Air pollution public health information
  - Advice on what people can do to limit their exposure to, and reduce their contribution to, air pollution
  - Details of what Greater Manchester is doing to tackle air pollution, including the Clean Air Plan
  - An air pollution forecasting and alert service for the region;
- social media (organic and paid-for content);
- marketing channels (including digital, outdoor, radio, TfGM and partner free-of-charge assets);
- national, regional, local and trade media; and
- community assets

5.11.7 Key stakeholders have been identified and will be engaged throughout the development of the GM CAP. Initial targeted activity was carried out to support the technical feasibility work around the Measures, and a plan for ongoing engagement with the wider stakeholder audience has been developed. Full details can be found at Appendix E.4.1.

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Consultation Approach and Requirements

5.11.8 Given the wide-ranging nature of the Measures proposed in the GM CAP, it is essential that the views of people living, working and commuting in and around Greater Manchester, including businesses, are sought as part of an assessment to discover the best package of interventions.

5.11.9 An initial phase of informal consultation activity – referred to as a 'Public Conversation' – will seek wide-ranging feedback on the options for achieving compliance in Greater Manchester and the identified 'preferred option' whilst at a formative stage. The outputs from this initial engagement activity will be used to inform the ongoing detailed design of the Measures and build the understanding around impacts of the preferred option from a public and stakeholder perspective.

5.11.10 Further phases of activity will be aligned to any statutory consultation requirements. Detailed plans will be developed at each stage of activity; however, the overarching aim of any informal or formal consultation periods is to support the FBC that will be presented to JAQU.

5.11.11 All activity will be planned to ensure compliance with the key legal principles for consultations, as captured in the 'Gunning Principles' which are as follows:

- consultation must take place when policies are at a formative stage;
- sufficient reasons must be provided to allow for intelligent consideration;
- adequate time must be allowed for consultees to consider and respond to proposals; and
- responses must be conscientiously taken into account.[15]

5.11.12 Additionally, the requirements of the Freedom of Information Act 2000; the Environmental Information Regulations 2004; the General Data Protection Regulation 2016/679; the Data Protection Act 2018, and the public sector equality duty as set out in section 149 of the Equality Act 2010 will also be taken into account.

5.11.13 Further stages of stakeholder engagement beyond the OBC and FBC development will be informed by feedback from the Public Conversation, Consultation, continuing stakeholder engagement and research. Together, these activities will provide a better understanding of the impacts and requirements for each stakeholder group and will enable a longer-term approach to be developed for the implementation of the GM CAP. Alongside this, there will be close working with JAQU to ensure activity is aligned to the national approach for stakeholder engagement and public communications.

15 See R v Brent London Borough Council, Ex p Gunning (1985) 84 LGR 168. See also Moseley, R (on the application of) v London Borough of Haringey [2014] UKSC 56

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5.12 Delivery Strategy

5.12.1 As set out in section 5.3.2, it is anticipated that the local authorities will delegate formal authority to TfGM in order for TfGM to fulfil its role as Delivery Body for the Programme on behalf of the ten local authorities. The detail of this will be discussed and agreed with the local authorities in developing the FBC. The Delivery Body is the organisation established or formally instructed to procure and deliver the GM CAP Programme and will be accountable for the building of the Service(s). TfGM will continue with the activity to produce the FBC on behalf of the ten Greater Manchester local authorities.

5.12.2 As described in section 5.6, a core Programme team will be put in place to coordinate Programme development and delivery. The implementation of the projects within the Programme will be undertaken by one or more Delivery Agents which are set out in the tables below. Delivery Agents are sub-contractors or other public sector bodies tasked with delivering a Measure in whole or in part. The first table shows the projects and components of each project, and the second table shows the work packages.

5.12.3 To ensure that the Programme is appropriately resourced, a combination of the following resources will be drawn upon:

- Lead Advisor;
- TfGM resource;
- local authority resource; and
- supplementary resources from the independent consultant market, where appropriate, e.g. where Project Management resources are required. Further detail on the procurement approach for securing this resource is detailed in the Commercial Case.

This will be a bespoke approach to ensure that the required skillsets are provided in order to deliver and manage the Programme.

5.12.4 The proposed Delivery Agents for each of the components throughout the phases in the project lifecycle are set out in the tables below, where it has been possible to determine them at this stage. In determining the best-placed Delivery Agent for each activity, the rationale was applied that where TfGM or the local authorities currently have the responsibilities for delivery/operation of the activities relating to the relevant components, it is proposed that this continues. With regard to EV infrastructure, it is proposed that the contractor currently utilised for installation and operation of this infrastructure continues. Where the legal service provider is included as the lead body, this is due to acknowledgement that a specialist central resource will be required to coordinate and develop the CSO and TROs. The components allocated to the Lead Advisor reflect the scope of services that was set out in the Invitation to Tender (ITT).

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5.12.5 Improving air quality and reducing emissions harmful to health is a key policy priority for Greater Manchester and the Measures proposed will also be complemented by Greater Manchester's existing programme of ongoing major investment in public transport and active travel. Throughout the GM CAP Programme, a dedicated work package will ensure that the interfaces with wider programmes, strategies and studies across Greater Manchester are managed.

Table 5- 7: Projects and Lead Bodies

		Lead Body			
Project Name	**Component**	**Design Phase**	**Implementation Phase**	**Operation Phase**	**Decommissioning Phase**
Clean Air Zone (CAZ)	Policy Design	Lead Advisor	N/A	N/A	N/A
	Highway Infrastructure	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
	Customer	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
	Technology	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
	Estates	Lead Advisor	TfGM	Operating Agent	Operating Agent
	Charging Scheme Order and Traffic Regulation Order	Legal Service Provider	Legal Service Provider	Operating Agent	Operating Agent
	Consultation	TfGM	N/A	N/A	N/A
Clean Freight Fund	Policy Design	Lead Advisor	N/A	N/A	N/A
	Consultation	TfGM	N/A	N/A	N/A
	Customer	TfGM	Delivery Agent	Operating Agent	Operating Agent
	Technology	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
	Estates	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
Clean Taxi Fund	Policy Design	Lead Advisor	N/A	N/A	N/A
	Consultation	TfGM	N/A	N/A	N/A
	Customer	TfGM	Delivery Agent	Operating Agent	Operating Agent
	Technology	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
	Estates	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
Clean Bus Fund	Policy Design	TfGM	N/A	N/A	N/A
	Consultation	TfGM	N/A	N/A	N/A
	Customer	TfGM	TfGM	TfGM	TfGM
	Technology	TfGM	TfGM	TfGM	TfGM
Loan Finance	Policy Design	TfGM/GMCA	TfGM/GMCA	TfGM/GMCA	N/A
	Consultation	TfGM/GMCA	N/A	N/A	N/A
	Customer	TfGM/Delivery Agent	TfGM/Delivery Agent	TfGM/Operating Agent	N/A
	Technology	TfGM/Delivery Agent	TfGM/Delivery Agent	TfGM/Operating Agent	Operating Agent
Electric Vehicle Infrastructure and Promotion	Policy Design	TfGM	N/A	N/A	N/A
	EV Infrastructure	TfGM	Greater Manchester Electric Vehicle Electric Charging Infrastructure (GMEV ECI) operator	Greater Manchester Electric Vehicle Electric Charging Infrastructure (GMEV ECI) operator	Greater Manchester Electric Vehicle Electric Charging Infrastructure (GMEV ECI) operator
	Traffic Regulation Order	Legal Service Provider	Legal Service Provider	Highway Authority	Highway Authority
	Consultation	TfGM	N/A	N/A	N/A
	Experience Days	TfGM	TfGM	TfGM	TfGM

Key:

Delivery Agent* – A sub-contractor or other public sector body tasked with delivering a Measure in whole or in part.

Operating Agent* – A sub-contractor or other public sector body tasked with operating (and decommissioning) one or more of the Measures in whole or in part over their lifetime.

*detail to be confirmed in the FBC.

Table 5- 8: Work Packages and Lead Bodies

		Lead Body			
Work Package Name	**Component**	**Design Phase**	**Implementation Phase**	**Operation Phase**	**Decommissioning Phase**
Sustainable Journeys	Business Engagement (including public and third sector)	TfGM	TfGM	TfGM	N/A
	School and Education Engagement	TfGM	TfGM	TfGM	N/A
	Community Engagement	TfGM	TfGM	TfGM	N/A
Local Authority & Greater Manchester Fleet Upgrade	Fleet Changes	Local / GM Authority	Local / GM Authority	Local / GM Authority	N/A
Parking Standards	Policy Design	Local Authority	N/A	N/A	N/A
	Parking Changes	Local Authority	Local Authority	Local Authority	N/A
Short Stay Parking	Policy Design	Local Authority	N/A	N/A	N/A
	Highway Infrastructure	Highway Authority	Highway Authority	Highway Authority	Highway Authority
	Traffic Regulation Order	Highway Authority	Highway Authority	Highway Authority	Highway Authority
	Consultation	Local Authority	N/A	N/A	N/A
Local Authority & Greater Manchester Staff Parking	Policy Design	Local / GM Authority	Local / GM Authority	Local / GM Authority	N/A
	Parking Infrastructure	Local / GM Authority	Local / GM Authority	Local / GM Authority	N/A
Bus Capacity	Bus Partnerships	TfGM	Bus Operators	Bus Operators	N/A

NB. As noted in section 5.4.10, the work packages Parking Standards, Short Stay Parking and Local Authority & Greater Manchester Staff Parking all relate to the Measure 'Parking Standards'

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Key Delivery Challenges

5.12.6 There are a number of key challenges in relation to the implementation of the GM CAP, including:

- securing the necessary approvals, powers and consents;
- securing the necessary funding at the required time;
- stakeholder management and engagement;
- interface with Highways England;
- cross-Greater Manchester political agreement;
- balancing local and strategic priorities;
- ensuring the design of schemes is at a sufficient level of maturity to facilitate efficient delivery/construction/operation;
- development of IS elements and interface with central Government systems;
- undertaking procurement activities to the require timescales;
- minimising disruption to public transport; and
- consideration of other initiatives and programmes to ensure alignment.

5.12.7 The above challenges will be mitigated through robust risk management processes and a comprehensive stakeholder and communications strategy, as set out in this Management Case.

5.13 Operating Model

5.13.1 Previous sections in the Management Case describe the proposed approach for the implementation of the GM CAP Programme and how it will be governed and delivered. Part of the implementation phase will include establishing an operating model to govern, manage and maintain the outputs of the projects and work packages, until either the EU Limit Value has been met or the funds utilised (incentive funds). The establishment of the operating model will include:

- An Operating Body – a body that is accountable for the ongoing delivery of the Service(s) and to manage, govern and provide oversight of GM CAP Programme outputs. A proposal in relation to the Operating Body will be developed as part of the FBC.
- Operating Agents – sub-contractors or public sector bodies tasked with operating (and decommissioning) one or more of the Measures in whole or in part over their lifetime.

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Operating Body

5.13.2 The role of the Operating Body will include:

- accounting activities for all of the Measures including the allocation of funds on behalf of the GMCA (this role will commence during the delivery phase and continue into operations);
- maintaining oversight on the operation of the GM CAP;
- reviewing and responding to the outputs from the Monitoring and Evaluation;
- tracking the performance and progress of the individual elements of the GM CAP;
- reporting to the Operations Board and Steering Group;
- making recommendations to the Steering Group for the implementation of additional measures if required to ensure the EU Limit Value is met;
- developing and making proposals to the Steering Group for the reinvestment of any revenue surpluses from the proposed CAZ back into additional clean air measures; and
- assessing when sustained compliance has been achieved and authorising the decommissioning.

5.13.3 The Operating Body will follow the governance approach detailed at Appendix E1.1. However, during the operating and decommissioning phases the Programme Board will be replaced by an Operations Board which would report to the Steering Group.

5.13.4 The Operating Body will report into the Operations Board. The Operating Body will be wound down at the end of the decommissioning phase.

Operating Agents

5.13.5 Table 5- 7 Projects and Lead Bodies and Table 5- 8 Work Packages and Lead Bodies describe, in the column entitled Operations Phase areas, where processes, organisation, systems and data will be required to support the operational management, delivered by the Operating Agents.

5.13.6 The guiding principles for the design of the operating model for the Operating Agents are:

- it is to be an organisation to operate the day to day activities of the measures and will need to be shut down when sustainable compliance with the EU Limit Value has been achieved;
- decommissioning costs of the Operating Agent(s) should be minimised, e.g. avoiding redundancy costs;
- there needs to be a mechanism to be able to cost effectively vary the length of time that the operating agent is in operation; and
- the most cost effective way of running the GM CAP should be sought whilst considering social value including local employment opportunities.

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Full Business Case (FBC) Design

5.13.7 During the FBC the detailed design of the Operating Body and Agents will be undertaken and will consider the following:

- development of the blue print (process, organisation, technology and information);
- methods of delivering e.g. temporary organisation, expanded existing capacity, outsourcing or a combination);
- development of detailed operating cost plan;
- development of a detailed implementation plan; and
- property requirements.

5.14 Monitoring and Evaluation

Benefits Realisation

5.14.1 The Strategic Case highlighted that poor air quality damages health. The primary benefits of reducing NO_2 and particulate matter (PM) emissions are improvements to the health of residents and those travelling within Greater Manchester due to reduced exposure to harmful concentrations of NO_2 and PM. A further benefit is the reduction in environmental impacts associated with poor air quality.

5.14.2 This will in turn reduce healthcare spending, increase productivity as illness is reduced, and prevent premature death. Long-term sustainable growth goals are more likely to be achieved with improvements to infrastructure and Measures that encourage less impactful and more efficient modes of travel.

5.14.3 The logic mapping identifies the interventions that make up the projects and work packages, the likely consequences of providing these interventions and the routes to realising the expected benefits. The logic map is located in Figure 1-19 of the Strategic Case. Benefits registers have been produced for each element of the programme and are included within Appendix O.1.1.

5.14.4 Benefits realisation management will ensure that the programme benefits are maximised. The schemes within the proposed GM CAP programme are large-scale, innovative and present the risk of unintended negative consequences for people's wellbeing. Therefore, the monitoring requirements will be proportional to the scale and type of the scheme to ensure benefits are realised. In order to clearly demonstrate all benefits from the Programme and component projects and subsequently ensure that they are all fully realised, a full benefits assessment will be undertaken at FBC to identify all benefits and disbenefits, allow presentation of benefits to stakeholders and ensure plans are in place for benefits realisation once the project is transferred to business as usual.

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5.14.5 Benefits will be realised only once the projects within the programme enter their operational phases. Benefits are anticipated to continue increasing post implementation as modal shift occurs and modern, less polluting, vehicles and technologies become more prevalent.

Monitoring and Evaluation Plan

5.14.6 An outline monitoring and evaluation plan is attached at Appendix E.4.3; this plan proposes a method of measurement to assess the success of the interventions in realising the benefits identified. The monitoring and evaluation plan considers the impacts of the GM CAP on the environment, society and the economy. In addition to the proposed monitoring of NO_2 levels, the monitoring plan also includes monitoring of the outcomes in relation to traffic volumes and traffic composition. It also proposes to capture customer attitudes and behaviours through undertaking surveys and the monitoring of responses to incentives.

5.14.7 JAQU has appointed a contractor to develop and deliver a central evaluation programme. The Programme will engage with the contractor to further develop Greater Manchester's monitoring and evaluation plan to reflect the scope and requirements of the central evaluation programme. A detailed evaluation plan will be produced ahead of the FBC.

5.14.8 The post-programme evaluation will be undertaken to reflect on the completed implementation and benefits realisation. This will commence once compliance has been reached. The scope of this evaluation will encompass examination of benefits realisation, actual cost comparison against planned, lessons learnt throughout programme delivery and any opportunities to increase the benefits through further works.

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Strategic Case

Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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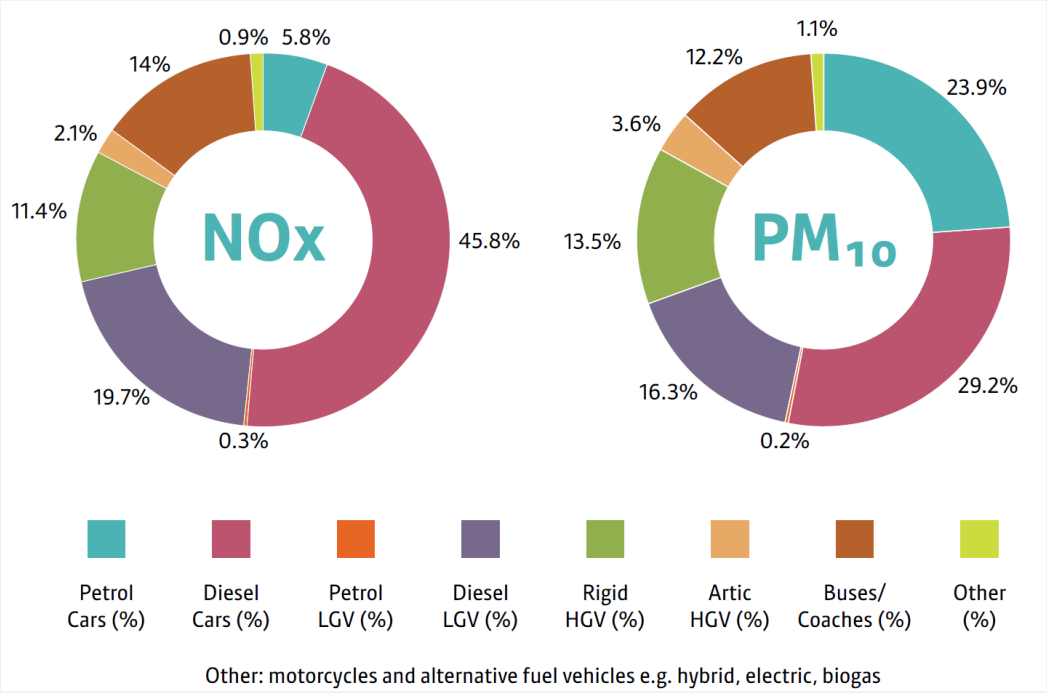
1 Strategic Case

1.1 What is air pollution and why does it matter?

Air pollution affects the health of people living, working and travelling in Greater Manchester. Pollutants such as nitrogen dioxide (NO_2) which is the harmful oxide of nitrogen (NO_x), and particulate matter ($PM_{2.5}$ and PM_{10}) that are not visible to the naked eye are found at dangerous levels in many urban areas and on busy roads. Road transport causes two-thirds of NO_x emissions[1]. Diesel vehicles are the main source of road-based NO_x emissions in Greater Manchester, and older vehicles are typically more polluting than newer vehicles. Large vehicles such as lorries are the most polluting from the exhaust pipe, and in general, diesel vehicles contribute the most, as shown in Figure 1- 1.

Figure 1- 1 Vehicles responsible for emissions damaging to health in Greater Manchester2



Breathing in polluted air contributes to the equivalent of 1,200 deaths a year in Greater Manchester[3]. Both long and short term exposure to air pollution are known to adversely affect health. It affects people's lungs in the short and long term**, worsening respiratory issues such as asthma or bronchitis, as well as cardiovascular problems, and reduces life expectancy[4].** Health damage caused by air pollution can begin as early as a baby's first few weeks in the womb and exposure over a long time can lead to heart and

[1] https://www.greatermanchester-ca.gov.uk/media/1272/air-quality-action-plan-2016-21.pdf

[2] https://www.cleanairgm.com/what-is-air-pollution

[3] Public Health England – Air Quality in Greater Manchester – from a Public Health Perspective (September 2018)

[4] Air Quality – A Briefing for Directors of Public Health (2017), https://www.local.gov.uk/air-quality-briefing-directors-public-health

lung disease. The most vulnerable in society are hit hardest – children, older people and those already in poor health.

Everyone is at risk. But people who spend more time in areas with a high concentration of air pollution are most affected – which can include drivers. The air you breathe inside your vehicle can be dirtier than the air outside so people who spend a lot of time in their cars, taxis, vans or lorries are particularly at risk.

The people living in places with the dirtiest air are often those least likely to drive, and some of the Greater Manchester's most deprived communities suffer the worst air pollution as they live close to busy roads. In total, it is estimated that **the health and social care costs of air pollution in England could reach £5.3 billion by 2035**[5] unless action is taken.

Changing the vehicles we drive and how we travel can clean up our air. This will require residents and businesses to take action, with Greater Manchester's local authorities leading the way. Action is already underway, and this Clean Air Plan will bring forward Measures to bring illegally high roadside NO2 levels within legal limits as soon as possible.

1.2 Why is Greater Manchester producing a Clean Air Plan?

1.2.1 Greater Manchester is producing a Clean Air Plan first and foremost to protect and promote the health of its population by improving air quality and reducing our impact on the environment. In so doing, the local authorities within Greater Manchester are also complying with the UK Air Quality Plan which requires the creation of the Greater Manchester's Clean Air Plan (GM CAP) and which sets out clear guidance on how the Plan should be developed.[6]

1.2.2 Since 2010, the UK has been in breach of the European Union (EU) Limit Value regarding levels of annual average NO_2 levels in major urban areas set by the European Ambient Air Quality Directive (2008/50/EC) (the Directive), which incorporates the many World Health Organisation (WHO) air quality standards into European Law. The EU Limit Value for concentrations of major air pollutants that affect human health, including NO_2 and particulates were implemented into UK law by the Air Quality Standards Regulations 2010 (SI. 2010 No. 1001) (the 2010 Regulations). Regulation 26 of the 2010 Regulations requires the Secretary of State to draw up and implement a national Air Quality Plan so as to achieve the relevant EU Limit Value within the "shortest possible time". The EU has recently re-stated its aim to achieve full compliance with existing air quality standards "by 2020 at the latest".

[5] https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/user_uploads/clean-air-strategy-2018-consultation.pdf

[6] DEFRA, DfT 'UK plan for tackling roadside nitrogen dioxide concentrations' (July 2017), https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017.

1.2.3 By 2015, compliance with the EU Limit Value had still not been achieved. The UK Government was held to be in breach of the Directive and was required to take action by the UK Supreme Court after a successful legal challenge by ClientEarth[7,8]. ClientEarth further challenged the UK Government in the UK High Court in 2016[9] and 2018[10], with the UK Government Air Quality Plans being declared unlawful as they did not comply with the Directive to achieve compliance with air quality standards in the "shortest possible time".

1.2.4 The Government's Air Quality Plans have required local authorities with persistent exceedances to undertake local action to consider the best option to achieve statutory NO_2 limit values in the 'shortest possible time'. Eight Greater Manchester local authorities[11] have been identified by the national Pollution Climate Mapping[12] (PCM) model to have roads which are expected to continue to exceed the EU Limit Value for NO_2 in 2021 and therefore have been directed by Government to undertake feasibility studies to identify Measures for reducing NO_2 concentrations to compliant levels in the 'shortest possible time'. These studies are required to produce a series of business cases for assessing and implementing the relevant Measures as part of the GM CAP. The Government has allocated £255 million for Implementation Funding and £220 million to a Clean Air Fund to fund such Measures nationally.

1.2.5 Following more detailed local modelling, the remaining Greater Manchester local authorities of Wigan and Rochdale were identified as containing roads which are expected to have NO_2 exceedances in 2021, and therefore it was agreed that the GM CAP should also include these local authorities.

[7] Non-profit environmental organisation

[8] *R (on the application of ClientEarth) v Secretary of State for the Environment, Food and Rural Affairs* [2015] UKSC 28.

[9] *R (on the application of ClientEarth) (No 2) v Secretary of State for the Environment, Food and Rural Affairs* [2016] EWHC 2740 (Admin).

[10] *R (on the application of ClientEarth) (No 2) v Secretary of State for the Environment, Food and Rural Affairs* [2018] EWHC 315 (Admin).

[11] In 2017, seven authorities were specified in the initial Direction: Bolton Metropolitan Borough Council, Bury Metropolitan Borough Council, Manchester City Council, Salford City Council, Stockport Metropolitan Borough Council, Tameside Metropolitan Borough Council, Trafford Metropolitan Borough Council. In 2018, Oldham Metropolitan Borough Council was specified in the latest Directive to areas identified as containing NO2 exceedances, This 2018 direction was different to the 2017 direction "To conduct a feasibility study and provide the Secretary of State with a document setting out, for each road-link within the specified authority's area projected to have a NO2 exceedance in 2018, 2019 or 2020 in the national PCM model (other than those for which Highways England is the highway authority), the nature of the exceedance and, where they exist, recommended measure(s) that would achieve compliance with the relevant statutory NO_2 EU Limit Value in the shortest possible time.".

[12] https://uk-air.defra.gov.uk/research/air-quality-modelling?view=modelling Pollution Climate Mapping (PCM) model is the UK's national air quality model and provides outputs of pollutant concentrations in the UK at a 1x1 km resolution and also at roadside locations for around 9,000 urban major roads (A and M class roads).

1.2.6 The ten Greater Manchester local authorities have taken a Greater Manchester-wide approach to producing a Clean Air Plan because it is recognised that air pollution does not respect local authority boundaries and therefore a consistent and co-ordinated approach is required to maximise air quality benefits for all people living and working in Greater Manchester and to minimise the risk of unintended consequences, such as displacing elevated NO_2 concentrations to other locations within Greater Manchester. A co-ordinated approach will also help to ensure, as far as possible, alignment between the GM CAP and other Greater Manchester strategies, including the existing Greater Manchester Air Quality Action Plan[13] and Greater Manchester Low-Emission Strategy[14]. Table 1- 1 below outlines the organisations related to the Clean Air Plan and their respective responsibilities.

Table 1- 1: Organisations related to the Clean Air Plan and their responsibilities

Organisation	Responsibility
European Commission	Issued air quality Directive (2008/50/EC) relating to ambient air quality, including NO2 concentrations, that was binding on EU member states, including the UK.
UK Government	Implemented the standards set out in the EU Directive into UK law in the Air Quality Standards Regulations 2010. The Government is responsible for achieving the EU Limit Values by 2020 but has required local authorities to undertake the feasibility studies and identify the local option which will achieve compliance with the EU Limit Value in the shortest possible time in each authority through ministerial directions.
Greater Manchester Combined Authority (GMCA)	The Greater Manchester Combined Authority (GMCA), chaired by the Mayor has concurrent responsibility with the respective GM local authorities for reviewing air quality pursuant to Article 10 of the Greater Manchester Combined Authority Order (2011) (SI 2011 No. 908) and schedule 3 and sections 82-84 Environment Act 1995. Whilst GMCA is not responsible for producing the feasibility study which is required of local authorities under s85 Environment Act 1995, it is assisting in coordinating the approach of the ten GM local authorities and its endorsement may be required in respect of some proposed Measures.
Transport for Greater Manchester (TfGM)	TfGM is coordinating the feasibility study and development of the GM CAP on behalf of the GMCA in collaboration with the ten Greater Manchester local authorities to ensure an integrated and coordinated response which does not lead to displacement of the air quality problem between local authorities.

[13] https://www.greatermanchester-ca.gov.uk/media/1272/air-quality-action-plan-2016-21.pdf

[14] https://www.greatermanchester-ca.gov.uk/media/1276/low-emission-strategy-dec-2016.pdf

Organisation	Responsibility
Bolton Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Bury Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Manchester City Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Salford City Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Stockport Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Tameside Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.

Organisation	Responsibility
Trafford Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Oldham Metropolitan Borough Council	Oldham Metropolitan Borough Council (Oldham MBC) was not directed along with the other Greater Manchester local authorities in 2017, however following a court ruling in 201815 the UK Government was ordered to produce supplements to the UK 2017 Air Quality Plan. Consequently, Oldham MBC was directed to conduct a feasibility study and provide the Secretary of State with a document setting out the Measure(s) that would achieve compliance with the EU Legal Limits in the shortest possible time. In October 2018 the UK Government produced a supplemental plan16, which acknowledged that, as Oldham MBC is part of the Greater Manchester Plan, the Oldham exceedances were being considered as part of the GM CAP.
Wigan Metropolitan Borough Council	No exceedances were identified in Wigan by UK Government analysis but more detailed modelling, produced as part of the target determination process, identified exceedances in Wigan. This modelling process was undertaken whilst the Strategic Outline Case (SOC) was being developed relating to the original direction to the seven local authorities. This new evidence was presented to the GMCA and led to an agreement that the remaining Greater Manchester local authorities (at that point Oldham, Wigan, and Rochdale) should become part of a GM CAP to ensure a comprehensive approach was adopted.
Rochdale Metropolitan Borough Council	No exceedances were identified in Rochdale by UK Government analysis but more detailed modelling, produced as part of the target determination process, identified exceedances in Rochdale. This modelling process was undertaken whilst the SOC was being developed relating to the original direction to the seven local authorities. This new evidence was presented to the GMCA and led to an agreement that the remaining Greater Manchester local authorities (at that point Oldham, Wigan, and Rochdale) should become part of a GM CAP to ensure a comprehensive approach was adopted.
Public Health England	Public Health England will advise and signpost, to enable TfGM to access appropriate technical advice and support.
Greater Manchester Health and Social Care Partnership	In addition to working with its partners to understand the health impacts of air pollution, the NHS Long Plan has stated its commitment to help reduce emissions and to reduce air quality,

[15] Client Earth (No3)) v (1) Secretary of State for the Environment, Food & Rural Affairs; (2) The Secretary of State for Transport and (3) Welsh Ministers [2018] EWHC 315

[16] Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations October 2018

Objectives of the Clean Air Plan

1.2.7 Greater Manchester is seeking to reduce the health impacts of air pollution. The primary aim of the GM CAP is to reduce NO_2 concentrations in Greater Manchester to below the EU Limit Value in the shortest possible time. In addition to achieving this primary aim, Greater Manchester has also sought to develop GM CAP interventions that align with Greater Manchester's wider strategic goals and do not undermine the GMCA and ten local authorities' other statutory and legal duties. This approach will minimise the risk of significant unintended negative economic, social or environmental consequences resulting from the implementation of the Clean Air Plan.

1.2.8 In developing the GM CAP, the assessment has taken account of the need to:

- ensure that compliance is achieved as soon as possible;
- choose a route to compliance which reduces human exposure as quickly as possible;
- ensure that compliance with the EU Limit Value is not just possible but likely.

1.2.9 It has also considered the feasibility and deliverability of the options under consideration.

1.2.10 This Strategic Case which forms part of the Outline Business Case sets out the underlying rationale for the GM CAP, including a robust case for change based upon local modelling that has revealed a much wider current NO_2 problem than initially identified by Government. It predicts a greater spatial distribution of exceedances and higher concentrations of NO_2 than those initially identified by Government. Sections of road with concentrations of NO_2 over the EU Limit Value of 40 $\mu g/m^3$ which is defined as an exceedance by the Directive, are located in all ten Greater Manchester local authorities, in a similar spatial distribution to the air quality problems identified in the established Air Quality Management Area. The scale of the local challenge has been formally agreed with Government's Joint Air Quality Unit (JAQU) through the Target Determination exercise.

1.2.11 This Strategic Case describes the process that has been undertaken to identify and assess the interventions that could be implemented to reduce annual mean NO_2 concentrations. It concludes with a summary of the best performing options and recommends a preferred option for delivery.

1.3 The nature of the air quality problem in Greater Manchester

Air quality in Greater Manchester

1.3.1 There are 152 stretches of road (road links) or 250 modelled points, where concentrations of NO_2 are forecast to exceed 40 µg/m^3 for NO_2 in 2021, across Greater Manchester as a whole. 112 of these roads (or 207 modelled points) coincide with roads included in the national PCM model. Typically, these roads have the greatest car use and heavy freight flows. The remaining 40 road link exceedances (or 43 modelled points) are on shorter stretches of local roads, primarily around town and city centres across Greater Manchester, which are not included in the national model but carry high volumes of traffic, including significant numbers of buses, taxis and Light Goods Vehicles (LGVs).

1.3.2 Local modelling of transport and air quality has been undertaken to support the Plan. The detailed methodology and results can be found in the accompanying evidence reports.[17] NO_2 concentrations in Greater Manchester have been measured for 2016 via local monitoring. Modelling has then estimated the concentrations of NO_2 in Greater Manchester in the baseline year 2016, and forecast for 2021, 2023 and 2025. The future forecasts provide an estimate of the position if no additional interventions were carried out beyond the funded plan; these are known as the Do Minimum scenarios. Model outputs have been compared with the results of the monitoring carried out across Greater Manchester to ensure that the predicted concentrations reflect real-world conditions.

1.3.3 Modelling of air quality can be presented in two different ways: a point along a road which has a certain concentration of NO_2 or the stretch of road which has a certain concentration of NO_2. Presenting point data provides more specific and detailed information on the air quality problem, as it allows an understanding of how concentrations of NO_2 vary at different locations on the road. The Outline Business Case (OBC) will present concentration and emissions information on the basis of point data.

1.3.4 Greater Manchester's Strategic Outline Case[18] (SOC) presented the results of national modelling which identified exceedances in seven out of ten of Greater Manchester's local authorities. As part of the feasibility study process, Greater Manchester was required to produce its own local modelling. Based on Government guidance the following local evidence was used to understand likely NO_2 concentrations in Greater Manchester beyond 2020:

- Detailed Baseline Year (2016) and Future Years (2021, 2023 and 2025) transport model (actual and future demand on the road network);

[17] Local Air Quality Plan Modelling and Methodology Reports and Local Plan Transport Model Validation, Methodology, and Forecasting Reports.

[18] There are three parts to the feasibility study assessing Greater Manchester's Clean Air Plan: SOC, Outline Business Case (OBC) and Full Business Case (FBC). All three develop the proposed Clean Air Plan in terms of level of detail and the assessment of impacts.

- local vehicle fleet profiles (e.g. ages and types of vehicle) using Automatic Number Plate Recognition (ANPR) data;
- vehicle fleet licensing data for bus and taxi fleet;
- local background concentrations of NOx and NO_2;
- more detailed road network and junction data (e.g. alignment and width);
- representation of “air pollution” canyons (e.g. tall buildings);
- local air quality monitoring data from across Greater Manchester; and
- confirmed future changes to the road network, and expected regional traffic growth and changes to the traffic fleet.

1.3.5 This local modelling was necessary to provide a more comprehensive understanding of the air quality across the entirety of Greater Manchester. The local modelling identified a larger number of locations which are expected to exceed the EU Limit Value, and higher concentrations of NO_2 in specific locations. This meant that all ten local authorities contained locations expected to be in exceedance of EU Limit Value for NO_2 after 2020. This reflected the fact that the local modelling used more detailed sources of data and more refined analytical tools. This resulted in three fundamental differences compared to the national modelling. Firstly, that the vehicle fleet in Greater Manchester is older and more polluting than assumed in the national model. Secondly, that in some areas vehicles are moving more slowly than assumed in the national model. And finally, that the background concentrations from non-road vehicle emissions sources (for example, electricity production, industry, local heating etc.) is higher than expected and needed to be increased in the modelling to reflect real-world conditions.

1.3.6 Greater Manchester submitted the results of its local modelling to JAQU in summer 2018. Following review by JAQU and an Independent Technical Review Panel, the local model process has been accepted as the reference for determining compliance with the EU Limit Value.

1.3.7 Table 1- 2 and Figure 1- 2 show the exceedances identified by local modelling and upon which the proposed GM CAP is based. Exceedances are found in the town and city centres and on major roads, particularly those close to the motorway network. The greatest concentration of sites in exceedance of the EU Limit Value is found in Manchester city centre, and this is also where some of the highest annual mean concentrations are predicted. This reflects higher traffic volumes, congestion, the number of high buildings which create air pollution 'canyons’, and high background levels of pollution. The aim of the GM CAP is to deliver Measures that deliver compliance at these locations as soon as possible, and without redistributing the problem to other locations. The geographical spread of NO_2 exceedances throughout Greater Manchester is shown in Figure 1- 2 and clearly highlights the complexity of the air quality issues the Clean Air Plan is trying to address.

1.3.8 Table 1- 2 shows the exceedances identified in the national modelling, using the PCM, and in the local modelling. The local modelling encompasses a wider road network than the PCM, including local and strategic roads. The primary spending objective of the GM CAP, as set out by JAQU, is to tackle exceedances identified by the local modelling on roads included within the PCM network. In Greater Manchester, this amounts to 207 exceedances in 2021. The secondary spending objective is to tackle exceedances identified by the local modelling on local roads, an additional 43 locations in Greater Manchester.

1.3.9 While the maps and tables show a number of exceedances on local roads that are in close proximity to the Strategic Road Network (SRN), which is managed by Highways England, it should be noted that the mapping and analysis does not include exceedances actually on the SRN as they have not been required to act to reduce NO_2 under the same direction as local authorities. Nevertheless, at local roads close to the SRN, pollution caused by motorway traffic can be as much as 50% greater than that from the local road. Furthermore, there are properties in exceedance situated along the motorway where there is very little local road traffic and 100,000 vehicles passing per day on the SRN.

1.3.10 Highways England have eight links predicted to be non-compliant in the PCM network based on national modelling. Highways England is currently assessing sections of the SRN around Greater Manchester to explore potential Measures to reduce air quality impacts. The GM CAP is predicted to provide substantial improvements in air quality on the SRN in Greater Manchester as most of the traffic on that network enters or exits within the region.

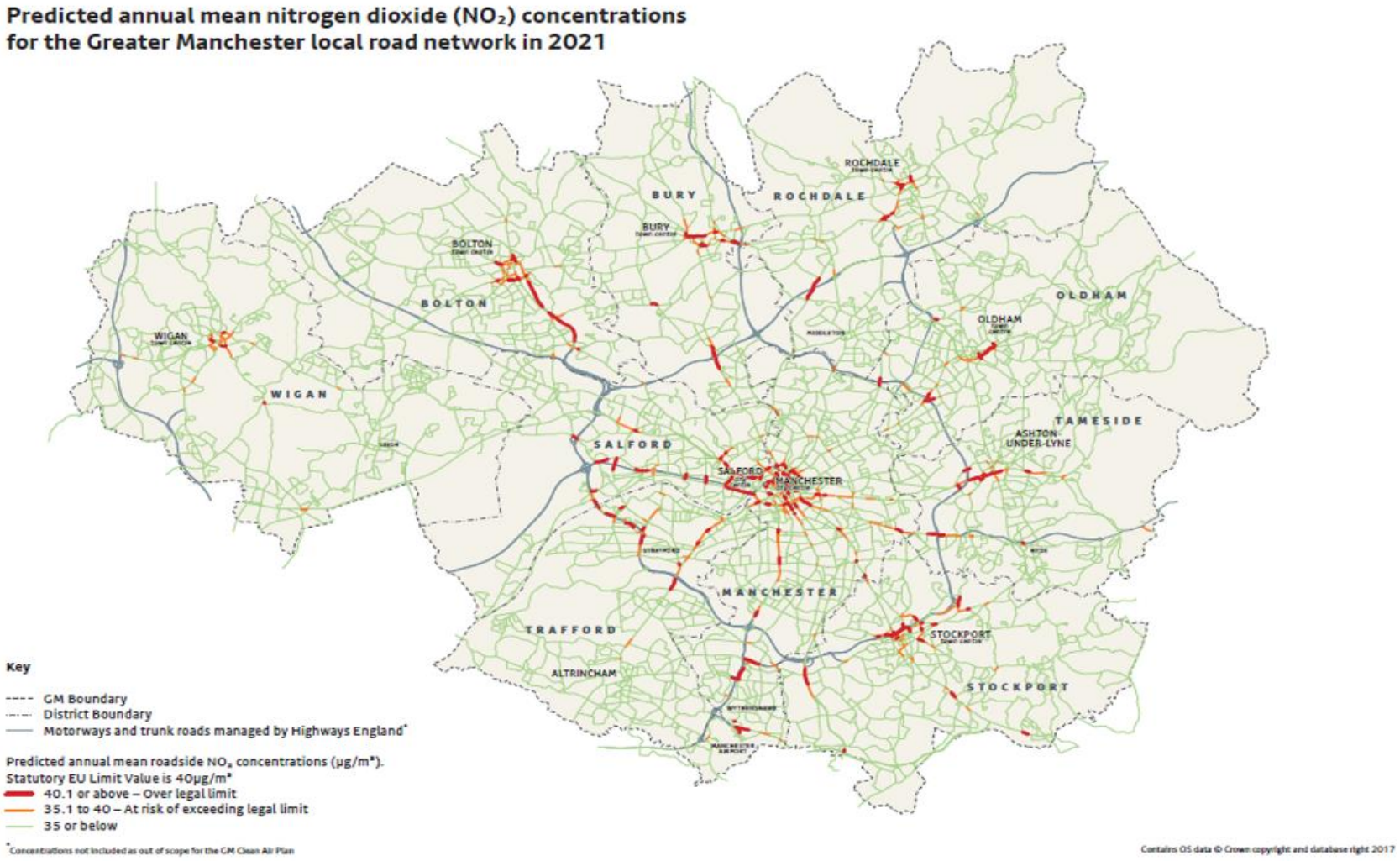
Table 1- 2: Predicted NO_2 Exceedances in Greater Manchester in 2021 in PCM and local modelling in 2021

Local authority	National (PCM) Model exceedances links	Local Model point exceedances on PCM links	Additional Local Model point exceedances on minor roads (non-PCM links)*	Total Local Model point exceedances
Bolton Metropolitan Borough Council	1	18	1	19
Bury Metropolitan Borough Council	1	19	4	23
Manchester City Council	4	70	18	88
Oldham Metropolitan Borough Council	0	13	2	15

Local authority	National (PCM) Model exceedances links	Local Model point exceedances on PCM links	Additional Local Model point exceedances on minor roads (non-PCM links)*	Total Local Model point exceedances
Rochdale Metropolitan Borough Council	0	10	0	10
Salford City Council	1	30	6	36
Stockport Metropolitan Borough Council	2	24	6	30
Tameside Metropolitan Borough Council	1	16	0	16
Trafford Metropolitan Borough Council	1	5	5	10
Wigan Metropolitan Borough Council	0	2	1	3
Total	**11**	**207**	**43**	**250**

**These are road links that are not included in the national PCM model but have been modelled locally.*

Figure 1- 2: Predicted annual mean NO_2 concentrations in Greater Manchester 2021



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1.3.11 Further modelling has been undertaken to assess what would happen in later years if no further action was taken. This shows that, based on current assumptions around trends in vehicle purchasing patterns and changes in background emission levels, without further action eight sites across Greater Manchester would remain in exceedance of the legal EU Limit Value in 2025, 15 years after the original target date for compliance. The location of sites remaining non-compliant are listed in the table below.

Table 1- 3: Points predicted to remain in exceedance of legal EU Limit Value in 2016, 2021, 2023 and 2025 across Greater Manchester without further action

Local authority	2021	2023	2025
Bolton Metropolitan Borough Council	19	3	0
Bury Metropolitan Borough Council	23	12	4
Manchester City Council	88	29	2
Oldham Metropolitan Borough Council	15	3	1
Rochdale Metropolitan Borough Council	10	2	0
Salford City Council	36	10	1
Stockport Metropolitan Borough Council	30	4	0
Tameside Metropolitan Borough Council	16	5	0
Trafford Metropolitan Borough Council	10	0	0
Wigan Metropolitan Borough Council	3	0	0
Total	250	68	8

1.3.12 Table 1- 4 below shows the distribution of non-compliant sites across Greater Manchester in terms of how close they are to compliance. This shows that, whilst levels of NO_2 are below the EU Limit Value across much of the road network, in 2021 it is anticipated that 250 sites will remain non-compliant, of which 62 are predicted to experience annual mean concentrations between 45 µg/m^3 and 50 µg/m^3, and 13 to experience annual mean concentrations over 50 µg/m^3 and as high as 55 µg/m^3. A further 603 sites are compliant but experience annual mean concentrations close to the EU Limit Value and given modelling uncertainties, could be at risk of still exceeding in 2021. By 2025, the transition towards cleaner vehicles that would be expected without further action, as well as a reduction in background emissions, leads to a very substantial reduction in the number

of sites in exceedance of the EU Limit Value, from 250 in 2021 to eight in 2025, and a reduction in the number of sites in compliance but close to EU Limit Value from 150 in 2021 to 12 in 2025. Nevertheless, this suggests that achieving compliance with the EU Limit Value will take more than seven years from today in Greater Manchester without further action. It should be noted that forecasts of improvements in air quality have been shown to be overly optimistic in the past; if this was the case then compliance may take longer to achieve and any intervention would be of greater value. Information on air quality performance for individual local authorities can be found in Appendix A2.

Table 1- 4: Predicted annual mean NO_2 concentrations at points on the Greater Manchester road network, 2021 and 2025 without further action ('Do Minimum')

Road classification [19]	Compliant sites		Non-compliant sites			
	Very compliant (below 35 µg/m3)	Compliant but marginal (35 to 40 µg/m3)	Non-compliant (>40 to 45 µg/m3)	Very non-compliant (>45 to 50 µg/m3)	Extremely non-compliant (>50 µg/m3)	Total non-compliant (>40 µg/m3)
2021						
Inside Manchester-Salford Inner Relief Route	475	73	34	19	5	58
Urban centres	465	66	17	4	0	21
Other locations	15,341	464	124	39	8	171
Total	16,281	603	175	62	13	250
2025						
Inside Manchester-Salford Inner Relief Route	601	4	1	0	0	1
Urban centres	547	5	0	0	0	0
Other locations	15,920	49	7	0	0	7
Total	17,068	58	8	0	0	8

Note that the total number of predicted points and distribution of those points changes between 2021 and 2025 due to planned changes to the road network.

1.3.13 In order to deliver compliance, emissions reductions equivalent to reducing traffic by as much as 40% are required at some locations. This proposed GM CAP has assessed solutions that aim to deliver equivalent reductions in emissions in the shortest possible time and without limiting the ability to travel around the region or preventing successful business operations.

[19] "Inside Inner Relief Route" is the area encircled by the Inner Relief Route. "Urban centres" are areas that met a definition used for the purposes of air quality modelling. "Routes" are roads outside of Urban centres and the Inner Relief Route.

What causes air pollution in Greater Manchester?

1.3.14 As demonstrated by the scale of exceedances identified in the Government's PCM, Greater Manchester suffers from some of the worst air quality in the UK and without further action, it will take longer to reach safe levels of NO_2 in Greater Manchester than in most other cities. The reasons for this are complex and multi-faceted.

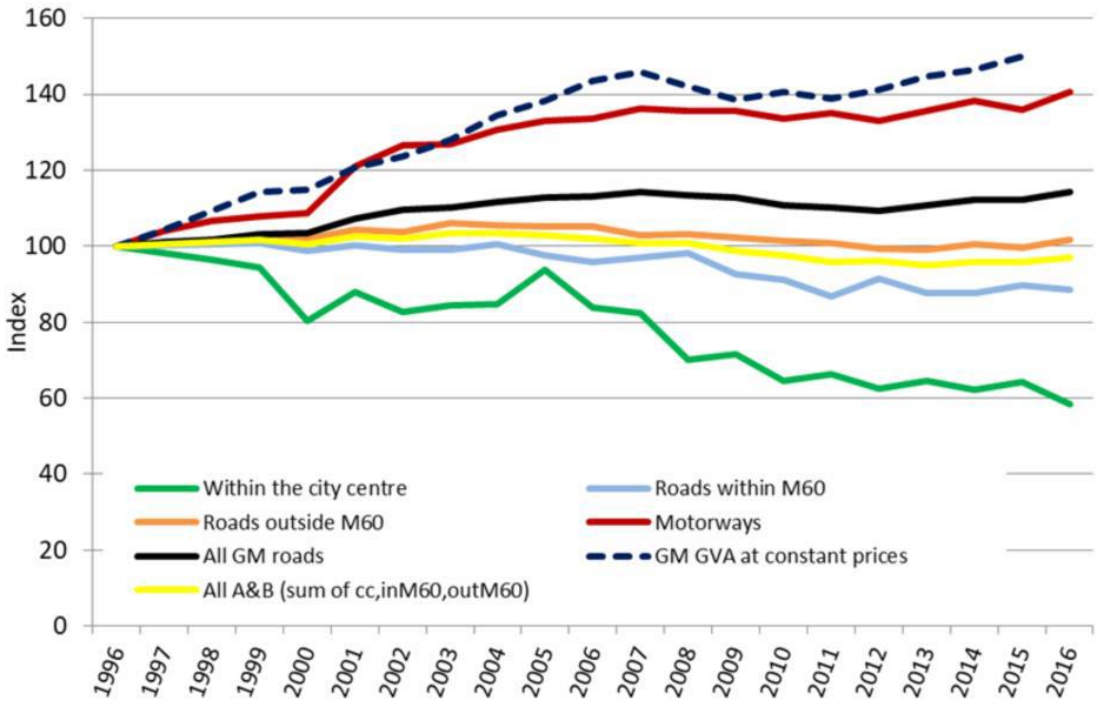
1.3.15 Vehicles travelling on the roads in Greater Manchester traffic are older and more polluting than the national average, and traffic speeds are slower than average.[20] This means the options considered in Greater Manchester may have to be bolder.

1.3.16 The transport modelling has also been analysed to understand the origins and destinations of traffic, by vehicle type, on these links. This shows that whilst a lot of traffic is associated with accessing the urban centres, there is also a significant use of the local road network to access the motorway for trips spread around Greater Manchester and beyond. The analysis indicates that a range of Measures will be necessary to tackle Greater Manchester's NO_2 concentrations due to the diverse spatial context and differing sources.

1.3.17 Vehicle travel in Greater Manchester has been changing over the past 20 years. Traffic volumes on Highways England controlled motorways have been increasing but elsewhere on the local road network traffic levels have been stable or falling.

[20] Local Plan Air Quality Modelling Report

Figure 1- 3: Annual Motor Vehicles kilometres (km) in Greater Manchester, indexed to a 1996 base and compared to economic growth (in GVA)[21]



1.3.18 Analysis of the pollution sources at each location of exceedance has been undertaken, and an estimate of the emissions reduction required from vehicle transport has been calculated to enable compliance with the EU Limit Value for NO_2. This was utilised to inform the detail of Measures required by the GM CAP.

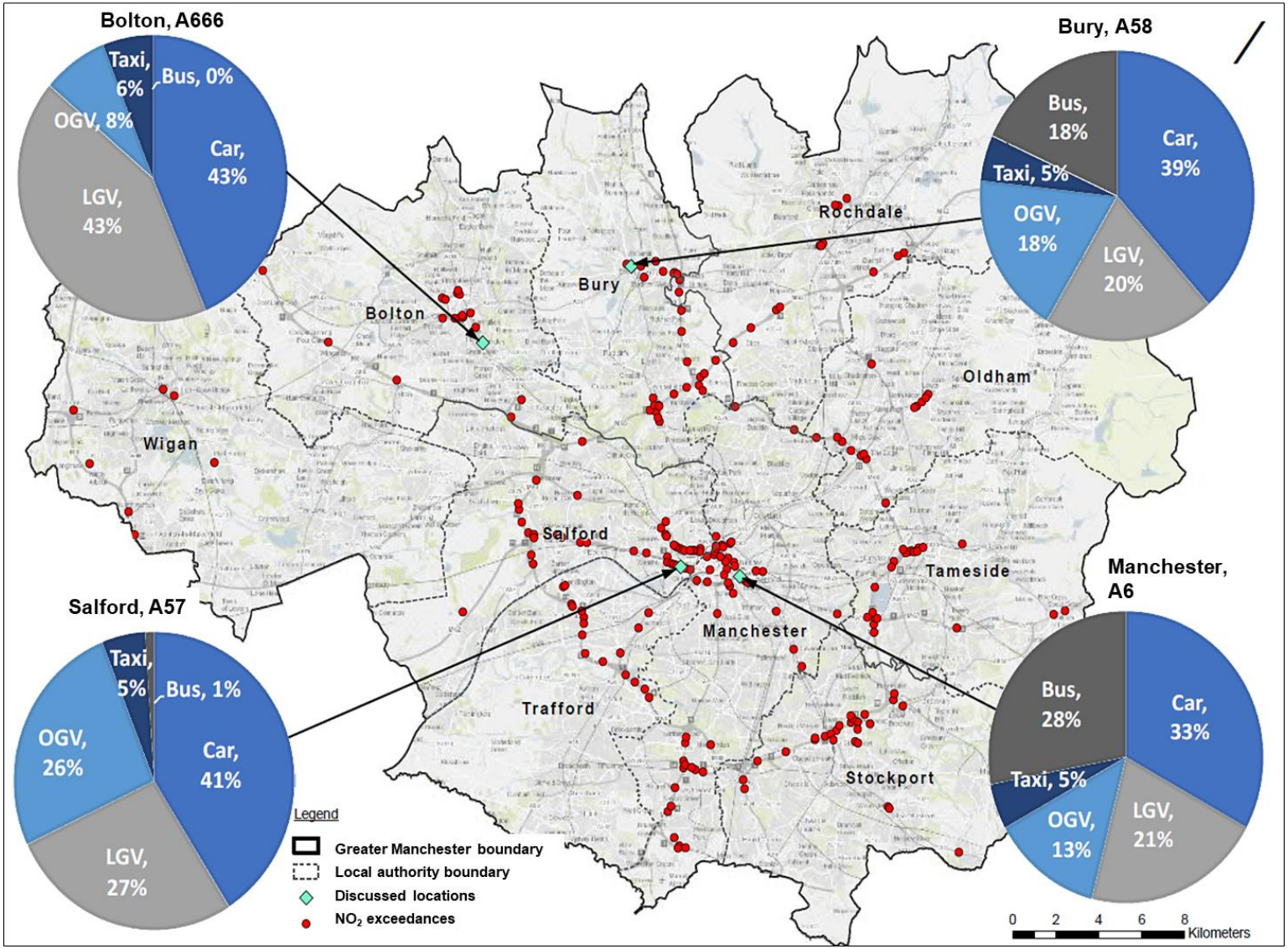
1.3.19 The analysis shows that there are very diverse factors affecting vehicle emissions across Greater Manchester, with vehicle types and levels often differing between roads in close proximity to each other (see Figure 1- 4 below). In many locations where there are significant exceedances, such as on roads in a city/town centre, the road network performs a variety of complex transport functions and therefore carries a diverse range of traffic, including cars, vans, Heavy Goods Vehicles (HGVs), buses and taxis.

[21] TfGM Highways Forecasting and Analytical Services. Note that 'GM roads' includes all roads in GM including the motorway network.

1.3.20 The graphs in Figure 1- 4 show how different vehicle types contribute to the total road transport emissions on a given road link. For example, buses are an insignificant fraction on the selected example Bolton and Salford links (but may represent a significant contribution elsewhere in these districts), whereas the selected example sites in Manchester and Bury comprise 18-28% bus emissions. Emissions from goods vehicles at the selected example link in Salford are over 50% of emissions, likely to be associated with accessing Trafford Park. The selected example Bolton link is dominated by cars and vans, whilst the selected example site in Bury has a relatively even distribution of vehicle type sources.

1.3.21 Note that the sites shown in Figure 1- 4 are selected examples, and that the sources of emissions at other sites within the same districts and elsewhere will be very different.

Figure 1- 4: Examples of how transport-related sources of NOx vary on different roads in Greater Manchester



National context: why are emissions worse than expected?

1.3.22 Nationally, emissions reductions have been lower than forecast over the past 20 years. This is because there has been larger than forecast growth in diesel vehicles which produce higher levels of NOx than petrol vehicles. This is linked to the failure of EU emissions standards and manufacturer tests and the growth in diesel vehicle use linked to UK Government tax incentives[22] aimed at decreasing CO_2 emissions from vehicles. Policy at the time was more focused on climate change, whilst improvements in air quality have assumed greater relative importance in recent years, particularly within urban areas. Only recently, in April 2018, have tax incentives changed to dissuade the use of diesel vehicles through increased taxation[23]. It also reflects the fact that, as stated by the European Environment Agency (EEA), "'real-world emissions' of NO_2 particularly from diesel cars and vans, generally exceed the permitted European emission standards, which define the acceptable limits for exhaust emissions of new vehicles sold in the EU Member states"[24].

1.4 The impacts of air pollution

Impact of Air Pollution on Public Health

1.4.1 Poor air quality has a real and significant effect on people's health. Air pollution is the largest environmental risk linked to deaths every year. Pollutants such as NO_x, principally NO_2, and PM ($PM_{2.5}$ and PM_{10}) that are not visible to the naked eye are found at dangerous levels in many urban areas and on busy roads.

1.4.2 Both long and short-term exposure to air pollution are known to adversely affect health. There is strong evidence associating air pollution with increased mortality and ill health, including the exacerbation of asthma, effects on lung function and increases in respiratory and cardiovascular hospital admissions[25].

[22] CO_2 based tax for cars that was introduced in 2001 (https://www.bbc.co.uk/news/uk-politics-41985715.

[23] https://www.gov.uk/vehicle-tax-rate-tables

[24] https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-air-pollutants-8/transport-emissions-of-air-pollutants-5

https://www.epa.gov/sites/production/files/2015-10/documents/vw-nov-caa-09-18-15.pdf

[25] Air Quality – A Briefing for Directors of Public Health (2017), https://www.local.gov.uk/air-quality-briefing-directors-public-health

1.4.3 It is estimated that long-term exposure to human-made particulate air pollution contributes to the equivalent of 1,200 deaths every year in Greater Manchester[26]. The Committee on the Medical Effects of Air Pollutants has established that short-term exposure to NO_2, particularly at high concentrations, is a respiratory irritant that can cause inflammation of the airways leading to, for example, coughing, the production of mucus and shortness of breath. Studies have shown association of NO_2 in outdoor air with reduced lung development and respiratory infections in early childhood, and effects on lung function in adulthood.

1.4.4 NO2 also contributes to wider environmental degradation, such as adverse effects on vegetation that can have impacts on human health.

1.4.5 In total, it is estimated that the health and social care costs of air pollution in England could reach £5.3 billion by 2035 unless action is taken[27].

1.4.6 Greater Manchester has a particular imperative to improve health, as the region has one of the lowest life expectancies at birth in England and large inequalities between areas. For example, there is an 18 year gap for men and a 13 year gap for women in healthy life expectancy across Greater Manchester when comparing those areas of highest healthy life expectancy with the lowest. Low income communities are more affected by air pollution.[28]

1.4.7 Conditions caused or exacerbated by air pollution may significantly reduce quality of life and could potentially result in affected people being less able to work, attend education or carry out their normal daily lives, and this in turn could widen the health inequality gap further.

1.4.8 In 2012, poor air quality was estimated to cost the economy in England up to £2.7 billion through its impact on productivity[29]. Achieving a major improvement in air quality across Greater Manchester will not only be important for improving human health but will also help to make Greater Manchester a more attractive place to live, visit and invest. Alongside this, there is a growing body of evidence that relates poor air quality with a secondary set of health impacts arising from spending less time outside, which can lead to more sedentary lifestyles and negative psychological effects on our mental health[30].

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[26] Public Health England – Air Quality in Greater Manchester – from a Public Health Perspective (September 2018)

[27] https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/user_uploads/clean-air-strategy-2018-consultation.pdf

[28] The devolution of health funding. https://www.research.manchester.ac.uk/portal/files/56630884/LifeandDevoHealthFundingJunePrePub2017.pdf

[29] https://uk-air.defra.gov.uk/assets/documents/reports/cat19/1511251135_140610_Valuing_the_impacts_of_air_quality_on_productivity_Final_Report_3_0.pdf

[30] https://paa.confex.com/paa/2017/mediafile/ExtendedAbstract/Paper13493/IndividualPsychologicalDistress_April7.pdf

1.4.9 In addition to reducing the impact on health from air pollution, measures that improve air quality can offer wider public health and well-being co-benefits including an improvement in overall environmental quality, increased physical activity, noise reduction, greater road safety and climate change mitigation. Multiple interventions, each producing a small benefit, can act cumulatively to produce significant overall benefits.[31]

Impact of air pollution on society

1.4.10 Around 7% of the Greater Manchester population, nearly 200,000 people, live in areas containing roads close to or in exceedance of the EU Limit Value for NO_2 and many more people will regularly spend time visiting areas or travelling on roads in exceedance of the EU Limit Value.

1.4.11 The youngest, the oldest, those living in areas of deprivation, and those with existing heart or lung problems are at greater risk of developing symptoms due to exposure to air pollution[32,33]. Greater Manchester contains some of the most deprived communities in the country, often living in urban areas with high levels of traffic. Figure X shows selected characteristics of people living in areas affected by poor air quality, defined as Census Output Areas that intersect road links above or close to NO_2 limits. People living in areas impacted by poor air quality are more likely to not be in employment, not own a car/van, and live in rented or overcrowded housing, as shown in Figure 1-5[34].

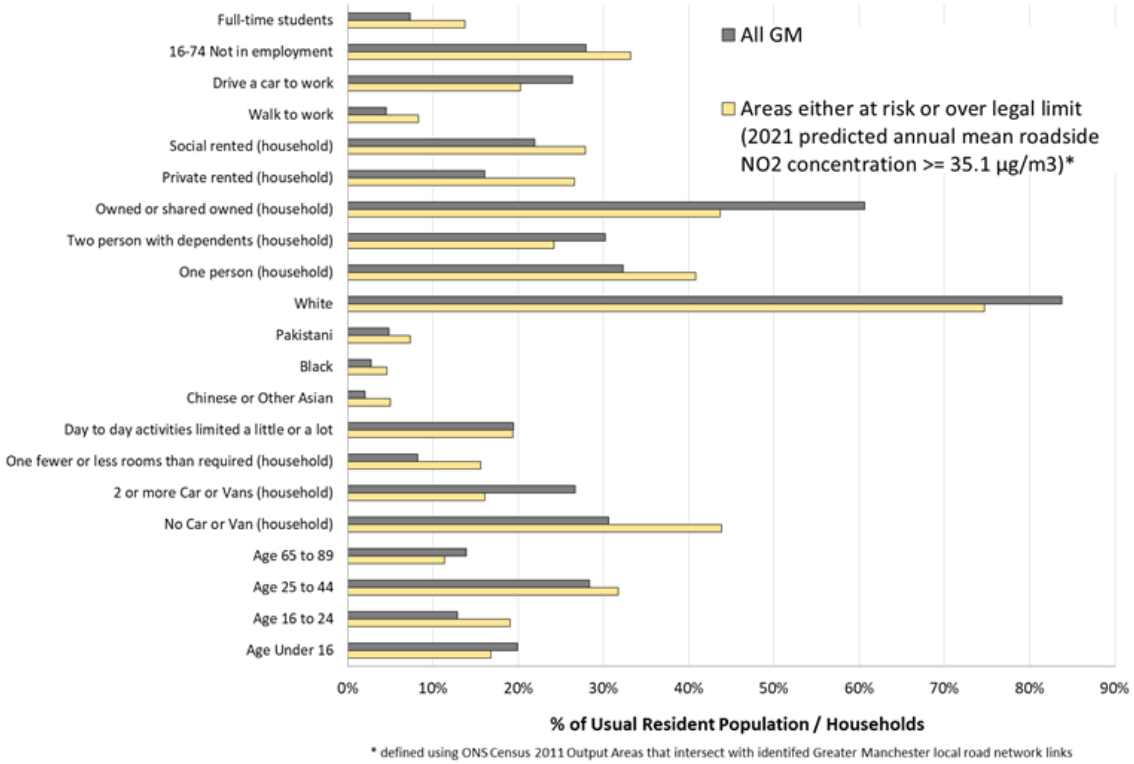
[31] Air Pollution and Health https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution

[32] Air Quality – A Briefing for Directors of Public Health (2017), https://www.local.gov.uk/air-quality-briefing-directors-public-health

[33] 10. RCP and RCPCH London, Every breath we take lifelong impact of air pollution (2016), https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution

[34] TfGM analysis of Acorn 2017 (CACI) data.

Figure 1- 5: Characteristics of Greater Manchester residents living in areas close to points of NO_2 exceedance[35]

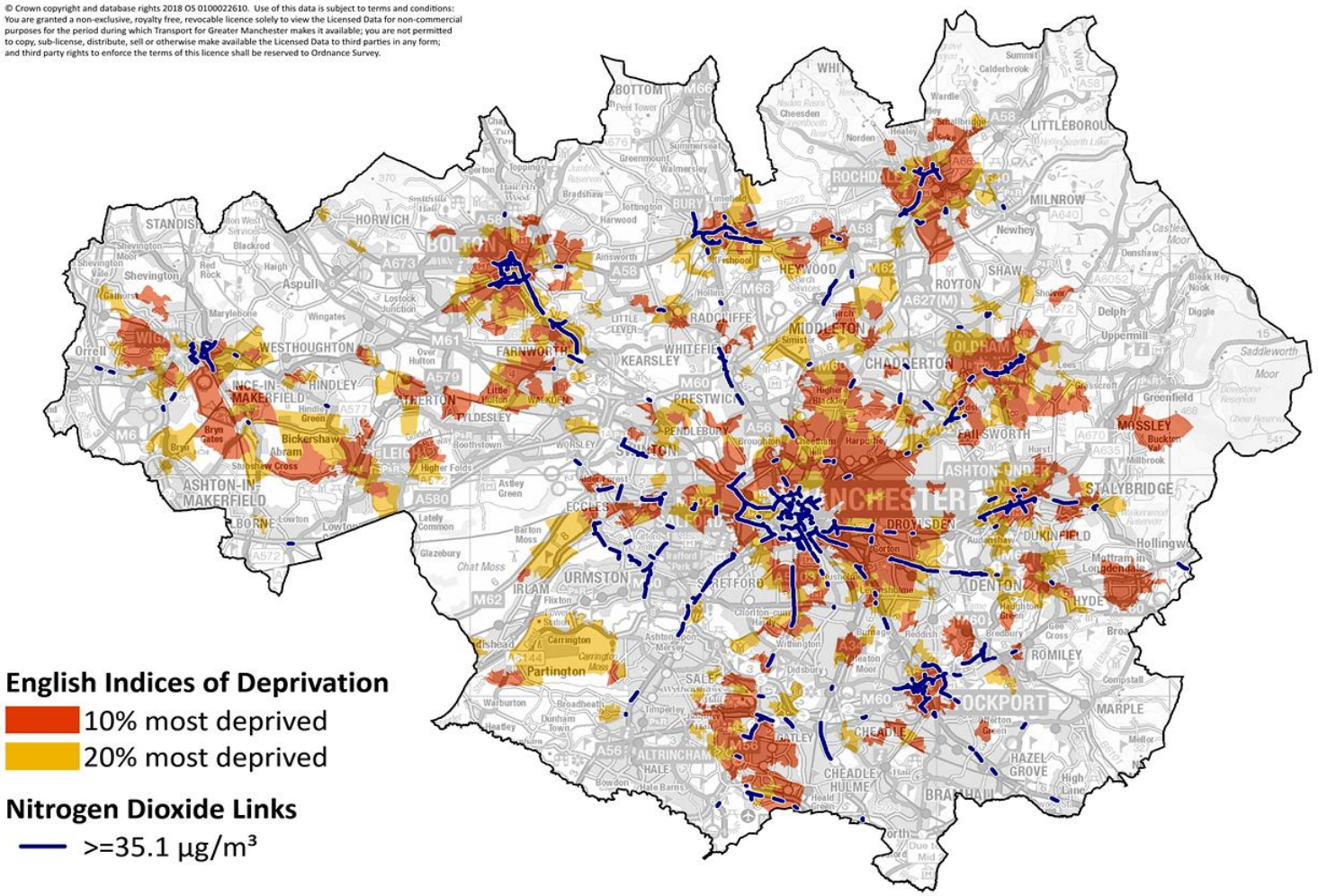


1.4.12 People living in areas suffering from poor air quality are less likely to own a car and to drive regularly.[36] This includes those on low-incomes, students and wealthier city dwellers (who are more likely to have chosen a car-free lifestyle). Figure 1- 6 below shows the relationship between locations close to or in exceedance of the EU Limit Value and deprivation.

[35] Selected Census 2011 variables available at the 2011 Output Area geography. Note: TfGM's segmentation dataset informed the choice of Census 2011 variables displayed.

[36] TfGM analysis of Acorn 2017 (CACI) data.

Figure 1- 6: Index of multiple deprivation and the links with high levels of NO_2 in Greater Manchester[37]



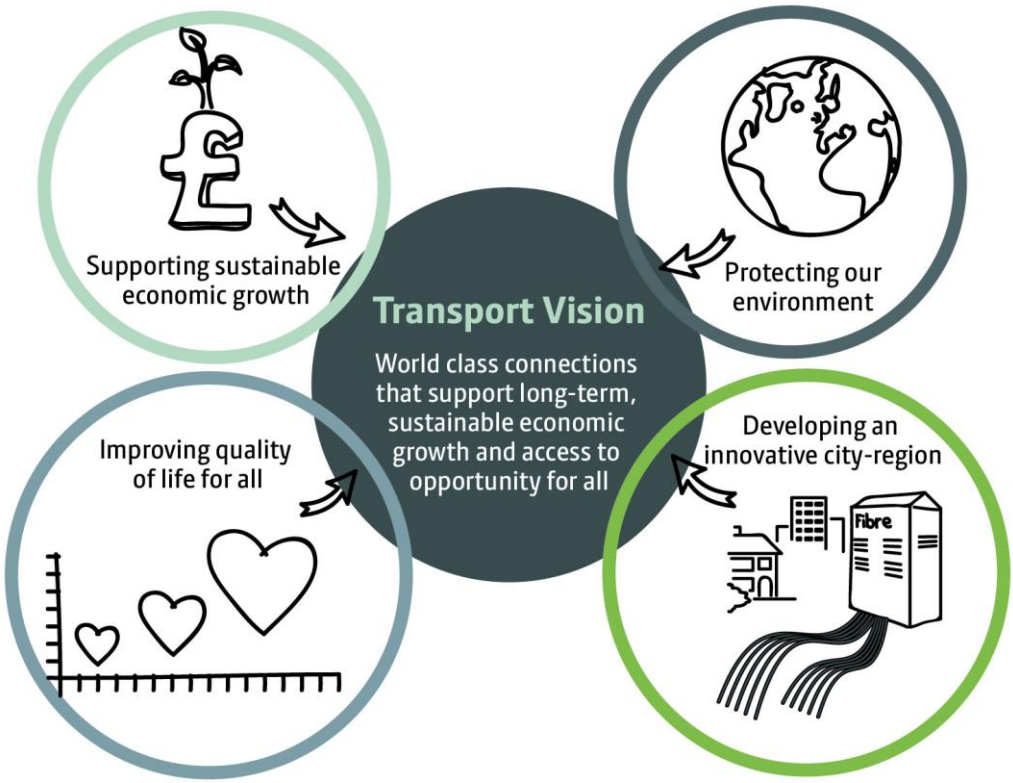
[37] English indices of deprivation (2015). Published 30 September 2015. From: Ministry of Housing, Communities & Local Government
Available at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

1.5 What is Greater Manchester doing about air quality?

1.5.1 Improving air quality is a key policy priority for Greater Manchester. The Greater Manchester Strategy[38] states that Greater Manchester should be 'a place at the forefront of action on climate change with clean air and a flourishing natural environment' including by 'reducing congestion and improving air quality'.

1.5.2 Air Quality is also a key focus of the Greater Manchester Transport Strategy 2040[39] ("2040 Strategy"), which is Greater Manchester's current statutory Local Transport Plan, prepared by TfGM on behalf of the GMCA and the Greater Manchester Local Enterprise Partnership (GMLEP). The four key elements of the 2040 vision are set out below:

Figure 1- 7: Greater Manchester Transport Strategy 2040 Vision[40]



1.5.3 The Strategy highlights the range of negative impacts of motorised transport on our environment and highlights the need to:

- increase the use of sustainable transport modes as realistic alternatives to car use;
- reduce transport emissions that cause air pollution and climate change;

[38] https://www.greatermanchester-ca.gov.uk/ourpeopleourplace 2017

[39] https://www.tfgm.com/2040

[40] Greater Manchester Transport Strategy 2040 (2017), p.3 TfGM https://www.tfgm.com/2040

- make best use of existing infrastructure; and
- protect the natural and built environment from the impacts of transport.

1.5.4 The strategy also establishes seven mutually-reinforcing network principles (each with its own ambition statement) which will be applied consistently as we improve Greater Manchester's transport system (See Figure 1- 8 below):

Figure 1- 8: Greater Manchester Transport Strategy 2040 Network Principles[41]

1.5.5 The 2040 Strategy demonstrates Greater Manchester's commitment to delivering a more sustainable, integrated and healthy transport system, with a particular focus on dramatically reducing transport emissions.

1.5.6 The 2040 Strategy is accompanied by 5-year delivery plans, which set out the city-region's short-term delivery priorities. In addition to identifying a range of improvements to sustainable transport in Greater Manchester, the current 5-year Delivery Plan (2016/17-2021/22)[42] includes a commitment to studying the potential for a Clean Air Zone (CAZ).

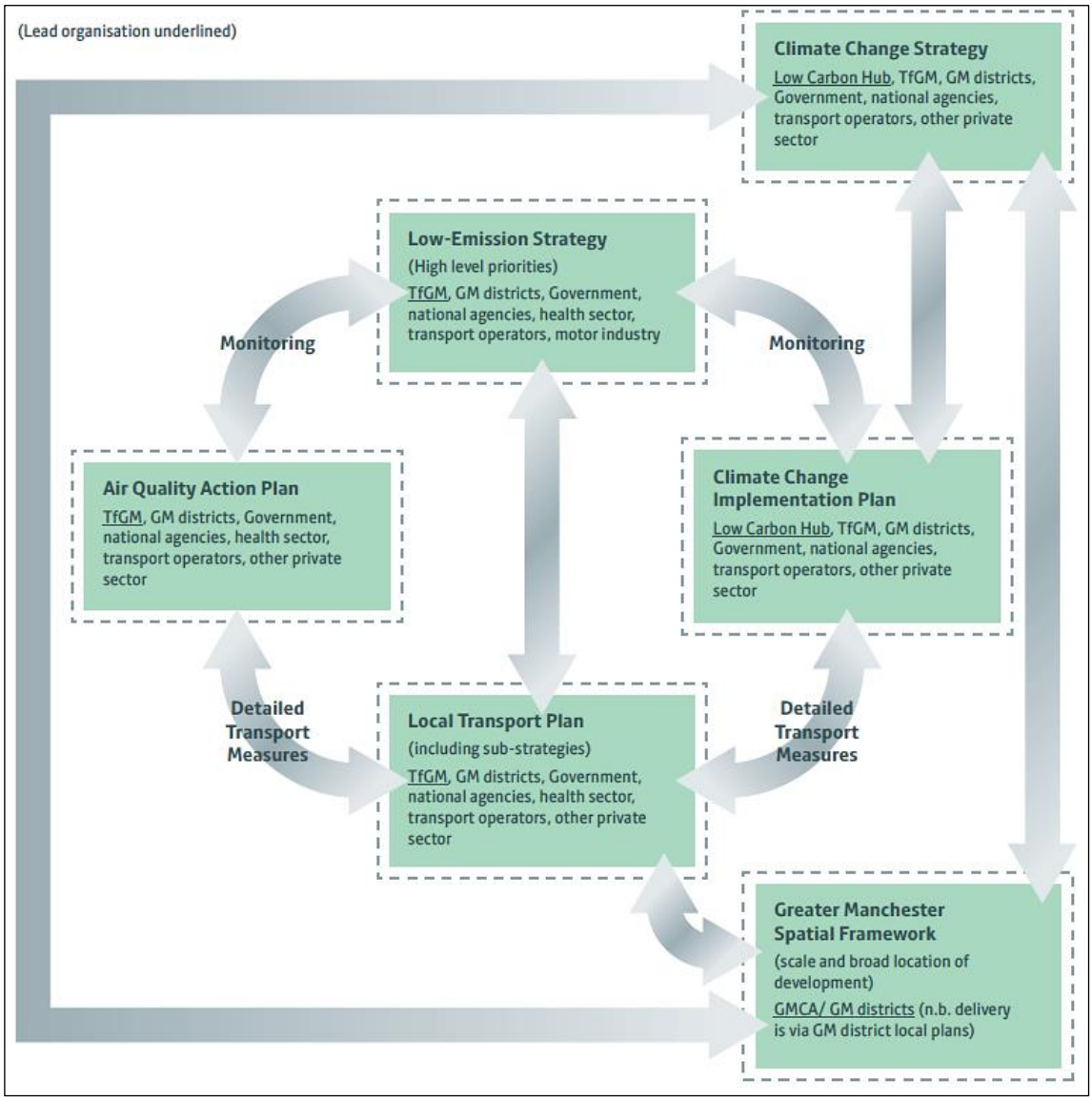
[41] Greater Manchester Transport Strategy 2040: Executive Summary (2017), TfGM p.10

[42] Greater Manchester Transport Strategy 2040: Delivery Plan 2016/17 – 2020/21 (2017), TfGM

1.5.7 A draft updated 5-year Delivery Plan for 2020 to 2025[43] was published in January 2019, and includes a range of recommendations for delivering Greater Manchester's clean air and carbon reduction ambitions, building on the Air Quality Action Plan (AQAP) 2016-2021 and Low Emission Strategy (LES) (GMCA, 2016). These include investment in the Greater Manchester Electric Vehicle (GMEV) charging network; ambitions to deliver a zero-emission bus fleet by 2040; transformation of cycling and walking infrastructure to reduce car use for shorter trips (including £160m investment in the next few years); and Measures to reduce freight emissions.

1.5.8 Figure 1- 9 below shows the relationship between the various strategies which we already have in place to tackle emissions in Greater Manchester.

Figure 1- 9: Relationship between different Greater Manchester strategies which tackle transport emissions[44]

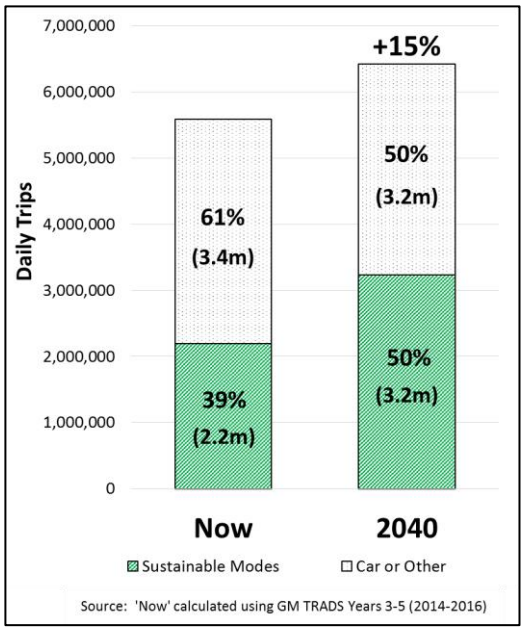


[43] Greater Manchester Transport Strategy 2040 Draft Delivery Plan (2020-2025) (2019), TfGM

[44] Greater Manchester Low Emission Strategy (2016), GMCA p.5 https://www.greatermanchester-ca.gov.uk/media/1276/low-emission-strategy-dec-2016.pdf

1.5.9 The 2040 Strategy draft delivery plan for 2020-2025 also sets out a quantified future vision for 2040, as set out below in Figure 1- 10.

Figure 1- 10: Our mode share ambitions for 2040[45]



1.5.10 This demonstrates our vision for an additional one million trips per day to be made by sustainable modes, which will require a significant reduction in the proportion and overall number of trips that are made by car. These ambitions have been derived from a series of carefully considered targets relating to future land use, travel patterns and transport provision, taking into account Office for National Statistics population growth forecasts. They are expected to deliver Greater Manchester's planned growth (as set out in the draft Greater Manchester Spatial Framework[46]) without an overall increase in total private road-vehicle traffic[47], which would be an extremely positive outcome for the city-region; and will need partnership working across the ten Greater Manchester local authorities and the GMCA.

1.5.11 Greater Manchester has also set targets for CO_2 emission reduction that exceed national ambitions – a reduction of 48% by 2020 (based upon 1990 levels); and to become carbon neutral by 2038[48], and Greater Manchester signed up to become a WHO 'BreatheLife' city, with the associated aim of achieving WHO air quality targets by 2030.

[45] Greater Manchester Transport Strategy 2040 Draft Delivery Plan 2020-2025 (2019) TfGM

[46] https://www.greatermanchester-ca.gov.uk/what-we-do/housing/greater-manchester-spatial-framework/gmsf-full-plan/

[47] The targeted zero increase in private motor-vehicle traffic includes trips by Greater Manchester residents, as well as trips by non-residents and goods vehicle movements, which will also be influenced by our transport and land-use interventions - but less so. We expect zero growth in motor-vehicle traffic to be achieved by a net reduction in residents' traffic (the great majority of motor vehicle-km in Greater Manchester); an increase in light goods vehicle movements; and – potentially – some net increase in car-trips by non-residents.

[48] Greater Manchester's Springboard to a Green City Region (2018) GMAF https://www.greatermanchester-ca.gov.uk/media/1317/springboard-report.pdf

1.5.12 A key priority for Greater Manchester is to seek to meet its legal requirements on air quality, whilst also taking a holistic view of what is required to deliver our 2040 Strategy Vision for a "*world class transport system that supports long-term sustainable economic growth and access to opportunity for all*". This integrated approach and long-term perspective is essential if the benefits of the GM CAP are to be maximised and the risks of unintended consequences minimised.

How Greater Manchester is using all available funding to deliver clean air

1.5.13 Greater Manchester has consistently used its available transport funding to improve public transport and active travel options, thereby encouraging people to leave their car at home and travel more sustainably. Greater Manchester works to maximise all opportunities to access funding for the region to make it easier and more appealing to travel by public transport, bike or on foot. In the long term, reducing the need to travel by car is the best way to reduce emissions from transport and improve air quality. In particular:

- **Greater Manchester Transport Fund 1 (2009-2017):** £1.5 billion local and government investment in clean transport infrastructure, including tripling size of Metrolink network (zero direct emissions), the Leigh-Salford-Manchester guided busway scheme, including low emission fleet, and the transport interchange renewal programme which has been rolled out to most of Greater Manchester's principal towns.
- **Transforming Cities Fund 1:** Delivering £160m of major walking and cycling improvements across Greater Manchester, supported by an additional £40m Cycle City Ambition Grant, as well as £83m towards 27 new Metrolink trams and supporting infrastructure, which will come into service between 2020 and 2021.
- **Transforming Cities Fund 2:** In the 2018 autumn budget, Greater Manchester was granted an additional £69.5m (to be spent by 2023). The intention is to prioritise this funding (in 2019) to deliver on improving public transport provision for both existing communities, and housing and employment growth areas identified in the Greater Manchester Spatial Framework (GMSF)[49]. Schemes under consideration aim to promote sustainable travel choices and include new stops on the Metrolink, Park and Ride schemes and bus improvements.
- **Growth Deal:** Delivering c.£400m of improvements through schemes such as Stockport Town Centre Accessibility Improvements, Salford Bolton Network Improvements and Tameside interchange.

[49] Greater Manchester Spatial Framework Revised Draft (2019) GMCA

1.5.14 Greater Manchester has secured £3m of **Early Measures Funding** in advance of submitting its Clean Air Plan. These funds will be used to promote EVs and cleaner choices:

- **Installing EV charging points:** Greater Manchester's Electric Vehicle (GMEV) network is one of the biggest and most modern in the UK, with 318 charging points. The network is currently being re-tendered with the ambition of doubling this provision. Early Measures Funding is being used to install at least 24 dual-headed rapid EV charging posts providing 48 new rapid charging points in total.
- **Promotion of EVs:** Early Measures Funding is also being used to promote the use of EVs and the expanded GMEV network.
- **Communications campaign:** Delivering a communications campaign to support the wider GM CAP by raising awareness of the need to clean up our air and promote alternative travel options.

1.5.15 Greater Manchester also secured £3m from the **Clean Bus Technology Fund** to upgrade the local bus fleet, targeted at air quality hotspots. Greater Manchester has a deregulated bus service and thus operators can make decisions about the routes and services they choose to run and the buses they choose to operate on those services. The Greater Manchester bus fleet is largely made up of Euro IV and V buses (around 1,300 buses), with around 350 older buses still in operation. The Clean Bus Technology Fund will provide support to operators to retrofit their vehicles as follows:

- **Phase 1:** operators are currently retrofitting 111 vehicles at a cost of £1.9m, targeted at routes with locations of non-compliance; and
- **Phase 2:** tendering is underway to retrofit an estimated 60 buses with the remaining funds.

1.5.16 Greater Manchester has been invited to submit a further bid for funding to the Clean Bus Technology Fund and preparation of such a bid is underway.

1.5.17 Greater Manchester has recently been successful in securing further funding to support the delivery of a low emission bus and taxi fleet:

- **Office for Low Emission Vehicles (OLEV):** £1.8m of funding has been secured to deliver 80 dual-headed rapid charging points to be installed across Greater Manchester for primary use by taxis and private hire vehicles, so that they get booking priority. This will be supported by a significant local match-funding requirement of £3.9m.
- **Ultra-Low Emission Bus Scheme:** the Greater Manchester region has secured around £15m funding to support the purchase of 70 ultra-low emission buses by the GMCA, Manchester Community Transport, Stagecoach Manchester and First Bus Manchester.

1.5.18 Greater Manchester uses **revenue funding** (generated principally from a transport levy on council tax from the 10 local authorities, a Greater Manchester Mayoral precept, plus net Metrolink revenues) to fund concessionary fares for children, elderly and disabled people; and to subsidise parts of the bus network that operators consider insufficiently profitable (especially in the evenings and on Sundays) but that are essential to connect people with work and other local services. Greater Manchester also funds and manages the delivery of the Ring and Ride accessible transport service, which provides door-to-door, demand-responsive transport to local residents who find it difficult to use conventional public transport due to disability or limited mobility. Additionally, TfGM supplies flexible transport services under the Local Link brand for journeys in areas where fixed route public transport services are limited. In 2018/19, the budget for these revenue activities totalled nearly £100m.

1.5.19 Local authorities in Greater Manchester are seeking new sources of funding to deliver cleaner air and improve sustainable travel options in the region:

- **Future High Streets Fund:** A new £675m national fund was announced in the Autumn Budget. In 2019 Greater Manchester will be preparing a bid for funding to invest in physical infrastructure in town and city centres (including transport enhancements).
- **Highways England:** Greater Manchester is also exploring opportunities for accessing funds from the £100m Highways England designated fund to tackle air quality challenges in the region related to the SRN.

1.5.20 The goal of this work is to clean up the fleet and improve sustainable travel options across the region, with the ultimate aim of delivering substantial mode shift to public transport and active travel to achieve the ambition that by 2040 half of all journeys are made by sustainable modes. In the longer term, this investment will deliver more sustainable travel patterns and improved air quality. Nevertheless, the imperative of the GM CAP is to act quickly to deliver a step change in air pollution, and this requires significant action.

1.5.21 In this OBC, Greater Manchester has focused its attention on actions that most directly contribute to clean air in the shortest possible time. These actions sit within a wider vision and delivery plan for a vibrant, innovative and successful city region that offers people a sustainable, healthy and good quality way of life.

What help does Greater Manchester need from Government to clean up its air?

1.5.22 Beyond the funding and technical support required to deliver the Measures proposed in this OBC, TfGM, the GMCA and the ten local authorities are united in their call to Government to take action and agree a new deal for the city region to make the transport and air quality plans a reality. Greater Manchester is asking for the creation of a Greater Manchester Transport Fund 2, a fully devolved, long-term infrastructure budget for the region.

1.5.23 In support of, and as a precursor to any future GM CAP, the Greater Manchester Mayor and Authorities have highlighted specific actions needed from central Government. These include:

- clear arrangements and funding to develop workable vehicle renewal scheme/upgrade Measures;
- short-term effective interventions in vehicle and technology manufacturing and distribution, led by central Government with local authorities;
- replacement of non-compliant buses;
- reform of taxi and private hire legislation to enable licensing authorities to enforce minimum standards and manage out-of-area operation;
- powers to act on congestion, including moving traffic offences;
- rail devolution to enable us to improve performance;
- swift action on outstanding rail commitments in relation to the Northern Hub, including investment along the Castlefield corridor to increase capacity at Piccadilly and Oxford Road stations and progress on electrification commitments.

1.5.24 Furthermore, Greater Manchester asks central Government to take action to tackle the impact of the extensive local motorway network on air quality in the region. Greater Manchester contains around 120km of SRN, managed by Highways England and outside of the control of local authorities and the Mayor. At local roads close to the SRN, pollution caused by motorway traffic can be as much as 50% greater than that from the local road; and homes are in close proximity to parts of the SRN in exceedance of legal limits. Some parts of the SRN carry substantial volumes of through-traffic, for example 30-40% of east-west HGV traffic does not enter or exit the SRN in Greater Manchester. It is clear that Highways England will need to take more action, to ensure that local businesses and workers contributing to the Greater Manchester economy do not bear the brunt of action taken on air quality, whilst through-traffic can travel unimpeded.

1.5.25 Nevertheless, Greater Manchester recognises the need to act quickly to comply with the Ministerial Direction and therefore this OBC sets out a plan that can achieve compliance in the shortest possible time, in a manner which is consistent with the Greater Manchester local authorities' legal and statutory duties and is achievable within its current powers.

1.6 Development of a Clean Air Plan for Greater Manchester

Case for change

1.6.1 Section 1.3 shows that there are high levels of NO_2 in Greater Manchester that exceed the EU Limit Value whilst section 1.4 underlines the negative impact this has on society and therefore presents a need for intervention. Besides the health and economic reasoning for the intervention, eight of the ten Greater Manchester local authorities have been given a direction under the Environment Act 1995 because modelling by the UK Government shows NO_2 concentrations exceed the EU Limit Value. The final two local authorities, Wigan and Rochdale, have been identified as containing exceedances through more detailed local modelling (as discussed in section 1.2) and it has been agreed to develop a comprehensive plan for the whole of Greater Manchester in recognition that travel and emissions are not confined within district boundaries and to avoid displacement of the problem by taking isolated action in some districts and not others.

1.6.2 The interventions needed to reduce NO_2 concentrations in Greater Manchester are proposed within this OBC, with further detail of the expected impact documented in the Economic Case and optioneering appendix A1.

Aim of a Clean Air Plan

1.6.3 The primary aim of the GM CAP is to enable Greater Manchester to reduce NO_2 concentrations to below the EU Limit Value in the shortest possible time. This is to be achieved in a manner which is consistent with the Greater Manchester authorities' legal and statutory duties. In doing so it supports delivery of the 'UK plan for tackling roadside nitrogen dioxide concentrations.

1.6.4 Furthermore, the project aims to deliver a Plan that is as consistent as possible with the region's wider economic, social and environmental policy objectives.

Approach to delivering Greater Manchester's Clean Air Plan

1.6.5 Greater Manchester's ten local authorities have chosen to work together and through the GMCA to produce a region-wide GM CAP. This collaborative approach is essential given the scale and extent of the problem, such that region-wide solutions will be necessary. Working together reduces the risk of displacing air pollution problems between districts and offers a solution that is as simple as possible for those affected to understand and comply with. It will enable more holistic, GM-wide solutions to be developed to tackle air quality issues, ensuring that the proposals are in line with the wider strategic goals of the region. Working together is the only way to deliver compliance in the shortest possible time.

1.6.6 TfGM is coordinating the approach between the GMCA and the ten local authorities to undertake the feasibility study and to develop the GM CAP.

1.6.7 A GM CAP Senior Leadership Steering Group (Steering Group) is responsible for: guiding the feasibility study, briefing senior officers and elected Members in their respective organisations, and securing local approvals. Representatives include Directors or Assistant Directors from each local authority and senior representatives from Highways England, Public Health England, JAQU, GMCA, Local Partnerships and TfGM.

1.6.8 This OBC builds upon the previously submitted SOC and sets out the range of Measures that have been assessed to understand their potential to achieve the aims of the CAP, either as a stand-alone Measure or as part of an option of grouped Measures. It recommends a preferred option for further development as part of the Full Business Case (FBC) to be consulted on with stakeholders, including the public.

What is a Clean Air Zone

1.6.9 Government guidance sets out charging Clean Air Zones (CAZ) as the measure most likely to achieve EU Limit Value for NO2 in towns and cities in the shortest possible time. A charging CAZ places a penalty on the most polluting vehicles if they travel into, within or through a designated area. Government specifies four classes of CAZ that apply penalties to different types of vehicle that are classified as non-compliant because they fall below particular euro emission standards. Cleaner vehicles are unaffected.

Category A: Buses, coaches, taxis and private hire vehicles (PHVs)

Category B: Buses, coaches, HGVs, taxis and PHVs.

Category C: Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and PHVs

Category D: Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and PHVs, cars, motorcycles/mopeds

1.6.10 The associated emissions standards are as follows:

Euro 3 for motorcycles, mopeds, motorised tricycles and quadricycles. Applied since 2007

Euro 4 for petrol cars, vans, minibuses and other specialist vehicles. Applied since 2006

Euro 6 for diesel cars, vans and minibuses and other specialist vehicles. Applied since 2015 (for cars) and 2016 (for vans)

Euro VI for lorries, buses and coaches and other specialist heavy vehicles. Applied since 2013

A vehicle's Euro emission standard is shown in the vehicle registration document – also known as a V5C.

1.6.11 The approach that Greater Manchester has taken in considering what vehicles should be included in potential CAZs follows the Government framework. In general vehicles, such as lorries and buses, or high frequency users such as taxis and private hire vehicles (PHVs) emit higher levels of pollution on a per vehicle basis.50 Analysis carried out by DEFRA demonstrated that tackling buses, heavy goods vehicles and LGVs in that order was the most cost effective approach to the UK.51

1.6.12 Whilst car traffic is the greatest contributor to NOx emissions, individually, cars are used much less intensively. Analysis by the RAC Foundation (which is backed up by local evidence on Greater Manchester car usage) suggested that the average car in the UK is parked for more than 95% of the time.52 In comparison, commercial and passenger transport vehicles are used much more intensively, and are often operating in the most densely populated areas, so the benefit of cleaning up each vehicle is significantly greater than for cars.

1.6.13 CAZs differ from Congestion Charging systems because of their very different objectives and time-spans. A CAZ does not seek to reduce the number of vehicles on roads but to clean up the fleet. Only the more polluting vehicles are required to pay, those driving cleaner vehicles can travel without charge. This also means that as vehicles are upgraded the number of penalties levied reduces, with ultimately all or nearly all vehicles becoming compliant and being able to travel without penalty. Under a Congestion Charge, the requirement to pay applies to all vehicles, is enduring, and creates a long-term revenue stream. Over time, the revenue provided by a CAZ will reduce as fewer vehicles are required to pay the penalty.

Assessing the options for action

1.6.14 The first output of the Greater Manchester feasibility study was the Strategic Outline Case (SOC) that was approved by the ten Greater Manchester local authorities and submitted to Government in March 2018. In this document, a long-list of 96 options was presented and sifted to a shortlist of 17 based on the Government's Primary Success Criteria (reduction of NO_2 concentrations in the "shortest possible time"). These shortlisted Measures are shown in Table 1- 5 below.

[50] 'Clean Air Zone Framework: Principles for setting up Clean Air Zones in England', DEFRA/DfT May 2017

[51] 'The abatement cost guidance for valuing changes in air quality' DEFRA May 2013

[52] https://www.racfoundation.org/research/mobility/spaced-out-perspectives-on-parking

Table 1- 5: Measures shortlisted in the SOC

Shortlisted Measure	Details
Clean Air Zone – Category B, C or D	Different classifications/time restriction and geographical areas to be modelled for their impact on NO2 and timescale of any impact.
Differential parking charges	E.g. different charges for times of day, vehicle type, car-sharers and could include a workplace parking levy.
Retrofit/upgrade public transport fleet	Retrofit or upgrade vehicles to a higher Euro standard.
Retrofit/upgrade local authority fleets	Retrofit or upgrade to a higher Euro standard (procurement).
Increase public transport capacity	Identify specific routes where most impact will be made.
Switch Bus/HGV/LGV/GM fleet to Gas to Liquid	Using cleaner alternative fuels
Electric vehicle (EV) incentivisation	Increase EV uptake through expanding the charging network or financial incentives.
Congestion Deal – increase capacity	Review existing junction improvement plans – assess impact and identify opportunities to accelerate.
Congestion Deal – encouraging alternatives	Encouraging alternative travel choices through road space reallocation.
Congestion Deal – network management	Changing traffic signal timing to optimise flows, reducing congestion.
Private hire and taxi alternative fuels	Incentivise shift to EV/Ultra-Low-Emission vehicles; increase EV infrastructure for taxis; and retrofitting and increasing Liquid Petroleum Gas (LPG) refuelling infrastructure for taxis.
Communications campaigns	Increase awareness of health and cost benefits for public and of different modes of transport or around particular communities/schools.
Sustainable travel engagement	Work with employers and individuals to encourage sustainable travel choices.
Active travel programme – infrastructure	Expand and improve cycling and walking infrastructure.

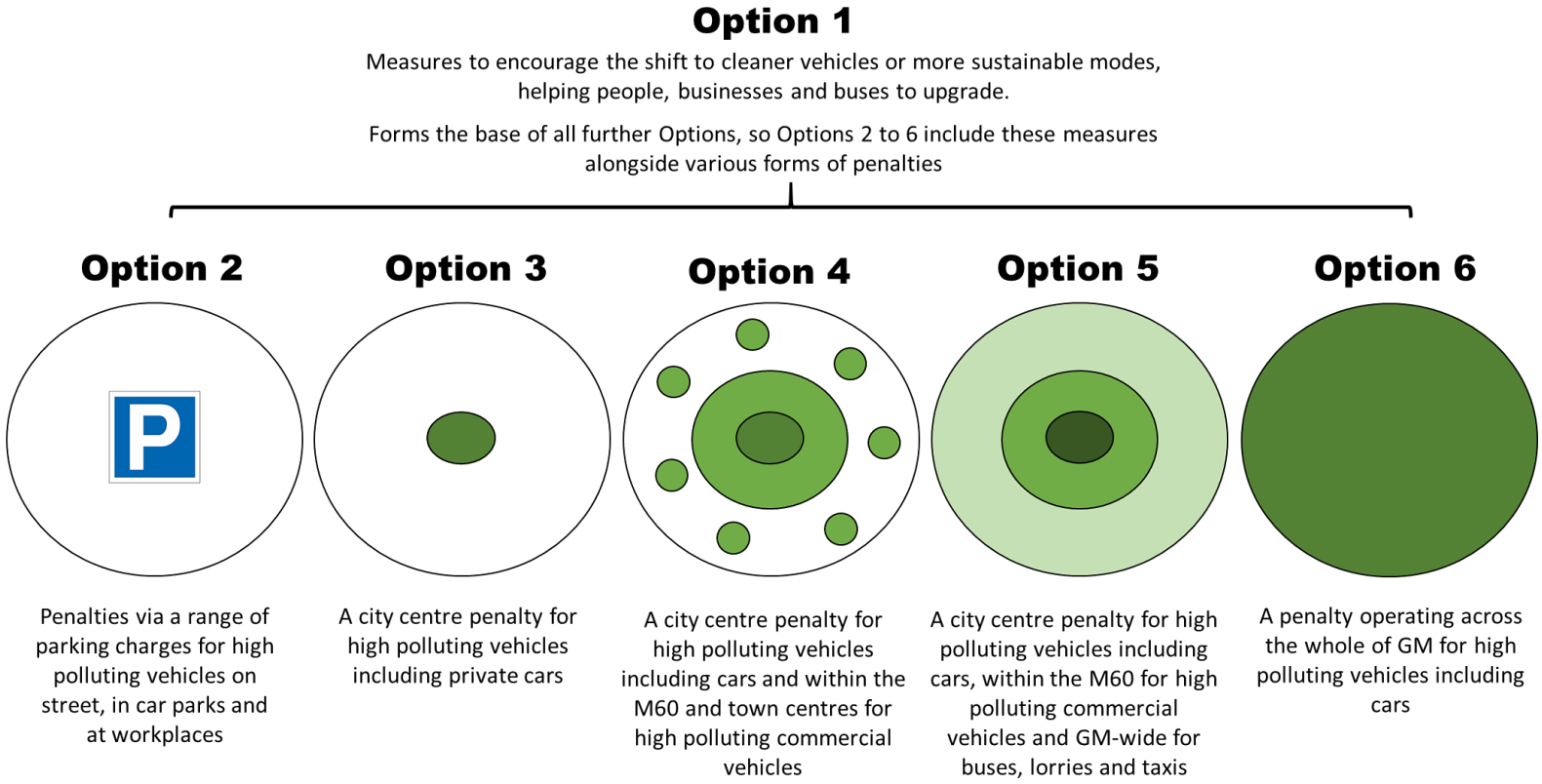
1.6.15 As previously described, local modelling has revealed the problem to be bigger than that initially identified by Government. Local modelling predicts a greater spatial distribution of NO_2 exceedances across roads in Greater Manchester and generally higher concentrations of NO_2 in specific locations.

1.6.16 The SOC described the complex causes of exceedances across Greater Manchester, relating to high volumes of traffic, slow traffic speeds, the composition and age of the fleet, the urban geography (particularly canyons caused by high buildings). The profile at each site is different, but the scale of the challenge means that the solutions are inter-related. Localised solutions such as re-routing traffic or tackling local pinch points will clearly be insufficient to tackle the region-wide problem, and risk simply moving the problem elsewhere. This meant that any effective proposals needed to involve a package of Measures able to tackle the problem holistically and beyond authority boundaries, to avoid unintended consequences of action in one authority on the problem in another. It became clear that working together was imperative. As the scale of the proposed Measures increases, the feasibility of delivery in a short timescale becomes increasingly complex and challenging. Nevertheless, the scale of the problem means that large scale interventions will inevitably be required.

1.6.17 A series of six options, containing packages of Measures including CAZ schemes at different categories and a range of geographies, were developed in response to the problem as revealed by local modelling. These Measures have been further refined from the shortlist in Table 1- 5, involving the development and assessment of more detailed proposals for each type of Measure. This process is described in more detail in Appendix A1 [Optioneering report].

1.6.18 Concurrently, an exercise was undertaken to further refine the Measures from the shortlist in Table 1- 5, involving the development and assessment of more detailed proposals for each type of Measure. As a result of this process, some Measures were rejected as being ineffective or not deliverable within the timescales and with existing powers. This process is described in more detail in Appendix A1.

Figure 1- 11: Summary of six Options for initial appraisal



1.6.19 The six options have been assessed against the UK Government's Primary Success Criteria:

- **Reduction in NO_2 emissions:** the likelihood that the Measure/option will contribute significantly to a reduction in NO_2 concentrations, enough to achieve compliance with the EU Limit Values.
- **Feasibility:** the likelihood of the Measure being implemented in the shortest possible time to deliver the desired NO_2 reduction and achieve compliance. This should consider real-life factors that could delay implementation such as the ease of putting governance systems in place to facilitate local government cooperation and the local authorities having the jurisdiction to implement such Measures/options. It should also consider the likelihood of the Measure being effective.

1.6.20 The Options have been further assessed against a series of Secondary Success Criteria as set out in the SOC and agreed with JAQU, as follows:

- **Strategic fit with local strategies and plans:** ensuring the alignment of the option with longer-term economic, social and environmental goals and that the risk of unintended consequences is minimised.
- **Value for money:** a high-level indication of the costs and benefits of each option, noting that a more detailed cost benefit analysis is presented for the best performing options in the Economic Case, which will be further refined for the preferred option in the FBC.
- **Distributional impact:** in order to understand the potential impacts, both positive and negative on different groups within society, with a particular focus on the most vulnerable. It is of vital importance that the Plan does not result in disproportionately negative economic or social impacts for the region or those living, working or doing business within it.
- **Deliverability** of the options, in terms of the **affordability** of the cost of implementation, the **supply-side capacity and capability** to deliver the Measures outlined in the options, and the **achievability** of delivering the option, considering potential issues such as obtaining the resources to implement and operate a Measure/option.

1.6.21 Note that no weighting has been applied to these criteria, beyond the requirement that the Options should deliver compliance in the shortest possible time (the determining criteria) and be feasible.

1.6.22 The assessment process involved further modelling and analysis of the effectiveness of Measures individually and as a package; engagement with stakeholders and professional experts, and the use of a Multi-Criteria Analysis (MCA) tool to assess the performance of each option against the success factors and relative to each other. This process is described in more detail in Appendix A1.

1.6.23 Engagement with stakeholders has helped to shape the options being considered within the GM CAP and has been used to raise awareness of the GM CAP. A range of workshops and meetings were conducted to help stakeholders understand the scale of the problem, involving local authorities, Highways England and Greater Manchester health bodies. These identified a range of Measures and interventions for further analysis over the course of four half-day sessions between 30 January and 5 February 2018.

1.6.24 Industry engagement has also been central to informing stakeholders and providing insight on the feasibility of proposed interventions:

- **Freight:** TfGM has updated the freight and logistics industry via presentations at two separate meetings of the Greater Manchester Freight Forum each attended by around 70 stakeholders in October 2017 and March 2018. This included updates on the problem, the proportion of the issue which is HGV/LGV-related and then outlined the shortlisted Measures. The most recent forum was 8 March 2018; this event should occur every six months but feedback indicated stakeholders wanted confirmed information which was not possible until the formulation of the OBC. One of the shortlisted Measures that has not been taken forward to the OBC is a development of Gas to Liquid alternatives; this was rejected following a survey of Greater Manchester Freight Forum members in which they expressed concern over cost and the potential effects on the warranty of vehicles. Updates have been provided on a regular basis to freight representative bodies, to share with their members.
- **Bus:** TfGM's mechanism for interacting with bus operators is via the regular OneBus forum, who represent 18 bus operators across Greater Manchester, and which has been used to update members regularly on relevant issues. As well as this, updates have been provided at the regular Regional Centre Bus Partnership meetings, chaired by Manchester City Council. During summer 2018 fleet data was provided to TfGM by bus operators to understand more about the GM-wide fleet, to inform measures development. On 8 November 2018, TfGM updated a wider group of bus operators and, following an update on Target Determination began to focus on the feasibility of retrofitting different ages/types of vehicles as well as upgrades. Feedback from this meeting showed there were concerns around the capacity for the potential demand of retrofitting, within GM and more widely, the supply of greener vehicles, funding to support these changes and timescales for implementation. The Clean Air Plan links with the Clean Bus Technology Fund and Greater Manchester aspirations for a zero carbon bus network. This has fed into the detail of the interventions for bus fleet enhancement.

- **Taxi and Private Hire:** TfGM conducted three workshops with taxi and private hire trade bodies from a number of areas in Greater Manchester between 13 and 21 August. The primary purpose of these preliminary workshops was to gauge opinion on a range of potential Measures such as electric vehicles and retrofitting with LPG. This process informed the development of a range of options for Private Hire and taxi trade in Greater Manchester. The taxi and Private Hire trade told us that subsidies and low interest rate loans would be beneficial as would other incentives through licensing and traffic flow. EV charging infrastructure was key to take up, but there's a limited choice for electric taxis. They also had concerns around the timescales for implementation.
- **The Local Enterprise Partnership and GM-wide representative bodies:** The Greater Manchester Local Enterprise Partnership has been updated throughout development of the OBC, allowing the business community to input comments throughout the process. Updates have been provided to GM-wide representative business bodies, providing them with an opportunity to share information with their members, present their national positions on Clean Air and express any concerns around the GM Clean Air Plan process. Certainty around the emissions standards and the timescales for implementation were two of the issues raised.

1.6.25 A brief summary of the outcomes of the initial appraisal of these Options is presented in Figure 1- 12 below and more detail is provided in Appendix A1.

Figure 1- 12: Outcome of initial appraisal of six Options

Option	Evaluation	Outcome
Option 1: Measures to encourage the shift to cleaner vehicles or more sustainable modes, helping people, businesses and buses to upgrade.	Assessment of a range of measures suggests that: 1. Some are not likely to be effective in tackling air quality, such as conversion from Gas to Liquid fuels or junction improvement schemes; 2. Some could be effective but are not deliverable within the timescale, such as new public transport capacity; and 3. Some could be effective with measures to deter the use of dirtier vehicles, such as incentives to upgrade & scrap vehicles, promotion of electric vehicles, and measures to promote sustainable travel choices.	On its own, does not deliver compliance in the shortest possible time. Effective and feasible measures have been incorporated into the Best Performing Options for full evaluation.
Option 2: Penalties via a range of parking charges for high polluting vehicles on street, in car parks and at workplaces	Parking measures have limited effect on the heaviest and dirtiest vehicles such as HGVs and buses and only affect those cars and vans that need to park in public places – so those with private off-street parking are not affected regardless of how dirty their vehicle is. In practice, would be expensive and slow to deliver due to existing contract restrictions.	Does not deliver compliance in the shortest possible time. Will not be progressed.
Option 3: A city centre penalty for high polluting vehicles including private cars	A city centre penalty for high polluting vehicles would be effective in the city centre and have some effect on approach roads but would leave around 200 sites non-compliant across the remainder of GM, with non-compliance remaining in the city centre at some sites. Does not deliver compliance in the shortest possible time.	Does not deliver compliance in the shortest possible time. Will not be progressed.
Option 4: A city centre penalty for high polluting vehicles including cars and within the M60 and town centres for high polluting commercial vehicles	Option 4 would reduce the number of non-compliant sites by around 80% in 2021. Concerns remain about whether customers would be able to understand and therefore respond to such a complex set of boundaries, and about the economic impact on town centres and deprived areas within the M60.	Initial evaluation suggests this Option may deliver compliance in the shortest possible time. A revised version of this Option, reflecting lessons learned, will be subject to a full evaluation as a Best Performing Option.
Option 5: A city centre penalty for high polluting vehicles including cars, within the M60 for high polluting commercial vehicles and GM-wide for buses, lorries and taxis	Option 5 would reduce the number of non-compliant sites by around 80% in 2021. Concerns remain about the appropriateness of a boundary at the M60, given the distribution and cause of AQ hotspots in the area and the level of deprivation. Concerns also remain about the viability & effectiveness of applying penalties to vans on a large scale given the limited availability/high cost of compliant vans in 2021.	Initial evaluation suggests this Option may deliver compliance in the shortest possible time. A revised version of this Option, reflecting lessons learned, will be subject to a full evaluation as a Best Performing Option.
Option 6: A penalty operating across the whole of GM for high polluting vehicles including cars	A GM-wide penalty for high polluting vehicles does not deliver compliance in 2021, with more than 20 sites remaining non-compliant despite significant trips per day being subjected to a penalty. Furthermore, the modelling results are not considered credible as the method is not appropriate for a region-wide scheme for car drivers, and it is likely that behavioural responses have been over-estimated. Delivery of a scheme on this scale would be slow, complex and risky, and very considerable social and economic impacts would be likely and need mitigating.	Does not deliver compliance in the shortest possible time and risk that contravenes GM's wider statutory duties. Will not be progressed.

1.6.26 For a more in-depth discussion of how the six options performed against the critical success factors, and why they were progressed or rejected, please see Appendix A1. This includes an explanation of why Option 6, despite appearing to provide the best outcome in emissions terms, is actually not considered likely to deliver compliance in the shortest possible time.

Best performing options identified for appraisal from high level assessment process

1.6.27 Following the initial appraisal of the six options, three options were developed as the 'best performing' options to be subject to a detailed appraisal process. These options are derived from Options 4 and 5 but have been adapted to reflect a deeper level of understanding of the issues that emerged throughout the initial options appraisal process. As such, they are considered more likely to deliver effective reductions in NOx emissions and greater compliance than the options as initially specified. The three developed options are Option 4, Option 5(i) and Option 5(ii) and are summarised below. In particular, the following changes have been made:

- A revised package of non-CAZ Measures, developed from Option 1, has been developed and incorporated into the three new options; Options 4, 5(i) and 5(ii)[53]. This includes those Measures found in the initial assessment to be effective, and removes Measures found to be ineffective or not deliverable.
- The initial appraisal suggested that the second-hand van market would not be sufficiently mature by 2021 to support a large-scale CAZ for vans – a lack of available affordable compliant vehicles could result in a higher than predicted proportion of vehicles 'staying and paying' rather than upgrading, and could create substantial risk of economic damage. Therefore, implementation of the city region schemes has been divided into two phases:
  - Phase 1, in 2021, would be a CAZ B encompassing buses, taxis and PHVs, HGVs and coaches
  - Phase 2, in 2023, woud be a CAZ C including LGVs and minibuses
- Finally, and related to the decision above, the M60 boundary in Option 5 has been abandoned, with the schemes reviewed for possible application within the Inner Relief Route (IRR) and would extend to Greater Manchester-wide instead. Applying an additional boundary adds cost and complexity to the scheme, and risks customer confusion. Further analysis showed that the M60 boundary does not reflect where the outstanding locations of non-compliance remain post-2021, many of which are outside this zone. Therefore, a CAZ C at the M60 boundary is not likely to deliver compliance in "the shortest possible time. More work is planned to develop a better understanding of where non-compliance remains post-2021 and the sources of these emissions and it is anticipated that refinements may be made to the later phase proposals to better reflect the

[53] 5 (i) and 5 (ii) are variations of the original option 5. Detail on them is presented below.

nature of the remaining problem and ensure compliance is delivered in the shortest possible time, and at the least cost to Greater Manchester.

1.6.28 The Options that were progressed for full appraisal in autumn 2018 are described below:

- **Option 4:** A CAZ Category D within the Inner Relief Route (IRR) to be delivered in Phase 1 (in 2021) alongside a CAZ Category B within the M60 and satellite towns. In Phase 2 (in 2023), the CAZ within the M60 and satellite towns extends to a Category C. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help people, businesses and bus operators upgrade.
- **Option 5(i):** A CAZ Category D within the IRR to be delivered in Phase 1 (in 2021) alongside a CAZ Category B across Greater Manchester. In Phase 2 (in 2023), the CAZ across Greater Manchester extends to a Category C. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help people, businesses and bus operators upgrade.
- **Option 5(ii):** An enhanced CAZ Category D within the IRR such that all diesel cars and private hire vehicles would be subject to a penalty as well as non-compliant petrol vehicles and larger diesel vehicles older than Euro 6, reflecting that even compliant diesel cars have higher emissions affecting air quality than their petrol equivalents. To be delivered in Phase 1 (in 2021) alongside a CAZ Category B across Greater Manchester. In Phase 2 (in 2023), the CAZ across Greater Manchester extends to a Category C. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help people, businesses and bus operators upgrade.

1.6.29 Modelling has indicated that Option 4 is predicted to deliver compliance (so that all sites have concentrations below the limit value) by 2025, and the remaining Options 5(i) and 5(ii) are all predicted to deliver compliance one year earlier, in 2024. Option 4 is therefore ruled out of further consideration. Results of the modelling conducted for Option 4 can be found in Appendix AQ2.

Additional options identified after initial appraisal process

1.6.30 Following an initial evaluation in December 2018 by the ten local authorities of the appraisal results of the three options set out above, concerns were raised that there was insufficient information to allow a decision to be made. In particular:

- that the risk of unintended socio-economic consequences was not sufficiently understood; and

- that other options had not been explored in sufficient depth to be ruled out, in that it was not clear if other options could also deliver compliance in the shortest possible time with less potential socioeconomic impact.

1.6.31 Further analysis was undertaken to better understand the risk of unintended socio-economic consequences. Initial outputs are described in the Economic Case and will continue as part of the FBC development process.

1.6.32 As a result, a decision was made to explore the potential effectiveness and impacts of two further options not previously considered. The options were assessed using the same process as applied to the six options considered in the high-level assessment stage.

1.6.33 The two additional options considered were:

- **Option 7:** A CAZ Category B across Greater Manchester to be implemented in a single phase. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help businesses and bus operators upgrade.
- **Option 8:** A CAZ Category B across Greater Manchester implemented as Phase 1. In Phase 2, the CAZ across Greater Manchester extends to a Category C. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help businesses and bus operators upgrade.

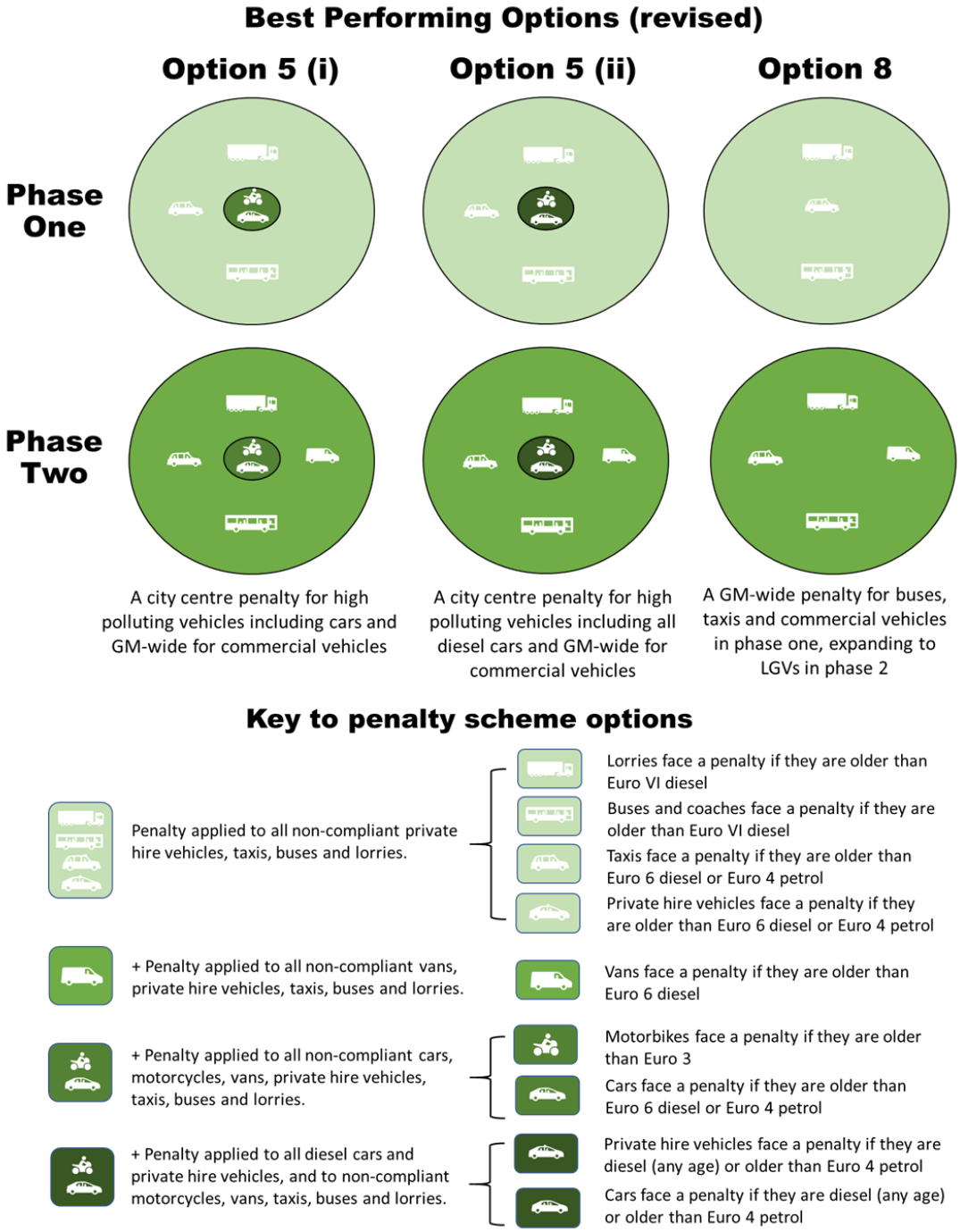
1.6.34 Modelling indicated that Option 7 was not likely to be sufficient, delivering lower emissions benefits in each year than Options 5(i), 5(ii) and 8 and reaching compliance two years later. Therefore, this option was not progressed to full appraisal.

1.6.35 Modelling indicated that Option 8 could deliver compliance in the same year as Options 5(i) and 5(ii). It was therefore subjected to a full appraisal using the same methodology as applied to those options.

Summary of best performing options progressed to full appraisal

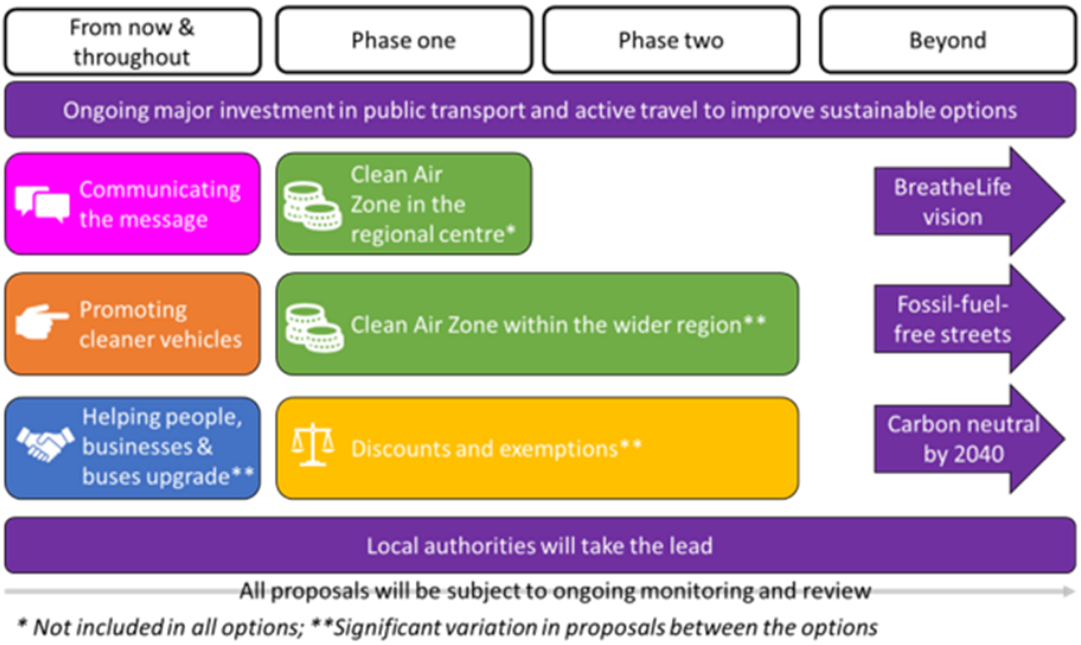
1.6.36 A full economic appraisal has been carried out for the three ‘best performing options’ that deliver compliance by 2024, the shortest possible time, encompassing Options 5(i) and 5(ii) that emerged from the high level assessment process in summer 2018, and the additional option (8) identified in January 2019. These are illustrated in Figure 1- 13 below.

Figure 1- 13: Best performing options included in full economic appraisal process



1.6.37 Each of the best performing options has been designed as a package of Measures, building on existing activity, so that action to deliver the GM CAP can commence as soon as possible with the aim of delivering real air quality benefits quickly, and readying Greater Manchester for the proposed implementation of CAZ scheme in 2021. The Measures, shown in Figure 1-14 below, are aligned with Greater Manchester's existing programme of ongoing major investment in public transport and active travel, and action on congestion. They will be supported by action within each local authority – this will mean upgrading local authority vehicle fleets to the cleanest vehicles, ensuring all policy and procurement is in line with the GM CAP goals, and taking local action to deliver cleaner air and a healthier living environment for residents, visitors and workers. The Measures proposed in the GM CAP are part of Greater Manchester's long-term strategy and trajectory as a BreatheLife city, delivering fossil-fuel-free streets and aiming to become carbon neutral by 2038.

Figure 1- 14: Best performing options: package of Measures



1.6.38 Table 1- 6 describes what Measures are proposed for each of the best performing options

Table 1- 6: Best performing options: Measures included in each option

	Measure	Option 5(i)	Option 5(ii)	Option 8
Communicating the message	Communications	✓	✓	✓
	Sustainable Journeys programme	✓	✓	✓
Promoting cleaner vehicles	Provision of 300 dual-headed Electric Vehicle (EV) charging points GM-wide	✓	✓	✓
	Promotion of EV	✓	✓	✓
Helping business and buses upgrade	Clean Air Funds Upgrade Car	✓	✓	
	Clean Air Funds Upgrade Freight / Commercial vehicles	✓	✓	✓
	Clean Air Funds Upgrade taxis and private hire vehicles (PHV)	✓	✓	✓
	Clean Air Funds Upgrade Buses	✓	✓	✓
	Loan Finance	✓	✓	✓
Clean Air Zones	City Centre CAZ D	✓		
	City Centre CAZ D+		✓	
	CAZ B/C across GM	✓	✓	✓
	Discounts and exemptions for CAZ	✓	✓	✓

1.6.39 The next section summarises the results and conclusions of the appraisal in terms of identifying the preferred option, and detailed results of the economic appraisal are presented in the Economic Case.

1.7 Selecting the preferred option for the proposed GM CAP

How we have selected the preferred option

1.7.1 Greater Manchester has identified a preferred option, becoming the proposed GM CAP, based on which of the best performing options delivers compliance in the shortest possible time. This takes into account:

- the results of traffic and air quality modelling, which predict the response to a range of Measures;
- an off-model assessment of the possible impacts of Measures that cannot be modelled;
- an assessment of how realistic these predicted impacts are and how likely they are to be achieved; and
- assessments carried out in the economic, management, commercial and financial cases which appraise the options against the success factors outlined below in Table 1- 7.

1.7.2 Critically, Greater Manchester has considered the risks in terms of when and how the Measures will be delivered. It is considered that taking account of the risk of non-delivery in this way supports the preferred option in delivering compliance in the shortest possible time, minimising human exposure over the lifetime of the Plan and being 'likely not just possible' to achieve its goals.

1.7.3 Greater Manchester has taken account of its wider responsibilities to its people and businesses, and has sought to develop proposals that bring the most benefit, with the least detrimental impact. In particular, evidence suggests that some of Greater Manchester's most vulnerable residents are most likely to suffer the effects of poor air quality, and Greater Manchester has aimed to bring forward a plan that improves air quality for those residents without damaging their quality of life in other ways.

Table 1- 7: Success factors against which the best performing Options have been appraised

Factor and description	Code	Criteria
Determining success factor		
Compliance in the shortest possible time	C1	Which option reduces to zero the number of locations in GM predicted to be in exceedance of the legal limits of NO2 concentrations in the shortest time?
Primary success factors		
Reduction in NO2 emissions The likelihood that the Measure/option will contribute significantly to a reduction in NO_2 concentrations, enough to achieve compliance with the EU Limit Values and reduce human exposure as quickly as possible.	N1	Which option delivers the greatest reduction in the number of locations in Greater Manchester in exceedance (presumed to represent human exposure) in each year prior to compliance being achieved?
	N2	Which option delivers the greatest reduction in NO2 concentrations at the roadside across Greater Manchester in each year prior to compliance being achieved, and upon compliance?
	N3	Does the option deliver compliance without putting other sites in Greater Manchester closer to exceedance (defined as concentrations of 38-40µg/m3) than without action?
Feasibility The likelihood of the Measure being implemented in time to deliver the desired NO_2 reduction, ensuring that compliance is 'not just possible but likely'.	F1	Are the Measures proposed within the legal powers of the Greater Manchester local authorities?
	F2	Can a governance route be developed to enable timely local government joint working as required for delivery?
	F3	What is the likelihood of the Measures being effective?
	F4	Is delivery of the option subject to significant risks that make achieving compliance in the shortest possible time, less likely?
Secondary (local) success factors		
Strategic fit with local strategies and plans	S1	Air quality and climate change: The Greater Manchester Strategy (Oct 2017) states that Greater Manchester should be "a place at the forefront of action on climate change with clean air and a flourishing natural environment" including by "reducing congestion and improving air quality".

Factor and description	Code	Criteria
The alignment of this Measure/option with policy/strategic aims at a local and regional level. Ensuring that the proposals set out in the option are aligned with the following vision for Greater Manchester as set out in key strategies and plans.	S2	Transport: The Greater Manchester Transport Strategy 2040 states a vision for "world class connections that support long-term sustainable economic growth and access to opportunity for all".
	S3	Growth: The Greater Manchester Strategy sets out "plans to build more than 10,000 more homes every year from now until 2035".
	S4	Economy: The Greater Manchester Strategy sets out a vision for "a thriving and productive economy in all parts of Greater Manchester" offering "good jobs, with opportunities for people to progress and develop".
Value for money A high-level indication of the costs and benefits of each Option.	V1	Estimated value for money of the option, compared to the risk of inaction
Distributional impact The potential impacts, both positive and negative on different groups within society, with a particular focus on protecting the most vulnerable. Overarching imperative to ensure that the Plan does not result in overly detrimental economic or social impacts for the region or those living, working or doing business within it.	Q1	Health benefits
	Q2	Accessibility (in terms of journey time and connectivity to opportunities and services)
	Q3	Affordability (for users)
	Q4	Impact on the local economy – considering low income workers, small businesses, town centres and key sectors
	Q5	Impact on the quality of life of local residents and on equalities
Deliverability Whether the Measures can be delivered within the time and funding available, and with the knowledge, skills and resources available in the delivery bodies and the wider market.	D1	The Affordability of the cost of implementation (for the public sector)
	D2	The Supply-side capacity and capability to deliver the Measures outlined in the option
	D3	The Achievability of delivering the option, considering potential blockers that exist such as difficulty with scale or obtaining resources (such as staff) to implement and operate a Measure/option

Identifying which option delivers compliance in the "shortest possible time"

1.7.4 Greater Manchester is completing its feasibility study according to Government guidelines. Government guidance sets out a charging CAZ as the Measure most likely to achieve EU Limit Values for NO_2 in towns and cities in the shortest possible time. A charging CAZ places a penalty on the most polluting vehicles if they enter a designated area. Government guidance specifies that local authorities must consider a CAZ as their Benchmark Measure in the feasibility study process as well as any alternative Measures that are at least as effective at reducing NO_2 and deliver compliance as quickly.

1.7.5 Modelling carried out during the initial options assessment process identified that none of the options tested, including the most extreme CAZ possible, could achieve compliance by 2021. As a result, new modelling tools were developed forecasting to 2023 and 2025. Those options that delivered the greatest air quality benefits in 2021 were progressed to appraisal stage and modelling was carried out to explore how effective they could be in 2021, 2023 and 2025. From these results, it is possible to interpolate a likely year of compliance.

1.7.6 Table 1- 8 shows the number of sites remaining in exceedance of legal limits in 2021, 2023 and 2025 under the Do Minimum scenario and with each of the three Options by local authority. The results show:

- without action, there are predicted to be 250 non-compliant sites across Greater Manchester in 2021, 68 in 2023 and eight remaining in 2025, with compliance forecast to be achieved by 2027;
- with action, two authorities (Wigan and Trafford) are forecast to become compliant in 2021, with between 49 and 71 points of non-compliance remaining across the rest of the region depending upon which Option is taken; and
- with action, by 2023 nine authorities are forecast to be compliant, with between one and three non-compliant sites remaining in the City of Manchester (depending on which Option is taken).

1.7.7 With action, compliance is expected to be achieved in all authorities across Greater Manchester by 2024.

Table 1- 8: Number of sites remaining in exceedance of legal limits for NO_2 concentrations by year, Greater Manchester, by local authority with action in the shortest possible time

	2021				2023				2025			
	Do Min	**5(i)**	**5(ii)**	**8**	**Do Min**	**5(i)**	**5(ii)**	**8**	**Do Min**	**5(i)**	**5(ii)**	**8**
Bolton	19	6	6	6	3	0	0	0	0	0	0	0
Bury	23	7	7	9	12	0	0	0	4	0	0	0
Manchester	88	18	12	28	29	2	1	3	2	0	0	0
Oldham	15	5	4	4	3	0	0	0	1	0	0	0
Rochdale	10	2	2	2	2	0	0	0	0	0	0	0
Salford	36	10	10	11	10	0	0	0	1	0	0	0
Stockport	30	7	3	5	4	0	0	0	0	0	0	0
Tameside	16	6	5	6	5	0	0	0	0	0	0	0
Trafford	10	1	0	0	0	0	0	0	0	0	0	0
Wigan	3	0	0	0	0	0	0	0	0	0	0	0
GM Total	**250**	**55**	**49**	**71**	**68**	**2**	**1**	**3**	**8**	**0**	**0**	**0**

1.7.8 Greater Manchester aims to deliver compliance in the shortest possible time in a way that takes into account the need to minimise human exposure. Table 1- 9 demonstrates the benefits being delivered in each year in terms of reduced concentrations even at sites remaining in exceedance in that year. This also shows that the number of sites close to exceedance reduces considerably in each year as a result of the Plan. Health benefits continue to be delivered by reductions in NO_2 concentrations even below the EU Limit Values. In particular:

- All Options reduce to zero the number of sites that are extremely non-compliant (with concentrations over 50 µg/m^3) in the first year; and reduce the number that are very non-compliant (with concentrations between 45-50 µg/m^3) by at least 85% in the same year. Thus, exposure to very high concentrations across Greater Manchester is almost eliminated with all Options.
- By 2023, all sites are at or close to compliance across Greater Manchester with all Options. Two sites are predicted to remain non-compliant in Option 5(i), one in Option 5(ii) and three in Option 8 but in all cases the predicted concentrations are close to 40 µg/m^3.
- With action, compliance is achieved in all local authorities across Greater Manchester by 2024 and the vast majority of sites across the region are predicted to have concentrations less than 35 µg/m^3.

Table 1- 9: Number of sites by scale of exceedance by year, Greater Manchester, best performing options

Scheme Options	Compliant		Non-compliant		
	Very compliant (below 35 µg/m3)	Compliant but marginal (35 to 40 µg/m3)	Non-compliant (>40 to 45 µg/m3)	Very non-compliant (>45 to 50 µg/m3)	Extremely non-compliant (>50 µg/m3)
2021					
Do Minimum	16,281	603	175	62	13
Option 5(i)	16,879	200	50	5	0
Option 5(ii)	16,892	193	44	5	0
Option 8	16,836	227	62	9	0
2023					
Do Minimum	16,856	210	58	10	0
Option 5(i)	17,081	51	2	0	0
Option 5(ii)	17,087	46	1	0	0
Option 8	17,072	59	3	0	0
2025					
Do Minimum	17,068	58	8	0	0
Option 5(i)	17,117	17	0	0	0
Option 5(ii)	17,121	13	0	0	0
Option 8	17,112	22	0	0	0

1.7.9 Table 1- 10 shows the concentrations at the highest point of exceedance with each option in each year. This shows that, by 2023, the highest exceedances in all 'Do Something' options are below 42, whereas in the Do Minimum the highest exceedance is near 50 (at 49.0).

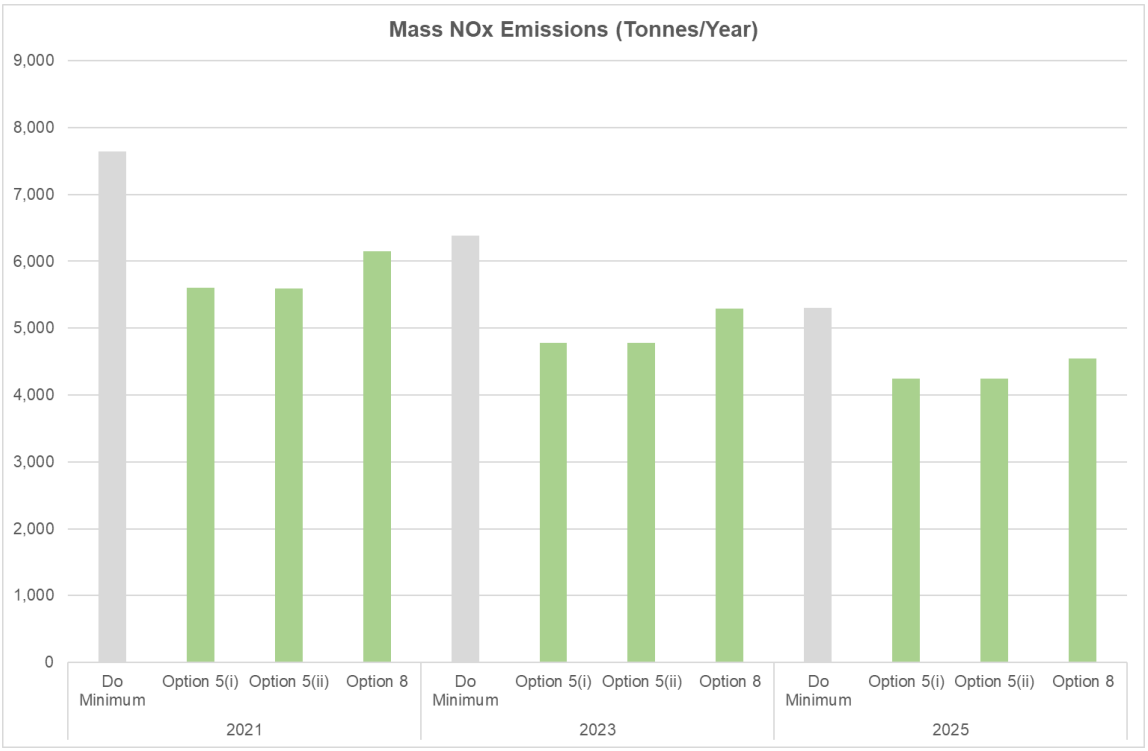
Table 1- 10: Highest NO2 concentration as forecast in each year, in µg/m^3

	2021	2023	2025
Do Minimum	54.8	49.0	43.2
Option 5(i)	47.4	40.9	38.6
Option 5(ii)	47.4	40.8	37.9
Option 8	48.0	41.7	38.8

1.7.10 Figure 1- 15 shows the total reduction in NO_X emissions across Greater Manchester by year. All parts of Greater Manchester will experience improved air quality; how these benefits are distributed is described in more detail in the Economic Case and Appendix AQ2.

1.7.11 The collaborative and regional approach taken in the GM CAP will avoid unintended consequences in terms of the redistribution of emissions and exceedances. The Greater Manchester-wide approach delivers benefits everywhere and avoids re-distributional impacts. The anticipated impacts are not significantly different between the three options.

Figure 1- 15 – Total reduction in NO_X emissions across Greater Manchester by year



1.7.12 Comparing the three Options 5(i), 5(ii) and 8 shows that in 2021, all Options reduce the number of exceedances by between 70% to 80%, with Option 5(i) delivering the greatest emissions benefit in the first year. By 2023, all sites are near compliance with all Options, with a maximum of three non-compliant sites predicted, and the three Options are all forecast to deliver compliance in the same year, 2024. The impact on human exposure over the lifetime of the Plan is similar with all Options; and all deliver emissions reductions and reductions in concentrations region-wide and avoid the risk of redistributing concentrations.

1.7.13 Options 5(i) and 5(ii) include a CAZ Category D within the Inner Relief Route bringing cars into scope for the scheme. This was considered because the city centre contains the highest density of sites in exceedance and many of the sites with the highest concentrations. As such it was thought that such a scheme would be necessary to deliver compliance in the shortest possible time. However, the analysis suggests that the last sites to become compliant sit on or just outside the Inner Relief Route and therefore that compliance is not ultimately determined by concentrations in the city centre. Consequently, although Options 5(i) and 5(ii) would bring greater benefits in terms of emissions reductions, particularly in the opening year, these are not as distinct as anticipated. Fundamentally, the analysis suggests that a city centre CAZ D does not bring forward the year of compliance despite bringing more people in scope for a penalty including private car drivers going to work or to visit the retail and leisure destinations in the city centre.

Conclusion

1.7.14 Options 5(i), 5(ii) and 8, as the most promising options, have been considered in terms of their performance against the Determining, Primary and Secondary Success Factors. Tables summarising this assessment are included in Appendix A1 and a summary of the results is shown as Table 1-11 below.

1.7.15 Each of the Options also includes a package of supporting Measures, designed to ensure local people and businesses understand clean air and know what they can do to reduce their impact; to encourage the uptake of the cleanest vehicles; and most significantly, to support local businesses to upgrade their fleets as quickly as possible. In addition, all three Options propose a region-wide CAZ, starting at Category B from 2021 and expanding to a Category C in a later phase, assumed to be 2023. As described below, this large-scale scheme is challenging to implement, in terms of the need for substantial funding and support from Government, as well as the need for considerable collaboration between the ten districts; and the demand for major capacity from a range of suppliers. Nevertheless, it is clear from the analysis carried out to date that a smaller-scale scheme would not be sufficient to deliver compliance in the shortest possible time.

1.7.16 The full implementation of the CAZ C is proposed for 2023 rather than 2021. Crucially, this reduces the risk of socio-economic damage but does not delay the year of compliance. A GM-wide CAZ C cannot deliver compliance in 2021 or earlier than 2024 regardless of when it is implemented. This is because it is only with the wider improvements delivered by 2024 that a CAZ C achieves compliance.

1.7.17 The reason it is necessary to support local businesses, residents and operators to upgrade their vehicles is because Greater Manchester has an older than average fleet and an economy dominated by small business. There is a risk that without these supporting Measures, the CAZ will be ineffective – because people cannot afford to upgrade – or will cause unacceptable economic damage.

1.7.18 Furthermore, there is a risk that a CAZ implemented without support could damage the public and accessible transport offer in the region. Most buses and nearly all hackney carriages in the region are non-compliant, with the oldest vehicles typically owned by small local businesses or sole traders. There is a risk that without support, bus operators may choose to reduce bus services rather than upgrade their fleets, and that hackney carriage drivers and operators may choose to switch to driving a (less accessible) private hire vehicle or choose to stop operating.

1.7.19 Therefore, this supporting package is an essential, common component in achieving compliance, but adds to the cost and complexity of delivery, and creates significant supply-side challenges.

1.7.20 Options 5(i) and 5(ii) require support to help private car drivers upgrade their vehicle. This is considered particularly risky as a viable, value-for-money model for car scrappage-type schemes has not yet been developed and tested. Option 8 carries less risk in this regard.

Differentiators

1.7.21 The key question in terms of differentiating Option 8 from Options 5(i) and 5(ii) is whether it is necessary to implement a further scheme in the city centre. Fundamentally, neither version of the city centre schemes proposed in Options 5(i) and 5(ii) brings forward the year of compliance.

1.7.22 The city centre schemes proposed in Options 5(i) and 5(ii) do deliver benefits in the early years of the programme, achieving the greatest reduction in NO_2 concentrations at the roadside and in the number of locations in exceedance in the first year. All Options deliver compliance without putting other sites closer to exceedance, and in fact deliver benefits to air quality region-wide.

1.7.23 It would be reasonable to conclude from the modelling carried out that there is greater certainty in the estimated year of compliance for Options 5(i) and particularly 5(ii), as they consistently deliver lower concentrations in the modelled years. However, this must be considered against the risk that delivery is subject to significant risks that make achieving compliance in the shortest possible time less likely. Options 5(i) and 5(ii) involve implementing an additional CAZ that involves private cars, alongside the region-wide CAZ proposed in all three Options. This creates a challenge of feasibility, in terms of obtaining approvals and managing risks, and of deliverability, in terms of the achievability of delivering proposals of this scale, and of obtaining the necessary human and financial resources.

1.7.24 Option 5(ii) carries additional risk of failure due to its innovative nature. Due to a lack of evidence on the effectiveness and impacts of such a proposal, the forecasts for this option should be considered particularly uncertain.

1.7.25 Option 8 can be delivered at a lower cost to the public sector and is thus more affordable. As the Option that delivers compliance in the shortest possible time, and at the lowest cost, Option 8 is also considered the 'benchmark CAZ' for the purposes of comparison.

1.7.26 Option 8 presents many delivery challenges, but is more feasible and achievable than Options 5(i) and 5(ii) and thus offers greater confidence that compliance can be achieved in the shortest possible time.

1.7.27 It is considered that Options 5(i) and 5(ii) may cause unacceptable and significant unintended consequences to distributional impacts, particularly in terms of the impact on the affordability for residents, the impact on the local economy, and the impact on the quality of life of local residents. There are particular concerns in terms of the potential impacts on low income car-dependent workers, small businesses, and city centre retail. Option 8 delivers compliance in the same year without the same potential risk of damaging economic impacts.

1.7.28 On balance, therefore, it is considered that Option 8, whilst remaining a substantial and complex undertaking, is the surest way of delivering compliance in the shortest possible time, providing considerable health benefits at the lowest cost to society and the economy, of the three Options.

1.7.29 Proceeding with Option 8 will mean that private cars are not in scope for a Clean Air Zone. Nevertheless, the GM CAP does aim to deliver benefits in terms of encouraging residents to consider their use of cars, and to switch to cleaner fuels or more sustainable modes of travel.

1.7.30 Option 7, a GM-wide CAZ B, delivers compliance two years later than Option 8 and was therefore rejected. In 2023, twelve sites remain non-compliant with Option 7, compared to three with Option 8. Therefore, as part of the FBC process, further work will be undertaken to understand the conditions at these twelve locations and to establish whether it would be possible to identify Measures other than a CAZ C that could deliver compliance in the shortest possible time (i.e. by 2024). However, at this stage it is presumed that expansion to a CAZ C will be necessary in 2023.

1.7.31 The comparison of shortlisted CAP Options against the Primary and Secondary critical success factors is summarised in Table 1- 11 below.

Table 1- 11: Comparison of the performance of Options 5(i), 5(ii) and 8 against the Critical and Secondary Success Factors

Success Factor	**Code** See Table 1- 7 for more details	**Option 5(i)** 2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	**Option 5(ii)** 2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	**Option 8** 2021: CAZ B GM-wide, 2023: CAZ C GM-wide	**Summary**
Determining Success Factor					
Compliance in the shortest possible time Which option reduces to zero the number of locations predicted to be in exceedance of the legal limits of NO2 concentrations in the shortest time?	C1	Yes	Yes	Yes	All Options deliver compliance in 2024, considered to be the shortest possible time for achieving compliance in GM.
Critical Success Factors					
Reduction in NO2 emissions Which option delivers… The greatest reduction in the number of locations in exceedance (presumed to represent human exposure) in each year?	N1				All Options deliver significant reductions in the number of locations in exceedance of 70-80% in 2021, with Option 5(ii) predicted to marginally deliver the greatest reductions in each year prior to compliance being achieved.
The greatest reduction in NO2 concentrations at the roadside in each year prior to compliance being achieved?	N2				All Options deliver reductions in mass emissions across GM of between 20-30% in 2021, with the greatest reductions forecast to be delivered by Option 5(ii).

Success Factor	Code See Table 1- 7 for more details	Option 5(i) 2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	Option 5(ii) 2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	Option 8 2021: CAZ B GM-wide, 2023: CAZ C GM-wide	Summary
Compliance without putting other sites closer to exceedance (defined as concentrations of 38-40 µg/m3) than without action?	N3				All Options are forecast to deliver compliance without putting other sites closer to exceedance. Risk that Option 5(ii) leads to more re-routing than forecast.
Feasibility Are the Measures proposed within the legal powers of the Greater Manchester Local Authorities?	F1				The Measures proposed in all Options are within the legal powers of the authorities.
Can a governance route be developed to enable timely local government joint working as required for delivery?	F2				GM has proposed a governance route that facilitates the local government co-operation required for delivery. The complex vehicle change requirements of Option 5(ii) are likely to make approvals more difficult.
What is the likelihood of the Measures being effective?	F3				Clean Air Zones are presumed to be effective, but there is considerable uncertainty about how drivers will respond within the local context and to a scheme on a region-wide scale. Option 5(ii) is more complex and thus more uncertain.

Success Factor	Code See Table 1- 7 for more details	Option 5(i) 2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	Option 5(ii) 2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	Option 8 2021: CAZ B GM-wide, 2023: CAZ C GM-wide	Summary
Is delivery of the option subject to significant risks that make achieving compliance in the shortest possible time less likely?	F4				If the full CAP cannot be delivered or funded, compliance may be delayed e.g. if there is not sufficient time or funds to achieve a clean hackney carriage or bus fleet. The Plan is subject to risks in terms of the need for multiple approvals from different bodies; the political sensitivity of the proposals; and the need to run activities in parallel. Option 5(ii) carries greater risk as it is out with the standard guidance, approved signage and so on. Option 8 involves one rather than two CAZ schemes so is subject to less risk.
Secondary Success Factors					
Strategic fit with local strategies and plans Air quality and climate change	S1				All Options deliver improvements in NO2 concentrations, and also reduce PM and greenhouse gas emissions.
Transport	S2				All options act to promote sustainable travel and will deliver a cleaner, newer bus and taxi fleet for GM passengers.

Success Factor	**Code** See Table 1- 7 for more details	**Option 5(i)** 2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	**Option 5(ii)** 2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	**Option 8** 2021: CAZ B GM-wide, 2023: CAZ C GM-wide	**Summary**
Growth	S3				Risk that the city centre CAZ schemes deter housing and employment development; which could impact on the delivery of the Greater Manchester Spatial Framework. Option 8 delivers clean air without this risk.
Economy	S4				Risk that the city centre CAZ schemes affect economic performance. Option 8 delivers clean air without this risk. In all Options, CAZs will impose costs on local businesses.
Value for money Estimated value for money of the option compared to the risk of inaction	V1				It would be more cost effective to deliver the changes more slowly; however this is a public health emergency so action is vital. Option 8 delivers compliance at the lowest imposed cost.
Distributional impact Health benefits	Q1				All groups will experience health benefits. Those living in areas with the worst air quality and those most vulnerable to the effects of poor air quality will benefit the most.

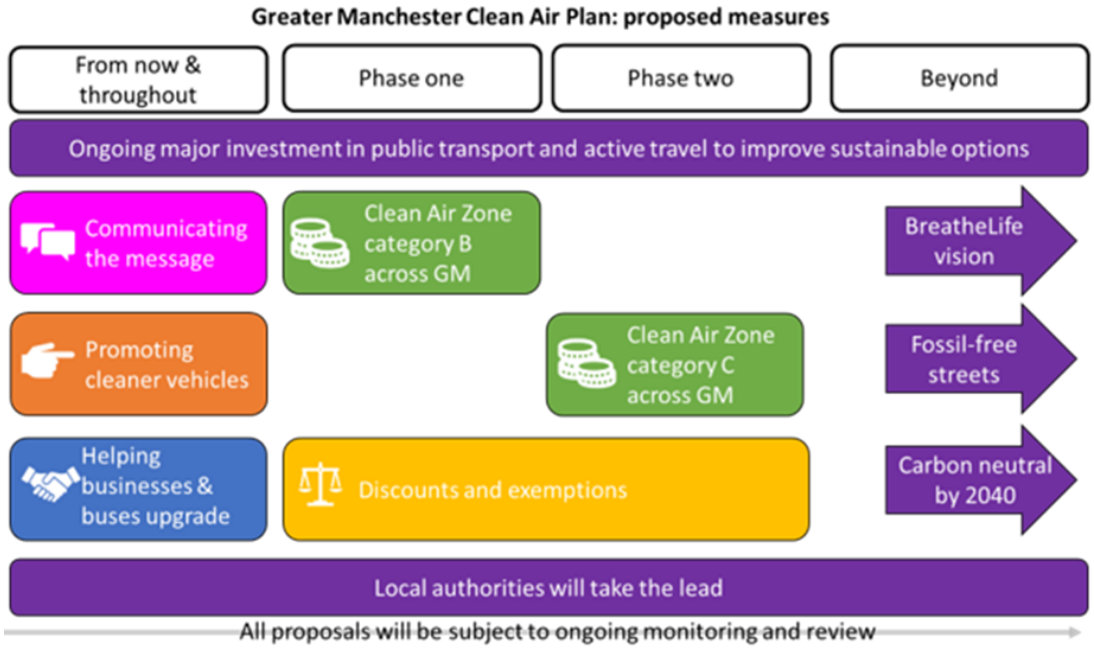
Success Factor	Code See Table 1- 7 for more details	Option 5(i) 2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	Option 5(ii) 2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	Option 8 2021: CAZ B GM-wide, 2023: CAZ C GM-wide	Summary
Accessibility (in terms of journey time and connectivity to opportunities and services)	Q2				The scheme brings improved accessibility in terms of small reductions in journey times for road traffic. Option 8 does not impose costs on private cars.
Affordability (for users)	Q3				Options 5(i/ii) impose costs affecting low income car drivers, with more vehicles in scope for charges in Option 5(ii). Option 8 delivers clean air without this risk but still imposes costs on small businesses and sole traders.
Impact on the local economy – considering low income workers, small businesses, town centres and key sectors	Q4				All Options impose costs on small businesses and low income professional drivers; proposals to support fleet upgrades mitigate this somewhat. Options 5(i/ii) risk impacts on the city centre economy avoided in Option 8.
Impact on the quality of life of local residents and on equalities	Q5				Options 5(i/ii) may affect the quality of life of low income car drivers. Low income residents driving a non-compliant commercial vehicle will be affected by all Options.

Success Factor	Code See Table 1- 7 for more details	Option 5(i) 2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	Option 5(ii) 2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	Option 8 2021: CAZ B GM-wide, 2023: CAZ C GM-wide	Summary
Deliverability The Affordability of the cost of implementation (for the public sector)	D1				Option 8 is the lowest cost option and is thus the most affordable for the public sector.
The Supply-side capacity and capability to deliver the Measures outlined in the option	D2				There are concerns about supply side capacity e.g. the availability of specialist compliant vehicles such as hackney carriages, and retrofitting capacity and risks of delays.
The Achievability of delivering the option, considering issues such as difficulty with scale or obtaining resources to implement and operate a Measure/option	D3				The scale of the region-wide CAZ, supporting programme and associated cost, and the need for cross-district collaboration, creates delivery risk. This risk is even greater for a city centre CAZ D scheme.

1.8 GM CAP: The Preferred Option

1.8.1 As described in Section 1.7, the optioneering has identified Option 8 as the preferred option to deliver compliance in the shortest possible time, becoming the proposed GM CAP. Figure 1- 16 illustrates the Measures included in Option 8 and this Section describes in more detail what Measures are proposed in the GM CAP preferred option. For more detail on each of the Measures in the preferred option see Appendices.

Figure 1- 16: Measures included in the GM CAP (preferred option)



Proposed Measures: Communicating the message

1.8.2 Crucial to the success of the GM CAP will be ongoing communications activity to help the residents and businesses of Greater Manchester understand the nature of the air quality challenge and what action they can take to reduce emissions. Evidence suggests that awareness of air quality issues is growing, but people are still confused as to what poor air quality means, where pollution comes from and what solutions would be effective.

1.8.3 Initial research was carried out in summer/autumn 2018 around perceptions of air pollution in Greater Manchester. This included focus groups and an on-street survey – supported by a literature review to understand the wider perceptions around air quality in the UK.

1.8.4 In summary, most people were aware that air quality differs across Greater Manchester, for example that it is worse in the city centre than the suburbs. However, both the focus groups and the survey highlighted a lack of understanding of the scale of the Greater Manchester air quality issue. Accordingly, the level of concern about the Greater Manchester air pollution issue was 'moderate', and there was little understanding of the impact of air pollution on health. Furthermore, while it was understood that road traffic plays a part in air pollution, factors other than transport featured strongly in people's understanding of the causes – e.g. industry.

1.8.5 The outputs from this research highlighted the need to raise awareness and understanding of air pollution as a health issue through public campaign activity. An initial phase of activity was delivered during autumn 2018. As the GM CAP is implemented, it will also be necessary to communicate effectively with those most affected by the Measures to ensure they know what choices they have available, what support they can access, and that they are able to make the best decisions for them and their business.

1.8.6 Further opportunities to track levels of awareness and understanding will be taken during the FBC development, implementation and post-implementation phases, to monitor the effectiveness of activity, ensure ongoing improvements to messaging, and to help develop future strategies for communications and engagement.

1.8.7 The GM CAP proposes a programme of sustainable travel in order to help people and businesses understand how they will be affected by the GM CAP and how best they can adapt:

- Personal travel planning is a demonstrably effective technique for residents and employees to encourage sustainable travel choices and vehicle purchasing decisions. This will be targeted at residents and businesses in air quality hotspots, and include bespoke information and incentives relating to their particular journeys and preferences.
- Through the Business Travel Advice service, expert advice, toolkits and incentives will be made available for workplaces to offer travel planning interventions to encourage and enable sustainable travel choices, inform vehicle purchasing decisions, purchasing, consolidation and freight practices. This will include grants to help businesses improve their sustainable travel offer, for example by providing cycle parking.
- Travel planning, events, classroom activities including mapping, challenges, air quality monitoring and other engagement activities will also be targeted at schools and families in areas of poor air quality and with high car use on the journey to school, to help increase awareness of air quality impacts, increase the use of sustainable travel (particularly walking and cycling) for students, parents and staff on their journeys to and from school, and reduce exposure for children.

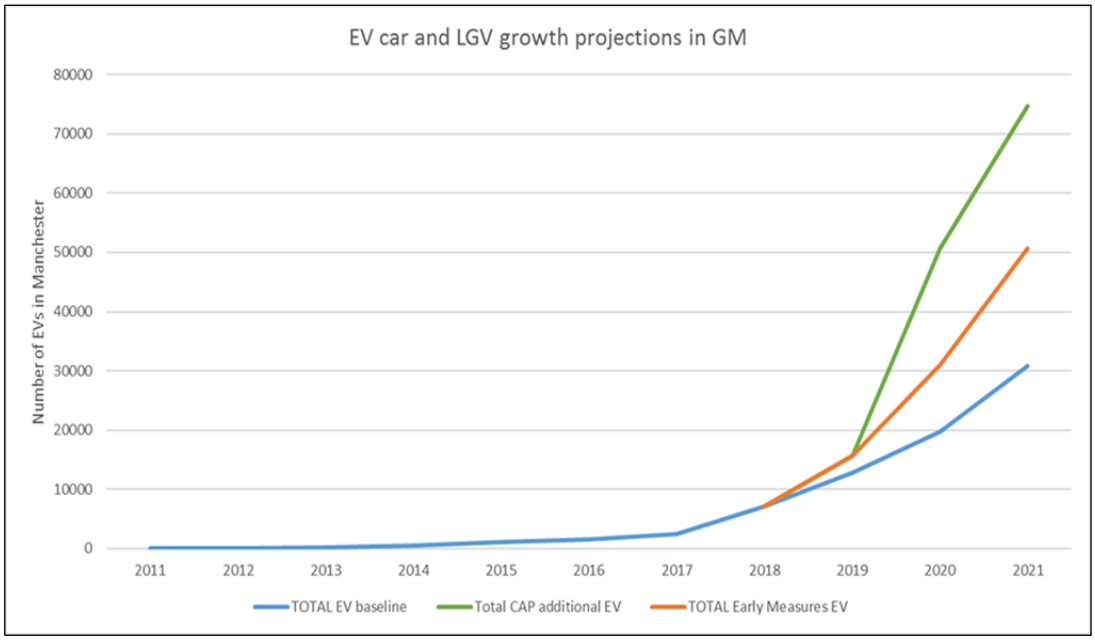
Proposed Measures: Promoting cleaner vehicles

1.8.8 Electric Vehicles (EVs) are the least polluting, but at present many potential purchasers are put off by concerns about the practicality of charging an electric vehicle, amongst other factors. The EV Infrastructure and Promotion initiative proposes 300 additional rapid charging points (dual headed) across the ten local authorities of Greater Manchester, including some for taxis/PHVs only.

1.8.9 A supporting communications programme will deliver events such as experience days that will showcase the benefits of electric vehicles and highlight the support available. They will allow people to compare EVs from a range of suppliers, and 'try before you buy'.

1.8.10 Greater Manchester already has ongoing initiatives to support the introduction of EVs (not included as part of this initiative). Figure 1- 17 shows how these 'Early Measures' are expected to increase the uptake of EVs in Greater Manchester. This is based on already planned increases in infrastructure and EV incentives under the Early Measures project. The Measures outlined here as part of the GM CAP are expected to further accelerate the update as shown by the green line in Figure 1- 17(source: adapted by TfGM from Climate Change commission (CCC) forecasts).

Figure 1- 17: Projections of growth in Electric Vehicle fleet in Greater Manchester, with Early Measures and CAP funding



Proposed Measures: Helping people and businesses upgrade

1.8.11 A CAZ category affecting buses, taxis, HGVs, coaches, minibuses and LGVs across the region will provide a financial incentive to the owners of commercial vehicles to invest in cleaner vehicles. This process can be made more effective in terms of reducing emissions and fairer in terms of minimising socio-economic damage if it is supported by schemes offering financial support to businesses and self-employed workers based in Greater Manchester to help them upgrade their vehicles.

1.8.12 Note that private cars are not included in the proposals (other than cars used as private hire vehicles and taxis) as they are exempt from the CAZ. The funds will be targeted at those most affected and in need of support to help them upgrade and comply.

1.8.13 Vehicle renewal schemes such as those proposed here offer a range of benefits:

- They bring forward emissions reductions prior to the introduction of a CAZ: CAZs take time to introduce and are not programmed to go live until 2021 in Greater Manchester, with the GM-wide scheme for LGVs not expected to go live until 2023. Vehicle renewal schemes targeted at those least likely to upgrade without support have the potential to bring forward some of the benefits of the CAZ in terms of reducing human exposure to harmful pollutants.
- They ready the fleet for a CAZ, reducing the risk of unintended consequences and allowing earlier implementation: there is a risk that if vehicle upgrade is unaffordable, unintended consequences emerge that may be damaging in terms of vehicle emissions, accessibility or socio-economic impact. For example, without financial support, there is a risk that licensed hackney carriage drivers cannot afford to upgrade and therefore cease trading or ‘trade down’ to a minicab licence, thus reducing the availability of accessible travel for disabled people and reducing general access to well-informed drivers offering a hail-and-ride service. Similarly, low-income van drivers affected by the GM-wide scheme may swap their van for a diesel estate car (out of scope for the scheme). In some instances, this allows for earlier implementation of a CAZ, where unintended consequences would push back the possible date of implementation and therefore potentially when compliance could be achieved.
- They mitigate the risk of damaging socio-economic impacts imposed by CAZs: small businesses operating to tight margins and low-income sole traders may struggle to afford to upgrade their vehicle or pay the charge. Vehicle renewal schemes can support these groups upgrading to compliant vehicles and thereby avoiding the charge.

1.8.14 The proposed vehicle renewal schemes will be delivered via Clean Air Funds, offering support to in-scope businesses and residents. Businesses and self-employed residents of Greater Manchester who own an HGV or LGV, hackney carriage or car licensed as a private hire vehicle with one of the ten local authorities: small and micro businesses based in Greater Manchester would have access to Measures offering a financial incentive to scrap or de-license non-compliant vehicles (HGV or LGV, hackney carriage or car registered as a private hire vehicle licensed with one of the ten Greater Manchester local authorities) and to replace them with a compliant vehicle, or to retrofit their vehicle to make it compliant.

1.8.15 For both businesses and residents, it is expected that the schemes would be subject to a competitive application process, with funds allocated on the basis of a series of criteria and prioritised in terms of the likely air quality benefit and socio-economic impact. In principle, it is proposed that priority will be given to upgrading the oldest and dirtiest vehicles, that are most likely to travel in areas suffering from poor air quality, and owned by those least able to upgrade them without support.

1.8.16 The vehicle renewal scheme delivered through the Clean Air Funds will offer owners of older non-compliant vehicles registered within Greater Manchester an incentive to renew their vehicles. The Fund will be split into three sub-groups covering LGVs and minibuses; HGVs and coaches; and taxis (hackney carriages and PHVs).

Proposed Measures: Helping buses upgrade

1.8.17 Buses are an essential component of the public transport offer, and in many parts of the region are the only public transport available. It is vital that action to clean up the bus fleet does not have the unintended consequence of reducing the number or frequency of bus services in the region.

1.8.18 At present, around 1,800 of the approximately 2,000 buses operating in Greater Manchester do not comply with the Clean Air Zone minimum emissions standards set by the Clean Air Zone Framework[54]. Greater Manchester successfully bid for funds to retrofit around 170 buses, and delivery of this activity is underway.

[54] Defra, Dft, 'Clean Air Zone Framework: Principles for setting up Clean Air Zones in England' (May 2017), Annex A.

1.8.19 Retrofit of buses is a relatively inexpensive way to deliver compliance quickly, however, it does not fit with the Greater Manchester longer term strategy or ambition to have a zero-emission bus fleet. Greater Manchester believes that investing more in a cleaner bus fleet would both reduce emissions and improve the appeal of bus travel in Greater Manchester. Improving the quality of public transport can reduce car travel and thus emissions through mode shift. In support of this vision, the Greater Manchester region has secured funding from the Ultra-Low Emission Bus Fund bid for around £15 million to support the purchase of 70 ultra-low emission buses.

1.8.20 Nevertheless, in response to the imperative to act quickly to clean up the bus fleet, and to do so without damaging service provision, a Clean Bus Fund is proposed, providing financial support towards retrofitting or potentially replacing existing Euro IV and V buses and leaving the market to identify a solution for the 365 buses older than this.

1.8.21 It has been assumed that the Clean Bus Fund supported by market action could deliver a fully compliant bus fleet by end 2021, although this assumption will be investigated further at FBC. This facilitates the introduction of a CAZ for buses over that time frame. Without funding for retrofit and upgrade of buses, it would not be possible to implement a GM-wide CAZ for buses in 2021 as the age and turnover of the existing fleet means that a high proportion of buses would be non-compliant and the risk of a substantial reduction in bus services would be high. Bus services in Greater Manchester are commercially operated and operators are able to reduce services provided if they are not sufficiently profitable. Consequently, the Clean Bus Fund is an integral part of the package required to deliver compliance in the shortest possible time.

Proposed Measures: Clean Air Zone across Greater Manchester

1.8.22 Modelling has shown that a Clean Air Zone for commercial vehicles is required to deliver compliance in the shortest possible time in Greater Manchester.

1.8.23 The GM CAP proposes a Clean Air Zone to be implemented across the region in two phases as follows:

- **Phase 1 (assumed to be 2021):** a **Clean Air Zone category B** across the region, placing a daily penalty on the most polluting buses, taxis (hackney carriages and private hire vehicles), HGVs and coaches if they travel into, within or through Greater Manchester.
- **Phase 2 (assumed to be 2023):** expansion to a **Clean Air Zone category C** across the region, placing a daily penalty on the most polluting light goods vehicles and minibuses if they travel into, within or through Greater Manchester, in addition to those vehicles placed in scope under Phase 1.

1.8.24 No private cars would be affected by this proposal.

1.8.25 Vehicles travelling exclusively on the Highways England SRN and passing through the region without entering the local road network in Greater Manchester, would also be unaffected by this proposal. This is because Greater Manchester's Authorities do not have the power to impose a scheme on the SRN. This is an aspect of the CAZ definition that we would like to explore further with Government and Highways England.

1.8.26 Figure 1- 18 illustrates those vehicles in and out of scope for a penalty.

Figure 1- 18: Vehicles by whether they are in scope for an emissions penalty across GM

GM-wide Clean Air Zone

	More polluting vehicles in scope for a penalty	Cleaner vehicles unaffected & uncharged
Phase 1	• Buses Euro V and older • Diesel Hackney cabs Euro 5 and older • Petrol Hackney cabs Euro 3 and older • Diesel PHVs Euro 5 and older • Petrol PHVs Euro 3 and older • HGVs Euro V and older • Coaches Euro V and older	• Buses Euro VI • Diesel Hackney cabs Euro 6 • Petrol Hackney cabs Euro 4 and newer • Diesel PHVs Euro 6 • Petrol PHVs Euro 4 and newer • HGVs Euro VI • Coaches Euro VI • All light goods vehicles and minibuses • All private cars • All motorbikes and mopeds
Phase 2	• Buses Euro V and older • Diesel Hackney cabs Euro 5 and older • Petrol Hackney cabs Euro 3 and older • Diesel PHVs Euro 5 and older • Petrol PHVs Euro 3 and older • HGVs Euro V and older • Coaches Euro V and older • Light goods vehicles Euro 5 and older • Minibuses Euro 5 and older	• Buses Euro VI • Diesel Hackney cabs Euro 6 • Petrol Hackney cabs Euro 4 and newer • Petrol PHVs Euro 4 and newer • Diesel PHVs Euro 6 • HGVs Euro VI • Coaches Euro VI • Light goods vehicles Euro 6 • Minibuses Euro 6 • All private cars • All motorbikes and mopeds

1.8.27 The boundary of the proposed CAZ is subject to further technical review as part of the scheme development work to support the FBC, however at present it is considered to be the authority boundary of Greater Manchester.

1.8.28 It is proposed that the CAZ will operate 24 hours a day, seven days a week, and will apply to all trips made by in-scope vehicles into, within and through Greater Manchester (excluding trips made wholly on the SRN).

1.8.29 The level of the penalty will be confirmed subject to public and stakeholder engagement, statutory consultation and further technical work. The indicative penalty levels that have been assumed for the purposes of modelling the impacts of the scheme are £7.50 per day for vans and minibuses; hackney carriages and PHVs; and £100 per day for HGVs, coaches and buses.

1.8.30 If the penalty charge is not paid within the required time a penalty charge notice would be incurred.

1.8.31 Vehicles will never be required to pay more than once per day regardless of how many trips they make within the CAZ boundary. However, if a vehicle enters the GM CAZ and also enters a CAZ or Low Emission Zone elsewhere in the UK they will be required to pay the local penalty charges for each CAZ. So, for example, if a non-compliant in-scope vehicle travelled from London to Greater Manchester on the same day, they would be required to pay charges incurred in both regions (however, the effect of this has not been captured in the assessment process at this stage).

1.8.32 As part of the detailed scheme design phase, Greater Manchester will be considering payment options that would be more beneficial and efficient to customers without undermining the principles of the scheme, such as offering taxi and private hire drivers the option of a periodic (perhaps quarterly or annual) permit or Clean Air Levy rather than a daily charge. Further work will be required as part of the engagement and consultation process with stakeholders, including Government who are designing and building a single Payment Portal for all Clean Air Charging Zones, to understand their needs and subsequent options.

Proposed Measures: Discounts and exemptions to the Clean Air Zone

1.8.33 Imposing a penalty on non-compliant vehicles is an effective way of encouraging drivers to upgrade their vehicle. Clearly, however, there is a risk that for micro businesses or sole traders on tight margins, a CAZ scheme may impose costs that cannot be absorbed, with a risk of consequent damage to the local economy and people's livelihoods. An initial assessment of the economic impacts of the proposed GM CAP is contained in the Economic Case, and more work is required to inform the FBC, including a full economic impact assessment, research and data analysis, and stakeholder engagement. It is assumed that where unacceptable unintended consequences are identified, solutions will be sought to refine the scheme or provide other support (in addition to the incentive Measures) to mitigate these as much as possible.

1.8.34 One way of protecting the most vulnerable from the negative economic impacts of a CAZ is to offer temporary or permanent discounts and exemptions to the scheme. These reduce the risk of unintended consequences for those in scope for a penalty charge, but reduce the effectiveness of the scheme in terms of reducing emissions and therefore the relative merits must be considered from both perspectives. Discounts and exemptions are not likely to be considered acceptable if they unreasonably delay the date when compliance could otherwise be achieved.

1.8.35 The nature and extent of the discounts and exemptions required to support GM CAP will be developed through public and stakeholder engagement as part of the FBC process. Some options are outlined below:

- Exemptions and discounts to limit the impact on **disabled people** and those with accessibility needs – for example, for specially adapted in-scope vehicles (such as minibuses or private hire vehicles)
- 'Sunset periods' (time-limited discounts) to limit the impact on any or all of: **local small/micro businesses/sole traders, not-for-profit organisations, charities and schools**
- Bespoke time-limited discounts for those with **outstanding lease or Personal Contract Purchase (PCP) contracts**
- Collaborative working with **bus companies and taxi operators** to help them comply and avoid unnecessary charges, and the offer of paying an annual Clean Air Levy for non-compliant GM-registered hackney carriages or PHVs.

GM CAP: Summary of proposed Measures and further development

1.8.36 The proposed GM CAP consists of a region-wide Clean Air Zone for buses and coaches, taxis and heavy goods vehicles in the first instance, expanding to include light goods vehicles and minibuses at a later date. The proposed Clean Air Zone will be supported by discounts and exemptions to protect the most vulnerable, as well as Measures to communicate the message and help people understand how to comply; Measures to promote the cleanest vehicles; and a series of schemes to help vehicle owners who might otherwise have struggled to do so, to upgrade their vehicles and comply with the scheme.

1.8.37 More work is required as part of the FBC to fully define these Measures. In particular, this work will focus on better understanding what support is required by businesses and workers to enable them to comply with the scheme. Work will also be carried out to look in more detail at the last remaining points of non-compliance in the region, to test the validity of the modelling and also to assess whether local action at these locations could remove or delay the need for the Phase 2 scheme (which brings light goods vehicles and minibuses in scope for the CAZ).

1.9 Benefit, risk, constraints, and contingencies

1.9.1 Whilst the impact of air quality on health and the environment has long been recognised, the evidence on direct health impacts and the related costs is strengthening constantly. Greater Manchester has the opportunity to drive forward a change in the approach to improving its local environment using the current political and public awareness of the critical nature of the issue. As a result of this there is access to major sources of funding which have not previously been available, that can be used to reduce air pollution and bring forward Measures from wider Greater Manchester strategies that lead to improvements in air quality. A well-designed package of Measures as set out in this OBC has the potential to provide an investment legacy opportunity that enables economic growth whilst reducing congestion and environmental impacts, as well as protecting and improving the health of our population.

1.9.2 There is now a recognition, across Europe and globally, that reducing harmful emissions is an imperative but highly complex issue. The types of Measures required to address poor air quality could have been viewed as politically and economically impracticable in the recent past. However, because many cities are now required to act simultaneously, the risk of not taking action could lead to Greater Manchester gaining a reputation for not protecting its citizens. Secondly, because other cities in the UK will be taking steps which will likely displace older more polluting fleets, weak regulation in Greater Manchester could lead to these dirtier fleets being re-deployed in Greater Manchester.

1.9.3 There is a risk that Measures implemented as part of a GM CAP could have unintended consequences, such as increasing carbon emissions or congestion, thereby resulting in damage to the local environment and economy. A detailed and robust process to developing the supporting evidence is critical.

1.9.4 It is also recognised that trends in NO_2 concentrations have not to-date seen the decreases predicted by Government toolkits, and therefore appropriate sensitivity testing in the modelling, alongside air quality monitoring needs to be implemented, to enable the CAP Measures to be evaluated and adapted as appropriate over time. The assessment process will be developed so that it can be responsive to emerging evidence as it becomes available throughout the programme.

1.9.5 The GM CAP requires a multi-faceted cross-disciplinary approach, and is therefore dependent on a wide range of stakeholders. For example, the Greater Manchester Congestion Plan will be reviewed as it develops, and the impacts upon and from the motorway network will be incorporated in conjunction with Highways England.

1.9.6 As part of the feasibility study, it is necessary to recognise the benefits, risks, dependencies and constraints that may arise with the GM CAP. This is due to the influence these factors have on the success of Measures in achieving the aim and therefore the choice of preferred option. The SOC presented a summary of benefits, risks, dependencies and constraints whilst this OBC presents a more informed understanding of the current situation and detail of options proposed.

Benefits

1.9.7 Figure 1- 19 presents a logic map for how the Measures in the GM CAP deliver real-world impacts. This also shows the inter-dependencies between the Measures within the GM CAP and that delivery of these benefits is contingent on delivery of the full package of Measures.

1.9.8 The logic map demonstrates the key first order benefits, which are:

- reduction in NOx emissions from road traffic and an associated reduction in NO_2 concentrations at the roadside. By 2024, this delivers compliance with NO_2 limit values across Greater Manchester;
- improved human health and associated benefits to quality of life, productivity and savings in health and social care costs. These cannot currently be quantified but could be expected to be substantial;
- reduced PM emissions and associated concentrations, delivering further health benefits. The air quality benefits are quantified in the Economic Case; and
- the GM CAP brings positive distributional impacts to residents of disadvantaged areas and may help reduce health inequalities.

1.9.9 The GM CAP brings wider benefits beyond those to air quality and health. These include the following benefits, all further described and quantified in the Economic Case:

- reduced Greenhouse Gas Emissions, quantified in the Economic Case;
- a more physically active population, driven by mode shift from LGVs and also by investment in a sustainable journeys programme;
- slightly faster journeys across the road network, from small scale but widespread reductions in traffic; and
- a newer vehicle fleet of private and public vehicles, including greater uptake of the cleanest vehicles.

Risks and Uncertainty

1.9.10 A comprehensive risk register has been developed, and is described in the Management Case. Key risks include:

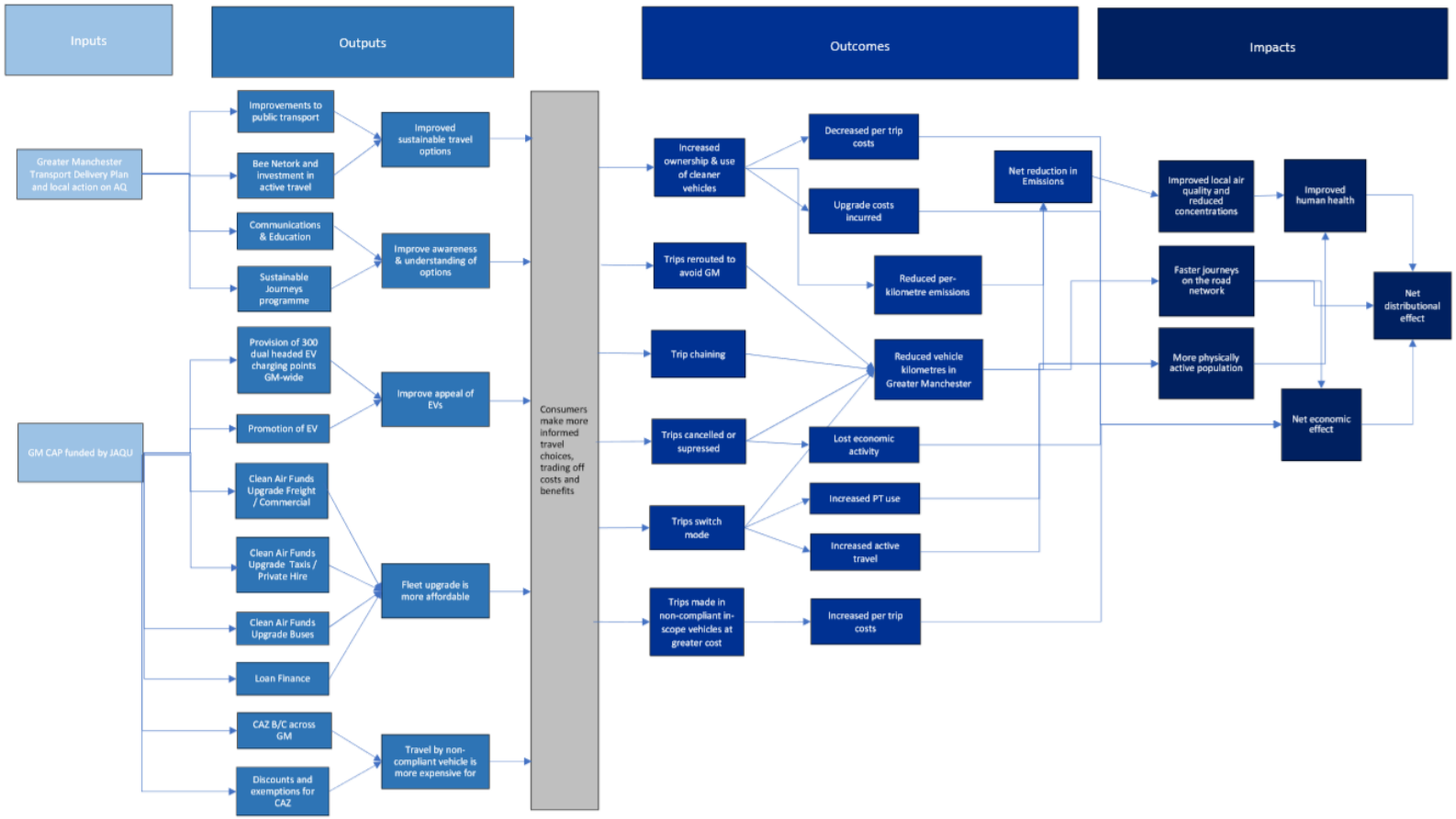
- uncertainty around costs and the ability to obtain necessary funds;
- that ten districts with differing constitutional arrangements need to approve each stage of the process;
- the risk of delay to the process, particularly given the need to carry out many complex activities in parallel; and
- that assumed behavioural responses do not materialise or do not prove possible, for example, if market capacity for retrofit or the provision of compliant vehicles proves inadequate.

1.9.11 The recommendations presented in this OBC are based on modelling that has been developed in line with Government guidance, using the best available data and underpinned by a series of assumptions and trends. This is consistent with the approach for development of OBC options used by other LAs directed to take actions (e.g. Leeds, Birmingham).

1.9.12 Nevertheless, much further work is required to test and develop these assumptions for the FBC, including work to ensure that the support measures are likely to be effective. This will include direct engagement with impacted groups.

1.9.13 The current set of working assumptions may be optimistic on some issues (such as the scale of bus and taxi compliance), and refinements could impact roads differentially. The current modelling is considered appropriate for evidencing decisions at OBC stage, but updates may alter the effective dates of compliance between districts.

Figure 1- 19: Logic map for GM CAP



Appendices

A1. Option Appraisal Report

A2. Air Quality Maps

Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Project and Work Package Summary Sheets

Draft for Approval

Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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Bus Capacity

Classification: Business as Usual (BAU) / **Cost:** Not an implementation funding ask

6. Project and Work Package Summary Sheets

6.1 Bus Capacity

Liaison with Bus Operators to agree routes with expected increase in demand for Bus Operators to plan increases to commercial services.
Category
The Bus Capacity measure will: • Help people and businesses to switch to a cleaner mode of transport • Reduce transport costs for people
Rationale
There is the potential for increases in use of public transport following the introduction of a Clean Air Zone. Transport for Greater Manchester will commit to provide analysis to operators to enable network planning to be done in a timely fashion.

Cost	**Top Risks**	**Procurement Route**
Not an implementation funding ask	1) Operators unable to meet capacity with compliant buses.	N/A

Process/Eligibility
N/A

Group Impacted	**Distributional Analysis**
Bus Operators, Bus Users	Greatest benefit will be in areas where there is a historically older fleet profile.

Component	**Engagement**
Component Description	This is a liaison exercise, and it will be important that operators are aware of all details in a timely fashion to allow network planning.

Phase Component	**Design Phase**	**Implementation Phase**	**Operation Phase**	**Decommissioning Phase**
Bus Capacity	TfGM	Bus Operators	Bus Operators	N/A

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Bus Capacity

Classification: Business as Usual (BAU) / **Cost:** Not an implementation funding ask

Dependencies
Internal Dependencies: Success of Clean Bus Fund and retrofitting of buses; Proposed CAZ scheme; Local Authority and Greater Manchester Family Fleet Upgrades; Sustainable Journeys uptake **Intra Dependencies:** Bus Reform; Congestion Deal; Made to Move - shift to cycling and walking; New Bus Interchanges in Greater Manchester **External Dependencies:** Bus operator capability and response to GM CAP scheme
Stakeholder Engagement
We have met bus operators through OneBus (GM operator meetings) and during evening briefing sessions. We have also contacted them in order to ascertain fleet data in order to refine policy.

Benefits Register	
Benefits Evaluation Process	Not a Funding Ask
Description	As above
Service Feature	As description
Costs	None within bid
Activities Required to Secure Benefit	As component description
Responsible Officer	Head of Bus
Performance Measure	N/A
Target Improvement	N/A
Timescale	N/A

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Vehicle Renewal Scheme - Clean Bus Fund
Classification: Project / **Cost:** £30m

6.2 Vehicle Renewal Scheme - Clean Bus Fund

The Clean Bus Fund is part of the Vehicle Renewal Scheme which would offer subsidies to retrofit the majority of existing Euro IV and V buses with flexibility for the move to an EV bus network, including financial assistance towards charging infrastructure, prioritised on Air Quality benefits and commercial contribution. The Fund, which would be managed and administered by the Operational Body would require Greater Manchester bus operators to submit applications to access funding that will provide the necessary financial support to upgrade their own fleet to be compliant. Within the application, operators would be expected to demonstrate the mechanisms that will be deployed to upgrade their fleet, associated timescales of delivery and continuity of service provision. In addition, coaches would be eligible under the Clean Freight Fund.

Category

The Clean Bus Fund would:

- Enable Greater Manchester to implement local plans that collectively impact on fewer people
- Help people and businesses to switch to a cleaner mode of transport

Rationale

Buses emit 2% of the NO_x emissions in Greater Manchester (9% on bus routes), within the 2021 Do Minimum.

Following implementation of a Clean Bus Fund, there is a prediction of 5% reduction of NOx across Greater Manchester. The number of modelled point exceedances is reduced from 250 to approximately 160.

Buses are an essential component of the public transport offer, and in many parts of the region are the only public transport available. It is vital that action to clean up the bus fleet does not have the unintended consequences of reducing the number or frequency of bus services in the region or add costs to the service to the extent that it forces a shift to more car usage.

At present, around 2,000 of the approximately 2,200 buses operating in Greater Manchester do not comply with the emissions standards set by the proposed Clean Air Zone (CAZ).

The retrofitting of buses is a relatively inexpensive way to deliver compliance quickly, however, it does not fit with the Greater Manchester longer term strategy or ambition to have a zero emission bus fleet. Investing more in a cleaner bus fleet would both reduce emissions and improve the appeal of bus travel in Greater Manchester, facilitating a mode shift and resulting reduction in emissions.

A Clean Bus Fund is proposed in response to the imperative to act quickly to clean up the bus fleet, and to do so without damaging service provision. Buses that are not eligible for retrofit would require the market to identify the solution.

Effective behavioural change will result from both charge base and locally delivered Vehicle Renewal and Loan Finance Schemes (See Section 1.7 of the Strategic Case). The Clean Bus Fund will assist the introduction of the proposed CAZ for buses by 2021. Without funding for retrofit and upgrade of buses, it would not be possible to implement a potential GM-wide CAZ for buses in 2021 as the age and turnover of the existing fleet means that a high proportion of buses would be non-compliant and the risk of a substantial reduction in bus services would be high. Bus services in Greater Manchester are commercially operated and operators are able to reduce services provided if they are not profitable. Consequently, the Clean Bus Fund is an integral part of the package required to deliver compliance in the shortest possible time.

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Vehicle Renewal Scheme - Clean Bus Fund

Classification: Project / **Cost:** £30m

Cost	Top Risks	Procurement Route
£30m including Optimism Bias and contingency. Costs estimated on the basis of TfGM database of fleet size and composition. Costs of retrofitting a single bus is estimated to be £20,000 including a level of contingency.	1) Eligibility of buses to be retrofitted due to vehicle age 2) Market capacity for bus retrofitting services impacting timescales and compliance 3) Cross boundary services from neighbouring authorities not under legal direction could be impacted	There are commercial organisations providing Selective Catalyst Reduction (SCR) retrofit services that could be expected to up-scale to meet the proposed scheme requirements, however, this will need forward planning and training of operatives and companies are likely to require confirmation of the scale of works to be undertaken before being willing to make the financial commitment to staff training / recruitment and the required engineering equipment needed.

Process/Eligibility

The following key points should be noted in terms of applying for the subsidy:

1) The existing Euro I, Euro II and Euro III fleet of buses are not eligible
2) Only vehicles operating within Greater Manchester are eligible, including cross-boundary services

The Clean Bus Fund will build upon the Clean Bus Technology Fund principles, for example buses must be deployed within Greater Manchester, and evidence will be needed around how retrofitted buses will be deployed and maintained in the region.

Group Impacted	Distributional Analysis
It is anticipated that the following groups will be directly impacted by the introduction of a Clean Bus Fund: • Bus Operators who are operating non-compliant buses (with engines lower than Euro 6 diesel specification) across the whole of Greater Manchester. • TfGM, specifically in relation to the routes that the organisation is responsible for subsidising the services	Low income households on average spend a greater share of their budget on transport, so are likely to be more sensitive to changes in public transport cost/availability. Where bus operators do not apply for funding assistance or meet CAZ deadlines, there is a risk that increased costs are passed down to users, resulting in negative impacts on low income households. This also applies to disabled residents who are more dependent on affordable and accessible transport. SMEs who work as bus operators may be able to benefit from the fund. Smaller operators on rural routes could be negatively impacted, where any increase in cost could affect the viability of maintaining a service on those routes. The BAME community make the highest percentage of trips by local bus compared to all other ethnic groups suggesting potential for disproportionate impacts on this group (DfT, 2017). There is potential for the impacts on public transport operators to be greater in Option 5 as more restrictions on car use will increase demand for public transport, increasing company revenues.

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Vehicle Renewal Scheme - Clean Bus Fund

Classification: Project / **Cost:** £30m

Component	Policy Design	Consultation	Customer	Technology
Component Description	Confirm rationale of retrofit / renewal Identify supplier Confirm policy for compliance	Potential consultation elements for the fund depending on the outcomes from the Policy Design component.	Customer facing elements of the fund including items such as managing applications, awards and validation (if required) managing queries and complaints. The development of the Customer component during the Design phase will be essential for establishing the requirements for the Technology component.	The technology elements of the fund including the establishment of the systems to manage the customer elements.

Phase Component	Design	Implementation	Operation	Decommissioning
Policy Design	TfGM	N/A	N/A	N/A
Consultation	TfGM	N/A	N/A	N/A
Customer	TfGM	TfGM	TfGM	TfGM
Technology	TfGM	TfGM	TfGM	TfGM

Dependencies

Internal Dependencies:

- Direction/output from Data, Evidence and Modelling workstream to identify the required shift in fleet composition to achieve compliance
- Outputs from Bus capacity measures
- Policy developed by Policy & Governance workstream and CAZ project
- Associated cost dictated by the Finance workstream.

Intra Dependencies:

- Increases to Public Transport Capacity
- Bus Reform Project

External Dependencies:

- Funding from JAQU
- Public feedback during FBC and consultations
- Feedback from Bus community on proposed Clean Bus Fund
- Market capacity to undertake retrofits

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Vehicle Renewal Scheme - Clean Bus Fund

Classification: Project / **Cost:** £30m

Stakeholder Engagement	
TfGM and the GM CAP Project Team have met bus operators through OneBus (GM Bus Trade Operating Body) and during evening briefing sessions. We have also contacted them in order to ascertain fleet data.	
Benefits Register	
Benefits Evaluation Process	Achievement of the Euro VI standard – evidence suggests that Selective Catalytic Reduction devices can reduce NOx emissions by 88% on older vehicles which suggests that a Euro IV vehicle's NOx emissions could be reduced to the Euro VI requirement, but Euro III vehicles would be reduced to 0.6g/kWh which would be close to, but not within, the required limit.
Description	As above
Service Feature	Reduction in NOx from buses on Greater Manchester roads
Costs	As above
Activities Required to Secure Benefit	As per component description
Responsible Officer	Head of Bus (TfGM)
Performance Measure	% of compliant buses
Target Improvement	100% fully compliant
Timescale	As above

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Sustainable Journeys
Classification: Work Package / **Cost:** £9m

6.3 Sustainable Journeys

Sustainable Journeys is a package of engagement and education measures and incentives targeted using behavioural insights techniques and data to a range of different audiences designed to influence and enable a shift to more sustainable transport options. It adds value to the overall Clean Air Plan package by providing practical and targeted assistance to facilitate behaviour change, filling the gap between the wider communications activities and infrastructure / regulatory measures in order to lower emissions.

Category

The Sustainable Journeys would

- Help people and businesses to switch to a cleaner mode of transport

Rationale

Crucial to the success of the GM CAP will be ongoing communications activity to help the residents and businesses of Greater Manchester understand the nature of the air quality challenge and what action they can take to reduce emissions. Evidence suggests that awareness of air quality issues is growing, but people are still confused as to what poor air quality means, where pollution comes from and what solutions would be effective.

Initial research, including focus groups, was carried out in summer/autumn 2018 around perceptions of air pollution in Greater Manchester. This demonstrated that there was a fundamental lack of understanding of the causes and awareness of air quality issues.

The outputs from this research highlighted the need to raise awareness and understanding of air pollution as a health issue through public campaign activities. An initial phase of activity was delivered during autumn 2018, “lets clear the air” campaign.

NICE guidance on outdoor air quality and health (NG70) recommends taking a number of actions in combination, because multiple interventions, each producing a small benefit, are likely to act cumulatively to produce significant change. Addressing fleets, driver training, increasing walking and cycling, and awareness raising are recommended by the guidance, and are all included in our package. The Sustainable Journeys element concentrates on the individual and community approaches to behaviour change, complementing the packages other elements of infrastructure, restrictions and general marketing. The guidance specifically suggests giving businesses information on how they can reduce road-traffic-related air pollution and improve fuel efficiency.

The Sustainable Journeys package is a support programme of targeted, effective education, promotional, influencing and enabling measures and incentives to help people and businesses understand how they will be affected by air quality and the GMCAP and how best they can adapt in order to reduce their NOx emissions.

Key stakeholders have been identified who either are responsible for exceedances of air quality thresholds and cost-effective to target with intensive behaviour change measures, or who are affected by poor air quality. These include:

- Major fleet operators, within and outside Greater Manchester
- Smaller fleet / SME vehicles within Greater Manchester
- Major receivers of deliveries in Greater Manchester, e.g. warehousing, hospitals
- Larger trip generators, e.g. retailers, universities / education, hospitals
- Major employers (over 500 employees), or located in city and town centres and industrial parks, e.g. Trafford Park. Includes those coming from High Peak and Cheshire
- Commuters to city and town centres, airport and industrial parks
- School pupils / parents / teachers to schools adjacent to exceedance areas
- Residents in areas of high trip generation or poor air quality such as town and city centres

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Sustainable Journeys

Classification: Work Package / **Cost:** £9m

Sustainable Journeys have experience of applying the key measures successfully, but the Clean Air funding is necessary both to develop and include specific air quality content and focus, and to increase the scale of activities to a level we consider is necessary in order to make the necessary level of impact on air quality at areas of exceedance achieve compliance. Key measures include:

- Personal Travel Planning (PTP) is a demonstrably effective techniques for residents and employees to encourage sustainable travel choices and vehicle purchasing decisions. This will be targeted at residents and businesses in air quality hotspots, and include bespoke information and incentives relating to their particular journeys and preferences.. This is a technique that TfGM has been using successfully for five years, but increased funding would be required to increase the numbers of people receiving advice, and to incorporate air quality specific content.
  - Between March 2014 and October 2018, the PTP programme delivered over 21,000 personal travel plans to employees, students, residents, apprentices and jobseekers. The phases of the programme consistently achieved mode shift from single occupancy car use towards more sustainable modes, and that shift ranged between 2% to 14% of participants dependent upon the phase.
  - Residential PTP, which was delivered extensively between 2014 and 2016 engaged almost 20,000 residents, delivered a mode shift from single car occupancy to more sustainable modes of between 2% and 11% of trips (depending on the phase), and PTP was a significant factor in these changes in 50%-90% of cases.
- Through the Business Travel Advice service, expert advice, toolkits and incentives will be made available for workplaces to offer travel planning interventions to encourage and enable sustainable travel choices, inform vehicle purchasing decisions, purchasing, consolidation and freight practices. This will include grants to help businesses improve their sustainable travel offer, for example by providing cycle parking. Evaluation of the LSTF project demonstrated that TfGM's Travel Choices business travel behaviour change programme achieved the following outcomes at surveyed businesses:
  - a 24% reduction in staff who drive to work alone for five days a week or more (from 46% to 35% of commuters);
  - 8% of employees changed from driving to a more sustainable mode;
  - the number of employees who never drive to work alone increased by 75%, from 24% of employees to 42%;
  - Our recently appointed AQ Delivery Officer (funded for 12 months through Early Measures Bid) has recently executed an inaugural Experience Electric Event' at Salford University's MediaCityUK campus with over 80 people attending from 37 organisations from across the public and private sectors, 76 driving an electric vehicle and 10 organisations interested in signing up to an Energy Savings Trust fleet review;
  - Increased funding for this activity would enable an increased level of support, including specific reference to the air quality problem, to be targeted at more businesses in, or contributing to, areas of poor air quality.
- Travel planning, events, classroom activities including mapping, challenges, air quality monitoring and other engagement activities will also be targeted at schools and families in areas of poor air quality and with high car use on the journey to school, to help increase awareness of air quality impacts, increase the use of sustainable travel (particularly walking and cycling) for students, parents and staff on their journeys to and from school, and reduce exposure for children. These types of techniques have been proven to be effective, for example TfGM's Road Safety Partnership and Living Streets 20117/18 WOW achieved a 30% increase in Modal Shift 30% and 56% decrease in car journeys. Funding would be essential to introduce a much wider programme of engagement twenty times more extensive than currently.

As suggested by the NICE guidance, the programme will be closely allied to other measures in the Clean Air Plan and other programmes (particularly the Made to Move cycling and walking infrastructure programme and Schools Street closures) in order to get the best value from

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Sustainable Journeys

Classification: Work Package / **Cost:** £9m

synergies between measures. For example, early impacts of the Edinburgh schools Schools Streets pilot (closing streets to traffic at pick up / drop off or more permanently) demonstrated;

- daily vehicle volumes on school streets reduced by an average of 454,
- An average reduction of 74.5g/km in NO_x emissions across 21 monitoring sites on School Streets.
- Students getting to school by car reduced by an average of 6%
- Students walking to school increased by 3%, and
- 'park and stride' students also increased by 3%

Cost (including OB/Contingency)	Top Risks	Procurement Route
£9m over 10 years	1) Sustainable Journeys offerings does not receive the desired uptake following targeted communications campaign.	It is intended that this project/work package is managed by TfGM providing services in respect of business engagement, school and education engagement and community engagement, all to support communicating the message of sustainable journeys. Potential procurement route through GM Charities.

Group Impacted	Distributional Analysis
The following target groups have been identified as having significant impact on air quality, affected by the CAZ, and able to be cost-effectively engaged by Sustainable Journeys behavioural change techniques: • Major fleet operators, within and outside Greater Manchester • Smaller fleet / SME vehicles within Greater Manchester • Major receivers of deliveries in Greater Manchester, e.g. warehousing, hospitals • Town and city centre receivers of deliveries, e.g. retailers, universities / education, hospitals • Major employers, esp. those over 500 employees, or located in city and town centres, airport, Trafford Park. Includes those coming from High Peak and Cheshire • Commuters to city and town centres, airport, Trafford Park • School pupils / parents / teachers to schools adjacent to exceedance areas • Students in Manchester City Centre and other town centres • Visitors to Manchester City Centre	This measure could result in reduced costs to low income households if positive engagement results in increased uptake of sustainable transport modes which are cheaper than current transport methods. For SMEs and LGV operators, there is potential for increased affordability if the engagement strategy results in the consolidation of freight practices and smarter green vehicle purchasing decisions which ultimately reduce costs for the company. The impact is likely to be greater in phase 2 when LGV operators are required to comply to CAZ standards. There is unlikely to be any benefit for disabled people without targeted engagement to help with bespoke personal travel planning which meets the needs of the individual.

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Classification: Work Package / **Cost:** £9m

Component Description	**Business Engagement (including public and third sector)**
	Targeted behaviour change interventions to encourage active and sustainable travel choices for commuters, business trips and deliveries. These include bespoke sustainable travel action plans to tackle a business's unique travel problems influencing green vehicle purchasing decisions, purchasing, consolidation and freight practices enabling modal shift to cleaner modes, or retiming in order to reduce congestion responsible for higher pollutant concentrations. Initiatives are developed and delivered using behavioural insight techniques to maximise effectiveness, and include Personal Travel Planning with bespoke messaging and incentives, sustainable travel grants for businesses, signposting to fleet reviews and driver training, car sharing, increasing access to bikes and other supporting walking and cycling interventions and flexible working. Uptake of the measures will be maximised through the use of targeted incentives such as discounted/subsidised ticketing for employees, and the popular TfGM business travel accreditation scheme,
	School and Education Engagement
	Behaviour change interventions, tailored to the needs of pupils, their families/guardians and staff, to help reduce exposure for children, and increase active and sustainable travel modes and reducing car use. Interventions will include: • Lessons with groups of up to 30 KS2 children covering air quality impact, mitigation, and promotion of shift to cleaner modes, particularly walking and cycling, production of clean air maps and • Campaigns to raise awareness particularly of parents and carers • Air pollution action plans in each school • Travel champions • Promotion and incentives to encourage pupils to walk and cycle to school rather than being driven • Parents focus groups • Sustainable travel grants for supporting measures such as cycle parking Similar behaviour change interventions such as the Living Street WOW (promoting walking at primary schools) have delivered modal shift (see evidence in Rationale section above). These behaviour change measures will be complemented by activities in other programmes in order to maximise impact, including the Bee-Network, filtered neighbourhoods, 'Schools Streets' closures, school bus provision and Modeshift Stars (which includes monitoring and accreditation elements).
	Community Engagement
	Targeted behaviour change interventions to encourage sustainable travel choices, and influence greener vehicle purchasing decisions, targeted at residents in air quality hotspots who are most likely to be receptive (using ACORN profiling and 'sales-funnel' market analysis techniques). Initiatives including targeted advice and incentives through residents personal travel planning and working with community groups to promote low-emission modes and community led 'Open Streets' programmes where residents can close their streets to realise the benefits of cleaner air and a safer environment for walking and cycling. This will also be linked to the Made to Move infrastructure programme, particularly the introduction of 'filtered neighbourhoods' where vehicular traffic is restricted.

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Classification: Work Package / **Cost:** £9m

Phase Component	Design	Implementation	Operation	Decommissioning
Business Engagement (public and 3rd sector)	TfGM	TfGM	TfGM	N/A
School and Education Engagement	TfGM	TfGM	TfGM	N/A
Community Engagement	TfGM	TfGM	TfGM	N/A

Dependencies
Internal Dependencies: Clean Air Plan communications, stakeholder engagement and consultations **Intra Dependencies:** • Electric Vehicles promotion and charging infrastructure Early Measures project • Public health and awareness campaigns associated with Air Quality • Congestion Deal • Made to Move - output from Greater Manchester-wide walking and cycling infrastructure proposal (Bee Network) to influence modal shift to cycling and walking **External Dependencies:** Funding from JAQU to provide cycling and walking infrastructure
Stakeholder Engagement
Ongoing engagement as part of Sustainable Journeys work.

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Sustainable Journeys

Classification: Work Package / **Cost:** £9m

Benefits Register	
Benefits Evaluation Process	Not modelled
Description	As above
Service Feature	Increasing use of Sustainable Travel Options
Costs	As above
Activities Required to Secure Benefit	As per component description
Responsible Officer	Head of Sustainable Journeys TfGM
Performance Measure	This is a wide ranging programme so possible indicators include: • Number of Delivery and Servicing Plans developed with businesses • Number of fleet reviews • Changes in vehicle types over time • Changes in mode split of commuters or by EV use/awareness • Changes in flexible/home working in businesses with 500+ staff • Number of Personal Travel Plans • Change of mode and awareness following Personal Travel Plans
Target Improvement	To be developed in FBC
Timescale	As above

Draft for approval

Electric Vehicle Infrastructure and Promotion
Classification: Project / **Cost:** £25m from implementation fund and £11m Operating costs.

6.4 Electric Vehicle Infrastructure and Promotion

Electric Vehicle (EV) Infrastructure and Promotion proposes to deliver 300 additional Rapid Charging Points (Dual Headed) across Greater Manchester, including a proportion ring-fenced for taxi and private hire vehicles (PHVs) only.

In addition to the charging points, TfGM would deliver a targeted marketing and engagement campaign with Greater Manchester businesses and residents that will showcase the benefits of EVs, highlight the support that is available and provide an opportunity for EVs to be compared across a range of suppliers**.**

Category

The Electric Vehicle Infrastructure and Promotion would:

- Help people and businesses to switch to a cleaner mode of transport

Rationale

At present many potential purchasers of EVs are discouraged by concerns about the practicality of charging an EV, amongst other factors. Therefore, investing in the required infrastructure is critical in increasing the numbers of EV within Greater Manchester and reducing the 'range anxiety'.

The EV Infrastructure and Promotion initiative proposes 300 additional rapid charging points (dual headed) across the ten Local Authorities of Greater Manchester, including some for taxis/PHVs only.

Modelling projections conducted for the GM CAP shows that with the additional infrastructure and supporting measures being implemented would lead to approximately 68,000 EVs (passengers) and 7000 E-LGV to be registered in Greater Manchester by 2021. On the basis of the number charge points assumed below this gives a ratio of 71 EVs per each publicly available charge point.

The supporting communications programme will deliver events such as experience days that will showcase the benefits of electric vehicles and highlight the support available. They will allow people to compare EVs from a range of suppliers, and 'try before you buy'.

Cost	Top Risks	Procurement Route
£25m from Implementation Fund and £11m Operating costs, including OB/contingency, nominal prices, total 2021-28 • Purchase, installation, connectivity to the grid of the Electric Vehicle Rapid chargers • TROs and projects costs to manage the implementation • Communication and marketing campaigns • Annual operational costs of c.£1m per annum to cover the maintenance and repairs of the infrastructure as well as staff costs to operate.	1) EV uptake is lower than predicted 2) Sites identified don't get desired uptake or use 3) Capacity of electricity network to support proposed scheme	Design implementation and operation to follow the same contractual route as the EV early measures project, which is currently undertaken by TfGM as the GMEV EVCI Project Various promotional activities to be undertaken by a range of third parties. Legal Advisor provider to provide support for the TROs.

Draft for Approval

Electric Vehicle Infrastructure and Promotion

Classification: Project / **Cost:** £25m from implementation fund and £11m Operating costs.

Group Impacted	Distributional Analysis
• Car and taxi/private hire • LGV users • Commuters	Low income households are less likely to be able to afford EVs and experience the direct benefit of this measure in the absence of further support measures. There could be an increased negative impact on low income households in option 5 due to the likelihood that use of EVs for personal use will be too expensive for this group. For SMEs, there is potential for positive affordability impacts if the cost of upgrading vehicles to meet CAZ standards is higher than the cost of EVs (including running/maintenance), further encouraging the transition to this mode.

Component	Policy Design
Component Description	Roll out of a further 300 charging units to follow on from Early Measures project that aims to deliver 48 charging points. Infrastructure and deployment strategy will have already been developed as part of Early Measures project.
Component	**EV Infrastructure**
Component Description	Delivery of 300 additional Rapid Charging Units (dual headed) across Greater Manchester. The TfGM Early Measures project is identifying a range of sites and further feasibility / design work would be conducted as part of the CAP to identify and prioritise sites for delivery. The deployment of chargers would be split across all 10 of the Authorities of Greater Manchester to create a comprehensive network. This would be approximately 27 dual chargers in each Authority with an additional 27 dual chargers in the regional centre to account for use by taxis and increased travel demand. Within each borough, the chargers would be delivered in a number of clusters/hubs rather than being isolated on their own. Clusters of chargers will mean that EV users are more likely to find a vacant charger rather than have to wait or drive to find another charging point. Although the GM CAP investment in EV charging infrastructure would be a significant contribution to the required number of charge points, further investment would be required which could potentially be provided as part of the GMEV procurement exercise which is enabling commercial investment in the network. This is in addition to the OLEV taxi fund that was secured on 5th Feb 2019. Number of charge points assumed: • GM CAP proposes 300 dual headed (600) • Early measures 48 • Existing GMEV 400 • Commercial points 400 • Total charge points 1448 • Number of EVs per charge point 71

Electric Vehicle Infrastructure and Promotion

Classification: Project / **Cost:** £25m from implementation fund and £11m Operating costs.

Component	**Marketing Engagement and Experience Days**
Component Description	Marketing, engagement with businesses/residents and experience events to showcase the benefits of electric vehicles, highlight the support available and allow people to compare EVs from a range of suppliers.

Phase Component	**Policy Design**	**EV Infrastructure**	**Traffic Regulation Order**	**Consultation**	**Experience Days**
Design Phase	TfGM	TfGM	Legal Service Provider	TfGM	TfGM
Implementation	N/A	GM EV Charging Infrastructure Operator	Legal Service Provider	N/A	TfGM
Operation	N/A	GM EV Charging Infrastructure Operator	Highway Authority	N/A	TfGM
Decommissioning	N/A	GM EV Charging Infrastructure Operator	Highway Authority	N/A	TfGM

Phase Component	**Design Phase**	**Implementation Phase**	**Operation Phase**	**Decommissioning**
Policy Design	TfGM	N/A	N/A	N/A
EV Infrastructure	TfGM	Greater Manchester Electric Vehicle Electric Charging infrastructure (GMEV ECI) Operator	Greater Manchester Electric Vehicle Electric Charging infrastructure (GMEV ECI) Operator	Greater Manchester Electric Vehicle Electric Charging infrastructure (GMEV ECI) Operator
Traffic Regulation Order	Legal Service Provider	Legal Service Provider	Highway Authority	Highway Authority
Consultation	TfGM	N/A	N/A	N/A
Experience Days	TfGM	TfGM	TfGM	TfGM

Draft for approval

Electric Vehicle Infrastructure and Promotion

Classification: Project / **Cost:** £25m from implementation fund and £11m Operating costs.

Dependencies
Internal Dependencies: • Early Measures project - output from EV charging points site identification exercise **Intra Dependencies:** • Early Measures project - output from public perception and Monitored and Evaluated uptake of EV • Campaign alignment with other GMCA and LA initiatives **External Dependencies:** • National EV Policy and incentives Public perception of EVs, accessibility for charging and reliability of vehicle • District Network Operator (DNO) approval and availability in network to power units

Benefits Register	
Benefits Evaluation Process	Modelling Results
Description	As above
Service Feature	Increasing use of EVs
Costs	As above
Activities Required to Secure Benefit	As component description
Responsible Officer	Advanced Solutions Manager TfGM
Performance Measure	Additional EVs
Target Improvement	75k EV registered vehicles in Greater Manchester
Timescale	2021

Draft for approval

6.5 Parking Standards & Local Authority Parking

Parking Standards and Local Authority Parking encompasses two key processes that can enable a mode shift to more sustainable transport options.

A parking standards review that incorporates new developments, with the aim of replacing minimum with maximums standards in high density, accessible locations. For example:

- A review of planning conditions to prevent disused land becoming parking sites in specific areas
- Conversion of long stay to short stay parking
- Enforcing conditions for existing licensed parking to reduce low cost parking offer
- Provide additional/priority parking
- Provide additional/priority parking for EVs in Local Authority public car parks and on controlled parking zones

In terms of Local Authority staff parking a review is to be undertaken on the provision of staff car parking and usage. The effort of Local Authorities is assumed to be a significant promoting force for the public.

Category
The Parking Standard and LA Parking would enable the Local Authorities to implement local plans that collectively impact on fewer people.
Rationale
These are measuring that Local Authorities can choose to undertake demonstrating their leadership and commitment to Clean Air objectives.

Cost	**Top Risks**	**Procurement Route**
Not an implementation funding ask, though there will be a requirement of LAs to invest time and resource	1) Proposed parking standards are not accepted and implemented	N/A – utilise existing Local Authority processes

Group Impacted	**Distributional Analysis**
• Car drivers • Commuters • Visitors to Regional Centre • Businesses • Local Authority Workforce	Low income groups would be affected the most. An exception for disability parking must be included to prevent social exclusion.

Component	**Design Phase**	**Implementation**	**Operation Phase**	**Decommissioning Phase**
Policy Design	Local Authorities	Local Authorities	Local Authorities	Local Authorities
Parking Infrastructure	Local Authorities	Local Authorities	Local Authorities	Local Authorities

Draft for Approval

Parking Standards & Local Authority Parking

Classification: Business as Usual (BAU) / **Cost:** Not an implementation funding ask

Dependencies	
Internal dependencies: Contributing to the GM CAP and associated measures to achieve compliance **Intra Dependencies:** Current private and public parking arrangements; planning conditions and approvals **External Dependencies:** Impact of challenge from private developers	
Benefits Register	
Benefits Evaluation Process	To be developed in FBC
Description	As above
Service Feature	N/A
Costs	As above
Activities Required to Secure Benefit	As component description
Responsible Officer	Local Authority Specific
Performance Measure	N/A
Target Improvement	N/A
Timescale	N/A

Draft for approval

Local Authority & Greater Manchester Fleet Upgrade
Classification: Work Package / **Cost:** £27m

6.6 Local Authority & Greater Manchester Fleet Upgrade

The Local Authority Fleet Upgrade would upgrade the Local Authority and Greater Manchester family fleets to the lowest emitting vehicles. This will include all Local Authority operated cars/vans, refuse collection vehicles, HGVs, contracted services and the TfGM provided bus fleet.

Category

The Local Authority and Greater Manchester Fleet Upgrade would

- Enable the local authority to implement local plans that collectively impact on fewer people

Rationale

This measure is for GM Local Authorities only and based on their forecast investment from 2020 onwards to enable them to have compliant fleet by 2021 (TfGM fleet will be covered by the Clean Bus Fund measure).

It is important that the Local Authorities demonstrate a positive example and take a leading position with regards to their own fleet and ensure that where technically possible it is fully compliant.

Approximate 0.5% reduction in 2021 mass NO_x emissions in tonnes within the county relative to the do-minimum.

Across the 26 crucial links (exceedances) identified and modelled, the same model run resulted in a range of reductions between 0% and 1.6%

Cost	Top Risks	Procurement Route
£27m including OB/contingency, nominal prices, total 2021-28	1) Local Authority/Greater Manchester operational fleets compliancy 2) EV uptake is lower than demand analysis 3) Fleet compliance with Clean Vehicle Retrofit Accreditation Scheme (CVRAS)	Procurement led by Local Authorities with coordination by TfGM

Process/Eligibility

Local Authority vehicles that are not compliant in 2021 would be eligible.

Each Local Authority has a different contractual/commercial arrangement so detail on precise arrangements need to be developed within FBC.

Need to confirm approach with blue light services.

Group Impacted	Distributional Analysis
• Local Authorities • TfGM • Potentially blue light vehicles	Disabled people are more likely to be reliant on community transport services (e.g. local link). There could be positive effects if this measure supports the ongoing delivery of Council-based services, meaning that this group do not need to pay for alternatives. Similarly, low income households are more reliant on public transport services. There will be positive effects if this measure supports the ongoing delivery of council run public transport services (buses etc.), without increased costs to the user.

Draft for approval

Local Authority & Greater Manchester Fleet Upgrade

Classification: Work Package / **Cost:** £27m

Phase Component	Design Phase	Implementation Phase	Operation Phase	Decommissioning Phase
Fleet Changes	Local / GM Authority	Local / GM Authority	Local / GM Authority	N/A

Dependencies
Internal Dependencies: Electric Vehicle Infrastructure and Promotion project: Clean Car Fund project; Sustainable Journeys Project **Intra Dependencies:** Early Measures Project- promotion and uptake of EVs and successful infrastructure **External Dependencies:** Funding provided by JAQU; Local Authorities/Greater Manchester Family to lead by example in their fleet.

Benefits Register	
Benefits Evaluation Process	Modelling Results
Description	Upgrade of Local Authority and Greater Manchester family fleets to lowest emission possible, including all Local Authority operated cars/vans, refuse collection vehicles, HGVs, contracted services and the TfGM operated bus fleet.
Service Feature	Change in fleet of Local Authorities and Greater Manchester family
Costs	None within bid
Activities Required to Secure Benefit	As component description
Responsible Officer	District Officer Specific
Performance Measure	% of Local Authority / Greater Manchester Family fleet compliant
Target Improvement	All Local Authority / Greater Manchester Family fleet compliant
Timescale	2021

Draft for approval

Vehicle Renewal Scheme - Clean Freight Fund
Classification: Project / **Cost:** £59m

6.7 Vehicle Renewal Scheme - Clean Freight Fund

The establishment of a **Clean Freight Fund**, as part of the Vehicle Renewal Scheme, would offer local small, micro businesses, sole traders and the voluntary sector, registered in Greater Manchester, with a discount on the purchase of a compliant commercial vehicle from an approved supplier when scrapping a non-compliant vehicle or retrofitting to make compliant. Priority for funding will be based primarily on air quality impact such that the most polluting vehicles can be targeted.

Vans, minibuses, HGV, coaches would be in scope for this fund.

Category

The Clean Freight Fund would

- Help people and businesses to switch to a cleaner mode of transport

Rationale

LGV's account for 33% of the GM NO_x emissions in Greater Manchester (transport related) and HGV's 17%.

The goal of the Greater Manchester Clean Air Plan is to clean up the vehicle fleet travelling around Greater Manchester to reduce emissions from traffic. A Clean Air Zone category affecting buses, taxis, heavy and light goods vehicles across the region will provide a financial incentive to the owners of commercial vehicles to invest in cleaner vehicles. Greater Manchester believes that this process can be made more effective in terms of reducing emissions and fairer in terms of minimising socio-economic damage if it is supported by schemes offering financial support to businesses and self-employed workers based in Greater Manchester to help them upgrade their vehicles.

There are 11,000 non-compliant HGVs and 77,000 non-compliant LGVs in Greater Manchester.

Vehicle renewal schemes such as those proposed here offer a range of benefits:

- They bring forward emissions reductions prior to the introduction of CAZs:
- They ready the fleet for a CAZ, reducing the risk of unintended consequences and allowing earlier implementation:
- They mitigate the risk of damaging socio-economic impacts imposed by CAZ:

The proposed Vehicle Renewal Schemes will be delivered follows:

- **Businesses:** small and micro businesses based in Greater Manchester would have access to a Fund offering them an incentive to scrap or de-license in-scope non-compliant vehicles (a heavy or light goods vehicle, hackney cab or car registered as a private hire vehicle with one of the ten GM Local Authorities) and to replace them with a compliant vehicle, or to retrofit their vehicle to make it compliant.
- **Residents:** self-employed residents of Greater Manchester who own a heavy or light goods vehicle, hackney cab or car registered as a private hire vehicle with one of the ten Greater Manchester Local Authorities would have access to a Fund offering them an incentive to scrap or de-license in-scope non-compliant vehicles and to replace them with a compliant vehicle, or to retrofit their vehicle to make it compliant.

This fund will enable fleet operators switch to a cleaner mode of transport. Effective behavioural change will result from both charge base and locally delivered Vehicle Renewal and Loan Finance Schemes (See Section 1.7 of the Strategic Case).

Draft for approval

Vehicle Renewal Scheme - Clean Freight Fund

Classification: Project / **Cost:** £59m

Cost	Top Risks	Procurement Route
£59m Implementation Fund including optimism bias and inflation	1) Availability and affordability of compliant vehicles 2) Clean Air Funding is not adequately supported by HM Government 3) Fleet mix changes	Database / IT system to register and administer grants. Application process by which vehicle owners can apply for the fund (paper or electronic system). Potential procurement exercise for a Vehicle Renewal Partner (as detailed in the Commercial Case) to support with the administration of the fund. Management of the Fund will potentially form part of the scope of the Operating Body which will be defined at FBC.

Process/Eligibility

For both businesses and residents, the schemes would be subject to a competitive application process, with funds allocated on the basis of a series of criteria, and prioritised in terms of the likely air quality benefit and socio-economic impact. In principle, priority would be given to upgrading the oldest and dirtiest vehicles, that are most likely to travel in areas suffering from poor air quality, and owned by those least able to upgrade them without support.

The Vehicle Renewal Scheme will offer owners of older non-compliant vehicles that are registered within Greater Manchester an affordable incentive to scrap their vehicles. The Fund will be split into three sub groups covering light goods vehicles and minibuses; heavy goods vehicles and coaches; and taxis (hackney carriages and PHVs).

Mechanisms for Obtaining a Compliant LGV Fleet

- The LGV Upgrade Fund would be subject to a competitive application process.
- The Fund would be administered and managed by TfGM.
- The fund would only be available to residents, businesses, charities and other third sector organisations who reside or are registered within Greater Manchester.
- The fund would be available to access up until either:
- - All GM funding allocated as part of the Clean Air Plan is spent; or
- - One year following when NOx compliance will be achieved (in line with the timescales for which the operation of a Clean Air Zone will be funded).
- Eligible non-compliant LGV must be scrapped on awarding of the upgrade fund – a series of approved scrappage companies based in GM will be identified and it will be the responsibility of TfGM officers to work with these companies to verify that the scrappage has taken place.

The fund will be put in place to ensure the process is fair, robust and transparent which would mean registered vehicle owners will have to demonstrate:

- Proof of a specified period of ownership;
- Proof of residence or business location;
- Proof of ownership.

In order to ensure that there is a sufficient incentive of the fund, non-compliant vehicle owners will be able to access a maximum of £4,300 (minimum Euro VI purchase cost).

The Fund will be administered in the following two stages:

1) A minimum price will be guaranteed for the trade in of every non-compliant LGV

2) A contribution value that will vary by Euro standard but will ensure that the £4,300 is available.

Draft for approval

Vehicle Renewal Scheme - Clean Freight Fund

Classification: Project / **Cost:** £59m

It should be noted that LGV owners can utilise the fund to purchase more expensive compliant vehicles.

Mechanisms for Obtaining a Compliant HGV Fleet

Support to the HGV sector to upgrade to a compliant fleet needs to be flexibly delivered and available rapidly.

It should be noted that at present, there are no accredited retro-fit schemes in the UK for HGVs – although the lack of accredited retrofitting schemes may be as a result of a lack of demand in the current market.

Other cities developing Clean Air Plans have assumed a retrofitting scheme for HGVs would come to the market – this assumption has been shared and agreed with JAQU.

Estimated cost of a single HGV Retrofit is £10,000

There is a viable second hand market for compliant HGVs, as the Euro VI standard vehicles came onto the market in 2013.

The criteria principles would include proof of ownership and registration, with SME's prioritised over 1st 12 months. If funding has been prioritised from another city's migration fund this must be declared.

The following factors have been taken into account when estimating the financial support required:

Retrofitting of Existing Non-Compliant HGV – Approximately £15,000

Minimum Cost for Purchasing Euro VI HGV – Approximately £19,000

- Taking into account the above, owners of non-compliant vehicles will be able to bid for a maximum of £16,000 per vehicle.
- Companies are restricted to a total of three applications.

Group Impacted	Distributional Analysis
• Focus is on SME's/self employed individuals who operate freight vehicles	SMEs, which often operate to tight margins, low income sole traders and self-employed residents who own heavy or light good vehicles may struggle to afford to upgrade their vehicle or pay the charge. The clean freight fund can help these groups upgrade their vehicle and avoid the charge resulting in increased affordability in the long term. There is a risk that since the fund is based on a competitive application scheme, businesses that do not qualify for the fund will face increased costs which are unaffordable. For businesses, these costs could be passed on to local businesses or residents, resulting in increased impacts on low income households. For LGV users, costs are likely to fall disproportionately on private individuals rather than companies as private individuals are more likely to own a non-compliant LGV and are also less likely to be able to afford the CAZ charges.

Draft for approval

Vehicle Renewal Scheme - Clean Freight Fund

Classification: Project / **Cost:** £59m

Component	Policy Design	Consultation	Customer	Technology	Estates
Component Description	Policy design of the fund including items such as research, data collection and modelling to support the design and appraisal of the scheme and impacts assessments.	Potential consultation elements for the fund depending on the outcomes from the Policy Design component.	The customer facing elements of the fund including items such as managing applications, awards and validation (if required), managing queries and complaints. The development of the Customer component during the Design Phase will be essential for establishing the requirements for the Technology component.	The technology elements of the fund including the establishment of systems to manage the Customer elements.	The buildings, offices and facilities including the equipment and hardware required for the operation of the fund.

Phase Component	Design Phase	Implementation Phase	Operation Phase	Decommissioning Phase
Policy Design	Lead Advisor	N/A	N/A	N/A
Consultation	TfGM	N/A	N/A	N/A
Customer	TfGM	Delivery Agent	Operating Agent	Operating Agent
Technology	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
Estates	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent

Dependencies

Internal dependencies:

Direction/output from Data, Evidence and Modelling workstream to identify the required shift in fleet composition to achieve compliance; Policy to be developed by Governance & Policy workstream; Associated cost developed by the Finance workstream

Intra Dependencies:

n/a

External Dependencies:

Funding from JAQU; Public feedback during FBC and consultations. Feedback from Freight Community on proposed Clean Freight Fund.

Stakeholder Engagement

Engagement through GM Freight Forum over a number of years. Online questionnaires to gain an understanding on issues such as Gas to Liquid.

Draft for approval

Vehicle Renewal Scheme - Clean Freight Fund

Classification: Project / **Cost:** £59m

Benefits Register	
Benefits Evaluation Process	Modelling work
Description	As above
Service Feature	Fleet Changes on GM roads
Costs	As above
Activities Required to Secure Benefit	As per component description
Responsible Officer	Head of Logistics and Environment
Performance Measure	Use of non-compliant vehicles falls
Target Improvement	To be developed in FBC
Timescale	As above

Draft for approval

Loan Finance
Classification: Project / **Cost:** - To be developed in FBC

6.8 Loan Finance

There is a political will to further assist groups of who may be adversely affected by the implementation of Clean Air Zone (CAZ). Depending upon the variant of CAZ selected this could include:

- Private Hire Vehicle Owners to upgrade to an EV or compliant vehicle
- Hackney Carriage Owners to upgrade to an EV or compliant vehicle
- LGV operators to upgrade to new compliant vehicles from recognised / approved dealers
- HGV Operators to upgrade to new compliant vehicles from recognised / approved dealers

In additional to centrally funded swappage or scrappage schemes which would be funded by JAQU, TfGM are looking at the possibility of defining and providing a supporting measure which would be to provide loans at preferential rates for those who are taking advantage of the Vehicle Renewal Scheme-this could be through a loan for a vehicle or subsidy of a lease plan, this would have to be determined at FBC stage and via consultation with those affected.

- For the purpose of this draft measure it is assumed that Bus operators would be out of scope for any preferential loans as they would be eligible for Bus Renewal scheme.

Category

The Loan Finance would

- Create an opportunity for people/businesses to borrow money at a preferential rate if they own/operate a vehicle that is affected by a CAZ and wish to upgrade the vehicle.
- Help people and businesses to switch to a cleaner vehicle.
- Running costs of vehicles should be reduced through more efficient engines and lower maintenance costs.

Rationale

Access to Capital

- GMCA can borrow money at lower rates through organisations such as PWLB/Treasury than banks accessing capital markets.
- If GMCA chooses to lend/subsidies the capital to people/businesses of Greater Manchester without adding (or keeping to a minimum) a commercial margin to the lending, it becomes a financially attractive proposition to an individual or business.
- GMCA would underwrite the loans and therefore be exposed to risk.
- An Financial Conduct Authority regulated 3rd Party would be required to administer the scheme and make the loan to customer.
- Loan secured against vehicle.
- The loan book or an alternative arrangement would need to be compliant with Islamic Finance rules to ensure equality-this can be done through ensuring loan agreement does not refer to interest rates or loans, but can have it called a rental agreement.

Issues to be Decided post OBC Submission

- Maximum term of the loan still to be determined, likelihood is it will be different across vehicle type to align with normal asset life, e.g. LGV 5 years and HGV 6 years.
- Deadline for when last loan can be approved-the scheme does not want to have an open loan book for a long period of time.

Draft for approval

Loan Finance

Classification: Project / **Cost:** - To be developed in FBC

- Would this be a direct link to Vehicle Renewal Scheme i.e. first criteria for eligibility is application for vehicle renewal scheme.
- Criteria for creditworthiness to determine who/which businesses eligible.
- Loan could be structured to be to cover full cost of a vehicle, subsidise a lease vehicle or PCP (more likely to be attractive to small businesses).
- To access the loan finance scheme a vehicle owner must be prepared to scrap/swap their current vehicle for a pre agreed compliant type of vehicle.
- Capping number of loans to businesses and capping size of business.
- GMCA margin to be added to cost to customer to cover loan defaults and administration costs.
- Joint Air Quality Unit (JAQU) would fund the administration and arrangement fees; typical costs for this might be 1% to 1.5% of loan book value plus £100 annual admin cost per application and allocation of £200 to recover vehicle if loan defaults.

Key Decisions Required

- What is high level value of loan book GMCA will to provide?

Cost	Top Risks	Procurement Route
Dependent: • 1% to 1.5% on value of loan book; • assumed default rates; • 3rd party operational contract; • Annual admin per loan cost, • Marketing launch costs;	1) Loan Default-could be as high as 25% in some categories of loan and would need a suitable mitigation strategy 2) PHV driver potentially poor credit rating and may have limited access to loan. 3) State Aid issues. 4) GDPR-personal data breaches. 5) Arrangement would need to be Islamic Finance compliant to ensure equality of access	3rd party will be required to administer loans covering credit checks to recovering loan defaults and taking monthly payments. O&M contract will also potentially have to be procured. This will have to be competitively tendered-potentially contract will be between GMCA and third party.

Process/Eligibility

Once a contract with a third party is procured to administer the loan scheme it is envisaged the 3rd party could have the scheme up and running within 3-4 months.

1) Eligibility criteria for credit worthiness would be completed via the 3rd party-business rules would need to be determined around what do they do with applicants rejected.
2) T&C within loan document need to provide insurance, including settlement figure.
3) Data protection will be key legal requirement for GMCA/3rd party supplier.
4) Type of vehicle and loan type would need to be determined in assessing credit worthiness.
5) Clarity on what happens at end of contract needs to be detailed i.e. hire purchase or PCP deal.
6) Is maintenance a compulsory part of the deal?

Draft for Approval

Loan Finance

Classification: Project / **Cost:** - To be developed in FBC

Group Impacted	Distributional Analysis
• Small Businesses • PHV/Taxi operators	• Open to all businesses/individuals where business or vehicle is registered in GM.

Component	Policy Design	Consultation	Customer	Technology
Component Description	Confirm value of loan book and criteria for people to be approved for loans along with vehicle types and willingness of public purse to fund loan defaults.	Some form of conversation/ consultation will be required to understand who will take offer up and how to structure e.g. loan for car or subsidy for lease?	Customer facing elements of the fund including items such as managing applications, approval of loans, what happens if rejected, what communications are required; who does customer think they are dealing with-3rd party, TfGM, GMCA (i.e. branding) and validation (if required) managing queries and complaints and dealing with financial issues.	Reliant on 3rd party systems and potentially some form of interface with GMCA/TfGM to pass over customers.

Phase Component	Design Phase	Implementation Phase	Operation Phase	Decommissioning Phase
Policy Design	TfGM / GMCA	TfGM / GMCA	TfGM / GMCA	N/A
Consultation	TfGM / GMCA	N/A	N/A	N/A
Customer	TfGM / Delivery Agent	TfGM / Delivery Agent	TfGM / Operating Body	N/A
Technology	TfGM / Delivery Agent	TfGM / Delivery Agent	TfGM / Delivery Agent	TfGM / Delivery Agent

Dependencies

Internal Dependencies:

- Understanding from modelling the number of potential loans to be taken out;
- Policy developed by Policy & Governance workstream.
- Loan criteria agreed in conjunction with GMCA

Intra Dependencies:

- GMCA appetite for risk and loan book value
- Mayoral priorities

External Dependencies:

- Funding from JAQU
- Public feedback during FBC and consultations with HGV,LGV and PHV/Taxi owners

Draft for approval

Loan Finance

Classification: Project / **Cost:** - To be developed in FBC

Stakeholder Engagement
None as of yet has been completed, but it is envisaged key stakeholders are: • The Mayor • GMCA • Districts • JAQU • HGV,LGV and PHV/Taxi owners affected by CAZ • Banks providing underwriting/insurance services • 3rd party suppliers providing administration of loan scheme • Vehicle manufacturers.

Benefits Register	
Benefits Evaluation Process	To be decided but a key KPI would reference new/compliant vehicles swapped for non-compliant vehicles.
Description	To be developed in FBC
Service Feature	Reduction in NO2 from non-compliant vehicles.
Costs	As above
Activities Required to Secure Benefit	As above
Responsible Officer	TBC
Performance Measure	No of loans for vehicles removed from GM
Target Improvement	TBC
Timescale	TBC

Draft for approval

6.9 Clean Air Zone

Modelling has shown that a Clean Air Zone (CAZ) for commercial vehicles is required to deliver compliance in the shortest possible time in Greater Manchester.

The Clean Air Plan proposes a CAZ to be implemented across the Greater Manchester region in two phases as follows:

Phase 1 (assumed to be 2021): a Clean Air Zone Category B across the region, placing a daily penalty on the most polluting buses, taxis (Hackney cabs and private hire vehicles), Heavy Goods Vehicles (HGVs) and coaches if they travel into, within or through Greater Manchester.

Phase 2 (assumed to be 2023): expansion to a Clean Air Zone Category C across the region, placing a daily penalty on the most polluting Light Goods Vehicles (LGVs) and minibuses if they travel into, within or through Greater Manchester, in addition to those vehicles placed in scope under Phase 1.

No private cars would be affected by this proposal.

Vehicles travelling exclusively on the Highways England Strategic Road Network (SRN), travelling through the region without entering Greater Manchester, would also be unaffected by this proposal. This is because Greater Manchester's Authorities do not have the power to impose a scheme on the SRN.

Category

The Clean Air Zone will:

- Enable the local authority to implement local plans that collectively impact on fewer people

Rationale

Following implementation of a CAZ B (initial phases of CAZ C) in 2020, these are predicted to result in a 20% reduction of NO_x across Greater Manchester. The number of modelled point exceedances is reduced from 250 to approx. 70.

There is a predicted 75% reduction of NOx by 2023 for the CAZ C scenario, and reduces the number of modelled point exceedances from 68 to 3.

The Economic Case details this is much greater detail.

Cost	Top Risks	Procurement Route
£78m Implementation Fund and £163m on Operating Fund	1) Responses from the scheme design consultation(s) and through stakeholder/political engagement significantly impacting design, costs and schedule 2) Interface between local system and Defra's Central Charging System (CCS) is unclear and currently limited detailed scope 3) The scale of the proposed CAZ Information Systems infrastructure is significant and may cause unforeseen delays and additional costs associated with implementation 4) Availability and affordability of compliant vehicles 5) Drivers seek out alternative routes to avoid ANPR cameras 6) Liaising with other local authorities outside of Greater Manchester to put up CAZ signage in advance of entering a CAZ 7) Implementation of CAZ signage on Motorway Infrastructure - Strategic Road Network (SRN)"	The Procurement Route is detailed in the Commercial Case of the OBC.

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Clean Air Zone

Classification: Work Package / **Cost:** £78m Implementation Fund & £163m Operating Costs

Process/Eligibility

The boundary of the CAZ is subject to further technical review as part of the FBC, however at present it is proposed as the Local Authority boundary of Greater Manchester.

It is proposed that the CAZ will operate 24 hours a day, seven days a week, and will apply to trips made by in-scope vehicles into, within and through Greater Manchester (excluding trips made wholly on the SRN).

The level of the penalty will be confirmed subject to public and stakeholder engagement and further technical work. The indicative penalty levels that have been assumed for the purposes of modelling the impacts of the scheme are £7.50 per day for vans and minibuses; Hackney cabs and PHVs; and £100 per day for HGVs, coaches and buses.

If the penalty charge is not paid within the required time period – as an example, the London scheme allows payment in advance, on the day or until midnight the day after travel – a penalty charge notice would be incurred.

It is assumed that vehicle owners would be able to register their vehicle to simplify the payment process, but drivers will be required to proactively pay for each day they travel; an auto-pay system (where a charge is automatically applied to an account if a vehicle is detected by an enforcement camera) cannot be supplied by JAQU and is therefore not available for Greater Manchester.

Vehicles will never be required to pay more than once per day regardless of how many trips they make within the CAZ boundary. However, if a vehicle enters the GM-wide CAZ and also enters a CAZ or Low Emission Zone elsewhere in the UK they will be required to pay the local penalty charges for each CAZ. So, for example, if a non-compliant in-scope vehicle travelled from London to Greater Manchester on the same day, they would be required to pay all charges incurred in both regions.

As part of the detailed scheme design phase, Greater Manchester will be considering alternative payment options that could be more beneficial and efficient to customers without risking the principle of the scheme. Further work will be required as part of the engagement and consultation process with stakeholders to understand their needs and subsequent options.

Group Impacted	Distributional Analysis
Freight and servicing industries, taxi and private hire industry, bus and coach operators.	Impact on businesses, but potential to have large impact on small businesses and operators with older fleets. May result in costs being passed to customers in some industries, without effecting change.

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Classification: Work Package / **Cost:** £78m Implementation Fund & £163m Operating Costs

Component	Policy Design	Highway Infrastructure	Customer	Technology	Estates	Charging Scheme Order and TRO	Consultation
Component Description	Scheme and policy design of the CAZ including discounts and exemptions. Including items such as research, data collection and modelling to support design and appraisal, and impacts assessments (socio-economic, equalities, environment).	The highway infrastructure elements of a CAZ including items such as signage, road markings, changes to highway layout (including statutory undertakers information and diversions, if required). The infrastructure elements of the ANPR cameras will also be covered in this component including items such as detailing exact locations of ANPR cameras, poles, camera installation, power and data ducting.	The customer facing elements of a CAZ including items such as managing discounts and exemptions, maintenance of the white list, managing queries and complaints, issuing of penalty charges. The development of the Customer component during the Design Phase will be essential for the development of the Technology component.	The technology elements of a CAZ including items such as the ANPR cameras, the systems to manage the Customer elements, including the interface with the Government payment portal. The technology elements of the ANPR cameras covered in this component including items such as specifying ANPR cameras, power and data cabling and connections. The technology elements of the equipment and hardware required for the operation of a CAZ are included in this component	The buildings, offices and facilities including the provision of equipment required for the operation of a CAZ.	The Charging Scheme Order (CSO) and any Traffic Regulation Order(s) (TROs) required for the implementation and operation of a CAZ.	Consultation related to the TROs

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Clean Air Zone

Classification: Work Package / **Cost:** £78m Implementation Fund & £163m Operating Costs

Phase Component	Design	Implementation	Operation	Decommissioning
Policy Design	Lead Advisor	N/A	N/A	N/A
Highway Infrastructure	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
Customer	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
Technology	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
Estates	Lead Advisor	TfGM	Operating Agent	Operating Agent
Charging Scheme & TRO	Legal Service Provider	Legal Service Provider	Operating Agent	Operating Agent
Consultation	TfGM	N/A	N/A	N/A

Dependencies
Internal Dependencies: Vehicle Renewal Schemes (Clean Bus/Freight/Taxi Funds), Electric Vehicle (EV) Infrastructure and Promotion **Intra Dependencies:** Impact on air quality from other Greater Manchester schemes/initiatives **External Dependencies:** JAQU CCS for processing and payment
Stakeholder Engagement
There have been a number of focus groups conducted with the public which introduced the themes of air quality and the benefits and constraints of the CAZ principles. We have also conducted wider stakeholder engagement where the CAZ principles have been discussed.

Benefits Register	
Benefits Evaluation Process	To be developed in FBC
Description	As above
Costs	As above
Activities Required to Secure Benefit	As component description
Responsible Officer	Head of Logistics and Environment TfGM
Performance Measure	Reduction in non-compliant vehicles
Target Improvement	To be developed in FBC
Timescale	To be developed in FBC

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Vehicle Renewal Scheme - Clean Taxi Fund
Classification: Project / **Cost:** £28m

6.10 Vehicle Renewal Scheme - Clean Taxi Fund

The **Clean Taxi Fund** would offer Greater Manchester registered taxi and private hire drivers support to upgrade their non-compliant vehicles

The establishment of a Clean Taxi Fund would offer taxi and private hire drivers a discount on the purchase of a compliant vehicle from an approved supplier when trading in a non-compliant taxi. It will also provide funding for the retrofitting of taxis.

It should be noted that the scheme would only be open to vehicles and drivers licensed within Greater Manchester. Over the past three years, the number of licenses has been falling; it is believed that this reflects the increasing tendency for drivers to license out of region but operate within the region. It is likely that the introduction of the Clean Air Zone - which will offer better terms including access to this vehicle renewal scheme - will act to reverse this trend.

Category

The Clean Taxi Fund would

- Help people and businesses to switch to a cleaner mode of transport

Rationale

The goal of the GM CAP is to clean up the vehicle fleet travelling around Greater Manchester to reduce emissions from traffic. A Clean Air Zone category affecting buses, taxis, heavy and light goods vehicles across the region will provide a financial incentive to the owners of commercial vehicles to invest in cleaner vehicles. Greater Manchester believes that this process can be made more effective in terms of reducing emissions and fairer in terms of minimising socio-economic damage if it is supported by schemes offering financial support to businesses and self-employed workers based in Greater Manchester to help them upgrade their vehicles. Effective behavioural change will result from both charge base and locally delivered Vehicle Renewal and Loan Finance Schemes (See Section 1.7 of the Strategic Case).

Vehicle renewal schemes such as those proposed here offer a range of benefits:

- They bring forward emissions reductions prior to the introduction of CAZs:
- They ready the fleet for a CAZ, reducing the risk of unintended consequences and allowing earlier implementation:
- They mitigate the risk of damaging socio-economic impacts imposed by CAZ:

The proposed Vehicle Renewal Schemes will be delivered via a ‘Clean Air Fund for GM’, offering support to in-scope businesses and residents as follows:

- **Businesses:** small and micro businesses based in Greater Manchester would have access to a Fund offering them an incentive to scrap or de-license in-scope non-compliant vehicles (a heavy or light goods vehicle, hackney cab or car registered as a private hire vehicle with one of the ten GM Local Authorities) and to replace them with a compliant vehicle, or to retrofit their vehicle to make it compliant.
- **Residents:** self-employed residents of Greater Manchester who own a heavy or light goods vehicle, hackney cab or car registered as a private hire vehicle with one of the ten GM Local Authorities would have access to a Fund offering them an incentive to scrap or de-license in-scope non-compliant vehicles and to replace them with a compliant vehicle, or to retrofit their vehicle to make it compliant.

For both businesses and residents, the schemes would be subject to a competitive application process, with funds allocated on the basis of a series of criteria, and prioritised in terms of the likely air quality benefit and socio-economic impact. In principle, priority will be given to upgrading the oldest and dirtiest vehicles, that are most likely to travel in areas suffering from poor air quality, and owned by those least able to upgrade them without support.

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Vehicle Renewal Scheme - Clean Taxi Fund

Classification: Project / **Cost:** £28m

The vehicle renewal scheme will offer owners of older non-compliant vehicles that are registered within Greater Manchester an affordable incentive to scrap their vehicles. The Fund will be split into three sub groups covering light goods vehicles and minibuses; heavy goods vehicles and coaches; and taxis (hackney carriages and PHVs).

There are currently around 9000 private hire and 2000 non-compliant hackney cabs and private hire vehicles licensed within Greater Manchester. These vehicles are not an even distribution across the conurbation, and can be observed using regular routes and congregating in urban areas, such as rail stations.

Taxis and Private Hire Vehicles provide an important transport function for Greater Manchester, providing a service supplementing the public transport network.

Modelling Results

Following implementation of a Clean Taxi Fund and in the initial phases of the CAZ, these are predicted to result in a c. 1-2% reduction in NO_x across Greater Manchester.

Cost	Top Risks	Procurement Route
£28m Implementation Fund, including optimism bias and inflation	1) Availability and affordability of compliant vehicles 2) Clean Air Funding is not adequately supported by HM Government 3) Fleet mix changes 4) Proposed scheme is not economically attractive	Database / IT system to register and administer grants. Application process by which vehicle owners can apply for the fund (paper or electronic system). Potential procurement exercise for a Vehicle Renewal Partner (as detailed in the Commercial Case) to support with the administration of the fund. Management of the Fund will potentially form part of the scope of the Operating Body which will be defined at FBC.

Process/Eligibility

Clean Taxi Fund is divided into two elements:

- Hackney Carriages (or equivalents)- designed to provide financial support towards upgrading to a zero emission capable taxi, purchased via an approved supplier; and
- Private Hire Vehicles (PHVs). The Private Hire element of the fund is designed in a similar way to the Car Fund by calculating an average value of vehicle and then applying an upgrade premium.
- The Fund will be subject to a competitive application process.
- The Fund would be administered and managed by TfGM on behalf of the 10 Districts.
- TfGM will facilitate financial transactions with the organisation selling the compliant vehicle.
- TfGM will assume responsibility for the monitoring and reporting of the fund to JAQU.
- Funds to be applied in 6-monthly cycles in line with Vehicle Criteria Principles.
- The Fund will target the most polluting vehicles as a priority.
- If there is remaining funding at December 2021, applications from vehicles operating in GM but not necessarily registered in GM could be considered.
- To ensure that taxi/private hire owners have the maximum time available to upgrade their non-compliant vehicle, the Upgrade Fund should operate as a programme, with funding available from December 2019.

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Vehicle Renewal Scheme - Clean Taxi Fund
Classification: Project / **Cost:** £28m

- Early uptake of compliant LGVs may mean the removal of exemptions may become necessary if air quality improves more quickly than anticipated.
- Fund would be available to access up until either:
  1) The whole GM allocated funding pot has been distributed to non-compliant taxi/private hire drivers
  2) One year following when NOx compliance will be achieved (in line with the timescales for which the operation of a Clean Air Zone will be funded).

It is anticipated that £2,000 is made available for GM based private hire drivers and £5,000 for GM based taxi drivers. The process should be for locally based drivers and should support GM minimum standards.

Group Impacted	Distributional Analysis
• Taxi and Private Hire Vehicle Owners • Drivers • Customers • Operators	For taxis, Hackney Carriages are required to be wheelchair-adapted. The cost of wheelchair adapted vehicles is higher than other vehicles. In the absence of support, taxi drivers may otherwise face disproportionately higher costs to upgrade to a CAZ compliant vehicle which could be passed on to users. People with a high level of health deprivation typically have lower average household income. The cost of upgrading wheelchair adapted private vehicles is higher, making them particularly vulnerable to increases in the costs of private transport services and private car travel. There is a high BAME representation amongst PHV owners suggesting impacts could be unevenly experienced by this group (Policy Exchange, 2017).

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Vehicle Renewal Scheme - Clean Taxi Fund

Classification: Project / **Cost:** £28m

Component	Policy Design	Consultation	Customer	Technology	Estates
Component Description	Policy design of the fund including items such as research, data collection and modelling to support the design and appraisal of the scheme and impacts assessments. The funding will be applied to three segments of the taxi trade depending on the age, compliance status and accessibility standard of their current vehicle. The measures are designed to tie in with proposed uniform licensing standards. Financial support is targeted at taxi drivers as the requirements for compliant replacement vehicles. No support is currently provided for PHV owners as barriers to compliant vehicles are low. Policy design of the fund including items such as research, data collection and modelling to support the design and appraisal of the scheme and impacts assessments."	Potential consultation elements for the fund depending on the outcomes from the Policy Design component.	The customer facing elements of the fund including items such as managing applications, awards and validation (if required), managing queries and complaints. The development of the Customer component during the Design Phase will be essential for establishing the requirements for the Technology component. Vehicles under 8 years old (in 2021) will be encouraged to either retrofit to LPG or can utilise funds for replacement. Vehicles between 9 and 17 years old in 2021 will be offered support to replace with a compliant vehicle. Vehicles 18 years or older will be expected to scrap "	The technology elements of the fund including the establishment of systems to manage the Customer elements. Liquid Petroleum Gas (LPG) is a viable alternative to diesel as it can significantly reduce both NOx and PM to below EURO 6 levels and it has a lower carbon content reducing CO2 emissions. Black cabs have their diesel engine replaced with a dual fuel petrol /LPG engine.	The buildings, offices and facilities including the equipment and hardware required for the operation of the fund.

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Vehicle Renewal Scheme - Clean Taxi Fund

Classification: Project / **Cost:** £28m

Phase Component	Design Phase	Implementation Phase	Operation Phase	Decommissioning Phase
Policy Design	Lead Advisor	N/A	N/A	N/A
Consultation	TfGM	N/A	N/A	N/A
Customer	TfGM	Delivery Agent	Operating Agent	Operating Agent
Technology	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent
Estates	Lead Advisor	Delivery Agent	Operating Agent	Operating Agent

Dependencies

Internal dependencies:

Direction/output from Data, Evidence and Modelling workstream to identify the required shift in vehicle to achieve compliance in Clean Air Zone project; Policy developed by Policy & Governance workstream; Associated cost dictated by the Finance workstream.

Intra Dependencies:

n/a

External Dependencies:

Funding from JAQU; Public feedback during FBC and consultations; Feedback from taxi community; links with Greater Manchester Licensing project

Stakeholder Engagement

A series of workshops with the industry took place with the industry in late summer 2018 to identify potential options for upgrade and renewal.

Benefits Register

Benefits Evaluation Process	Modelling
Description	As above
Service Feature	Fleet Changes on GM Roads
Costs	TBC
Activities Required to Secure Benefit	As per component description
Responsible Officer	Head of Logistics Environment
Performance Measure	Number of non-compliant vehicles falls.
Target Improvement	TBC
Timescale	TBc

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Analysis of Distributional Impacts

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Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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1 Executive Summary

1.1 Overview

As set out in the Options Appraisal Report, two clean air options are proposed within the Greater Manchester Clean Air Plan (GM CAP), Option 5(i)/(ii)[1] and Option 8. Option 5(i)/(ii) is broadly framed around a CAZ D scenario (including buses, coaches, taxis, Private Hire Vehicles (PHVs), Heavy Goods Vehicles (HGVs), Light Goods Vehicles (LGVs) and private cars), whereas Option 8 is framed around a CAZ C scenario (the same as CAZ D but without private cars), both with variations on the standard CAZ classes and with proposed sunset periods.

This report presents the results of the distributional impacts analysis of Option 5(i)/(ii) and Option 8. For the purpose of the analysis, the ten council districts of Greater Manchester were divided into 1,673 Lower Layer Super Output Areas (LSOAs), as illustrated in Figure 4 (Appendix A). LSOAs are small geographical areas referred to by the Office for National Statistics (ONS) and were used as the default spatial framework for the analysis of distributional impacts[2].

The analysis is structured around the key social and economic groups considered most likely to be impacted by the proposed clean air measures. The analysis aims to establish whether one group is being unfairly disadvantaged or advantaged by the options being proposed

Within this report, consideration has been given to children, the elderly, the disabled, low income households, women, and the Black, Asian and Minority Ethnic (BAME) community. In addition, two business groups were considered: Small and medium sized enterprises (SMEs) and LGVs. Impacts on each group was considered, where relevant, under the following three variables: air quality, affordability and accessibility.

The distributional analysis of air quality impacts looks at changes in emissions across the study area focussing on low-income households, under 16s and over 65s. An assessment of health and environmental damage costs is also provided. Next the report examines affordability distributional impacts, including personal affordability, user benefits[3] and business affordability, focussing on low income households, the disabled population, SMEs and the use of LGVs. Finally, the accessibility distributional impacts analysis considers changes to the ability and ease of individuals or

[1] Modelling was undertaken separately for Option 5(i), Option 5(ii) and Option 8. In some instances, the results of the analysis are comparable for both Option 5(i) and Option 5(ii). And the options are considered as one – Option 5(i)/(ii).

[2] Where LSOA data was not available (i.e. for business counts), data for Middle Layer Super Output Areas (MSOAs) was used (Figure 3 in Appendix A).

[3] User benefits capture the experience of people commuting to a place of work or education and undertaking journeys for social or leisure purposes via private vehicle. Benefits are associated with improved journey times and the reduction in cost of operating a car.

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businesses to get to places of work, social networks and public amenities focusing on low income households, children, the elderly, the disabled population, women and the BAME community.

The results of the analysis are summarised here and explained in detail in the main body of the report. The assessment of distributional impacts presented here is not considered exhaustive; recommendations for further work are presented in Appendix B.

1.2 Assessment criteria

The following scale, as recommended by TAG Unit A4.2, is used in the reporting of the distributional impacts. In cases where the methodology has deviated from the guidance, potential impacts are described qualitatively.

Table 1- 1 Distributional Impact Assessment Criteria

Assessment		Impact Description
✓✓✓	Large beneficial	Beneficial and the population impacted is significantly greater than the proportion of the group in the total population
✓✓	Moderate beneficial	Beneficial and the population impacted is broadly in line[4] with the proportion of the group in the total population
✓	Slight beneficial	Beneficial and the population impacted is smaller than the proportion of the group in the total population
-	Neutral	There are no significant benefits or dis-benefits experienced by the group for the specified impact
✘	Slight adverse	Adverse and the population impacted is smaller than the proportion of the population of the group in the total population
✘✘	Moderate adverse	Adverse and the population impacted is broadly in line with the proportion of the population of the group in the total population
✘✘✘	Large adverse	Adverse and the population impacted is significantly greater than the proportion of the group in the total population

It is important to note that a large beneficial impact does not represent the areas receiving the greatest air quality/affordability/accessibility benefits. For example, from an air quality perspective, benefits would be expected to be greatest in areas where the emissions reduction is highest. Instead, the WebTAG methodology determines whether the impacts are representative of an even distribution if all groups received the same share of the benefit. As such, care must be taken when interpreting the results of the analysis.

[4] For the assessment of air quality and affordability, 'broadly in line' refers to a +/- 2% threshold between the percentage of net winners/losers and the share of the resident population in each group. For the assessment of affordability, this threshold is increased to +/- 5% in line with the TAG Unit A4.2 guidance.

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1.3 Key findings

1.3.1 Key findings for social groups for each impact variable

An overview of findings for key social groups and each impact variable is presented in Table 1- 2.

To identify social groups that could be disproportionately impacted by the GM CAP, the population within the study area was divided into quintiles. For example, to assess income deprivation, LSOA populations were first divided into five equal parts depending on the level of income: the first quintile contains the top fifth of the population on the scale (i.e. the 20% of the population with high levels of deprivation), the second quintile represents the second fifth (from 20% to 40%) and the fifth quintile represents the 20% of the population with the lowest level of income deprivation. Once the LSOA populations have been divided into quintiles, it is then possible to see which groups receive the highest share of the benefits.

It is noted that Greater Manchester has a higher proportion of low income households relative to the national profile for England and Wales, with 35% of Greater Manchester living in LSOAs that are in the most income-deprived quintile.

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Table 1- 2 Overview of impacts on key social groups

Social group	Impact Variable	Comment
Low income households	Air quality	For low income households, results are comparable for Option 5(i)/(ii) and Option 8, although Option 8 provides slightly better opportunities for enhancement than Option 5(i)/(ii). For Option 5(i)/(ii), moderate benefits are experienced evenly across all quintiles. For Option 8, moderate benefits are experienced across the majority of the population, with large benefits experienced by the 20-40% most income-deprived households (quintile 2).
	Personal Affordability	When the distribution of impacts on low income households is compared to the distribution across England and Wales, impacts for Option 5(i)/(ii) and Option 8 are distributed *unevenly.* When compared to the distribution across Greater Manchester, distributional impacts on low income households are distributed *unevenly* for Option 5(i)/(ii) and *evenly* for Option 8. The analysis also shows that under Option 5(i)/(ii), the burden of costs associated with upgrading private cars to compliant vehicles across Greater Manchester would fall disproportionately on low income households, including the high proportion of low income households (quintile 1), located just outside of the IRR. Under Option 8, the use of non-compliant private cars would not incur a charge, therefore there is likely to be a significantly lower affordability impact on low income households under this option.
	User benefits	For both Option 5(i)/(ii) and Option 8, when the distribution of low income households is compared to the distribution across Greater Manchester, moderate beneficial user benefits are evenly distributed across all quintiles. When compared to the distribution across England and Wales, those in quintile 1 experience a slightly lower share of the benefits (slight beneficial impacts).
	Accessibility	When compared to the distribution of low income households across Greater Manchester, under Option 5(i)/(ii) moderate beneficial impacts are anticipated to be experienced evenly across all income groups. When compared to the distribution across England and Wales, the benefits for Option 5(i)/(ii) are greatest (large beneficial) in quintile 2. Similarly, for Option 8 large benefits are anticipated in the areas with the greatest income deprivation (quintiles 1 and 2). For both Option 5(i)/(ii) and Option 8, the areas with the greatest improvements in journey times are located within the IRR and in the key centres of Bolton, Rochdale and Oldham.

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Social group	Impact Variable	Comment
Children	Air quality	For children (under 16s), results are comparable for Option 5(i)/(ii) and Option 8, although Option 5(i)/(ii) provides slightly better opportunities for enhancement than Option 8. For Option 5(i)/(ii), benefits are experienced by all under 16s, although the spread of benefits is uneven. Large benefits are experienced in quintile 1 and quintile 3, slight benefits in quintile 2, and moderate benefits in quintile 4 and quintile 5. For Option 8, benefits are experienced by all under 16s, with large benefits experienced by areas with the highest concentration of under 16s compared to other areas (quintile 1). In general, air quality impacts on children are likely to be more beneficial outside of the Manchester IRR boundary. Despite there being high emissions reductions in this zone, this area contains less than 1% of total population of under 16's and only a small number of facilities of importance to children (three nurseries, four parks/open space and no junior/secondary schools). Within the M60 and the rest of Greater Manchester the overall impacts on children are more apparent with residents located in close proximity to the major road networks (M6, M60, M61, M62, M602, M66, M56) likely to experience the greatest air quality benefits.
	Accessibility	Beneficial impacts are experienced *unevenly* across all quintiles for Option 5(i)/(ii) and Option 8. For Option 5(i)/(ii), large beneficial impacts are experienced by quintiles 1 and 3, moderate beneficial impacts are experienced by quintiles 4 and 5 and slight beneficial impacts are experienced by quintile 3. For Option 8, moderate beneficial impacts are experienced by quintiles 3, 4 and 5 (least children) large beneficial impacts are experienced by quintile 1 (most children) and slight beneficial impacts are experienced by quintile 2. For Option 5(i)/(ii) and Option 8, large beneficial impacts are experienced in quintile 1 (most children). Overall, journey time benefits are highest within the IRR. This has little impact on children as the IRR contains a very low proportion of under 16's and no schools. There are no special educational needs schools within areas with increased journey times.
Elderly	Air quality	For the elderly population, results are comparable for Option 5(i)/(ii) and Option 8, although the benefits are more evenly spread for Option 8. For Option 5(i)/(ii), the areas with relatively low levels of elderly residents (quintile 4) receive the greatest share of the benefits. For Option 8, moderate benefits are experienced evenly across all quintiles.

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Social group	Impact Variable	Comment
		The analysis shows that LSOAs within the M60 (and the IRR) are expected to receive the highest changes in emissions. In general, high concentrations of elderly residents are located outside of M60/IRR, towards the outskirts of Greater Manchester. The relatively small proportion of elderly people living within the IRR would be expected to experience largely beneficial impacts with over 70% (490 elderly residents) located in areas of high emissions reductions. It is likely that given the distribution of the elderly population, benefits are more likely to be experienced through improved accessibility and affordability of local transport services as a result of the GM CAP rather than reductions in emissions.
	Accessibility	Under Option 5(i)/(ii), the impacts across the elderly population are anticipated to be uneven with large beneficial impacts expected in quintile 4 and slight beneficial impacts in quintile 2. Quintiles 1, 3 and 5 experience moderate beneficial impacts. Overall the impacts are anticipated to be moderate beneficial. Under Option 8, moderate beneficial impacts are distributed evenly across the elderly population. In general, the areas with the highest proportion of elderly residents (located towards the outskirts of Greater Manchester rather than in the M60/IRR) also have the lowest availability of public transport options. The age profile of community transport vehicles used by elderly residents is also typically older and hence more likely to be non-compliant. In the event that community transport operators (e.g. Local Link) cannot afford to upgrade vehicles, there could be a reduction in the availability of services. This would result in significant adverse impacts on users who are reliant on this form of transport.
Disabled people	Accessibility	For both Option 5(i)/(ii) and Option 8, the distribution of beneficial impacts is anticipated to be uneven with the areas containing the highest proportion of disabled people (quintile 1) receiving the largest benefits. Disabled people with reduced mobility may be unable to make use of conventional public transport services or active transport modes (walking and cycling) and may be more reliant on private cars for personal journeys than people who do not have reduced mobility. As car owners only experience a travel cost under Option 5(i)/(ii) the impact on accessibility on disabled people would be greater under this option than it would be under Option 8 (a CAZ C which excludes private cars).

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Social group	Impact Variable	Comment
		Data from the Department for Transport (DfT) shows that, in England, the proportion of personal trips undertaken by taxi is on average three times higher for adults with mobility difficulties than those without (DfT, 2017a). Wheelchair adapted vehicles that are used solely for the transport of disabled people, and hence are registered as disabled passenger vehicles, are exempted from the clean air charge for those travelling within the IRR. However, a proportion of community transport vehicles operating within Greater Manchester may not be registered as disabled passenger vehicles as they are also used to transport people who do not have a disability. Since WAVs are more expensive than standard vehicles, these types of adapted vehicles tend to be kept or leased by their owners for longer periods than non-adapted vehicles, making them more likely to be non-compliant. If the cost of upgrading vehicles is too high, this could have a disproportionate impact on this group.
	Personal affordability	The high concentration of LSOAs with relatively high levels of health deprivation located within the M60 suggests that for Option 5(i)/(ii), in which private cars are charged for entering the IRR, there may be a disproportionate adverse impact on this group. For this option, exemptions for blue badge holders, wheelchair adapted vehicles and specialist vehicles would provide some mitigation. In Option 8, the impact on those with a disability is likely to be significantly less than that for Option 5(i)/(ii) as there would be no affordability impacts linked to the use of private vehicles. Affordability impacts would only be experienced in cases where disabled people are dependent on non-compliant community transport vehicles. Exemptions for blue badge holders, wheelchair adapted vehicles and specialist vehicles would provide some mitigation of impacts on this group.
Women	Accessibility	Under Option 5(i)/(ii) accessibility benefits are distributed unevenly, with the areas containing the lowest proportion of women (quintile 5) receiving large beneficial impacts. Quintile 2, which contains a relatively high proportion of women receives slight beneficial impacts. Quintiles 1,3 and 4 all receive moderate beneficial impacts. Analysis of distributional impacts on women was screened out under Option 8. Evidence shows that women are less likely to use public transport than men (Section 3.9) and as such, any changes in the availability of taxis and/or PHV or increases in fares would have a slightly disproportionate and differential adverse impact on women.
Ethnicity (BAME)	Accessibility	In general, areas with high concentrations of BAME populations correlate with areas of improved accessibility. For both Option 5(i)/(ii) and Option 8, moderate beneficial impacts are anticipated to be evenly across all quintiles.

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Social group	Impact Variable	Comment
		Any increase in the cost of travel by private vehicle could have a differential adverse accessibility impact on ethnic minorities due to their perceived negative experience of alternative travel options (Section 3.10). However, as private vehicles do not incur a travel cost under Option 8, this differential adverse impact would only be experienced under Option 5(i)/(ii).

Table 1-2 shows that all social groups are likely to experience moderate beneficial air quality, personal affordability and accessibility impacts, with the following exceptions:

- Under Option 5(i)/(ii), adverse impacts fall disproportionately on residents of the IRR who otherwise have no choice other than to comply with CAP charges for private car travel. These impacts could be mitigated in part through the implementation of 'sunset periods' (time-limited discounts) for IRR residents. Under Option 8, the use of non-compliant private cars would not incur a charge, therefore there is likely to be a significantly lower affordability impact on low income households under this option.
- There is potential for disabled people to experience an adverse personal affordability impact due to the increased costs associated with upgrading wheelchair accessible vehicles and the potential for increased costs of community transport services. However, the exemptions for blue badge holders, wheelchair adapted vehicles and specialist vehicles would provide some mitigation.
- Under Option 5(i)/(ii) there is potential for disabled people with reduced mobility to incur a greater share of the costs than those without reduced mobility. Disabled people with reduced mobility may be unable to make use of conventional public transport services or active transport modes (walking and cycling) and may be more reliant on private cars for personal journeys than people who do not have reduced mobility. As car owners only experience a travel cost under Option 5(i)/(ii) the impact on accessibility on disabled people would be greater under this option than it would be under Option 8 (a CAZ C which excludes private cars).
- Although accessibility benefits for the BAME community are more evenly spread across quintiles for Option 8 than for Option 5(i)/(ii), it is noted that for Option 5(i)/(ii), any increase in the cost of travel by private vehicle could have a differential adverse accessibility impact on ethnic minorities due to their perceived negative experience of alternative travel options.

1.3.2 Key findings for business groups

Two business groups were considered: SMEs and LGVs. Due to the challenges associated with the quantitative approach prescribed by JAQU, a qualitative assessment was completed (see section 6.2.2), which highlights the potential for the following adverse business affordability impacts:

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SMEs

The qualitative analysis of business affordability distributional impacts for SMEs is summarised as follows:

- The business profile of Greater Manchester (83.9% micro, 12.9% small, 3.2% medium and 0.4% large) is broadly in line with the national average for each business type (84.6% micro, 12.4% small, 2.6% medium and 0.4% large). Within the IRR, there is a slight shift away from micro businesses compared to the national and regional trend, and a slightly larger proportion of small, medium and large businesses. Larger businesses would be expected to be more resilient to a new clean air charge than SMEs since they have greater resources and can better adapt to increasing costs. However, it is assumed that levels of resilience are homogenous across the study area and that all SMEs would be vulnerable to potential affordability impacts resulting from the GM CAP.
- It is noted that although businesses in the IRR might have a slightly elevated level of economic resilience to the GM CAP than the national and regional average, approximately 10% of all SMEs within Greater Manchester are concentrated within the IRR and therefore overall this area is likely to experience a disproportionate business affordability impact compared to the Greater Manchester region as a whole.
- It is assumed that almost all Greater Manchester SMEs are reliant on the transportation of goods and services on the road network, meaning that impacts could directly affect suppliers travelling from outside of Greater Manchester, potentially resulting in indirect effects on the businesses located within. Similarly, increased costs could be generated if the business relies on HGVs, or if the LGV fleets are owned by individuals rather than registered to the company. For employee-owned vans, the rate of fleet turnover is typically slower, meaning these vehicles are likely to account for a higher proportion of non-compliant vehicles in 2021. Businesses are less likely to own HGV vehicles but may rely on HGV services, which could become more expensive if the providers choose to pass on any costs to the customer.
- Overall, impacts on SMEs are expected to be similar for Option 5(i)/(ii) and Option 8. It is assumed that all businesses across Greater Manchester are reliant on commercial vehicles, all of which face the same charges under each clean air option. In cases where businesses are dependent on the use of personal cars, it is anticipated that Option 5(i)/(ii) is likely to result in greater adverse impacts on business affordability than Option 8. There is also a risk under the conditions of Option 5(i)/(ii) that SME workers within the IRR could choose to move to employment outside of the IRR to avoid a charge, potentially resulting in lost productivity and an increase in recruitment costs.
- In acknowledgement of the potential affordability impacts on SMEs, ‘sunset periods’ (time-limited discounts) have been considered for small and micro businesses under all options (Refer to the Options Appraisal Report). Similarly, for Option 5(i)/(ii), sunset periods have been considered for IRR residents.

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LGVs

The qualitative analysis of business and personal affordability distributional impacts for LGVs is summarised as follows:

- It is assumed that business sectors that are more heavily reliant on LGVs and HGVs, such as Retail, Wholesale and Transport and Storage, would be more heavily impacted by the GM CAP than those that are not reliant on good vehicles. Within the IRR, 37% of the SMEs are either Retail, Wholesale or Transport and Storage. Across the entirety of Greater Manchester, this figure is 21%.
- Across Greater Manchester, only 1% of LGVs are currently compliant (euro rating of four or above for petrol and six or above for diesel). The majority of businesses with an LGV fleet would therefore be expected to incur additional vehicle replacement costs between 2021 and 2023. However, some vehicle replacement and improvement in compliance levels are expected by 2023 as part of routine fleet upgrade, with an average reduction of 17% for non-compliant LGVs and 33% for non-compliant HGVs across Greater Manchester in this time.
- Figure 51 (in Appendix A) shows that there are areas of high concentrations of LGV registrations just outside the IRR suggesting this area could also be disproportionately impacted by the GM CAP.
- Although LGV affordability impacts are considered as business costs rather than social costs, there is potential for LGVs to also be used for leisure/personal purposes. In these instances, the impact could shift from a business affordability issue to a personal affordability issue.

Overall, the analysis shows that based on current and forecasted compliance levels, there is potential for adverse affordability impacts for those using and relying on LGVs. The magnitude of this impact would depend on the frequency of journeys and the behavioural response to the GM CAP.

1.3.3 Health and environmental benefits

This report also includes details of an assessment of the health and environmental benefits. A summary of this assessment for the Greater Manchester area is presented as follows:

- For Option 5(ii), the total monetised health and environmental benefit across Greater Manchester is estimated at around £17.9 million. This is slightly higher than the total monetised benefit of £17.8 million for Option 5(i). Option 8 delivers the lowest benefits of all options at £14.9 million across Greater Manchester.
- Within the IRR, the total monetised health and environmental benefit is estimated at £480,000 for Option 5(ii). The benefit within the IRR for Option 5(i) is slightly higher than Option 5(ii) at £430,000. The total benefit within the IRR for Option 8 is the lowest of all three options at approximately £350,000.

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1.4 Summary of baseline socio-economic data

A selection of key socio-economic characteristics of Greater Manchester is provided as follows:

- Greater Manchester has an economy larger than that of Wales or Northern Ireland with a GVA of £56 billion.
- Greater Manchester contains 348 of the 3,284 top 10% most deprived LSOAs in England. This equates to just over one fifth of Greater Manchester's LSOAs in the 10% most deprived in the country.
- Within Manchester City Council, 18 LSOAs are within the top 1% most deprived nationally. Within the IRR, 53% of the LSOAs fall within the top 30% most deprived in the country.
- There are considerably more people in their 20s living in Greater Manchester than the national average (24% compared to 13%). In all age groups beyond the age of 39, the proportion of people in Greater Manchester is lower than the national average. Almost 7%5 of the Greater Manchester population is over the age of 75, which is broadly in line with the national average of 8%6.
- Within the M60 there are 23 hospitals/hospices, including Manchester's Children's Hospital.
- The average life expectancy (LE) of residents in Greater Manchester is lower than the national average. Average male LE in Greater Manchester is 81.3 compared to 83.1 for England. For females, LE in Greater Manchester is 77.8, lower than the England average of 79.5.
- There are 3,981 people in Greater Manchester in contact with mental health services for every 100,000 of the population, compared to 2,176 nationally.
- Approximately 28% of trips within Greater Manchester have a length of less than 1km. One third of these journeys are made by car.
- 73% of all journeys made within Greater Manchester stay within the council in which they originated, 19% move between councils and only 8% travel outside of Greater Manchester.
- Travelling to work by car/van is the largest mode of transport in Greater Manchester (68%) and within the M60 (52%). Over half (51%) of residents within the IRR walk to work (51%).
- Within Greater Manchester, 31% of households have no car/van and 43% have one car/van per household. Within the M60, 40% have no car/van and 42% have one car/van per household. Within the IRR, 59% of households do not have access to a car/van.

[5] 6.9% to two significant figures.

[6] 8.2% to two significant figures.

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- In 2017, 86% of the total taxis (excluding PHVs) within the Greater Manchester region were accessible to wheelchair users, which is significantly higher than the average for England (58%). Only 1% of the total PHVs in Greater Manchester are wheelchair accessible vehicles (WAVs).
- There are approximately 124,000 businesses in Greater Manchester. The majority of businesses have fewer than ten employees. Within the IRR, 96.8% of the businesses are either micro or small.
- Outside of London, Greater Manchester is the UK's main centre for Business, Financial and Professional Services. The Wholesale and Retail Trade is currently the largest employer in Greater Manchester.
- Greater Manchester has the largest Creative and Digital Clusters in the UK, employing 63,500 people and generating GVA of £3.1 billion each year. Key assets include MediaCity UK (home of the BBC and ITV) and The Sharp Project.
- In 2016, there were approximately 78 start-ups per 10,000 population in Manchester7, a large increase from an approximate 60 start-ups per 10,000 in 2015.
- There are approximately 1.5 million international visitors to Greater Manchester each year making it the third most popular city in the UK for international visits after London and Edinburgh. According to STEAM (Tourism Economic Activity Monitor), Greater Manchester's tourism sector is worth £7.9 billion and supports 94,000 jobs.

1.5 Mitigation and enhancement

In line with TAG unit A4-2, where the distributional impacts analysis shows evidence of an intervention having particularly high benefits or dis-benefits to a certain group, enhancement and mitigation ought to be considered.

The findings of the Distributional Analysis indicate that, for Option 5(i)/(ii), the burden of costs associated with upgrading private cars to compliant vehicles across Greater Manchester falls disproportionately on low income households. This would be true of any CAP in any city because low income households are more likely to have older (non-compliant) cars and are less able to afford to upgrade to a compliance vehicle. What is unique about Greater Manchester is that the region has relatively high levels of income deprivation with just over one fifth of Greater Manchester's LSOAs in the 10% most deprived in the country.

This highlights the importance of the proposed Clean Air Credits, an incentive upgrade scheme for private car owners. The credits would be awarded at the point of scrappage of a vehicle at an approved location and would be used to finance a cleaner car or alternative more sustainable means of travel.

[7] This is defined as the primary urban areas (PUA) within Manchester, so it is a measure of the 'built-up' areas of a city rather than individual council districts. The Local authorities included in 'Manchester' PUA are Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside and Trafford. Wigan is therefore not included in this statistic and is captured separately.

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As set out in the Options Appraisal Report, the following discounts and exemptions have been considered:

- Exemptions and discounts to limit the impact on disabled people and those with accessibility needs – for blue badge holders and adapted vehicles.
- ‘Sunset periods’ (time-limited discounts) for residents of the zone, who otherwise have no choice other than to comply.
- ‘Sunset periods’ (time-limited discounts) to limit the impact on local small/micro businesses, not-for-profit organisations, charities and schools.
- Bespoke time-limited discounts for those with outstanding lease or pcp contracts.
- Collaborative working with bus companies and taxi operators to help them comply and avoid unnecessary charges, and the offer of paying an annual Clean Air Levy for non-compliant GM-registered Hackney cabs or PHVs, at a discounted rate to the daily charge.

It is recommended that further work be undertaken to ensure sufficient mitigation is proposed to reduce impacts on social and economic groups, and that any potential to enhance beneficial distributional impacts be fully explored.

2 Introduction

2.1 Overview

The city region of Greater Manchester is home to more than 2.7 million people (Office for National Statistics, 2016a). The ten councils of Greater Manchester make up the Greater Manchester Combined Authority (GMCA), which is run jointly by the leaders of the ten councils and the Mayor of Greater Manchester. The ten council boundaries are displayed in Figure 1 of the Map Book, provided in Appendix A.

As set out in the Options Appraisal Report, two clean air options are proposed within the Greater Manchester Clean Air Plan, Option 5(i)/(ii) and Option 8. Option 5(i)/(ii) is broadly framed around a CAZ D scenario (including buses, coaches, taxis, PHVs, HGVs, LGVs and private cars), whereas Option 8 is framed around a CAZ C scenario (the same as CAZ D but without private cars), both with variations on the standard CAZ classes and with proposed sunset periods.

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This report presents the results of the distributional impacts analysis of these two options. For the purpose of the analysis, the ten council districts of Greater Manchester were divided into 1,673 LSOAs, as illustrated in Figure 4 (Appendix A). LSOAs are small geographical areas referred to by the ONS and were used as the default spatial framework for the analysis of distributional impacts[8].

Where LSOA data was not available (i.e. for business counts), data for MSOAs was used (Figure 3 in Appendix A).

The analysis is structured around the key social and economic groups considered most likely to be impacted by the proposed clean air measures. The analysis aims to establish whether one group is being unfairly disadvantaged or advantaged by the options being proposed

Within this report, consideration has been given to children, the elderly, the disabled, low income households, women, and the BAME community. In addition, two business groups were considered: SMEs and LGVs. Impacts on each group was considered, where relevant, under the following three variables: air quality, affordability and accessibility.

The distributional analysis of air quality impacts looks at changes in emissions across the study area focussing on low-income households, under 16s and over 65s. An assessment of health and environmental damage costs is also provided. Next the report examines affordability distributional impacts, including personal affordability, user benefits and business affordability, focussing on low income households, the disabled population, SMEs and the use of LGVs. Finally, the accessibility distributional impacts analysis considers changes to the ability and ease of individuals or businesses to get to places of work, social networks and public amenities focusing on low income households, children, the elderly, the disabled population, women and the BAME community.

The results of the analysis are summarised here and explained in detail in the main body of the report. The assessment of distributional impacts presented here is not considered exhaustive; recommendations for further work are presented in Appendix B.

2.2 Strategic context

The Greater Manchester Strategy, ‘Our People, Our Place,’ was written by the ten Greater Manchester councils (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan), the Mayor, the National Health Service (NHS), police, the fire service and several businesses, community and social enterprises and members of the public (GMCA, 2017a). The strategy consists of ten priorities which address education and skills, health, wellbeing, environment, work and economic growth. The strategy outlines plans for a fully integrated transport system,

[8] Where LSOA data was not available (i.e. for business counts), data for Middle Layer Super Output Areas (MSOAs) was used (Figure 3 in Appendix A).

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reduced congestion and improved air quality. It is supported by several documents including the 2040 Transport Strategy, the Greater Manchester Spatial Framework (GMSF), the Low Emissions Strategy and the Air Quality Action Plan (AQAP), all designed to aid in the implementation of the overarching strategy.

The Low Emissions Strategy (GMCA, 2016) recognises both the health and economic impacts of poor air quality and aims to identify key actions which can be developed in more detail in the AQAP (GMCA, 2018b), Local Transport Plan (GMCA, 2017d) and other accompanying sub-strategies. Priority areas identified as having the biggest impact on emissions include: stimulating the uptake of Ultra-Low-Emission Vehicles, reducing emissions from buses on key urban corridors, changing travel behaviour (particularly driver only trips and travel to work) and the investigation of Clean Air Zones (CAZ).

The Low Emissions Strategy also focuses on areas within the Air Quality Management Area (AQMA). The AQMA reflects the areas of Manchester where NO_2 limits are exceeded. This reflects the locations of major motorways, major roads and urban centres.

3 Baseline

3.1 Study area

Baseline data collection focused on three key study areas:

1) Greater Manchester – The areas covered by the ten councils (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan). This area has an economy larger than that of Wales or Northern Ireland.
2) Within the M60 – The geographical area within the M60 cordon. This area includes the IRR but also extends to include the towns of Prestwich, Failsworth, Stretford and Eccles.
3) Within the IRR – The geographic area within the IRR which covers the city centre of Manchester. This extends to Manchester Victoria station in the North, the Ring Road to the East and the A57 Mancunian Way leading onto Trinity Way to the South and East respectively. The Quays area of Salford is also situated within the IRR and is recognised as a key area for future economic growth within the city of Manchester.

Table 3- 1 provides an overview of the baseline data provided and at which spatial level the data was available. The baseline data presented here is not necessarily used for the purposes of the assessment, rather this data is intended to set the socio-economic context of Greater Manchester.

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Table 3- 1: Baseline data presented at each spatial level

Topics	Key study areas (M60, IRR)	Greater Manchester	Regional / National
Travel to education	×	✓	×
Special needs schools	×	✓	×
Youth centres	×	✓	×
Children's hospitals	×	✓	×
Community transport	×	✓	×
Isolation/Loneliness	×	✓	✓
Blue Badges	×	✓	×
Wheelchair accessible taxis	×	✓	×
Overview	✓	✓	×
Car/van availability	✓	✓	×
Employment and the gender pay gap	×	×	✓
Modes of transport	×	×	✓
Religion	✓	✓	×
Ethnicity	×	✓	×
Health	×	✓	✓
Economic context	×	✓	✓
Economic activity	✓	×	×
Business counts	✓	✓	×
SMEs	✓	✓	×
Business turnover	✓	✓	✓
Growth of enterprises and business innovation	×	✓	×
Business sectors	✓	✓	×
Visitor economy	×	✓	×
Night time economy	×	✓	✓
LGVs and HGVs	×	✓	×

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Topics	Key study areas (M60, IRR)	Greater Manchester	Regional / National
Taxis	×	✓	×
Land use	✓	✓	✓
Shift workers	×	×	✓
Travel to work patterns	✓	✓	×
Access to a vehicle	✓	✓	✓
Vehicle compliance	✓	✓	×
Accessibility levels	×	✓	×
Bus and cycle routes	✓	✓	×
Coaches	×	✓	×

3.2 Social groups

The baseline is structured around the key social and economic groups considered most likely to be impacted by the proposed clean air measures. Within this report, consideration is given to children, the elderly, the disabled, low income households, women, and the BAME population. Baseline data is also provided on the economic context and the potential impacts on businesses, LGV and HGVs and those in employment (including shift workers and taxi drivers). This report also outlines key health indicators and the baseline health of the Greater Manchester population.

3.3 Key receptors

Baseline data for social groups is supplemented with data on key receptors within the study area. This allows the distributional impacts analysis to look further than that of the resident population. For example, the overall proportion of children in the impact area may not be high, but if there is a school located within the area, it is assumed that children will be travelling within this area and this facility should therefore be considered within the assessment. Table 3- 2 gives the number of key receptors within the study area.

Table 3- 2: Key receptors within the key study areas (education and social receptors)

	Within Greater Manchester	Within the M60	Within the IRR
Junior schools	947	264	0
Secondary schools	228	72	0
University Buildings	64	55	17

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	Within Greater Manchester	Within the M60	Within the IRR
Nursery/Crèche	642	206	3
Playgrounds/play areas	339	84	0
Parks/open space	835	215	4
Religious Centres	541	186	6

There are approximately 2,000 educational establishments within Greater Manchester, with approximately 600 of these located within the M60 and approximately 20 located within the IRR. This includes, schools, universities and nurseries/crèches. These are also shown in Figure 14 (Appendix A). Locations of playgrounds, parks and open space are shown in Figure 15 (Appendix A).

Table 3- 3 shows the number of medical and health care receptors in the key study area.

Table 3- 3: Key receptors within the key study areas (medical and health care receptors)

	Within Greater Manchester	Within the M60	Within the IRR
Hospitals/hospice	134	23	0
Care homes	1,080	238	0
Dentists	271	48	2
GPs/Clinics	379	176	12

As shown in Table 3- 3, there are a total of 134 hospitals/hospices within Greater Manchester, 23 of which are located within the M60 cordon. These are also shown in Figure 16 (Appendix A). There are no hospitals or hospices located within the IRR. For those located within the M60, the hospitals promote use of public transport due to the congested nature of the city and high demand for parking at the hospitals. The hospitals do not provide unique transport services for users however they recommend community transport providers within the city such as Ring and Ride, Local Link and Transport for Sick Children.

Additional health care receptors were considered, such as stroke centres and mobile cancer care units, but insufficient relevant information was available. The locations of care/nursing homes are shown in Figure 17 (Appendix A).

Table 3- 4 shows the number of micro, small, medium and large businesses within the key study areas.

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Table 3- 4: Key receptors within the key study areas (economic receptors) (Nomis, 2018)

Business Type	Greater Manchester		Within the M60		Within the IRR	
	Count	%	Count	%	Count	%
Micro (0-9 employees)	104,000	83.9%	38,600	83.0%	10,500	81.4%
Small (10-49 employees)	15,805	12.9%	6,100	13.1%	1,900	14.7%
Medium (50-249 employees)	3,555	3.2%	1,500	3.2%	500	3.9%
Large (250+ employees)	500	0.4%	200	0.4%	100	0.8%
Total	124,000	100%	46,500	100%	12,900	100%

As shown in Table 3- 4, within Greater Manchester there are over 104,000 micro businesses, employing less than 10 employees per business. Within the IRR, micro businesses still dominate with over 10,500 total businesses in the city centre. Similarly, there are over 15,800 small businesses within Greater Manchester, 6,100 of which are located within the M60 and 1,900 within the IRR. Further information on SMEs is provided in section 3.12.4.

The business profile of Greater Manchester is broadly in line with the national averages for each business type: 84.6% micro, 12.4% small, 2.6% medium and 0.4% large. The greatest deviation from this profile is within the IRR, where there is a slight shift away from micro businesses, and a larger proportion of small, medium and large businesses.

3.4 Population demographics

3.4.1 Population density

Population density per hectare across the study area is presented in Figure 27 (Appendix A). As can be seen from the figure, most of the LSOA within the IRR have a relatively high population density, with several pockets of very high population density (more than 125 people per hectare). Outside of the IRR, population density is higher in the vicinity of the major urban centres, such Oldham and Bolton. In general, population density is relatively low at the furthest edges of the Greater Manchester boundary.

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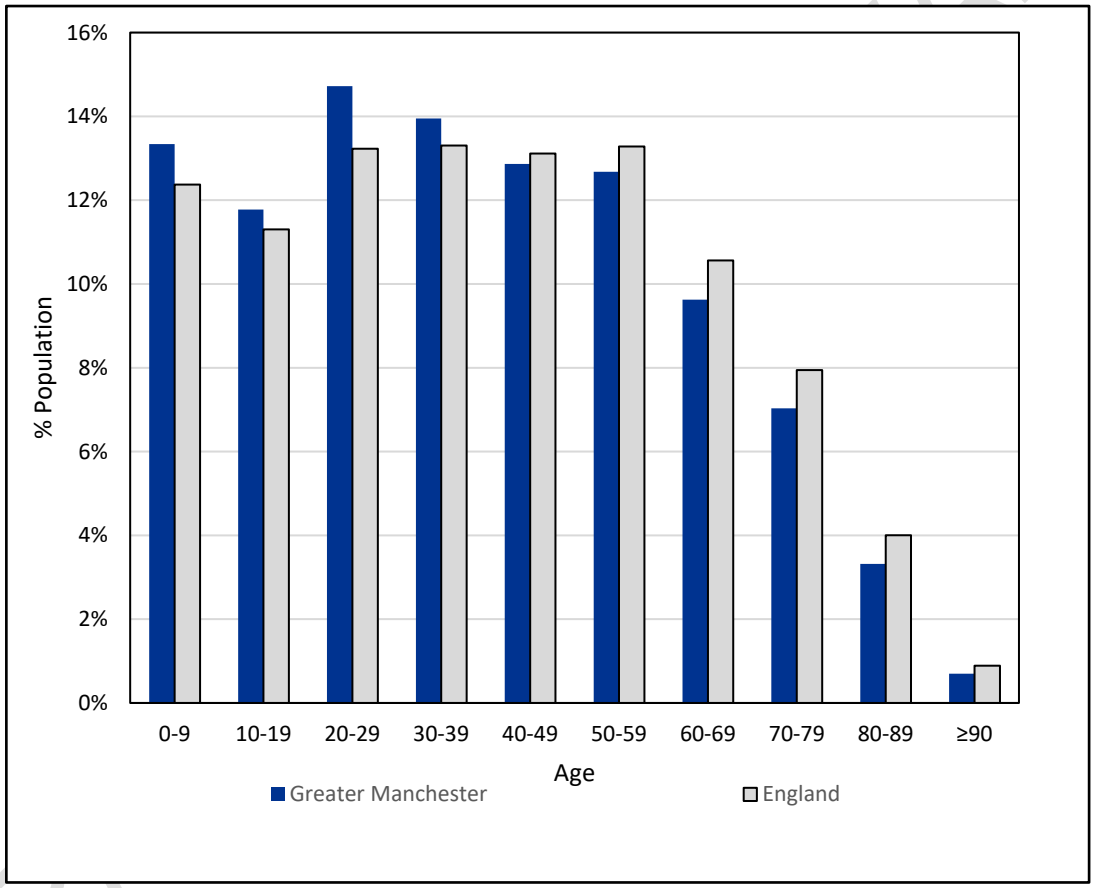
3.4.2 Age profile

Image 3- 1 shows that the population is evenly spread across the different age bands from 20 to 59 for Greater Manchester and England. There are more people in their 20s living in Greater Manchester than the national average (15% compared to 13%). This is also true of the 0-9, 10-19 and the 30-39 age bands, although the difference for these four bands is not more than a couple of percentage points. In all age bands beyond the age of 39, the proportion of people in Greater Manchester is lower than the national average (ONS, 2017e).

Image 3- 1: Age profile of Greater Manchester and England (ONS, 2017e)



3.5 Children

3.5.1 Greater Manchester overview

Within Greater Manchester, there are approximately 565,000 people under the age of 16 (ONS, 2016a). This equates to 20% of the population of Greater Manchester. Table 3- 5 shows the distribution of children under the age of 16 across Greater Manchester compared to England and Wales.

3.5.2 Travel to education

Table 3- 5 shows that in the North West region, more children walk to school (42%) than are driven by an adult (35%).

Table 3- 5: Mode of transport to travel to schools in the North West (DfT, 2017c)

Area	Mode of transport to travel to school			
	Walk	Car	Bus	Other
North West	42%	35%	14%	1%
England	45%	34%	12%	1%

Children, or people with children, may place greater value on the availability of routes closer to home, lower priced fares and higher frequency services than other groups. Increased costs because of a transport intervention could affect the ability of children to travel to school. Image 3- 2 shows that the main mode of travel to education within Greater Manchester between 2013-2015 is by foot followed by passenger in a car/van.

Image 3- 2: Method of travel to school (TfGM Travel Diary Surveys, 2013-2015)

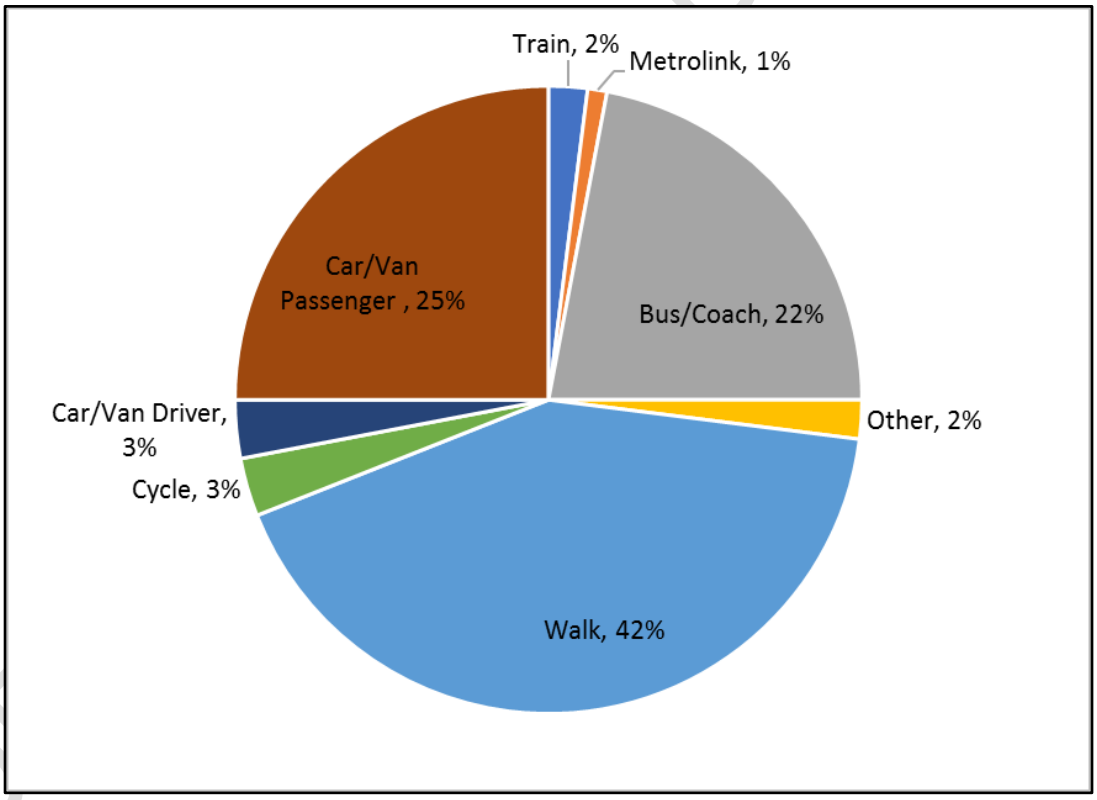


Table 3- 6 shows how the method of travel to education differs between age bands in Greater Manchester. For those in secondary school, college and university, bus or coach is the predominant mode of travel (TfGM, 2017). TfGM fund a Yellow School Bus program to help pupils aged 11 to 16 get to and from several Greater Manchester secondary schools. The cost of a ticket on these services is £1.35 for a single and £2.30 for a return. Weekly tickets can be bought for £7.30. For those aged between five and ten, the predominant form of transport is by foot, followed by passenger in a car/van (TfGM, 2017).

Table 3- 6: Main mode of travel to education by age range (TfGM Travel Diary Surveys, 2013-2015)

Main mode of travel to Education	Age Band					
	5 to 10	11 to 16	17 to 18	19 to 21	22 to 25	26+
Walk	53.5%	29.5%	22.0%	18.8%	18.1%	12.5%
Cycle	0.8%	1.6%	2.4%	10.7%	22.3%	8.3%
Car/Van Driver	0.0%	0.0%	3.1%	10.8%	10.9%	31.0%
Car/Van Passenger	32.7%	18.5%	11.8%	6.5%	8.2%	5.0%
Train	0.1%	0.6%	5.4%	10.5%	6.6%	8.0%
Metrolink	0.7%	2.3%	2.6%	3.2%	0.0%	1.5%
Bus/Coach	11.1%	45.0%	50.7%	36.2%	33.0%	28.4%
Study mainly at home	0.0%	0.0%	0.0%	0.8%	0.9%	1.0%
Other	1.1%	2.5%	2.0%	2.5%	0.0%	3.4%

3.5.3 Special needs schools

Within the Manchester City Council area there are 14 schools for those with special educational needs. Eleven of these are located within the M60 cordon. A further three are located outside of the M60 boundary within Greater Manchester. Of these schools, one organises daily transport to and from the school for its students. The remaining schools rely on the Greater Manchester Travel Co-ordination Unit. This unit is responsible for providing unique travel solutions to children who need extra assistance. They look after 1,100 children per day, using over 250 routes and various travel solutions (Manchester City Council, 2018a). There are no special needs schools located within the IRR.

3.5.4 Youth centres

There are three main youth centres within the Manchester city council region, two of which are located within the M60. A further eight youth clubs are listed on the Manchester City Council website. Whilst most do not provide transport to and from the youth centre, it is assumed that a number of these own or rent minibuses or community transport vehicles for events and activities. Often youth groups such as these are funded either partially or fully by charitable donations. They are therefore unlikely to have cash reserves available to upgrade fleet or afford increasing costs which may be associated with clean air measures.

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3.5.5 Children's hospitals

Greater Manchester is home to Royal Manchester Children's Hospital. This is located on Oxford Road to the south of the IRR. The hospital is easily accessible from several public transport links within the city centre. There is also a free park and ride service in which people can park at dedicated sites and take a free shuttle bus to the hospital. For those with special requirements, there are a range of accessible transport options.

Transport for Sick Children is a registered charity which helps children living within Greater Manchester access essential health care. This includes help for families living in deprivation and those unable to drive. The charity receives funding from the NHS, Clinical Commissioning Groups, small community groups and individuals.

3.6 Elderly

3.6.1 Greater Manchester overview

Within Greater Manchester, there are approximately 411,000 people over the age of 65 (ONS, 2016a). This equates to 15% of the population of Greater Manchester. This is lower than the average for England and Wales of 17.2%. Older people are less likely to drive and more likely to be dependent on public or community transport that offers door to door usage, or lifts from family and friends.

By 2021, Greater Manchester's population is predicted to increase by 3%. The number of people aged over 70 is predicted to increase by 12.5% during the same period.

3.6.2 Community Transport

Greater Manchester offers a wide range of services to help older people and disabled people get access to transport to get around the city. Key services include 'Ring and Ride', a door to door accessible minibus service for people of all ages who find it hard to use public transport and 'Local Link', which offers low-cost flexible transport solutions in areas where public transport is limited or unavailable. Ring and Ride costs up to £3 for those with an over-60 pass, and Local Link costs £2.60 for a single adult journey. Other services include Manchester Community Transport, the largest non-publicly funded community transport operator in Greater Manchester.

3.6.3 Isolation/Loneliness

Age UK identify loneliness as one of the major factors older people worry about (Age UK, 2015). Personal circumstances such as poor health, living alone and lack of support can all contribute to feelings of loneliness which has a secondary effect on a person's wellbeing (ONS, 2015). A study of three English Cities, including parts of Manchester, identified that 16% of older people reported being severely lonely (Scharf et al., 2002). Another study found that 10% of the population aged over 65 are lonely all or most of the time (Victor C., 2011).

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According to the 2011 Census, within Greater Manchester there approximately 211,000 households containing someone aged 65 and over; 64% of these are one-person households. This equates to 12% of the population of the study area living alone.

According to mid-year population estimates, 191,768 people in Greater Manchester are over the age of 75, which constitutes 6.9% of the Greater Manchester population.

3.7 Disability

Under the Equality Act (2010), disability refers to people who have a physical or mental impairment that has a 'substantial' and 'long-term' negative effect on their ability to do normal daily activities. It is recognised that people with disability are less likely to drive and more likely to be dependent on public transport (including taxis and PHVs), community transport that offers door to door usage, or lifts from family and friends.

3.7.1 Greater Manchester overview

Within the study area there are approximately 521,000 people with a long-term health problem or disability (Nomis, 2011d). This equates to approximately 19% of the population of the study area. Amongst these, approximately 264,000 state that their disability limits their day to day activities a lot, and 258,000 state that their disability limits their day to day activities a little (Nomis, 2011d).

3.7.2 Blue Badges

'Blue Badges' are parking badges for disabled people issued by local authorities to individuals and organisations concerned with the care of disabled people. Once a Blue Badge is issued, it remains valid for three years.

In 2017, Greater Manchester issued a total of 47,212 Blue Badges (DfT, 2018). This equated to 49% of the total Blue Badges issued in the North West (DfT, 2018).

Evidence from the London Ultra Low Emission Zone (ULEZ) project suggests that the average age of a blue badge registered petrol vehicle entering the London Congestion Charge Zone was eight years (Jacobs, 2014). In 2011, the average age of a blue badge diesel vehicle was five years.

3.7.3 Wheelchair accessible taxis

As stated above, disabled drivers occasionally require specific vehicles adjusted to their needs. For those who don't drive, there is an increased dependence on wheelchair accessible forms of public transport including taxis and PHVs. PHVs are any vehicle that seats up to eight passengers and are available to hire with a driver. These must be booked with a licensed private hire operator.

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Overall, in 2017, 86% of the total taxis within the Greater Manchester region were accessible to wheelchair users, this is higher than the average for England (58%). Only 1% of the total PHVs in Greater Manchester were wheelchair accessible. Since WAVs are more expensive than standard vehicles, these types of adapted vehicles tend to be kept or leased by their owners for longer than non-adapted vehicles.

3.8 Low Income Households

The Index of Multiple Deprivation (IMD) provides a measure of relative deprivation across England. The deprivation ranking refers to the population weighted average of the combined ranks for the LSOAs in each district.

Income deprivation is one of seven domains of deprivation. Measures of income deprivation are concerned with people on low incomes who are in receipt of benefits and tax credits (DfT, 2015). It is not an absolute measure of household income and therefore it does not reflect household income in a given area, nor does it cover the distribution of that income across its resident population. Whilst it effectively captures concentrations of low income households it does not identify areas of affluence. For example, an area with a relatively small proportion of people on low incomes may also have relatively few or no people on high incomes (DfT, 2015).

3.8.1 Greater Manchester overview

Greater Manchester contains 348 of the 3,284 top 10% most deprived LSOA's in England. This equates to just over one fifth of Greater Manchester's LSOAs in the 10% most deprived in the country. Within Manchester city council, 18 LSOAs are within the top 1% most deprived nationally. Within the IRR, 53% of the LSOAs fall within the top 30% most deprived in the country.

Two figures have been produced to show the distribution of income deprivation across Greater Manchester; Figure 5 (Appendix A) maps income deprivation based on the distribution of income deprivation across the whole of England and Wales. Figure 6 (Appendix A) is reflective of the distribution of income deprivation across Greater Manchester.

Figure 5 (Appendix A) shows that the greatest levels of deprivation are focused around Manchester city centre, and districts located to the centre and north of GM including: Rochdale, Bury, Wigan, Oldham and Salford. These areas fall within the first quintile of income deprivation on a national scale. To the south of Greater Manchester, Wythenshawe and the residential area near Manchester Airport are also shown to display high levels of income deprivation within the first quintile.

Figure 6 (Appendix A) shows that the greatest levels of deprivation are concentrated around Manchester city centre/Salford and districts to the north of Greater Manchester including: Bolton, Rochdale and Oldham. Pockets of deprivation are also evident in Wythenshawe and Wigan. The greatest levels of deprivation within Manchester city centre are located between the IRR and M60 with areas within the IRR itself displaying relatively low levels of income deprivation.

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3.8.2 Car/van availability

Table 3- 7 shows household car/van availability in Greater Manchester. This data includes company cars and vans that are available for private use. It does not include motorbikes, scooters or any cars or vans belonging to visitors. The table shows that within Greater Manchester, most households (43%) have one car or van per household. Within the M60, most households have either no car/van (40%) or one car/van per household (42%). Once within the IRR, most households have no car/van (59%) (Nomis, 2011a).

Table 3- 7: Household car/van availability in Greater Manchester (Nomis, 2011a)

	Greater Manchester		Within M60		Within IRR	
	Total number of households	**% of households**	**Total number of households**	**% of households**	**Total number of households**	**% of households**
No cars or vans in household	345,000	31%	134,000	40%	7,500	59%
1 car of van in household	482,000	43%	139,000	42%	4,500	35%
2 car or van in household	245,000	22%	50,000	15%	700	5%
3 car or van in household	44,000	4%	8,000	2%	69	1%
4+ car or van in household	12,000	1%	2,000	1%	14	0%

3.9 Gender

This section looks at gender differences that could potentially drive distributional effects on men or on women, i.e. where differences in travel patterns between men and women could result in differential impacts between the two groups. For example, personal safety on public transport is more of a concern for women than for men, particularly when travelling at night (TfL, 2016; Sustrans, 2018).

The total number of women within the study area is approximately 1,400,000; this equates to approximately 20,000 more women than men (ONS, 2016a). Figure 10 (Appendix A) shows the distribution of the female population across the study area compared to the distribution of females across England and Wales.

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3.9.1 Employment and the gender pay gap

Table 3- 8 presents the gender pay gap for all occupations in the UK in 2017. In every occupation category women, were on average paid less per hour for the same occupation than men. This difference was greatest in 'Chief Executive and Senior Official' occupations where women are paid on average £12.24 per hour less than men. The occupation with the closest average hourly pay was found in the 'Caring, Leisure and Other Service' occupations, where women earn on average 39p less than their male counterparts (Nomis, 2017a).

Table 3- 8: Difference in median gross hourly pay between men and women, UK (Nomis, 2017a)

Occupation	Median gross hourly pay (excluding overtime)		
	Male (£)	Female (£)	Gender Pay Gap
Chief Executives and Senior Officials	47.40	35.16	12.24
Managers and Directors	23.18	19.99	3.19
Other Managers & Proprietors	14.65	13.57	1.08
Professional Occupations	21.29	19.08	2.21
Associate Professional and Technical Occupations	16.48	14.11	2.37
Administrative and Secretarial Occupations	11.51	10.49	1.02
Skilled Trades Occupations	12.15	8.84	3.31
Caring, Leisure and Other Service Occupations	9.41	9.02	0.39
Sales and Customer Service Occupations	8.76	8.29	0.47
Process, Plant and Machine Operatives	10.50	8.49	2.01
Elementary Occupations	8.63	7.83	0.80

The TfGM Gender Pay Gap report found that there was a difference of 11.3% in the hourly average rate of pay between men and women (TfGM, 2018). This suggests that Manchester and other large cities in the UK may experience a similar pattern to the UK, with men on average earning more than women across different occupations. As men on average are earning more, this may influence their choice of transport around the city. They may choose to use more expensive modes of transport compared to women, e.g. a taxi instead of a bus.

Table 3- 9 shows that both men and women chose to drive on most trips. However, more women tend to be passengers than men. Marginally more women chose to walk (26.9%) on trips compared to men (25.3%), whereas more men choose to cycle (2.5%) than women (0.9%).

Table 3- 9: Average number of trips by mode of transport for men and women in the UK (DfT, 2017b)

Main mode	Average trips per person per year			
	Male	Percent	Female	Percent
Walk	240	25.3%	269	26.9%
Bicycle	24	2.5%	9	0.9%
Car/van driver	412	43.5%	369	36.9%
Car/van passenger	162	17.1%	245	24.5%
Other private transport	7	0.8%	5	0.5%
Local and non-local buses	34	3.6%	43	4.3%
Rail	24	2.5%	18	1.8%
Taxi/minicab	8	0.8%	10	1.0%
Other public transport	4	0.4%	4	0.4%

3.9.2 Modes of transport

The National Transport Survey found that in 2017, women made six times more trips than men, but men travelled 16% further. In general, the survey found that women make more trips for shopping and the 'school run', which tend to be relatively short, whereas men make more commuting trips. For trips made by car, men made a higher share of trips as driver (44%) compared to women (37%) (DfT, 2017i).

DfT data from 2017 shows that women are slightly more likely to use taxis and PHVs than men (DfT, 2017). Due to concerns over safety, it is anticipated that women travelling into the city centre during anti-social hours for work or social purposes are likely to use taxis.

Transport for London (TfL) conducted a study of late night travel options looking at the use of un-booked minicabs (i.e. those minicabs that are not pre-booked) and perceptions towards un-booked minicabs. It was identified that one of the main reasons women chose this method of transport was due to a lack of available alternatives (TfL, 2016). The use of buses as an alternative transport mode has been steadily decreasing while the number of women choosing to walk from venues to their next destination has increased. In large urban area such as Manchester, walking is also likely to be a popular method of transport. Safety concerns were also highlighted as a key factor in discouraging women from un-booked minicabs.

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3.9.3 Religion

Figures from the 2011 Census show that 73% of the population of Greater Manchester have some religious affiliation. The main religions/beliefs in Greater Manchester are Christian (62%) and Muslim (9%), followed by Jewish (1%) and Hindu (1%). Within the IRR, the main religions/beliefs are Christian (73%) followed by no religion (17%), those who have not stated a religion (6%) and Muslim (3%) (Nomis, 2011b).

As illustrated in Figure 18 (Appendix A), there are 541 religious sites across Greater Manchester. This includes registered places of worship, church halls and religious communities. 186 of these are located within the M60 boundary and six are registered within the IRR. Key religious centres within Greater Manchester include the Jewish community located in Broughton, Salford, which is now the second largest Orthodox Jewish community in the UK. This is situated within the M60 to the North of Manchester centre.

Muslim communities are centred around the areas of Rusholme and Fallowfield towards the South of the city centre. This includes Manchester Islamic Centre located just outside the IRR between the main university campuses in Manchester. This centre holds over 30 religious and educational programs and conferences annually, attracting visitors from across Manchester and the UK. Similarly, this area is home to several Mosques including Shahjalal Mosque and Islamic Centre, Manchester Central Mosque and Shahporan Mosque.

To the north of the city centre, Manchester Buddhist centre is home to a large Triratna Buddhist community with a small residential community. Manchester city centre is also home to Manchester Reform Synagogue, attracting a large Jewish community.

3.10 Ethnicity

The Black, Asian and Minority Ethnic (BAME) community encompasses all those of non-white decent. For the purposes of this study, BAME communities are defined as those who identify as Asian, Black or Minority Ethnic.

Within Greater Manchester, high concentrations of BAME communities reside around the main centres of Bolton, Bury, Rochdale, Oldham and Ashton-Under-Lyne. Similarly, within the centre of Manchester, there are large numbers of BAME residents located to the north towards Broughton and to the south and south east in Old Trafford, Hulme and Ardwick. The distribution of BAME residents compared to the distribution across England and Wales is shown in Figure 11 (Appendix A).

Overall, the proportion of White residents in Greater Manchester has decreased from 81% in 2001 to 67% in 2011. This compares to a national average in 2011 of 85%, and an average of 90% for the North West region.

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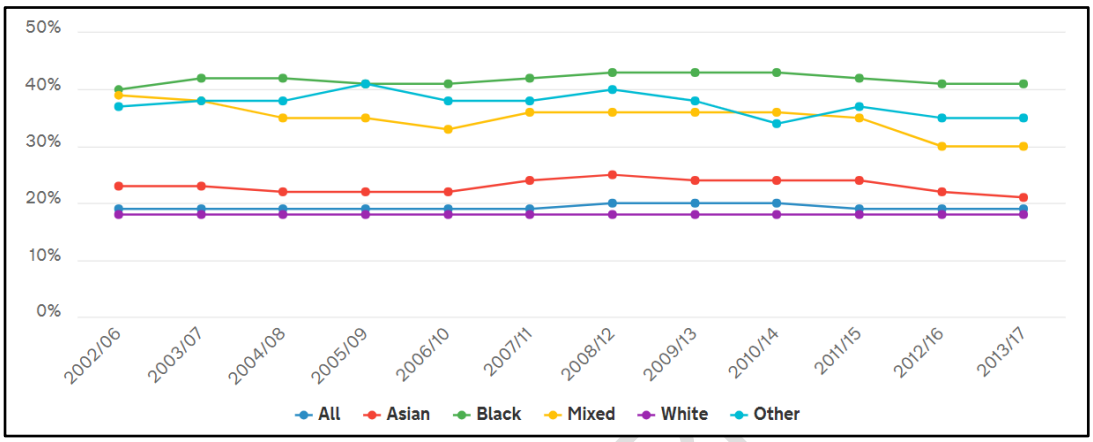
3.10.1 Access to a car/van by ethnic group

Image 3- 3 shows the percentage of people aged 17 and over with no access to a car or van, by ethnicity, between 2002 and 2017.

Image 3- 3: Percentage of people aged 17 and over with no access to a car or van, by ethnicity over time (DfT, 2017)



The graph shows that in every period from 2002/6 to 2013/17, White people were more likely to live in a household with access to a car or van than any other ethnic group. The graph also shows that Black people were most likely to have no access to a car or van out of all ethnic groups (at 41%), followed by people from the Other ethnic group (at 35%), people with Mixed ethnicity (at 30%), Asian people (at 21%), and White people (at 18%). For most groups, this figure has remained broadly similar since the 2002/06 figure.

3.10.2 Travel patterns by ethnic groups

The list below provides a brief overview of travel trends from the National Travel Survey (2017):

- In the period from 2013 to 2017, White people travelled the greatest distance and made the most trips and Black people travelled the smallest distance and made the fewest trips (DfT, 2017i).
- 79% of the distance travelled by White people was by car or van, compared to 54% of the distance travelled by Black people (DfT, 2017i)
- Black people were most likely to have no access to a car or van out of all ethnic groups (41%), followed by people from the Other ethnic group (35%), people with Mixed ethnicity (30%), Asian people (21%), and White people (18%) (DfT, 2017i).
- Between 2013 to 2017, White people made the highest percentage of trips by car or van out of all ethnic groups (64%), while Black people made the lowest percentage of trips by car or van (40%) (DfT, 2017i).
- Black people made the highest percentage of trips by local bus out of all ethnic groups (21%) (DfT, 2017i).

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3.11 Health

3.11.1 Health in the UK

Daily physical activity is hugely important for maintaining health (Department of Health, 2011), and inactivity directly contributes towards one in six deaths in the UK (Lee et al., 2012). It is estimated that physical inactivity costs the UK approximately £7.4 billion per year when the impact on NHS, social care, sickness absence from work and other factors are considered (PHE, 2016). The costs to business of absenteeism and presenteeism (working whilst sick can cause productivity loss and further poor health) are significant. In 2014, the cost of absences was approximately £14 billion (Confederation of British Industry/Pfizer, 2013), of which approximately £5 billion can be attributed to physical inactivity (Sustrans, 2017). The costs of presenteeism may be even more (Centre for Mental Health, 2011).

High traffic volumes and speeds can reduce opportunities for positive contacts with other residents in a neighbourhood, contributing towards increased social isolation and reduced community cohesion (Appleyard, 1981; Hart and Parkhurst, 2011). Individuals who are socially isolated are more likely to make use of public services due to lack of support networks and have increased likelihood of developing certain health conditions such as depression and dementia (Social Finance, 2015). They are also more likely to be physically inactive (Social Finance, 2015), which is again linked to increased likelihood of developing certain diseases as discussed above. People experiencing high levels of social isolation have significantly higher mortality levels than those with low or average levels of isolation (Steptoe et al., 2013). It has been estimated that better community cohesion could save the UK around £530 million per year (Public Health England (PHE), 2017).

3.11.2 Health in Greater Manchester

Greater Manchester has significant health inequalities across the region (GMCA, 2017b). For example, in Manchester city council, LE is 8.1 years lower for men and 7.0 years lower for women in the most deprived areas than in the least deprived areas (PHE, 2018c). Similarly, figures show that there are 3.5 times as many premature deaths (deaths under the age of 75) in the most deprived parts of Manchester (primarily in the north east of the city and in parts of Wythenshawe) compared with the least deprived parts (Manchester City Council, 2018).

Table 3- 10 shows how Greater Manchester compares to the North West and England average across a broad range of health indicators. The table shows that overall, Greater Manchester performs worse than the England average for all indicators except statutory homelessness, diagnoses of dementia, diabetes and cancer, and the number of residents killed and seriously injured on the roads.

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Table 3- 10: PHE health profile summary[9] (PHE, 2018)

	Year	England	North West	GMCA
LE at birth (Male)	2014 - 16	79.5	78.2	77.8
LE at birth (Female)	2014 - 16	83.1	81.7	81.3
Under 75 mortality rates: all causes	2014 - 16	334	394	415
Under 75 mortality rates: cardiovascular	2014 - 16	73.5	87.8	97.3
Under 75 mortality rates: cancer	2014 - 16	136.8	151.4	157.3
Suicide rate	2014 - 16	9.9	11	10.5
Killed and seriously injured on roads	2014 - 16	39.7	39.8	24.8
Hospital stays for self-harm	2016/17	185.3	231.2	207.1
Hip fractures in older people (aged 65+)	2016/17	575	612	631
Cancer diagnosed at early stage	2016	52.6	51.9	54.3
Diabetes diagnoses (aged 17+)	2017	77.1	81	-
Dementia diagnoses (aged 65+)	2018	67.5	72.2	76.3
Alcohol-specific hospital stays (under 18s)	2014/15 - 16/17	34.2	49.6	48
Alcohol-related harm hospital stays	2016/17	636	719	679
Smoking prevalence in adults (aged 18+)	2017	14.9	16.1	17.5
Physically active adults (aged 19+)	2016/17	66	65.1	64.6
Excess weight in adults (aged 18+)	2016/17	61.3	63.6	63.3
Under 18 conceptions	2016	18.8	22.3	22.3
Smoking status at time of delivery	2016/17	10.7	13.4	12.5
Breastfeeding initiation	2016/17	74.5	64.5	66.3[10]
Infant mortality rate	2014 - 16	3.9	4.5	4.7
Obese children (aged 10-11)	2016/17	20	20.8	21.6
Deprivation score (IMD 2015)	2015	21.8	-	-
Smoking prevalence: routine and manual occupations	2017	25.7	26	28.8
Children in low income families (under 16s)	2015	16.8	18.7	20.1
GCSEs achieved	2015/16	57.8	56.6	56.1
Employment rate (aged 16-64)	2016/17	74.4	71.8	70.6
Statutory homelessness	2016/17	0.8	1.1	0
Violent crime (violence offences)	2016/17	20	21.2	24.3
Excess winter deaths	2013-2016	17.9	18	17.7
New sexually transmitted infections	2017	794	718	802
New cases of tuberculosis	2014 - 16	10.9	8.4	13.8[11]

[9] Orange cells reflect health outcomes which are worse than the England average. Green cells reflect health outcomes which are better than the England average. White cells reflect areas in which there is no data available.

[10] This number is aggregated from all known lower geography values.

[11] This number is aggregated from all known lower geography values.

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In 2016, the Health and Social Care Partnership produced the Devolution Difference, which aims to improve health and social care within the communities of Greater Manchester (GMCA, 2016b). Measures include:

- Helping 115,000 smokers quit over the next three years;
- Spending £74 m on child and adolescent mental health;
- Spending a further £50 m on adult mental health services; and
- Spotting and treating dementia quicker.

Greater Manchester also runs a programme for dementia care called 'Dementia United'. Current estimates suggest that by 2021, there will be 34,973 people living with dementia in Greater Manchester. Nearly, a third of these people have severe symptoms requiring 24-hour care. Currently Greater Manchester spends £221m a per year on dementia across health and social care. In 2016, the dementia diagnosis rate was 87.13%. Predictions suggest spending on dementia would rise to £320m a year with more accurate diagnosis (GMCA, 2015).

Similarly, there are 3,981 people in Greater Manchester in contact with mental health services for every 100,000 of the population, compared to 2,176 nationally. This is often tied into a wider set of issues for families for example, 18% of secondary care patients in Manchester city council are not in stable accommodation. Currently, people with chronic mental health illnesses in Greater Manchester are likely to die 15 years earlier than people in other areas (Greater Manchester Health and Social Care Partnership, 2016). Greater Manchester's Mental Health Strategy works to address issues identified across the region.

Table 3- 11 outlines how Greater Manchester compares to the England average for respiratory and heart disease related health outcomes. The table shows that overall, Greater Manchester performs worse than the England average. In 2016/17, prevalence of COPD amongst Greater Manchester residents was 2.3%, higher than the England prevalence rate of 1.9%. Similarly, the total number of COPD admissions in Greater Manchester is 2.84 (per 1,000 population), higher than the average for England of 2.15 (PHE, 2018).

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Table 3- 11: Respiratory and heart disease related health outcomes (PHE, 2018).

	England	Greater Manchester
Under 75 mortality rates from respiratory disease (per 100,000 population)	33.8	47.5
COPD prevalence	1.9%	2.3%
COPD admissions (per 1,000 population)	2.15	2.84
Deaths from COPD (per 100,000 population)	52.2	72.1
Hospital admissions for asthma (under 19) (per 100,000 population)	202.8	301.5
Under 75 mortality rate from heart disease (per 100,000 population)	39.4	56.2

3.12 Economy

Business size is a key factor that would determine how businesses are affected by charges associated with the implementation of clean air measures. Businesses with lower number of employees, especially micro, small and medium size enterprises have less capacity to adapt to financial pressures linked to clean air measures. Larger businesses tend to be more resilient since they have more resources and can spread any costs incurred over a larger customer base. Smaller businesses tend to be less resilient to a shifting economic landscape due to limited options to diversify or increase productivity and fewer cash reserves.

The following section describes the economic context of the study area, including the location and sector of operation of small medium enterprises (SMEs), employment statistics and travel to work patterns. SMEs are micro, small and medium sized enterprises (SMEs) which employ fewer than 250 persons. SME's represent 99% of all businesses in the European Union (EU) (European Commission, 2018).

3.12.1 Economic context

The Greater Manchester economy generates £56 billion of Gross Value Added (GVA) on an annual basis. This is higher than the GVA of the North East (£46 billion), West Yorkshire (£46 billion), and accounts for nearly 40% of the total GVA in the North West (ONS, 2017a). The Greater Manchester Forecasting Model (GMFM), produced by Oxford Economics, benchmarks the anticipated level of growth of the Greater Manchester economy (GMCA, 2017c). This forecast shows GVA growing at 1.7% per annum up to 2035.

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3.12.2 Economic activity

Table 3- 12 presents the economic activity of people in the three key study areas (Nomis, 2011g). Levels of unemployment and retirement are lowest within the IRR at 2% and 1% respectively.

Table 3- 12: Economic activity (Nomis, 2011g)

Study areas	Economically active (%)	Part-time employment (%)	Full-time employment (%)	Unemployed (%)	Retired (%)
Within the IRR	60%	3%	36%	2%	1%
Within the M60	65%	11%	35%	5%	9%
Greater Manchester	68%	13%	38%	5%	13%

3.12.3 Business counts

As set out in Table 3- 4, there are approximately 124,000 businesses in Greater Manchester. Table 3- 4 presents the number of businesses within Greater Manchester, the M60 and the IRR by size. Most of businesses within the three study areas are micro i.e. they have fewer than ten employees. As you move inside the IRR the proportion of medium and large businesses increase. However, within the IRR, the majority (96.1%) of the businesses are either micro or small (Nomis, 2018).

3.12.4 SMEs

Table 3- 13 presents the number of SMEs by industry in the key study areas. The largest number of SMEs within the M60 are professional, scientific & technical businesses (17%), closely followed by retail (16%). The industries that are most likely to be reliant upon LGVs and HGVs are retail, wholesale and transport & storage, constituting 25% of businesses with the M60 and 37% of businesses within the IRR. Within the IRR, most SMEs are within the retail industry (33%), then the professional, scientific & technical industry (22%). Of the total businesses within Greater Manchester 87% are SMEs, this decreases to 84.7% within the M60 and 78.8% within the IRR (Nomis, 2017b).

Table 3- 13: SMEs by industry in key study areas (Nomis, 2017b)

Industry	Greater Manchester		Within the M60		Within the IRR	
	Count	%	Count	%	Count	%
Agriculture, forestry & fishing	695	1%	50	0%	5	0%

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Industry	Greater Manchester		Within the M60		Within the IRR	
	Count	%	Count	%	Count	%
Mining, quarrying & utilities	465	0%	170	0%	40	0%
Manufacturing	5,640	6%	1,420	4%	150	2%
Construction	10,885	11%	2,870	8%	435	5%
Motor trades	2,985	3%	710	2%	35	0%
Wholesale	4,995	5%	1,945	5%	225	2%
Retail	11,105	11%	5,785	16%	3,065	33%
Transport & storage	5,285	5%	1,445	4%	140	2%
Accommodation & food services	5,545	6%	1,970	5%	495	5%
Information & communication	6,595	7%	2,710	7%	580	6%
Financial & insurance	3,280	3%	1,910	5%	260	3%
Property	3,875	4%	1,770	5%	420	5%
Professional, scientific & technical	16,725	17%	6,290	17%	2,000	22%
Business administration & support services	8,825	9%	2,950	8%	600	7%
Public administration & defence	15	0%	0	0%	0	0%
Education	1,545	2%	580	2%	105	1%
Health	5,630	6%	1,950	5%	180	2%
Arts, entertainment, recreation & other services	5,985	6%	1,870	5%	405	4%
Total	**100,090**	**100%**	**36,410**	**100%**	**9,150**	**100%**

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3.12.5 Business Turnover

Table 3- 14 shows the number of businesses within each turnover size band. Across all key study areas, the majority of businesses (25-30%) sit within the £50,000-£199,000 a year turnover band. Within the IRR, approximately 19% of businesses are in the lowest turnover bracket of £0-£49,000 a year. Figure 25 (Appendix A) shows the locations of SMEs with a turnover of less than £200,000 per annum. The map shows that some of these businesses are located within the IRR. There is also a high concentration of SMEs with

this level of annual turnover within the Trafford Park retail area. Figure 26 (Appendix A) shows the locations of SMEs with a turnover of greater than £1 million per annum. The map also shows high concentrations of businesses in this category within the IRR.

Table 3- 14: Greater Manchester business counts by turnover size band (Nomis, 2017b)

Turnover band	Greater Manchester		Within M60		Within IRR	
0 to 49 (thousand £)	16,475	16%	6,785	19%	1,730	19%
50 to 99 (thousand £)	26,060	26%	9,200	25%	2380	26%
100 to 199 (thousand £)	29,960	30%	10,345	28%	2,400	26%
200 to 499 (thousand £)	11,720	12%	4,150	11%	1,005	11%
500 to 999 (thousand £)	6,995	7%	2,570	7%	705	8%
1,000 to 1,999 (thousand £)	3,965	4%	1,510	4%	395	4%
2,000 to 4,999 (thousand £)	2,955	3%	1,145	3%	335	4%
5,000 to 9,999 (thousand £)	1,165	1%	410	1%	110	1%
10,000 to 49,999 (thousand £)	925	1%	350	1%	105	1%
50,000+ (thousand £)	285	0%	95	0%	40	0%

3.12.6 Growth of enterprises and business innovation

Greater Manchester has two enterprise zones. One zone is located near Manchester Airport - Airport City Manchester. It totals 5 million sq. ft. once completed, will be filled with offices, hotels, advanced manufacturing, logistics facilities, hybrid and ancillary retail space. It has a total development value of £1billion (Airport City, 2018). This enterprise zone is expected to be popular with start-ups who will attract foreign customers due to the close location to Manchester Airport.

The second enterprise zone is located within the M60 – the Corridor Manchester Enterprise Zone. This comprises Manchester Science Park and Citylabs campuses. Health Innovation Manchester (a partnership with academia, industry and the NHS) plan to expand Citylabs to create a world-leading precision medicine campus. The project could support 1,500 jobs whilst also adding almost £150m to Manchester's economy over a decade (Health Innovation Manchester, 2018).

The Business Growth Hub supports different businesses at all stages of their journey, partially funded by the European Regional Development Fund. It currently supports 8,642 businesses across Greater Manchester with £166.9million secured in funding (Business Growth Hub, 2018).

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In total, there are 2,043 companies providing environmental goods and services in Greater Manchester (Green Growth, 2018). Between 2012 and 2013, the green technology and service sectors in Greater Manchester assisted 13,594 businesses and created and safeguarded 8,314 jobs (Green Growth, 2018). In the same period, the low carbon and environmental goods services employed 38,000 people.

3.12.7 Business sectors

The location of key business sectors is also a key consideration when assessing the impact of clean air measures. It is assumed that business sectors that are heavily reliant on LGVs and HGVs, such as retail, wholesale and transport & storage, are likely to be more greatly impacted by clean air measures.

Outside of London, Greater Manchester is the UK's main centre for business, financial and professional services. This sector employs 324,000 and is expected to account for up to half of net additional job creation in Greater Manchester in the period to 2035 (totalling +88,800). The wholesale and retail trade is currently the largest employer in Greater Manchester. Similarly, the study area has the largest creative and digital clusters in the UK, employing 63,500 people and generating GVA of £3.1 billion each year. Key assets include MediaCity UK (home of the BBC and ITV) and The Sharp Project.

Within the M60 boundary, employees are evenly split across three industries: professional, scientific & technical (12.1%), business administration & support services (12.6%), and health (11.5%). Once inside the IRR, the professional, scientific and technical industry and the business administration and support sectors employ the greatest number of people (Nomis, 2016).

3.12.8 Visitor Economy

There are approximately 1.5 million international visitors to Greater Manchester each year making it the third most popular city for international visits after London and Edinburgh. A 2014 leisure visitor survey found that 42% of visitors were on a staying visit while 58% were day visitors to Greater Manchester. Within Manchester city centre this changed to 45% staying and 55% visiting during the day (Marketing Manchester, 2014).

According to STEAM, Greater Manchester's tourism sector is worth £7.9 billion and supports 94,000 jobs (Marketing Manchester, 2016a). Top attractions in Greater Manchester include The Lowry, the Museum of Science and Industry, Manchester Art Gallery, the National Football Museum and Manchester Museum. Manchester airport is also a key transport hub that continues to grow year on year handling close to 28 million passengers in 2017, up 8.5% from 2016 figures (Manchester Airport Group, 2018).

Table 3- 15 presents the top visitor attractions in Greater Manchester and the visitor number at these attractions in 2016.

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Table 3- 15: Top Visitor Attractions and their Visitor Numbers in Greater Manchester (Marketing Manchester, 2016a)

Visitor Attraction	Visitor Number	Parking available (paid / free)	Coach parking available
The Lowry Theatre	846,097	On street	No
HOME	837,621	Discounted Q-Park	No
Museum of Science and Industry	651,473	No	No
Manchester Art Gallery	593,168	NCP car park nearby	No – only drop off
National Football Museum	481,541	Discounted Q-Park	No
Manchester Museum	406,997	Paid	No
Bolton Museum, Aquarium and Archive	354,653	NCP	No
Runway Visitor Park	338,450	Paid	Yes - fee
The Whitworth	321,269	On street parking	No
Manchester United Museum and Tour Centre	313,812	Free	No
Dunham Massey	285,637	Paid (free for members)	No
IWM North	281,919	Paid	Yes - fee
The John Ryland's Library	242,892	On street/NCP	No
East Lancashire Railway & Bury Transport Museum	201,916	On street	Yes - restricted
Manchester Cathedral	176,704	Discounted Q-Park	No
Portland Basin Museum	114,207	Free	No
Gallery Oldham	110,491	On street	No
Salford Museum & Art Gallery	104,701	Paid	No
People's History Museum	93,404	On street	No- only drop off

Most of these attractions ask that coaches do not park outside the attraction to avoid congestion. They suggest parking around the venue or in coach parking which is provided across the city.

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A 2014 survey found that within Greater Manchester there were a higher number of incidences where visitors travelled with their family or with groups of friends (Marketing Manchester, 2014). Many of those that said they were travelling with a group of friends said they were attending a theatre show. Theatres within the IRR include the Palace Theatre and the Royal Exchange Theatre.

Other attractions/venues that may attract visitors include:

- The Bridgewater Hall;
- Hilton Manchester;
- Radisson Blue Hotel;
- Manchester Opera House;
- Albert Hall;
- Manchester Conference Centre;
- The University of Manchester Conferences and Venues;
- Princess St. Hotel;
- Midland Hotel;
- Manchester Marriott Victoria & Albert Hotel; and
- Manchester Coach Station.

Conferences and business events generate business through the hiring of the venue and accommodation bookings for conference attendees. A study showed that in 2015 4.5million delegates were hosted in Greater Manchester, with 1.9million of these staying overnight. These delegates were likely staying in central Manchester hotels close to the large conference centres (Marketing Manchester, 2016b). At the end of 2017 there were 9,350 accommodation rooms in Manchester City Centre. This includes rooms in hotels, B&Bs, self-catering units and serviced apartments. These are the most likely to be used by delegates using the Manchester Conference Centre due to the close location. The accommodation room count is expected to grow to 10,540 in 2018 (Marketing Manchester, 2018).

Manchester City Council provides coach parking within the IRR to allow coaches to pick up and drop off visitors close to city centre attractions. There is coach parking for short stays (20mins), medium stays (4 hours) and long stays (including overnight). In 2018, there are currently 5 short stay stands with 9 parking bays; 9 medium stay stands with 36 parking bays; and 3 long stay and overnight stands (Visit Manchester, 2018).

3.12.9 Night Time Economy in Manchester

In June 2018, Andy Burnham appointed Greater Manchester's first-ever night-time economy adviser. The role of the advisor will be to champion Greater Manchester's thriving nightlife and set out plans to ensure people on a night out can have a safe and enjoyable time.

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In addition to the leisure and retail aspects of the Night Time Economy, the ONS defines the Night Time Economy as industry sectors that operate in the evening or night, although they may also operate during the daytime. These sectors have been identified using the Standard Industrial Classification (SIC) and include various types of accommodation and food services, retail, leisure, agriculture, manufacturing, health and social care, passenger transport, freight, storage, call centres, publishing and motion picture industries.

Data has been published by the ONS detailing the Night Time Economy in London and Manchester from 2001 to 2017 (ONS, 2018b). This is user-requested data, rather than a regular statistical publication.

In total, 43 sectors with 3-digit SIC codes have been deemed to be within the Night Time Economy, and have been mapped to four Night Time Economy categories:

- Cultural and leisure activities;
- Activities which support night time cultural and leisure activities;
- 24-hour health and personal social services; and
- Activities which support wider social and economic activities.

ONS data for the Night Time Economy in Manchester includes information on:

- The number of workplaces in the Night Time Economy by Manchester metropolitan districts and by middle super output area (MSOA), 2001 to 2017;
- The number of employees in the Night Time Economy by Manchester metropolitan districts, 2001-2017; and
- The percentages and numbers of Night Time Economy employee jobs in Greater Manchester paid less than the UK Living Wage, 2017.

3.12.10 Night Time Employment

In 2017, there were 27,070 workplaces in the Night Time Economy in Greater Manchester, a 11% increase from 2016. This is equivalent to 414,400 employees in the Night Time Economy in Greater Manchester in 2017.

Table 3- 16 shows the number of workplaces in the Night Time Economy in Greater Manchester broken down by the Night Time Economy Sub-category. In Greater Manchester, cultural and leisure activities account for a slightly higher share of the total Night Time Economy (37%) than at a national level (35%), along with 24-hour health and personal social services (13% and 10%, respectively). In contrast, activities which support wider social and economic activities account for 38% of the Night Time Economy in Greater Manchester, compared with 43% at a UK level.

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Table 3- 16: The number of workplaces in the Night Time Economy in Greater Manchester by Night Time Economy Category, 2016 and 2017 (ONS, 2018b)

Night Time Economy Category	2016	2017	Change 2016 to 2017	Share of Night Time Economy, 2017
Cultural and leisure activities	9,645	9,990	4%	37%
Activities which support night time cultural and leisure activities	3,320	3,315	0%	12%
24-hour health and personal social services	3,075	3,435	12%	13%
Activities which support wider social and economic activities	8,340	10,330	24%	38%
Total	**24,380**	**27,070**	**11%**	

The ONS also publishes data on the number and percentage of jobs in the Night Time Economy which are paid less than the UK Living Wage, which was £8.45 in 2017 (ONS, 2017d).

Across any industry or occupation, almost 22% of employee jobs in Greater Manchester were paid less than the UK Living Wage. Across all Night Time Economy categories, this figure was higher at 30%; however, there was a significant variation across the individual Night Time Economy categories. More than half (55%) of employee jobs in the cultural and leisure activities sector were paid below the UK Living Wage in 2017, while the proportion was just 17% for 24-hour health and personal social services; the proportion was 44% for activities which support night time cultural and leisure activities, and almost 19% for activities which support wider social and economic activities.

There is a difference between the proportion of full-time and part-time employee jobs which are paid less than the UK Living Wage; around 14% of all full-time employee jobs in Greater Manchester are paid less than the UK Living Wage, compared with around 44% of part-time employee jobs. Across the Night Time Economy categories, the proportion for part-time employee jobs ranges from almost 74% for the cultural leisure activities category to around 27% for 24-hour health and personal social services.

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Table 3- 17: Percentage of Night Time Economy employee jobs in Greater Manchester paid less than the UK Living Wage, held by those aged 18 or over, part-time and full-time, 2017 (ONS, 2017d)

Night Time Economy Category	All employees, percentage of jobs		
	Total	Full-time	Part-time
Cultural and leisure activities	55.4	35.7	73.9
Activities which support night time cultural and leisure activities	44.0	24.2	67.8
24-hour health and personal social services	16.8	13.0	27.3
Activities which support wider social and economic activities	18.8	14.7	39.0
Any Night Time Economy Category	29.5	18.3	52.6
All other industries	17.7	11.6	38.2
Total any industry or occupation	21.8	13.7	44.4

The proportion of employee jobs paid less than the UK Living Wage in the Night Time Economy varies by gender, with approximately 26% of male employees in Greater Manchester earning less than the UK Living Wage compared with 33% of female employees. For male employees, there is a greater difference between the proportion of full-time (17%) and part-time (61%) employee jobs in the Night Time Economy sector paid less than the UK Living Wage, compared with females (20% and 49%, respectively).

Table 3- 18: Percentage of Night Time Economy employee jobs in Greater Manchester paid less than the UK Living Wage, male and female, full-time and part-time, 2017 (ONS, 2017d)

Night Time Economy Category	Males employees, percentage of jobs			Female employees, percentage of jobs		
	Total	Full-time	Part-time	Total	Full-time	Part-time
Cultural and leisure activities	47.2%	28.8%	73.9%	64.5%	48.0%	73.9%
Activities which support night time cultural and leisure activities	30.8%	17.2%	60.8%	58.8%	38.1%	71.9%
24-hour health and personal social services	12.0%	10.1%	-	18.6%	14.5%	26.8%
Activities which support wider social and economic activities	17.1%	15.1%	-	22.9%	-	40.0%

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Night Time Economy Category	Males employees, percentage of jobs			Female employees, percentage of jobs		
	Total	Full-time	Part-time	Total	Full-time	Part-time
Any Night Time Economy Category	25.5%	16.5%	61.0%	32.9%	20.4%	49.3%
All other industries	14.6%	11.5%	39.7%	21.1%	11.8%	37.7%
Total any industry or occupation	18.1%	12.9%	49.4%	25.5%	14.8%	42.6%

3.12.11 LGVs and HGVs

Manchester is a net importer of goods, importing 58 million tonnes to the region per year (TfGM, 2017). On average 17,000 goods vehicles make trips into Greater Manchester town centres each day.

LGVs are goods vehicles whose gross vehicles weight does not exceed 3,5 tonnes. In the UK, of the almost 4 million LGVs that were registered at the end of 2017, the majority of LGVs are diesel fuelled (96.4%), with only 3.3% petrol fuelled (DfT, 2017f). Diesel engines are popularly used for commercial businesses because they have a longer life and better fuel efficiency. These benefits are partially offset by the higher cost of a diesel engine and the cost of the fuel itself.

HGVs are vehicles such as lorries, busses and coaches. Large goods vehicles such as HGVs contribute a disproportionately large amount of NO_x emissions. HGV emissions are markedly worse at lower speeds; therefore, the ‘last mile’ of deliveries which are often close to key population centres, contribute greatly to the total emissions of the journey. The Greater Manchester Transport Strategy recognises the effect of this and aims to ensure increasing sustainability of freight, minimising the impact on the environment and communities of Greater Manchester.

3.12.12 Taxis

Table 3- 19 shows the number of taxis and private hire vehicles (PHV) within Greater Manchester. The table shows there are a total of 2,146 registered taxis. Approximately 32million trips are made each year using taxis and PHVs in Greater Manchester (GMCA, 2018d). Taxis and PHVs provide invaluable transport services by operating at times and to places where public transport is not an option however they also raise key concerns over public safety, congestion, inadequate vehicle standards and illegal out of area operation.

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Table 3- 19: Total number of Licensed Taxis and PHVs within Greater Manchester (DfT, 2017h)

Area	Total Taxi's	Taxi only licensed drivers	Total PHVs	PHV only licensed drivers	Total licensed vehicles
Greater Manchester	2,146	3,783	11,246	12,763	13,392

Recent developments in app-based taxi services and new business models has led to the rapid development of the taxi and PHV market, creating a significant opportunity for social and technological change. It is therefore recognised that any package of clean air measures could create a significant opportunity and have a large impact on owners and users of taxis.

3.12.13 Land Use

An overview of land use across the Greater Manchester region is provided as follows.

- Trafford Park, located within Trafford, is the largest Industrial Estate in Europe. The park is home to approximately 1,400 businesses (Trafford Council, 2018).
- The GMSF has allocated areas which will focus on employment, housing or mixed use. There are no allocation areas within the IRR. There are three within the M60 but the majority are located within Greater Manchester, with the largest pockets of allocated land located in Bury, Trafford and Bolton (GMCA, 2018a).
- The large allocation area in Bolton is the North Bolton Strategic Opportunity Area. An area identified for future housing development sites. There is the potential to deliver up to 3,000 homes in around 15 locations (GMCA, 2016c).
- In addition to the allocation sites there are general development area across Greater Manchester for housing. There are concentrations of new housing planned for just outside the IRR and a large area (1,560 total additions between 2017-2035) in the south west Greater Manchester in Trafford (GMCA, 2018c).
- The location of future office development is concentrated within the IRR (GMCA, 2018c).
- Figure 22 (Appendix A) shows projected housing development areas located within the Manchester city centre boundary which are considered to be suitable for future housing growth and hence expected to be proposed for development by 2040. Most of the committed housing allocated areas are focused to the east of Manchester city centre itself and comprise sites in excess of 1000 houses. Smaller areas of housing allocation are located to the south of Manchester city centre with several sites located in close proximity to Wythenshawe. It should be noted that a significant proportion of the allocated housing sites are not expected to be allocated housing sites until post-2021 and are therefore unlikely to be completed before implementation of the GM CAP.

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- Figure 23 (Appendix A) shows projected employment growth in 2016-17 within the Manchester city centre boundary based upon B2 and B8 land uses only. The largest employment areas identified are focused around Manchester Airport with reference to the Airport City North and the Airport City South. These employment areas are significantly greater than the other employment areas forecast for Manchester city centre in 2016-17. The remaining employment areas are located in Wythenshawe to the north of Manchester Airport, and Manchester city centre itself. The employment areas currently under construction within the Manchester city centre boundary only consists of four sites, none of which are particularly significant in total size.
- The Greater Manchester Brownfield Land Register 2017 shows that the brownfield sites are widely spread across the area, with a large concentration of brownfield sites within the M60. There are particularly large brownfield sites to the north east of the IRR within the M60 including: Miles Platting Neighbourhood (71 hectares), Holt Town Waterfront (31 hectares) and New Cross Zones B&C (22 hectares).
- Within the IRR there are several smaller brownfield sites within Salford and Manchester council.
- Within the wider Greater Manchester, the largest brownfield site is located in Wigan, which is a total of 109 hectares.
- Greater Manchester has large areas of designated greenbelt land. In general, these areas tend to be in less developed areas, outside of the M60 boundary and on the outskirts of Greater Manchester. Within the M60, designated greenbelt land includes Clayton Vale, and Medlock Vale to the north east, Reddish Vale to the south east, Chorlton and Sale waterpark to the south and the area surrounding the River Irwell and Clifton in the north.

3.13 Employment

3.13.1 Greater Manchester overview

There are a total of 1,267,000 jobs held by employees in Greater Manchester - 864,000 of these are full time and 402,000 are part time (Nomis, 2016). This excludes self-employed, government supported trainees and HM forces. The GMFM (GMCA, 2017c) estimates the number of Greater Manchester residents in employment will rise by 100,400 between 2016 and 2036, equivalent to growth of 0.4% per year, similar to the average rate of increase in the UK (GMCA, 2017c).

3.13.2 Shift workers

In 2017, 4.8 million people were employed in shift work in the UK. This equates to 18.6% of total employment in the UK (ONS, 2017c). Of this 4.8 million, the percentage of male shift workers (57%) was higher than the percentage of female shift workers (43%). In the three months at the end of June 2014 there were 637,000 people employed in shift work in the North West. This equates to 20% of people over the age of 16 employed in shift work (ONS, 2014). Of these, 94,000 conduct evening, night or twilight shifts. This equates to 29% of the regions working population.

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Within the UK, the industries with the highest number of shift workers include health and social work (3.4 million) wholesale, retail and repair of vehicles (3.6 million) and manufacturing (3 million). For those working evening or twilight shifts, health and social work and wholesale, retail and repair of vehicles remain the most prominent industries. There are also high numbers of night and twilight shift workers in the transport and storage industry (ONS, 2017c).

Table 3- 20: Shift workers as a percent of employment in each sector (ONS, 2017c)

Industry	All Employed in Sector	Percent of shift workers in sector	All in Shift Work
Agriculture, forestry and fishing	229,478	8.6%	19,755
Manufacturing	1,749,259	24.4%	426,985
Wholesale, retail, repair of vehicles	1,775,691	23.6%	419,528
Transport and storage	1,005,771	39.7%	399,713
Financial and insurance activities	543,582	7.4%	40,136
Real estate activities	134,948	2.1%	2,826
Health and social work	771,793	36.5%	282,007
Other service activities	315,144	8.7%	27,412

3.13.3 Travel to work patterns

According to the TFGM transport strategy evidence base, less than 9% of total trips originating within Greater Manchester travel to a destination outside of the region. Approximately 28% of trips within Greater Manchester have a length of less than 1km, and a third of these are made by car.

Table 3- 21 below shows the travel to work patterns of those within Greater Manchester, within the M60 and within the IRR. This table excludes those that work from home and those that use ‘other’ alternative modes of transport that are not covered in the table below. Travelling to work by car/van is the largest mode of transport in Greater Manchester (68%) and within the M60 (52%). However, once within the IRR most individuals walk to work (51%). Bus is the second most popular mode of transport within the M60 with 20% choosing this mode, this drops to 10% within the IRR.

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Table 3- 21: Travel to work patterns within key study areas (Nomis, 2011c)[12]

Mode of transport	Greater Manchester		Within M60		Within IRR	
	Count	%	Count	%	Count	%
Taxi	10,437	1%	8,427	3%	33	0%
Car/van	744,287	68%	150,896	52%	1,920	22%
Walk	127,603	12%	44,235	15%	4,392	51%
Metro	16,106	1%	6,454	2%	370	4%
Train	31,552	3%	8,427	3%	806	9%
Bus/minibus	131,096	12%	59,521	20%	886	10%
Motorbike	6,838	1%	1,359	0%	11	0%
Bike	25,769	2%	11,085	4%	165	2%
Total	**1,093,688**	**100%**	**290,404**	**100%**	**8,583**	**100%**

There are distinct differences in the number of trips and journey purpose when comparing employment status. For those in employment, the main purpose of trips is commuting. For those out of employment, the main purpose is for shopping (Nomis, 2011c). Similar number of movements are made by those in employment and not in employment for sport and entertainment purposes. Table 3- 22 shows the modes of travel taken to work by those who work in the IRR.

Table 3- 22: Travel to work for those who work in the IRR (Nomis, 2011f)

Mode of transport	Live outside the region		Live outside the LA		Live outside the MSOA		Live outside workplace zones[13]		Live inside workplace zones	
	Count	%	Count	%	Count	%	Count	%	Count	%
Work from home	0	0%	0	0%	0	0%	0	0%	12	50%
Taxi	0	0%	1	0%	3	1%	0	0%	0	0%
Car/van driver	16	24%	346	41%	76	19%	4	10%	5	21%

[12] The method of travel used for the longest part, by distance, of the usual journey to work (Nomis, 2011c).

[13] A workplace zone is based entirely on 2011 Census data. The workplace population encompasses: employees, self-employed, people on a government-sponsored training scheme, people working from home, people on sick leave, maternity leave, holiday or temporarily laid off and full-time students who are working. A 'workplace' is defined as a place of work recorded by a worker on their census form (ONS, 2018).

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Mode of transport	Live outside the region		Live outside the LA		Live outside the MSOA		Live outside workplace zones[13]		Live inside workplace zones	
	Count	%	Count	%	Count	%	Count	%	Count	%
Car/van passenger	0	0%	40	5%	11	3%	0	0%	0	0%
Walk	3	4%	62	7%	91	22%	36	90%	5	21%
Metro	3	4%	62	7%	5	1%	0	0%	0	0%
Train	41	61%	148	18%	17	4%	0	0%	1	0%
Bus/ minibus	4	6%	168	20%	193	46%	0	0%	0	0%
Motorbike	0	0%	2	0%	1	0%	0	0%	0	0%
Bike	0	0%	7	1%	13	3%	0	0%	0	0%
Other	0	0%	2	0%	0	0%	0	0%	1	0%
Total	**67**	**100%**	**838**	**100%**	**410**	**100%**	**40**	**100%**	**24**	**100%**

3.14 Vehicle compliance and availability

3.14.1 Overview

Since 1992, EU regulations have been imposed on new cars, with the aim of improving air quality - meaning a car must meet a certain Euro emissions standard when it is made. Euro 1 was introduced in 1992. The current standard is Euro 6, which was introduced in September 2014 for new type approvals and September 2015 for most vehicle sales and registrations. The regulations – which are designed to become more stringent over time – define acceptable limits for exhaust emissions of new light duty vehicles sold in EU and European Economic Area (EEA) member states (RAC, 2018).

Over the next two years, 16 of the UKs largest fleet operations are signing the Clean Van Commitment and investing an initial £40 million. The Clean Van Commitment will aim to deploy 2,400 electric vans by 2020 as well as a long-term pledge to deliver zero tailpipe emissions by 2028. Progress towards this aim is dependent on the availability of sufficient charging infrastructure and competitively priced electric vans (Business Growth Hub, 2018).

3.14.2 Vehicle composition

Table 3- 23 shows the vehicle composition by fuel type in Greater Manchester. The table shows that diesel buses make up 99% of total busses in Manchester. Similarly, 100% of HGVs, 97% of LGVs and 98% of minibuses are diesel vehicles. The table also shows that there are more petrol cars (63%) than diesel cars (35%), and 100% of all motorcycles, mopeds and scooters are petrol engines.

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Table 3- 23: Vehicle composition by fuel type in Greater Manchester (DfT, 2017d)[14]

	Diesel		Petrol		Hybrid/Electric		Other	
4	2,700	99%	0	0%	0	0%	0	0%
Cars	404,000	35%	723,600	63%	11,000	1%	1,400	0%
HGVs	30,500	100%	0	0%	0	0%	0	0%
LGVs	108,700	97%	2,900	3%	200	0%	200	0%
Minibuses	2,800	98%	100	2%	0	0%	0	0%
Motorcycles/ Mopeds/ Scooters	0	0%	37,600	100%	0	0%	0	0%
Other	8,100	68%	1,000	9%	2,700	23%	100	1%

3.14.3 Euro compliance by vehicle type

Table 3- 24 shows the number of vehicles which meet the most up to date euro standard (Euro six). The table shows that in all modes, less than 25% of the total vehicles meet the latest engine standards. HGVs have the highest percentage of vehicles at euro six standard (24%). This is followed by buses with 15% of registered vehicles estimated at euro six and cars with 10%. Motorcycles, mopeds, scooters, LGVs and minibuses all have 5% or lower of the total registered vehicles in the highest euro class.

Table 3- 24: Total vehicles of euro status six in Greater Manchester (DfT, 2017d)

	Euro 6 status	Total registered vehicles	% of total vehicles Euro 6 or above.
Buses	400	2,700	15%
Cars	119,600	1,140,000	10%
HGVs	7,200	30,600	24%
LGVs	1,900	112,100	2%
Minibuses	200	2,900	5%
Motorcycles/ Mopeds/ Scooters	0	37,700	0%
Other	0	12,000	0%

[14] Note that there may be minor inconsistencies between data for Greater Manchester, compared to data presented elsewhere for council district areas and the LSOA-based areas, as sometimes the Driver and Vehicle Licensing Agency (DVLA) database only has partial postcodes recorded for vehicles, e.g. a vehicle could be recorded as M2 *** so it can be allocated to GM but not to an individual LSOA. These differences will not be material to any analysis undertaken (DVLA, 2018).

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3.14.4 Euro compliance of cars and LGVs by LSOA

For the purposes of this study, compliant cars and LGVs are those with a euro rating of four or above for petrol and six or above for diesel. Table 3- 25 shows the number of compliant cars and LGVs, according to these thresholds, within the key study areas.

Table 3- 25: Euro compliance of vehicles in Greater Manchester (DVLA, 2018)

	Compliant cars		Non-compliant cars		Compliant LGVs		Non-compliant LGVs	
Greater Manchester	580,000	51%	560,000	49%	1,000	1%	110,000	99%
M60	131,000	50%	131,000	50%	400	2%	25,000	98%
IRR	2,300	54%	2,000	46%	100	9%	1,200	91%

The table shows that across the whole of Greater Manchester, approximately 50% of cars and 1% of LGVs are compliant. There is a similar story within the M60 with 50% compliant cars and only 2% compliant LGVs, however, the total number of overall cars and LGVs is significantly lower (262,000 cars and 25,400 LGVs). Within the IRR, this increases to 54% compliant cars and 9% compliant LGVs. The percentage of non-compliant cars and LGVs at LSOA level are shown in Figure 28 and Figure 29 in Appendix A respectively.

3.14.5 Access to a vehicle

Table 3- 26 shows that most households (42.7%) across Greater Manchester own one car or van per household. This is in line with the England average for number of households with one car or van (42.2%). In contrast, 30.6% of households have no access to a car or van, slightly higher than the England rate of 25.8%. Only 1.1% of households within Greater Manchester have access to four or more cars or vans per household. Figure 24 (Appendix A) shows the percentage of households with no access to a car or van across Greater Manchester.

Table 3- 26: Household car/van availability (Nomis, 2011a)

Household car/van availability	Greater Manchester		England	
	Count	%	Count	%
No cars or vans in household	350,000	30.6%	5,690,000	25.8%
1 car or van in household	480,000	42.7%	9,300,000	42.2%
2 cars or vans in household	250,000	21.8%	5,440,000	24.7%
3 cars or vans in household	40,000	3.9%	1,200,000	5.5%
4 or more cars or vans in household	10,000	1.1%	420,000	1.9%

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3.14.6 Access to a vehicle at LSOA level

Table 3- 27 shows the number of households with no access to a car or van within the key study areas.

The table shows that approximately one third of the study area have no access to a car or van. Within the M60, this number increases to 40.1%, representing the increased accessibility by public transport within these areas (see section 3.15.1 - accessibility levels). The data also shows that within the IRR, 58.8% of households do not have access to a car or van, representing approximately 7,500 households.

Table 3- 27: Households with no access to a car/van (Nomis, 2011a)

	Number of households with no car/van availability	% of total
Greater Manchester	345,000	30.6%
M60	133,600	40.1%
IRR	7,500	58.8%

3.15 Public Transport

3.15.1 Accessibility Levels (GMAL)

Accessibility is of key importance in the operation of a transport system. Greater Manchester Accessibility Levels (GMAL) are a measure of the accessibility of a point to both the conventional public transport network (i.e. bus, Metrolink and rail) and Greater Manchester's Local Link. This measure considers walking times, number of services and average waiting times to show the density and availability of public transport provision at any location in the Greater Manchester area, as illustrated in Figure 21 (Appendix A). The map clearly shows areas of very high accessibility are concentrated within the city centre. Areas with very low accessibility are concentrated on the very outskirts of the Greater Manchester boundary.

3.15.2 Bus/Cycle Routes

Figure 19 and Figure 20 (Appendix A) show the locations of cycle and bus routes within Greater Manchester.

Table 3- 28 shows the total length of cycle routes within Greater Manchester, which is approximately 1,700km. The total length of bus routes within Greater Manchester is approximately 61,000km. Table 3- 28 shows the total distance of bus and cycle routes within the key study areas.

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Table 3- 28: Total distance of bus and cycle routes within key study areas (TfGM, 2015; TfGM, 2018b)

Key study area	Approximate total distance of cycle routes (2015)	Approximate total distance of bus routes (2018)
Within IRR	27 km	1636 km
Within the M60	503 km	28,000 km
Greater Manchester	**1,700 km**	**61,000 km**

3.15.3 Bus/Coach operators

In total, in 2017, there are approximately 5,525 licensed buses and coaches in Greater Manchester (DfT, 2017e), being run by approximately 87 bus operators in Greater Manchester (TfGM Committee, 2018). This includes school bus operators, ring and ride services, community transport and local link bus companies, as well as regional and national bus and coach operators.

First Manchester is a bus operator in Greater Manchester which owns four depots located in Bolton, Manchester, Oldham and Rusholme. A second operator, 'Stagecoach' has 6 depots; two in Manchester and one in Stockport, Wigan, Aston-under-Lynne and Middleton. Stagecoach operates a fleet of 750 buses consisting of 144 hybrid electric buses and 144 buses with Euro 6 engines (Stagecoach, 2018). Finally, Arriva North West operate in Greater Manchester and have depots located in Manchester (Wythenshawe) and Bolton.

There are three bus stations within the IRR located in Shudehill, Piccadilly and on Chorlton Street (UK Bus Fleetlist, 2018). Manchester's largest bus station, Shudehill Interchange, is used by Arriva North West, First Greater Manchester, Manchester Community Transport, Megabus and Stagecoach Manchester.

3.16 Summary matrix

A summary of socio-economic indicators for the key study areas is presented in Table 3- 29. The data presented here indicates that there is considerable variability in the socio-economic context across Greater Manchester. For example, within the IRR, only 1% of the population is over the age of 75, whereas across all of Greater Manchester this figure is 7%.

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Table 3- 29: Socio-economic characteristics of key study areas

Study Areas	Socio-economic indicator		
	Greater Manchester	**Within M60**	**IRR**
Key Study Areas			
Economically active, proportion of the total population (%)	68%	65%	60%
Over 75 years of age, proportion of the total population (%)	7%	5%	1%
Number of schools (nursery's, junior, secondary and specialist)	1,826	548	3
Number of hospitals	134	23	0
Number of religious centres	541	186	6
% of the population driving to work by car	38%	29%	13%
IMD Income deprivation decile	6	5	6
IMD Health deprivation and disability decile	5	5	8
% of households with one or more cars	69%	60%	41%
Number of SMEs (% of total businesses)	99.6%	99.5%	99.4%

4 Air Quality

4.1 Overview

This section presents the findings of the preliminary analysis of air quality, health and environmental distributional impacts for the proposed GM CAP. The analysis is based on outputs of TfGM's EMIGMA (Emissions Inventory for Greater Manchester) software, which provides the change in emissions in tonnes for oxides of nitrogen (NO_X) and particulate matter (PM_{10}) for a Do Minimum (DM) scenario (2021) compared the clean air options under analysis (Option 5(i)/(ii) and Option 8).

The findings reported here are intended as illustrative of the final analysis that will be completed for the preferred clean air option selected for Greater Manchester, once the final air dispersion modelling results are available. The aim here is to present an overview of the methodology and the approach to the analysis, and to present some indicative results.

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In February 2016, the Joint Air Quality Unit (JAQU) was established by Defra and the Department for Transport (DfT) to coordinate delivery of the Government's plans for achieving NO_2 compliance. Part of the remit of JAQU is to support the implementation of CAZs or other measures selected by local authorities (UK Parliament, 2018).

As recommended by the JAQU, the method of appraisal follows the guidance set out in the DfT's Transport Analysis Guidance (TAG) Unit A4-2 'Distributional Impact Appraisal' (DfT, 2015). This follows three stages of screening, assessment and appraisal to identify groups which could be disproportionately impacted by a proposed scheme. This approach is supplemented with additional qualitative narrative relating to the potential impacts on specific groups in specific geographies.

Air quality impacts are assessed at Lower Super Output Area (LSOA) level[15], as dictated by the guidance.

The key findings of the assessment are presented as follows:

- The analysis shows that, using the WebTAG methodology, moderate beneficial air quality impacts are distributed evenly across all income groups for both Option 5(i)/(ii) and Option 8. For children and the elderly, however, air quality benefits are not evenly distributed. For these two groups, air quality impacts favour residents in quintiles 4 and 5 (those with the lowest proportion of children/elderly people), where the impact is large beneficial. Those in quintile 1 (with the highest proportion of children/elderly), who may be considered the most vulnerable, experience slight beneficial air quality impacts.
- Overall, the number of net winners for Option 5(i)/(ii) is approximately 2,750,000 residents compared to a slightly lower 2,720,000 for Option 8.
- For all options, there is a strong correlation between areas experiencing the highest reductions in emissions and the areas ranked with the highest level of deprivation. For those under the age of 16, it is anticipated that the air quality benefits are likely to be greater outside of the Manchester IRR boundary. Despite there being large reductions in emissions (NO_x and PM_{10}) within the IRR, this area contains less than 1% of the total population of under 16's and only a small number of facilities of importance to children.

[15] Output Areas and Lower Super Output Areas are geographical definitions used for the mapping of socio-economic characteristics. These cover different scales: for example, Lower Super Output Areas typically have a resident population of around 1,500 people.

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- In general, the elderly population are located towards the outskirts of Greater Manchester outside of areas most likely to receive the highest air quality benefits (M60, IRR). For the elderly population located within the IRR, over 70% of the population is expected to benefit from the 10% highest emissions reductions of anywhere across the study area.
- No distributional impacts from air quality are anticipated for any of the following key social groups; women, minority ethnic groups, disabled people, SMEs or LGV owners.

4.2 Methodology

The appraisal of the air quality distributional impacts is a minimum requirement of JAQU.

A three-step approach, in line with TAG unit A4-2, has been applied to the distributional impacts appraisal as follows:

1) Screening: to consider the variety of impacts that the options may have and to prioritise particular impacts for further analysis so that only the most relevant issues for the scheme are appraised to ensure proportionality.
2) Assessment: to collect information on the geographical area likely to be affected by each option and how different social and business groups are distributed within that geographical area. To calculate the number of areas with improved air quality, GIS techniques have been used to calculate the change in concentration between the baseline scenario and the intervention for each LSOA in the study area.
3) Appraisal: to assess the extent of the impact of each option on the social or business groups identified.

To identify societal groups who could be 'disproportionately' impacted, the population within the study area was divided into quintiles, based on the distribution across England and Wales. For example, to assess income deprivation, the population was first divided into five equal parts depending on the level of income: the first quintile contains the top fifth of the population on the scale (i.e. the 20% of the population with high levels of deprivation), the second quintile represents the second fifth (from 20% to 40%) and the fifth quintile represents the 20% of the population with the lowest level of income deprivation. Once the population has been divided into quintiles, it is then possible to see which groups receive the highest share of the benefits.

It is acknowledged that a large beneficial impact, does not represent the areas receiving the greatest air quality benefits. For example, from an air quality perspective, benefits would be expected to be greatest in areas where the emissions reduction is highest. Instead, the WebTAG methodology determines whether the impacts are representative of an even distribution if all groups received the same share of the benefit. As such, care must be taken when interpreting the results of the analysis.

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The appraisal section (section 4.6) aims to give a qualitative interpretation of these results, focussing on the areas with the 10% greatest reduction in emissions and the relation to key amenities of importance to the various social groups.

4.3 Screening

The impacts of air quality are primarily spatial. It is therefore likely that impacts are likely to be experienced differently throughout the study area. Table 4- 1 shows the screening process used to consider the potential impacts on specific social groups.

Table 4- 1: Screening of air quality impacts (all options)

Grouping Variable	Screened in	Reason for screening in/out
Low income households	✓	Vulnerable groups, including poorer people, are more likely to live in polluted areas and are therefore more likely to experience health problems caused by air pollution (Royal College of Physicians, 2016).
Children	✓	Children are particularly vulnerable to air pollution effects due to different patterns of exposure (i.e. young children crawl on the ground). Also, for their size, children breath in more air each minute than adults (British Lung Foundation, 2018).
The elderly	✓	For older people, air pollution effects can speed up the rate of decline in lung functioning making them more vulnerable to the effects of air pollution (Royal College of Physicians, 2016).
Disabled	×	There is limited evidence to suggest that disabled people are more vulnerable to air pollution effects than any other population group.
Women	×	There is limited evidence to suggest that women are more vulnerable to air pollution effects than any other population group.
Ethnicity (BAME)	×	There is limited evidence to suggest that the BAME population are more vulnerable to air pollution effects than any other population group.
Businesses	×	Businesses themselves are not considered to be vulnerable to air pollution effects. Indirect effects on businesses will be considered under the appraisal of affordability impacts (see affordability assessment – section 0).
LGVs	×	LGVs are used as a proxy for effects on SMEs. LGVs themselves are not considered to be vulnerable to air pollution effects. Indirect effects on SMEs will be considered under the appraisal of Affordability impacts (See affordability assessment – section 0).

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4.4 Assessment Criteria

The consideration of whether impacts are disproportionate is important to understand if one group is being unfairly disadvantaged or advantaged by the option/package. In such cases it is necessary to understand how these impacts are occurring and whether it is acceptable or whether the option should be amended or mitigated. Table 4- 2 shows the scale, recommended by TAG Unit A4.2, to be used in the reporting of the distributional impacts.

Table 4- 2: DistributionalImpact Assessment Criteria

Assessment		Impact Description
✓✓✓	Large beneficial	Beneficial and the population impacted is significantly greater than the proportion of the group in the total population
✓✓	Moderate beneficial	Beneficial and the population impacted is broadly in line[16] with the proportion of the group in the total population
✓	Slight beneficial	Beneficial and the population impacted is smaller than the proportion of the group in the total population
-	Neutral	There are no significant benefits or dis-benefits experienced by the group for the specified impact
×	Slight adverse	Adverse and the population impacted is smaller than the proportion of the population of the group in the total population
××	Moderate adverse	Adverse and the population impacted is broadly in line with the proportion of the population of the group in the total population
×××	Large adverse	Adverse and the population impacted is significantly greater than the proportion of the group in the total population

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[16] For the purposes of this assessment, 'broadly in line' refers to a +/- 2% threshold between the percentage of net winners and the share of the resident population in each group.

4.5 Air Quality Assessment

4.5.1 Introduction

The following section provides an assessment of the change in total emissions on the relevant grouping variables (low income households, children and the elderly). Air quality impacts associated with PM_{10} and NO_X were calculated for each LSOA within Greater Manchester. For each quintile, the number of LSOAs with improved or worsened air quality was calculated, and their relative populations totalled, to calculate the net winners[17].

As explained in section 4.2 above, the WebTAG distributional impacts methodology refers to 'winners' and 'losers', corresponding to improvements in, or worsening of air quality. Using this methodology, the number of net winners for Option 5(i)/(ii) is approximately 2,750,000 residents compared to a slightly lower figure of 2,720,000 net winners for Option 8. Since the WebTAG methodology does not consider the magnitude of air quality improvement, the results of the overall analysis remain largely the same for all options. The tables presented below include the detailed results for Option 5(i)/(ii) and are illustrative of the results for Option 8.

4.5.2 Low income households

Income deprivation is one of seven domains of deprivation. Measures of income deprivation are concerned with people on low incomes who are in receipt of benefits and tax credits (DfT, 2015). It is not an absolute measure of household income and therefore it does not reflect household income in a given area, nor does it cover the distribution of that income across its resident population. Whilst it effectively captures concentrations of low income households it does not identify areas of affluence. For example, an area with a relatively small proportion of people on low incomes may also have relatively few or no people on high incomes (DfT, 2015).

The distribution of air quality impacts on low income households has been assessed in two ways. Firstly, deprivation was mapped based on the distribution of income deprivation across England and Wales. The second method ranks all the LSOAs within the study area only, based on their income deprivation; this gives a more study area specific distribution.

Table 4- 3 shows the distribution of air quality impacts on low income households in the study area compared to the distribution across England and Wales.

[17] Numbers in tables have been rounded to the nearest thousand.

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Table 4- 3: Distributional impact of air quality on low income households (compared to the distribution across England and Wales)

	Deprivation quintile (where 1 is the 20% of the population ranked highest in terms of income deprivation)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved air quality	983,000	562,000	423,000	390,000	409,000
Number of people with no change in air quality	4,000	0	1,000	6,000	3,000
No. of net winners	979,000	562,000	421,000	384,000	407,000
Total number of winners across all groups	2,750,000				
Net winners in each area as % of total	36%	20%	15%	14%	15%
Share of population in impact area (%)	35%	20%	15%	14%	15%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✓✓

Table 4- 4 shows the distribution of air quality impacts on low income households in the study area compared to the distribution across Greater Manchester.

Table 4- 4: Distributional impact of air quality on low income households (compared to the distribution across Greater Manchester)

	Deprivation quintile compared to Greater Manchester (where 1 is the 20% of the population ranked highest in terms of income deprivation)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved air quality	557,000	558,000	555,000	545,000	553,000
Number of people with reduced/no change in air quality	2,000	4,000	1,000	5,000	2,000
No. of net winners	555,000	554,000	554,000	540,000	551,000

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	Deprivation quintile compared to Greater Manchester (where 1 is the 20% of the population ranked highest in terms of income deprivation)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Total number of winners across all groups	2,750,000				
Net winners in each area as % of total	20%	20%	20%	20%	20%
Share of population in impact area (%)	21%	21%	20%	19%	19%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✓✓

Table 4- 3 and Table 4- 4 both show that beneficial impacts are experienced equally across all quintiles. This means the proportion of net winners within each quintile is broadly in line with the proportion of the resident population. This shows that areas in which there are high concentrations of low-income households experience equal benefits to areas with a low concentration of low-income households and a score of **moderate beneficial** has been applied to all quintiles. Further analysis on the location of low-income groups and the size of the change in emissions is given in section 4.6.3.

4.5.3 Children (under 16's)

The Equality Act 2010 states that local authorities should show due regard to certain protected characteristics, including age. This includes taking steps to meet the needs of individuals who share a protected characteristic, and minimising the disadvantage associated with it. It is recognised, for the reasons stated in Table 4- 1, that children are particularly vulnerable to the effects of air pollution. Therefore, to assess the distribution of air quality impacts on children, ONS 2016 mid-year population estimates have been used to calculate the distribution of children across Greater Manchester. For the purposes of this assessment, children are defined as those under the age of 16.

Table 4- 5 shows the distributional impacts of air quality on children.

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Table 4- 5: Distributional impacts of air quality on children (compared to the distribution across England and Wales)

	Population quintile (where 1 is the 20% of the population with the most under 16s)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved air quality	859,000	575,000	521,000	456,000	357,000
Number of people with reduced/no change in air quality	2,000	5,000	2,000	1,000	5,000
No. of net winners	857,000	571,000	519,000	455,000	352,000
Total number of winners across all groups	2,750,000				
Net winners in each area as % of total	31%	21%	19%	17%	13%
Share of population in impact area (%)	41%	21%	17%	13%	7%
Assessment (✓)	✓	✓✓	✓✓	✓✓✓	✓✓✓

Table 4- 5 shows that beneficial impacts are experienced across all quintiles. The table shows that in quintiles 2 and 3, the population receiving air quality benefits is as expected based on the share of the population in the impact area. Therefore, these quintiles have been assigned a score of **moderate beneficial**. Quintile 1, which represents the 20% of the study area with the most children, has a 41% share of the total population but only 31% of the net winners in terms of reduced emission levels. In this case, the proportion of children receiving air quality benefits is significantly smaller than the proportion of children in this group. This quintile has therefore been assigned a score of **slight beneficial.** Quintiles 4 and 5, which represents the 60-100% of the population with the least children, have a significantly higher share of total net winners compared to their population. This shows that the population in these quintiles are receiving a higher than expected share of the air quality benefits. These quintiles therefore receive a score of **large beneficial**.

Further analysis, including commentary on the number of facilities of importance to children in areas of greatest and least improvements in air quality is given in section 4.6.4.

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4.5.4 Elderly (Over 65's)

It is recognised that elderly populations are particularly vulnerable to the effects of air pollution. This is because they are more likely to have long lasting health problems which can be exacerbated by pollutants. Due regard has therefore been given to those over the age of 65 within the study area. For the purposes of this assessment, to assess the distribution of air quality impacts on the elderly, ONS 2016 mid-year population estimates have been used to calculate the distribution of over 65's within the study area.

Table 4- 6 shows the distributional impacts of air quality on the elderly population within the study area.

Table 4- 6: Distributional impacts of air quality on the elderly population (compared to the distribution across England and Wales)

	Population quintile (where 1 is the 20% of the population with the most elderly residents)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved air quality	253,000	426,000	596,000	735,000	757,000
Number of people with reduced air quality	0	3,000	6,000	0	6,000
No. of net winners	253,000	424,000	590,000	735,000	751,000
Total number of winners across all groups	2,750,000				
Net winners in each area as % of total	9%	15%	21%	27%	27%
Share of population in impact area (%)	17%	22%	25%	23%	13%
Assessment (✓)	✓	✓	✓	✓✓✓	✓✓✓

Table 4- 6shows that positive impacts are experienced across all quintiles. In quintiles 1, 2 and 3 (which represent the 0-60% of the study area with the most children), the proportion of air quality benefits experienced are significantly smaller than the proportion of children in this group. A score of **slight beneficial** was therefore assigned to these quintiles. In contrast, quintiles 4 and 5 receive a higher than expected share of the air quality benefits in comparison to their relative populations. A score of **large beneficial** was therefore assigned to these quintiles.

Further analysis of the magnitude of change experienced is provided in section 4.6.5.

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4.5.5 Summary Assessment Matrix

Table 4- 7 shows an overview of the assessment stage. Dark green cells represent areas in which the benefits (from a distributional impact perspective) are higher than expected (based on an even distribution)[18]. Light green cells represent areas in which the benefits are lower than expected and those in the middle represent areas in which benefits are as expected based on the proportion of residents and the level of air quality benefits.

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[18] An even distribution would be a situation in which the proportion of the net winners is in line with the proportion of the population in that impact group. Therefore, the impacts are distributed evenly across the study area. Impacts 'higher than expected' refer to situations in which the share of the benefits deviate from what would be expected from an even distribution.

Table 4- 7: Distributional impacts appraisal matrix (all options)

	(1 Most)	2	3	4	5 (Least)	Are the impacts distributed evenly?	Key impacts
Low income households (Relative to England and Wales)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	The analysis shows that in both the Greater Manchester and England and Wales context, distributional impacts are spread evenly across all income quintiles.
Low income households (Relative to Greater Manchester)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	
Children (Relative to England and Wales)	✓	✓✓	✓✓	✓✓✓	✓✓✓	No	Air quality impacts favour residents in quintiles 4 and 5. Those in quintile 1 (with the highest proportion of children), who may be considered the most vulnerable to air pollution, experience a lower proportion of air quality benefits than may be expected from an even distribution. Residents living in population quintiles 2 and 3 experience moderate benefits as expected.
Elderly (Relative to England and Wales)	✓	✓	✓	✓✓✓	✓✓✓	No	Air quality impacts favour residents in quintiles 4 and 5 with the lowest share of elderly population. Those in quintiles 1, 2 and 3, (with the highest proportion of elderly residents) that may be considered the most vulnerable to air pollution, experience a considerable lower proportion of air quality benefits than may be expected from an even distribution.

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4.6 Air Quality Appraisal

4.6.1 Introduction

The analysis in section 4.5 provides an assessment score for each of the grouping variables under consideration. Section 4.6 provides further qualitative narrative to describe the impacts in each case. For the purposes of this analysis, the change in emissions for each LSOA has been multiplied by the resident population. In general, the reduction in emissions of NO_x are significantly higher than PM_{10}. Therefore, the emissions data for each option was converted, using the statistical method of standardisation[19], to ease the comparison between changes in NO_x and PM_{10}.

In the following section, Option 5(i) and 5(ii) are considered separately. Whilst the number of 'net winners' is the same for both options, within the key study areas (Greater Manchester, M60, IRR), the total reduction in emissions varies between options. Similarly, in the section below, the first map (Image 4- 1), which shows reductions in emissions across Greater Manchester, is intended to be illustrative of all options. For reasons of proportionality, further maps in this section are illustrative of Option 5(i) only. Individual maps for each option are provided in Appendix A.

For Option 5(i) and Option 5(ii), 100% of the population of Greater Manchester are anticipated to experience improvements in air quality. For Option 8, a very small percentage of the population (less than 0.5%) is predicted to experience an increase in emissions. It is anticipated that this will affect less than 0.5% of Greater Manchester's over 65's/under 16's and is therefore unlikely to have an impact on any areas with significant numbers of low income households.

As this small increase in emissions in some areas for Option 8 is unlikely to result in significant differences to the overall assessment, the following section focuses on air quality improvements only (i.e. reductions in emissions). To differentiate between areas receiving the greatest air quality benefits and the lowest air quality benefits the narrative in this section focuses on the following two cross-sections of the data:

- High reductions in emissions: LSOAs with the 10% highest reduction in both NO_x and PM_{10} emissions.
- Low reductions in emissions: LSOAs with the 10% lowest reduction in both NO_x and PM_{10} emissions.

[19] Standardization is the process of putting different variables on the same scale. This process allows you to compare scores between different types of variables (e.g. PM_{10} and NOx).

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4.6.2 Distribution of air quality improvements

Table 4- 8 shows the reduction in emissions in each of the key study areas for each clean air option modelled. The table shows that for the whole of Greater Manchester, Option 5(i) and Option 5(ii) deliver higher overall reductions in emissions than Option 8. This is also true within the M60 boundary in which the relative reduction in emissions for Option 5(i) (23%) and Option 5(ii) (23%) are also higher than Option 8 (20%). Within the IRR Option 5(ii) delivers the greatest emission reductions of all options, followed by Option 5(i) and Option 8.

Table 4- 8: Reduction in emissions (PM_{10} and NO_x) from a do minimum scenario within the key study areas for all options.

Key study area	Option 5(i)		Option 5(ii)		Option 8	
	Tonnes	% reduction in emissions	Tonnes	% reduction in emissions	Tonnes	% reduction in emissions
Greater Manchester	-1,563	18%	-1,563	18%	-1,471	17%
M60 (including IRR)	-568	23%	-583	23%	-504	20%
IRR	-47	37%	-54	43%	-39	31%

Image 4- 1 below shows the LSOAs with the highest and lowest reductions in emissions for all options combined. This is intended to show all the LSOAs experiencing the greatest benefits (green) and the least benefits (red). The map does not distinguish between options e.g. a light green shade represents an LSOA experiencing the highest emissions reductions for one option (e.g. Option 5(i) only). A darker green shade represents an LSOA with high reductions in emissions for more than one option (e.g. both Option 5(i) and Option 8). Individual maps for each option can be found in the map book (Appendix A).

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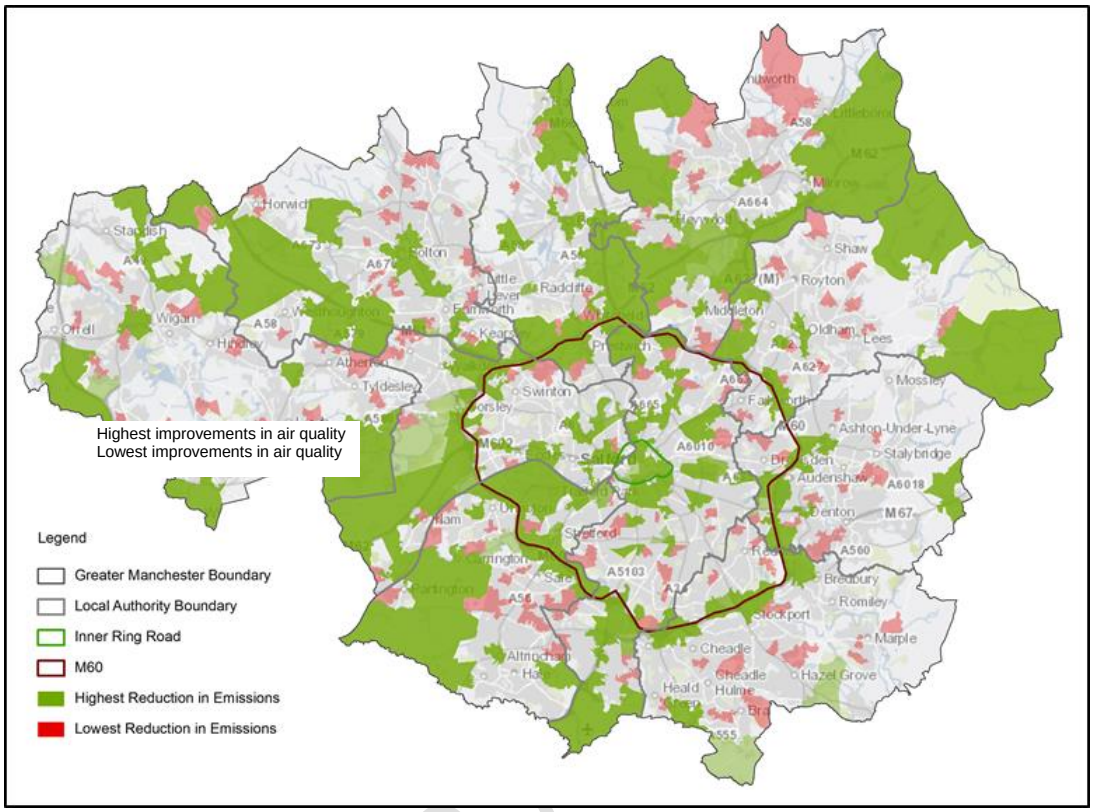
Image 4- 1: Map to show the overall highest and lowest reductions in emissions for all options



In general, across all options, the areas experiencing the highest reductions in emissions are located along the major road networks including the M6, M60, M61, M62, M602, M66 and the M56. This also includes the LSOAs which border the IRR and connecting road networks to the south east (A5103, A34, A6 and A635) and the north (A56). To the very south of the study area, the area surrounding Manchester Airport is also anticipated to experience high emission reductions. In general, the areas experiencing the lowest reduction in emissions are evenly spread across Greater Manchester. There are no LSOAs with low reductions in emissions located within the IRR.

4.6.3 Low income households

As stated in section 4.3, vulnerable groups, including low income households are more likely to live in polluted areas and are therefore more likely to experience health problems associated with air pollution. Section 4.5.2 showed that using the WebTAG Distributional Impacts methodology, impacts on low income households are distributed evenly, with a score of moderate beneficial applied across the study area. This section provides further qualitative narrative, focussing on the areas with the 10% highest and 10% lowest reductions in emissions (refer to Figure 36, 37 and 38 in Appendix A).

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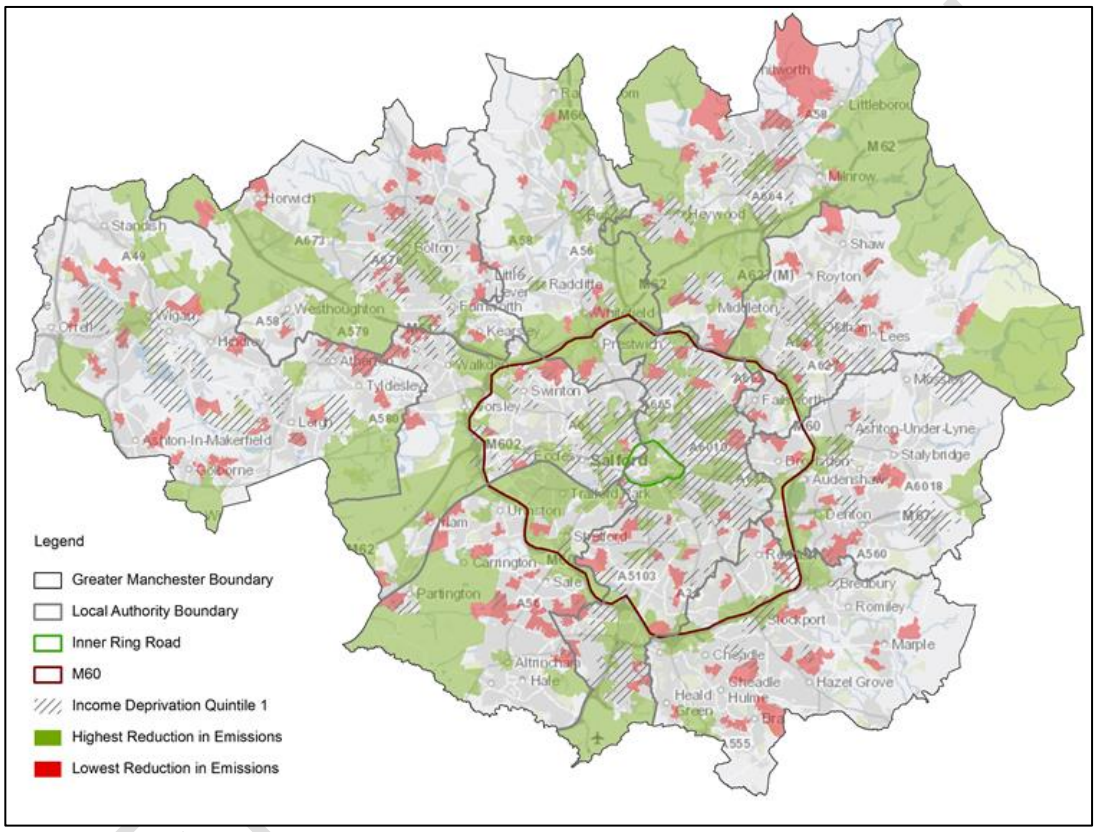
Image 4- 2 provides an example for Option 5(i). Areas coloured green represent those with the 10% highest emission reductions. Those in red represent the 10% lowest emission reductions. The cross shaded areas are those which also contain the 20% of the population ranked highest in terms of income deprivation (compared to the distribution across Greater Manchester).

Image 4- 2: Map to show LSOAs with the 10% highest and 10% lowest reductions in emissions as well as areas with the highest proportion of low income households for Option 5(i)



The map shows that areas of high deprivation are concentrated on the outskirts of the city centre of Manchester (within the M60), and that these are the areas that correlate strongly with the areas experiencing the highest reductions in emissions. There is also a strong correlation in the town centres of Bolton, Bury, Rochdale and Ashton in which there are high emission reductions in areas of high deprivation. Low emissions reductions are scattered evenly across the study area, with no obvious pattern or distribution. Within the IRR, there are no LSOAs with the 10% lowest reduction in emissions.

Table 4- 9 shows the number of residents in quintile 1 (highest levels of deprivation) that receive the highest air quality benefits in each of the key study areas. The last row of the table shows the total population in each of the key study areas (regardless of air quality).

Table 4- 9: Population in deprivation quintile 1 (most deprived) living in areas with the 10% highest reductions in emissions for all options.

		Greater Manchester		M60 (excluding IRR)		IRR	
		Number of residents	% of GM population	Number of residents	% of M60 population	Number of residents	% of IRR population
Low income population (population in quintile 1)	Option 5(i)	82,000	14%	42,000	17%	0	-
	Option 5(ii)	80,000	14%	42,000	17%	0	-
	Option 8	78,000	13%	36,000	15%	0	-
Total low-income population		593,822		242,000		0	

The table shows that for all options, between 78,000 – 82,000 (13%-14%) of residents in highly deprived areas experience the highest emission reductions. Within the M60, between 15-17% of the population is expected to experience the very highest reductions in emissions equating to between 36,000 – 42,000 people. There are no LSOAs with high proportions of low income households (quintile 1) located within the IRR; however, it is expected that the benefits of reduced emissions in this area would still be experienced by the large majority of the population located just outside of this area who travel into the city centre for business and leisure purposes (see travel to work data in Section 3 for those who live in the IRR).

In general, Option 5(i) and Option 5(ii) deliver the greatest benefit, providing high emissions reductions for over 82,000 people. This is closely followed by Option 8 which provides high emissions reductions for over 78,000 residents. For all options, the greatest benefits are anticipated in areas where the most vulnerable people live (within the M60). In the context of wider determinants of health, this is likely to result in positive benefits across the study area by resulting in greater health gains in areas with the greatest health needs. Nevertheless, there are still small areas of the study area in which the most vulnerable (with the highest deprivation levels) are anticipated to experience the lowest health benefits.

4.6.4 Children (under 16's)

As stated in section 3.3, children are particularly vulnerable to air pollution effects due to them having different patterns of exposure compared to adults (i.e. young children crawl on the ground). Also, for their size, children breath in more air each minute than adults resulting in more profound air quality impacts (British Lung Foundation, 2018). The assessment in section 4.5.3 shows that the effects of air quality on children are unevenly distributed across the study area for both options, with residents in quintiles 4 and 5 (with the least children) receiving a score of **large beneficial** and residents

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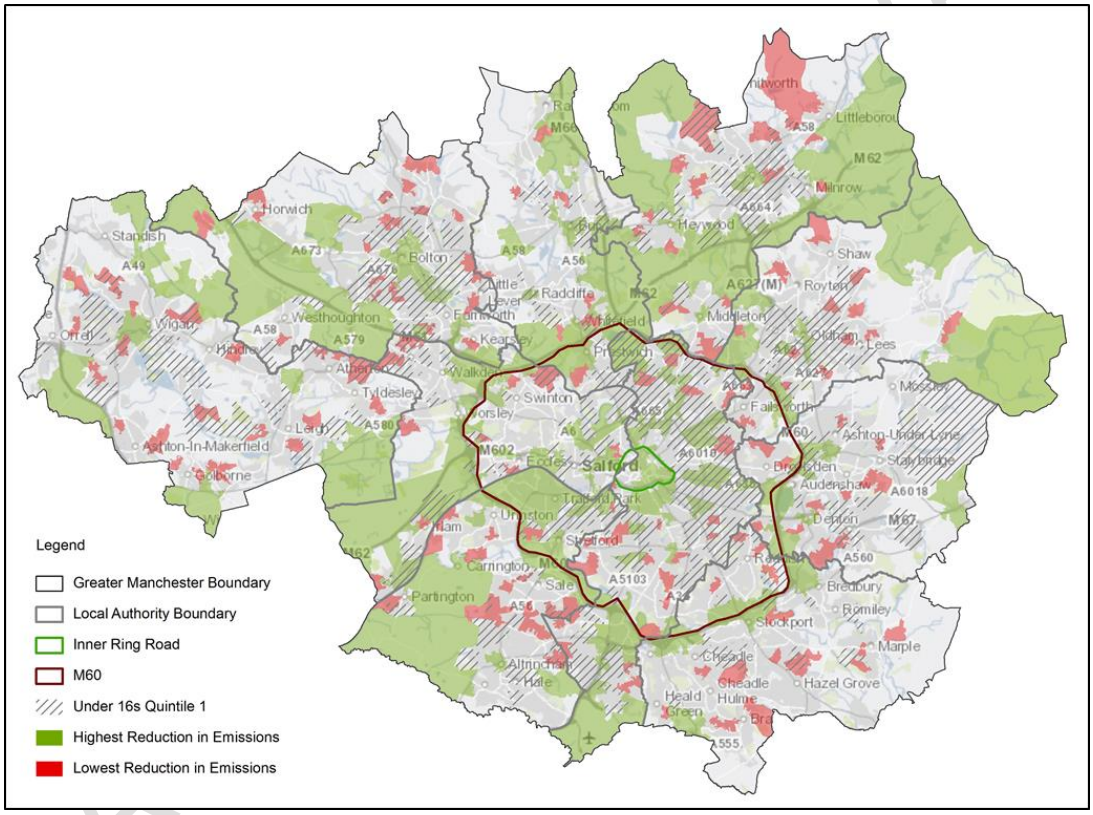
in quintile 1 (most children) receiving a score of **slight beneficial.** This section describes the distribution of these benefits on the areas with the 10% highest and 10% lowest reductions in emissions (refer to Figure 39, 40 and 41 in Appendix A).

Image 4- 3 provides an example for Option 5(i). Areas coloured green represent those with the 10% highest emissions reductions. Those in red represent the 10% lowest emissions reductions. The shaded (cross checked) areas are those which also contain the 20% of the population with the highest proportion of children.

Image 4- 3: Map to show LSOAs with the 10% highest and 10% reductions in emissions as well as areas with the highest proportion of under 16s for Option 5(i)



The map shows that areas with a high proportion of under 16's (cross shaded on the map) are concentrated on the outskirts of the city centre of Manchester. Within the M60 there are many areas with high levels of under 16's and high reductions in emissions. There are no areas with a high proportion of under 16's located within the IRR however it is expected that the benefits of emissions reductions in this area would still be experienced by the majority of the population located just outside of this area who travel into the city centre for leisure purposes (see Section 2 for data on travel patterns) or to access amenities of importance to children (see Table 4- 11).

Table 4- 10 shows the total number of children (aged under 16), living in areas with the 10% highest reductions in emissions for all options. The last row of the table shows the total population of under 16's in each zone (regardless of air quality).

Table 4- 10: The number of children living in areas with the 10% highest reductions in emissions

		Greater Manchester		M60 (excluding IRR)		IRR	
		Number of residents	**%**	**Number of residents**	**%**	**Number of residents**	**%**
Children (under 16)	Option 5(i)	68,000	12%	27,000	16%	510	48%
	Option 5(ii)	68,000	12%	27,000	16%	660	63%
	Option 8	66,000	12%	24,000	14%	510	48%
Total population under 16		**564,500**		**169,000**		**1,100**	

The table shows that across Greater Manchester, between 66,000-68,000 (12%) children under the age of 16 live in areas experiencing the 10% highest reductions in emissions. Within the M60, between 14-16% of children experience high emissions reductions, with Option 5(i) and Option 5(ii) performing marginally better than Option 8. Within the IRR, Option 5(ii) results in 63% of children in this area receiving the highest reductions in emissions. For Option 5(i) and Option 8, just under half of the children in the IRR experience the highest emissions reductions, this equates to approximately 510 children (less than 1% of the total study area).

The analysis also considers areas with facilities of importance to children such as schools, playgrounds and parks/open space. Table 4- 11 shows the number of facilities of importance to children located in areas experiencing the overall highest and lowest reductions in emissions.

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Table 4- 11: The number of facilities of importance to children in areas with 10% lowest and 10% highest reductions in emissions

	10% lowest reductions in emissions						10% highest reductions in emissions					
	Junior, secondary and nurseries/ creches		Parks/ open space		Playgrounds		Junior, secondary and nurseries/ creches		Parks/ open space		Playgrounds	
Option 5(i)	130	7%	89	11%	25	7%	285	16%	104	12%	46	13%
Option 5(ii)	130	7%	89	11%	25	7%	280	15%	104	12%	46	13%
Option 8	137	8%	86	10%	24	7%	265	15%	106	13%	45	13%

The table shows that just over 7% of all schools and nurseries in Manchester are located in areas experiencing the lowest emissions reductions. In contrast, over 15% of schools are located in areas experiencing the highest emissions reductions. For parks and open spaces, approximately 10-13% are located in areas receiving both the 10% highest and 10% lowest reductions in emissions. In general, there are more playgrounds located in areas of high reductions (approximately 13%) than in areas with low reductions (approximately 7%). Overall, there are more facilities used by children located in areas of high emissions reductions with minor differences of less than 2% between Option 5(i), Option 5(ii) and Option 8.

In general, air quality impacts on children are likely to be more beneficial outside of the Manchester IRR boundary. Despite there being high emissions reductions in this zone, this area contains less than 1% of total population of under 16's and only a small number of facilities of importance to children (three nurseries, four parks/open space and no junior/secondary schools). Within the M60 and the rest of Greater Manchester the overall impacts on children are more apparent with residents located in close proximity to the major road networks (M6, M60, M61, M62, M602, M66, M56) likely to experience the greatest air quality benefits.

4.6.5 Elderly (over 65's)

The assessment in section 4.5.4 showed that, using the WebTAG Distributional Impacts methodology, the distributional effects of air quality on elderly residents were unevenly distributed across the study area with residents in quintiles 4 and 5 receiving a score of **large beneficial** and residents in quintile 1, 2 and 3 receiving a score of **slight beneficial.**

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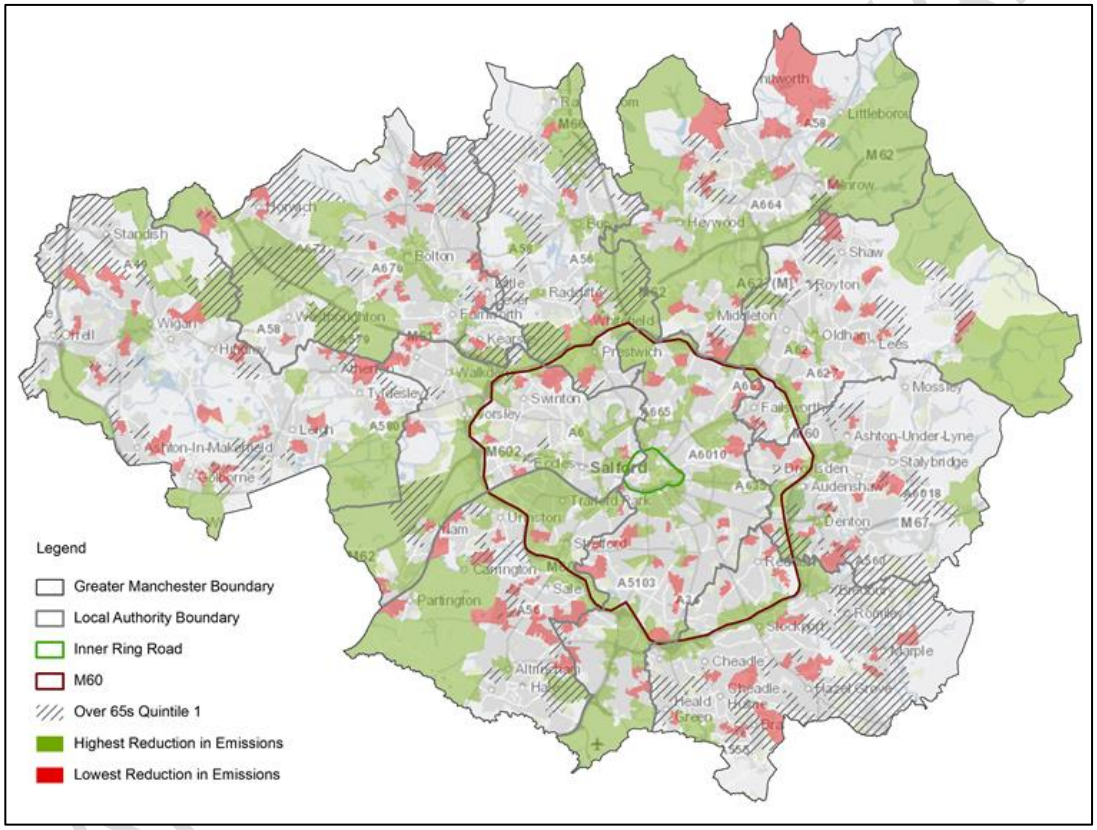
This section describes the distribution of these benefits on the areas with the 10% highest and 10% lowest reductions in emissions (refer to Figure 42, 43 and 44 in map book).

Image 4- 4 provides an example for Option 5(i). Areas coloured green represent those with the 10% highest emissions reductions. Those in red represent the 10% lowest emissions reductions. The highlighted areas are those which also contain the 20% of the population with the highest proportion of elderly residents.

Image 4- 4: Map to show LSOAs with the 10% highest and 10% reductions in emissions as well as areas with the highest proportion of over 65s for Option 5(i)



The map shows that areas with a high proportion of over 65s are concentrated on the outskirts of Greater Manchester with a small elderly population located within the M60. Within the IRR, there are no areas with a very high concentration of elderly residents. In the south east of the study area, there is a high concentration of elderly residents however this area contains mostly low emissions reductions. In contrast, the north west of the study area contains a high elderly population and high emissions reductions. Table 4- 12 shows the number of over 65's located within each of the key study areas which also experience the highest reductions in emissions. The final row of the table shows the total elderly population within each zone (regardless of air quality impacts).

Table 4- 12: The number of over 65's living in areas with the 10% highest reductions in emissions

		Greater Manchester		M60 (excluding IRR)		IRR	
		Number of residents	**%**	**Number of residents**	**%**	**Number of residents**	**%**
Elderly population (over 65)	Option 5(i)	48,000	12%	15,000	16%	490	70%
	Option 5(ii)	48,000	12%	15,000	16%	540	77%
	Option 8	48,000	12%	14,000	15%	490	70%
Total elderly population		**410,700**		**91,000**		**700**	

Table 4- 12 shows that across the whole of Greater Manchester, approximately 48,000 (12%) of elderly residents experience the highest reductions in emissions. Within the M60, Option 5(i) and Option 5(ii) presents marginally higher benefits than Option 8, with approximately 16% of this area benefitting from high emissions reductions compared to 15% for Option 8. The greatest impact is seen within the IRR in which Option 5(ii) results in 77% of over 65's in this zone receiving the greatest reductions in emissions. For Option 5(i) and Option 8, 70% of the residents in the IRR experience the highest emissions reductions, this equates to approximately 490 elderly residents (less than 1% of the total study area).

The analysis shows that overall, the M60 and IRR are expected to receive the highest air quality benefits. In general, the elderly population are located outside of these zones, on the outskirts of Greater Manchester. Having said that, the small elderly population located within the IRR, does experience largely positive impacts with over 70% (490 residents) located in areas of high emissions reductions. It is likely that given the distribution of the elderly population, benefits are more likely to be experienced through improved accessibility and affordability of local transport services as a result of the CAP rather than reductions in emissions.

4.6.6 Summary

Overall, across the whole of Greater Manchester, Option 5(ii) and Option 5(i) are the best performing options in terms of overall emissions reductions, resulting in an 18% decrease in total emissions compared to the do minimum scenario. Option 8 follows closely behind with a 17% reduction in total emissions of PM and NO_X. This is also true within the M60 where Option 5(ii) and Option 5(i) result in a 23% reduction in emissions compared to a 20% reduction for Option 8.

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Within the IRR, Option 5(ii) is the highest performing option, resulting in the greatest reductions in total emissions. This is closely followed by Option 5(i) and Option 8. Within the IRR, the majority (>70%) of the total elderly population experience the highest reductions in emissions.

4.7 Mitigation and enhancement

In line with TAG unit A4-2A, where the distributional impacts analysis shows evidence of an intervention having particularly high benefits or dis-benefits to a certain group, enhancement and mitigation should be considered. Section 4.5 shows that beneficial air quality impacts are experienced across all quintiles. In absence of adverse effects, no mitigation is considered necessary.

It is recommended that further work be undertaken to explore potential enhancement measures for any beneficial distributional impacts.

4.8 Sensitivity analysis

The sensitivity tests reported in this section test the extent to which the conclusions of the assessment may alter because of modelling uncertainties.

Table 4- 13 shows the distributional impacts appraisal matrix from section 4.5.5. In absence of specific guidance on the threshold used to determine moderate beneficial impacts, a threshold of +/- 2% was applied. To test the sensitivity of the results to this threshold, a sensitivity test has been run applying 5% threshold. This is the level used for distributional analysis of user benefits and is recommended by WebTAG Unit A4-2.

Table 4- 13 shows the sensitivity analysis using the results from the assessment on Option 5(i)/(ii) and Option 8.

Table 4- 13: Distributional impacts appraisal matrix with 2% and 5% thresholds on significance levels

	+/- 2% threshold on moderate significance					**+/- 5% threshold on moderate significance**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Low income households (Relative to England and Wales)	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Low income households (Relative to Greater Manchester)	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓

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	+/- 2% threshold on moderate significance					+/- 5% threshold on moderate significance				
	1	2	3	4	5	1	2	3	4	5
Children (Relative to England and Wales)	✓	✓✓	✓✓	✓✓ ✓	✓✓ ✓	✓	✓✓	✓✓	✓✓	✓✓ ✓
Elderly (Relative to England and Wales)	✓	✓	✓	✓✓ ✓	✓✓ ✓	✓	✓	✓✓	✓✓	✓✓ ✓

As seen in Table 4- 13, the distributional impacts appraisal matrix for low income households is not sensitive to this change in significance threshold. For children and the elderly, quintiles 3 and 4 change from large and slightly beneficial to moderate beneficial. Since the results of the sensitivity test result in only minor differences, with no adverse impacts, these can be considered insignificant.

4.9 Limitations

Although there is a lot of evidence linking air pollution with adverse health effects, the ability to quantify these effects presents a challenge. The challenges stem from multiple pollutants coming from the same source and with similar distribution.

The impact factors in Table 5- 13 were derived based on the best available scientific information and medical evidence on the effects of pollutants on health and the environment. However, it is noted that the methodology is not without its limitations. For example, there are a range of other negative health outcomes that are not included in JAQU's impact pathway methodology. These include:

- cognitive decline and dementia, which have been linked to traffic-related air pollutants (Power et al., 2016);
- lower lung function in early life which has been associated to exposure during pregnancy (Morales et al., 2015);
- self-reported life satisfaction has been linked to NO_2 (after controlling for other economic, social and environmental factors) (Knight and Howley, 2017).

The evidence on the health effects of traffic related air pollutants is continually evolving and approaches to measuring health benefits will need to adapt as new evidence emerges.

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5 Health and Environment

5.1 Overview

This section presents the findings of the preliminary analysis of health and environmental distributional impacts (DI) for the proposed GM CAP. The analysis is based on outputs of TfGM's EMIGMA (Emissions Inventory for Greater Manchester) software, which provides the change in emissions in tonnes for NO_X and PM_{10} for a 'DM Scenario' (2021) compared to each of the clean air options under analysis (Option 5(i)/(ii) and Option 8).

The findings reported here are intended as illustrative of the final analysis that will be completed for the preferred clean air option selected for Greater Manchester, once the final air dispersion modelling results are available. The aim here is to present an overview of the methodology and the approach to the analysis, and to present some indicative results.

In February 2016, the JAQU was established by Defra and the DfT to coordinate delivery of the Government's plans for achieving NO_2 compliance. Part of the remit of JAQU is to support the implementation of CAZs or other measures selected by local authorities (UK Parliament, 2018).

The outputs from the EMIGMA modelling comprise estimates of mass road traffic emissions for each road or link. A GIS solution was devised to crop the links so that the total change in emissions at LSOA level could be derived. Defra damage cost multipliers were then applied to the change in emissions.

Monetised health and environmental benefits are described for Greater Manchester as a whole, and within each of the proposed charging zones, as well as at the LA level. The health and environmental impact assessment does not look at LSOAs on an individual basis, rather the assessment for these wider study areas is built up from the LSOA level results.

5.2 Key findings

The key findings of the assessment are presented as follows:

- For Option 5(ii), the total monetised health and environmental benefit in Greater Manchester is estimated at around £17.9 million. This is slightly higher than the total monetised benefit of £17.8 million for Option 5(i). Option 8 delivers the lowest benefits of all options at £14.9 million across Greater Manchester.
- Within the IRR, the total monetised health and environmental benefit is estimated at £480,000 for option 5(ii). The benefit within the IRR for Option 5(i) is slightly higher than Option 5(ii), at £430,000. The total benefit within the IRR for Option 8 is the lowest of all three options at approximately £350,000.

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5.3 Key health and environmental concerns

The following key health and environmental concerns are considered in this report. A summary of issues screened in/out of the analysis is provided in section 5.5.

5.3.1 Respiratory illness

The links between air quality emissions and health effects are well established. The main pollutants from vehicle emissions are PM and NO_X, which are linked to effects on lung function and other respiratory problems.

PM particles with a diameter of less than 10µm are referred to as PM_{10}. Those with a diameter of less than 2.5µm are called $PM_{2.5}$. $PM_{2.5}$ also consists of ultrafine particles with a diameter of less than 0.1µm which can remain in the atmosphere for days or weeks at a time and are therefore subject to long-range transboundary transport in the air. Both PM_{10} and $PM_{2.5}$ include particles small enough to penetrate the human respiratory system, therefore resulting in health effects (World Health Organisation (WHO), 2013).

Evidence shows high exposure to poor air quality (particularly PM and NO_X) in the short term can result in inflammation of the airways and increased incidence of shortness of breath and wheeze symptoms (Royal College of Physicians, 2016).

In the long term, exposure can affect lung function and increase hospital admissions and mortality for those with existing respiratory conditions such as chronic obstructive pulmonary disease (COPD) and asthma. There is also evidence to suggest that long-term exposure to poor air quality causes new-onset asthma in both children and adults (Royal College of Physicians, 2016).

Recently, evidence has shown links between PM and chronic bronchitis; however, currently there is not sufficient evidence to establish causality. Therefore, this issue would be acknowledged during the assessment but not assessed quantitatively. Impacts related to respiratory illness are captured in the monetisation of health and environmental impacts in sections 5.6.4 to 5.6.6.

5.3.2 Cardiovascular disease

Cardiovascular disease includes all the diseases of the heart and circulation including CHD, angina, heart attack, congenital heart disease and stroke (British Heart Foundation, 2017). CHD is the leading cause of death in the UK (British Heart Foundation, 2015). Evidence shows exposure to high levels of PM both in the short and long term can exacerbate existing cardiovascular disease and is associated with a range of cardiovascular effects such as heart failure and strokes. Impacts related to cardiovascular disease are captured in the monetisation of health and environmental impacts in sections 5.6.4 to 5.6.6.

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5.3.3 Mortality

The link between mortality and long-term exposure to air pollution is well evidenced (COMEAP, 2017). Cohort studies looking at the effects of air pollution on health over several years have shown that the deaths from respiratory and cardiovascular causes, in combination with other factors, increase with long term exposure to air pollution. Studies also found that the link between exposure and mortality is much stronger for $PM_{2.5}$ than PM_{10} (WHO, 2013). Impacts related to mortality are captured in the monetisation of health and environmental impacts in sections 5.6.4 to 5.6.6.

5.3.4 Active travel

The GM CAP has the potential to encourage a city-wide transition towards active transport. Journeys by bicycle or on foot not only reduce emissions and improve air quality but have the added advantages of improving health by helping reduce obesity, diabetes, CHD, stroke, road traffic accidents, and improving mental health (UK Alliance on Climate Change, 2016). Impacts related to active travel are considered in the context of baseline data for obesity and other key health indicators, and the results of the analysis of distributional effects on accessibility (section 7).

5.3.5 Productivity

Productivity refers to the impact on the efficiency with which an input is used in the production process e.g. labour, human capital, natural capital. The pathway between air pollution and productivity focusses on the direct impacts of air pollution on human health via inhalation. These pathways subsequently impact on productivity through lost time participating in employment or non-market productive activities (Ricardo AEA, 2014). For example, an individual being admitted to hospital because of a pollution induced respiratory disorder could result in significant time off work, therefore impacting on workplace productivity. Health impacts could also affect non-market productive activities (e.g. volunteering and non-paid caring) by preventing an individual partaking in these activities. Impacts related to productivity are captured in the monetisation of health and environmental impacts in sections 5.6.4 to 5.6.6.

5.3.6 Building soiling

Soiling of buildings by particles is one of the most obvious signs of pollution in urban areas (Defra, 2015). The soiling of buildings includes both residential buildings and historical/cultural buildings. This results in economic damages through both cleaning and amenity costs. In the absence of willingness to pay values, building soiling costs are calculated based on the costs of cleaning. Impacts related to building soiling are captured in the monetisation of health and environmental impacts in sections 5.6.4 to 5.6.6.

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5.3.7 Ecosystem effects

Increased nitrogen deposition in the form of NO_X poses a risk to biodiversity, through increased nitrogen deposition and overloading by nitrogen favourable species, reducing plant diversity in natural and semi-natural ecosystems.

5.4 Health and environmental issues screened out

The following effects were screened out, based on the following justification.

5.4.1 Indoor pollution

A report commissioned by the Royal College of Physicians (2016) considered the large potential effect on health of indoor sources of air pollution such as gas cookers, cleaning products and carbon monoxide. The report showed that several thousand's deaths per year in the UK could be attributed to indoor air pollution. Whilst consideration would be made to the potential health effects at built community facilities with limited ability to lessen interference from local emission sources such as hospitals and car homes (in line with TAG Unit 4.2), indoor air pollution falls outside the scope of this study, which focuses on mainly on traffic emissions.

5.4.2 Noise

Noise nuisance and vibration caused by road traffic can increase levels of stress, anxiety and aggression, increase the risk of hypertension and cardiovascular disease, and contribute to sleep disturbance and psycho-physiological effects (WHO, 2011). Noise is also a key contributing factor of neighbourhood amenity with excessive noise reducing the quality of the local environment. This reduction in neighbourhood amenity can lead to avoidance of the street for social use and reduced levels of active travel, ultimately leading to impacts on physical and mental health (Mindell et al., 2011). Key receptors of noise impacts include residential properties, schools, hospitals, care homes, open spaces, streetscapes and public rights of way.

The introduction of a clean air charge means there is potential for some change in fleet composition with older (generally louder engines) vehicles to be replaced with newer vehicles (generally quieter engines) that are subject to tighter noise limits in accordance with Regulation (EU) No 540/2014. Additionally, there is potential for some heavy vehicles to be replaced with multiple smaller vehicles in order to avoid the additional charge. However, these changes are not expected to result in a perceivable noise reduction. Further, establishing causal relationships between exposure to noise and health can be problematic as the effects of exposure vary between different types of noise sources and are also compounded by other factors. As such, noise effects are screened out, although the assessment of distributional impacts has considered where the main changes in traffic flows would occur and the characteristics of the population and facilities in that area. These locations would potentially experience change in levels of noise, as well as other traffic related impacts such as risk of accidents and community severance.

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5.4.3 Climate change

Climate adaption in urban areas now considers the impacts of urban heat islands as an important part of forming strategic climate change action plans. Urban heat islands are man-made areas which are significantly warmer than the surrounding countryside. This mainly occurs because the materials used in towns and cities e.g. tarmac and stone have different thermal properties allowing them to absorb more heat than the materials found in rural areas.

The impacts of Urban Heat Island (UHI) compounds intensify the impacts of climate change resulting in hotter summers and heatwaves, preventing night-time cooling.

Whilst there are many factors that contribute to UHI, transport is a major contributor. Vehicles generate a large amount of heat through their exhaust emissions, radiant heat and tyre-road surface friction. As there is a higher density of vehicles in urban areas, this significantly contributes to the UHI and its associated health effects. Improved urban planning and investment in active transport can reduce the effects of the UHI, resulting in improvements to health, air quality and helping to meet climate change targets.

Assessment of the potential effects on the UHI in Greater Manchester resulting from the GM CAP is considered outside the scope of this assessment.

5.4.4 Crime reduction and community safety

In relation to community safety, being a victim of crime has an immediate physical and psychological impact. It can also have indirect long-term health consequences including disability, victimisation and isolation because of fear. Thoughtful planning and urban design that promotes natural surveillance and social interaction can help to reduce crime and the ‘fear of crime’, both of which impacts on the mental wellbeing of residents.

It is recognised that ANPR cameras and surveillance could potentially provide a deterrent for crime; however, given that closed-circuit television (CCTV) has been found to reduce property and vehicle crime, but provide little deterrent for street crime in open areas, the potential for clean air charging in Greater Manchester to provide any additional deterrent to crime is considered unlikely (Gill and Spriggs, 2005). For this reason, this topic has been screened out of the assessment.

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5.5 Summary of screening

Table 5- 1 gives a summary of the health and environmental issues screen in/out of the assessment, as detailed in section 3.2 and 3.4. Colour coding in the first column refers to where this is covered within the analysis.

	Health effect considered within damage cost methodology
	Health effect additional to damage cost methodology
	Environmental consideration considered within damage cost methodology
	Environmental consideration additional to damage cost methodology

Table 5- 1: Screening of health and environmental impacts

Health/ environmental consideration	Screened in	Reason for screening in/out
Respiratory illness	✓	The links between air quality emissions and health effects are well established. The main pollutants from vehicle emissions are $PM_{10}$and NO_x, which are linked to effects on lung function and other respiratory problems (Royal College of Physicians, 2016).
Cardiovascular disease	✓	Evidence shows exposure to high levels of PM_{10}both in the short and long term can exacerbate existing cardiovascular disease and is associated with a range of cardiovascular effects such as heart failure and strokes. (British Heart Foundation, 2017).
Mortality	✓	The link between mortality and long-term exposure to air pollution is well evidenced (COMEAP, 2017).
Active travel	✓	The GM CAP has the potential to encourage a city-wide transition towards active transport. Journeys by bicycle or on foot not only reduce emissions and improve air quality but have the added advantages of improving health by helping reduce obesity, diabetes, coronary heart disease (CHD), stroke, road traffic accidents, and improving mental health (UK Alliance on Climate Change, 2016).
Diabetes	✓	Evidence suggests a link between air pollution and diabetes, especially type 2 diabetes mellitus. The association was stronger for traffic associated pollutants including NOx and PM (Royal College of Physicians, 2016). Further work is recommended (see Appendix B).
Cognitive decline and dementia	✓	There is emerging evidence to suggest that poor air quality affects cognitive functioning in both children and adults (Royal College of Physicians, 2016). Further work is recommended (see Appendix B).
Mental health	✓	According to a growing body of evidence, air pollution can be associated with changes in behaviour within society, for example, spending less time outside, which can lead to more sedentary lifestyles and negative psychological effects on our mental health (Crowder, 2017). Further work is recommended (see Appendix B).

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Health/ environmental consideration	Screened in	Reason for screening in/out
Risks to unborn baby	✓	There is emerging evidence on the links between high levels of emissions and effects on the unborn child. Further work is recommended (see Appendix B).
Productivity	✓	Productivity refers to the impact on the efficiency with which an input is used in the production process e.g. labour, human capital, natural capital.
Building Soiling	✓	Reduced soiling of buildings by combustion particulates (the soiling of buildings includes both residential dwellings and historic/cultural buildings and causes economic damages through cleaning costs and amenity costs)
Ecosystem effects	✓	Reduced impact of NO_2 on ecosystems (impact of NO_2 results in increased nitrogen deposition and overloading by nitrogen favourable species, reducing plant diversity in natural and semi-natural ecosystems)
Indoor pollution	×	Indoor air pollution (gas cookers, cleaning products, carbon monoxide) falls outside the scope of this study, which focuses on mainly traffic emissions (see section 5.4.1).
Noise	×	Changes in fleet composition could result in perceivable noise reductions, reducing stress, anxiety, aggression and further associated health problems associated with noise. However, changes in fleet composition are unexpected to result in perceivable noise reduction (see section 5.4.2).
Climate change	×	Potential effects of urban heat islands are considered outside the scope of the assessment for reasons of proportionality (see section 5.4.3).
Crime reduction and community safety	×	It is recognised that ANPR cameras and surveillance measures associated with a GM CAP could provide deterrent for crime, increasing safety, however this topic has been scoped out of the assessment due to the limited evidence (see section 5.4.4).

5.6 Damage cost methodology

Damage costs are a simple way to value changes in air pollution. They estimate the cost to society of a change in emissions of different pollutants (Defra, 2015). Damage costs are provided by pollutant type, pollutant source and location. Monetary benefits are calculated by multiplying damage cost by the change in emissions (tonnes of pollutant).

5.6.1 Introduction

This section describes the methodology applied to the assessment of air quality distributional impacts.

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1) Firstly, each LSOA was assigned a classification based on ONS residential-based area classifications. Using socio-economic and demographic data from each census, these classifications aim to identify areas of the country with similar characteristics e.g. population size. These were then matched with Defra's pollutant source classifications (see Table 5- 2). Out of 1,673 LSOAs, the majority (97%) are assigned the 'Road Transport Urban Big' classification. 'Road Transport Urban Medium' and 'Road Transport Rural' account for 2.3% and 0.8% respectively.

Table 5- 2: Pollutant source and ONS classifications

Defra pollutant source classification	Corresponding ONS classification (ONS, 2011)	Rural/urban LA classification (England)
Road Transport Inner Conurbation	Not applied in the assessment	N/A
Road Transport Outer Conurbation	Not applied in the assessment	N/A
Road Transport Urban Big	Urban major conurbation	Major urban: districts with either 100,000 people or 50% of their population in urban areas with a population of more than 750,000. Less than 26% of the population living in rural settlements and hub towns.
Road Transport Urban Large	Not applied in the assessment	N/A
Road Transport Urban Medium	Urban city and town	At least 26% but less than 50% of the population living in rural settlements and hub towns[20].
Road Transport Urban Small	Not applied in the assessment	N/A
Road Transport Rural	Rural town and fringe	At least 50% but less than 80% of population living in rural settlements and hub towns.
	Rural village and dispersed	At least 80% living in rural settlements and hub towns.

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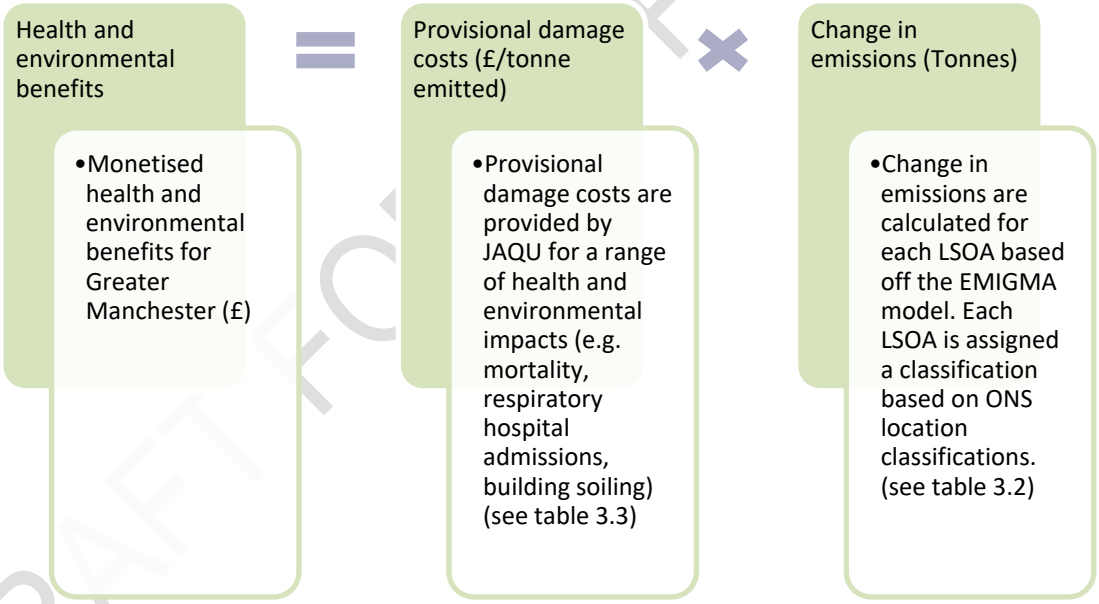
[20] Hub towns are built up areas with a population of 10,000 to 30,000 that meet specific criteria relating to dwelling and business densities, suggesting the potential to serve the wider rural hinterland (ONS, 2017).

2) Secondly, the outputs of the EMIGMA model were manipulated using GIS techniques to calculate the approximate change in emissions for each LSOA in the study area. This provided the change in emissions between the DM (2021) and the clean air option scenario (2021) (Option 5(i)/(ii) and Option 8). Provisional damage costs multipliers for NOx and PM10 were uplifted from 2015 prices to 2018 base year, using the WebTAG GDP deflator series (see Table 5- 3 and Table 5- 4). Further work is recommended to uplift these values to more accurately reflect the willingness to pay assumption (see Appendix B). The JAQU guidance indicates that ozone impacts are an optional requirement and are not included in the analysis presented here.
3) The adjusted damage costs and the change in emissions were used to calculate the benefits of a reduction in pollutants emitted at LSOA level. The results are presented in 2018 prices.

Image 5- 1 provides an overview of the approach used to calculate health and environmental benefits.

Image 5- 1: Methodology for the calculation of health and environmental benefits



5.6.2 Provisional damage costs for health effects

The provisional damage costs (Table 5- 3 and Table 5- 4) cover a range of pollutant and exposure pathways as follows:

- NO_2 Mortality – the impact on LE of long-term exposure to average levels of pollutants in the air
- PM_{10} Mortality – the impact on LE of long-term exposure to average levels of pollutants in the air

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- PM_{10} Respiratory hospital admissions – emergency admissions to hospital due to pollution induced respiratory problems
- PM_{10} Cardiovascular hospital admissions – emergency admissions to hospital due to pollution induced cardiovascular problems

5.6.3 Provisional damage costs for environmental effects

Using the provisional damage costs, it is also possible to quantify the effects on the environment as follows:

- PM_{10} Productivity – the impact on the efficiency with which an input is used in the production process e.g. labour, human capital, natural capital.
- Building Soiling (PM_{10}) – reduced soiling of buildings by combustion particulates (the soiling of buildings includes both residential dwellings and historic/cultural buildings and causes economic damages through cleaning costs and amenity costs)
- Ecosystem impact (NO_2) – reduced impact of NO_2 on ecosystems (impact of NO_2 results in increased nitrogen deposition and overloading by nitrogen favourable species, reducing plant diversity in natural and semi-natural ecosystems)
- Ozone ecosystem impact – negative effect on human and environmental health from depletion in the ozone layer resulting in greenhouse gas (GHG) effects[21]

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[21] The JAQU guidance indicates that ozone impacts are an optional requirement and are not included in the analysis presented here.

Table 5- 3: Provisional Damage Costs (2018 £/tonne emitted) - PM_{10}

Source	PM Mortality	NO_2 Mortality	PM Respiratory hospital admissioN	PM Cardiovascular hospital admission	PM Productivity	PM Building Soiling	NO_2 Ecosystem
Average Road Transport	£80,116	n/a[22]	£702	£429	£7,979	£574	n/a
Road Transport Inner Conurbation	£143,244	n/a	£1,255	£768	£14,266	£574	n/a
Road Transport Outer Conurbation	£85,117	n/a	£746	£456	£8,477	£574	n/a
Road Transport Urban Big	£103,943	n/a	£911	£557	£10,352	£574	n/a
Road Transport Urban Large	£84,033	n/a	£736	£450	£8,369	£574	n/a
Road Transport Urban Medium	£69,123	n/a	£606	£371	£6,884	£574	n/a
Road Transport Urban Small	£51,830	n/a	£454	£278	£5,162	£574	n/a
Road Transport Rural	£23,518	n/a	£206	£126	£2,342	£574	n/a

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[22] n/a represents areas in which there is no recognised pathway between the pollutant and the damage cost.

Table 5- 4: Provisional Damage Costs (£/tonne emitted) - NO_X

Source	PM Mortality	NO_2 Mortality	PM Respiratory hospital admission	PM Cardiovascular hospital admission	PM Productivity	PM Building Soiling	NO_2 Ecosystem
Average Road Transport	£528	£4,571	£4.18	£2.56	£52.59	n/a	£64
Road Transport Inner Conurbation	£528	£8,489	£4.18	£2.56	£52.59	n/a	£64
Road Transport Outer Conurbation	£528	£4,854	£4.18	£2.56	£52.59	n/a	£64
Road Transport Urban Big	£528	£6,015	£4.18	£2.56	£52.59	n/a	£64
Road Transport Urban Large	£528	£4,76	£4.18	£2.56	£52.59	n/a	£64
Road Transport Urban Medium	£528	£3,882	£4.18	£2.56	£52.59	n/a	£64
Road Transport Urban Small	£528	£2,850	£4.18	£2.56	£52.59	n/a	£64
Road Transport Rural	£528	£1,136	£4.18	£2.56	£52.59	n/a	£64

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5.6.4 Heath and Environmental Impacts - Option 5(i)

For the entirety of Greater Manchester, the total health and environmental benefit provided by the implementation of Option 5(i) is estimated at around £18 million, as illustrated in Table 5- 5.

Table 5- 5: Health and environmental benefits for Greater Manchester – Option 5(i)

Pollutant emitted / impact	Monetised health and environmental benefit (£, 2018)	% contribution to the total health and environmental benefit
PM_{10} / Mortality	£8,050,000	45%
NO_2 / Mortality	£8,750,000	49%
PM / Respiratory hospital admission	£70,000	0.4%
PM / Cardiovascular hospital admission	£40,000	0.2%
PM / Productivity	£800,000	4.5%
PM / Building Soiling	£40,000	0.2%
NO_2 / Ecosystem	£100,000	0.5%
Total	**£17,850,000**	**100%**

Approximately half (49%) of the total health and environmental benefit is derived from the avoided deaths (reduced rates of mortality) resulting from reduced exposure to NO_2. Reduced exposure to PM_{10} and the associated avoided deaths (reduced rates of mortality) contributed 45% to the overall total. The reduction in lost productivity resulting from the reduction in concentrations of PM_{10} accounts for 4.5% of the total. All other impacts contribute less than 1% to the total benefit. Overall, health factors contribute approximately £17million (95%) to the total whilst environmental factors contribute approximately £1million (5%).

The breakdown of the total benefit for each of the proposed charging zones is illustrated in Table 5- 6.

Table 5- 6: Health and environmental benefits by charging zone – Option 5(i)

Zone description	Number of LSOAs	Total monetised health and environmental benefit (£, 2018)
Greater Manchester (all LSOAs)	1,673	£17,850,000
Greater Manchester (excluding M60 and IRR)	1,182	£11,690,000

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Zone description	Number of LSOAs	Total monetised health and environmental benefit (£, 2018)
LSOAs within the M60 (including IRR)	491	£6,160,000
LSOAs within the M60 (excluding IRR)	474	£5,730,000
IRR	17	£430,000

Within the IRR, the total monetised health and environmental benefit (£430,000) contributes 2% to the overall total benefit across Greater Manchester. Within the M60 (including the IRR), the total benefit is approximately £6million, contributing 34% to the overall total.

5.6.5 Heath and Environmental Impacts - Option 5(ii)

For the entirety of Greater Manchester, the total health and environmental benefit provided by the implementation of Option 5(ii) is estimated at around £18 million, as illustrated in Table 5- 7.

Table 5- 7: Health and environmental benefits for Greater Manchester – Option 5(ii)

Pollutant emitted / impact	Monetised health and environmental benefit (£, 2018)	% contribution to the total health and environmental benefit
PM_{10} / Mortality	£8,060,000	45%
NO_2 / Mortality	£8,790,000	49%
PM_{10} / Respiratory hospital admission	£70,000	0.4%
PM_{10} / Cardiovascular hospital admission	£40,000	0.2%
PM_{10} / Productivity	£800,000	4.5%
PM_{10} / Building Soiling	£40,000	0.2%
NO_2 / Ecosystem	£100,000	0.5%
Total	**£17,900,000**	**100%**

Approximately half (49%) of the total health and environmental benefit is derived from the avoided deaths (reduced rates of mortality) resulting from reduced exposure to NO_2. Reduced exposure to PM_{10} and the associated avoided deaths (reduced rates of mortality) contributed 45% to the overall total. The reduction in lost productivity resulting from the reduction in concentrations of PM_{10} accounts for 4.5% of the total. All other impacts contribute less than 1% to the total benefit.

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The breakdown of the total benefit for each of the proposed charging zones is illustrated in Table 5- 8.

Table 5- 8: Health and environmental benefits by charging zone – Option 5(ii)

Zone description	Number of LSOAs	Total monetised health and environmental benefit (£, 2018)
Greater Manchester (all LSOAs)	1,673	£17,900,000
Greater Manchester (excluding M60 and IRR)	1,182	£11,640,000
LSOAs within the M60 (including IRR)	491	£6,270,000
LSOAs within the M60 (excluding IRR)	474	£5,790,000
IRR	17	£480,000

Within the IRR, the total monetised health and environmental benefit contributes 3% (£480,000) to the overall total benefit across Greater Manchester. Within the M60 (including the IRR), the total benefit is approximately £6.2million, contributing 35% to the overall total.

5.6.6 Health and Environmental Impacts – Option 8

For the entirety of Greater Manchester, the total health and environmental benefit provided by the implementation of Option 8 is estimated at around £17 million, as illustrated in Table 5- 9.

Table 5- 9: Health and Environmental benefits for Greater Manchester - Option 8

Pollutant emitted / impact	Monetised health and environmental benefit (£, 2018)	% contribution to the total health and environmental benefit
PM_{10} / Mortality	£5,890,000	39%
NO_2 / Mortality	£8,300,000	55%
PM / Respiratory hospital admission	£50,000	0.3%
PM / Cardiovascular hospital admission	£30,000	0.2%
PM / Productivity	£590,000	3.9%
PM / Building Soiling	£30,000	0.2%
NO_2 / Ecosystem	£90,000	0.6%
Total	**£14,980,000**	**100%**

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Reduced exposure to NO_2 and the associated avoided deaths (reduced rates of mortality) contributed over half (55%) of the overall total. Less than half (39%) of the total health and environmental benefit is derived from the avoided deaths (reduced rates of mortality) resulting from reduced exposure to PM_{10}. The reduction in lost productivity resulting from the reduction in concentrations of PM_{10} accounts for 3.9% of the total. All other impacts contribute less than 1% to the total benefit.

5.6.7 Total health and environmental benefits all options

Table 5- 10 shows the total health and environmental benefits for all options.

Table 5- 10: Total health and environmental benefits – all options

Total health and environmental benefit (£, 2018)	Option 5(i)	Option 5(ii)	Option 8
Health	£16,910,000	£16,963,000	£14,270,000
Environmental	£938,700	£940,000	£709,000
Total	**£17,850,000**	**£17,900,000**	**£14,980,000**

The table shows that Option 5(ii) delivers the most benefits contributing almost £18 million in health and environmental benefits to Greater Manchester. This is very closely followed by Option 5(i) which is £50,000 less than Option 5(ii). Overall, Option 8 delivers the lowest health benefits in the region of £15 million.

Table 5- 11: Total health and environmental benefits in key study areas – all options

Zone	Option 5(i)	Option 5(ii)	Option 8[23]
Greater Manchester (excluding M60 and IRR)	£11,690,000	£11,640,000	£9,870,000
M60 (excluding IRR)	£5,730,000	£5,790,000	£4,760,000
IRR	£430,000	£480,000	£350,000
Total (Greater Manchester Wide)	**£17,850,000**	**£17,900,000**	**£14,980,000**

[23] Option 8 is a Greater Manchester wide scheme. The figures for the M60 and IRR key study areas are presented for comparison only.

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5.7 Sensitivity Tests

The sensitivity tests reported in this section test the extent to which the conclusions of the assessment may alter because of modelling uncertainties.

5.7.1 Population weightings

Damage costs are provided by pollutant, source and location. In absence of the ADMS data required to complete a full impact pathway analysis, the methodology applied here classified all LSOAs according to ONS residential-based areas classifications. These have then been matched to Defra's pollutant source classifications. To test the sensitivity of the results to this process, all areas have been re-classified as "Road Transport Urban Big" and the results have been compared representing a worst-case scenario.

Table 5- 12 shows the total damage cost for all options with original classifications and a sensitivity test.

Table 5- 12: Sensitivity test of population weightings

	Option 5(i)	**Option 5(ii)**	**Option 8**
Total damage cost with original LSOA classifications.	£17,850,000	£17,900,000	£14,980,000
Total damage cost with all LSOAs classified as 'Urban Big'	£18,300,000	£18,360,000	£15,450,000
% difference	2.5%	2.6%	3.2%

The results show minor differences (less than 4%) across all options. Overall, Option 5(ii) still delivers the greatest health and environmental benefits. It is therefore concluded that the results of the analysis are not sensitive to the population weightings used in the analysis.

5.8 Impact pathway methodology

5.8.1 Introduction

This section describes the impact pathway methodology, which could be applied subject to a workable methodology using ADMS results (see section 1.1 Appendix B).

The full impact pathway approach is outlined below:

- Initial location-specific air quality modelling is undertaken to calculate the change in air quality emissions between a baseline scenario (i.e. when no interventions have taken place) and the modelled scenario (i.e. the implementation of a clean air intervention).

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- The change in population weighted mean concentrations between the baseline and the modelled scenario are calculated. The population weighted mean concentration is the estimated average exposure of the population to different pollutants. This is weighted by population so that the concentration data in more populated areas are given a higher weight than those in less populated areas.
- The health impacts are then quantified and monetised using a set of impact factors provided by JAQU. The impact factors capture the value in GBP per person of a 1 μgm^{-3} change in concentration of a pollutant. The impact factors represent the pathway between exposure to a pollutant and the ultimate health outcome.

5.8.2 Impact pathway pollutants for health effects

The provisional impact factors, provided by JAQU (Table 5- 13), are based on the recommended concentration response functions from the Committee on the Medical Effects of Air Pollutants (COMEAP). These are then monetised using the value of a life year and recommendations from a study by Chilton et al (2004). Applying he approach recommended by JAQU, the following impacts can be quantified:

- NO_2 Mortality – the impact on LE of long-term exposure to average levels of pollutants in the air
- PM_{10} Mortality – the impact on LE of long-term exposure to average levels of pollutants in the air
- PM_{10} Respiratory hospital admissions – emergency admissions to hospital due to pollution induced respiratory problems
- PM_{10} Cardiovascular hospital admissions – emergency admissions to hospital due to pollution induced cardiovascular problems
- PM_{10} Productivity – the impact on the efficiency with which an input is used in the production process e.g. labour, human capital, natural capital.

5.8.3 Impact pathway pollutants for non-health (environmental) effects

Using the JAQU impact factors, it is also possible to quantify the effects on the environment, such as the effects of PM on building soiling and the associated costs involved in cleaning buildings in urban areas. It is possible to quantify the following impacts:

- Building Soiling (PM_{10}) – reduced soiling of buildings by combustion particulates (the soiling of buildings includes both residential dwellings and historic/cultural buildings and causes economic damages through cleaning costs and amenity costs)

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- Ecosystem impact (NO_2) – reduced impact of NO_2 on ecosystems (impact of NO_2 results in increased nitrogen deposition and overloading by nitrogen favourable species, reducing plant diversity in natural and semi-natural ecosystems)
- Ozone ecosystem impact – negative effect on human and environmental health from depletion in the ozone layer resulting in GHG effects

Table 5- 13: Provisional Damage Cost Impact Factors (£/ug^{-3}/person) (2015 prices)

Pollutant	PM Mortality	NO_2 Mortality	PM Respiratory Hospital Admissions	PM Cardiovascular hospital admission	PM productivity	Building Soiling (PM_{10})	Ecosystem Impact ($N0_2$)	Ecosystem Impact (Ozone)
	(£/ug-3/person)				(£ per tonne emitted)			
PM_{10}	£16.20	n/a	£0.10	£0.06	£1.61	£543	n/a	n/a
NO_2	n/a	£2.47	n/a	n/a	n/a	n/a	£61	-£35

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6 Affordability

6.1 Overview

This report presents the findings of the preliminary analysis of affordability distributional impacts for the proposed GM CAP. The method of appraisal has been developed with reference to the guidance set out in DfT's TAG Unit A4-2 'Distributional Impact Appraisal' (DfT, 2015). This follows three stages of screening, assessment and appraisal to identify groups which could be disproportionately impacted by a proposed scheme. This approach has been supplemented with additional qualitative narrative relating to the potential affordability impacts on different social or economic groups in different geographies.

Three key topics are considered within this appraisal: personal affordability, user benefits and business affordability. These are explained below:

Personal affordability

Personal affordability is the cost of travel for local people commuting to a place of work or education and undertaking journeys for social or leisure purposes via private vehicle. For this scheme, changes to personal affordability are linked to the costs associated with either paying the clean air

charge for non-compliant vehicles or upgrading to a compliant vehicle where required, and in operating a vehicle (such as fuel and oil consumption, mileage related depreciation and tyre wear) that are considered critical to the decision of whether to undertake a journey.

User benefits

User benefits capture the experience of people commuting to a place of work or education and undertaking journeys for social or leisure purposes via private vehicle, and are associated with reduced journey times and reductions in the cost of operating a car, as described above. In contrast to personal affordability, this impact variable considers time and money costs that affect a person's experience when travelling, which are not likely to be critical to the decision of whether to undertake a journey.

Business affordability

The introduction of clean air charging zones in Greater Manchester would impose direct costs on businesses through increased transportation costs associated with either paying the clean air charge for non-compliant vehicles or upgrading to a compliant vehicle where required, and/or procurement costs.

6.2 Methodology

The DI appraisal applies the three-stage method set out in TAG Unit A4-2. The stages are:

1) Screening: The stage where the variety of impacts that the option may have are considered and particular impacts are prioritised for further analysis so that only the most relevant issues for the scheme are appraised to ensure proportionality.
2) Assessment: The stage where information is collected on the geographical area likely to be affected by the option and how different social and business groups are distributed within that geographical area.
3) Appraisal: The assessment of the extent of the impact of the option on the social or business groups identified.

JAQU guidance on the appraisal of distributional impacts acknowledges that in some cases it is appropriate to use a more 'light touch' approach than is set out in TAG unit A4-2, depending on scheme particulars and available information and research. The approach for this distributional impact appraisal has therefore been to screen for which types of impact are the most relevant to the influence of the CAP, and then to determine what level of analysis is proportionate, taking into account the availability of data to inform the assessment in the context of the GM CAP.

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In order to identify societal groups who could be 'disproportionately' impacted, the population within the study area has been divided into quintiles, based on the distribution across England and Wales. For example, to assess income deprivation, the population is first divided into five equal parts depending on the level of income: the first quintile contains the top fifth of the population on the scale (i.e. the 20% of the population with the highest income), the second quintile represents the second fifth (from 20% to 40%) and the fifth quintile represents the 20% of the population with the lowest income. Once the population has been divided into quintiles, it is then possible to see which groups receive the highest share of the benefits.

The aim of the analysis is to ascertain whether any social or business groups may experience disproportionate or differential affordability impacts. This can inform measures to mitigate the impact of the option if required, or if the option should be amended.

6.2.1 Personal affordability and user benefits

In accordance with JAQU and WebTAG unit 4.2 (Section 2.4), quantitative appraisals of the distributional impacts of user benefits and personal affordability have been undertaken using the outputs of Transport User Benefit Appraisal (TUBA), a software tool which calculates the economic benefits to road users. TUBA compares the economic benefits of a 'Do Something' scenario (i.e. implementation of one of the shortlisted clean air options) relative to the economic benefits of the 'Do Minimum' scenario. These can include user charges, travel time and vehicle operating costs.

The TUBA model produces monetised outputs for geographical zones correlated with UK 2011 census merged wards, which can then be disaggregated to LSOA level according to the proportion of the total population of a ward or wards resident in the intersecting area of a given LSOA. It is assumed that journeys undertaken during the morning peak in traffic flows originate from the driver's place of residence, and vice versa for those undertaken during the early evening peak.

Table 6- 1 shows the monetised outputs generated by TUBA and indicates which outputs were included in the two affordability appraisals (personal affordability and user benefits). Although the two appraisals rely on some of the same outputs, each approach is independent and serves a difference purpose.

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Table 6- 1: TUBA outputs applied in the personal affordability and user benefits appraisals

TUBA output	Personal affordability	User benefits
Fuel vehicle operating costs (i.e. changes in fuel consumption)	✓	✓
Non-fuel vehicle operating costs (for example oil consumption, tyres, vehicle maintenance and mileage-related depreciation.	✓	✓
Clean Air Plan charges as derived from operator revenue (local authority tolls) calculations	✓	×
Time benefits (a monetised value of forecast changes in travel time).	×	✓

The quantitative assessment of personal affordability described above has been supplemented with a qualitative assessment of the impacts on specific social or business groups who may experience disproportionate or differential impacts over and above those defined by their geographical location or specific needs (for example mobility level).

Distributional impacts on personal affordability and user benefits have been assessed for Greater Manchester, which constitutes the core area represented by the transport model.

6.2.2 Business affordability

JAQU Options Appraisal Guidance describes a method for quantitively assessing the distributional impacts of business affordability. This considers the distribution of SMEs and LGVs registered across the study area and uses this as an indicator for the distribution of businesses which depend on vehicles. However, there are several limitations with this approach. For example;

- Many businesses depend on cars as well as other forms of vehicle, meaning the use of LGVs is only a partially useful indicator for transport dependent businesses;
- Many vehicles are registered to addresses which are not the main location of use, for example they may be registered to a personal address or business headquarters but are in use elsewhere;
- Many businesses may not use their own vehicles but would nevertheless depend on the transport of their suppliers.

This appraisal therefore takes a high-level qualitative approach to assessing business affordability considering the baseline conditions described in section 3.12 to section 3.14. This includes an understanding of the economic context in which businesses are operating, the location and sector of

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operation of SMEs, business turnover, future growth areas, visitor and night time economies, employment patterns and land use.

Business affordability distributional impacts have been assessed by examining the following study areas that coincide with the proposed charging zones:

- The area within the IRR; and
- Greater Manchester.

6.2.3 Assessment criteria

The consideration of whether impacts are disproportionate is important to understand if one group is being unfairly disadvantaged or advantaged by the option/package. In such cases it is necessary to understand how these impacts are occurring and whether it is acceptable or whether the option should be amended or mitigated. The following scale, as recommended by TAG Unit A4.2, is used in the reporting of the DI assessment.

Table 6- 2: Distributional Impact Assessment Criteria

Assessment		Impact Description
✓✓✓	Large beneficial	Beneficial and the population impacted is significantly greater than the proportion of the group in the total population
✓✓	Moderate beneficial	Beneficial and the population impacted is broadly in line[24] with the proportion of the group in the total population
✓	Slight beneficial	Beneficial and the population impacted is smaller than the proportion of the group in the total population
-	Neutral	There are no significant benefits or dis-benefits experienced by the group for the specified impact
×	Slight adverse	Adverse and the population impacted is smaller than the proportion of the population of the group in the total population
××	Moderate adverse	Adverse and the population impacted is broadly in line with the proportion of the population of the group in the total population
×××	Large adverse	Adverse and the population impacted is significantly greater than the proportion of the group in the total population

[24] For the purposes of this assessment, 'broadly in line' refers to +/- 5% threshold between the percentage of net winners/losers and the share of the resident population in each group.

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6.3 Screening

6.3.1 Affordability impact screening

This section presents the findings of the first step of the appraisal process: the screening stage. The 'affordability' impact variable was screened in on the basis that it was one of the minimum requirements of JAQU. Changes to costs associated with private transport are anticipated through requirement to pay charge/upgrade non-compliant vehicles/change mode and loss of free parking. Differences in ability to absorb these costs or change mode may arise, based on income distribution or size of business.

Table 6- 3 shows the screening process used to consider the potential for affordability impacts on specific social groups as well as the rationale for what has been screened in or out.

Table 6- 3: Screening of personal affordability impacts

Grouping Variable	Screened in/out	Reason for screening in/out
	Option 5(i)/(ii) and Option 8	
Low income households	✓	Low income households have reduced ability to absorb increases in cost of private travel (Crisp et al., 2018).
Children	×	Whilst the GM CAP could affect the availability and cost of community transport services used by children, the effect on children as a group is one of accessibility and is therefore is considered within section 7.
Older people	×	Whilst the GM CAP could affect the availability and cost of community transport services used by older people, the effect on older people as a group is one of accessibility and is therefore is considered within section 7.
Disabled people	✓	Disabled people typically have lower average household income and the cost of upgrading wheelchair adapted private vehicles is higher, making them particularly vulnerable to increases in the costs of private transport services and private car travel (Scope, 2018). *Screened in but assessed qualitatively.
Women	×	There is limited evidence to suggest that women are more vulnerable to increases in the cost of private or public transport (section 3.9) although they may have differing transport preferences. For this reason, effects associated with the accessibility of different transport options is considered within section 7.

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Grouping Variable	Screened in/out	Reason for screening in/out
	Option 5(i)/(ii) and Option 8	
Black, Asian and Minority Ethnic (BAME)	×	There is limited evidence to suggest that BAME people are more vulnerable to increases in the cost of private transport, therefore this impact is screened out.
Religious groups	×	The CAP could affect access to religious facilities within the study area, however this issue is primarily one of accessibility and is therefore considered within section 7.

6.3.2 Business group screening

The introduction of clean air charging zones in Greater Manchester would impose direct costs on businesses. These include businesses that are located within Greater Manchester, and transport service providers of people and goods into and out of the city. How businesses and individuals decide to respond "will depend on availability of funds to upgrade their non-compliance vehicle, or pay the charge, or flexibility to change behaviour in another way" (Defra, 2016) (e.g. switch transport mode or re-route travel).

Table 6- 4 shows the screening process used to consider the potential for affordability impacts on specific business groups as well as the rationale for what has been screened in or out.

Table 6- 4: Screening of business affordability impacts

Grouping Variable	Screened in/out	Reason for screening in/out
	Option 5(i)/(ii) and Option 8	
Small and Medium Sized Enterprises (SMEs)	✓	The impact on SMEs has been identified as a key area of concern since smaller businesses are less adaptable to increases in overhead costs. It is acknowledged that there is potential for compounded affordability impacts on owners of SMEs, resulting from: Increased procurement costs (passed on from suppliers) for all SMEs who are reliant on the transportation of goods and services on the road network.

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Grouping Variable	Screened in/out	Reason for screening in/out
	Option 5(i)/(ii) and Option 8	
		Increased transportation costs, particularly if the business relies on HGVs, or if the LGV fleets are owned by individuals rather than registered to the company. The greatest impact is likely to be on employee-owned vans where the rate of fleet turnover is typically slower, meaning they will account for a higher proportion of non-compliant vehicles in 2021. Businesses are less likely to own HGV vehicles, but may rely on HGV services, which may become more expensive. No option to relocate outside of the charging zones for businesses that rely on specific environmental licenses or permits (e.g. hazardous material handling).
Buses and coaches	×	Businesses that provide or are dependent on passenger transport may be more exposed to financial pressures linked to the GM CAP. For the purpose of traffic and air quality modelling, it was assumed that buses and coaches will achieve 100% compliance rate (i.e. no buses or coaches will pay the charge); this has been factored into the cost of the Clean Bus Fund in order to provide support to operators allowing them to upgrade or retrofit. Recommendations for further work include a review of the residual impact on bus and coach operators.
HGVs	×	Businesses dependent on freight transport may be more exposed to financial pressures linked to the GM CAP. Assessment would require information such as TfGM fleet mix, DVLA registration data and DVSA vehicle operator licencing statistics. Therefore, this group has been screened out to maintain a proportionate approach at this stage. Refer to Appendix B: Recommendations for Further Work.
LGVs	✓	Businesses dependent on transport may be more exposed to financial pressures linked to the proposed clean air measures.
Taxis	×	Businesses that provide or are dependent on private passenger transport would be more exposed to financial pressures linked to the GM CAP. For the purpose of traffic and air quality modelling, it was assumed that taxis will achieve 100% compliance rate (i.e. none will pay the charge); this has been factored into the cost of the Clean Taxi Fund in order to provide support to operators allowing them to upgrade. Further review of the residual impact on taxi operators is recommended.

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Grouping Variable	Screened in/out	Reason for screening in/out
	Option 5(i)/(ii) and Option 8	
PHVs	×	Businesses that provide or are dependent on private passenger transport would be more exposed to financial pressures linked to the GM CAP. A full assessment would require analysis of licensing information for taxis and PHVs from councils within GMCA has been screened out to maintain a proportionate approach.

6.4 Assessment

6.4.1 Introduction

The following section provides an assessment of the distributional impacts of personal affordability and user benefits on the relevant grouping variable (low income households) using the prescribed Web TAG methodology. The impacts on personal affordability for people with a disability and the impacts on business affordability have been assessed qualitatively, following a bespoke methodology, and are therefore not assessed in this section (see section 6.5.4 and section 6.5.5).

For the purposes of this assessment, user costs are deemed to be associated with the LSOA in which the trip originated. It is acknowledged that this methodology does not explain where the car making the trip is registered to, or who is driving the car. For example, it could be the case that a journey is taking place from destination A to destination B, yet the driver (and therefore the person incurring the cost), lives in destination C. For the purposes of this assessment, it is assumed that trips generating user costs occur in the same LSOAs that the cars are registered in. Therefore, as an example, a moderate adverse impact for those in deprivation quintile 1 represents a situation in which user costs (personal affordability impact) associated with trips originating in these areas are roughly in line with the proportion of the population that are the most deprived (refer to the assessment criteria guide in Table 6- 2).

6.4.2 Personal Affordability - Income deprivation

As described in section 6.2.1, the distributional impacts on personal affordability have been assessed quantitively following the method set out in TAG Unit A4.2. TUBA analysis has been run to calculate the user cost impacts for each option. Modelling was undertaken separately for Option 5(i), Option 5(ii) and Option 8 however since the results of the analysis are comparable for both Option 5(i) and Option 5(ii), these options are considered as one – Option 5(i)/(ii).

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Table 6- 5 shows the distributional impacts of user costs by income group, relative to the distribution of income deprivation across England and Wales for Option 5(i)/(ii).

Table 6- 5: User costs by income group (compared to the distribution across England and Wales) for Option 5(i)/(ii)

	IMD Income deprivation quintile (England and Wales)					Total
	1 (most deprived)	2	3	4	5 (least deprived)	
Net change in user costs (Sum over LSOAs)	-1,062,397	-658,112	-490,229	-465,089	22,349	-2,653,378
Share of net user cost decreases	40%	25%	18%	17%	0%	100%
Share of population in impact area (%)	35%	20%	15%	14%	15%	100%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✖✖✖	

Table 6- 5 shows that user cost decreases are experienced across most quintiles, but not all. For quintiles 1 to 4, the share of decreased user costs is in line with the share of the study area population within those respective quintiles. A score of moderate beneficial has been assigned to these quintiles.

Quintile 5, which represents the 80-100% least deprived LSOAs and accounts for 15% of the study area population, experiences a zero percent decrease in user costs. As the population impacted is significantly greater than the proportion of the group in the total population, and since the population in the least deprived quintiles do not experience any reduction in user costs, a score of large adverse has been assigned to this group. This is as expected based on the distribution of income deprivation across the study area and the relatively low levels of deprivation within the IRR. This is further explained in section 6.5.3.

Table 6- 6 shows the distributional impacts of user costs by income group, relative to the distribution of income deprivation across Greater Manchester for Option 5(i)/(ii).

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Table 6- 6: User costs by income group (compared to the distribution across Greater Manchester) for Option 5(i)/(ii)

	IMD Income deprivation quintile (within Greater Manchester)					Total
	1 (most deprived)	2	3	4	5 (least deprived)	
Net change in user costs (Sum over LSOAs)	-626,405	-648,140	-574,893	-691,639	-112,301	-2,653,378
Share of net user cost decreases	24%	24%	22%	26%	4%	100%
Share of population in impact area (%)	21%	21%	20%	19%	19%	100%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓✓	✓	

Table 6- 6 shows that cost decreases are experienced across all quintiles. Quintile 4 experiences a large share of the user cost decreases (26%), relative to the population (19%). A score of large beneficial has been assigned to this group. For quintiles 1 to 3, the share of decreased user costs are in line with the share of the study area population within those respective quintiles. A score of moderate beneficial has been assigned to these quintiles. Quintile 5, which represents the least deprived LSOAs, accounts for 19% of the study area population but only experiences 4% of the decreased user costs. A score of slight beneficial has been assigned to this group.

Table 6- 7 shows the distributional impacts of user costs by income group, relative to the distribution of income deprivation across England and Wales for Option 8.

Table 6- 7: User costs by income group (compared to the distribution across England and Wales) for Option 8

	IMD Income deprivation quintile (England and Wales)					
	1 (most deprived)	2	3	4	5 (least deprived)	Total
Net change in user costs (Sum over LSOAs)	-104,485	-65,360	-60,739	-74,326	-60,331	-365,241
Share of net user cost decreases	29%	18%	17%	20%	17%	100%
Share of population in impact area (%)	35%	20%	15%	14%	15%	100%
Assessment (✓)	✓	✓✓	✓✓	✓✓✓	✓✓	

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Table 6- 7 shows that cost decreases are experienced across all quintiles. For quintiles 2, 3 and 5, the share of the decreased user costs are in line with the share of the study area population within those respective quintiles. A score of **moderate beneficial** has been assigned to these quintiles. Quintile 1, which represents the 20% most deprived LSOAs, account for 35% of the study area population but only experience 29% of the decreased user costs. A score of **slight beneficial** has been assigned to this group. Quintile 4 experiences a large share of the user costs decreases (20%), relative to the population (14%). A score of **large beneficial** has been assigned to this group. Table 6- 8 shows the distributional impacts of user costs by income group, relative to the distribution of income deprivation across Greater Manchester for Option 8.

Table 6- 8: User costs by income group (compared to the distribution across Greater Manchester) for Option 8

	IMD Income deprivation quintile (within Greater Manchester)					
	1 (most deprived)	**2**	**3**	**4**	**5 (least deprived)**	**Total**
Net change in user costs (Sum over LSOAs)	-63,785	-60,296	-69,662	-85,193	-86,306	-365,241
Share of net user cost decreases	17%	17%	19%	23%	24%	100%
Share of population in impact area (%)	21%	21%	20%	19%	19%	100%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✓✓	

Table 6- 8 shows that cost decreases are experienced evenly across all quintiles. For all quintiles, the share of decreased user costs are in line with the share of the study area population within those respective quintiles. A score of **moderate beneficial** has been assigned to all quintiles.

Further qualitative narrative on the impact on low income households is provided in section 6.5.3.

6.4.3 User benefits

As described in 6.2.1, the distributional impacts of user benefits have been assessed quantitively following the method set out in TAG Unit A4.2. TUBA analysis has been run to calculate the user cost impacts for each option. This includes fuel vehicle operating costs (changes in fuel consumption), non-fuel vehicle operating costs (e.g. tyres/ vehicle maintenance) and time benefits. Modelling was undertaken separately for Options 5(i) and Option 5(ii), however it has been assumed that the same assessment can apply to both scenarios.

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Table 6- 9 shows the distributional impacts of user benefits by income group, relative to the distribution of income deprivation across England and Wales for Option 5(i)/(ii).

Table 6- 9: User benefits by income group (compared to the distribution across England and Wales) for Option 5(i)/(ii)

	IMD Income deprivation quintile (England and Wales)					Total
	1 (most deprived)	2	3	4	5 (least deprived)	
Net change in user benefits (Sum over LSOAs)	5,452,710	3,588,391	3,328,966	2,993,614	3,096,884	18,460,566
Share of net user benefit	30%	19%	18%	16%	17%	100%
Share of population in impact area (%)	35%	20%	15%	14%	15%	100%
Assessment (✓)	✓	✓✓	✓✓	✓✓	✓✓	

Table 6- 9 shows that user benefits are experienced across all quintiles. For quintiles 2 to 5, the share of user benefits is in line with the share of the study area population within those respective quintiles. A score of moderate beneficial has been assigned to these quintiles. Quintile 1, which represents the 20% most deprived LSOAs, accounts for 35% of the population but only experience 30% of the benefit. A score of slight beneficial has been assigned to this quintile.

Table 6- 10 shows the distributional impacts of user benefits by income group, relative to the distribution of income deprivation across Greater Manchester for Option 5(i)/(ii).

Table 6- 10: User benefits by income group (compared to the distribution across Greater Manchester) for Option 5(i)/(ii)

	IMD Income deprivation quintile (within Greater Manchester)					Total
	1 (most deprived)	2	3	4	5 (least deprived)	
Net change in user benefits (Sum over LSOAs)	3,258,338	3,376,995	3,735,385	4,034,295	4,055,553	18,460,566
Share of net user benefit	18%	18%	20%	22%	22%	100%

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	IMD Income deprivation quintile (within Greater Manchester)					Total
	1 (most deprived)	2	3	4	5 (least deprived)	
Share of population in impact area (%)	21%	21%	20%	19%	19%	100%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✓✓	

Table 6- 10 shows that user benefits are experienced evenly across all quintiles with the population impacted broadly in line with the share of the user benefits in each group. A score of **moderate beneficial** has been assigned to these quintiles.

Table 6- 11 shows the distributional impacts of user benefits by income group, relative to the distribution of income deprivation across England and Wales for Option 8.

Table 6- 11: User benefits by income group (compared to the distribution across England and Wales) for Option 8

	IMD Income deprivation quintile (England and Wales)					
	1 (most deprived)	2	3	4	5 (least deprived)	Total
Net change in user benefits (Sum over LSOAs)	1,702,140	1,120,270	1,078,826	1,047,400	886,364	5,835,000
Share of net user benefit	29%	19%	18%	18%	15%	100%
Share of population in impact area (%)	35%	20%	15%	14%	15%	100%
Assessment (✓)	✓	✓✓	✓✓	✓✓	✓✓	

Table 6- 11 shows that user benefits are experienced across all quintiles. For quintiles 2 to 5, the share of user benefits is in line with the share of the study area population with those respective quintiles. A score of **moderate beneficial** has been assigned to these quintiles. Quintile 1, which represents the 20% most deprived LSOAs, accounts for 35% of the population but only experiences 29% of the benefit. A score of **slight beneficial** has been assigned to this quintile.

Table 6- 12 shows the distributional impacts of user benefits by income group, relative to the distribution of income deprivation across Greater Manchester for Option 8.

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Table 6- 12: User benefits by income group (compared to the distribution across Greater Manchester) for Option 8

	IMD Income deprivation quintile (within Greater Manchester)					
	1 (most deprived)	**2**	**3**	**4**	**5 (least deprived)**	**Total**
Net change in user benefits (Sum over LSOAs)	1,006,229	1,034,494	1,198,147	1,359,928	1,236,202	5,835,000
Share of net user benefit	17%	18%	21%	23%	21%	100%
Share of population in impact area (%)	21%	21%	20%	19%	19%	100%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✓✓	

Table 6- 12 shows that user benefits are experienced evenly all quintiles with the population impacted broadly in line with the share of the user benefits in each group. A score of **moderate beneficial** has been assigned to these quintiles.

Further qualitative narrative on the impact on low income households is provided in section 6.5.3.

6.4.4 Summary Assessment Matrix

Table 6- 13 shows an overview of the Distributional Impact assessment stage for Option 5(i)/(ii) and Option 8. Colour coding in the table refers to the assessment matrix (Table 6- 2) presented in section 6.2.3.

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Table 6- 13: Distributional impacts appraisal matrix (all options)

	(1 Most)	2	3	4	5 (Least)	Are the impacts distributed evenly?	Key impacts
Option 5(i)/(ii)							
Personal Affordability - Income deprivation (England and Wales)	✓✓	✓✓	✓✓	✓✓	✗✗✗	No	The share of increased user costs experienced by the lowest income households in quintiles 1, 2 and 3 is in line with the share of the population in these areas. When compared to the distribution across England and Wales, those in quintile 5 receive a score of large adverse, compared to slight beneficial when mapped in comparison to Greater Manchester only. Differences exist within quintile 4, which receives a score of moderate beneficial when mapped against England and Wales and a score of large beneficial when mapped in comparison to Greater Manchester only.
Personal Affordability - Income deprivation (Greater Manchester)	✓✓	✓✓	✓✓	✓✓✓	✓	No	
Personal affordability – Disabled	Personal affordability impacts on the disabled population are assessed qualitatively. See section 6.5.4.						
User benefits Income deprivation (England and Wales)	✓	✓✓	✓✓	✓✓	✓✓	No	When compared to the distribution across Greater Manchester, user benefits are equally distributed across all income groups with all quintiles receiving a score of moderate beneficial. When compared to the distribution across England and Wales, those in quintile 1 receive a score of slight beneficial.
User benefits Income deprivation (Greater Manchester)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	
Business affordability – SMEs	Business affordability impacts are assessed qualitatively. See section 0.						
Business affordability – LGVs	Business affordability impacts are assessed qualitatively. See section 0.						

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	(1 Most)	2	3	4	5 (Least)	Are the impacts distributed evenly?	Key impacts
Option 8							
Personal Affordability - Income deprivation (England and Wales)	✓	✓✓	✓✓	✓✓✓	✓✓	No	When compared against the distribution across England and Wales, the share of decreased user costs (user benefit) experienced by the lowest income households in quintile 1 is in line with the share of the population in these areas. In quintile 4, there is a large beneficial impact where the population experiencing decreased costs is higher than the total population in this area. When compared to the distribution across Greater Manchester, user benefits are equally distributed across all income groups (moderate beneficial impacts).
Personal Affordability - Income deprivation (Greater Manchester)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	
Personal affordability – Disabled	It is recognised that people with a disability are less likely to drive and more likely to be dependent on public transport (including taxis and PHVs) and community transport. Disabled people typically have lower average household income making them particularly vulnerable to increases in the costs of private transport services and private car travel (Crisp et al., 2018)[25]. As there is no charging of private vehicles under the conditions of Option 8, there would be no requirement for wheelchair-adapted private vehicles to be upgraded. Similarly, disabled people receiving lifts from family and friends would not be affected.						
User benefits Income deprivation (England and Wales)	✓	✓✓	✓✓	✓✓	✓✓	No	When compared to the distribution across Greater Manchester, user benefits are equally distributed across all income groups with all quintiles receiving a score of moderate adverse. When compared to the distribution across England and Wales, those in quintile 1 receive a score of slight adverse.
User benefits Income deprivation (Greater Manchester)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	
Business affordability – SMEs	Business affordability impacts are assessed qualitatively. See section 0.						
Business affordability – LGVs	Business affordability impacts are assessed qualitatively. See section 0.						

[25] Crisp et al., (2018). Tackling transport-related barriers to employment in low-income neighbourhoods. Joseph Roundtree Foundation. Available at: https://www.jrf.org.uk/report/tackling-transport-related-barriers-employment-low-income-neighbourhoods [Accessed 03/12/2018]

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6.5 Appraisal

6.5.1 Introduction

The assessment in section 6.4 provides an assessment score of each of the grouping variables under consideration. Section 6.5 provides further qualitative narrative to describe the impacts in each case. This section also provides narrative on the impacts on personal affordability for people with a disability and the impacts on business affordability which were not assessed using the distributional impacts methodology as seen in section 6.4.

6.5.2 Population distribution of key grouping variables

Table 6- 14 shows the distribution of social and business groups within the key study areas. This table aims to provide context to the narrative regarding the scale of the impact on the relative grouping variables.

Table 6- 14: Distribution of the key grouping variables within the key study areas

	Greater Manchester (excluding M60/IRR)		**M60 (excluding IRR)**		**IRR**	
	Number	**%**	**Number**	**%**	**Number**	**%**
Low income households (population in quintile 1)	352,100	59.30%	242,000	40.70%	0	0%
Disability	853,200	58.49%	567,800	39.54%	14,300	1%
SMEs	76,910	62.46%	33,385	27.11%	12,840	10%
LGVs	83,150	76.82%	23,716	21.91%	1,372	1%

Table 6- 14 shows that no LSOAs within the IRR contain the highest levels of deprivation (deprivation quintile 1) when compared to the rest of Greater Manchester. In contrast, approximately 40% of the population live in LSOAs classified as quintile 1 within the M60. The remaining 59% of the population in quintile 1 are distributed across Greater Manchester.

The table also shows that for those with a high level of health deprivation (used as a proxy for disability), less than 1% of the study area in this group live within the IRR and approximately 40% live within the M60. In the SME category, 10% of the total SMEs are located within the IRR and over 25% are located within the M60. Finally, for LGVs, the large majority (over 75%) are registered within Greater Manchester, outside of the key study areas (M60 and IRR).

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6.5.3 Low income households

The assessment above shows that using the WebTAG Distributional Impacts methodology, distributional impacts of low income households are distributed unevenly for Option 5(i)/(ii) and Option 8. This is as expected based on the distribution of income deprivation across the study area and the proposed clean air measures.

Under Option 5(i)/(ii), low income households in quintile 5 (least deprived) are anticipated to experience large adverse impacts, as described by the distributional impacts methodology. Within the IRR, the majority of LSOAs fall within quintile 5 (least deprived) for income deprivation (see Figure 6 in Appendix A). The IRR is the only area in which non-compliant cars would incur a cost for travel. Therefore, the adverse impacts would fall disproportionately on residents within this zone.

Although there is no reduction in user costs within the IRR and drivers will experience a charge for undertaking journeys, it is likely that since the IRR contains low levels of income deprivation, drivers are more likely to be able to afford the charge. Similarly, ‘sunset periods’ will be provided for residents of the zone, who otherwise have no choice other than to comply lessening the impact on this group.

Having said this, LSOAs immediately surrounding the IRR area fall largely within quintile 1 for income deprivation (highest levels of income deprivation) and also have a relatively high proportion of households with no access to a car (see Figure 24). These residents will not benefit from ‘sunset periods’ and may therefore experience disproportionate adverse impacts.

Personal affordability is influenced not only by user costs but also the ability of households to upgrade their vehicles or change their travel behaviour. The costs of replacing a vehicle are particularly significant for low income households. Overall, Greater Manchester has a higher proportion of low income households relative to England and Wales, with 35% of the population living in LSOAs that are in the most income-deprived quintile (quintile 1). Table 6- 13 shows that whilst there are no LSOAs in quintile 1 within the IRR, 40% of the population within the M60 boundary live in LSOAs categorised as ‘low income’.

Under Option 5(i)/(ii) the burden of costs associated with upgrading private cars to compliant vehicles across Greater Manchester would be expected to fall disproportionately on low income households. In some cases, if the cost of compliance is unaffordable, this will leave many households reliant on public transport. This is particularly true of job seekers who are more than twice as likely to use buses than anyone else (Raikes, 2016). Similarly, since the costs of public transport have increased consistently above the rate of inflation for the last two decades, the adverse effects on low income households could be further exacerbated.

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Under Option 8 no non-compliant cars would incur a cost for travel, therefore there may be significantly less impact on low income households. There is however potential for low income households to be affected by increases in costs of public transport, i.e. where the cost of compliance for public transport operators is passed onto users.

It is recognised that there may be further impacts in cases where employees are required to have their own car as part of an employment contract. This includes occupations such as community-based care work that involves travelling between patients. This is identified as an area for further work (refer to Appendix B: Recommendations for further work).

6.5.4 Disabled people

It is recognised that people with a disability are less likely to drive and more likely to be dependent on public transport (including taxis and PHVs), community transport that offers door to door usage, or lifts from family and friends (DfT, 2018a). Similarly, disabled people typically have lower average household income and the cost of upgrading wheelchair adapted private vehicles is higher, making them particularly vulnerable to increases in the costs of private transport services and private car travel (Crisp et al., 2018).

Evidence from the London ULEZ project has been used to identify potential impacts on disabled drivers within Manchester, on the assumption that some of the issues would be similar for both cities.

- In 2011, the average age of a blue badge[26] registered petrol vehicle entering the London Congestion Charge Zone was eight years (TfL CCZ data, 2011). Assuming the age profile of vehicles is the same in 2020, approximately 16% of all petrol blue badge registered vehicles could be non-compliant when the clean air measures comes into operation.
- In 2011, the average age of a blue badge diesel vehicle was five years (TfL CCZ data, 2011). Assuming the age profile of vehicles is the same in 2020, approximately 45% of all diesel blue badge registered vehicles could be non-compliant, which is higher than the level of non-compliance across all vehicles.

Therefore, the cost of the charge and/or replacing or retrofitting non-compliant vehicles for disabled people is less likely to be affordable, on the basis that a person with disability is more likely to be on a low income, and in general disabled people have higher living costs (Scope, 2018).

A proportion of blue badge holders will require vehicles adapted for wheelchair use. It is expected that the absolute number of non-compliant adapted vehicles would be lower than in the population as the majority of wheelchair users rely on vehicles supplied through the Motability[27] scheme,

[26] 'Blue Badges' are parking badges for disabled people issued by local authorities to individuals and organisations concerned with the care of disabled people. Once a Blue Badge is issued, it remains valid for three years. In 2017, Greater Manchester issued a total of 47,212 Blue Badges. This equated to 49% of the total Blue Badges issued in the North West.

[27] Motability is a registered charity which provides a service for disabled people to lease a car, scooter or wheelchair in exchange for their mobility allowance.

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through which they receive VAT relief on substantially and permanently adapted vehicles. Motability leased vehicles are generally no more than three or four-years old so the majority would be CAZ compliant (HMRC, 2014), however some Wheelchair Adapted Vehicles (WAVs) can be leased for up to seven years.

Community transport is also an important form of public transport for disabled people who are unable to make use of conventional public transport. The age profile of community transport vehicles is typically older than average, and hence more likely to be non-compliant. Non-profit organisations are unlikely to have the cash reserves to either pay the clean air charge or upgrade to a compliant vehicle without increasing the cost of their services to end users and/or reducing the availability of services that they offer. This is because their vehicles tend to be older, and as services are run on a not-for-profit basis, organisations are unlikely to have the cash reserves to absorb the additional cost of compliance. Community transport availability is considered as part of the Accessibility DI assessment and therefore not considered further here.

Figure 9 (Appendix A) shows that LSOAs with high levels of health deprivation are concentrated in the centre of Greater Manchester, within the M60 boundary. These LSOAs contain approximately 40% of the total population of the study area within deprivation quintile 1 (see Table 6- 14). High concentrations of LSOAs in quintile 1 (high levels of health deprivation) are also found in the key centres of Bolton, Bury, Rochdale, Oldham, Wigan and to the south of the study area surrounding Manchester airport. The IRR contains less than 1% of the total population in quintile 1 (most health deprived).

The high concentration of LSOAs with relatively high levels of health deprivation located within the M60 suggests that for Option 5(i)/(ii), in which private cars are charged for entering the IRR, there may be a disproportionate adverse impact on disabled people. Under Option 8, the impact on those with a disability is likely to be significantly less as there would be no impact on private vehicles and therefore affordability impacts would only be experienced in cases where disabled people are dependent on non-compliant community transport vehicles. For Option 5(i)/(ii), an exemption for blue badge holders, wheelchair adapted vehicles and specialist vehicles would provide some mitigation.

6.5.5 Business and Personal Affordability

SMEs

Figure 12 (Appendix A) shows the proportion of SMEs by quintile, based on the distribution across England and Wales. The mapping is based on the percentage of SMEs compared to total business counts (including large businesses) as required by the JAQU guidance. Since the proportion of SMEs in comparison to total business counts is typically greater than 95%, the map shows that within the IRR and surrounding areas, there are a greater number of registered large businesses than the rest of the study area. Based on this, it is more useful to rely on raw business counts as explained below.

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As shown in Table 6- 14, approximately 10% of the total SMEs within Greater Manchester are located within the IRR. The business profile of Greater Manchester (83.9% micro, 12.9% small, 3.2% medium and 0.4% large) is broadly in line with the national average for each business type (84.6% micro, 12.4% small, 2.6% medium and 0.4% large). The greatest deviation from this profile is within the IRR, where there is a slight shift away from micro businesses, and a larger proportion of small, medium and large businesses. Larger businesses would be expected to be more resilient to a new clean air charge than SMEs since they have greater resources and can better adapt to increasing costs. However, it is assumed that levels of resilience are homogenous across the study area and that all SMEs would be vulnerable to potential affordability impacts resulting from the Greater Manchester Clean Air Plan (GM CAP).

It is noted that although businesses in the IRR might have a slightly elevated level of resilience than the national and regional average, approximately 10% of the total SMEs within Greater Manchester are concentrated within the IRR and therefore overall this area is likely to experience a disproportionate business affordability impact compared to the Greater Manchester region as a whole.

It is assumed that almost all Greater Manchester SMEs would be reliant on the transportation of goods and services on the road network, meaning that impacts could directly affect suppliers travelling from outside of Greater Manchester, potentially resulting in indirect effects on the businesses located within. Similarly, increased costs could be generated if the business relies on HGVs, or if the LGV fleets are owned by individuals rather than registered to the company. For employee-owned vans, the rate of fleet turnover is typically slower, meaning these vehicles would account for a higher proportion of non-compliant vehicles in 2021. Businesses are less likely to own HGV vehicles but may rely on HGV services, which could become more expensive if the providers choose to pass on any costs to the customer

Figure 25 (in Appendix A) shows the location of SMEs with a turnover of less than £200k per annum. The map clearly shows higher concentrations of businesses with this level of turnover within the IRR. Section 3.12.5 in the baseline also shows that within the IRR, approximately 19% of businesses are in the lowest turnover bracket of £0-£49,000 a year, making them particularly vulnerable to increasing costs. In some cases, for example businesses that rely on specific environmental licenses or permits (e.g. hazardous material handling), there will be no option to relocate outside of this zone to avoid paying the charge.

Overall, impacts on SMEs are expected to be similar for Option 5(i)/(ii) and Option 8. It is assumed that all businesses across Greater Manchester are reliant on commercial vehicles, all of which face the same charges under each clean air option. In cases where businesses are dependent on the use of personal cars, it is anticipated that Option 5(i)/(ii) would result in greater adverse impacts on business affordability than Option 8. There is also a risk under the conditions of Option 5(i)/(ii) that SME workers within the IRR could choose to move to employment outside of the IRR to avoid a charge, potentially resulting in lost productivity and an increase in recruitment costs.

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Whilst there is a high potential for SMEs to feel disproportionate impacts as a result of a clean air package, the introduction of 'sunset period' for small and micro businesses is likely to lessen the initial impact for some SMEs.

LGVs

Manchester is a net importer of goods, importing 58 million tonnes to the region per year (TfGM, 2017). On average 17,000 goods vehicles make trips into Greater Manchester town centres each day. This means that there is a large potential for adverse impacts on LGVs from the implementation of the GM CAP. It is assumed that business sectors that are more heavily reliant on LGVs and HGVs, such as Retail, Wholesale and Transport and Storage, would be more greatly impacted by clean air measures. As shown in Table 3- 13, 37% of the SMEs within the IRR are either Retail, Wholesale or Transport and storage.

Figure 13 (Appendix A) shows the proportion of non-compliant LGVs by quintile, based on the distribution across England and Wales. The mapping is based on the percentage of non-compliant LGVs compared to total LGV counts, as required by the JAQU guidance. Since the proportion of non-compliant LGVs is typically greater than 95%, the map shows that the majority of LSOAs are within quintile 1. Based on this, it is more useful to rely on raw business counts as explained below.

Across Greater Manchester, only 1% of LGVs are currently compliant (euro rating of four or above for petrol and six or above for diesel) as shown in Figure 29 (Appendix A). This suggests that for all options (Option 5(i)/(ii) and Option 8) almost all businesses reliant on LGVs would incur additional costs by 2023 for replacing LGVs with compliant vehicles.

LGV-dependent businesses may be more susceptible to additional costs associated with the GM CAP, or with the need to accelerate fleet upgrades to ensure vehicles are compliant. However, some vehicle replacement and improvement in compliance levels are expected by 2023 as part of routine fleet upgrade, with an average reduction of 17% for non-compliant LGVs and 33% for non-compliant HGVs across Greater Manchester in this time. To this end, fleet upgrades would lessen the severity of all options where the Low Emission Zone for travel in Greater Manchester would come into effect during phase two in 2023.

Analysis undertaken by Element Energy for the Birmingham Clean Air Plan in 2018 looked at the options available to non-compliant van owners. These options included;

- Continuing to operate the vehicle and pay the charge
- Purchasing a compliant vehicle (Euro four or above Petrol and Euro 6 Diesel)
- Purchasing an electric van.

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Overall, the decisions were based on the frequency with which the van would need to enter the charging zone, the van types and range of finance options available, and the charging infrastructure or upfront costs associated with the change. The analysis showed that whilst Birmingham has overall higher levels of compliance than Greater Manchester, the economically best option was to purchase a second-hand electric vehicle as these have overall lower running costs, however this market is very limited. Recommendations for further work include an analysis of the options available to van owners based on costs of compliance in Greater Manchester.

Consideration also needs to be made where a business is a sole trader or family owned business, the impact of charging non-compliant LGVs could shift from a business affordability issue to a personal affordability issue. WebTAG guidance shows there is a split in the number of LGVs that are marked for personal or business purposes. However, where LGVs are marked as 'business' they may also be used for personal reasons, which would not be captured in the same way if the LGV was marked as 'personal'. For example, a small-scale business i.e. a sole trader working from home, may use their 'business' LGV for leisure and non-work-related trips. A person may use their LGV to pick their child up from school because it is easier to access at that time of the day. In this case the affordability impact would be captured as a personal impact on the individual and not an impact on the business.

Overall, the analysis shows that based on current and forecasted compliance levels, for all options (Option 5(i)/(ii) and Option 8) there is potential for adverse effects on LGV users. The magnitude of this impact will depend on the frequency of journeys a van owner will need to make, and the behavioural response made.

6.6 Methodology limitations

6.6.1 Personal affordability and user benefits

Personal affordability and user benefits distributional impacts have been assessed using TUBA outputs according to the method set out in TAG Unit A4-2. The key limitations of this approach are:

- Income deprivation indices are used as a proxy to determine relative average levels of household income within an area but the method does not identify whether travel is undertaken by people from relatively higher or lower income levels.
- The TUBA methodology does not account for costs associated with replacing vehicles, or user benefits or dis-benefits associated with changing travel behaviour (such as increasing public transport usage) prompted by the introduction of charging.

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6.6.2 Business affordability

It is noted that some transport dependent businesses are more likely to have compliant fleets than others and so the impact of clean air charging would be distributed unequally across businesses.

Business affordability distributional impacts have been assessed using a qualitative approach whereas a quantitative approach is desirable where possible and proportionate. JAQU Options Appraisal Guidance describes a method for quantitively assessing business affordability distributional impacts which is to consider the distribution of SMEs and LGVs registered across the LSOAs as an indicator for the distribution of businesses which depend on vehicles. However, there are a number of limitations with this approach. For example;

- Many businesses depend on cars as well as other forms of vehicle, meaning the use of LGV is only a partially useful indicator for transport dependent businesses;
- Many vehicles are registered to addresses which are not the main location of use, for example they may be registered to a personal address or business headquarters but are in use elsewhere;
- Many businesses may not use their own vehicles but would nevertheless depend on the transport of their suppliers.

7 Accessibility

7.1 Overview

Accessibility describes changes to the ability and ease of individuals or businesses to get to places of work, social networks and public amenities. This links with severance impacts which include barriers to accessibility and impacts on personal affordability which can also affect an individual's ability to access a key service or amenity (See section 6).

As recommended by JAQU, the method of appraisal follows the guidance set out in DfT's TAG Unit A4-2 'Distributional Impact Appraisal' (DfT, 2015). This follows three stages of screening, assessment and appraisal to identify groups which could be disproportionately impacted by a proposed scheme. This approach is supplemented with additional qualitative narrative relating to the potential impacts on specific groups in specific geographies.

The appraisal of accessibility distributional impacts is supplemented by further analysis of potential severance effects (see section 8), looking at community facilities along links that are expected to experience an increase in traffic flow.

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In this section, accessibility benefits are described for Greater Manchester as a whole, and within each of the proposed charging zones.

The key findings of the assessment are presented as follows:

- Overall, for Option 5(i)/(ii) Option 8 all study areas (quintiles) experience either slight, moderate or large accessibility benefits (improvement in accessibility).
- For Option 5(i)/(ii), moderate benefits are experienced evenly across all quintiles for low income households and BAME residents. Areas with high proportions of disabled people and children experience the highest share of accessibility benefits. In contrast, areas with low proportions of elderly and female populations experience the highest share of the benefits.
- For Option 8 moderate benefits are experienced evenly across all quintiles for elderly and BAME residents. Areas with high concentrations of low income households, under 16s and disabled people experience the highest share of accessibility benefits.
- For Option 5(i)/(ii) there is a slight shift towards areas of Greater Manchester with the least elderly residents receiving the greatest share of the benefits. This is as expected based on the distribution of the resident population and the locations likely see the greatest changes in journey times, i.e. in the city centre locations, which typically has lower numbers of elderly residents relative to other areas.

7.2 Methodology

The appraisal of the accessibility distributional impacts is a minimum requirement of the Joint Air Quality Unit (JAQU).

A three-step approach, in line with TAG unit A4-2, has been applied to the distributional impacts appraisal. The three steps are:

1) Screening: The stage where the variety of impacts that the option may have are considered and particular impacts are prioritised for further analysis so that only the most relevant issues for the scheme are appraised to ensure proportionality.
2) Assessment: The stage where information is collected on the geographical area likely to be affected by the option and how different social and business groups are distributed within that geographical area. To calculate the number of areas with improved accessibility, GIS techniques were used to calculate the change in journey times between the baseline scenario and the intervention for each LSOA[28] in the study area.
3) Appraisal: The assessment of the extent of the impact of the option on the social or business groups identified.

[28] Output Areas and Lower Super Output Areas are geographical definitions used for the mapping of socio-economic characteristics. These cover different scales: for example, Lower Super Output Areas typically have a resident population of around 1,500 people.

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The assessment method set out in the DfTs TAG Unit A4-2 ‘Distributional Impact Appraisal’ (DfT, 2015) focuses the assessment of accessibility on public transport accessibility. Whilst there may be some indirect effects on public transport travel times because of changes in traffic volumes and patterns following the implementation of a clean air package, no change to train or bus schedules, routes or fares are anticipated because of the scheme. The main impacts are likely to be related to increased journey times and accessibility to employment, services and social networks. Therefore, the bespoke approach developed for this scheme was considered more proportionate.

It is acknowledged that a large beneficial impact, as reported by the distributional impacts methodology, does not represent the areas receiving the greatest accessibility benefits. From an accessibility perspective, the benefits are greatest in areas where reduction in traffic flows are highest. Since the distributional impacts methodology refers to only ‘winners’ or ‘losers,’ it is not possible to distinguish the magnitude of change experienced by each group. Therefore, care must be taken when interpreting the results of the distributional impacts analysis. The appraisal section (section 7.6) aims to give a qualitative interpretation of these results, focussing on the areas with the 10% greatest change in emissions and the relation to key amenities of importance to the various social groups.

To calculate changes in accessibility, outputs from the Traffic Modelling software ‘SATURN’ were used, specifically journey times derived from 24 hours Annual Average Daily Traffic (AADT24) 2-way link flows. These outputs were manipulated in GIS to determine the change in journey times for each LSOA for each of the proposed GM CAP options. Areas with reduced journey times are considered ‘winners’ and areas with increased journey times are considered ‘losers’.

To identify societal groups who could be ‘disproportionately’ impacted by changes in journey times, the population within the study area was divided into quintiles, based on the distribution across England and Wales. For example, to assess income deprivation, the population was first divided into five equal parts depending on the level of income: the first quintile contains the top fifth of the population on the scale (i.e. the 20% of the population with the highest income), the second quintile represents the second fifth (from 20% to 40%) and the fifth quintile represents the 20% of the population with the lowest income. Once the population was divided into quintiles, it was then possible to see which groups receive the highest share of the accessibility benefits by looking at the number of ‘winners’ or those with reduced journey times.

This analysis has been supplemented with further qualitative narrative about how the implementation of the shortlisted options may affect access to community facilities for those groups whose mobility limits the range of transport options available to them.

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7.3 Screening

The screening process below considers the impacts of most relevance to the GM CAP on different social groups. This considers the availability of data and the sensitivity of the issue in the context of the CAP proposals. Table 7-1 shows the screening process used to consider the potential accessibility impacts on specific social groups.

Table 7- 1: Screening of accessibility impacts

Grouping Variable	Screened in/out		Reason for screening in/out
	Option 5(i)/(ii)	Option 8	
Low income households	✓	✓	It is widely evidenced that people on low incomes living in households with no access to a car are particularly vulnerable to social exclusion if public transport does not provide the accessibility needed to reach key destinations (Crisp et al., 2018).
Children	✓	✓	Children, or people with children may place greater value on the availability of routes closer to home, lower priced fares and higher frequency services than other groups (DfT, 2017c).
The elderly	✓	✓	The elderly community are less mobile and often report great difficulty in accessing local amenities, especially when no longer driving. This group area therefore more likely to be dependent on public or community transport that offers door to door usage, or lifts from family and friends (Musselwhite et al. 2015).
Disability	✓	✓	People with disabilities face many barriers when accessing transport facilities. This includes physical infrastructure (i.e. accessible vehicles, stations etc.) and lack of information on travel options (DfT, 2018a).
Women	✓	×	In some cases, women are less likely than men to have access to a car during the day and often undertaking more complex trip chains relating to caring responsibilities or school drop offs/pickups (Crisp et al., 2018). Under a CAZ C scenario cars are excluded from the charges and therefore the impacts on women is screened out for Option 8.
Ethnicity (BAME)	✓	✓	There are potential differential impacts on BAME communities based on differing travel patterns and access to key amenities. A study by Transport for London found that BAME Londoners cite a greater number of barriers to increased public transport use than white Londoners, this includes concerns over crime whilst travelling (TfL, 2015). Based on limited evidence, a light touch is taken in this assessment.

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Grouping Variable	Screened in/out		Reason for screening in/out
	Option 5(i)/(ii)	Option 8	
Businesses	×	×	Businesses themselves are not considered to be vulnerable to accessibility effects. Indirect effects on businesses will be considered under the appraisal of affordability impacts (see affordability report).
LGVs	×	×	LGVs are used as a proxy for effects on SMEs. LGVs themselves are not considered to be vulnerable to accessibility effects. Indirect effects on SMEs will be considered under the appraisal of Affordability impacts (see Section 0).

7.4 Assessment criteria

The consideration of whether impacts are disproportionate is important to understand if one group is being unfairly disadvantaged or advantaged by the option/package. In such cases it is necessary to understand how these impacts are occurring and whether it is acceptable or whether the option should be amended or mitigated. The following scale, as recommended by TAG Unit A4.2, is used in the reporting of the distributional impacts.

Table 7- 2: Distributional Impact Assessment Criteria

Assessment[29]		Impact Description
✓✓✓	Large beneficial	Beneficial and the population impacted is significantly greater than the proportion of the group in the total population
✓✓	Moderate beneficial	Beneficial and the population impacted is broadly in line[30] with the proportion of the group in the total population
✓	Slight beneficial	Beneficial and the population impacted is smaller than the proportion of the group in the total population
-	Neutral	There are no significant benefits or dis-benefits experienced by the group for the specified impact
×	Slight adverse	Adverse and the population impacted is smaller than the proportion of the population of the group in the total population
××	Moderate adverse	Adverse and the population impacted is broadly in line with the proportion of the population of the group in the total population
×××	Large adverse	Adverse and the population impacted is significantly greater than the proportion of the group in the total population

[29] The assessment criteria (ticks) have been applied to the raw data outputs. The accessibility results tables present rounded figures. There may be instances where an increase/decrease in net winners does not exactly match the number of ticks assigned to the quintile due to rounding.

[30] For the purposes of this assessment, 'broadly in line' refers to +/- 2% threshold between the percentage of net winners and the share of the resident population in each group.

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7.5 Accessibility Assessment

7.5.1 Introduction

The following section provides an assessment of the change in journey times on the relevant grouping variables (low income households, children, the elderly, the disabled, women and BAME communities). Accessibility impacts were calculated for each LSOA within the Greater Manchester area. For each quintile, the number of LSOAs with improved or worsened traffic flows was calculated, and their relative populations totalled, to calculate the net winners.

This section applies to all options; 5(i)/(ii) and 8. The definitions of options results in no difference in traffic modelling outputs for Option 5(i) and Option 5(ii). The results for Option 5(i)/(ii) and Option 8 are outlined below. Further analysis on the differences in accessibility impacts between options is provided in section 7.6.

7.5.2 Low income households

Income deprivation is one of seven domains of deprivation, and its aim is to capture the proportion of the population experiencing income deprivation in an area (DfT, 2015). It is not an absolute measure of household income and therefore it does not reflect household income in a given area, nor does it cover the distribution of that income across its resident population. Whilst it effectively captures concentrations of low income households it does not identify areas of affluence. Instead, it identifies areas of relatively low deprivation i.e. areas with lower proportions of low income households (DfT, 2015).

Evidence shows that the key transport barriers faced by low income households include limited availability of transport services, resource constraints (e.g. lack of money) and travel times and their interaction with caring responsibilities (Crisp et al., 2018).

For the purpose of this assessment, income deprivation is assessed in two ways. Firstly, income is mapped based on the distribution of income across England and Wales. This results in uneven numbers of LSOAs within each quintile. The second method ranks all the LSOAs within the study area only, based on their income deprivation; this gives a more study area specific distribution.

Table 7- 3 shows the distribution of accessibility impacts across different income deprivation groups in the study area compared to the distribution across England and Wales for Option 5(i)/(ii).

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Table 7- 3: Distribution of accessibility impacts on income deprivation (compared to the distribution across England and Wales) for Option 5(i)/(ii)

	Deprivation quintile (where 1 is the 20% of the population ranked highest in terms of income deprivation)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	805,000	480,000	346,000	312,000	295,000
Number of people with reduced accessibility	182,000	83,000	79,000	84,000	117,000
No. of net winners	623,000	397,000	267,000	229,000	178,000
Total number of winners across all groups	1,694,000				
Net winners in each area as % of total	37%	23%	16%	13%	11%
Share of population in impact area (%)	35%	20%	15%	14%	15%
Assessment (✓)	✓✓	✓✓✓	✓✓	✓✓	✓

Table 7- 3 shows that in quintile 2, the population receiving accessibility benefits is higher than expected based on the share of the population in the impact area. A score of **large beneficial** has been assigned to this quintile. Quintiles 1, 3 and 4 represent the 0-20% and 40%-80% of the study area with the most income deprivation. In this case, the population receiving accessibility benefits is as expected based on the share of the population in the impact area. A score of **moderate beneficial** has been assigned to these quintiles. Quintile 5, which represents the least deprived areas of the study area, receive benefits slightly lower than the share of the population. A score of **slight beneficial** has been assigned to this group.

Overall, the analysis shows that at LSOA level, the majority of households would benefit from increased accessibility however, from a distributional impacts perspective, those in the most deprived areas, on average, experience the highest share of the accessibility benefits.

Table 7- 4 shows the distribution of accessibility impacts on low income households in the study area compared to the distribution across Greater Manchester for Option 5(i)/(ii).

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Table 7- 4: Distribution of accessibility impacts on income deprivation (compared to the distribution across GM) for Option 5(i)/(ii)

	Deprivation quintile (where 1 is the 20% of the population ranked highest in terms of income deprivation)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	455,000	461,000	454,000	435,000	433,000
Number of people with reduced accessibility	104,000	102,000	103,000	115,000	121,000
No. of net winners	351,000	358,000	351,000	321,000	312,000
Total number of winners across all groups	1,694,000				
Net winners in each area as % of total	21%	21%	21%	19%	18%
Share of population in impact area (%)	21%	21%	20%	19%	19%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✓✓

Table 7- 4 shows that beneficial impacts are experienced equally across all quintiles. This means the proportion of net winners within each quintile is broadly in line with the proportion of the resident population. This shows that areas in which there are high concentrations of low income households receive an equal share of benefits to areas with a low concentration of low income households. A score of **moderate beneficial** has been assigned to all quintiles. Section 7.6.3 provides further analysis on the magnitude of the impact and the number of low income households that are likely to be affected by the proposed clean air measures.

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Table 7- 5 shows the distribution of accessibility impacts across different income deprivation quintiles in the study area compared to the distribution across England and Wales for Option 8.

Table 7- 5: Distribution of accessibility impacts on income deprivation (compared to the distribution across England and Wales) for Option 8

	Deprivation quintile (where 1 is the 20% of the population ranked highest in terms of income deprivation)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	748,000	441,000	312,000	293,000	271,000
Number of people with reduced accessibility	239,000	121,000	113,000	103,000	142,000
No. of net winners	509,000	320,000	199,000	190,000	129,000
Total number of winners across all groups	1,347,000				
Net winners in each area as % of total	38%	24%	15%	14%	10%
Share of population in impact area (%)	35%	20%	15%	14%	15%
Assessment (✓)	✓✓✓	✓✓✓	✓✓	✓✓	✓

Table 7- 5 shows that in quintile 1 and 2, the population receiving accessibility benefits is higher than expected based on the share of the population. A score of large beneficial has been assigned to these quintiles. Quintiles 3 and 4 represent the 40-80% of the study area with the most income deprivation. In this case, the population receiving accessibility benefits is as expected based on the share of the population. A score of moderate beneficial has been assigned to these quintiles. Quintile 5, which represents the least deprived areas of the study area, receive benefits lightly lower than the share of the population. A score of slight beneficial has been assigned to this group.

Overall, the analysis shows that at LSOA level, the majority of households are likely to benefit from increased accessibility however, from a distributional impacts perspective, those in the most deprived areas experience the highest share of the accessibility benefits.

Table 7- 6 shows the distribution of accessibility impacts on low income households in the study area compared to the distribution across Greater Manchester for Option 8.

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Table 7- 6: Distribution of accessibility impacts on income deprivation (compared to the distribution across GM) for Option 8

	Deprivation quintile (where 1 is the 20% of the population ranked highest in terms of income deprivation)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	410,000	432,000	413,000	408,000	401,000
Number of people with reduced accessibility	148,000	131,000	144,000	142,000	153,000
No. of net winners	263,000	301,000	270,000	267,000	248,000
Total number of winners across all groups	1,347,000				
Net winners in each area as % of total	19%	22%	20%	20%	18%
Share of population in impact area (%)	20%	20%	20%	20%	20%
Assessment (✓)	✓✓	✓✓✓	✓✓	✓✓	✓✓

Table 7- 6 shows that in quintile 2, the population receiving accessibility benefits is higher than expected based on the share of the population in the impact area. A score of **large beneficial** has been assigned to this quintile. Across the other quintiles, the proportion of net winners is broadly in line with the proportion of the resident population. This shows that the areas with the highest concentration of low income households (quintile 1) receive an equal share of benefits to the area with the lowest concentration of low income households (quintile 5). A score of **moderate beneficial** has been assigned to this group. Section 7.6.3 provides further analysis on the magnitude of the impact and the number of low income households that are likely to be affected but the proposed clean air measures.

7.5.3 Children (Under 16's)

The Equality Act 2010 states that local authorities should show due regard to certain protected characteristics, including age (legislation.gov.uk, 2010). This includes taking steps to meet the needs of individuals who share a protected characteristic, and minimising the disadvantage associated with it. It is recognised, for the reasons stated in Table 7- 1, that children are particularly vulnerable to accessibility impacts. Therefore, ONS 2016 mid-year population estimates have been used to calculate the proportion of under 16's compared to the distribution across England and Wales to assess the distribution of accessibility impacts on children.

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Table 7- 7 shows the distribution of accessibility impacts on children for Option 5(i)/(ii).

Table 7- 7: Distribution of accessibility impacts on children (compared to the distribution across England and Wales) for Option 5(i)/(ii)

	Population quintile (where 1 is the 20% of the population with the most under 16s)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	190,000	92,000	81,000	58,000	32,000
Number of people with reduced accessibility	42,000	29,000	15,000	17,000	8,000
No. of net winners	148,000	63,000	66,000	41,000	25,000
Total number of winners across all groups	343,000				
Net winners in each area as % of total	43%	19%	19%	12%	7%
Share of population in impact area (%)	41%	21%	17%	13%	7%
Assessment (✓)	✓✓✓	✓	✓✓✓	✓✓	✓✓

Table 7- 7 shows that positive impacts are experienced across all quintiles for Option 5(i)/(ii). For quintiles 4 and 5 the under 16s receiving accessibility benefits is as expected based on the share of the population in the impact area. A score of **moderate beneficial** has been assigned to this group. Quintile 1 and 3 which have a higher proportion of under 16s, receives a high share of the accessibility benefits. A score of **large beneficial** has been assigned to these quintiles. Quintile 2 has a slightly lower share of net winners than the share of the population in the impact area. A score of **slight beneficial** has been assigned to this quintile.

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Table 7- 8 shows the distribution of accessibility impacts on children for Option 8.

Table 7- 8: Distribution of accessibility impacts on children (compared to the distribution across England and Wales) for Option 8

	Population quintile (where 1 is the 20% of the population with the most under 16s)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	177,000	85,000	72,000	57,000	28,000
Number of people with reduced accessibility	55,000	36,000	24,000	18,000	12,000
No. of net winners	122,000	50,000	48,000	40,000	16,000
Total number of winners across all groups	276,000				
Net winners in each area as % of total	44%	18%	17%	14%	6%
Share of population in impact area (%)	41%	21%	17%	13%	7%
Assessment (✓)	✓✓✓	✓	✓✓	✓✓	✓✓

Table 7- 8 shows that in quintile 1, the under 16 population receiving accessibility benefits is higher than expected based on the share of the under 16 population in the impact area. A score of **large beneficial** has been assigned to this quintile. Quintiles 3, 4 and 5 have the highest concentration of under 16's, the under 16s receiving accessibility benefits is as expected based on the share of the under 16 population in the impact area. A score of **moderate beneficial** has been assigned to these quintiles. Quintile 2, which represents the 20-40% of the study area with the most under 16s receives benefits slightly lower than the share of the under 16 population. A score of **slight beneficial** has been assigned to this quintile.

7.5.4 Elderly (Over 65's)

It is recognised that people over 65 are particularly susceptible to accessibility impacts as they are more likely to have a disability with reduced mobility or a long-term illness than any other age group. Therefore, good access to health services or shopping amenities is key to improving their independence and quality of life. Due regard is therefore given to those over the age of 65 within the study area.

Table 7- 9 shows the distributional impacts of accessibility on the elderly population within the study area for Option 5(i)/(ii).

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Table 7- 9: Distribution of accessibility impacts on the elderly population for Option 5(i)/(ii)

	Population quintile (where 1 is the 20% of the population with the most elderly residents)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	54,000	67,000	81,000	78,000	45,000
Number of people with reduced accessibility	15,000	24,000	20,000	16,000	10,000
No. of net winners	39,000	43,000	61,000	62,000	34,000
Total number of winners across all groups	239,000				
Net winners in each area as % of total	16%	18%	26%	26%	14%
Share of population in impact area (%)	17%	22%	25%	23%	13%
Assessment (✓)	✓✓	✓	✓✓	✓✓✓	✓✓

Table 7- 9 shows that positive impacts are experienced, across all quintiles for Option 5(i)/(ii). For those in quintiles 1, 3 and 5, this benefit is of a magnitude as expected based on the share of the population in these areas. A score of **moderate beneficial** has been assigned to these quintiles. Quintile 2 has a lower number of net winners compared to the share of population in the impact area. A score of **slight beneficial** has been assigned to this group**.** In contrast, quintile 4 has a higher number of winners compared to the resident population. A score of **large beneficial** has been assigned to this group**.**

Overall the analysis for Option 5(i)/(ii) shows that at LSOA level there is a slight shift towards areas of Greater Manchester with the least elderly residents receiving the greatest share of the benefits. This is as expected based on the distribution of the resident population and the clean air options, which are likely to affect city centre locations with lower numbers of elderly residents.

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Table 7- 10 shows the distribution of accessibility impacts on the elderly for Option 8.

Table 7- 10: Distribution of accessibility impacts on the elderly population for Option 8

	Population quintile (where 1 is the 20% of the population with the most elderly residents)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	52,000	67,000	74,000	71,000	41,000
Number of people with reduced accessibility	18,000	25,000	28,000	23,000	14,000
No. of net winners	34,000	42,000	46,000	48,000	27,000
Total number of winners across all groups	197,000				
Net winners in each area as % of total	17%	21%	23%	24%	14%
Share of population in impact area (%)	17%	22%	25%	23%	13%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✓✓

Table 7- 10 shows that positive impacts are experienced equally across all quintiles. This means the proportion of net winners within each quintile is broadly in line with the proportion of the resident population. This shows that area which have a high concentration of elderly experience equal benefits to areas with a low concentration of elderly. A score of **moderate beneficial** has been assigned to all quintiles. Further analysis, including commentary on the magnitude of change, is provided in Section 7.6.5.

7.5.5 Disability

People with a physical or mental impairment are less likely to drive and more likely to be dependent on public transport (including taxis and PHVs), community transport that offers door to door usage, or lifts from family and friends. Throughout this assessment, the health deprivation and disability domain of the IMD (2015) has been used. The health and deprivation domain takes into consideration years of potential life lost, illness and disability, admissions to hospital and mood and anxiety disorders.

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Table 7- 11 shows the distributional impacts of accessibility on the population with disabilities within the study area for Option 5(i)/(ii).

Table 7- 11: Distribution of accessibility impacts on the disabled for Option 5(i)/(ii)

	Population quintile (where 1 is the 20% of the population with the most disabled residents)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	1,210,000	513,000	323,000	154,000	38,000
Number of people with reduced accessibility	248,000	104,000	107,000	76,000	9,000
No. of net winners	962,000	409,000	216,000	78,000	28,000
Total number of winners across all groups	1,694,000				
Net winners in each area as % of total	57%	24%	13%	5%	2%
Share of population in impact area (%)	52%	22%	15%	8%	2%
Assessment (✓)	✓✓✓	✓✓	✓✓	✓	✓✓

Table 7- 11 shows that in quintiles 2, 3 and 5 the population receiving accessibility benefits is as expected based on the share of the population in the impact area. A score of **moderate beneficial** has been assigned to these quintiles. Quintile 1, which has the highest proportion of health deprived residents, receives the highest share of accessibility benefits, significantly more than the share of the population in this quintile. A score of **large beneficial** has been assigned to this quintile. Quintile 4 has a slightly lower share of net winners than the share of the population in the impact area. A score of **slight beneficial** has been assigned to this quintile.

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Table 7- 12 shows the distributional impacts of accessibility on the population with disabilities within the study area for Option 8.

Table 7- 12: Distribution of accessibility impacts on the disabled for Option 8

	Population quintile (where 1 is the 20% of the population with the most disabled residents)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	1,117,000	461,000	301,000	148,000	38,000
Number of people with reduced accessibility	341,000	156,000	129,000	82,000	9,000
No. of net winners	776,000	305,000	172,000	65,000	28,000
Total number of winners across all groups	1,347,000				
Net winners in each area as % of total	58%	23%	13%	5%	2%
Share of population in impact area (%)	52%	22%	15%	8%	2%
Assessment (✓)	✓✓✓	✓✓	✓	✓	✓✓

Table 7- 12 shows that in quintiles 2 and 5 the population receiving accessibility benefits is as expected based on the share of the population in the impact area. A score of **moderate beneficial** has been assigned to these quintiles. Quintile 1, which has the highest proportion of health deprived residents, receives the highest share of accessibility benefits, significantly more than the share of the population in this quintile. A score of **large beneficial** has been assigned to this quintile. Quintile 3 and 4 have a slightly lower share of net winners than the share of the population in the impact area. A score of **slight beneficial** has been assigned to these quintiles.

Overall the analysis for both options shows that at LSOA level areas with the most health deprived residents experience a greater share of the benefits that those with less health deprived areas. Further analysis is provided in Section 7.6.6 on this distribution across the study area in relation to key facilities.

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7.5.6 Women

As stated in section 7.3, in some instances, women are less likely than men to have access to a car during the day and after often undertaking more complex trip chains relating to caring responsibilities or school drop offs/pickups (Crisp et al., 2018). This can make them more vulnerable to changes in transport as a result of an intervention.

Table 7- 13 shows the distributional impacts of accessibility on women within the study area for Option 5(i)/(ii).

Table 7- 13: Distribution of accessibility impacts on women for Option 5(i)/(ii)

	Population quintile (where 1 is the 20% of the population with the most women)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	188,000	189,000	229,000	255,000	264,000
Number of people with reduced accessibility	51,000	60,000	55,000	60,000	51,000
No. of net winners	137,000	129,000	175,000	195,000	213,000
Total number of winners across all groups	849,000				
Net winners in each area as % of total	16%	15%	21%	23%	25%
Share of population in impact area (%)	17%	18%	20%	22%	22%
Assessment (✓)	✓✓	✓	✓✓	✓✓	✓✓✓

Table 7- 13 shows that positive impacts are experienced, in accessibility terms, across all quintiles. For those in quintiles 1, 3 and 4, the number of net winners is in line with the resident population. A score of **moderate beneficial** has been assigned to these quintiles. Quintile 2 has a slightly lower share of net winners than its population. A score of **slight beneficial** has been assigned to this quintile. In contrast, quintile 5, which has the 20% least women, has a slightly higher share of the net winners compared to its resident population. A score of **large beneficial** has been assigned to this quintile.

Overall the analysis for Option 5(i)/(ii) shows that at LSOA level there is a slight shift towards areas of Greater Manchester with the least women receiving the greatest share of the benefits. However, the difference between quintiles is small with only a 10% difference between the percentage of net winners in the least and the worst effected group. Further analysis is provided in section 7.6 to consider how female travel patterns and accessibility to key locations may be affected by a clean air proposal.

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Under Option 8 (a CAZ C scenario), private cars are not part of the proposed charging regime so private vehicle users would not incur an increase in the cost of private travel. Analysis in section 3.9.2 shows women are more likely to use cars to make multi-purposes trips, e.g. school runs, and would be more likely to incur this cost.

7.5.7 Option 8 is also not expected to lead to a change in service times for trains and buses (including night-time services which women are more likely to avoid). The distributional impact on women has therefore been screened out of the accessibility assessment for Option 8.Ethnicity

As stated in section 7.3, there are potential differential impacts on BAME communities based on travel patterns and access to key amenities. Additionally, as reported in the baseline report, minority ethnic groups are less likely to have access to a car than other ethnicities which could make this group particularly vulnerable to the effects of a transport intervention.

Table 7- 14 shows the distributional impacts of accessibility on BAME residents within the study area for Option 5(i)/(ii).

Table 7- 14: Distribution of accessibility impacts on BAME for Option 5(i)/(ii)

	Population quintile (where 1 is the 20% of the population with the most BAME residents)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	778,000	75,000	4,000	-	-
Number of people with reduced accessibility	201,000	19,000	-	-	-
No. of net winners	577,000	56,000	4,000	-	-
Total number of winners across all groups	637,000				
Net winners in each area as % of total	91%	9%	1%	0%	0%
Share of population in impact area (%)	91%	9%	0%	0%	0%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✓✓

Table 7- 14 shows that positive impacts are experienced equally, in accessibility terms, across all quintiles. This means the proportion of net winners within each quintile is broadly in line with the proportion of the resident population. This shows that the areas which have a high concentration of BAME residents experience equal accessibility benefits to areas with a low concentration of BAME residents. A score of **moderate beneficial** has been assigned to all quintiles.

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Table 7- 15 shows the distributional impacts of accessibility on BAME residents within the study area for Option 8.

Table 7- 15: Distribution of accessibility impacts on BAME for Option 8

	Population quintile (where 1 is the 20% of the population with the most BAME residents)				
	1 (0-20%)	**2 (20-40%)**	**3 (40-60%)**	**4 (60-80%)**	**5 (80-100%)**
Number of people with improved accessibility	706,000	71,000	4,000	-	-
Number of people with reduced accessibility	274,000	24,000	1,000	-	-
No. of net winners	433,000	47,000	4,000	-	-
Total number of winners across all groups	483,000				
Net winners in each area as % of total	90%	10%	1%	0%	0%
Share of population in impact area (%)	91%	9%	0%	0%	0%
Assessment (✓)	✓✓	✓✓	✓✓	✓✓	✓✓

Table 7- 15 shows that beneficial impacts are experienced equally, in accessibility terms, across all quintiles. This means the proportion of net winners within each quintile is broadly in line with the proportion of the resident population. This shows that the areas which have a high concentration of BAME residents experience equal accessibility benefits to areas with a low concentration of BAME residents. A score of **moderate beneficial** has been assigned to all quintiles.

Overall the analysis for both options shows that the share of accessibility benefits are experienced equally across the study area. Further analysis is provided in section 7.6.8 on the magnitude of change experienced by this group.

7.5.8 Summary Assessment Matrix

Table 7- 16 shows an overview of the assessment stage. Dark green cells represent areas in which the benefits are higher than expected; light green cells represent areas in which the benefits are lower than expected and those in the middle represent areas in which benefits are of a magnitude as expected based on the proportion of residents and the level of accessibility benefits.

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Table 7- 16: Accessibility distributional impacts appraisal matrix (for all options)

Socio-economic group	1 (Most)	2	3	4	5 (Least)	Are the impacts distributed evenly?	Key impacts
Option 5(i)/(ii)							
Low income households (Relative to England and Wales)	✓✓	✓✓✓	✓✓	✓✓	✓	No	Residents in quintile 2 experience the highest proportion of accessibility benefits, while residents in quintile 5 experience the least. Those in quintiles 1, 3 and 4 experience benefits as expected based on the proportion of the population in these groups.
Low income households (Relative to Greater Manchester)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	The analysis shows that moderate benefits are experienced evenly across all income groups.
Children (Relative to England and Wales)	✓✓✓	✓	✓✓✓	✓✓	✓✓	No	Residents in quintile 1 and 3 experience the highest proportion of accessibility benefits, while residents in quintile 2 experience the least. Those in quintiles 4 and 5 experience benefits as expected based on the proportion of the population in these groups.
Elderly (Relative to England and Wales)	✓✓	✓	✓✓	✓✓✓	✓✓	No	Residents in quintile 4 experience the highest proportion of accessibility benefits, while residents in quintile 2 experience the least. Those in quintiles 1, 3 and 5 experience benefits as expected based on the proportion of the population in these groups.
Disabled People (Relative to England and Wales)	✓✓✓	✓✓	✓✓	✓	✓✓	No	Residents in quintile 1 experience the highest proportion of accessibility benefits, while residents in quintile 4 experience the least. Those in quintiles 2, 3 and 5 experience benefits as expected based on the proportion of the population in these groups.
Women (Relative to England and Wales)	✓✓	✓	✓✓	✓✓	✓✓✓	No	Residents in quintile 5 experience the highest proportion of accessibility benefits, while residents in quintile 2 experience the least. Those in quintiles 1, 3 and 4 experience benefits as expected based on the proportion of the population in these groups.
BAME (Relative to England and Wales)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	The analysis shows that moderate benefits are experienced evenly across all groups.
Option 8							

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Socio-economic group	1 (Most)	2	3	4	5 (Least)	Are the impacts distributed evenly?	Key impacts
Low income households (Relative to England and Wales)	✓✓✓	✓✓✓	✓✓	✓✓	✓	No	Residents in quintile 1 and 2 experience the highest proportion of accessibility benefits, while residents in quintile 5 experience the least. Those in quintiles 3 and 4 experience benefits as expected based on the proportion of the population in these groups.
Low income households (Relative to Greater Manchester)	✓✓	✓✓✓	✓✓	✓✓	✓✓	No	Residents in quintile 2 experience the highest proportion of accessibility benefits. Those in quintiles 1, 3, 4 and 5 experience benefits as expected based on the proportion of the population in these groups.
Children (Relative to England and Wales)	✓✓✓	✓	✓✓	✓✓	✓✓	No	Residents in quintile 1 experience the highest proportion of accessibility benefits, while residents in quintile 2 experience the least. Those in quintiles 3, 4 and 5 experience benefits as expected based on the proportion of the population in these groups.
Elderly (Relative to England and Wales)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	The analysis shows that moderate benefits are experienced evenly across all groups.
Disabled People (Relative to England and Wales)	✓✓✓	✓✓	✓	✓	✓✓	No	Residents in quintile 1 experience the highest proportion of accessibility benefits, while residents in 3 and 4 experience the least. Those in quintiles 2 and 5 experience benefits as expected based on the proportion of the population in these groups.
BAME (Relative to England and Wales)	✓✓	✓✓	✓✓	✓✓	✓✓	Yes	The analysis shows that moderate benefits are experienced evenly across all groups.

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7.6 Accessibility Appraisal

The analysis in section 7.5 provides an assessment score for each of the grouping variables under consideration. This section provides further qualitative narrative on how accessibility impacts might differ between the different groups. For example, the introduction of a clean air charge could change the cost of travel by car or specialist transport services (for example school transport or community transport), which could affect how easy it is for people to access places of employment or study and to visit places of worship, friends and family or recreational facilities.

7.6.1 Population distribution

Table 7- 17 shows the distribution of social groups within the key study areas. This aims to provide context to the narrative regarding the scale of the impact on the relative grouping variables. This table should also be looked at in parallel with Figure 27 (Appendix A) which gives the population density per hectare across the study area.

Table 7- 17: Distribution of the population of social groups within the key study areas

	Greater Manchester (excluding M60/IRR)		**M60 (excluding IRR)**		**IRR**	
	Number	**%**	**Number**	**%**	**Number**	**%**
Low income households (population in quintile 1)	352,100	59.30%	242,000	40.70%	0	0.00%
Elderly (over 65's)	318,500	77.55%	91,000	22.27%	700	0.17%
Children (Under 16s)	394,100	69.81%	169,000	30.00%	1,100	0.19%
BAME populations	765,800	70.98%	274,000	25.40%	19,600	1.81%
Disability	853,200	58.49%	567,800	39.54%	14,300	0.98%
Women	963,800	68.83%	406,000	29.01%	15,100	1.08%

The table shows that for the elderly population, under 16's, BAME population, disabled and women, less than 2% are located within the IRR. The majority (over 58%) of these residents are located outside of the M60 boundary in the rest of Greater Manchester.

The table also shows that no low-income households (categorised as those within quintile 1, when compared to the rest of Greater Manchester) are located within the IRR. Approximately 40% of low income households are however, located within the M60. The remaining 59% are distributed across Greater Manchester.

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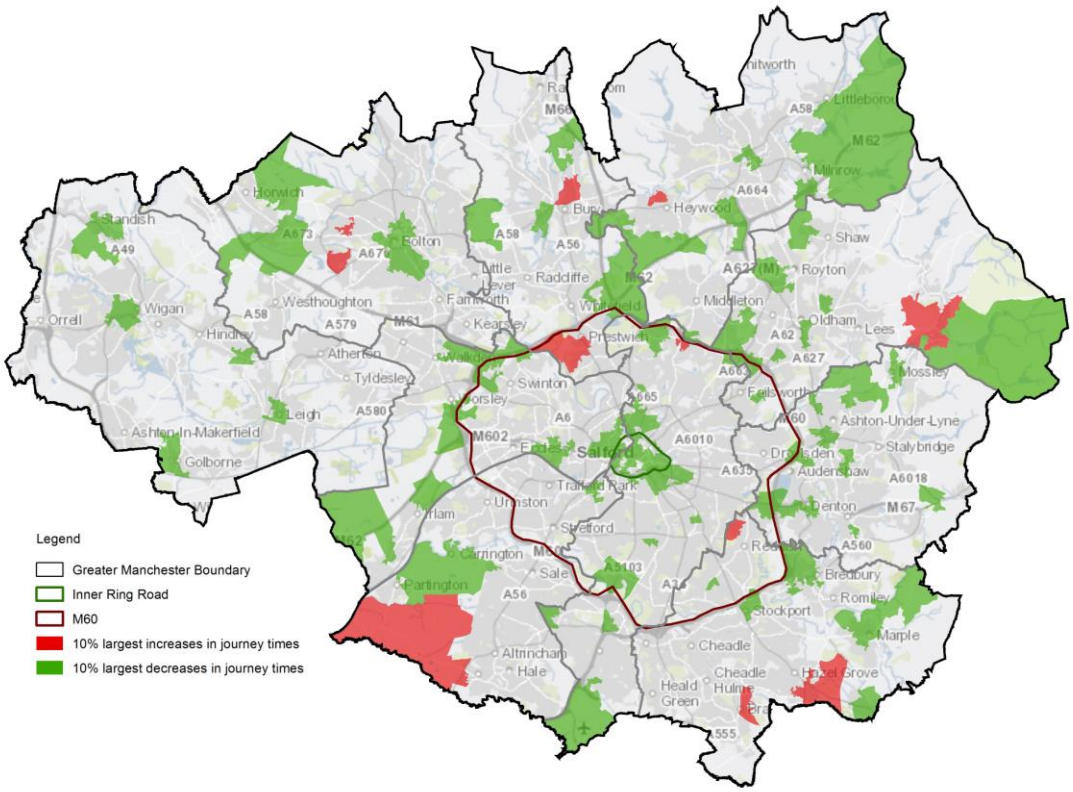
7.6.2 Areas with the greatest increases and decreases in journey times

Image 7.1 show the LSOAs with the 10% largest increase and decrease in journey times for Option 5(i)/(ii).

Image 7- 1 shows the LSOAs with 10% greatest increases and decreases in journey times for Option8. These are also shown in Figure 49 and Figure 50 (Appendix A).

Image 7- 1: LSOAs with increases and decreases in journey times greater than 10% of the 'Do Minimum' for Option 5(i)/(ii)



Overall, the areas with the highest decrease in journey times are distributed evenly across the study area. Most notably there are a number of LSOAs located along the M62 that experience a decrease in journey times. The main improvements in journey time exist within the IRR, Salford and in LSOAs bordering or overlapping the M60. Journey time improvements also exist to the north of the city centre in Strangeways and Cheetham Hill and to the south of the IRR along the oxford road corridor into Hulme. The largest increases in journey times are seen in a small number of LSOAs, particularly in the south west of Greater Manchester, east of Oldham and three LSOAs within the M60. There are no LSOAs within the IRR that experience a large increase in journey times.

There are only a few differences between the Option 5(i)/(ii) and Option 8 maps. Most notably within the M60 and IRR, there are much fewer areas that experience a large decrease in journey times with Option 8 compared to

Option 5(i)/(ii). There are a few LSOAs in Option 8 that experience a large increase in journey time which are not seen under Option 5(i)/(ii), in the following locations;

- Ashton-under-Lyne;
- Higher Blackley; and
- Far Moor on the west edge of Greater Manchester.

7.6.3 Income deprivation

As stated in section 7.3, low income households are particularly vulnerable to accessibility impacts. The assessment for all options in section 7.5.2 showed that when income deprivation is looked at in the context of Greater Manchester the impacts are evenly distributed across all groups. When compared to the distribution across England and Wales, the impacts were uneven with areas with more deprivation receiving a score of **large beneficial** and those in less deprived areas receiving a score of **slight beneficial**.

The ability of low income households to find paid work often depends on affordable, regular and reliable transport. Similarly, evidence shows that for low income groups, there is a spatial mismatch between the location of affordable housing and major centres of employment (Crisp et al., 2018). As shown in Table 6- 14, there are no residents in quintile 1 located within the IRR. It is therefore assumed that those working in the IRR would be required to commute using car or public transport. Often, difficulties are exacerbated by shift work or other anti-social working patterns which make accessibility to employment and key amenities hard for this group. People in low incomes living in households with no access to a car are also particularly vulnerable to social exclusion if public transport is not available nearby to reach key destinations.

Figure 5 and 6 (Appendix A) show the distribution of income deprivation across Greater Manchester. The maps show that areas of high deprivation largely correlate with areas experiencing the 10% largest decrease in journey times (Figures 49 and 50 in the map book (Appendix A)). This includes the town centre of Bolton, Rochdale, Oldham and the area to the south east of the IRR. In contrast, there are some areas which experience both the highest levels of deprivation and the 10% largest increase in journey times. This includes part of Bury and in the LSOA west of Reddish.

In some cases, if low income households cannot afford to upgrade personal transport to meet the latest standards, this could result in them being unable to access key facilities or amenities. It is therefore likely that there would be a disproportionate and differential adverse impact on low income households if there is an increase in cost to users or reduction in availability of services. As Option 8 will not charge cars this distributional impact on low income households is expected to be less with this option, although impacts on PHVs would still be captured under all options.

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7.6.4 Children (under 16's)

As stated in section 7.3, children are more likely to place greater value on the availability of routes closer to home, lower priced fares and higher frequency services than other groups. The assessment in section 7.5.3 showed that **large beneficial** impacts were experienced in quintiles 1 and 3, **slight beneficial** in quintile 2 and **moderate beneficial** in quintile 4 and 5 for Option 5(i)/(ii). For Option 8 the benefits are similarly spread with **large beneficial** impacts experienced by the area with the most under 16s (quintile 1).

For Option 5(i)/(ii), journey time benefits are highest within the IRR (Figure 49 and 50 in Appendix A). This has little impact on children as less than 1% of the total residents of Greater Manchester under the age of 16 live within the IRR and the area also contains no schools (Figure 7 in Appendix A). Benefits are more likely to be experienced by children who live or go to school in in the wider Greater Manchester area, particularly close to town centres such as Bolton, Rochdale and Oldham.

As reported in the baseline report, there are 14 schools in the Greater Manchester for those with special educational needs, eleven of which are within the M60. It is likely that a high proportion of pupils attending these schools are not able to use conventional public transport and are transported to and from school. There are no special educational needs schools within areas with increased journey times. However due to limited numbers of special educational needs schools, some pupils may travel from outside of the Greater Manchester area and experience increased journey times. It is assumed that in most cases, transport of SEN pupils is funded by the LA or schools themselves and/or undertaken in vehicles registered in the disabled passenger vehicle tax class, and hence there would be no increase in cost of travel to the end user. Where this is not the case, then there would be a differential adverse impact on children attending these schools if introduction of the CAP discourages or prevents families from supporting their attendance at the school.

7.6.5 Elderly (over 65's)

As stated in section 7.3, the elderly community are often less mobile and frequently report great difficulty in accessing local amenities, especially when no longer driving. This group are therefore more likely to be dependent on public or community transport that offers door to door usage, or lifts from family and friends (Musselwhite et al. 2015). The assessment for Option 5(i)/(ii) in section 7.5.4 showed that whilst all areas received accessibility benefits, the impacts across the elderly population are uneven with areas with the least elderly people receiving a score of **large beneficial** and areas with more elderly residents receiving a score of **slight beneficial**. The Option 8 assessment showed that the accessibility benefits are experienced evenly across all groups, with all areas receiving a score of **moderate beneficial.**

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Figure 8 (Appendix A) shows that the areas with the highest proportion of elderly residents are located towards the outskirts of Greater Manchester. When compared to Figure 21 (Appendix A) (which shows average accessibility levels) these areas also correspond with the areas which are least accessible by public transport.

People over the age of 65 are more likely to have a disability than any other age group and therefore may also be more reliant on community transport than other age groups. The age profile of community transport vehicles is typically older than average, and hence more likely to be non-compliant. Non-profit organisations are unlikely to have the cash reserves to either pay the clean air charge or upgrade to a compliant vehicle without increasing the cost of their services to end users and/or reducing the availability of services that they offer. This is because their vehicles tend to be older, and as services are run on a not-for-profit basis, organisations are unlikely to have the cash reserves to absorb the additional cost of compliance. It is therefore likely that there would be a disproportionate and differential adverse impact on users if there is an increase in cost to users or reduction in availability of such services.

For Option 8, the share of accessibility benefits are expected to be evenly distributed across the Greater Manchester. However, for Option 5(i)/(ii) the greatest share of accessibility benefits are expected within the M60 and IRR boundaries. As seen in Figure 8, the M60 contains less than 23% of the total over 65's in the study area and the IRR contains less than 0.5%. This suggests that changes in accessibility within the city centre are unlikely to have a significant impact on resident elderly population within the IRR however there is still potential for impacts on the elderly population travelling within this area for leisure purposes.

7.6.6 Disability

As stated in section 7.3, disabled populations face many barriers when accessing transport facilities. This includes physical infrastructure (i.e. vehicles, stations etc. designed for use for all) and lack of information on transport options (DfT, 2018a). The assessment in section 7.5.3 showed that whilst accessibility benefits were experienced across the whole population the distribution is uneven with the areas containing the highest proportion of disabled people receiving a score of **large beneficial** and areas with less disabled people receiving a score of **slight beneficial**.

Figure 9 (Appendix A) shows the location of populations with relatively high levels of health deprivation across the study area. Areas of high levels of health deprivation are concentrated in the centre of Greater Manchester, within the M60 boundary, which contains approximately 40% of the total population of the study area within deprivation quintile 1. Concentrations of health deprived populations are also found in the key centres of Bolton, Bury, Rochdale, Oldham, Wigan and to the south of the study area surrounding Manchester airport. Less than 1% of the health deprived population of Manchester live within the IRR where accessibility benefits are expected to increase the most. This suggests that whilst the impacts are likely to be beneficial, they are not likely to be of large significance when looked in the context of the whole study area.

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When compared to Figure 49 and 50 (Appendix A), which show areas of decreased journey times, there is a good correlation, suggesting beneficial impacts on journey times for these areas in all options. Disabled people with reduced mobility may be unable to make use of conventional public transport services or active transport modes (walking and cycling), and therefore more reliant on private cars for personal journeys than people who do not have reduced mobility. If the increased costs associated with these journeys (discussed further in the affordability report) are sufficient to deter disabled people with mobility problems from making these journeys then there would be a differential adverse impact on accessibility for this group. As car owners only experience a travel cost under Option 5(i)/(ii) the impact on accessibility on the disabled group would be larger under this option than it would be under Option 8 (a CAZ C which excludes cars).

Taxis are another important form of transport for people unable to drive, use conventional public transport or use active travel modes due to disability. DfT data shows that, in England, the proportion of personal trips undertaken by taxi is on average three times higher for adults with mobility difficulties than those without (DfT, 2017a). A reduction in the availability of taxis would therefore have a disproportionate and differential effect on disabled people.

Wheelchair adapted vehicles that are used solely for the transport of disabled people, and hence are registered as disabled passenger vehicles, are exempted from the clean air charge for those travelling within the IRR. However, a proportion of community transport vehicles operating within Greater Manchester may not be registered as disabled passenger vehicles as they are also used to transport people who do not have a disability. As stated in the baseline report, only 1% of the total PHVs in Greater Manchester are currently wheelchair accessible. Since WAVs are more expensive than standard vehicles, these types of adapted vehicles tend to be kept or leased by their owners for longer than non-adapted vehicles. This makes them more likely to be non-compliant. If the cost of upgrading vehicles is too high, this could have a disproportionate impact on this group.

7.6.7 Women

As stated in section 7.3, women are often less likely than men to have access to a car during the day and are regularly undertaking more complex trip chains relating to caring responsibilities or school drop offs/pickups (Crisp et al., 2018). The assessment in section 7.5.6 showed that whilst accessibility benefits were experienced across the whole population, the distribution is uneven with the areas containing the lowest proportion of women receiving a score of **large beneficial** and areas with less women receiving a score of **slight beneficial**. Distributional impacts on women were screened out under Option 8, see section 7.5.6.

A study of public transport behaviour in London undertaken by Transport for London (TfL) in 2014 found that women are more concerned than men with regards to personal safety when using public transport (TfL, 2014), and a recent report by Sustrans found that fears surrounding personal safety are a key barrier to undertaking active travel journeys particularly when travelling

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at night (Sustrans, 2018). The increase in cost of travel by private vehicle associated with the introduction of clean air charging in Greater Manchester would therefore have a differential adverse accessibility impact on women due to their perceived negative experience of alternative travel options. Similarly, DfT data from 2017 shows that women are slightly more likely to use taxis and PHVs than men (DfT, 2017). As such, any changes in the availability of taxis and/or PHV or increases in fares would have a slightly disproportionate and differential adverse impact on women.

7.6.8 Ethnicity

As stated in section 7.3, there are potential differential impacts on BAME communities based on differences in travel patterns and access to key amenities. For all options the assessment in section 7.5.6 showed that the accessibility benefits are experienced evenly across all groups, with all areas receiving a score of **moderate beneficial.**

Within Greater Manchester, the highest proportion of BAME populations are located within the M60, outside of the IRR (Figure 11 in Appendix A). This area contains 25% of the total BAME population within Greater Manchester. There are also high concentrations of BAME populations within the key centres of Bolton, Bury, Rochdale, Oldham and Ashton however this equates to less than 3% of the total population of Greater Manchester. Figures 49 and Figure 50 (Appendix A) show that for all clean air options, journey times in the key centres are likely to decrease suggesting potential benefits for the population in these areas.

As reported in the baseline report, minority ethnic groups are less likely to have access to a car than other ethnicities. Similarly, between 2013 and 2017, ethnic minorities travelled the smallest distance and made the fewest trips (DfT, 2017i). A study by Transport for London also found that BAME Londoners cite a greater number of barriers to increased public transport use than white Londoners including concerns over crime whilst travelling (TfL, 2015). The increase in cost of travel by private vehicle associated with the introduction of clean air charging in Greater Manchester could therefore have a differential adverse accessibility impact on ethnic minorities due to their perceived negative experience of alternative travel options.

7.7 Mitigation

In line with TAG unit A4-2A, where the Distributional Impact analysis shows evidence of an intervention having particularly high benefits or dis-benefits to a certain group, enhancement and mitigation ought to be considered. Section 7.5 shows that beneficial accessibility impacts are experienced across the study area. In absence of adverse effects, no mitigation is considered necessary.

It is recommended that further work be undertaken to explore potential enhancement measures for any beneficial distributional impacts.

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8 Severance

8.1 Overview

The appraisal of severance impacts looks at the potential barriers to accessibility within a local community due to road traffic and transport infrastructure.

WebTAG unit 4.2 states that certain groups are potentially vulnerable to severance effects, including people without access to a car, older people, people with disabilities, parents with pushchairs and children. At the options appraisal stage, the analysis focused on identifying road links that are at risk of causing severance and their relative proximity to facilities used particularly by these groups.

Criteria used to identify routes with the potential to cause severance are when combinations of conditions arise[31]:

- Annual Average Daily Traffic (AADT) flows exceed 8,000 vehicles per day **and** the predicted change in traffic flows is greater than 10%, or
- Annual Average Daily Traffic (AADT) flows exceed 8,000 vehicles per day **and** the predicted change in HGV composition of traffic flows is greater than 10%, or
- The predicted change in traffic flows exceeds 10% and the predicted change in the HGV composition of traffic flows is greater than 10%.

The key findings of the assessment of potential severance impacts are presented as follows:

- For Option 5(i)/5(ii), 96 roads/corridors are expected to experience traffic flow conditions under which severance impacts could occur. The potential for severance impacts on medical/health and educational facilities has been identified along 26 roads/corridors. Along these, 27 education facilities and 19 medical/healthcare facilities were identified (Figures 45 and 46 in Appendix A).
- For Option 8, 82 roads/corridors are expected to experience traffic flow conditions under which severance impacts could occur. The potential for severance impacts on medical/health and educational facilities has been identified along 25 roads/corridors. Along these, 19 education facilities and 23 medical/healthcare facilities were identified (Figures 47 and 48 in Appendix A).

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[31] Guidance on AADT flows are from the Highways Agency (1993) and on proportionate change in traffic flows and vehicle composition from DfT (2015)

Given that a very small proportion of facilities are potentially affected across the entire network of Greater Manchester, the overall impact is not expected to be significant; however, further monitoring of traffic flows at these locations would be recommended to ensure that any potential community severance effects can be properly managed.

Further work on identified receptors could look at analysis of travel modes and populations of vulnerable groups for a better understanding of potential severance effects.

8.2 Methodology

Outputs from the Traffic Modelling software SATURN were manipulated in a spreadsheet to determine the change in traffic flows and HGVs composition across the Greater Manchester road network.

Links shorter than 200m in length were screened out as they were considered unlikely to represent a significant barrier to accessibility. Shorter road sections in proximity to one another that individually met the criteria for severance were combined into corridors, and their overall length and impacts were considered.

To determine key locations with potential for severance effects[32], medical/health and educational facilities within a 200m radius of road sections were identified and mapped in GIS, using Open Street Map datasets[33]. The locations of routes affecting these facilities is shown in Figures 45-48 (see Appendix A).

Note that this methodology provides an indication of the potential for severance on facilities used particularly by vulnerable groups. The methodology does not allow for assessing how groups access this facility, or the wider levels of pedestrian movement in the area. Other datasets could identify wider facilities. However, routes impacting more than one facility indicate a location that is likely to be more highly accessed, such as close to a town centre or education cluster, and where levels of pedestrian movement are likely to be higher with greater potential for severance effects.

8.3 Severance Analysis

8.3.1 Analysis of Option 5(i)/(ii)

Under the conditions of Option 5(i)/(ii), compared to the 'Do-Minimum' scenario, most of the road network within Greater Manchester (95%) would not experience a change in traffic flow (increase or decrease) that meets the conditions set out in Section 8.1. As such, most of the network is excluded from any further assessment of severance impacts.

[32] Note that the analysis of severance impacts does not differentiate between Option 5(i) and Option 5(ii) since the same AADT24 2-way link flows from 'SATURN' were utilised.

[33] The facility classes include care/nursing homes, hospitals/hospices, GP surgeries and clinics, preparatory, first, primary, infant, junior and middle schools, secondary schools and universities.

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Approximately 3% of the network would experience a decrease in traffic flows (AADT24) of more than 10%, and 2% of the road network would experience an increase in traffic flows (AADT24) greater than 10%.

Areas of increased traffic flows

For Option 5(i)/(ii), the potential for community severance impacts has been identified along 96 roads/corridors due to increased traffic flows. Using available data, 26 are located within a distance that means they could affect accessibility to health and educational facilities (see Table 8- 1). The facilities identified here could be vulnerable to severance impacts if traffic flows increase further in the future.

Table 8- 1: Key impact roads for effects related to Changes in Traffic Flows for Option 5(i)/(ii)

CAP	Local Authority	Road	Length (metres)	Medical facilities (including care/nursing homes)	Education centres
IRR	Manchester	Byron Street/ Hardman Street	696	None	John Rylands University Library
M60	Bury	King's Road (Prestwich)	206	Fernica Residential Care Home Outreach Community & Residential Services – 118 King's Road Langdon Foundation Outreach Community and Residential Services - 17 York Avenue	Sedgley Park School
M60	Manchester	Vine Street (Gorton)	724	None	St. Clements C of E Primary School
		Richmond Grove (Longsight)	496	Little Sisters of The Poor Care Fertility	Dean Trust Ardwick Plymouth Grove Primary School St. Josephs RC Primary School
		Abbey Hey Lane (Gorton)	450	St Georges Residential Home	Abbey Hey Academy
		Stanley Grove (Longsight)	260	Lighthouse	St. Peters RC High School
		Reddish Lane (Gorton)	253	None	Oasis Academy Aspinal

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CAP	Local Authority	Road	Length (metres)	Medical facilities (including care/nursing homes)	Education centres
	Salford	Lower Broughton Road (Salford)	2263	None	River View Primary School
		Bolton Road (Salford)	361	Pendleton Court Care Home Dental Surgery	None
		King's Road (Prestwich)	206	None	St. Phillips RC Primary School
GM	Bolton	New Lane (Harwood)	936	The Respite House Care Home	Bolton St Catherine's Academy
		Stitch-Mi Lane (Harwood)	433	None	Bolton St. Catherine's Academy Harwood Meadows Primary School
		Hindley Road (Westthoughton)	248	None	St. James C of E School
	Bury	Bradley Fold Road (Ainsworth)	301	None	Ainsworth C of E Primary School
	Manchester	Car Bank Street (Atherton)	271	Surgery	St. Richards RC School Meadowbank Primary School & Nursery Education Centre
	Oldham	Broaders Lane/Lane Head Road (Mossley)	687	Ashbourne House Residential Home	St. Agnes C of E School St. Georges C of E Primary School
	Stockport	Wellington Street (Stockport)	487	None	St. Josephs RC Primary School
		Buckingham Road/Queens Road (Cheadle Hulme)	267	Dr Seabrook & Partners	Oak Tree Primary School
	Tameside	Old Road (Hyde)	1366	Sure Start Children's Centre	Dale Grove School
		Broaders Lane/Lane Head Road (Mossley)	687	None	St. Georges C of E Primary School
		Mottran Road (Hyde)	428	Tameside General Hospital	None

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CAP	Local Authority	Road	Length (metres)	Medical facilities (including care/nursing homes)	Education centres
		Smith Street/Ryecroft Street/Hamilton Street (Ashton-Under-Lyne)	423	Moss Cottage Nursing Home	St. Peters Primary School Ashton West End Primary Academy
		Knott Lane (Hyde)	213	Laurel Bank Residential Care Home	None
	Trafford	Broad Road (Sale)	225	None	Holy Family RC Primary School
	Wigan	Car Bank Street (Atherton)	271	Atherton Start Well Family Centre	None

Table 8- 1 shows that the potential for severance has been identified for 27 educational facilities and 19 health facilities, using Open Street Map data.

Under Option 5 (i)/(ii), nursing or residential homes are the main type of health/medical facility that could potentially experience severance effects, while primary schools are the most common type of educational facility that could be affected. As more than half of children across Greater Manchester aged 5-10 walk to school, the potential for severance effects to these facilities may need to reviewed further.

There is likely to be greater potential for severance effects associated with some specific roads that are close to town centres and multiple facilities. Analysis of data available shows that a small number of roads/corridors have the potential to affect access to 3 or more health or educational facilities: King's Road (Prestwich), Richmond Grove (Longsight), Car Bank Street (Atherton), Broaders Lane/Lane Head Road (Mossley) and Smith Street/Ryecroft Street/Hamilton Street (Ashton-under-Lyne). Additional datasets could be used to review risk of severance on receptors in such locations.

Areas of reduced traffic flows

Figures 45 and 46 show links that are expected to experience levels of reductions in traffic flows (AADT levels, traffic flow or HGV content) that, combined, meet the opposite conditions against the severance criteria set out in section 8.1.

There is a concentration of roads within the IRR; outside of the IRR the distribution of roads that are expected to have reduced traffic flows is generally even across local authority areas.

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Some of the roads identified in the IRR form important access routes to and from the city centre such as Camp Street/Upper Camp Street (Broughton), Bury New Road (Broughton), and Oxford Road. Within the M60, there is a slightly greater concentration to the north of the city centre, in proximity to a number of care and nursing facilities. In the Greater Manchester area, a similar pattern arises around care homes and nursing facilities around Rochdale centre.

Roads on the outer boundary of Greater Manchester also show reductions in traffic flows, such as Moor End Road (Mellor) and Watling Street (Bury). However modelled changes in flows in rural areas can be skewed by the relatively low levels of traffic using these roads, such that a small change in vehicle numbers can easily exceed the 10% change in traffic flow threshold.

8.3.2 Analysis of Option 8

Under the conditions of Option 8, compared to the 'Do-Minimum' scenario, most of the road network within Greater Manchester (98%) is unlikely to experience a change in traffic flow (increase or decrease) that meets the conditions set out in section 8.1 and therefore the majority of the network is excluded from any further assessment of severance impacts.

Approximately 1% of the network would experience a decrease in traffic flows (AADT24) of more than 10%, and 1% of the road network would experience an increase in traffic flows (AADT24) greater than 10%.

Areas of increased traffic flows

For Option 8, the potential for community severance impacts has been identified along 82 roads/corridors i.e. are expected to experience an increase in traffic flows against the criteria for potential severance effects. Using available data, 25 are located within a distance that means they could affect accessibility to health and educational facilities (Table 8- 2). The facilities identified here could be vulnerable to severance impacts if traffic flows increase further in the future.

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Table 8- 2: Key impact roads for effects related to Changes in Traffic Flows for Option 8

CAP	Metropolitan Borough	Link/Corridor	Length	Medical facilities (including care/nursing homes)	Educational facilities
M60	Manchester	Elizabeth Slinger Road (Didsbury)	371	Ashley House Residential Care Home Rowlsey House Care Home Withington Community Hospital Holmfield Residential Care Home Spire Manchester Hospital	None
		Stanley Grove (Longsight)	260	Lighthouse Care UK	St. Peters RC High School
		Yew Tree Road (Fallowfield)	210	The Dental Practice	None
	Salford	Great Cloves Street (Lower Broughton)	1075	The Willows Nursing Home Bluebell Court	None
		Bolton Road (Salford)	361	Pendleton Court Care Home Dental Surgery	None
	Bury	Butterstile Lane (Prestwich)	437	The Salvation Army	None
GM	Bolton	Hindley Road (Westthoughton)	248	None	St. James C of E School
	Bury	Eton Hill Road (Radcliffe)	2419	The Regard Partnership	Radcliffe Hall C of E Methodist Primary School
		Bradley Fold Road (Ainsworth)	301	None	Ainsworth C of E Primary School
	Oldham	Broaders Lane/Lane Head Road (Mossley)	687	Ashbourne House Residential Home	St. Agnes C of E School

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CAP	Metropolitan Borough	Link/Corridor	Length	Medical facilities (including care/nursing homes)	Educational facilities
	Rochdale	Dale Street (Milnrow)	207	Rosemary Care Home	None
	Stockport	Wellington Street (Stockport)	487	None	St. Josephs RC Primary School
	Tameside	Old Road (Hyde)	1366	None	Dale Grove School
		Mottran Road (Hyde)	428	Tameside General Hospital	None
		Lancaster Road (Hindley)	1047	The Acorns Care Centre	All Saints C of E Primary School
		Warrington Road (Ashton in Makerfield)	518	Ashwood Residential Care Home	Byrchall High School St. Edmund Arrowsmith Catholic High School St. Oswalds Primary School
		Car Bank Street (Atherton)	271	Surgery	St. Richards RC School Meadowbank Primary School & Nursery Education Centre
		Bolton Road (Ashton in Makerfield)	207	Ashton View Care Home	St. Thomas C of E Primary School
	Tameside	Old Road (Hyde)	1366	Sure Start Children's Centre	None
		Broaders Lane/Lane Head Road (Mossley)	687	None	St. Georges C of E Primary School
		Smith Street/Ryecroft Street/Hamilton Street (Ashton-under-Lyne)	423	Moss Cottage Nursing Home	St. Peters Primary School Ashton West End Primary Academy
		Knott Lane (Hyde)	213	Laurel Bank Residential Care Home	Dowson CP School

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CAP	Metropolitan Borough	Link/Corridor	Length	Medical facilities (including care/nursing homes)	Educational facilities
	Trafford	Broad Road (Sale)	225	None	Holy Family RC Primary School

Using the available data, potential for severance has been identified for 19 educational and 23 health facilities. Tameside has the highest number (5) of links that could affect educational centres, however none would impact more than one facility. This is the same for most of the roads/corridors assessed, although there are two high schools and one primary school within radius of Warrington Road (Wigan).

Overall, the potential for severance to health facilities is primarily in relation to residential care homes in the outer areas of Greater Manchester, where the majority of such facilities are located (Table 3- 3). Several within the M60 may also be impacted. Several roads/corridors across the study area have the potential to impact multiple health facilities including Elizabeth Slinger Road (Didsbury), Great Cloves Street (Lower Broughton) and Bolton Road (Salford).

There is likely to be greater potential for severance effects associated with some specific roads that are close to town centres and multiple facilities, and additional datasets could be used to review risk of severance on receptors in these locations.

Areas of reduced traffic flows

Figures 46 and 47 show roads that are expected to experience a reduction in the magnitude in traffic flows (AADT, percentage change in flow or HGV content) against the criteria set out in section 8.1.

The majority of changes are located outside the IRR and M60 boundaries and are relatively evenly dispersed. Parts of the network around Rochdale are expected to experience a reduction in traffic flows, including areas in close proximity to a number of care and nursing home facilities.

Roads on the periphery of Greater Manchester also show reductions in traffic flows, such as Moor End Road (Mellor) and Monks' Road (Glossop). However modelled changes in flows in rural areas can be skewed by the relatively low levels of traffic using these roads, such that a small change in vehicle numbers can easily exceed the 10% change in traffic flow threshold, and therefore no further analysis of these peripheral traffic flow reductions have been completed at this time.

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9 Conclusion

Across the whole of Greater Manchester, Option 5(i)/(ii) is the best performing option in terms of overall emissions reductions, resulting in an 18% decrease in total emissions compared to the do minimum scenario. Option 8 follows closely behind with a 17% reduction in total emissions of PM and NO_X. This is also true within the M60 where Option 5(i)/(ii) results in a 23% reduction in emissions compared to a 20% reduction for Option 8.

For all **social groups** screened into the **analysis of air quality impacts** (low income households, children and the elderly), the results are comparable for Option 5(i)/(ii) and Option 8. Option 8 provides slightly better opportunities for enhancement of impacts on low income households than Option 5(i)/(ii), and the reverse is true for impacts on children (Option 5(i)/(ii) provides slightly better opportunities for enhancement than Option 8). Air quality benefits for elderly people are more evenly spread across quintiles for Option 8 than for Option 5(i)/(ii), although it is noted that, given the distribution of the elderly population, impacts on this group are more likely to be experienced through changes in accessibility and affordability rather than reductions in emissions.

The **analysis of affordability impacts** shows that, under option 5(i)/(ii), adverse impacts fall disproportionately on residents of the IRR who would have no choice other than to comply with the charges for private car travel. These impacts could be mitigated in part through 'sunset periods' (time-limited discounts) for IRR residents.

Under Option 5(i)/(ii), the least deprived LSOAs within the IRR account for a relatively high proportion of the low deprivation population across the study area (Greater Manchester) and yet they experience zero reductions in user costs. This is as expected based on the distribution of income deprivation across the study area and the relatively low levels of deprivation within the IRR. However, the analysis also shows that under Option 5(i)/(ii), the burden of costs associated with upgrading private cars to compliant vehicles across Greater Manchester would fall disproportionately on low income households, including the high proportion of low income households (quintile 1), located just outside of the IRR. Under Option 8, the use of non-compliant private cars would not incur a charge, therefore there is likely to be a significantly lower affordability impact on low income households under this option.

The **analysis of accessibility impacts** shows that, for Option 5(i)/(ii) and Option 8, large accessibility benefits are anticipated in the areas with the greatest income deprivation. The areas with the greatest improvements in journey times are located within the IRR and in the key centres of Bolton, Rochdale and Oldham.

For children, beneficial accessibility impacts are experienced unevenly across all quintiles for Option 5(i)/(ii) and Option 8, although for both options, large beneficial impacts are experienced in quintile 1 (highest numbers of children). The same is true for the beneficial impacts on disabled people.

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Overall, there is little to distinguish the social impacts of Option 5(i)/(ii) versus Option 8. Both options show that all social groups are likely to experience moderate beneficial air quality, personal affordability and accessibility impacts. Exceptions to this are summarised as follows.

- Under Option 5(i)/(ii), adverse impacts fall disproportionately on residents in IRR who otherwise have no choice other than to comply with the charge for private car travel. These impacts fall disproportionately on the least deprived populations of Greater Manchester due to the relatively low levels of deprivation within the IRR.
- Under Option 8, the use of non-compliant private cars would not incur a charge, therefore there is likely to be a significantly lower affordability impact on low income households under this option compared to Option 5(i)/(ii).
- The analysis identified potential adverse affordability impacts on disabled people under Option 5(i)/(ii) due to the potential for increased costs of community transport services and the costs associated with upgrading wheelchair accessible vehicles.
- Similarly, the accessibility impact of Option 5(i)/(ii) on disabled people would be greater than under Option 8, since people with reduced mobility may be more reliant on private cars for personal journeys than people who do not have reduced mobility.
- Although accessibility benefits for the BAME community are more evenly spread across quintiles for Option 8 than for Option 5(i)/(ii), it is noted that for Option 5(i)/(ii), any increase in the cost of travel by private vehicle could have a differential adverse accessibility impact on ethnic minorities due to their perceived negative experience of alternative travel options.

For the **analysis of economic impacts**, it was assumed that levels of economic resilience are homogenous across the study area and that all SMEs would be vulnerable to potential adverse business affordability impacts. However, given that approximately 10% of all SMEs within Greater Manchester are concentrated within the IRR, it is likely that this area would experience a disproportionate adverse business affordability impact compared to the Greater Manchester region as a whole.

It is assumed that almost all Greater Manchester SMEs would experience increased costs related to the transportation of goods and services on the road network, although businesses that are more heavily reliant on LGVs and HGVs, such as Retail, Wholesale and Transport and Storage, would be more heavily impacted. The magnitude of this impact would depend on the frequency of journeys and the behavioural response to the GM CAP.

Across Greater Manchester, only 1% of LGVs are currently compliant (euro rating of four or above for petrol and six or above for diesel). The majority of businesses with an LGV fleet would therefore be expected to incur additional vehicle replacement costs between 2021 and 2023. However, some vehicle replacement and improvement in compliance levels are expected by 2023 as

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part of routine fleet upgrade, with an average reduction of 17% for non-compliant LGVs and 33% for non-compliant HGVs across Greater Manchester in this time.

High concentrations of LGV registrations were identified just outside the IRR suggesting this area could also be disproportionately impacted by the GM CAP.

Although LGV affordability impacts are considered as business costs rather than social costs, there is potential for LGVs to also be used for leisure/personal purposes. In these instances, the impact could shift from a business affordability issue to a personal affordability issue.

For the two **economic groups** considered, SMEs and LGVs, the analysis shows that the distribution of adverse **business affordability** impacts on SMEs are expected to be similar for Option 5(i)/(ii) and Option 8. In cases where businesses are dependent on the use of personal cars, it is anticipated that Option 5(i)/(ii) would result in greater adverse impacts on business affordability than Option 8. There is also a risk under the conditions of Option 5(i)/(ii) that SME workers within the IRR could choose to move to employment outside of the IRR to avoid a charge, potentially resulting in lost productivity and an increase in recruitment costs.

Several key assumptions have been applied throughout the distributional impacts analysis including a reliance on current publicly available information, medical evidence, and guidance. The limitations of each assessment (air quality, affordability and accessibility) have been identified in the relevant sections of this report, and recommended areas for further work are described in Appendix B.

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Analysis of Distributional Impacts
Appendix A Map Book

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Authorised by: **Date:**	Simon Warburton 28th February 2019		

FIGURE 1

Legend

- Greater Manchester Boundary
- Local Authority Boundary

Wigan
Bolton
Bury
Rochdale
Oldham
Salford
Manchester
Tameside
Trafford
Stockport

0 2 4 6 8 Kilometers

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0	24/10/2018	Initial Issue	LK	BK	EK	EK

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FIGURE 2

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60

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FIGURE 3

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Greater Manchester MSOA Boundary

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FIGURE 4

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Greater Manchester LSOA Boundary

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Project

Greater Manchester Clean Air Plan

Drawing Title

Greater Manchester Lower Super Output Areas (LSOAs)

Scale @ A3	1:180,000	DO NOT SCALE
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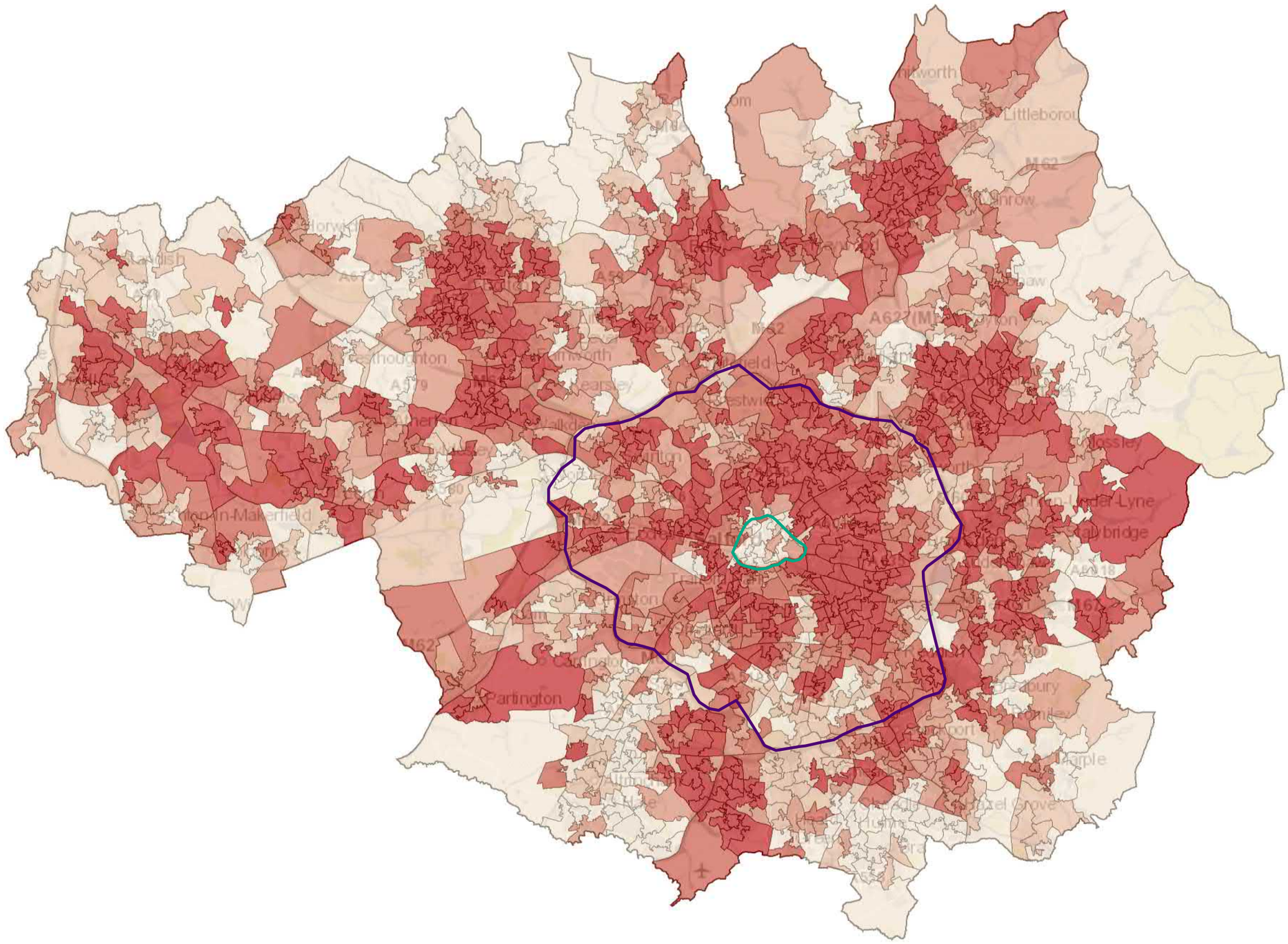
FIGURE 5



Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60

Income Deprivation Quintiles

- 1= 0-20% (most deprived)
- 2= 20-40%
- 3= 40-60%
- 4= 60-80%
- 5= 80-100% (least deprived)

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Income Deprivation by Quintile
Based on the distribution across England and Wales

Scale @ A3	1:180,000	DO NOT SCALE
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FIGURE 6

N
W E
S

Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60

Income Deprivation Quintiles

- 1= 0-20% (most deprived)
- 2= 20-40%
- 3= 40-60%
- 4= 60-80%
- 5= 80-100% (least deprived)

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Income Deprivation by Quintile
Based on the distribution across Greater Manchester

Scale @ A3	1:180,000	DO NOT SCALE
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FIGURE 7

N
W E
S

Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60

Under 16 Quintiles

- 1= 0-20% (most under 16s)
- 2= 20-40%
- 3= 40-60%
- 4= 60-80%
- 5=80-100% (least under 16s)

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Proportion of Under 16s by Quintile
Based on the distribution across Greater Manchester

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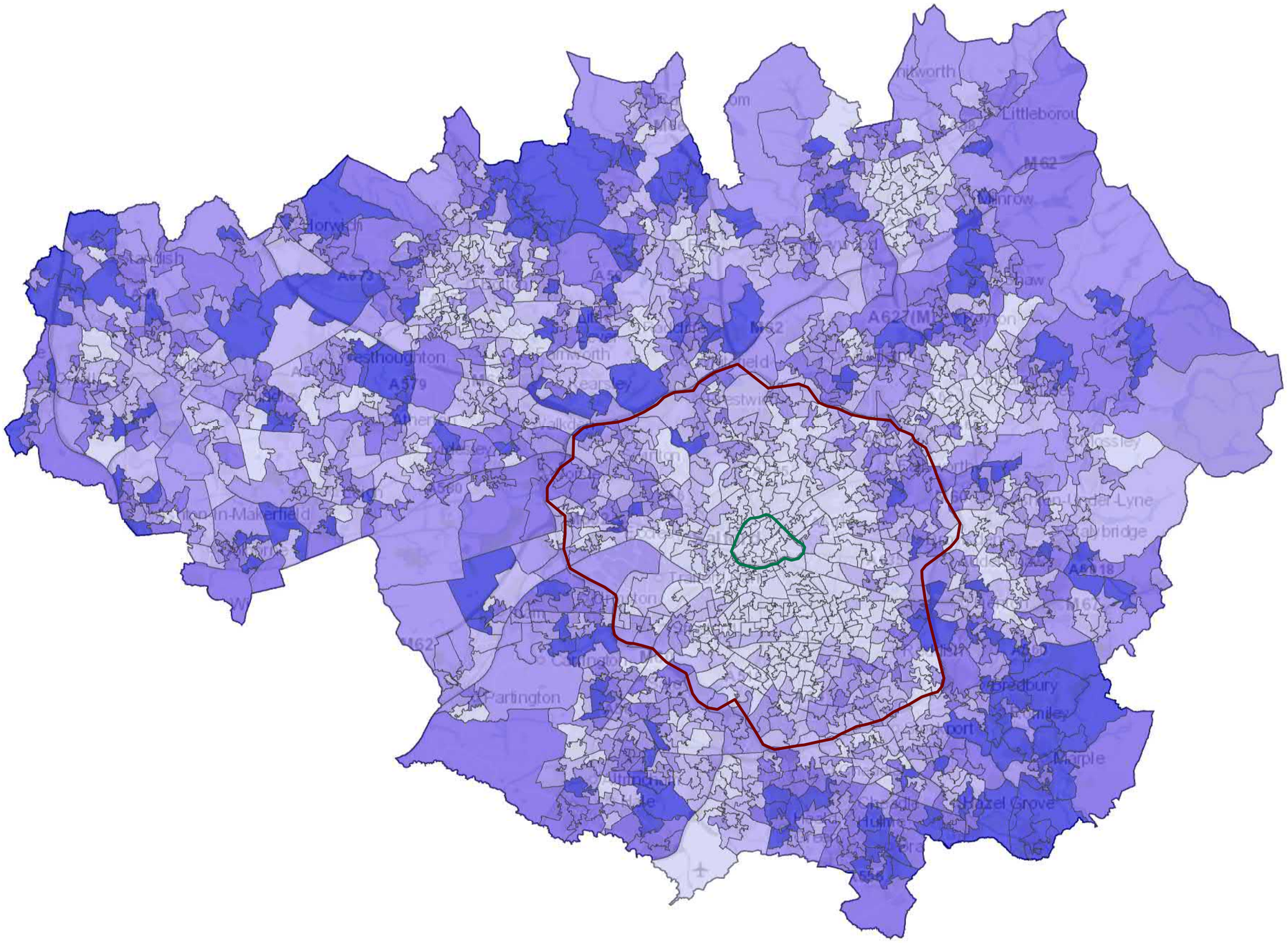
FIGURE 8



Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60

Over 65 Quintiles

- 1= 0-20% (most over 65s)
- 2= 20-40%
- 3= 40-60%
- 4= 60-80%
- 5= 80-100% (least under 65s)

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Proportion of Over 65s by Quintile
Based on the distribution across England and Wales

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FIGURE 9

Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60

Health Deprivation Quintiles

- 1= 0-20% (most deprived)
- 2= 20-40%
- 3= 40-60%
- 4= 60-80%
- 5= 80-100% (least deprived)

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Project: Greater Manchester Clean Air Plan

Drawing Title: Health Deprivation by Quintile
Based on the distribution across England and Wales

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FIGURE 10

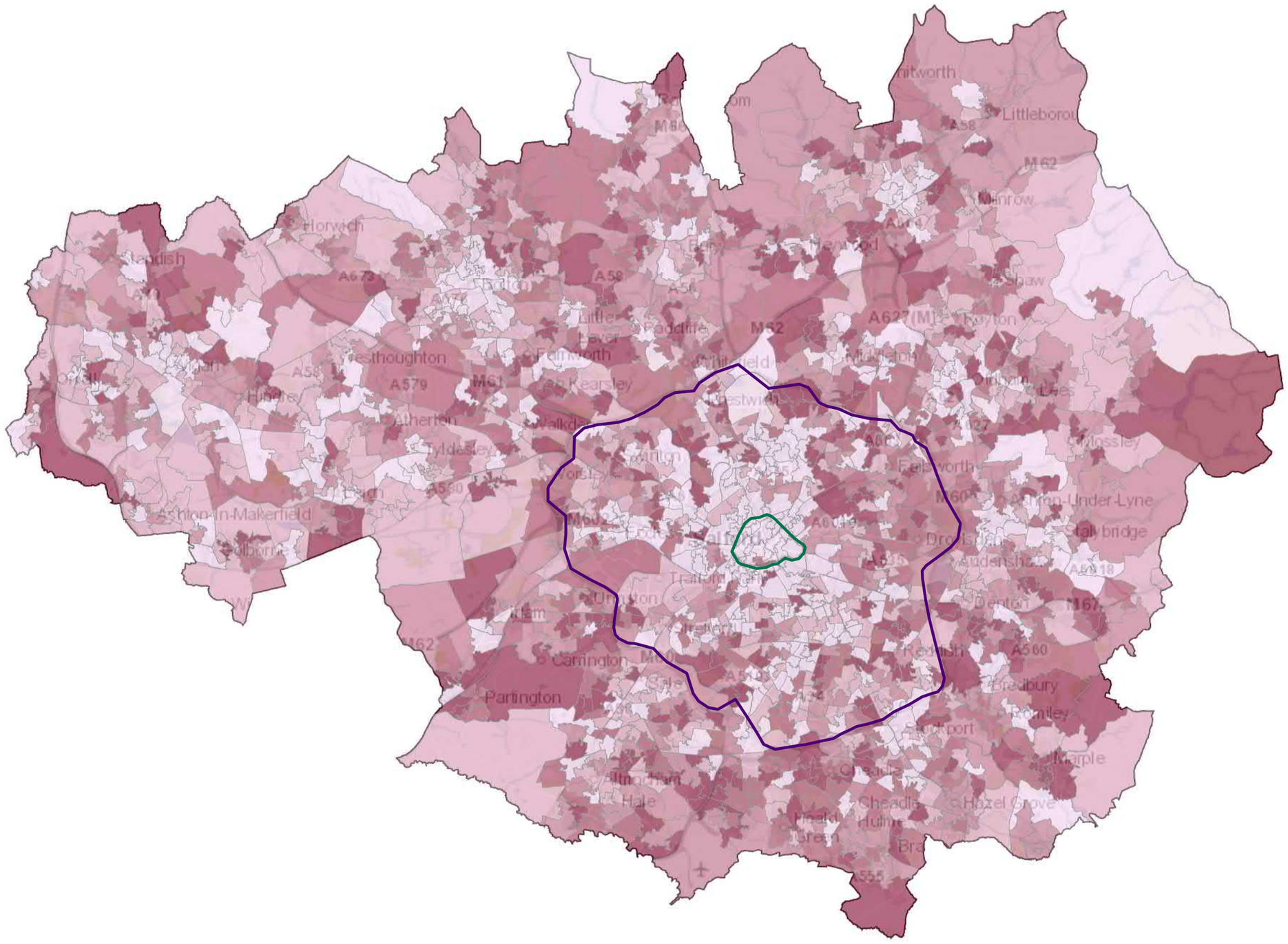
N
W
E
S
Littleborough
Rochdale
Bolton
Bury
Oldham
Stockport
Salford
Eccles
Trafford
Partington
Carrington
Urmston
Sale
Altrincham
Hale
Ashton-Under-Lyne
Glossop
Hyde
Denton
Reddish
Stretford
Chadderton
Middleton
Failsworth
Droylsden
Audenshaw
Dukinfield
Mossley
Tameside
Wigan
Leigh
Ashton-In-Makerfield
Westhoughton
Atherton
Tyldesley
Farnworth
Kearsley
Prestwich
Whitefield
Radcliffe
Walkden
Worsley
Eccles
Irlam
Cadishead
Flixton
Urmston
Davyhulme
Stretford
Sale
Altrincham
Hale
Bowdon
Hazel Grove
Cheadle
Gatley
Heald Green
Cheadle Hulme
Bramhall
Poynton
Marple
Romiley
Bredbury
Woodley
Hyde
Mottram
Glossop
Tintwistle
Holmfirth
Meltham
Slaithwaite
Marsden
Huddersfield
Golcar
Lindley
Milnsbridge
Linthwaite
Colne
Nelson
Brierfield
Burnley
Padiham
Accrington
Rawtenstall
Bacup
Whitworth
Littleborough
Milnrow
Shaw
Crompton
Royton
Chadderton
Oldham
Failsworth
Droylsden
Audenshaw
Dukinfield
Ashton-Under-Lyne
Stalybridge
Mossley
Denton
Reddish
Stockport
Bredbury
Romiley
Marple
Hazel Grove
Cheadle
Gatley
Heald Green
Cheadle Hulme
Bramhall
Poynton
Wilmslow
Alderley Edge
Handforth
Knutsford
Northwich
Winsford
Middlewich
Sandbach
Crewe
Nantwich
Tarporley
Frodsham
Runcorn
Widnes
Warrington
Lymm
Altrincham
Sale
Partington
Carrington
Urmston
Trafford
Stretford
Davyhulme
Irlam
Cadishead
Flixton
Eccles
Salford
Swinton
Pendlebury
Clifton
Kearsley
Farnworth
Bolton
Horwich
Blackrod
Westhoughton
Atherton
Tyldesley
Leigh
Ashton-In-Makerfield
Wigan
Golborne
Lowton
Newton-le-Willows
St Helens
Rainford
Skelmersdale
Ormskirk
Burscough
Rufford
Preston
Leyland
Chorley
Adlington
Darwen
Blackburn
Accrington
Burnley
Nelson
Colne
Brierfield
Padiham

FIGURE 11

Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60

BAME Population Quintiles

- 1= 0-20% (most BAME population)
- 2= 20-40%
- 3= 40-60%
- 4= 60-80%
- 5= 80-100% (least BAME population)

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Proportion of Black, Asian and Minority Ethnic (BAME) residents by Quintile Based on the distribution across England and Wales

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0 2 4 6 8 Kilometers

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FIGURE 12

Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60

SME Quintiles

- 1= 0-20% (most SMEs)
- 5= 80-100% (least SMEs)

NOTE: The distribution of SME's has been mapped based on the distribution across England and Wales. Based on this distribution, there are no LSOAs in quintiles 2,3 or 4 and therefore these are not shown on the map.

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Proportion of Small and Medium-sized Enterprises (SMEs) by Quintile Based on the distribution across England and Wales

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FIGURE 13

Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60

Non-compliant LGV Quintiles

- 1= 0-20% (most)
- 5= 80-100% (least)

NOTE: The distribution of non compliant LGV's has been mapped based on the distribution across England and Wales. Based on this distribution, there are no LSOAs in quintiles 2,3 or 4 and therefore these are not shown on the map

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Project: Greater Manchester Clean Air Plan

Drawing Title: Non-Compliant LGVs Mapped by Quintile
Based on the Proportion of Non-Compliant LGVs in Greater Manchester

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FIGURE 14

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Primary School
- Secondary School
- Nursery
- University Boundary

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Client

Transport for Greater Manchester

Project

Greater Manchester Clean Air Plan

Drawing Title

Locations of educational establishments in Greater Manchester

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FIGURE 15

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Parks/Open Space
- Playground

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Locations of parks and playgrounds in Greater Manchester

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FIGURE 16

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Medical Facility

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Zone

Drawing Title: Locations of Medical Facilities (including hospitals and GP clinics) in Greater Manchester

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FIGURE 17

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Care/Nursing Home

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Project: Greater Manchester Clean Air Plan

Drawing Title: Locations of care/nursing homes in Greater Manchester

Scale @ A3	1:180,000	DO NOT SCALE
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FIGURE 18

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Religious Sites

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Project: Greater Manchester Clean Air Plan

Drawing Title: Locations of religious sites in Greater Manchester

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FIGURE 19

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Cycle Routes

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Project: Greater Manchester Clean Air Plan

Drawing Title: Locations of cycle routes in Greater Manchester

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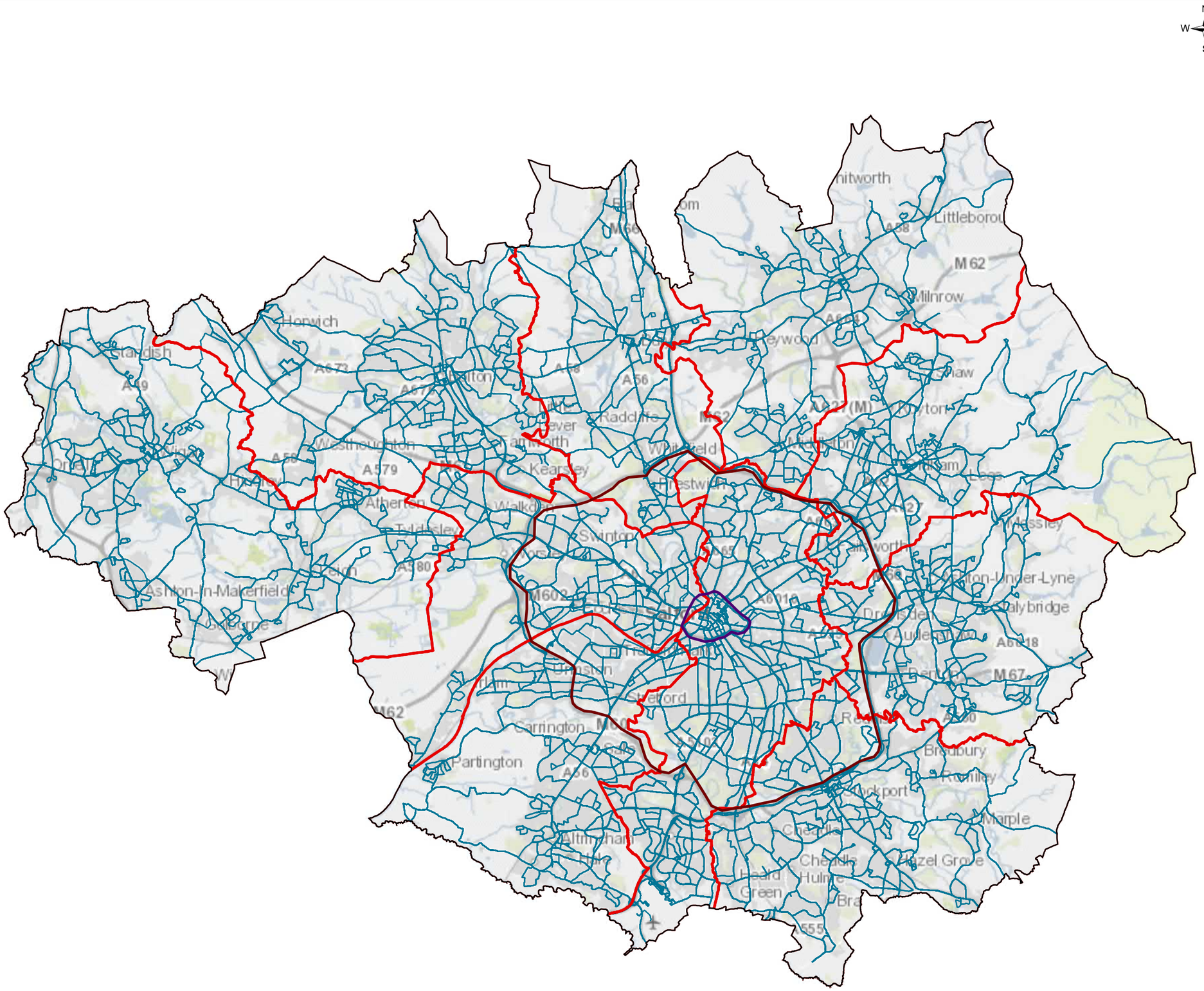
FIGURE 20



Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Bus Route

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Project: Greater Manchester Clean Air Plan

Drawing Title: Locations of bus routes in Greater Manchester

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FIGURE 21

Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60

Accessibility Level

- 1 = very low
- 2
- 3
- 4
- 5
- 6
- 7
- 8 = very high

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Client

Transport for Greater Manchester

Project

Greater Manchester Clean Air Plan

Drawing Title

Accessibility Levels in Greater Manchester

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FIGURE 22

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Housing Sites Under Construction (2017)
- Housing Planning Permission Sites (2017)
- Housing Capacity Sites (2017)

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Areas identified for housing in the Manchester Local Authority

Scale @ A3	1:83,637	DO NOT SCALE
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FIGURE 23

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Future Employment Areas B2 & B8 (2016-2017)
- Future Employment Areas under Construction B8 only (2016-2017)
- Future Employment Areas under Construction B2 only (2016-2017)

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Areas Identified as Future Employment Areas in the Manchester Local Authority

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0 1 2 3 4 Kilometers

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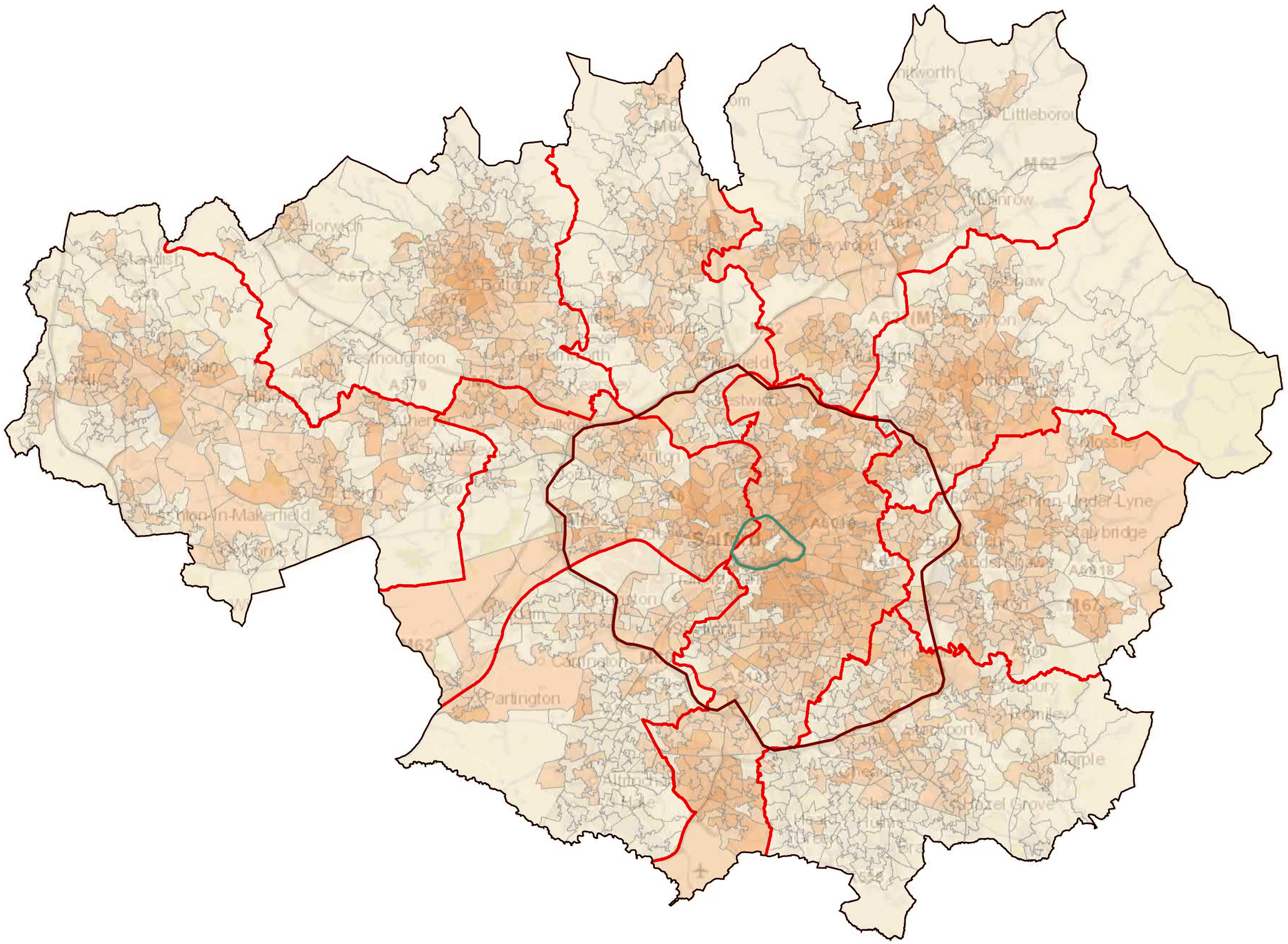
FIGURE 24



Legend

- Greater Manchester Boundary
- Local Authority Boundary
- M60
- Inner Ring Road

Car/Van Availability (% of households with no access)

- 0% - 20%
- 21% - 40%
- 41% - 60%
- 61% - 80%
- 81% - 100%

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Percentage of households with no access to a car or van in Greater Manchester

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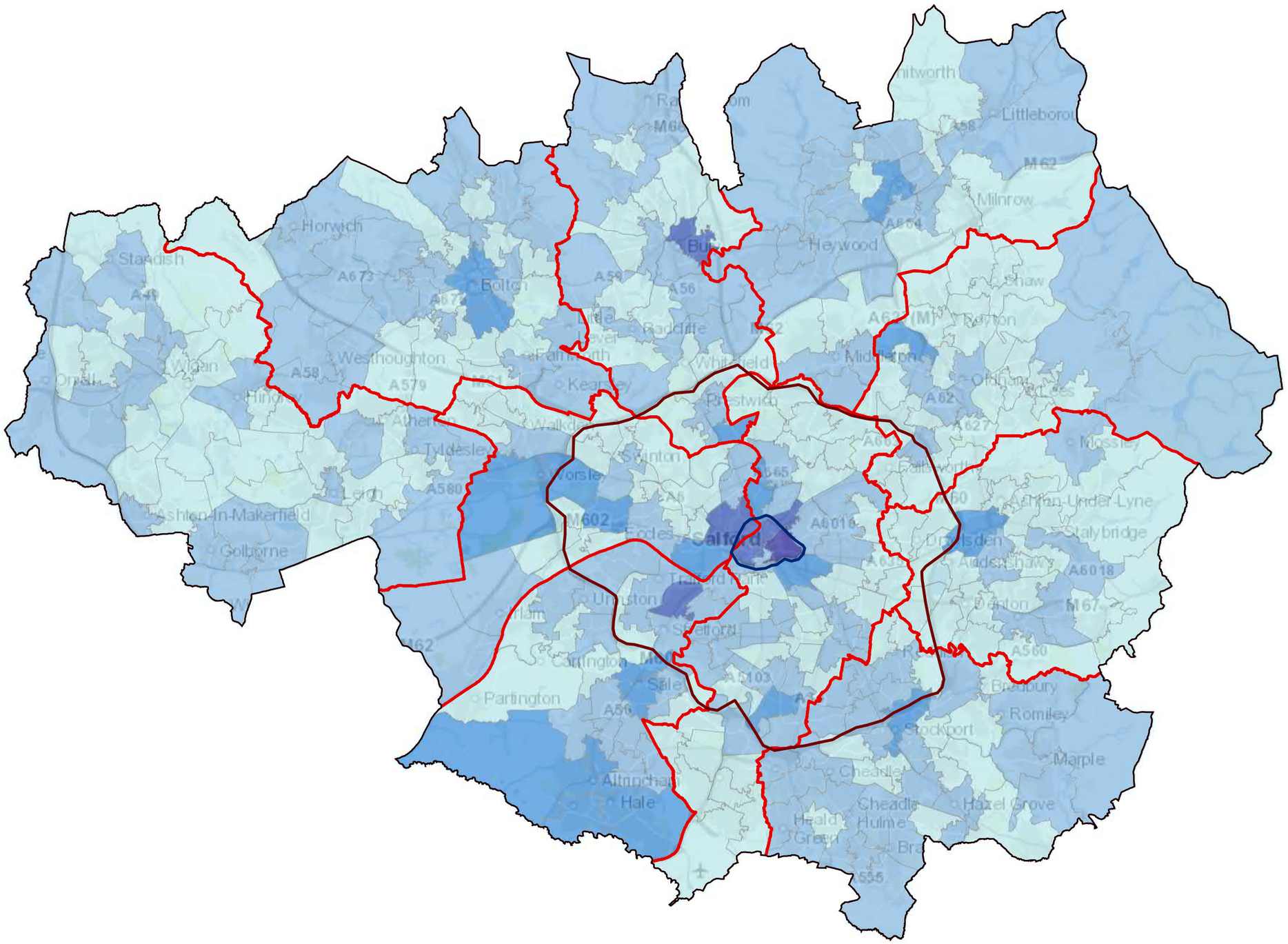
FIGURE 25



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Legend

- Greater Manchester Boundary
- Local Authority Boundary
- M60
- Inner Ring Road

SMEs with a turnover of less than £200,000 per annum

- 30 - 170
- 171 - 325
- 326 - 710
- 711 - 1500
- 1501 - 3765

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Number of Small Medium Enterprises (SMEs) with an annual turnover of less than £200,000, in each MSOA

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

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FIGURE 26

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- M60
- Inner Ring Road

SMEs with a turnover of more than £1 million per annum

- 0 - 20
- 21 - 45
- 46 - 95
- 96 - 205
- 206 - 440

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	19/02/2019	Initial Issue	LK	BK	EK	EK

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Number of Small Medium Enterprises (SME's) with an annual turnover of more than £1million, in each MSOA

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

0 2 4 6 8 Kilometers

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FIGURE 27

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- M60
- Inner Ring Road

Population Density (people per hectare)

- 1 - 25
- 26 - 45
- 46 - 75
- 76 - 125
- > 125

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Project: Greater Manchester Clean Air Plan

Drawing Title: Population Density (people per hectare) in each LSOA

Scale @ A3	1:180,000	DO NOT SCALE
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0 2 4 6 8 Kilometers

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FIGURE 28

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- M60
- Inner Ring Road

Percentage Non-Compliance (Cars)

- < 40%
- 40% - 50%
- 50% - 60%
- 60% - 70%
- > 70%

Note: Non-compliant here means less than or equal to Euro 4 petrol and Euro 6 diesel

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Client: Transport for Greater Manchester

Project: Greater Manchester Clean Air Plan

Drawing Title: Percentage of Non-Compliant Cars Within Each LSOA in Greater Manchester

Scale @ A3	1:180,000	DO NOT SCALE
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0 2 4 6 8 Kilometers

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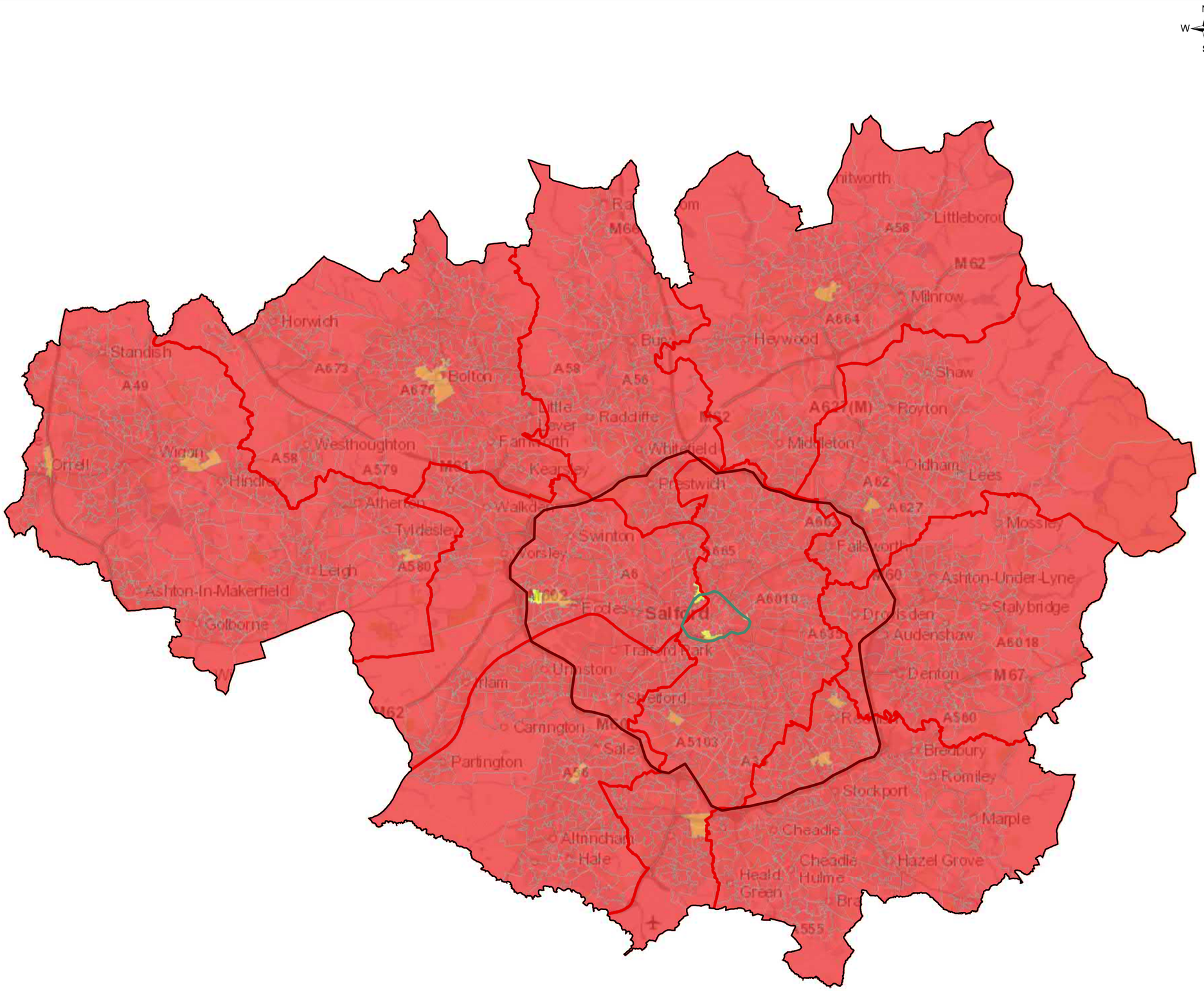
FIGURE 29



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Legend

- Greater Manchester Boundary
- Local Authority Boundary
- M60
- Inner Ring Road

Percentage Non-Compliance (LGVs)

- <50%
- 50% - 90%
- > 90 %

Note: Non-compliant here means less than or equal to Euro 4 petrol and Euro 6 diesel

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Project: Greater Manchester Clean Air Plan

Drawing Title: Percentage of Non-Compliant LGVs Within Each LSOA in Greater Manchester

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

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FIGURE 30

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60

Reduction in PM_{10} Emissions (tonnes) - Option 5(i)

- 0.00 - 0.05
- 0.06 - 0.10
- 0.11 - 0.15
- 0.16 - 0.20
- >0.20

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Project: Greater Manchester Clean Air Plan

Drawing Title: Modelled reduction in PM_{10} Emissions - Option 5(i)

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

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0 2 4 6 8 Kilometers

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FIGURE 31

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60

Reduction in NOx Emissions (tonnes) - Option 5(i)

- 0.00 - 1.00
- 1.01 - 2.00
- 2.01 - 4.00
- 4.01 - 8.00
- 8.01 - 20.00

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Project: Greater Manchester Clean Air Plan

Drawing Title: Modelled reduction in NOx Emissions - Option 5(i)

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

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0 2 4 6 8 Kilometers

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FIGURE 32

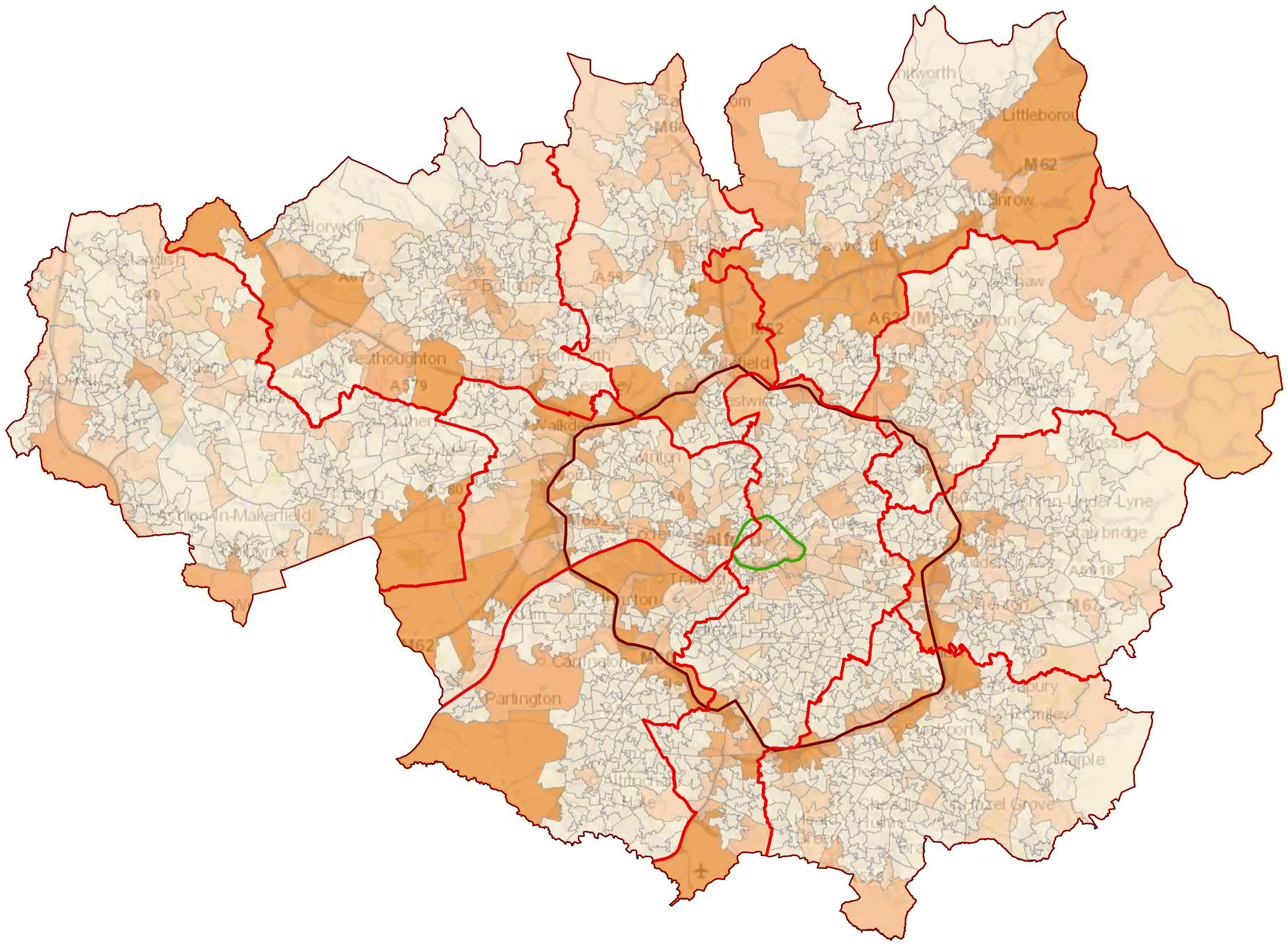
N
W
E
S
M62
A58
A579
A6
A666
A675
M61
M60
A580
A666
A6053
A6
A58
A62 (M)
M62
A6
A58
A6
A58
A6
A58

FIGURE 33

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60

Reduction in NOx Emissions (tonnes) - Option 5(ii)

- 0.00 - 1.00
- 1.01 - 2.00
- 2.01 - 4.00
- 4.01 - 8.00
- 8.01 - 20.00

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Project: Greater Manchester Clean Air Plan

Drawing Title: Modelled Reduction in NOx Emissions - Option 5(ii)

Scale @ A3	1:180,000	DO NOT SCALE
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0 2 4 6 8 Kilometers

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FIGURE 34

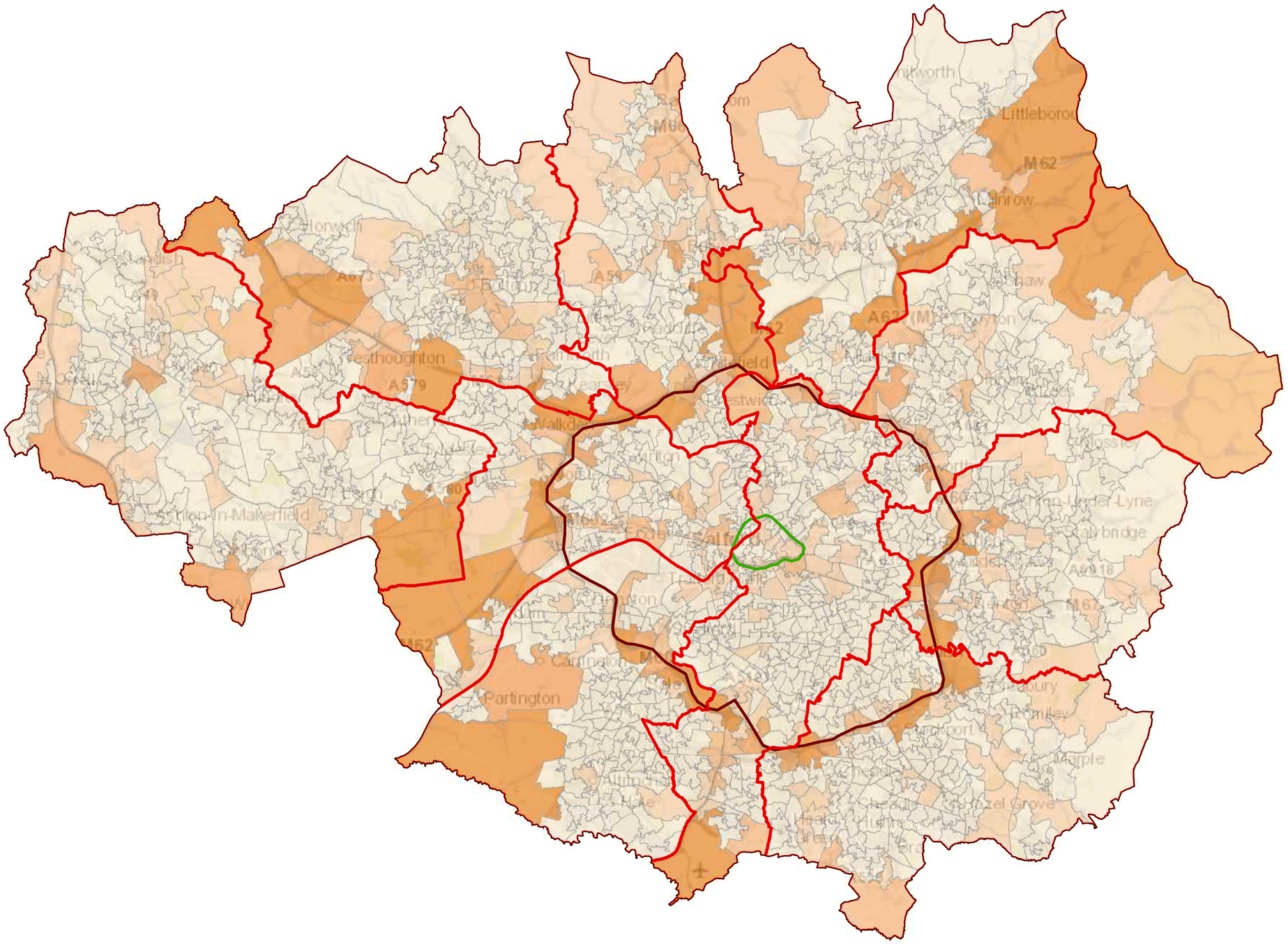
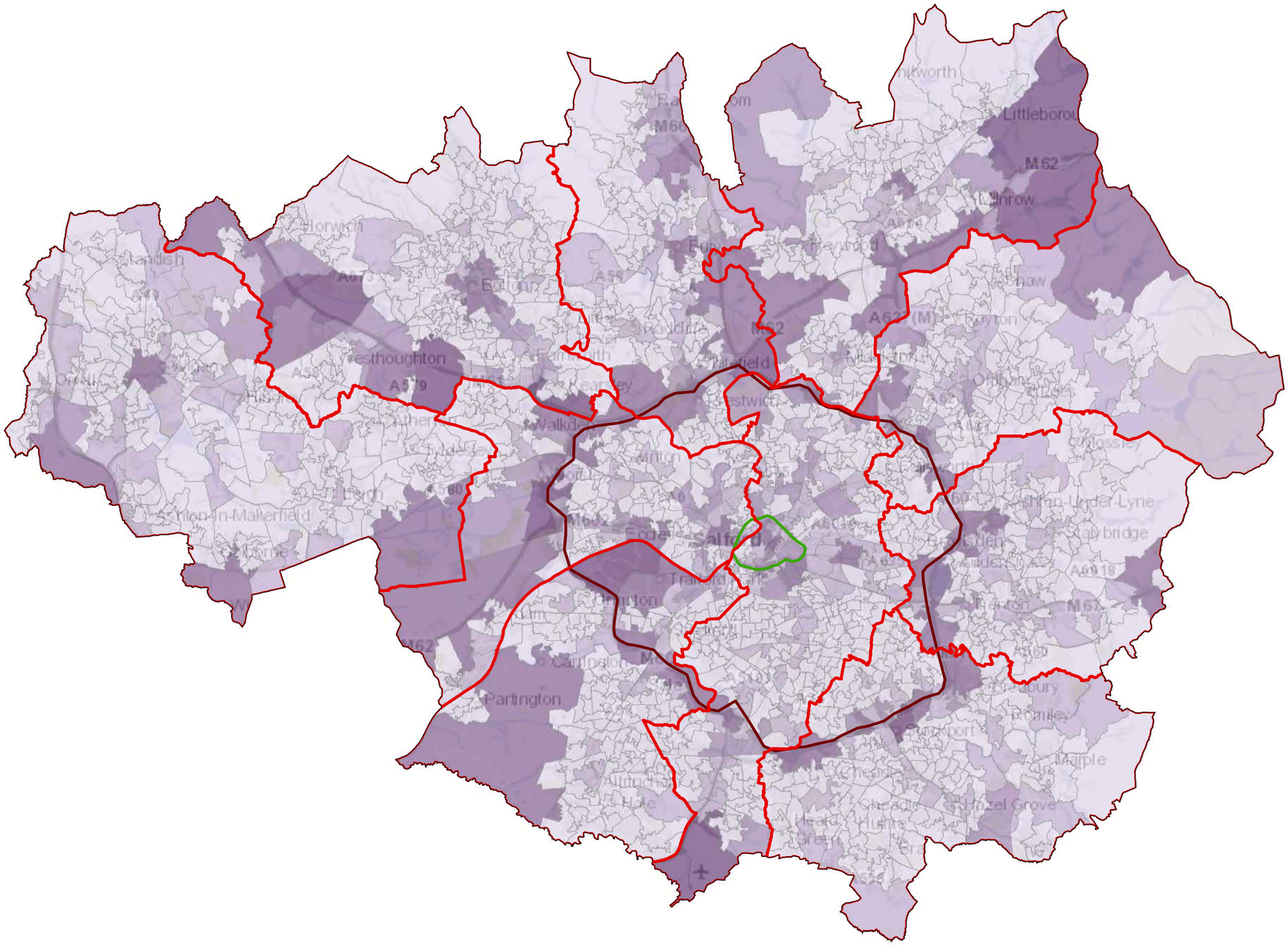

N
W
E
S
M62
A580
A579
A59
A6(M)
M6
M61
M66
M60
M67
A56
A58
A666
A676
A680
A581
A6209
A571
A49
A5103
A5082
A5145
A5106
A5027
A5036
A5067
A5103
A5082
A5145
A5106
A5027
A5036
A5067
Littleborough
Milnrow
Rochdale
Bury
Bolton
Wigan
Leigh
Atherton
Tyldesley
Walkden
Eccles
Salford
Irlam
Partington
Cadishead
Flixton
Urmston
Stretford
Sale
Altrincham
Hale
Timperley
Wythenshawe
Northenden
Chorlton
Didsbury
Withington
Fallowfield
Rusholme
Levenshulme
Longsight
Gorton
Openshaw
Droylsden
Audenshaw
Denton
Reddish
Heaton Chapel
Heaton Moor
Stockport
Cheadle
Gatley
Heald Green
Cheadle Hulme
Bramhall
Poynton
Hazel Grove
Marple
Romiley
Glossop
Mottram
Hyde
Dukinfield
Ashton-under-Lyne
Stalybridge
Mossley
Oldham
Failsworth
Middleton
Prestwich
Whitefield
Radcliffe
Ramsbottom
Tottington
Walmersley
Bury
Heywood
Middleton
Chadderton
Royton
Shaw
Crompton
Milnrow
Littleborough
Wardle
Rochdale
Castleton
Kearsley
Farnworth
Little Hulton
Walkden
Worsley
Boothstown
Ellenbrook
Astley
Tyldesley
Mosley Common
Ince-in-Makerfield
Hindley
Abram
Platt Bridge
Westhoughton
Blackrod
Horwich
Adlington
Chorley
Leyland
Penwortham
Preston
Kirkham
Wesham
Fleetwood
Thornton
Cleveleys
Poulton-le-Fylde
Blackpool
Lytham St Annes
Freckleton
Warton
Lytham
Ormskirk
Burscough
Rufford
Skelmersdale
Up Holland
Newton-le-Willows
Earlestown
Haydock
St Helens
Rainford
Billinge
Ashton-in-Makerfield
Golborne
Lowton
Leigh
Atherton
Tyldesley
Mosley Common
Boothstown
Ellenbrook
Worsley
Eccles
Irlam

FIGURE 35



Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60

Reduction in NOx Emissions (tonnes) - option 8

- <0.00 - 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.01 - 8.00
- 8.01 - 20.00

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Client

Transport for Greater Manchester

Project

Greater Manchester Clean Air Plan

Drawing Title

Modelled Reduction in NOx Emissions - Option 8

Scale @ A3	1:177,510	DO NOT SCALE
Jacobs No.	BTGMO002	

0 2 4 6 8 Kilometers

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FIGURE 36

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Income Deprivation Quintile 1
- Lowest Reductions in Emissions in Deprivation Quintile 1
- Highest Reductions in Emissions in Deprivation Quintile 1

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Project: Greater Manchester Clean Air Plan

Drawing Title: LSOAs with the 10% Highest/Lowest Reductions in Emissions (PM_{10} and NO_x) Which Contain the Most Deprived Areas under Option 5(i)

Scale @ A3	1:180,000	DO NOT SCALE
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0 2 4 6 8 Kilometers

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FIGURE 37

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Income Deprivation Quintile 1
- Lowest Reductions in Emissions In Deprivation Quintile 1
- Highest Reductions in Emissions In Deprivation Quintile 1

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Project: Greater Manchester Clean Air Plan

Drawing Title: LSOAs with the 10% Highest/Lowest Reductions in Emissions (PM_{10} and NO_x) Which Contain the Most Deprived Areas for Option 5(ii)

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

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FIGURE 38

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Income Deprivation Quintile 1
- Lowest Reductions in Emissions in Deprivation Quintile 1
- Highest reductions in Emissions in Deprivation Quintlie 1

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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Client

Transport for Greater Manchester

Project

Greater Manchester Clean Air Plan

Drawing Title

LSOAs with the 10% Highest/Lowest Reductions in Emissions (PM_{10} and NO_x) Which Contain the Most Deprived Areas under Option 8

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

0 2 4 6 8 Kilometers

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FIGURE 39

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Under 16s Quintile 1
- Lowest Reductions in Emissions in Under 16's Quintile 1
- Highest Reductions in Emissions in Under 16's Quintile 1

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Project: Greater Manchester Clean Air Plan

Drawing Title: LSOAs with the 10% Highest/Lowest Reductions in Emissions (PM_{10} and NO_x) Which Also Contain the Most Under 16s for Option 5(i)

Scale @ A3	1:180,000	DO NOT SCALE
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0 2 4 6 8 Kilometers

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FIGURE 40

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Under 16s Quintile 1
- Lowest Reductions in Emissions in Under 16s Quintile 1
- Highest Reductions in Emissions in Under 16s Quintile 1

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Project: Greater Manchester Clean Air Plan

Drawing Title: LSOAs with the 10% Highest/Lowest reductions in Emissions (PM_{10} and NO_x) Which Also Contain the Most Under 16s for Option 5(ii)

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

0 2 4 6 8 Kilometers

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FIGURE 41

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Under 16s Quintile 1
- Lowest Reductions in Emissions in Under 16s Quintile 1
- Highest Reductions in Emissions in Under 16s Quintile 1

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Project: Greater Manchester Clean Air Plan

Drawing Title: LSOAs with the 10% Highest/Lowest Reductions in Emissions (PM_{10} and NO_X) Which Also Contain the Most Under 16s for Option 8

Scale @ A3	1:180,000	DO NOT SCALE
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0 2 4 6 8 Kilometers

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FIGURE 42

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Over 65s Quintile 1
- Lowest Reductions in Emissions in Over 65s Quintile 1
- Highest Reductions in Emissions in Over 65s Quintile 1

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Client

Transport for Greater Manchester

Project

Greater Manchester Clean Air Plan

Drawing Title

LSOAs with the 10% Highest/Lowest Reductions in Emissions (PM_{10} and NO_x) Which Also Contain the Most Over 65s for Option 5(i)

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

0 2 4 6 8 Kilometers

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FIGURE 43

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Over 65s Quintile 1
- Lowest Reductions in Emissions in Over 65's Quintile 1
- Highest Reductions in Emissions in Over 65's Quintile 1

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Project: Greater Manchester Clean Air Plan

Drawing Title: LSOAs with the 10% Highest/Lowest Reductions in Emissions (PM_{10} and NO_x) Which Also Contain the Most Over 65s for Option 5(ii)

Scale @ A3	1:180,000	DO NOT SCALE
Jacobs No.	BTGMO002	

0 2 4 6 8 Kilometers

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FIGURE 44

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Over 65s Quintile 1
- Lowest Reductions in Emissions in Over 65s Quintile 1
- Highest Reductions in Emissions in Over 65s Quintile 1

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Project: Greater Manchester Clean Air Plan

Drawing Title: LSOAs with the 10% Highest/Lowest Reductions in Emissions (PM_{10} and NO_X) Which Also Contain the Most Over 65s for Option 8

Scale @ A3	1:187,509	DO NOT SCALE
Jacobs No.	BTGMO002	

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0 2 4 6 8 Kilometers

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FIGURE 45

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Medical Facility
- Care/Nursing Home
- Primary School
- Secondary School
- University
- Decrease in traffic flows >10%
- Increase in traffic flows >10%
- Links with >8000 vehicles per day

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0 2 4 6 8 Kilometers

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FIGURE 46

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Medical Facility
- Care/Nursing Home
- Primary School
- Secondary School
- University
- Decrease in traffic flows >10%
- Increase in traffic flows >10%
- Links with >8000 vehicles per day

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FIGURE 47

0 2 4 6 8 Kilometers

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Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Medical Facility
- Care/Nursing Home
- Primary School
- Secondary School
- University
- Decrease in traffic flows >10%
- Increase in traffic flows >10%
- Links with >8000 vehicles per day

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Drawing Title: Key Impact Areas for Effects Relating to Changes in Traffic Flows for CAP Option 8 in 2021 - Greater Manchester

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FIGURE 48

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- Inner Ring Road
- M60
- Medical Facility
- Care/Nursing Home
- Primary School
- Secondary School
- University
- Decrease in traffic flows >10%
- Increase in traffic flows >10%
- Links with >8000 vehicles per day

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Drawing Title: Key Impact Areas for Effects Relating to Changes in Traffic Flows for CAP Option 8 in 2021 - M60 and IRR

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FIGURE 49

Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60
- 10% largest increases in journey times
- 10% largest decreases in journey times

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Project

Greater Manchester Clean Air Plan

Drawing Title

LSOAs With the 10% Largest Increases and Decreases in Journey Times for Options 5(i) and 5(ii)

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0 2 4 6 8 Kilometers

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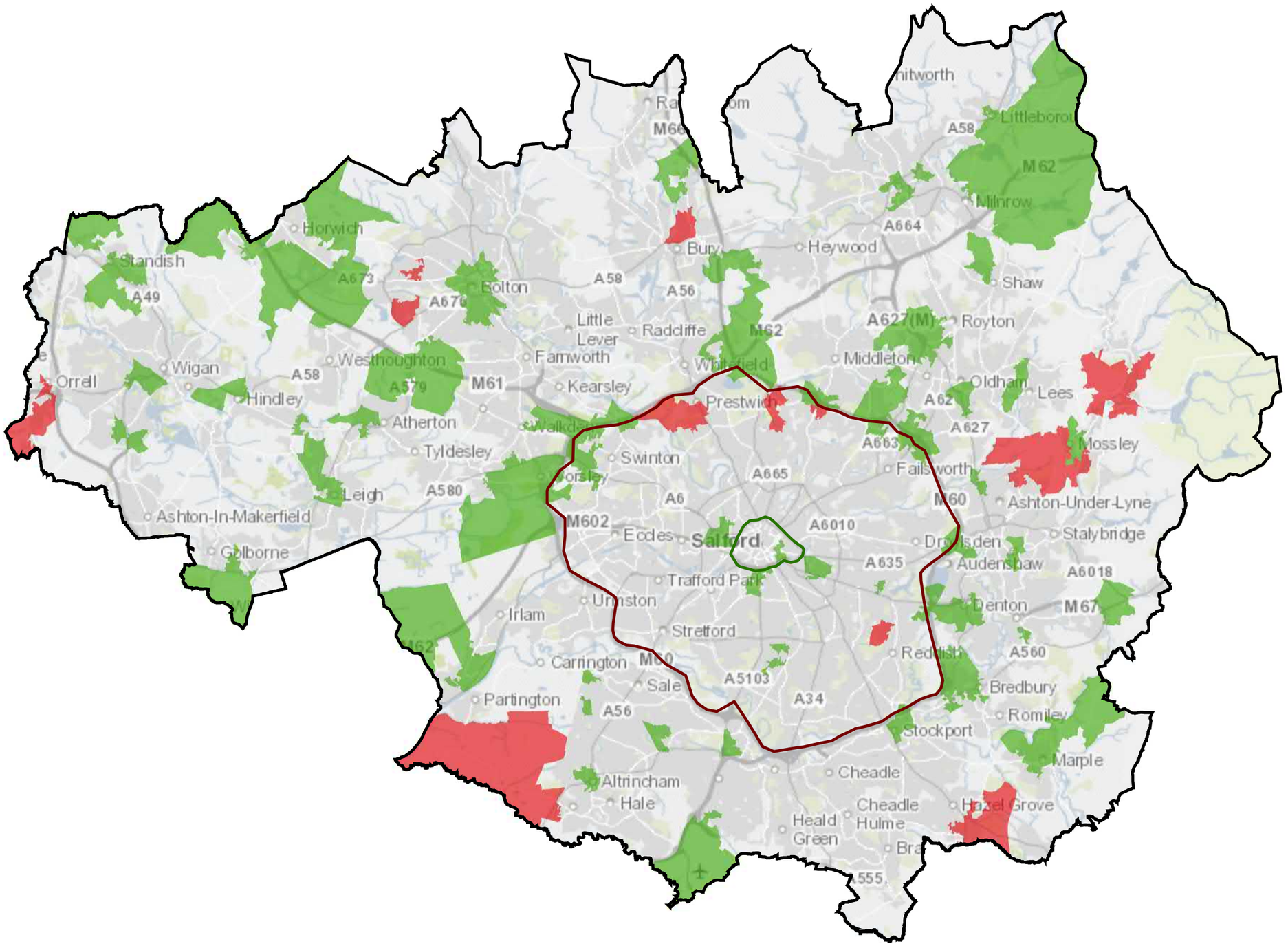
FIGURE 50

Legend

- Greater Manchester Boundary
- Inner Ring Road
- M60
- 10% largest increases in journey times
- 10% largest decreases in journey times



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Drawing Title: LSOAs With the 10% Largest Increases and Decreases in Journey Times for Option 8

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FIGURE 51

Legend

- Greater Manchester Boundary
- Local Authority Boundary
- M60
- Inner Ring Road

Total registered LGVs

- 0 - 60
- 61 - 120
- 121 - 300
- 301 - 600
- 601 - 2,200
- > 2,200

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Project: Greater Manchester Clean Air Plan

Drawing Title: Total Resitered LGVs Within Each LSOA in Greater Manchester

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Analysis of Distributional Impacts
Appendix B
Recommendations for Further Work

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Authorised by: **Date:**	Simon Warburton 28th February 2019		

1 Recommendations for further work

1.1 Mitigation and enhancement

It is recommended that further work be undertaken to fully embed the findings of the distributional impacts analysis in the context of the socio-economic baseline, and to ensure that sufficient mitigation measures are proposed to alleviate any disproportionate impacts on social and business groups. Similarly, it is recommended that further work be undertaken to explore potential enhancement measures for any beneficial distributional impacts.

1.2 Air quality

GIS techniques were used to calculate the change in emissions (tonnes) between the baseline scenario and each option for each LSOA in the study area. This method was based on the outputs of EMIGMA[1], resulting in LSOAs with no road links, being assigned a score of zero. It is recommended that further work be completed based on Atmospheric Dispersion Modelling System (ADMS) results for NO_2 and PM_{10} rather than EMIGMA, subject to the development of a workable methodology. This would improve the accuracy of the distributional impacts analysis.

It is recommended that the replicability of the air quality results be tested using ADMS results, and that further sensitivity testing be completed.

In addition, provisional damage costs multipliers for NO_x and PM_{10} were uplifted from 2015 prices to 2018 base year, using the WebTAG GDP deflator series. It is recommended that further work be completed to uplift these values by 2% per year over the appraisal period to reflect the assumption that willingness to pay for health will rise in line with economic growth.

1.3 Health and environmental impact assessment

1.3.1 Data sources and modelling

Consideration should be given to anticipated Government guidance on monetising health and environmental effects. An alternative methodology could also be applied to test the emissions modelling findings:

- Guidance from Defra on an updated set of damage cost multipliers for atmospheric pollutants is expected in November 2018. Once published, a sensitivity test could be conducted using high and low damage costs per tonne.
- It is also recommended that the replicability of findings for the health and environmental impact assessment (that used EMIGMA software) is tested against Atmospheric Dispersion Modelling System (ADMS) modelling for NO_2 and PM_{10}, subject to the development of a workable methodology.

[1] The EMIGMA model provided the change in mass emissions in tonnes. For FBC, ADMS modelling will provide the change in concentration in μgm^{-}

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1.3.2 Other effects

In addition to the key health and environmental concerns described in section 5.3, consideration could be given to the following effects, subject to the availability of suitable baseline data: diabetes, cognitive decline and dementia, mental health and risks to the unborn baby. These health concerns have not been screened out but are considered more relevant for future work when more detailed assessment might be required.

Diabetes

Evidence suggests a link between air pollution and diabetes, especially type 2 diabetes mellitus. The association was stronger for traffic associated pollutants including NO_x and PM (Royal College of Physicians, 2016).

Cognitive decline and dementia

There is emerging evidence to suggest that poor air quality affects cognitive functioning in both children and adults (Royal College of Physicians, 2016). Early evidence shows that prenatal exposure to heavy metals, particularly lead and mercury, that can cross the placenta and accumulate in the foetus, has been associated with reduced cognitive functioning in children (Canfield et al., 2003). Similarly, an association has been found between particulate air pollution and some measures of cognitive function, as well as decline over time in cognition (Tonne, C 2014).

Mental health

According to a growing body of evidence, air pollution can be associated with changes in behaviour within society, for example, spending less time outside, which can lead to more sedentary lifestyles and negative psychological effects on our mental health (Crowder, 2017). Additionally, it is well known that physical environments that promote good health can have a positive effect on reducing the socio-economic health inequalities of the area (Marmot Review, 2010).

Risks to the unborn baby

There is emerging evidence on the links between high levels of emissions and effects on the unborn child. Evidence shows that air pollution can affect the growth of the unborn baby and may be linked to premature birth or even still birth (Nezeeba Siddika et al., 2016). It is estimated that traffic-related air pollution exposure (particularly exposure to PM) of pregnant women accounts for more than one-fifth of all cases of low birth weight at term. Low birth weight is associated with low lung function, COPD, cardiovascular disease and early death in adulthood (Risnes et al., 2011, in Royal College of Physicians, 2016). Air pollution can also harm placental development, which affects the development of the unborn child and has been associated with several chronic diseases, including heart disease, obesity and type 2 diabetes. Poor foetal growth is linked to abnormal development of the kidneys, and to hypertension and kidney disease in later life (Luyck et al., 2013 in Royal College of Physicians, 2016).

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1.4 Affordability

Further issues relating to private transport include the requirement of some jobs for employees to have their own car. This includes occupations such as community-based care work that involve travelling between private homes. In these cases, using public transport is often unfeasible due to complications of appointments, schedules and availability of transport services. Whilst there is potential for an adverse effect on low income households, further work should look at the percentage of low income households working within this sector to identify any disproportionate effects on this group.

1.5 Mapping of vehicle compliance distribution

Using DVLA registration data identifying vehicle compliance, a mapping of the distribution of compliant cars can be used to look at the relative levels of non-compliant cars within income-deprived areas to identify whether people in those areas would be differentially affected by costs associated with upgrading private cars to compliant vehicles.

1.6 Boundary parking measures

Some areas bordering the IRR already have parking schemes, but these are generally free for residents and businesses. A more in-depth look at the proposals for boundary parking measures and their impacts may reveal further insight into personal affordability impacts for low income households and people with a disability. For example, if residents parking charges are introduced this may have distributional impacts depending on the eventual locations.

1.7 Key workers

There are hospitals and places of education located within the IRR. Exemptions for key workers (to include social workers and other LA/NHS staff who travel such as midwives) should be investigated, especially for option 5(ii) as which would increase the percentage of non-compliant vehicles given that all diesel cars would incur a charge. A review of MCC staff travel arrangements could be undertaken to understand the likely impact on staff and measures such as use of pool cars.

1.8 Taxis and PHVs

Business affordability impacts for taxis and PHVs could be explored using licensing information obtained from councils within GMCA (including vehicle age, registration address, age of driver/owner, whether WAV or not). Analysis could be done focusing on number of vehicles requiring upgrade to become compliant (Euro 6) by 2021. As stated in Table 6.4, it is assumed that 100% of taxis will achieve compliance through the implementation of the Clean Taxi Fund; therefore, further investigation is required to understand the affordability implications of taxi operators absorbing the residual costs (i.e. the proportion of the total upgrade cost not covered by the fund).

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1.9 Bus fleet data

As stated in Table 6.4, it is assumed that 100% of taxis will achieve compliance through the implementation of the Clean Bus Technology Fund; therefore, further investigation is required to understand the affordability implications of bus/coach operators absorbing the residual costs (i.e. the proportion of the total upgrade or retrofit cost not covered by the fund). This could have particular implications for smaller operators on rural routes, where any increase in cost could affect the viability of maintaining a service on those routes. An analysis of TfGM bus fleet, route and frequency data should be undertaken as the conclusions may also have implications for the accessibility assessment.

1.10 LGV and HGV dependent businesses

Fleet analysis of the Driver and Vehicle Licensing Agency (DVLA) registration data could be undertaken to determine the proportion of HGVs within Greater Manchester anticipated to be non-compliant by 2021 and the proportion of LGVs anticipated to be non-compliant by 2023 (not incorporating any CAP behavioural change assumptions).

Analysis of DVLA vehicle operator licencing statistics could also be undertaken to identify spatial distribution of small (<5 vehicle) HGV operators across Greater Manchester.

This could be compared with the analysis undertaken here which is based on trip origin / destination as opposed to the location of vehicle registration to provide further insight as to where businesses are located that are likely to be the most significantly affected.

1.11 Other business affordability impacts

Other business affordability impacts that could be explored further in future investigations include:

- visitor and night time economy; and
- costs to businesses associated with potential loss of workers as a result of altered travel behaviour.

1.12 Accessibility

The accessibility appraisal uses the outputs of SATURN to locate areas with increased or decreased journey times. Whilst this method effectively highlights areas affected by the intervention, the magnitude of this impact (i.e. how much the journey time is increased or reduced by) has not been reported. Further work should include analysis of the percentage increase in journey time to determine the significance of this increase/decrease on the key social groups.

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1.13 Severance

Changes in traffic flows can lead to a significant impact on community severance when Annual Average Daily Traffic (AADT) flows exceed 8,000 vehicles per day (Highways Agency, 1993). However, it is noted that there are limitations in using AADT. For example, a school route may require a road to be crossed where traffic is heavily 'peaked'. While the AADT may be below the 8,000 vehicles per day threshold, if the majority of this traffic flows at a time when the school route is most in use (for example traffic to a business park where peak flows may coincide with journey to school times), there is a likelihood that this would be sufficient to dissuade some journeys on foot by children and parents. The consideration of the AADT threshold has been used, but the assessment and appraisal has relied more on a qualitative review of community facilities and the local conditions. It is recommended that further monitoring of traffic flows be completed to improve the accuracy of the assessment.

Identification of medical/health and education facilities that could experience severance has used ONS data. There may be instances where some data is out of date. It is recommended that additional datasets are used to confirm the facilities for routes where there is potential for severance effects.

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Strategic Case Appendix
Air Quality Maps

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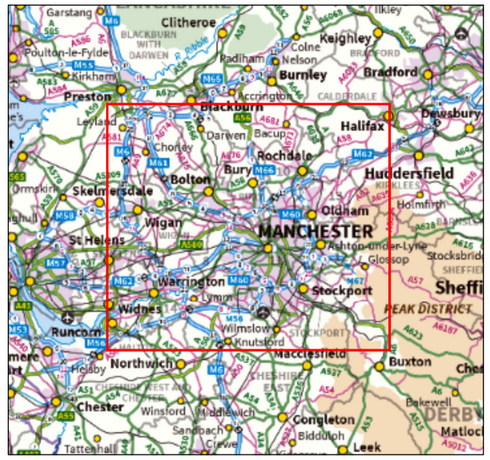
Authorised by: **Date:**	Simon Warburton 28th February 2019		

FIGURE 1

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021



0 2 4 6 8 10 kilometres

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FIGURE 1- Bolton

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021

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0 1 2 3 4 5 Kilometers

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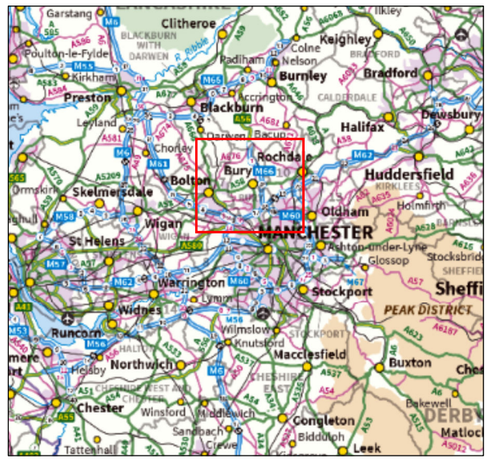
FIGURE 1- Bury

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021



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Do Minimum Exceedances – 2021
Bury

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0 1 2 3 4 5 Kilometers

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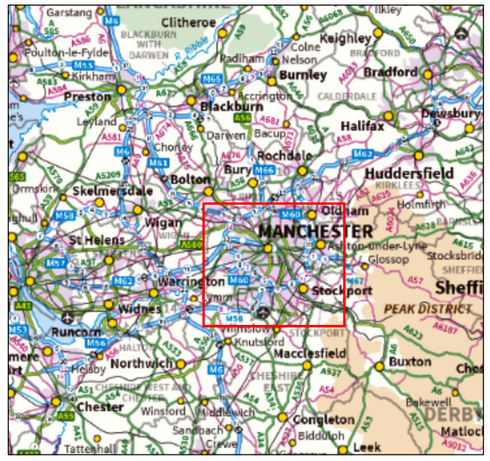
FIGURE 1- Manchester

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021



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Manchester

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0 1 2 3 4 5 Kilometers

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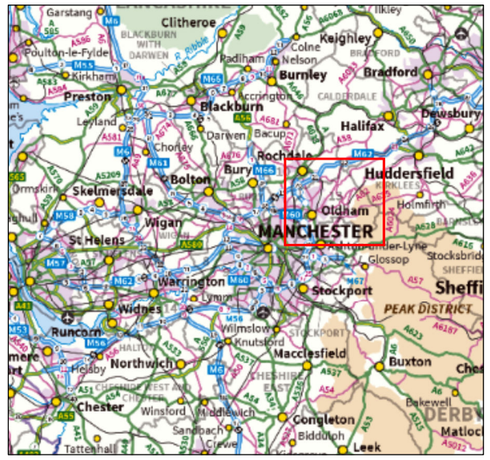
FIGURE 1- Oldham

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021



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0 1 2 3 4 5 Kilometers

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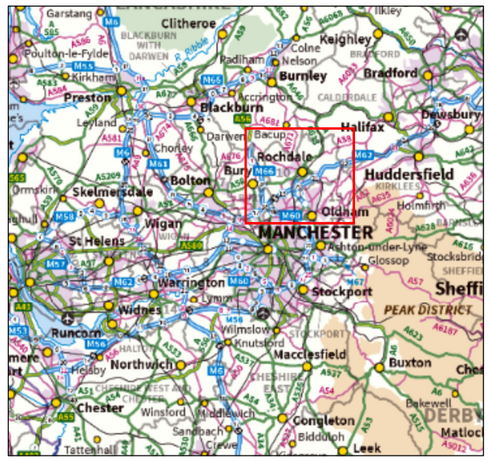
FIGURE 1- Rochdale

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021



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0 1 2 3 4 5 Kilometers

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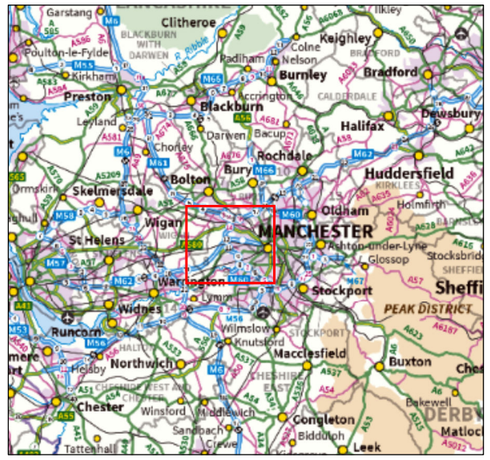
FIGURE 1- Salford

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021



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Salford

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0 1 2 3 4 5 Kilometers

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FIGURE 1- Stockport

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021

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Transport for Greater Manchester

Project

Greater Manchester Clean Air Plan

Drawing Title

Do Minimum Exceedances – 2021
Stockport

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Jacobs No.	BTGMO002	

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0 1 2 3 4 5 Kilometers

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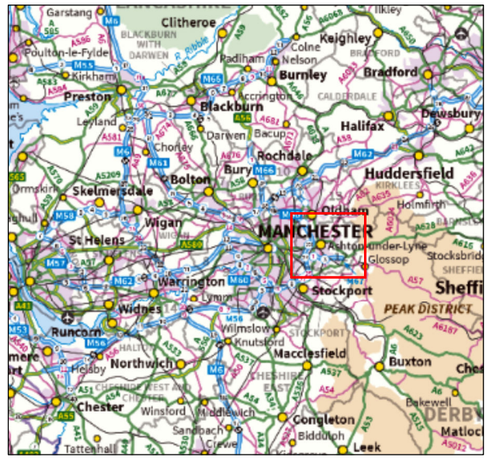
FIGURE 1- Tameside

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021



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Tameside

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0 1 2 3 4 5 Kilometers

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FIGURE 1- Trafford

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021

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0 1 2 3 4 5 Kilometers

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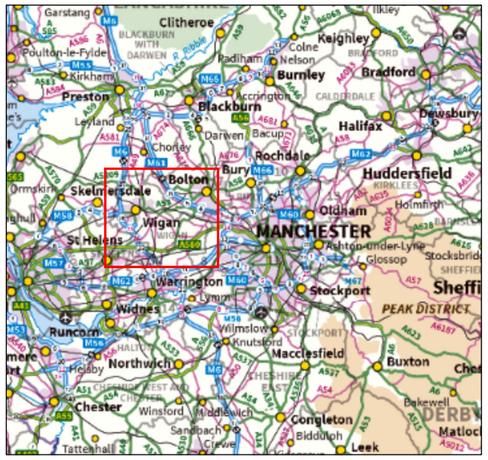
FIGURE 1- Wigan

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021



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Drawing Title

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Wigan

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0 1 2 3 4 5 Kilometers

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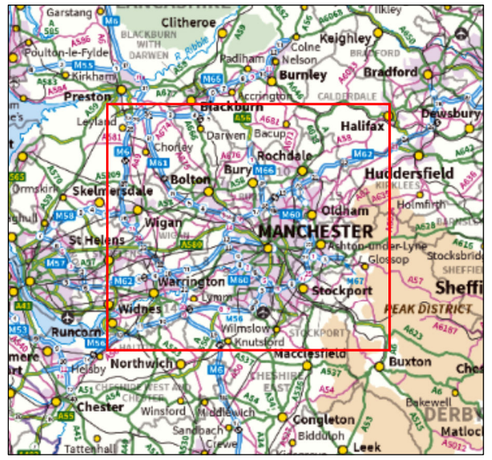
FIGURE 4

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023



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Drawing Title: Do Minimum Exceedances - 2023

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0 2 4 6 8 10 kilometres

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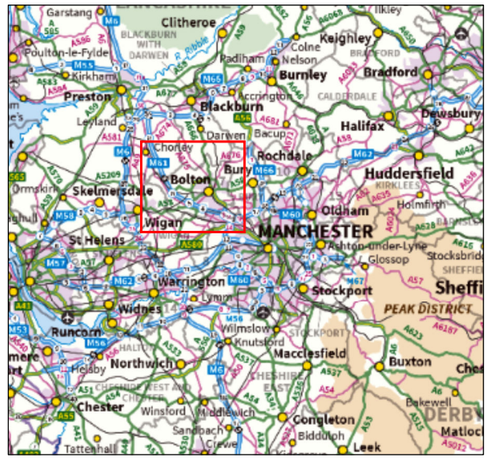
FIGURE 4- Bolton

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023



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0 1 2 3 4 5 Kilometers

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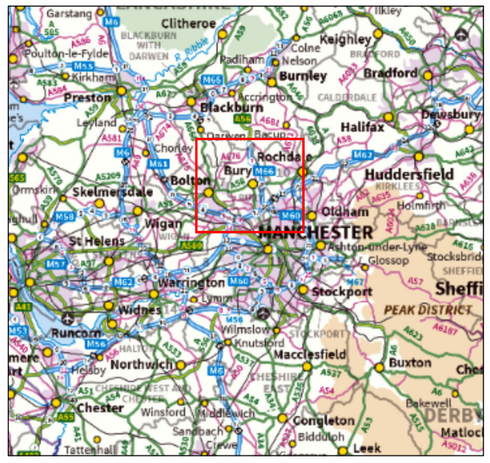
FIGURE 4- Bury

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023



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Drawing Title: Do Minimum Exceedances – 2023
Bury

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0 1 2 3 4 5 Kilometers

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FIGURE 4- Manchester

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023

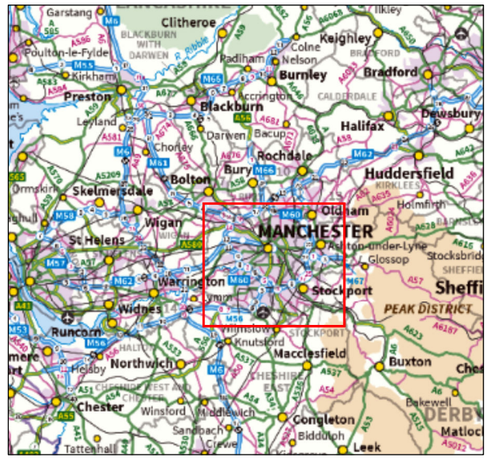

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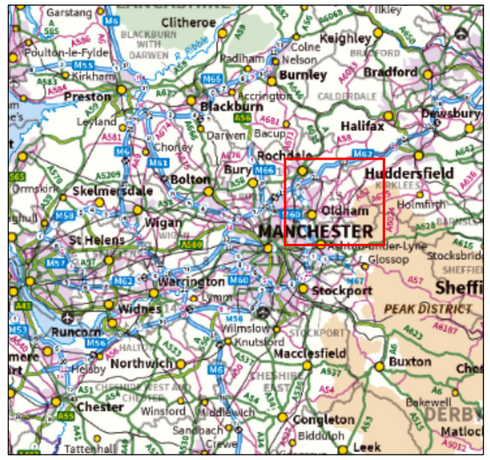
FIGURE 4- Oldham

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023



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0 1 2 3 4 5 Kilometers

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FIGURE 4- Rochdale

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023

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Rochdale

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0 1 2 3 4 5 Kilometers

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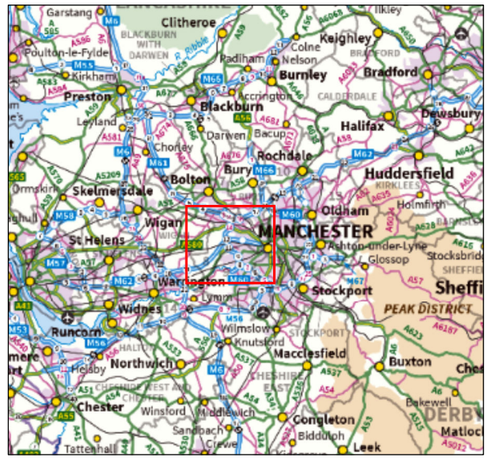
FIGURE 4- Salford

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023



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Do Minimum Exceedances – 2023
Salford

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0 1 2 3 4 5 Kilometers

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FIGURE 4- Stockport

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023

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Drawing Title

Do Minimum Exceedances – 2023
Stockport

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0 1 2 3 4 5 Kilometers

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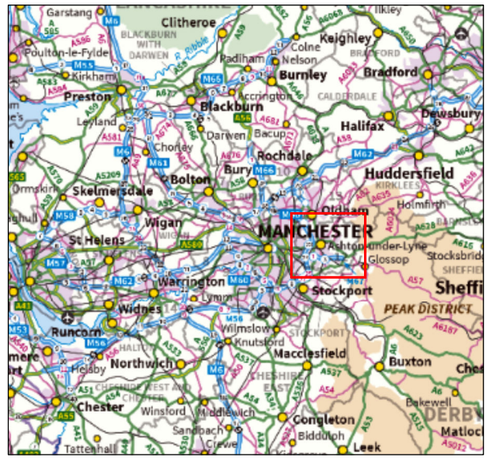
FIGURE 4- Tameside

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023



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Drawing Title

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Tameside

Scale @ A3	1:47,000	DO NOT SCALE
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0 1 2 3 4 5 Kilometers

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FIGURE 4- Trafford

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023

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0 1 2 3 4 5 Kilometers

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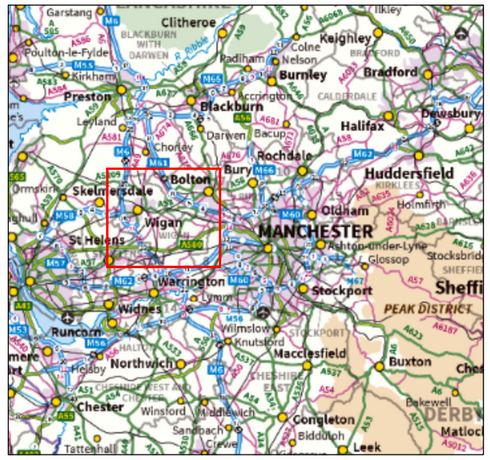
FIGURE 4- Wigan

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023



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Wigan

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0 1 2 3 4 5 Kilometers

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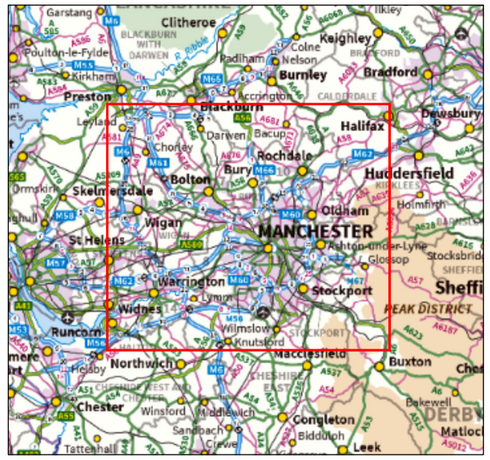
FIGURE 2

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021



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0 2 4 6 8 10 kilometres

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FIGURE 2- Bolton

Legend

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- Option 8 Exceedances 2021

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Bolton

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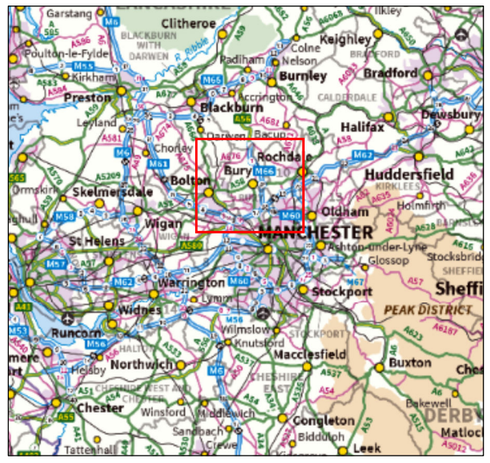
FIGURE 2- Bury

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021



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Bury

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FIGURE 2- Manchester

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021

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Manchester

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0 1 2 3 4 5 Kilometers

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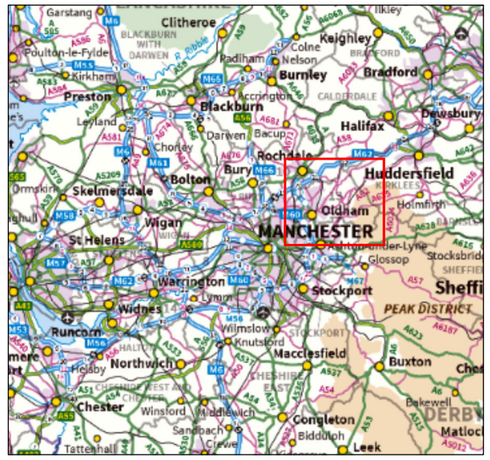
FIGURE 2- Oldham

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021



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Oldham

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0 1 2 3 4 5 Kilometers

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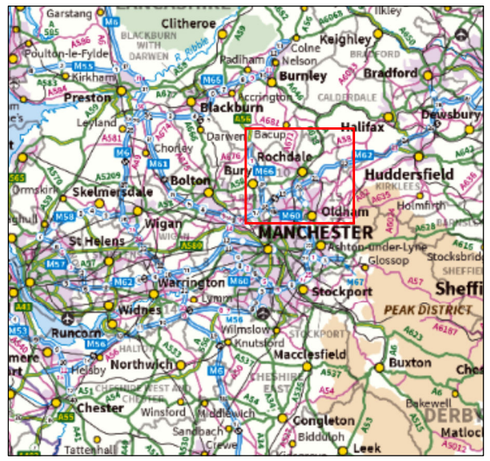
FIGURE 2- Rochdale

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021



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Option 8: Exceedances - 2021
Rochdale

Scale @ A3	1:69,000	DO NOT SCALE
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0 1 2 3 4 5 Kilometers

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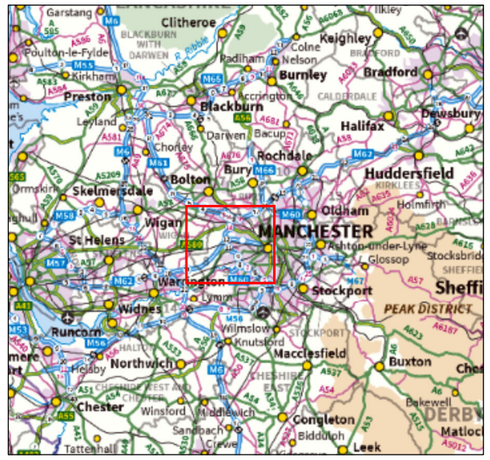
FIGURE 2- Salford

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021



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0 1 2 3 4 5 Kilometers

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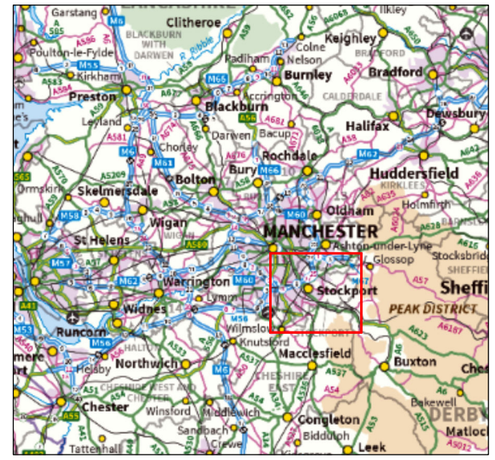
FIGURE 2- Stockport

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021



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Drawing Title

Option 8: Exceedances - 2021
Stockport

Scale @ A3	1:58,000	DO NOT SCALE
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0 1 2 3 4 5 Kilometers

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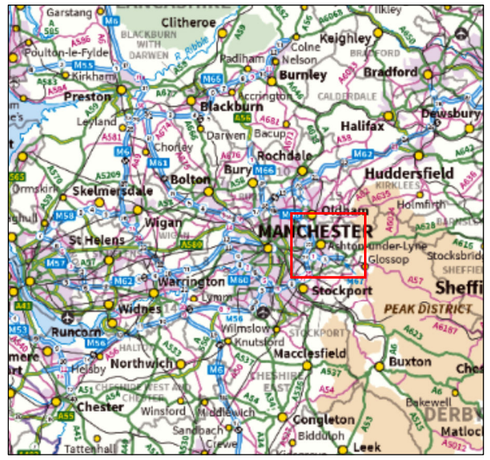
FIGURE 2- Tameside

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021



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Drawing Title: Option 8: Exceedances - 2021
Tameside

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0 1 2 3 4 5 Kilometers

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FIGURE 2- Trafford

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021

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Trafford

Scale @ A3	1:54,000	DO NOT SCALE
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0 1 2 3 4 5 Kilometers

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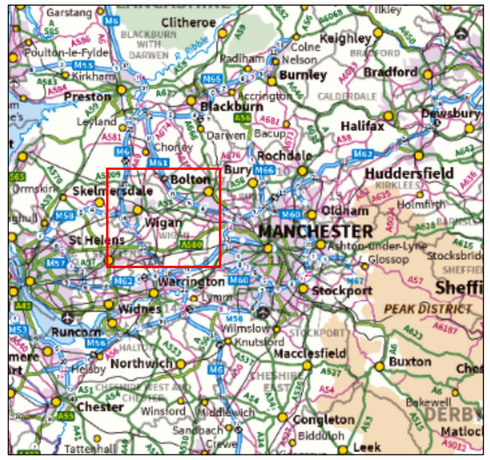
FIGURE 2- Wigan

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2021



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Drawing Title: Option 8: Exceedances - 2021
Wigan

Scale @ A3	1:72,000	DO NOT SCALE
Jacobs No.	BTGMO002	

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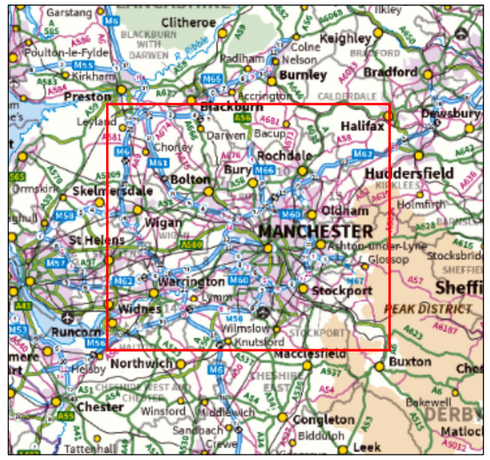
FIGURE 5

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023



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Project: Greater Manchester Clean Air Plan

Drawing Title: Option 8: Exceedances - 2023

Scale @ A3	1:180,000	DO NOT SCALE
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0 2 4 6 8 10 kilometres

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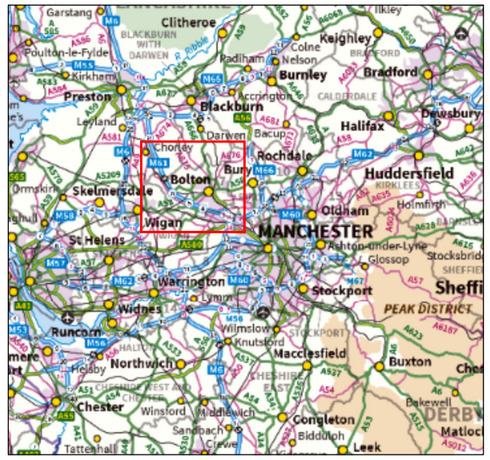
FIGURE 5- Bolton

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023



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Option 8: Exceedances – 2023
Bolton

Scale @ A3	1:66,000	DO NOT SCALE
Jacobs No.	BTGMO002	

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0 1 2 3 4 5 Kilometers

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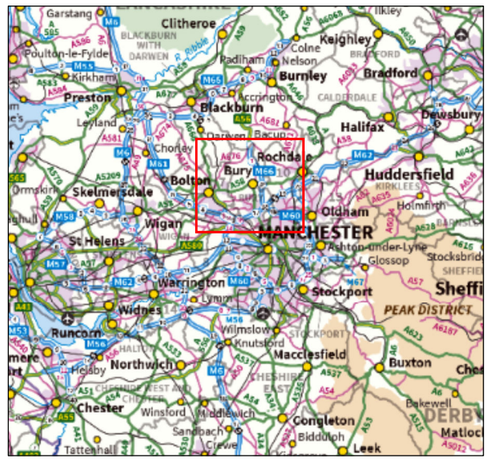
FIGURE 5- Bury

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023



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Option 8: Exceedances – 2023
Bury

Scale @ A3	1:68,000	DO NOT SCALE
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0 1 2 3 4 5 Kilometers

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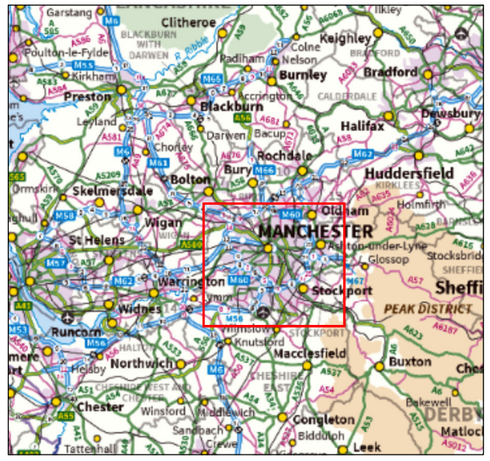
FIGURE 5- Manchester

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023



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Drawing Title

Option 8: Exceedances – 2023
Manchester

Scale @ A3	1:90,000	DO NOT SCALE
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0 1 2 3 4 5 Kilometers

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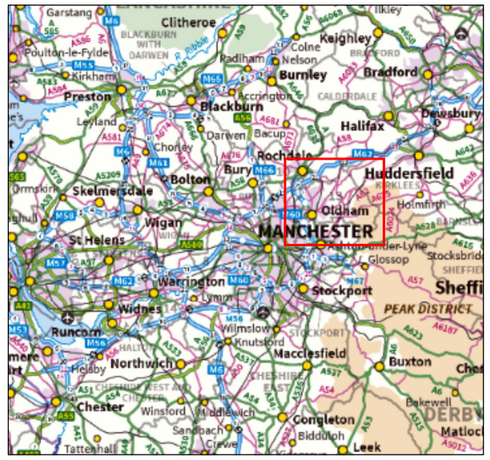
FIGURE 5- Oldham

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023



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Drawing Title: Option 8: Exceedances – 2023
Oldham

Scale @ A3	1:63,000	DO NOT SCALE
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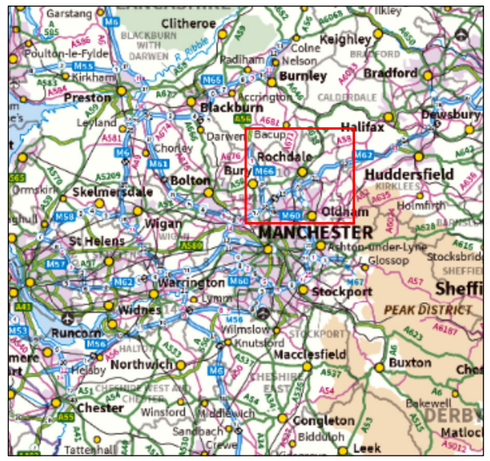
FIGURE 5- Rochdale

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023



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Rochdale

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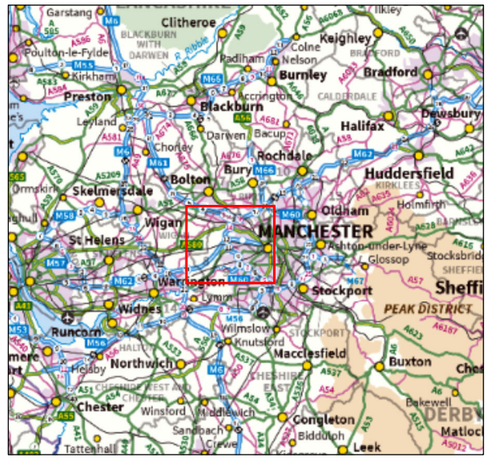
FIGURE 5- Salford

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023



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Salford

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0 1 2 3 4 5 Kilometers

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FIGURE 5- Stockport

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023

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0 1 2 3 4 5 Kilometers

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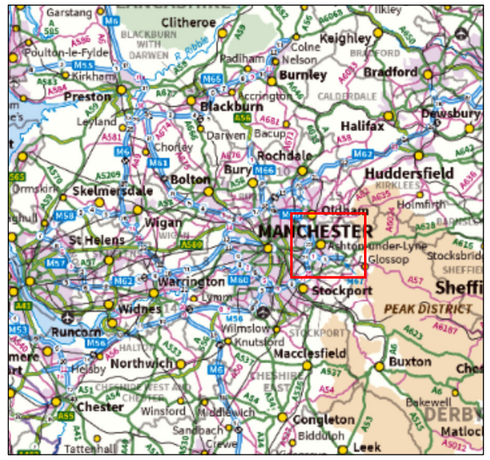
FIGURE 5- Tameside

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023



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0 1 2 3 4 5 Kilometers

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FIGURE 5- Trafford

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023

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Trafford

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0 1 2 3 4 5 Kilometers

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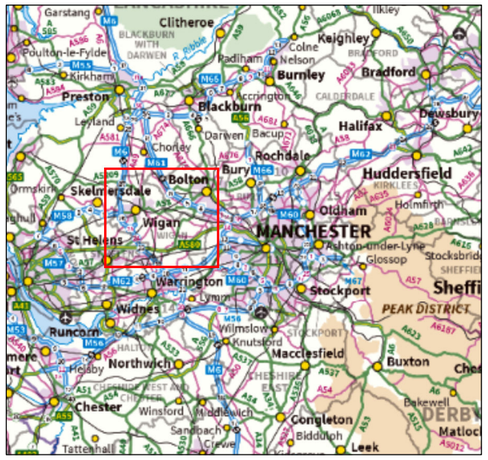
FIGURE 5- Wigan

Legend

- Greater Manchester District Boundaries
- Option 8 Exceedances 2023



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Option 8: Exceedances – 2023
Wigan

Scale @ A3	1:72,000	DO NOT SCALE
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0 1 2 3 4 5 Kilometers

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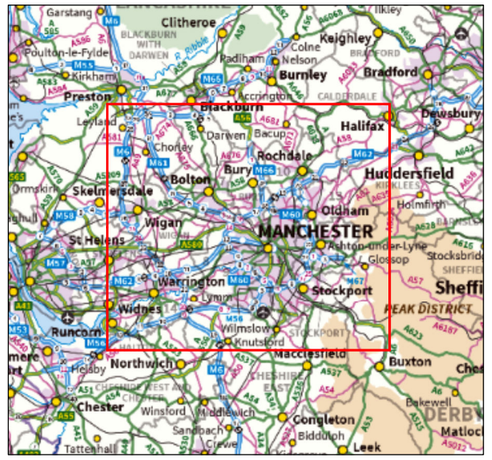
FIGURE 3

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021



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Scale @ A3	1:180,000	DO NOT SCALE
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0 2 4 6 8 10 kilometres

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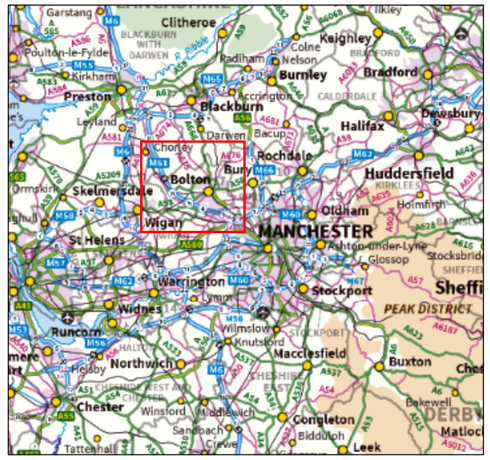
FIGURE 3- Bolton

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021



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Project

Greater Manchester Clean Air Plan

Drawing Title

Option 8: Removed and Remaining Exceedances - 2021
Bolton

Scale @ A3	1:66,000	DO NOT SCALE
Jacobs No.	BTGMO002	

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0 1 2 3 4 5 Kilometers

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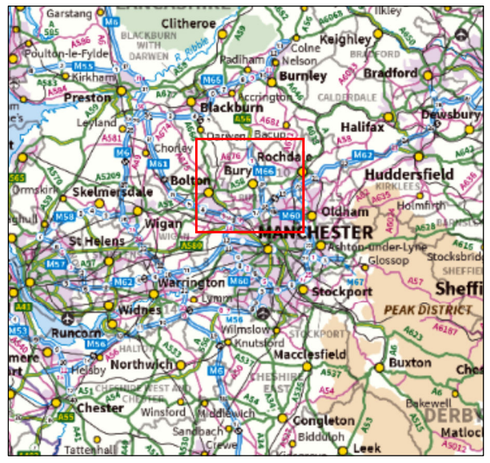
FIGURE 3- Bury

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021



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Project

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Drawing Title

Option 8: Removed and Remaining Exceedances - 2021
Bury

Scale @ A3	1:68,000	DO NOT SCALE
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0 1 2 3 4 5 Kilometers

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FIGURE 3- Manchester

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021

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Drawing Title

Option 8: Removed and Remaining Exceedances - 2021
Manchester

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0 1 2 3 4 5 Kilometers

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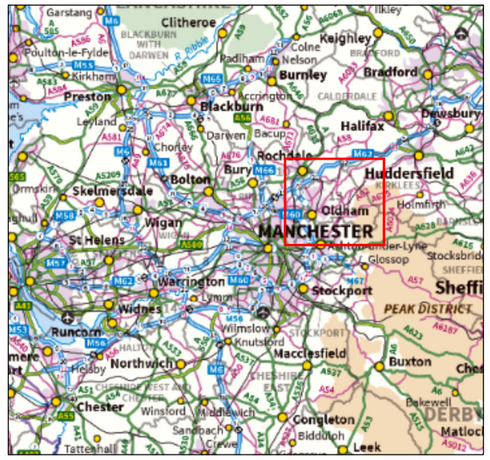
FIGURE 3- Oldham

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021



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Drawing Title

Option 8: Removed and Remaining Exceedances - 2021
Oldham

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0 1 2 3 4 5 Kilometers

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FIGURE 3- Rochdale

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021

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Rochdale

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0 1 2 3 4 5 Kilometers

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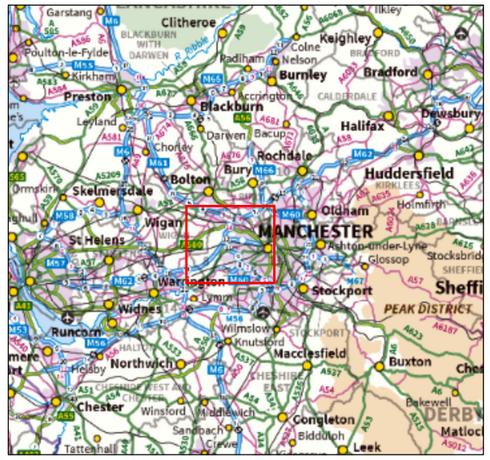
FIGURE 3- Salford

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021



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0 1 2 3 4 5 Kilometers

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FIGURE 3- Stockport

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021

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Drawing Title

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Stockport

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0 1 2 3 4 5 Kilometers

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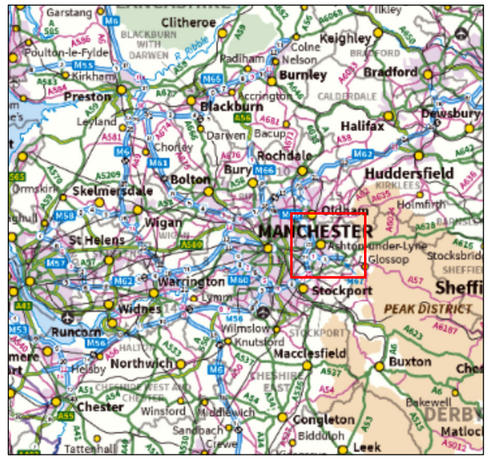
FIGURE 3- Tameside

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021



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Drawing Title

Option 8: Removed and Remaining Exceedances - 2021
Tameside

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0 1 2 3 4 5 Kilometers

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FIGURE 3- Trafford

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021

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0 1 2 3 4 5 Kilometers

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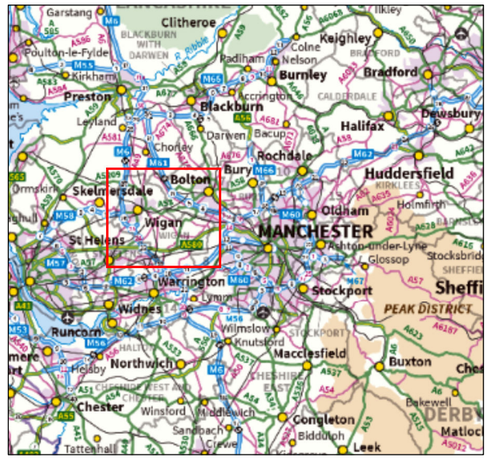
FIGURE 3- Wigan

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2021
- Option 8 Exceedances 2021



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Option 8: Removed and Remaining Exceedances - 2021
Wigan

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0 1 2 3 4 5 Kilometers

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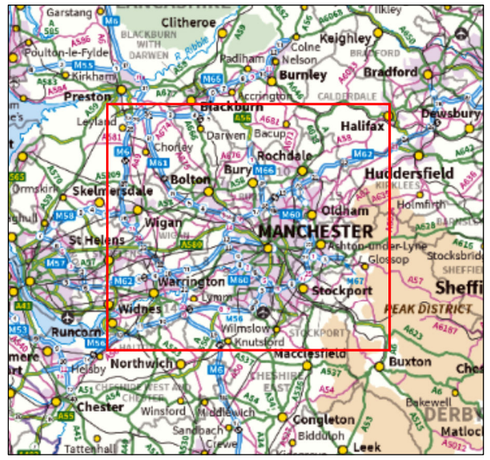
FIGURE 6

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023



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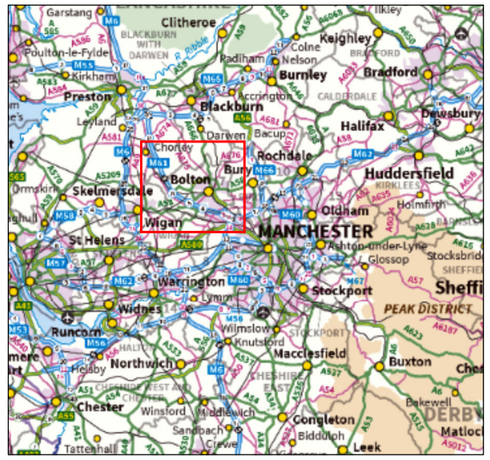
0 2 4 6 8 10 kilometres

\\Gbmnc0vs01\gis\BTGMO002_TFGM_CAZ\ArcGIS\TfGM_CAZ_RemainingAndRemovedExceedances_2023.mxd

FIGURE 6- Bolton

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023



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Drawing Title

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Bolton

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0 1 2 3 4 5 Kilometers

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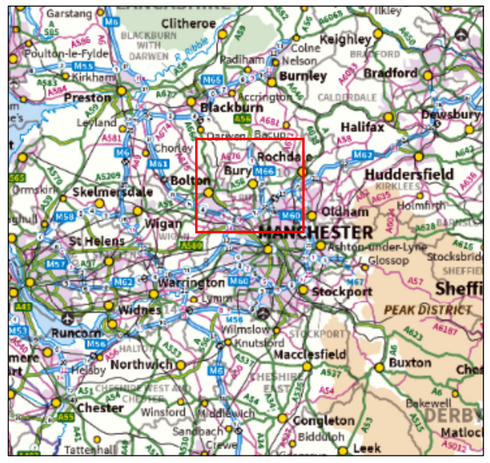
FIGURE 6- Bury

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023



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Bury

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0 1 2 3 4 5 Kilometers

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FIGURE 6- Manchester

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023

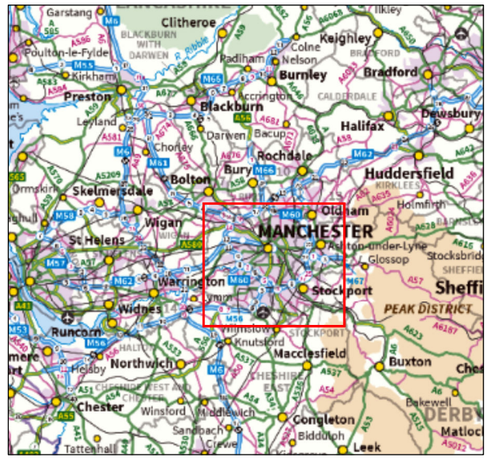
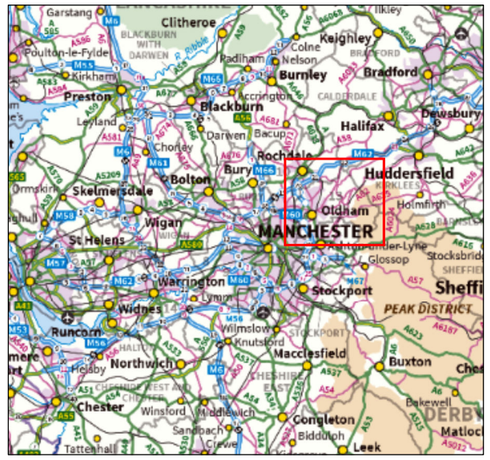

Clitheroe
Keighley
Burnley
Bradford
Blackburn
Halifax
Dewsbury
Rochdale
Huddersfield
Bolton
Skelmersdale
Wigan
St Helens
MANCHESTER
Oldham
Ashton-under-Lyne
Warrington
Stockport
Widnes
Runcorn
Northwich
Macclesfield
Buxton
Chester
Congleton
Leek
Preston
Chorley
Lancaster
Barrow-in-Furness
Blackpool
Carlisle
Penrith
Kendal
Workington
Whitehaven
Barnsley
Wakefield
Leeds
Sheffield
Doncaster
Scunthorpe
Grimsby
Hull
York
Middlesbrough
Darlington
Newcastle upon Tyne
Sunderland
Durham
Gateshead
Hartlepool
Stockton-on-Tees
Scarborough
Harrogate
Ripon
Skipton
Selby
Goole
Beverley
Bridlington
Whitby
Northallerton
Richmond
Alnwick
Berwick-upon-Tweed
Hexham
Morpeth
Ashington
Cramlington
Blyth
Peterlee
Consett
Chester-le-Street
Washington
Houghton-le-Spring
Seaham
Billingham
Redcar
Saltburn-by-the-Sea
Guisborough
Whitley Bay
North Shields
South Shields
Tynemouth
Jarrow
Hebburn
Boldon
Ryton
Prudhoe
Haltwhistle
Brampton
Penrith
Appleby-in-Westmorland
Kirkby Stephen
Sedbergh
Ingleton
Settle
Clitheroe
Longridge
Chorley
Leyland
Penwortham
Fulwood
Garstang
Poulton-le-Fylde
Fleetwood
Lytham St Annes
Kirkham
Padiham
Nelson
Colne
Barnoldswick
Earby
Skipton
Ilkley
Otley
Wetherby
Tadcaster
Knaresborough
Boroughbridge
Thirsk
Malton
Pickering
Filey
Driffield
Beverley
Hornsea
Withernsea
Goole
Doncaster
Rotherham
Sheffield
Chesterfield
Matlock
Bakewell
Buxton
Leek
Stoke-on-Trent
Newcastle-under-Lyme
Crewe
Nantwich
Middlewich
Northwich
Winsford
Frodsham
Runcorn
Widnes
Warrington
Wigan
Leigh
Atherton
Tyldesley
Ashton-in-Makerfield
Golborne
Newton-le-Willows
Prescot
Whiston
Kirkby
Liverpool
Bootle
Crosby
Southport
Ormskirk
Skelmersdale
Rochdale
Bury
Bolton
Oldham
Ashton-under-Lyne
Glossop
Stalybridge
Hyde
Mossley
Denton
Stockport
Wilmslow
Knutsford
Macclesfield
Congleton
Biddulph
Tamworth
Lichfield
Burton upon Trent
Uttoxeter
Ashbourne
Derby
Belper
Ripley
Alfreton
Chesterfield
Mansfield
Worksop
Retford
Gainsborough
Scunthorpe
Grimsby
Cleethorpes
Louth
Skegness
Boston
Spalding
Peterborough
Stamford
Grantham
Sleaford
Lincoln
Newark-on-Trent
Southwell
Nottingham
Beeston
Long Eaton
Ilkeston
Heanor
Ripley

FIGURE 6- Oldham

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023



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Oldham

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0 1 2 3 4 5 Kilometers

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FIGURE 6- Rochdale

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023

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0 1 2 3 4 5 Kilometers

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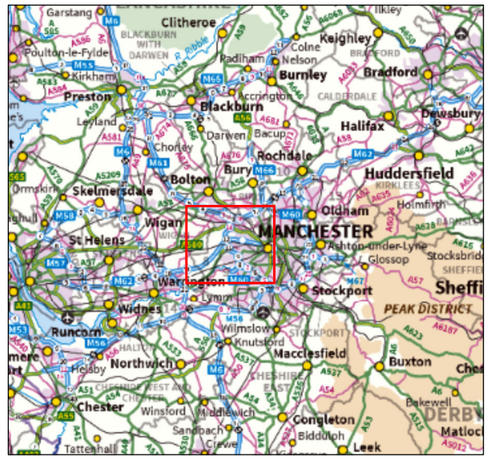
FIGURE 6- Salford

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023



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0 1 2 3 4 5 Kilometers

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FIGURE 6- Stockport

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023

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Drawing Title

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Stockport

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0 1 2 3 4 5 Kilometers

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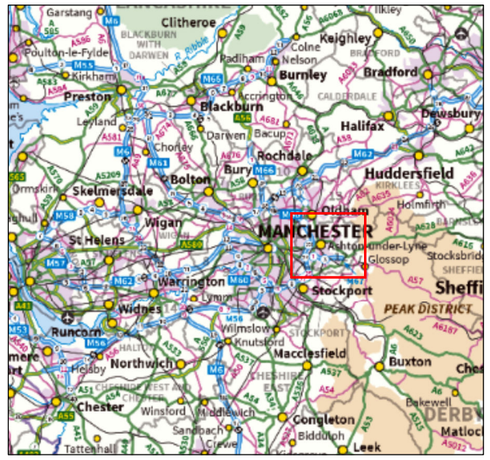
FIGURE 6- Tameside

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023



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0 1 2 3 4 5 Kilometers

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FIGURE 6- Trafford

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023

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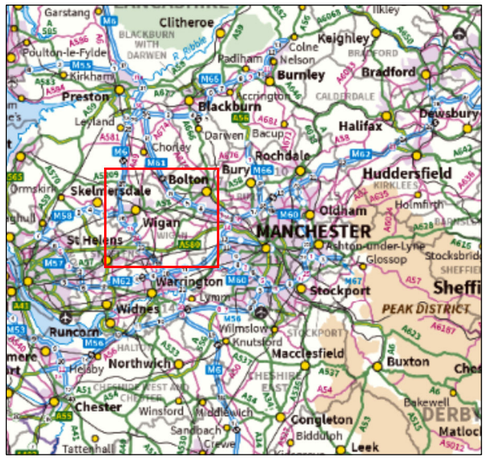
FIGURE 6- Wigan

Legend

- Greater Manchester District Boundaries
- Do Minimum Exceedances 2023
- Option 8 Exceedances 2023



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	08/02/2019	Initial Issue	RW	--	--	--

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Project

Greater Manchester Clean Air Plan

Drawing Title

Option 8: Removed and Remaining Exceedances - 2023
Wigan

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E1 Economic Appraisal Methodology Report

draft approval

Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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Appendix 1 - Key Assumptions

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1 Introduction

1.1 Purpose of this Report

1.1.1 This Economic Appraisal Methodology Report (EAMR) details the methodology of the economic appraisal presented in the Economic Case of the Outline Business Case (OBC) for the Greater Manchester Clean Air Plan (GM CAP).

1.1.2 This EAMR is presented in conjunction with the Economic Case. The Economic Case presents the results of the economic appraisal, whereas the focus of this report is on the economic modelling[1] and subsequent analysis underpinning the results of the monetised impacts presented in the economic case. The methodology of the Distributional Impact Appraisal can be found in Appendix of the GM CAP OBC (Distributional Impact Appraisal Report). This report only refers to the monetised impacts and does not detail the non-monetised benefits and costs outlined in the GM CAP OBC document.

1.2 Economic Appraisal Framework

1.2.1 Assessments included in the Economic Appraisal

1.2.2 The economic appraisal incorporates the results from three main assessments:

- Health and Environmental Impacts – an assessment of the benefits gained in the form of health and environmental impacts, as a result of the expected reduction in harmful concentrations of NO_2 and other pollutant emissions.
- Costs to Transport Users – an assessment of the potential costs, benefits and disbenefits to transport users directly affected by the GM CAP
- Costs to the Government – an assessment of the implementation cost of the GM CAP, as well as the operating & maintenance costs. The revenue generated by the GM CAP are included as a transfer payment from transport users to the Government (i.e. they net to zero).

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[1] For details about the transport modelling undertaken see Technical Reports T1 to T4

1.2.3 The GM CAP should be treated as one package and has been modelled as a package. Some of the component measures have not been assessed individually due to the critical inter-dependencies of the various measures.

1.2.4 The monetised cost and benefits of the options have been calculated to assess the net-present value (NPV) and cost-effectiveness of each option. In all instances costs and benefits are assessed against the baseline (Do Minimum) scenario.

1.2.5 Guidance

1.2.6 The methodology of the traffic modelling, air quality modelling and economic assessment is based on various guidance reports, mainly:

- JAQU Guidance for CAZ Options Appraisal (Defra 2017);
- JAQU Supplementary Guidance
- JAQU UK Plan for tackling roadside nitrogen dioxide concentrations – July 2017 (Defra 2017)
- JAQU National data inputs for local economic models (Defra 2017)
- Green Book: Central Government Guidance on Appraisal and Evaluation (HM Treasury, 2018)
- DfT WebTAG (DfT, last updated May 2018)

1.2.7 The economic assessment is primarily based on the JAQU guidance for CAZ Options Appraisal. As recommended by JAQU the approach and assumptions underpinning the assessment have been adjusted as necessary to incorporate specific issues related to the GM CAP.

1.2.8 Options

1.2.9 For the purpose of the economic appraisal, three options were shortlisted from a long-list of options. For a description of the optioneering of the GM CAP, please refer to GM OBC Appendix Optioneering Appraisal Report. The three best performing options are as follows:

- Option 5(i): A city centre penalty for high polluting vehicles including cars and GM-wide for commercial vehicles; and
- Option 5(ii): A city centre penalty for high polluting vehicles including all diesel cars and GM-wide for commercial vehicles.
- Option 8: A GM wide penalty for high polluting vehicles including all diesel commercial vehicles.

1.2.10 All of the above best performing options also include a package of non-CAZ measures as shown in Table 1-1 below.

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Table Error! No text of specified style in document.**-1 – Best performing options: measures included in each option**

	Measure	Option 5(i)	Option 5(ii)	Option 8
Communicating the message	Communications	✓	✓	✓
	Sustainable Journeys programme	✓	✓	✓
Promoting cleaner vehicles	Provision of 300 dual-headed Electric Vehicle (EV) charging points GM-wide	✓	✓	✓
	Promotion of EV	✓	✓	✓
Helping business and buses upgrade	Clean Air Funds Upgrade Car	✓	✓	
	Clean Air Funds Upgrade Freight / Commercial vehicles	✓	✓	✓
	Clean Air Funds Upgrade taxis and private hire vehicles (PHV)	✓	✓	✓
	Clean Air Funds Upgrade Buses	✓	✓	✓
	Loan Finance	✓	✓	✓
Clean Air Zones	City Centre CAZ D	✓		
	City Centre CAZ D+		✓	
	CAZ B/C across GM	✓	✓	✓
	Discounts and exemptions for CAZ	✓	✓	✓

1.2.11 General Assumptions

1.2.12 The economic assessment is constructed around the following general assumptions:

- Opening year of all options is 2021 (with some measures to help prepare for the CAZ schemes launching earlier than this);
- Each option is assessed against the 'Do Minimum' scenario[2];
- The monetised impacts of the GM CAP are presented in 2018 prices;
- Inflation has been applied using DfT's WebTAG Databook GDP Deflator (May 2018 edition), except where an alternative inflation index is

[2] For a description of the Do Minimum scenario refer to Section 1.3 of the Strategic Case of the OBC

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considered more appropriate for a particular cost element, details of which have been provided in the financial case section of the OBC;

- The monetised impacts of the GM CAP are discounted to the year 2018, applying the discount factor of 3.5% in accordance to the Green Book guidance; and
- The appraisal period of the GM CAP is assessed from the opening year 2021 to 2030.

1.2.13 Further assumptions and parameters are outlined in this report under the relevant sections.

1.2.14 Data Sources:

1.2.15 The main sources of data used to inform the economic assessment are:

- Transport and Air Quality model outputs;
- JAQU National data inputs for local economic models;
- WebTAG Databook (May 2018)
- GM Automatic Number Plate Recognition (ANPR) raw data
- Office for National Statistics
- TfGM Published Datasets (https://data.gov.uk/publisher/transport-for-greater-manchester)

1.2.16 Transport and Air Quality Modelling

1.2.17 The economic modelling undertaken is reliant on the traffic modelling and air quality modelling, as outlined in Figure 1-1 below. For more detail on the methodology applied to the traffic and air quality modelling, please see the associated methodology reports (AQ1-3 and T1-4).

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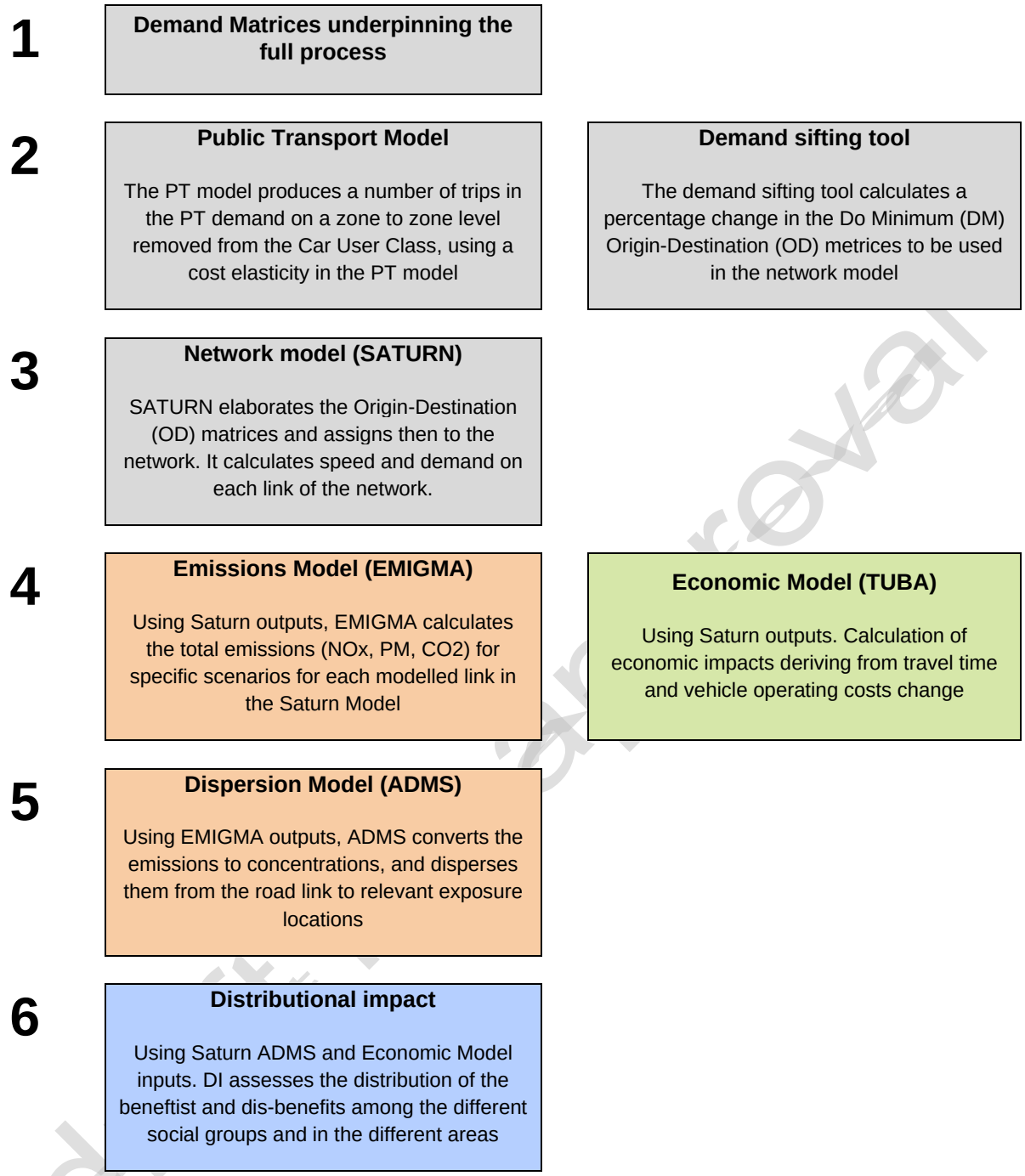
Figure 1-1: Modelling Process



1.2.18 Going forward, the transport, air quality, and subsequently the economic, modelling will be modified and updated to incorporate the following:

- Further development of the measures;
- Feedback from the public and stakeholder engagement;
- New data from ANPR and other sources; and
- General refinement and improvement of the models.

1.3 Report Structure

1.3.1 The remainder of this report describes the stages involved in the development of the economic assessment. The structure of the remainder of this report is as follows:

- **Chapter 2** – Note on Clean Air Zone Charges
- **Chapter 3** – Scope of the Economic Appraisal
- **Chapter 4** – Health and Environmental Impacts
- **Chapter 5** – Changes in Travel Behaviour
- **Chapter 6** – Impact of Vehicle Upgrades
- **Chapter 7** – Congestion Effect
- **Chapter 8** – Cost to the Public Sector
- **Chapter 9** – Issues and Caveats

2 Note on Clean Air Zone Charges

2.1.1 Table 3-1 presents the assumed charges used for the economic analysis. The charges do not differ across the different cordons and assume a non-compliant vehicle will be charged once per day for travel into/out of, within or through the CAZ, regardless of how many times the CAZ boundary is crossed. For more detail about the methodology and behavioural responses assumed, please see the associated technical methodology reports (T4).

Table 2-2: Assumed daily Charges for non-compliant vehicle user trips entering the CAZ boundary for modelling purposes

Vehicle Type	Daily Charge, £
Cars	£7.50
Taxis/PHVs	£7.50
LGVs	£7.50
HGVs	£100.00
Buses/Coaches	£100.00

2.1.2 For HGVs, buses and coaches, a daily charge of £100.00 was assumed as it was consistent with the charges proposed in other cities at the time the assumptions were made, noting that some cities have come forward with revised charges following public consultation.

2.1.3 **Please note**: the CAZ charges proposed in Table 2-1 are assumptions applied for modelling purposes only. The CAZ charges are subject to change and may be revised based on public and stakeholder conversations, as well as further analysis.

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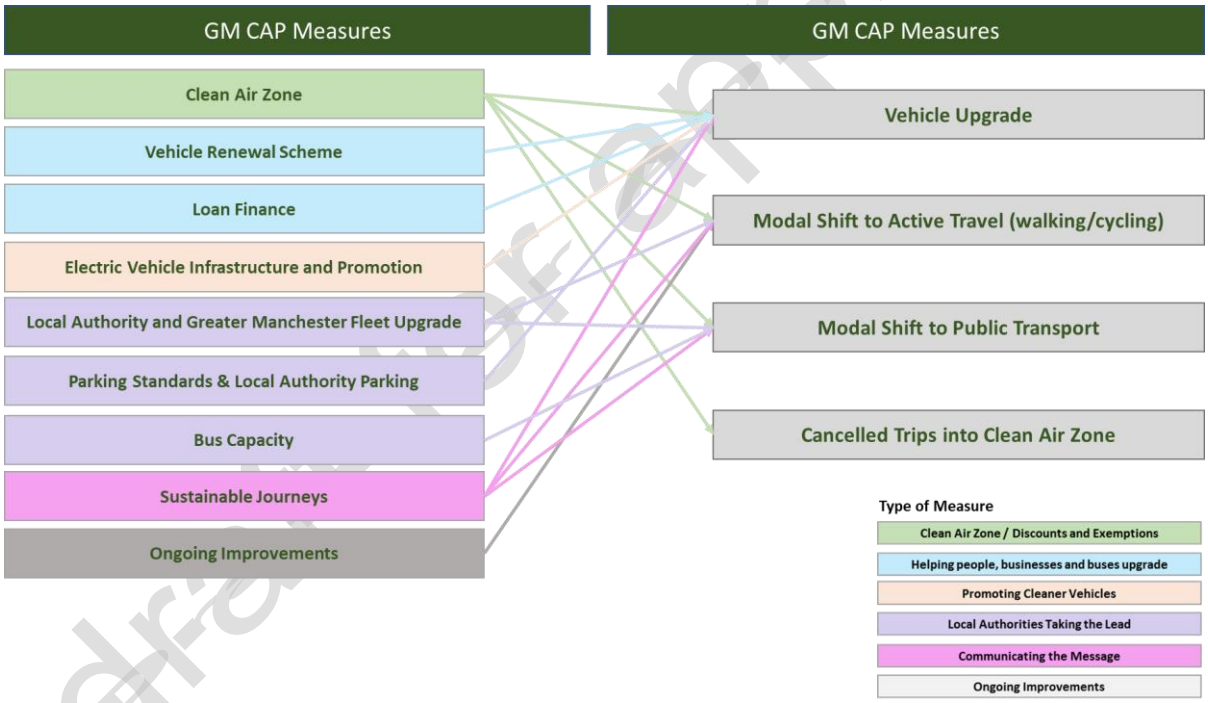
3 Scope of the Economic Appraisal

3.1.1 The implementation of the GM CAP will result in a wide-range of impacts across the economic, environmental and social spectrum to transport users. The economic analysis aimed to quantify and monetise as many impacts of the GM CAP within the given time, resource and data available. Any impacts not quantified and/or monetised may be considered for further assessment in the Full Business Case. Table 4-1 outlines the impacts considered within the economic analysis and whether they were assessed quantitively or qualitatively.

3.1.2 Please note, for the economic appraisal the cost and benefits are not assessed by individual sub-measures of the GM CAP. There are critical inter-dependencies between the CAZ and the non-CAZ measures, therefore it would be inappropriate to present the benefits derived from each measure separately. The dependencies between the measures and the behavioural response to the GM CAP is illustrated in Figure 3-1, which shows the interaction between the measures and the behavioural responses.

Figure 3-1: Measures and Dependencies



3.1.3 The scope of the economic appraisal excludes the user charges (to transport users) and the revenue (received by the public sector) due to the high level of uncertainty over the user charges and revenue forecasts. The exclusion of the user charges and revenue has no material impact on the economic appraisal as the two elements are treated as a transfer from the transport user to the public sector.

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Table 3-1: Scope of the impacts of the GM CAP

Impact	Benefits/Cost	Description	Methodology
Health and Environmental Impacts	Air Quality (NO2 and PM)	The impact of the reduction in NO2 and PM emissions in terms of avoided health and environmental damage.	The change in emissions (tonnes) of NO2 and PM is modelled using outputs from the transport model to provide an indication of the level of change across Greater Manchester. The NO2 and PM savings are then monetised using damage costs (per tonne saved) recommended by JAQU.
	Greenhouse Gases Emissions	The impact on GHG emissions as a result of the change in vehicle fleet and network effects.	The change in CO2 emissions is estimated based on the link level emissions in DM and DS estimated within EMIGMA software.
Changes in Travel Behaviour	Health Benefits	The health benefits gained from those switching from cars to walking and cycling.	The health benefits associated with increased walking/cycling are calculated using World Health Organisation (WHO)'s Health Economic Assessment Tool (HEAT). For more details of the methodology, please refer to https://www.heatwalkingcycling.org/#homepage
	Welfare Loss (Cancelled Trips)	The welfare loss of those opting to cancel their trip altogether.	This impact assumes that there is a disbenefit to users in choosing an alternative to their original course of action. The loss of welfare from changing travel behaviour is estimated using the rule of a half (RoH) for trips foregone (cancelled), and trips re-moded (i.e. change to public transport). This implies that the value of the disbenefit falls somewhere between £0 and the price of the charge (or else users would have simply paid the charge and taken made their original journey as planned). The midpoint is taken to be the average dis-benefit and multiplied by the number of trips foregone, or re-moded, to determine the overall welfare loss.
	Welfare Loss (Re-moded Trips)	The welfare loss of those opting to switch from car travel to public transport and/or active travel.	
Vehicle Upgrade	Welfare Loss	The welfare loss of having to purchase a new/used compliant vehicle earlier than planned.	The welfare loss associated with vehicle upgrade induced by the GM CAP is estimated based on the difference between the purchase price of a compliant vehicle and the deprecation value of the non-compliant vehicle that is traded in. The rule of a half is applied to account for the consumer welfare loss to account for the fact that the user will experience some benefit in having a newer vehicle beyond the fact that it is merely compliant.

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Impact	Benefits/Cost	Description	Methodology
	Loss of Asset Value	The loss in asset value for those choosing to scrap (as opposed to trade in) their older, non-compliant vehicles.	Based on the number of vehicles upgrading estimated, the average loss of asset value (after the GM CAP implementation) of each vehicle type and euro standards was estimated using JAQU's depreciation rate assumption.
	Transaction Cost	For vehicle owners choosing to upgrade their non-compliant vehicle earlier than planned, they are likely to incur a cost in having to locate a vehicle to their taste.	The transaction cost was estimated using JAQU's average transaction cost per vehicle type and euro standards.
	Fuel Switch Cost	Vehicle owners upgrading to a compliant vehicle may choose to upgrade to a different fuel type, for example a diesel car owner could upgrade to a compliant petrol car. The switch in fuel type leads to a change in running costs.	The total vehicle kilometres by non-compliant vehicle owners upgrading to a different fuel type is estimated based on the average vehicle kilometre travelled per vehicle. The average fuel consumption (of petrol vs diesel) is calculated, based on values provided by DfT WebTAG, and then the total fuel cost is estimated based on the average fuel price per litre consumed. The fuel switch cost is estimated by subtracting the Do Something fuel cost (i.e. the fuel type they switch to) from the Do Minimum fuel cost (i.e. the original fuel type).
	Financial Subsidy	Non-compliant vehicle owners choosing to upgrade early may receive a financial subsidy via the Clean Car Fund, Clean Freight Fund, Clean Taxi Fund and the Clean Bus Fund. This would offset some of the welfare loss gained from upgrading.	The financial relief which offsets the welfare loss associated with upgrading was estimated by the financial model, taking into the account the number of vehicles upgrading and the maximum financial subsidy offered per applicant via the measures Clean Car Fund, Clean Taxi Fund, Clean Bus Fund and Clean Freight Fund.

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Impact	Benefits/Cost	Description	Methodology
Congestion Effect	Travel Time Impact	Due to the nature of the GM CAP, there may be an impact on traffic flow. For example, if more non-compliant vehicle owners opt to avoid the CAZ boundary, this may result in fewer vehicles crossing and moving within the CAZ boundary, leading to travel time savings.	The congestion effects are modelled using DfT's Transport User Benefit Appraisal (TUBA) software. The input for TUBA is generated by the transport model.
	Changes in vehicle operating cost	Vehicles may see a difference in vehicle operating costs as a result of travel time savings or costs and an increase or decrease in fuel consumption	
Cost to the Public Sector	Implementation Cost	The up-front cost of implementing the GM CAP.	Assumptions on the implementation costs and how they were derived can be found in the Financial Case (section 3)
	Operating & Maintenance Cost	The on-going cost of operating and maintaining the GM CAP.	Assumptions on the O&M costs and how they were derived can be found in the Financial Case (section 3)

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4 Health and Environmental Impact

4.1 Air Quality (NO_2 and PM)

4.1.1 The objective of the GM CAP is to improve air quality in Greater Manchester by targeting a reduction in exposure to harmful concentrations of NO_2 and other polluting particulates. The reduction in air pollution will subsequently have health benefits for residents and workers within Greater Manchester, as well as a knock-on effect on those outside of Greater Manchester. As well as health, the GM CAP will lead to environmental benefits such as a reduction in building soiling and ecosystem damages.

4.1.2 The change in NO_x and PM across Greater Manchester was estimated using the outputs of the EMIGMA model (Emissions inventory Greater Manchester). The EMIGMA model provides the concentration of NO_2 and PM for each modelled road link within Greater Manchester. This data was manipulated in GIS to calculate the change in emissions at a lower super output area (LSOA) level, and summed to a district level, between the Do Minimum (2021 & 2025) and the clean air option scenario (2021 & 2025).

4.1.3 Each LSOA was assigned a classification based on ONS residential-based area classifications. Out of 1,673 LSOAs, the majority (97%) were assigned the 'Road Transport Urban Big' classification. 'Road Transport Urban Medium' and 'Road Transport Rural' account for 2.3% and 0.8% respectively.

4.1.4 The quantified reduction in NO_2 and PM (tonnes) was then monetised using JAQU's damage cost for a range of health and environmental impacts (e.g. mortality, respiratory disease, building soiling etc.). These were converted from 2015 prices to 2018 prices using the GDP Deflator Series from DfT's WebTAG Databook.

4.1.5 The monetised benefits of the GM CAP were extrapolated across the appraisal period, where we see the health and environmental benefits reduce year by year until 2030 to reflect the increasing rate of compliance.

4.2 Greenhouse Gas Emission (GHG)

4.2.1 Similar to the expected change in NO_2 and PM, the change in the traffic network as a result of the GM CAP may lead to either an increase or decrease in GHG emissions in GM. The difference in the level of GHG emissions between the Do Minimum and Do Something scenario were calculated based on total CO_2 emissions at a link level for the DM and DS scenarios in year 2021 and 2025

4.2.2 The emissions, estimated for the year 2021 and 2025 were then interpolated between the two modelled years and extrapolated for the whole appraisal period using the average reduction rate between year 2021 and 2025.

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4.2.3 The CO_2 emissions have been then multiplied by the non-traded value per tonne of CO_2 emitted (central case) reported in the WebTAG (ver. May 2018).

5 Changes in Travel Behaviour

5.1 Active travel impacts

5.1.1 When non-compliant vehicle users change their mode of travelling to the walking or cycling mode, health benefits are gained from increased exercise, subsequently reducing the rate of mortality.

5.1.2 The health benefits associated with increased walking/cycling is calculated using World Health Organisation (WHO)'s Health Economic Assessment Tool (HEAT). Please note, the active travel health benefits are identical for Option 5(i) and Option 5(ii) as the number of trips forecast to switch to active travel is assumed to be same. These are referred to as "Option 5" during this section.

5.1.3 The number of trips forecast to switch to active travel was estimated by the demand sifting tool for the opening year 2021 and converted into the number of unique vehicles switching into active travel using the trips to vehicle conversion factor (Table 5-1). The number of unique vehicles switching to active travel were then split between the proportion switching to cycling, and those switching to walking[3]. For the purpose of the economic modelling, we have assumed 90% of vehicles would switching to cycling and 10% would switching to walking. There is a high level of uncertainty over the proportion adopted and would require further fieldwork to understand the behavioural response to the GM CAP. Additionally, we did not consider trips which involve both cycling and walking, as the HEAT tool can only assess purely cycling and walking trips separately.

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[3] Active mode trips are capped at 5 miles in length. Re-moding longer trips all switch to public transport

Table 5-1: Number of unique vehicles (per day) forecast to switch to active travel (2021)

Vehicle Type	No. of Unique Vehicles Switching into Active Travel (1)	Number of Unique Vehicles Switching to Cycling (90% *(1))	Number of Unique Vehicles Switching to Walking (10% *(1))
Option 5			
Cars	1022	920	102
LGVs	35	31	4
Total	1057	951	106
Option 8			
Cars	0	0	0
LGVs	516	464	52
Total	516	464	52

5.1.4 For more details on the methodology, please refer to https://www.heatwalkingcycling.org.

5.2 Impact of cancelling or re-moding trips

5.2.1 When non-compliant vehicle users change their travel behaviour in response to the GM CAP, a welfare cost is incurred as the vehicle users are no longer choosing their preferred action. For example, a non-compliant vehicle owner may choose to cancel their trip rather than cross the CAZ cordon and pay the charge. The cancellation of the trip means the vehicle owner is no longer able to fulfil the purpose of the original trip at the destination (for e.g. trip to cinema within the IRR). Note that this analysis does not allow for the possibility that the activity is replaced with another of equal merit to the trip-maker and so may somewhat overestimate the welfare loss of cancelled trips. Similar to the approach set out in section 7.1, this impact aims to capture the reduction in consumer surplus, using the ROH approach:

5.2.2 **Step 1:** Estimate the number of trips (using the DM cordon crossings from the traffic model) that are either cancelled or shift travel mode using the behavioural response assumption by vehicle type.

5.2.3 **Step 2:** Convert the number of trips from AADTs to number of unique vehicles affected per day, based on the average number of trips per vehicle. The number of unique vehicles is then annualised by 253 days.

5.2.4 **Step 3:** Multiply the number of vehicles (for the modelled years 2021 and 2025) affected by the CAZ charge and ROH.

5.2.5 **Step 4:** Extrapolate the 2021 and 2025 value across the appraisal period, based on the percentage of non-compliant vehicles in each year, relative to

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the opening year. This assumes the total welfare loss will diminish as we approach 2030.

5.2.6 The number of trips re-moded or cancelled was provided by the demand sifting tool for the AM, IP and PM peak period for the year 2021 and 2025. The AADTs were then calculated using the expansion factors, as shown in Table 5-2. For the purpose of the economic appraisal, HGV trips were converted using the average expansion factor of articulated and rigid HGVs.

Table 5-2: Expansion factors form peak hour to peak period

Vehicle Type	AM Peak Hour to AM Peak Period	Inter-Peak Hour to Off-Peak Period	PM Peak Hour to PM Peak Period
Cars/Motorcycles	2.693	9.649	2.807
LGVS	3.125	9.649	3.071
Rigid HGVS	3.04	9.649	3.472
Articulated HGVS	3.018	9.649	3.049
Buses	2.941	9.649	3.098

5.2.7 The AADTs were then adjusted to take into consideration that a vehicle owner is very likely to be making more than one trip per day. The number of vehicles affected were then calculated using the average trips per vehicle factors presented in Table 5-3. As expected, taxis on average make the most trips per day, whilst cars, LGVs and HGVs on average make 2-3 trips per day, most likely reflecting the return trips.

Table 5-3 Conversion factor from trips to unique vehicles

Vehicle Type	Cars	Taxi	LGVs	HGV
Trips per day	2.63	9.65	2.79	2.95

5.2.8 For the purpose of the economic appraisal, the following assumptions have been done in relation to the estimation of the trips cancelled or re-moded process:

- The consumer welfare impact is assumed the same for option 5 (i) and option 5 (ii) as the transport model assumes the traffic network changes between the baseline and Do Something scenario are identical for the two versions of option 5. In reality, the Ultra-Low Emission Zone within the Inner Ring Road in Option 5(ii) would mean that all diesel cars are non-compliant which would result in a higher number of trips cancelled or re-moded.
- The appraisal assumes that the option of switching mode of travel is only applicable to cars, PHVs, and LGVs.

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- HGVs are assumed to be unable to switch to active travel or public transport but are able to cancel their trip.
- Neither taxis nor buses experience welfare loss due to trips re-moded, as we have assumed both vehicle types would be 100% compliant by 2021.
- Note that the possibility of changing mode to another vehicle type, for example from HGV to LGV, or LGV to car, has not been considered here.

6 Impact of Vehicle upgrade

6.1.1 The implementation of the GM CAP will result in a number of non-compliant vehicle owners opting to upgrade to a compliant vehicle. The upgrade to compliant vehicles imposes a cost to the vehicles owners in the following form:

- Welfare Loss
- Loss of asset value
- Fuel switch cost
- Transaction cost

6.2 Welfare loss

6.2.1 Our approach combines the concept of consumer surplus and the financial cost associated with upgrading. The consumer surplus approach is set out by JAQU on the basis of the following assumptions:

- Owners of vehicles value them differently. It is assumed the levels at which the vehicles are valued is equally distributed between the minimum value (i.e. market price) and the maximum (i.e. minimum price of a vehicle one Euro standard above);
- The market price is the minimum price at which owners would value their vehicle. This is assumed on the basis that they would otherwise sell their vehicle in the baseline; and,
- The maximum value placed on a vehicle is the value of a vehicle one Euro standard above. This is based on the assumption that people always prefer newer vehicles, and if they are willing to pay more for a vehicle, they would purchase the higher Euro standard in the baseline.

6.2.2 The welfare loss of upgrading is based on the difference in depreciation that the vehicle owner would experience in the baseline compared to the with-CAZ scenario. To determine this, we use the financial cost approach as set out by JAQU which values two elements for both the year that the user would upgrade in the baseline, and the year the user is forced to upgrade in the with-CAZ scenario. They are the following:

- The extra cost of purchasing a vehicle exempt from the charge; and,
- The benefit gained by selling the baseline vehicle (residual value).

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6.2.3 In order to calculate this, certain assumptions are invoked regarding the vehicle the user would decide to upgrade to, and when. The assumptions are as follows:

- The decision to upgrade is made independent of vehicle age (i.e. the proportion of upgrading vehicles of each Euro class reflects the wider fleet proportions of each Euro class);
- The vehicle owner would upgrade to the same compliant vehicle in the CAZ scenario as they would do in the baseline;
- The timing of the upgrade in the baseline can be predicted by the rolling fleet assumptions used in the Traffic Modelling Forecasting Report;
- All users would upgrade in the baseline within the appraisal period; and,
- Each owner would upgrade to the cheapest possible vehicle that is at least one Euro standard higher than their current vehicle.

6.2.4 With this we have the necessary information to calculate the maximum loss of consumer surplus to each user that upgrades. The rule of a half (RoH) is applied to the maximum consumer surplus welfare loss as a result of upgrading through the following formula, summed for all x, u :

$$W(E^x, E^u) = \frac{1}{2} \times \big((RV2020(E^x) - RV2020(E^u)\big) - (RV202Y(E^x) - RV202Y(E^u)) \times VY(E^x, E^u)$$

6.2.5 Where:

- E^x represents a given Euro class of a type of vehicle in the baseline;
- E^u represents the Euro class of the same vehicle type that the user would upgrade to in the scenario
- RV represents the residual value function based on average fleet age and depreciation rates
- 202Y represents the year that the user would have upgraded their vehicle in the baseline scenario
- VY is the function that determines the number of users that upgrade from E^x to E^u in the scenario in year 202Y.
- The VY and RV calculations are explained in the following sections.

6.2.6 The total welfare loss of upgrading is offset, to an extent, by the vehicle renewal funds, whereby non-compliant vehicle owners (if eligible, subject to meeting minimum requirement of the funds) have the option to apply for financial aid to subsidise the up-front cost of upgrading to a compliant vehicle.

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6.3 Number of Vehicles Upgrading

6.3.1 The number of vehicles forecast to upgrade due to the GM CAP was estimated based on the proportion of trips to upgrade (see Table 3-2) and the frequency data calculated from the ANPR data available. The following steps were taken:

6.3.2 **Step 1**: Estimate the Do Minimum AADTs by vehicle type, using output from the traffic model.

6.3.3 **Step 2**: Disaggregate the Do Minimum ADDTs by frequency of trips per non-compliant vehicle in one week (using Table 7-1).

6.3.4 **Step 3:** Convert the Do Minimum AADTs into weekly trips.

6.3.5 **Step 4**: Convert the percentage of trips forecast to upgrade (see Table 3-2) to the percentage of unique vehicles forecast to upgrade by vehicle type.

6.3.6 **Step 5:** Calculate the number of vehicles upgrading by applying the percentage of vehicles upgrading (step 4) by the total number of vehicles in Greater Manchester.

6.3.7 The frequency distribution of each vehicle type is presented in Table 6-1, sourced from the local ANPR data provided, presenting the percentage of vehicle counts captured within one given week, from various different locations in GM, by vehicle type and Euro standards. The table shows that 53% of cars travelled one of the seven days of the given week the ANPR data was collected and only 10% travel at least 5 times a week. As expected Taxi, PHV and Bus are travelling more often, with respectively 56%, 51% and 44% of the vehicles travelling at least 5 times week in the IRR.

Table 6-1: Frequency Distribution of non-compliant vehicles by vehicle type capture in one week. (Option 5(i) and 5(ii)) (source: ANPR data)

Vehicle	1 per week	2 per week	3 per week	4 per week	5 per week	6 per week	7 per week
Car	53%	19%	10%	7%	6%	3%	1%
Taxi	20%	9%	8%	8%	8%	15%	33%
PHV	14%	12%	11%	12%	14%	16%	21%
LGV	50%	20%	12%	8%	7%	3%	1%
HGV	59%	18%	9%	6%	5%	2%	1%
Bus	28%	12%	7%	9%	12%	15%	16%

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6.3.8 The frequency distribution presented in Table 7-1 and the AADTs were then used to convert the percentage of trips upgrading to the percentage of unique vehicle upgrading. The conversion between trips and vehicles is based on the assumption that:

- The ANPR data from one week for non-compliant vehicles is representative of the set.
- The most frequent entrants to the CAZ are first to upgrade.

6.3.9 The results showed that the most frequent travellers were responsible for a disproportionate volume of trips/vehicle kilometres (VKM). Table 6-2 presents the adjusted response from proportion of non-compliant trips upgraded to the proportion of non-compliant vehicles due to upgrade.

Table 6-2: Proportion of trips and vehicles due to upgrade (Option 5(i)

	Trips	**Vehicles**
Cars	65%	37%
Taxi	100%	100%
PHV	38%	24%
LGV	75%	49%
HGV	86%	75%
Bus/Coach	100%	100%

6.3.10 As the ANPR data was only recorded in one week, not all vehicles that travel within GM were captured within the ANPR data. Therefore, we must treat the ANPR data as a sample of vehicles travelling in and around GM and treated as the absolute minimum number of vehicles impacted.

6.3.11 The total number of non-compliant vehicles were then estimated based on the percentage of unique vehicles upgrading, as shown in Table 6-3, and the total number of vehicles in Greater Manchester. The total number of vehicles, by vehicle type, was sourced mainly from the DVLA. The figures were adjusted to 2021 projection using the growth factor of car ownership from the base year (column “base year” of Table 7-3) to the opening year sourced from the software Trip End Model Presentation (TEMPro).

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Table 6-3: Total Number of Vehicles in Greater Manchester

Vehicle Type	Base Year	Base Number of Vehicles	Projected Number of Vehicles in 2021	Source:
Cars	2016	1,139,980	1,200,741	DVLA
LGV	2016	111,872	117,835	DVLA
HGV	2016	30,525	32,152	DVLA
Bus/ Coach	2016	2,739	2,885	DVLA
Taxi	2018	2,135	2,202	DfT statistics, Table TAXI0104 "Taxis, Private Hire Vehicles (PHVs) and their drivers: England and Wales by licensing area"
PHV	2018	11,681	12,047	DfT statistics, Table TAXI0104 "Taxis, Private Hire Vehicles (PHVs) and their drivers: England and Wales by licensing area"

6.3.12 Table 6-4 shows the number of vehicles upgrading due to GM CAP.

6.3.13 Option 5(ii) presents the highest number of vehicles forecast to upgrade in response to the GM CAP, mainly due to the ULEZ imposed along the IRR cordon, meaning all diesel cars are considered non-compliant. Option 8 presents the lower number of vehicles upgrading, as it does not affect cars. The difference in the number of LGVs upgrading in option 8 is due to the fact that the CAZ C will become operational in 2023, when a smaller number of non-compliant LGVs will be circulating.

Table 6-4:Number of vehicles upgrading due to GM CAP

	Option 5(i)	Option 5(ii)	Option 8
Cars	81,801	198,694	0
PHVs	966	2,464	1,965
Taxis	2,127	2,127	2,127
LGVs	41,271	41,271	32,277
HGVs	6,995	6,955	6,955
Buses/Coaches	1,154	1,154	1,154
Total	134,314	252,665	44,478

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6.4 Vehicle Asset Value

6.4.1 The aim of the GM CAP is to induce uptake of cleaner vehicles, whilst simultaneously discouraging the use of older vehicles. Scrappage schemes are designed to encourage this behaviour, but they will result in a loss of asset value as cars that still function have their value reduced to zero through being scrapped and not being allowed to enter the second-hand market. The loss of asset value therefore considers the loss in total vehicle fleet value due to scrappage.

6.4.2 It is assumed that vehicles are only scrapped when a scrappage scheme is available. When a scrappage scheme is available it is assumed that vehicles which are Euro class 6 or above will not be eligible for the scheme. It is then assumed that 50% of those cars which are upgrading, and are in Euro class 5 or below, will scrap their vehicle and the loss will be the residual value of that vehicle.

6.4.3 Table 6-5 shows the depreciation rates (using the reducing balance depreciation method) that were used for the cost of upgrade, which are assumptions defined by JAQU.

Table 6-5: Depreciation rates by vehicle type provided by JAQU

	Year 1	Year 2	Year 3+
Cars	37%	18%	16%
LGVs	37%	18%	16%
RHGVs	35%	18%	18%
AHGVs	35%	18%	18%
Buses	35%	18%	18%

6.4.4 Table 6-6 presents the assumed price of a new vehicle by vehicle type, and the source of that assumption. The price of new vehicles was assumed to remain constant in real terms (i.e. a new car will cost £13k in 2018 in 2018 prices and will also cost £13k in 2029 in 2018 prices). The prices of new cars have been estimated as an average cost of the 10 most popular cars on Autotrader website sold in the year of registration. Same source has been used for LGVs, not limiting it to any make/model but splitting it by large/medium/small vehicle size.

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Table 6-6: New vehicle price

Vehicle Type	Up-Front Cost (2018 prices)	Source
Car/PHV	£ 12,997	AutoTrader UK
Taxi	£ 46,000	http://www.levc.com/new-taxis/new_tx4_taxi/
LGV	£ 13,328	AutoTrader UK
HGV	£ 65,700	5-year financed price averaged across a number of HGV types, "Road Haulage Association Cost Tables 2014", DFF International Ltd, 2014. Average between rigid and artic HGV
Bus	£ 160,000	JAQU, “National Data Inputs for Local Economic Models”
Coach	£ 250,000	JAQU, “National Data Inputs for Local Economic Models”

6.4.5 The average age of each Euro standard was calculated using the midpoint year between the year of implementation of that euro standard and the year of implementation of the next euro standard.

6.4.6 Table 6-7 shows the residual value of each vehicle type and Euro class in 2021 based on the vehicle price assumption and depreciation rates.

Table 6-7: Average residual value of vehicle by type and euro standards in 2021

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Euro 6c	Euro 6d
Car Petrol	102	205	413	986	1,981	4,738	8,188	12,997
Car Diesel	102	205	413	986	1,981	4,738	8,188	12,997
PHV Petrol	102	205	413	986	1,981	4,738	8,188	12,997
PHV Diesel	102	205	413	986	1,981	4,738	8,188	12,997
Taxi Petrol	362	727	1,460	3,491	7,012	16,768	28,980	46,000
Taxi Diesel	362	727	1,460	3,491	7,012	16,768	28,980	46,000
LGV petrol	149	251	423	1,012	2,032	4,858	8,397	13,328
LGV diesel	149	251	423	1,012	2,032	4,858	8,397	13,328
HGV	299	662	1,463	3,236	7,158	19,308	42,705	65,700
Bus	728	1,611	3,563	7,882	17,432	47,021	104,000	160,000
Coach	1,138	2,517	5,568	12,315	27,238	73,470	162,500	250,000

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6.5 Fuel Switch Cost

6.5.1 For vehicles upgrading to a different fuel type, this will incur a change in the running cost of the vehicle. As Table 6-8 demonstrates, the cost per litre of fuel consumed is higher for diesels than it is for petrol. The fuel cost comprises of resource cost, fuel duty, and 20% VAT.

Table 6-8: Average Fuel Cost (£ per litre) in the opening year 2021

Fuel Type	£ per litre
Petrol	£1.21
Diesel	£1.25

6.5.2 To estimate the difference in fuel consumption, the annual vehicle kilometres has been multiplied by the fuel consumption (litres per km) and by the fuel cost (£ per litre).

6.5.3 The number of vehicles switching fuel type when upgrading are presented in Table 6-9. For the purpose of the economic appraisal, we only considered vehicles switching from diesel to petrol only. This doesn't account for those potentially switching to electric, nor petrol cars switching to diesel. More field research is required to understand the behavioural response of non-compliant vehicle owners, and the likelihood they will upgrade to a different fuel type.

6.5.4 Note that this is under-estimating the fuel saving benefits derived from the proposed investment in electric vehicle infrastructure and associated increase in uptake of electric cars and vans. This benefit would be common across all Options. The benefits of increased uptake of EVs will be considered in more depth at FBC.

Table 6-9: Number of vehicles switching fuel from diesel to petrol

	Option 5(i)		Option 5(ii)		Option 8	
	Car	PHV	Car	PHV	Car	PHV
Total	42,038	539	107,791	1,381	0	1096

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6.5.5 The total vehicle kilometres of the Do Minimum and Do Something scenario have been estimated based on the average vehicle kilometres travelled per vehicle per year, presented in Table 6-10.

Table 6-10: Vehicle Kilometres per vehicle per year

Vehicle type	Vehicle Kilometres	Source
Petrol Car	10,460	DfT, 2017 - https://www.gov.uk/government/statistical-data-sets/nts09-vehicle-mileage-and-occupancy
Diesel Car	16,254	DfT, 2017 - https://www.gov.uk/government/statistical-data-sets/nts09-vehicle-mileage-and-occupancy
Petrol PHV	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Diesel PHV	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Petrol Taxi	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Diesel Taxi	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Petrol LGV	20,617	DfT, 2017 - https://www.telegraph.co.uk/connect/small-business/operations-and-logistics/renault/how-many-miles-do-vans-clock-up/
Diesel LGV	20,617	DfT, 2017 - https://www.telegraph.co.uk/connect/small-business/operations-and-logistics/renault/how-many-miles-do-vans-clock-up/
OGV1 (rigid)	28,000	DfT, 2017 road freight statistics table 0112
OGV2 (artic)	77,000	DfT, 2017 road freight statistics table 0113

6.5.6 The average new car fuel consumption assumed in the estimation is reported in Table 6-11.

Table 6-11: Average new car fuel consumption, Great Britain: 2000 to 2016 (litres per 100Km)

Vehicle	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Petrol Car	8.0	7.9	7.8	7.7	7.6	7.5	7.4	7.2	7.0	6.5	6.3	6.1	5.8	5.6	5.5	5.4	5.4
Diesel Car	6.3	6.2	6.1	6.2	6.2	6.2	6.3	6.2	5.9	5.7	5.5	5.2	5.0	4.9	4.7	4.6	4.5

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6.6 Transaction cost

6.6.1 The transaction cost is the cost involved in searching for a new vehicle. It has been estimated by multiplying the number of vehicles (cars, LGV and HGVs) upgrading by the weighted transaction cost.

6.6.2 The weighted transaction cost has been taken from the JAQU's "National Data Inputs for Local Economic Models" workbook, whereby the transaction cost associated searching for a new vehicle are tailored according to the age and ownership length of the fleet composition. Users pay an amount based on the cost imposed by bringing the date of upgrade forwards. The assumed transaction cost is £76 for cars, £154 for LGVs and £181 for HGVs (based on WebTAG values for time and an average of 15hrs to search for a new vehicle) – users are impacted only by the change in perceived (discounted) cost of upgrading sooner than they would have done without the introduction of the CAZ.

Table 6-12: Weighted Transaction Costs

	Weighted Transaction Costs		
Euro Standard	**Car**	**LGV**	**HGV**
Euro 5	£5.77	£10.13	£6.71
Euro 4	£3.40	£7.89	£7.70
Euro 3	£3.38	£9.65	£6.67
Euro 2	£6.07	£12.17	£5.58
Euro 1	£6.07	£12.17	£5.58

6.6.3 For the purpose of the economic appraisal of Option 5(ii), we assumed the weighed transaction cost of the euro classes 6, 6c and 6d to be the same as the Euro 5.

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7 Congestion effect

7.1.1 The introduction of the GM CAP will lead to non-compliant vehicle owners cancelling their trips or shifting to alternative mode of travel. Effectively, vehicle users, whether they are compliant or not, will experience a change in travel time and vehicle operating cost (VOC).

7.1.2 The calculation of the travel time and VOC impact to road users incorporates use of the DfT's Transport Users Benefit Appraisal (TUBA) v1.9.11 program. TUBA compares the economic costs for the Do Something (DS) situation with the costs for the Do Minimum (DM) situation to establish the value of forecast savings in travel time and vehicle operating costs.

7.1.3 Data input to TUBA comprised trip, flow weighted average travel time and travel distance skim matrices. These matrices were prepared for each option scenario separately for combinations of three time periods (AM, IP, PM), eight user classes (see Table 7-2) and two forecast years (2021 and 2025) for both Do Minimum (Without GM CAP) and Do Something (With GM CAP)

7.1.4 TUBA works on the basis of five standard-definition time periods as follows:

- AM peak (weekday 07:00 to 10:00);
- PM peak (weekday 16:00 to 19:00);
- Inter-peak (weekday 10:00 to 16:00);
- Off-peak (weekday 19:00 to 07:00); and
- Weekend.

7.1.5 The traffic model comprises three weekday time periods; an AM peak hour (08:00-09:00), an average inter-peak hour (10:00-15:30) and a PM peak hour (17:00-18:00). The off-peak and weekend time periods are not included within the appraisal. Note that this means that the congestion benefits are likely to have been somewhat underestimated.

7.1.6 The modelled period benefits calculated by TUBA were converted into an estimate of annual benefits using the following peak hour to peak period factors:

- Weekday AM peak period (7am to 10am, 3 hours) – 2.82 * AM peak hour
- Weekday IP period (10am to 4pm, 6 hours) – 6.45 * IP average hour; and
- Weekday PM period (4pm to 7pm, 3 hours) – 2.77 * PM peak hour

7.1.7 The annualisation factor for each TUBA time period also has to incorporate the number of times the period occurs per year, with the year divided up as follows:

- 253 normal weekdays

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7.1.8 The two sets of factors above were combined to create annualisation factors applicable to the standard TUBA time periods. Table 7-1 summarises the TUBA periods and relevant annualisation factors.

Table 7-1 : Time slices and annualisation factors

No	Time Slice	Time Period	Duration (mins)	Formula	Annualisation Factor
1	07:00-10:00	AM Period	60	2.82 * 253	679
2	10:00-16:00	IP Period	60	6.45 * 253	1512
3	16:00-19:00	PM Period	60	2.77 * 253	707

7.1.9 The traffic model user classes split into eight user classes within TUBA, and the purpose split was derived using the default WebTAG split:

Table 7-2: User Classes

User Class	Description
1	Compliant Cars
2	Non-Compliant Cars
3	Compliant LGVs
4	Non-Compliant LGVs
5	Compliant OGVs
6	Non-Compliant OGVs
7	Compliant Taxis
8	Non-Compliant Taxis

7.1.10 The TUBA outputs were converted from present value 2010 prices to present value 2018 prices using the GDP deflator series sourced from DfT's WebTAG Databook (May 2018 edition).

7.1.11 In order to bypass a limitation of the software (which doesn't allow to have two different user classes with same vehicle type, purpose and person type), the 8 user classes have been divided into 4 separate runs. The user classes have been split in the groups reported in Table 7-3.

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7.1.12 The results from the different runs have been summed up later to obtain the total results.

Table 7-3: User classes included in the TUBA runs

Run Nr.	User Classes
1	Compliant Cars, Compliant LGVs, Compliant OGVs
2	Non-Compliant Cars, Non-Compliant LGVs, Non-Compliant OGVs
3	Compliant Taxis
4	Non-Compliant Taxis

8 Cost to the public sector

8.1.1 As part of this economic appraisal, costs for scheme implementation, operating and maintenance costs and revenue for the public sector have been analysed as well. For more details on the methodology and the results refer to the main OBC document, section Financial Case.

8.2 Implementation cost

8.2.1 The implementation costs include all costs associated with setting up scheme measures, this includes purchasing and administering the implementation of depreciable and non-depreciable assets. Table 8-1 summarises the implementation cost types by scheme and outlines the key drivers underlying cost forecasts.

Table 8-1: Implementation costs and primary cost drivers

CAP Measure	Cost Drivers
Clean Air Zone	Signs, Automatic Number-Plate Recognition (ANPR) cameras and associated installation costs IT systems to manage the scheme and Penalty Charge Notice PCN process Detail design work and marketing campaigns prior to scheme launch Mobilisation and recruitment costs for staffing the scheme
Local Authority and Greater Manchester Fleet Upgrade	Upgrade of non-compliant vehicles owned by the Districts to lowest emission possible, including all Local Authority operated cars/vans, refuse collection vehicles, HGVs
Clean Taxi Fund	Population of non-compliant taxis and PHVs Amount allocated per vehicle
Clean Bus Fund	Population of non-compliant buses in Greater Manchester Cost to retrofit buses, where possible

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CAP Measure	Cost Drivers
Clean Freight Fund	Population of non-compliant vehicles Amount allocated per vehicle
Electric Vehicle Infrastructure and Promotion	Cost to buy and install dual head rapid chargers
Sustainable Journeys	Resource to deliver interventions Costs are profiles from 2019 to 2018
Loan Finance	This measure is yet to be further defined, however, a general assumption for cost to administer a loan scheme is c1% of the loan book value

8.3 Operating & Maintenance Cost

8.3.1 Operational costs are assumed that will continue for a period of 8 years after implementation, which is the agreed NO2 compliance date plus one year, with decommissioning infrastructure taking place in year 9.

8.3.2 Table 8-2 summarises the operation and maintenance cost types by scheme and outlines the key drivers underlying cost forecasts.

Table 8-2: Operation and maintenance costs and primary cost drivers

CAP Measure	Cost Drivers
Clean Air Zone	Staff to recover PCN charges Premise space and systems ANPR camera and sign maintenance Mobile enforcement units
EV Infrastructure and Promotion	Ongoing maintenance of the charge points Electricity costs are assumed to be covered by revenue generated
Vehicle Renewal Scheme: Clean Air Funds	Population of non-compliant vehicles Amount allocated per vehicle
Vehicle Renewal: Clean Taxi Fund	Population of non-compliant taxi and PHVs Amount allocated per vehicle
Vehicle Renewal: Clean Bus Fund	Population of non-compliant buses in Greater Manchester Cost to retrofit buses
Sustainable Journeys	Resource to deliver interventions Costs are profiled from 2019 to 2027

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9 Issues and Caveats

9.1 Sensitivity Testing

9.1.1 There is considerable uncertainty about the possible impacts of the proposed GM CAP on travel patterns and thus on the economy and quality of life. More work is required to better understand and test the proposals: this will be carried out at FBC.

9.1.2 Sensitivity testing is an important step in analysing the impact of uncertainty on results and subsequently on decision making and is required by JAQU. Sensitivity testing has been carried out and is reported in the supplementary technical report. The wider implications of the sensitivity testing are discussed in the Analytical Assurance statement.

9.1.3 Further sensitivity testing is likely to be required at FBC.

9.2 Assessing Air Quality Benefits

9.2.1 Changes in NO_2 and PM have been quantified using the damage cost approach which relies on the change in total (gross) emissions. This does not reflect the change in ambient concentration levels over the appraisal period which ultimately drive improved health outcomes. A more thorough methodology will be explored at FBC.

9.2.2 The air quality impact of option 5(ii) is underestimated for two reasons. Firstly, the model is only able to assess the benefit within the CAZ area, such that the same vehicle is considered to be a petrol vehicle within the zone and a diesel vehicle whilst travelling outside the zone. Secondly, the modelling does not assume any diesel euro 6 car trips to be cancelled or re-moded. Realistically, we would expect to see a substantial amount of diesel trips cancelled or re-moded, especially for those that do not enter the CAZ frequently and have reasonable accessibility to public transport. These assumptions were imposed by the limitations of the modelling tools available.

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Appendix 1 - Key Assumptions

General Parameter	Assumption-Description	Source
Active Travel	10% of all trips switching into active travel are walking trips, and 90% are cycling trips	Jacobs
Average price of compliant vehicles (new vehicles)	The average cost for petrol and diesel cars developed from online research	JAQU National data inputs for Local Economic Models.xlsm (available on Huddle) Online research (AutoTrader)
Behavioural Response	The proportion of vehicles to upgrade, pay charge, re-mode etc.	Jacobs
Buses	The oldest vehicles will be replaced rather than retrofitted.	TfGM/Jacobs
Buses	The average cost of retrofitting a bus is £18,000	Jacobs
Buses	All buses will be 100% compliant by 2021.	Jacobs
Congestion Effect	The travel time savings and change in vehicle operating cost is identical between option 5(i) and option 5(ii)	TfGM/Jacobs
Daily charges	Cars/LGV/PHV & Cabs = £7.50 HGVs/buses/coaches = £100.00	Jacobs
Euro/GBP conversion	The Euro/pound conversion used is 1.12168. This is based on the conversion rate of 21/11/2018	Jacobs
Fuel switch	Assume diesel car owners may switch to petrol, but no petrol car owners will choose to switch to diesel	Jacobs
Fuel switch	Assume the vehicle km travelled for diesel vehicle owners do not change when switching to petrol	Jacobs
Fuel switch	Assume the vehicle km travelled per vehicle is constant throughout the appraisal period	Jacobs
Fuel switch	The average fuel consumption (litre/km) for euro 6 is assumed the same for euro 6c and 6d.	Jacobs
Fuel switch	Vehicles switching from Diesel to petrol are assumed to make the same km as a diesel vehicle	Jacobs
General	Opening year of the CAZ is 2021, and last year of appraisal period is 2030	TfGM/Jacobs
General	The value of all monetised impacts will be presented in 2018 values	JAQU's Option Appraisal Guidance

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General Parameter	Assumption-Description	Source
General	All values will be discounted to 2018 base year using a 3.5% discount factor per annum	JAQU's Option Appraisal Guidance
General	The annualisation factor is 253 days	TfGM
Health and Environmental Impact (appraisal period)	To estimate the health and environmental benefits over the appraisal period, the 2021 estimate will be adjusted according to the % of non-compliance across 2021-2030 relative to the opening year	Jacobs
HGVs	Assume HGVs trips cannot be switched to either public transport, nor active travel.	Jacobs
Impacts in non-modelled years	Future year costs and benefits will decrease relative to scheme opening year at the same rate as non-compliant users would upgrade to compliant vehicles in the baseline	Jacobs
Scrappage	50% of non-compliant vehicles eligible for the Vehicle Renewal Fund will choose to scrap their vehicle	Jacobs
Taxis	Taxis (hackney cabs) are assumed to be 100% compliant by 2021, meaning all non-compliant taxis we assume to upgrade only.	TfGM/Jacobs
Transaction cost	Euro 6, 6c and 6d transaction cost is assumed to be the same as euro 5	Jacobs
Transaction costs	Transaction costs based on JAQU-recommended transaction cost values	JAQU
Upgrade to compliant vehicles	Car drivers who choose to replace a non-compliant vehicle with a compliant model would purchase compliant vehicles in the same proportions as compliant vehicles in the existing fleet mix.	TfGM/AQ Consultants
Vehicle Upgrade	If upgrade response is triggered then 25% of those upgrading will purchase a new vehicle and 75% will replace their non-compliant vehicle with a second-hand compliant vehicle.	JAQU
Vehicle Upgrade	All vehicle upgrades are assumed to take place in 2021, with the exception of LGV's in option 8 which are assumed to upgrade in 2023, no growth in LGV's is assumed between 2021 and 2023.	Jacobs
Vehicle Upgrade	The market price is the minimum price at which owners would value their vehicle.	Jacobs
Vehicle Upgrade	The maximum value placed on a vehicle is the value of a vehicle one Euro standard above.	Jacobs
Welfare Loss (trips cancelled and re-moded)	There is no difference in the number of trips cancelled and re-moded between option 5(i) and option 5(ii). Subsequently, this means the value of welfare loss attributed to trips cancelled/re-moded is the same.	TfGM/Jacobs

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E1 Organisation
E1.1 – Programme Governance Model

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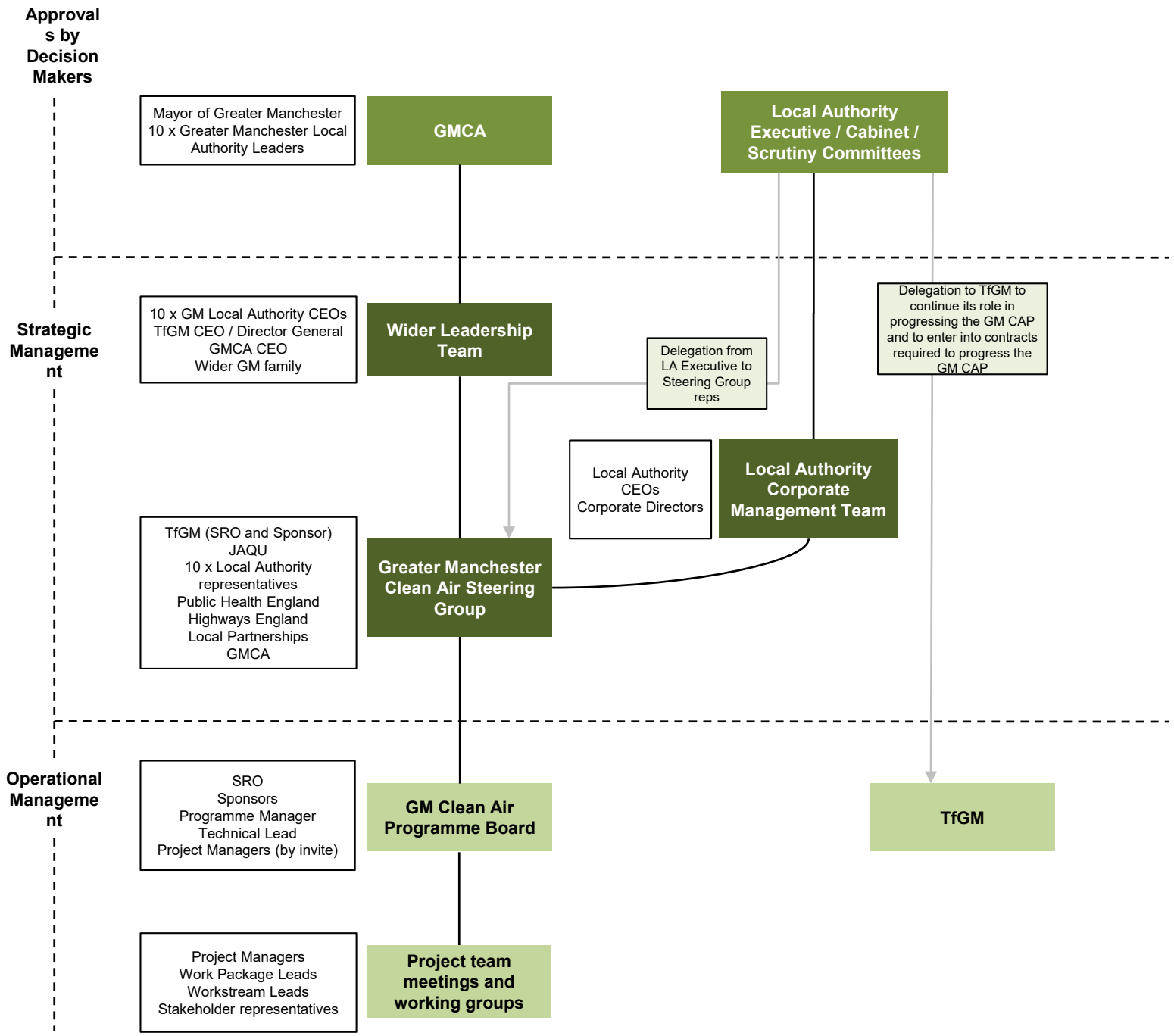
Authorised by: **Date:**	Simon Warburton 28th February 2019		

Greater Manchester Clean Air Plan Governance

Working draft - confidential



Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E1 Organisation
E1.2 – Programme Structure

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Appendix E.1.2 – Greater Manchester Clean Air Plan Programme Structure

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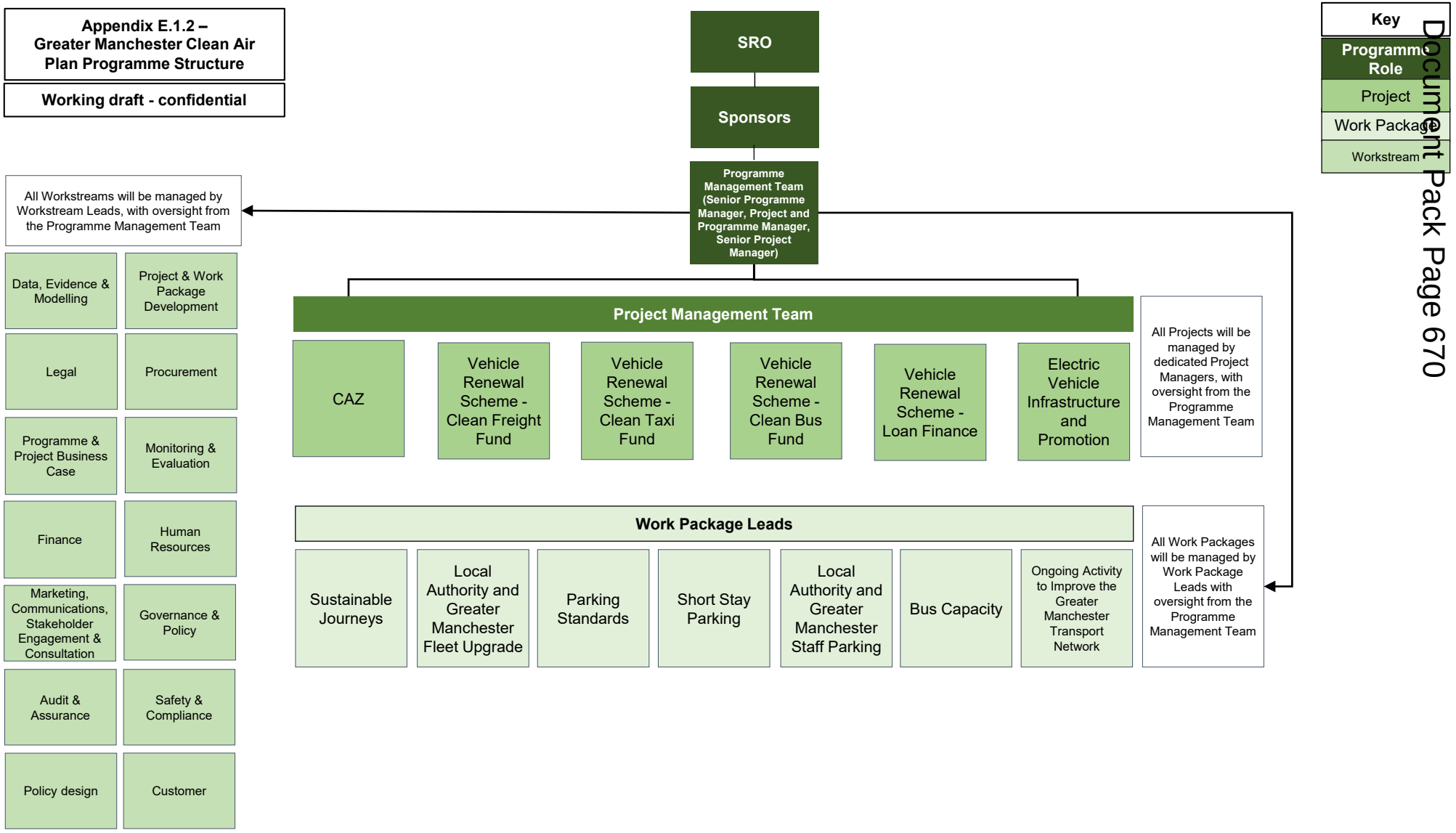

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E1 Organisation
E1.3 – Steering Group Terms of Reference

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1.8 Public Health England (PHE) 4
1.9 Local Partnerships 4
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1.11 Terms of Reference review 5

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1 Greater Manchester Clean Air Plan Steering Group – Terms of Reference

1.1.1 In July 2017, the Government set out the National Plan for tackling roadside nitrogen dioxide (NO_2) concentrations. The Joint Air Quality Unit (JAQU), comprising teams from Defra and the Department for Transport (DfT), has been set up by the Government to deliver the National Plan to improve air quality and comply with the European Union (EU) Limit Value. The National Plan identified that twenty nine local authorities, including seven within Greater Manchester (GM), have areas that are likely to exceed the statutory NO_2 annual mean EU Limit Value of 40 µg/m^3 (the EU Limit Value) beyond 2020.

1.1.2 Those local authorities have been instructed by the Government to undertake detailed feasibility studies and develop plans for the implementation of appropriate measures to deliver compliance with the EU Limit Value in the 'shortest possible time'.

1.2 Purpose of the Group

1.2.1 To provide direction and guidance to deliver the GM Clean Air Plan for Outline Business Case (OBC) and Full Business Case (FBC) though to implementation.

1.2.2 The Steering Group (SG) has been established and includes Directors or Assistant Directors from each of the local authorities as well as representatives from Highways England, Public Health England (PHE) and Transport for Greater Manchester (TfGM). The Steering Group members are responsible for steering the direction of the feasibility study, briefing senior officers and elected members within their organisations and securing local approvals.

1.3 Membership:

- Bolton Council
- Bury Council
- Manchester City Council
- Oldham Council
- Rochdale Borough Council
- Salford City Council
- Stockport Metropolitan Borough Council
- Tameside Metropolitan Borough Council
- Trafford Council
- Wigan Metropolitan Borough Council
- Public Health England

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- Highways England
- Joint Air Quality Unit
- TfGM
- Local Partnerships
- Association of Greater Manchester Authorities

1.4 Transport for Greater Manchester (TfGM)

1.4.1 TfGM is acting on behalf of the Greater Manchester Combined Authority (GMCA) and the ten GM local authorities to undertake the feasibility study and develop a plan to meet the air quality challenge across the whole conurbation.

1.4.2 The role/responsibility of TfGM is:

- To develop the OBC for submission to JAQU by 31st December 2018;
- To develop the short list of measures to evaluate against the primary critical success factors and has been assessed against the secondary critical success factors;
- To develop a solution for the GM Clean Air Plan;
- To manage the overall project and interfaces between other relevant programmes and projects;
- To manage the interfaces for Communications and Stakeholder Engagement;
- To manage the associated risks and issues that arise on the project;
- To ensure the project is adequately resources to achieve project deadlines; and
- To brief other Steering Group members as well as the Wider Leadership Team on progress, development of solutions and any risks/issues associated with the project.

1.5 Local Authorities

1.5.1 The role/responsibility of the Local Authorities is:

- To provide appropriate steer for the direction of the project and development of measures/solutions;
- To receive and appropriately challenge information presented on the project;
- To provide input to general project related decisions;

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- To brief senior officers and elected members within their organisations on the information presented and agreed at the Steering Group throughout the project and in particular prior to sign off of the proposed solution; and
- Drive approval and authorisation via Local Authorities of OBC/FBC submission to JAQU.

1.6 Joint Air Quality Unit (JAQU)

1.6.1 The Joint Air Quality Unit (JAQU) is the regulatory body that has been set up between Defra and DfT and is specifically tasked with delivering the government's national plans to improve air quality and meet EU limits.

1.6.2 The role/responsibility of JAQU is:

- To act as the primary two-way communication route between JAQU and TfGM (via the Account Manager);
- To act as a signpost to a range of other support including available guidance, tools, training and technical and economic experts – through both account management arrangements with local authorities and through the Huddle on-line sharing site;
- To ensure that local plans deliver the necessary air quality compliance, are cost effective and where possible deliver wider benefits;
- To provide appropriate implementation funding once local plans are approved;
- To oversee the delivery of competitive funding available to local authorities for mitigating negative impacts of local schemes through managing the Clean Air Fund; and
- To implement secondary legislation and other legal instruments to require feasibility studies and delivery of schemes.

1.7 Highways England

1.7.1 Highways England works with the DfT to operate, maintain and improve England's motorways and major A roads.

1.7.2 The role/responsibility of Highways England is:

- To identify any potential issues and impacts to the SRN network from our measures and preferred package proposed in the OBC
- To advise on the impact of Highways England plans to the SRN network to the measures options and preferred package detailed in the OBC
- To work together to tackle the impact of roadside vehicle emissions, particularly with the high volume of SRN within GM

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1.8 Public Health England (PHE)

1.8.1 Public Health England (PHE) works to protect and improve the nation's health and wellbeing, and reduce health inequalities.

1.8.2 The role/responsibility of PHE is:

- To receive and appropriately challenge information presented on the project;
- To provide input to general project related decisions;
- To provide appropriate steer for the direction of the project and development of measures/solutions; and
- To ensure the project meets the required improvement in Air Quality across Greater Manchester.
- To challenge third party reports and marketing materials to ensure a consistent message for public health.

1.9 Local Partnerships

1.9.1 Local Partnerships has been commissioned by Defra, as part of JAQU's package of support to local authorities who are working toward reducing NO_2 concentrations to within statutory limits. Local Partnerships will provide end-to-end support and guidance to LAs, from the delivery of the Strategic Outline Case (SOC), Outline Business Case (OBC), Full Business Case (FBC) and through the procurement and implementation stages.

1.9.2 The role/responsibility of the Local Partnerships is:

- To help with business case planning and draft review;
- To provide process assurance with the aim that the key programme documents produced are right first time, so eliminating unnecessary delays or re-works;
- To complement and not conflict with the role/responsibility of the JAQU Account Manager who is the single point of contact with JAQU;
- To provide high-level support across the whole JAQU delivery process, providing early feedback on such things as project management systems, partnership arrangements (where relevant), governance and decision making; and
- To provide a greater level of input to the 'financial', 'commercial' and 'management' cases for the OBC.

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1.9.3 Please note: It is not the Local Partnerships' responsibility to provide detailed technical or economic advice and will not major on the 'strategic' or 'economic' cases of the 5-case model.

1.10 Frequency of meetings

1.10.1 Monthly (or more frequently if deemed necessary)

1.11 Terms of Reference review

1.11.1 Following submission of OBC or in the event a significant change to the project.

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E2 Modelling Report

draft for approval

Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

Disclaimer

Please note:

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Version

Conventions

Cells with a red background are **labels or table headings**.
Cells with a yellow background contain **hard-coded input data**
Cells with a white background contain **model calculations**.
Cells with a green background contain reportable **model outputs**.
Cells with a white background are **textual annotations** that are neither headings nor data (e.g. description of a calculation)

Latest Agreed / Circulated Version

Version	Sign-Off Date	Model Responsible Owner	Senior Responsible Owner

Version Control

Version	Based On	Release Date	Lead Analyst	Description of Changes	Impact of Changes	Comments
0.1		26 Feb 2019				

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Quality Assurance

This sheet should be used for recording planned and completed quality assurance activities, as well as any follow-up actions resulting from these. Checks conducted by the analysts delivering the work

Validation

Is the methodology appropriate?

Appropriateness of Model	**GREEN**	Based on this test, the approach seems appropriate for it's intended
	AMBER	There are some concerns about the appropriateness of the approach
	RED	There are major concerns about the appropriateness of the approach

"Validation" is testing whether the model is a suitable simplification of the real world. Ideally this should be quantitative, checking if the model would have predicted real world outcomes. At the very least, the model structure should be qualitatively validated by reviewing the structure and assumptions with business experts, and reviewing the technical approach with analytical experts.

ID	Model Version	Activity	Details of Activity	Reviewer	Date	Completed	Appropriateness of Model	Comments and Issues	Related Documentation	Detail of Follow-up Action	Follow-up Complete
A1											
A2											
A3											
A4											
A5											
A6											
A7											
A8											

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ECONOMICS CASE - ASSUMPTIONS LOG

The purpose of this worksheet is to outline the key assumptions applied to the economic modelling, source of assumptions and JAQU comments
The assumptions are outlined by type of measure
To add assumptions, manually add rows under the relevant measure

Assumption Quality	**GREEN**	**High Quality**	Reliable assumption, well understood and/or documented; anything up to a validated & recent set of actual data.
	AMBER	**Mid Quality**	Some evidence to support the assumption; may vary from a source with poor methodology to a good source that is a few years old.
	RED	**Low Quality**	Little evidence to support the assumption; may vary from an opinion to a limited data source with poor methodology.

Assumption Impact	**GREEN**	**Limited Impact**	Marginal assumptions: their changes have no or limited impact on the outputs
	AMBER	**Medium Impact**	Assumptions with a relevant, even if not critical, impact on the outputs
	RED	**Critical Impact**	Core assumptions of the analysis; the output would be drastically affected by their change.

ID	Area	Assumption	Purpose	Progress	Quality RAG	Impact RAG	Source/Owner	Comments	Link
A1	Active Travel	10% of all trips switching into active travel are walking trips, and 90% are cycling trips	Calculating the health benefits of active travel	COMPLETED	RED	GREEN	Jacobs - Wendy Cheung	The HEAT tool is designed to assess pure cycle trips and walking trips separately. Therefore, the number of trips remoded to active travel had to be proportioned between the two model of travel.	
A2	Average price of compliant vehicles (new vehicles)	The average cost for petrol and diesel cars developed from online research	Cost of upgrade for non-compliant vehicle owners	COMPLETED	GREEN	AMBER	JAQU National data inputs for Local Economic Models.xlsm (available on Huddle) Online research (autotrader)		
A3	Behavoural Response	The proportion of vehicles to upgrade, pay charge, remode etc.	Determine the number of vehicles to upgrade, divert, cancel trips etc.	COMPLETED	GREEN	RED	Jacobs		
A4	Buses	The oldest vehicles (euro 3 and below) will be replaced rather than retrofitted.	Capital costs	COMPLETED	GREEN	RED	Clare Sheffield and Alec Curley		
A5	Buses	The average cost of retrofitting a bus is £20,000	Cost of retrofitting	COMPLETED	AMBER	AMBER	Jacobs	TfL Bus Retrofit Programme - £86m/5000 buses (Euro VI)	https://www.airqualitynews.com/2017/06/28/86-1-million-london-bus-retrofit-programme-announced/
A6	Buses	All buses will be 100% compliant by 2021.	Cost of scrappage	COMPLETED	RED	AMBER	Jacobs		
A7	Congestion Effect	The travel time savings and change in vehicle operating cost is identical between option 5(i) and option 5(ii)	Calculating the congestion effect impact	COMPLETED	RED	AMBER	Jacobs/TfGM	The traffic network modelling for option 5(i) and option 5(ii) is the same.	
A8	Daily charges	Cars/LGV/PHV & Cabs = £7.50 HGVs/buses/coaches = £100.00	Calculate the cost to non-compliant vehicles entering the CAZ cordons (and revenue)	COMPLETED	AMBER	RED	Jacobs		
A9	Euro/pound conversion (21/11/2018)	The Euro/pound conversion used is 1.12168. This is based on the conversion rate of 21/11/2018	Converting value of health benefits from euros to £GBP.	COMPLETED	GREEN	GREEN			
A10	Fuel switch	Assume diesel car owners may switch to petrol, but no petrol car owners will choose to switch to diesel	Cost of fuel switch for vehicle owners switching to different fuel type	COMPLETED	RED	GREEN	Jacobs	This assumption will certainly apply in option 5c	
A11	Fuel switch	Assume the vehicle km travelled for diesel vehicle owners do not change when switching to petrol	Cost of fuel switch for vehicle owners switching to different fuel type	COMPLETED	GREEN	AMBER	Jacobs - Paolo Medici		
A12	Fuel switch	Assume the vehicle km travelled per vehicle is constant throughout the appraisal period	Cost of fuel switch for vehicle owners switching to different fuel type	COMPLETED	AMBER	AMBER	Jacobs - Wendy Cheung		
A13	Fuel switch	The average fuel consumption (litre/km) for euro 6 is assumed the same for euro 6c and 6d.	Cost of fuel switch for vehicle owners switching to different fuel type	COMPLETED	AMBER	AMBER	Jacobs - Wendy Cheung	The average fuel consumption is unavailable for Euro 6c and 6ds.	
A14	General	Opening year of the CAZ is 2021, and last year of appraisal period is 2030	Appraisal Period	COMPLETED	GREEN	RED	Jacobs/TfGM		
A15	General	The value of all monetised impacts will be presented in 2018 values	Price Year	COMPLETED	GREEN	RED	JAQU's Option Appraisal Guidance		
A16	General	All values will be discounted to 2018 base year using a 3.5% discount factor per annum	Discounting	COMPLETED	GREEN	RED	JAQU's Option Appraisal Guidance		
A17	General	The annualisation factor is 253 days	Annualisation factor	COMPLETED	GREEN	AMBER			
A18	Health and Environmental Impact (appraisal period)	To estimate the health and environmental benefits over the appraisal period, the 2021 estimate will be adjusted according to the % of non-compliance across 2021-2030 relative to the opening year	Calculate the health and environmental benefits for the appraisal period	COMPLETED	GREEN	RED	Jacobs - Shamai Cohen		
A19	HGVs	Assume HGVs trips cannot be switched to either public transport, nor active travel.	Welfare loss of trips remoded	COMPLETED	GREEN	AMBER	Jacobs		
A20	Scrappage	50% of non-compliant vehicles euro 5 and below eligble for the Vehicle Renewal Fund will apply for funding	Loss of asset value	COMPLETED	RED	RED	Jacobs		
A21	Taxis	Taxis (hackney cabs) are assumed to be 100% compliant by 2021, meaning all non-compliant taxis we assume to upgrade only.	Calculating the impact of vehicle upgrade	COMPLETED	RED	RED	Clare Sheffield and Alec Curley		
A22	Transaction cost	Euro 6, 6c and 6d transaction cost is assumed to be the same as euro 5	Calculating the transaction associated with upgrading	COMPLETED	GREEN	GREEN	Jacobs - Paolo Medici		
A23	Transaction costs	Transaction costs based on JAQU-recommended transaction cost values	Transaction cost	COMPLETED	GREEN	GREEN	JAQU		National data inputs for Local Economic Models.xlsm
A24	Upgrade to compliant vehicles	The number of vehicles upgrading do no differ between option 4 and option 5(i)	Cost of upgrade for non-compliant vehicle owners	COMPLETED	RED	RED	Jacobs	There is no clear methodology to distinguish the difference in the number of LGVs and HGVs upgrading between option 4 and option 5(i). Although we do expect less LGVs and HGVs upgrading in option 4, we do not expect the difference to have a significant material impact on the results.	
A25	Upgrade to compliant vehicles	Car drivers who choose to replace a non-compliant vehicle with a compliant model would purchase compliant vehicles in the same proportions as compliant vehicles in the existing fleet mix.	Cost of upgrade for non-compliant vehicle owners	COMPLETED	RED	AMBER	Nigel Bellamy - http://my.hdle.it/64374863	If, for example, the proportions of compliant cars in the local fleet mix in 2021 (estimated from ANPR data) were as shown in Table C2, then we would assume that 37.5% of drivers who choose to acquire a compliant car would purchase a diesel Euro 6 car, 26.2% of drivers would acquire a Petrol Euro 6 car, 21.8% of drivers would acquire a Petrol Euro 5 car and 14.5% of drivers would acquire a Petrol Euro 4 car.	
A26	Vehicle Upgrade	If upgrade response is triggered then 25% of those upgrading will purchase a new vehicle and 75% will replace their non-compliant vehicle with a second-hand compliant vehicle.	Cost of upgrade for non-compliant vehicle owners	COMPLETED	AMBER	AMBER	JAQU-recommended assumption		
A27	Vehicle Upgrade	Total number of vehicles is assumed to be constant along the appraisal period 2021-2030	Fleet Forecast	COMPLETED	RED	AMBER	Jacobs - Wendy Cheung		
A28	Vehicle Upgrade	Vehicle upgrades is assumed to occur entirely in the first year of the activation of the scheme	Calculating the welfare loss of upgrading	COMPLETED	AMBER	AMBER	Jacobs - Paolo Medici		
A29	Vehicle Upgrade	The vehicles entering the CAZ most frequently will upgrade first	Converting the percentage of trips upgrading to the percentage of vehicle upgrading	COMPLETED	AMBER	AMBER	Jacobs - Wendy Cheung		
A30	Vehicle Upgrade	The market price is the minimum price at which owners would value their vehicle.	Calculating the welfare loss of upgrading	COMPLETED	AMBER	RED	Jacobs - Wendy Cheung	This is assumed on the basis that they would otherwise sell their vehicle in the baseline	
A31	Welfare Loss (trips canceleld and remoded)	There is no difference in the number of trips cancelled and remoded between option 5(i) and option 5(ii). Subsequently, this means the value of welfare loss attributed to trips cancelled/remoded is the same.	Calculating the welfare loss of trips cancelled/remoded	COMPLETED	RED	RED	Jacobs/TfGM	The traffic network modelling for option 5(i) and option 5(ii) is the same.	
A32									
A33									

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Option 8

Yes
No

Area		2021	2023
Inner Ring Road	IRR		
M60	M60		
Satellite Towns	ST		
Greater Manchester	GM	CAZ B	CAZ C

	2021				2023			
	IRR	M60	ST	GM	IRR	M60	ST	GM
Car Petrol								
Car Diesel								
Taxi				CAZ B				CAZ C
PHV Petrol				CAZ B				CAZ C
PHV Diesel				CAZ B				CAZ C
LGV								CAZ C
HGV				CAZ B				CAZ C
Bus				CAZ B				CAZ C
Coach				CAZ B				CAZ C

Clean Air Fund

	Active
Clean Air Credit Scheme	No
Clean Taxi Fund	No
Clean Freight Fund	No
Clean Bus Technology Fu	No

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Economic Parameters

This sheet contains values that might be expected to change under different scenarios, and which model users might be expected to change.

Standalone inputs and assumptions	Value	Source if relevant
Discount Year	2018	
Price Year	2018	
Appraisal Period - start year	2021	
Appraisal Period - duration (years)	10	JAQU guidance
Discount Rate	3.50%	Green Book
Annual increase in willingness to pay for health	2.00%	Defra damage costs guidance
Days in year	365	
Rule of Half	0.5	
Annualisation factor	253	TUBA guidance/WebTAG
Euro/pound conversion (21/11/2018)	1.12168	
Market price factor	1.19	

WebTAG Databook (base year = 2018)

DATABOOK MAY 2018

Source: https://www.gov.uk/government/publications/webtag-tag-data-book-may-2018

GDP deflator

Annual Parameters

Year	GDP deflator (2018 = 100)
1990	55.22
1991	58.85
1992	60.64
1993	62.23
1994	62.98
1995	64.50
1996	67.14
1997	67.77
1998	68.55
1999	69.12
2000	70.53
2001	71.14
2002	72.72
2003	74.47
2004	76.34
2005	78.36
2006	80.74
2007	82.82
2008	85.17
2009	86.45
2010	87.81
2011	89.58
2012	90.97
2013	92.71
2014	94.30
2015	94.73
2016	96.60
2017	98.50
2018	100.00
2019	101.56
2020	103.23
2021	104.99
2022	106.90
2023	109.26
2024	111.66
2025	114.12
2026	116.63
2027	119.19
2028	121.82
2029	124.50
2030	127.23
2031	130.03
2032	132.89
2033	135.82
2034	138.81
2035	141.86
2036	144.98
2037	148.17
2038	151.43
2039	154.76
2040	158.17
2041	161.65
2042	165.20
2043	168.84
2044	172.55
2045	176.35
2046	180.23
2047	184.19
2048	188.24
2049	192.39
2050	196.62
2051	200.94
2052	205.36
2053	209.88
2054	214.50
2055	219.22
2056	224.04
2057	228.97
2058	234.01
2059	239.16
2060	244.42
2061	249.79
2062	255.29
2063	260.91
2064	266.65
2065	272.51
2066	278.51
2067	284.63
2068	290.90
2069	297.30
2070	303.84
2071	310.52
2072	317.35
2073	324.33
2074	331.47
2075	338.76
2076	346.21
2077	353.83
2078	361.62
2079	369.57
2080	377.70
2081	386.01
2082	394.50
2083	403.18
2084	412.05
2085	421.12
2086	430.38
2087	439.85
2088	449.53
2089	459.42
2090	469.52
2091	479.85
2092	490.41
2093	501.20
2094	512.23
2095	523.50
2096	535.01
2097	546.78
2098	558.81
2099	571.11
2100	583.67

Table A 1.3.7: Fuel and Electricity Prices and Components (prices)

Year	Resource Cost					Duty				VAT rate		
	Petrol	Diesel	Gas Oil	Electricity		Petrol	Diesel	Gas Oil	Electricity	Petrol	Diesel	Electricity
		Rail Diese		Road	Rail		Rail Diesel					Road
	(p/litre)	(p/litre)	(p/litre)	(p/kWh)	(p/kWh)	(p/litre)	(p/litre)	(p/litre)	(p/kWh)	(%)	(%)	(%)
2010	47.62	49.57	45.36	13.48	7.74	65.13	65.13	12.52	0.00	17.5	17.5	5
2011	58.24	62.94	58.02	14.31	8.03	64.97	64.97	12.49	0.00	20	20	5
2012	59.48	65.05	59.88	14.88	8.78	63.70	63.70	12.25	0.00	20	20	5
2013	57.36	62.58	57.32	15.54	9.63	62.51	62.51	12.02	0.00	20	20	5
2014	50.62	55.49	50.07	15.70	9.77	61.45	61.45	11.81	0.00	20	20	5
2015	36.25	39.20	34.63	15.37	9.87	61.17	61.17	11.76	0.00	20	20	5
2016	33.66	34.40	30.65	15.18	9.63	60.01	60.01	11.54	0.00	20	20	5
2017	37.76	40.85	35.01	15.77	10.30	58.78	58.78	11.30	0.00	20	20	5
2018	36.98	39.95	34.10	17.33	10.78	59.36	59.36	11.41	0.00	20	20	5
2019	37.67	40.74	34.90	17.79	11.53	60.48	60.48	11.63	0.00	20	20	5
2020	38.36	41.54	35.70	18.09	11.88	61.34	61.34	11.79	0.00	20	20	5
2021	39.04	42.31	36.48	18.37	12.20	62.05	62.05	11.93	0.00	20	20	5
2022	40.71	44.21	38.38	18.05	12.20	62.84	62.84	12.08	0.00	20	20	5
2023	41.74	45.39	39.58	18.08	12.35	63.43	63.43	12.19	0.00	20	20	5
2024	42.77	46.57	40.78	18.23	12.63	64.04	64.04	12.31	0.00	20	20	5
2025	44.30	48.32	42.55	19.22	13.39	64.65	64.65	12.43	0.00	20	20	5
2026	45.34	49.51	43.76	19.42	13.45	65.27	65.27	12.55	0.00	20	20	5
2027	46.38	50.70	44.96	18.54	13.05	65.89	65.89	12.67	0.00	20	20	5
2028	47.42	51.89	46.17	18.90	13.00	66.53	66.53	12.79	0.00	20	20	5
2029	48.96	53.65	47.96	18.92	12.93	67.17	67.17	12.91	0.00	20	20	5
2030	50.00	54.85	49.17	18.48	13.06	67.83	67.83	13.04	0.00	20	20	5
2031	50.00	54.85	49.17	18.48	13.06	68.48	68.48	13.16	0.00	20	20	5
2032	50.00	54.85	49.17	18.48	13.06	69.14	69.14	13.29	0.00	20	20	5
2033	50.00	54.85	49.17	18.48	13.06	69.81	69.81	13.42	0.00	20	20	5
2034	50.00	54.85	49.17	18.48	13.06	70.47	70.47	13.55	0.00	20	20	5
2035	50.00	54.85	49.17	18.48	13.06	71.14	71.14	13.68	0.00	20	20	5
2036	50.00	54.85	49.17	18.48	13.06	71.82	71.82	13.81	0.00	20	20	5
2037	50.00	54.85	49.17	18.48	13.06	72.49	72.49	13.94	0.00	20	20	5
2038	50.00	54.85	49.17	18.48	13.06	73.13	73.13	14.06	0.00	20	20	5
2039	50.00	54.85	49.17	18.48	13.06	73.71	73.71	14.17	0.00	20	20	5
2040	50.00	54.85	49.17	18.48	13.06	74.28	74.28	14.28	0.00	20	20	5
2041	50.00	54.85	49.17	18.48	13.06	74.86	74.86	14.39	0.00	20	20	5
2042	50.00	54.85	49.17	18.48	13.06	75.45	75.45	14.50	0.00	20	20	5
2043	50.00	54.85	49.17	18.48	13.06	76.04	76.04	14.62	0.00	20	20	5
2044	50.00	54.85	49.17	18.48	13.06	76.64	76.64	14.73	0.00	20	20	5
2045	50.00	54.85	49.17	18.48	13.06	77.24	77.24	14.85	0.00	20	20	5
2046	50.00	54.85	49.17	18.48	13.06	77.84	77.84	14.96	0.00	20	20	5
2047	50.00	54.85	49.17	18.48	13.06	78.45	78.45	15.08	0.00	20	20	5
2048	50.00	54.85	49.17	18.48	13.06	79.06	79.06	15.20	0.00	20	20	5
2049	50.00	54.85	49.17	18.48	13.06	79.68	79.68	15.32	0.00	20	20	5
2050	50.00	54.85	49.17	18.48	13.06	80.31	80.31	15.44	0.00	20	20	5
2051	50.00	54.85	49.17	18.48	13.06	80.94	80.94	15.56	0.00	20	20	5
2052	50.00	54.85	49.17	18.48	13.06	81.57	81.57	15.68	0.00	20	20	5
2053	50.00	54.85	49.17	18.48	13.06	82.21	82.21	15.80	0.00	20	20	5
2054	50.00	54.85	49.17	18.48	13.06	82.85	82.85	15.93	0.00	20	20	5
2055	50.00	54.85	49.17	18.48	13.06	83.50	83.50	16.05	0.00	20	20	5
2056	50.00	54.85	49.17	18.48	13.06	84.15	84.15	16.18	0.00	20	20	5
2057	50.00	54.85	49.17	18.48	13.06	84.81	84.81	16.30	0.00	20	20	5
2058	50.00	54.85	49.17	18.48	13.06	85.48	85.48	16.43	0.00	20	20	5
2059	50.00	54.85	49.17	18.48	13.06	86.14	86.14	16.56	0.00	20	20	5
2060	50.00	54.85	49.17	18.48	13.06	86.82	86.82	16.69	0.00	20	20	5
2061	50.00	54.85	49.17	18.48	13.06	87.50	87.50	16.82	0.00	20	20	5
2062	50.00	54.85	49.17	18.48	13.06	88.18	88.18	16.95	0.00	20	20	5
2063	50.00	54.85	49.17	18.48	13.06	88.87	88.87	17.08	0.00	20	20	5
2064	50.00	54.85	49.17	18.48	13.06	89.57	89.57	17.22	0.00	20	20	5
2065	50.00	54.85	49.17	18.48	13.06	90.27	90.27	17.35	0.00	20	20	5
2066	50.00	54.85	49.17	18.48	13.06	90.98	90.98	17.49	0.00	20	20	5
2067	50.00	54.85	49.17	18.48	13.06	91.69	91.69	17.63	0.00	20	20	5
2068	50.00	54.85	49.17	18.48	13.06	92.41	92.41	17.76	0.00	20	20	5
2069	50.00	54.85	49.17	18.48	13.06	93.13	93.13	17.90	0.00	20	20	5
2070	50.00	54.85	49.17	18.48	13.06	93.86	93.86	18.04	0.00	20	20	5
2071	50.00	54.85	49.17	18.48	13.06	94.59	94.59	18.18	0.00	20	20	5
2072	50.00	54.85	49.17	18.48	13.06	95.33	95.33	18.33	0.00	20	20	5
2073	50.00	54.85	49.17	18.48	13.06	96.08	96.08	18.47	0.00	20	20	5
2074	50.00	54.85	49.17	18.48	13.06	96.83	96.83	18.61	0.00	20	20	5
2075	50.00	54.85	49.17	18.48	13.06	97.59	97.59	18.76	0.00	20	20	5
2076	50.00	54.85	49.17	18.48	13.06	98.36	98.36	18.91	0.00	20	20	5
2077	50.00	54.85	49.17	18.48	13.06	99.13	99.13	19.06	0.00	20	20	5
2078	50.00	54.85	49.17	18.48	13.06	99.90	99.90	19.20	0.00	20	20	5
2079	50.00	54.85	49.17	18.48	13.06	100.68	100.68	19.35	0.00	20	20	5
2080	50.00	54.85	49.17	18.48	13.06	101.47	101.47	19.51	0.00	20	20	5
2081	50.00	54.85	49.17	18.48	13.06	102.27	102.27	19.66	0.00	20	20	5
2082	50.00	54.85	49.17	18.48	13.06	103.07	103.07	19.81	0.00	20	20	5
2083	50.00	54.85	49.17	18.48	13.06	103.87	103.87	19.97	0.00	20	20	5
2084	50.00	54.85	49.17	18.48	13.06	104.69	104.69	20.12	0.00	20	20	5
2085	50.00	54.85	49.17	18.48	13.06	105.51	105.51	20.28	0.00	20	20	5
2086	50.00	54.85	49.17	18.48	13.06	106.33	106.33	20.44	0.00	20	20	5
2087	50.00	54.85	49.17	18.48	13.06	107.16	107.16	20.60	0.00	20	20	5
2088	50.00	54.85	49.17	18.48	13.06	108.00	108.00	20.76	0.00	20	20	5
2089	50.00	54.85	49.17	18.48	13.06	108.85	108.85	20.92	0.00	20	20	5
2090	50.00	54.85	49.17	18.48	13.06	109.70	109.70	21.09	0.00	20	20	5
2091	50.00	54.85	49.17	18.48	13.06	110.56	110.56	21.25	0.00	20	20	5
2092	50.00	54.85	49.17	18.48	13.06	111.42	111.42	21.42	0.00	20	20	5
2093	50.00	54.85	49.17	18.48	13.06	112.30	112.30	21.59	0.00	20	20	5
2094	50.00	54.85	49.17	18.48	13.06	113.18	113.18	21.76	0.00	20	20	5
2095	50.00	54.85	49.17	18.48	13.06	114.06	114.06	21.93	0.00	20	20	5
2096	50.00	54.85	49.17	18.48	13.06	114.95	114.95	22.10	0.00	20	20	5
2097	50.00	54.85	49.17	18.48	13.06	115.85	115.85	22.27	0.00	20	20	5
2098	50.00	54.85	49.17	18.48	13.06	116.76	116.76	22.45	0.00	20	20	5
2099	50.00	54.85	49.17	18.48	13.06	117.67	117.67	22.62	0.00	20	20	5
2100	50.00	54.85	49.17	18.48	13.06	118.60	118.60	22.80	0.00	20	20	5

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WebTAG Databook (base year = 2010)

Annual Parameters

Year	GDP deflator[1] (2010 = 100)
1990	62.89
1991	67.02
1992	69.06
1993	70.86
1994	71.72
1995	73.46
1996	76.46
1997	77.17
1998	78.06
1999	78.71
2000	80.32
2001	81.01
2002	82.82
2003	84.81
2004	86.94
2005	89.24
2006	91.94
2007	94.31
2008	96.99
2009	98.45
2010	100.00
2011	102.01
2012	103.60
2013	105.58
2014	107.39
2015	107.88
2016	110.01
2017	112.17
2018	113.88
2019	115.65
2020	117.56
2021	119.57
2022	121.74
2023	124.42
2024	127.16
2025	129.96
2026	132.82
2027	135.74
2028	138.73
2029	141.78
2030	144.90
2031	148.08
2032	151.34
2033	154.67
2034	158.07
2035	161.55
2036	165.11
2037	168.74
2038	172.45
2039	176.24
2040	180.12
2041	184.08
2042	188.13
2043	192.27
2044	196.50
2045	200.83
2046	205.24
2047	209.76
2048	214.37
2049	219.09
2050	223.91
2051	228.84
2052	233.87
2053	239.02
2054	244.28
2055	249.65
2056	255.14
2057	260.75
2058	266.49
2059	272.35
2060	278.35
2061	284.47
2062	290.73
2063	297.12
2064	303.66
2065	310.34
2066	317.17
2067	324.15
2068	331.28
2069	338.57
2070	346.01
2071	353.63
2072	361.41
2073	369.36
2074	377.48
2075	385.79
2076	394.27
2077	402.95
2078	411.81
2079	420.87
2080	430.13
2081	439.60
2082	449.27
2083	459.15
2084	469.25
2085	479.58
2086	490.13
2087	500.91
2088	511.93
2089	523.19
2090	534.70
2091	546.47
2092	558.49
2093	570.77
2094	583.33
2095	596.16
2096	609.28
2097	622.68
2098	636.38
2099	650.38
2100	664.69

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Indexation

				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1																		
2	**General Index**	Unit	Source															
3	GDP	%	Webtag A5.3.1	97	98	100	102	103	105	107	109	112	114	117	119	122	124	127
4	Inflation	%					1.56%	1.65%	1.71%	1.82%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
5	Discount Rate	%	Webtag A1.1			0.00%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%
6																		
7																		
8	**2018 price**																	
9	Deflation	[calc]				1	0.98	0.97	0.95	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.79
10	GDP deflator	[calc]	Webtag A1.1			100	102	103	105	107	109	112	114	117	119	122	124	127
11	Discounting Factor	[calc]				1	0.97	0.93	0.90	0.87	0.84	0.81	0.79	0.76	0.73	0.71	0.68	0.66
12																		
13	**2021 price**																	
14	Deflation	[calc]							1	0.982	0.961	0.940	0.920	0.900	0.881	0.862	0.843	0.825
15	GDP deflator	[calc]	Webtag A1.1						100	102	104	106	109	111	114	116	119	121
16	Discounting Factor	[calc]							1	0.97	0.93	0.90	0.87	0.84	0.81	0.79	0.76	0.73
17																		
18	**2010 prices**																	
19	**Inflation**																	
20	Deflation	[calc]																
21	GDP deflator	[calc]	Webtag A1.1	110	112	114	116	118	120	122	124	127	130	133	136	139	142	145
22	Discounting Factor	[calc]		0.81	0.79	0.76	0.73	0.71	0.68	0.66	0.64	0.62	0.60	0.58	0.56	0.54	0.52	0.50

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JAQU Assumptions

Depreciation Assumptions

	Year																																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Car	37%	18%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
LGV	37%	18%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
HGV	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Bus	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Coach	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%

Source: JAQU (National data inputs for Local Economic Models.xlsm)

Euro standards implementation

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	1992	1996	2000	2005	2009	2014	2018	2020
Car Diesel	1992	1996	2000	2005	2009	2014	2018	2020
PHV Petrol	1992	1996	2000	2005	2009	2014	2018	2020
PHV Diesel	1992	1996	2000	2005	2009	2014	2018	2020
Taxi Petrol	1992	1996	2000	2005	2009	2014	2018	2020
Taxi Diesel	1992	1996	2000	2005	2009	2014	2018	2020
LGV petrol	1994	1998	2000	2005	2009	2014	2018	2020
LGV diesel	1994	1998	2000	2005	2009	2014	2018	2020
HGV Rigid	1992	1996	2000	2005	2008	2013	2018	2020
HGV Artic	1992	1996	2000	2005	2008	2013	2018	2020
Buses	1992	1996	2000	2005	2008	2013	2018	2020
Coach	1992	1996	2000	2005	2008	2013	2018	2020
Taxi Electric						2013	2018	2020
PHV Electric						2013	2018	2020

Source: JAQU

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Financial Case Input

Source: Financial summary for economic "finance to economics 181205"&"finance to economics 181205 v2", received 05/12/18 (Timothy Kooyers, Jacobs)

Costs

Nominal Prices	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Implementation Cost	**- 256,827,722**	- 29,341,774	- 137,031,574	- 50,015,159	- 34,503,490	- 1,312,225	- 1,154,692	- 1,079,032	- 1,050,572	- 1,064,844	- 274,360		
Operating Cost	**- 173,886,679**	- 842,958	- 1,012,339	- 21,295,246	- 22,202,893	- 23,431,050	- 22,061,893	- 20,613,316	- 20,146,971	- 19,360,599	- 18,626,628	- 4,292,786	

Adjusted for VAT and GDP deflator to base year 2018

2018 prices (market price)	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Implementation Cost	**- 293,634,541**	- 34,381,938	- 157,969,450	- 56,687,836	- 38,407,198	- 1,429,246	- 1,230,592	- 1,125,203	- 1,071,943	- 1,063,117	- 268,019	-	-
Operating Cost	**- 183,719,408**	- 987,756	- 1,167,021	- 24,136,311	- 24,714,917	- 25,520,575	- 23,512,054	- 21,495,362	- 20,556,813	- 19,329,201	- 18,196,106	- 4,103,293	-

Revenue

Nominal Prices	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenue	**261,529,253**			47,941,718	39,079,807	56,027,602	42,415,961	28,804,320	23,679,567	15,479,962	8,100,317		

Real 2018 prices	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenue	**281,633,161**	-	-	54,337,771	43,501,276	61,024,008	45,204,025	30,036,860	24,161,270	15,454,857	7,913,093	-	-

Incentive Funds

The incentive funds (excluding staff costs) is applied to offset the consumer welfare loss experienced when upgrading vehicles early.

Nominal Prices	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Clean Incentive Funds	**- 56,981,375**	- 2,688,030	- 13,832,346	- 19,932,939	- 20,528,060	-	-	-	-	-	-		
Clean Taxi Fund	**- 26,799,789**	- 2,572,247	- 12,229,956	- 9,863,545	- 2,134,040	-	-	-	-	-	-		
Clean Bus Fund	**- 28,153,929**	- 6,837,277	- 14,073,588	- 7,243,064	-	-	-	-	-	-	-		

2018 prices (market price)	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Clean Incentive Funds	**- 64,538,486**	- 3,149,765	- 15,945,873	- 22,592,254	- 22,850,594	-	-	-	-	-	-	-	-
Clean Taxi Fund	**- 30,667,694**	- 3,014,093	- 14,098,645	- 11,179,471	- 2,375,485	-	-	-	-	-	-	-	-
Clean Bus Fund	**- 32,445,105**	- 8,011,745	- 16,223,976	- 8,209,383	-	-	-	-	-	-	-	-	-

2018 prices (market price) (+ve benefit)	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Clean Incentive Funds	**64,538,486**	3,149,765	15,945,873	22,592,254	22,850,594	-	-	-	-	-	-	-	-
Clean Taxi Fund	**30,667,694**	3,014,093	14,098,645	11,179,471	2,375,485	-	-	-	-	-	-	-	-
Clean Bus Fund	**32,445,105**	8,011,745	16,223,976	8,209,383	-	-	-	-	-	-	-	-	-
Total	**127,651,285**	14,175,603	46,268,494	41,981,109	25,226,079	-	-	-	-	-	-	-	-

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TUBA Output

Source: \\EDIFIL01\Data\Environmental\Jobs\Economics\TfGM CAP\0_Project Works\TUBA

Option 8 2010 prices, discounted, £000s

£s, discounted, 2010 prices	Price Year	Total	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Time benefit	2010	78,975,000	9,197,000	8,794,000	8,423,000	8,074,000	7,748,000	7,602,000	7,466,000	7,340,000	7,222,000	7,109,000
Fuel VOC benefit	2010	5,249,000	585,000	575,000	563,000	552,000	544,000	523,000	504,000	483,000	468,000	452,000
Non-fuel VOC benefit	2010	37,130,000	3,238,000	3,489,000	3,721,000	3,932,000	4,125,000	3,986,000	3,850,000	3,720,000	3,595,000	3,474,000

2010 prices, undiscounted, £000s

Time benefit	2010	134,183,317	13,427,341	13,288,338	13,173,202	13,069,340	12,980,603	13,181,762	13,399,048	13,633,971	13,884,305	14,145,409
Fuel VOC benefit	2010	8,916,037	854,082	868,864	880,507	893,519	911,390	906,875	904,516	897,167	899,731	899,385
Non-fuel VOC benefit	2010	63,649,450	4,727,382	5,272,119	5,819,481	6,364,707	6,910,814	6,911,668	6,909,501	6,909,860	6,911,392	6,912,527

Inflation adjustment	2018 prices, undiscounted, £000s		1.196	1.217	1.244	1.272	1.300	1.328	1.357	1.387	1.418	1.449
Time benefit	2018	176,901,682	16,054,697	16,177,871	16,390,528	16,619,048	16,869,346	17,507,646	18,187,756	18,913,784	19,684,804	20,496,201
Fuel VOC benefit	2018	11,750,845	1,021,202	1,057,798	1,095,556	1,136,204	1,184,425	1,204,485	1,227,783	1,244,599	1,275,615	1,303,177
Non-fuel VOC benefit	2018	84,345,597	5,652,398	6,418,534	7,240,788	8,093,398	8,981,163	9,179,884	9,378,899	9,585,733	9,798,791	10,016,008

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Additional Measures Input and Assumptions

Clean Air Credits Scheme for cars

Maximum financial incentive offered (£):	3000
Percentage of average car price	24%

Source: Alec Curley, 22/10/2018

Clean Freight Fund scheme for vans, HGVs, minibuses and coaches

Maximum financial incentive offered - Van	3,189
Maximum financial incentive offered - HGV	15,721

Assumption: assume the public sector will subsidise the same percentage of the vehicle value as the percentage of the car subsidy

Clean Taxi Fund

Maximum financial incentive offered (£)	7,500

Source: https://tfl.gov.uk/info-for/taxis-and-private-hire/emissions-standards-for-taxis

Clean Bus Technology Fund

Maximum financial incentive offered - upgrade	38,285
Maximum financial incentive offered - retrofit	4,786

Fuel Switch

Assumed VKMs per vehicle per year		source:
Petrol Car	10,460	DfT, 2017 - https://www.gov.uk/government/statistical-data-sets/nts09-vehicle-mileage-and-occupancy
Diesel Car	16,254	DfT, 2017 - https://www.gov.uk/government/statistical-data-sets/nts09-vehicle-mileage-and-occupancy
Alternative Car	10,460	assumed equal to petrol car
Petrol PHV	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Diesel PHV	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Alternative PHV	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Petrol Taxi	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Diesel Taxi	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Alternative Taxi	40,233	taxi survey 2016 https://www.insuretaxi.com/2016/08/taxi-driver-survey-2016/
Petrol LGV	20,617	DfT, 2017 - https://www.telegraph.co.uk/connect/small-business/operations-and-logistics/renault/how-many-miles-do-vans-clock-up/
Diesel LGV	20,617	DfT, 2017 - https://www.telegraph.co.uk/connect/small-business/operations-and-logistics/renault/how-many-miles-do-vans-clock-up/
Alternative LGV	20,617	DfT, 2017 - https://www.telegraph.co.uk/connect/small-business/operations-and-logistics/renault/how-many-miles-do-vans-clock-up/
OGV1 (rigid)	28,000	DfT, 2017 road freight statistics table 0112
OGV2 (artic)	77,000	DfT, 2017 road freight statistics table 0113

Table TSGB0303 (ENV0103)

Average new car fuel consumption, Great Britain: 2000 to 2016[1,2]

litres per 100 km/miles per gallon

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Petrol cars	litres per 100km	8.0	7.9	7.8	7.7	7.6	7.5	7.4	7.2	7.0	6.5	6.3	6.1	5.8	5.6	5.5	5.4	5.4
	miles per gallon	35.3	35.8	36.2	36.8	37.0	37.5	38.3	39.0	40.5	43.4	44.6	46.3	48.3	50.1	51.1	52.0	52.2
Diesel cars	litres per 100km	6.3	6.2	6.1	6.2	6.2	6.2	6.3	6.2	5.9	5.7	5.5	5.2	5.0	4.9	4.7	4.6	4.5
	miles per gallon	44.6	45.5	46.0	45.5	45.7	45.4	45.1	45.7	47.7	49.4	51.8	54.4	56.2	58.0	59.9	61.6	62.2

1. These figures are registration weighted (weighted to account for the relative sales of different models of cars).
2. These figures are obtained under consistent, carefully controlled laboratory conditions and do not refect external factors such as cold starts, differing driving conditions, different loads carried, etc.

Source: DVLA database
Society of Motor Manufacturers and Traders (SMMT)
Defra/DECC's Greenhouse Gas Conversion Factors
Last updated: November 2017
Next update: December 2018
Telephone: 020 7944 6068
E-mail: environment.stats@dft.gsi.gov.uk

Active travel

Cumulative Active travel impact

Type	**2021**
Walking	1,940,000
Cycling	24,200,000
Total	26,140,000

\\EDIFIL01\Data\Environmental\Jobs\Economics\TfGM CAP\0_Project Works\Economic model\Active travel

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Frequency Data

Source: \\EDIFIL01\Data\Environmental\Jobs\Economics\TfGM CAP\0_Project Works\Supporting calculations\GM Vehicle Data.xlsx

Below presents the projected ANPR data for the inner ring road for 2021, projected from the base year 2021 raw data

Pre-Euro

	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Bus Diesel	Bus	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
Car Diesel	Car	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
Car Electric	Car	Electric	Non-compliant	0	0	0	2	0	0	0	**2**
Car Other	Car	Other	Non-compliant	5	4	3	0	0	0	0	**12**
Car Petrol	Car	Petrol	Non-compliant	0	0	0	0	0	0	0	**0**
HGV Diesel	HGV	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
PHV Diesel	PHV	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
Van Diesel	Van	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
	Grand Total			**5**	**4**	**3**	**2**	**0**	**0**	**0**	**14**

Euro 1

	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Bus Diesel	Bus	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
Car Diesel	Car	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
Car Electric	Car	Electric	Non-compliant	1	1	0	0	0	0	0	**2**
Car Other	Car	Other	Non-compliant	14	7	2	0	0	0	1	**24**
Car Petrol	Car	Petrol	Non-compliant	0	0	0	0	0	0	0	**0**
HGV Diesel	HGV	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
PHV Diesel	PHV	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
PHV Petrol	PHV	Petrol	Non-compliant	0	0	0	0	0	0	0	**0**
Van Diesel	Van	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
	Grand Total			**15**	**8**	**2**	**0**	**0**	**0**	**1**	**26**

Euro 2

	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Bus Diesel	Bus	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
Car Diesel	Car	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
Car Electric	Car	Electric	Non-compliant	2	1	1	0	1	0	0	**5**
Car Other	Car	Other	Non-compliant	17	4	3	1	2	1	0	**28**
Car Petrol	Car	Petrol	Non-compliant	0	0	0	0	0	0	0	**0**
Hackney Diesel	Hackney	Diesel	Non-compliant	8	6	0	2	4	0	3	**23**
HGV Diesel	HGV	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
PHV Other	PHV	Other	Non-compliant	0	0	0	0	0	0	0	**0**
PHV Diesel	PHV	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
PHV Petrol	PHV	Petrol	Non-compliant	0	0	0	0	0	0	0	**0**
Van Diesel	Van	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
	Grand Total			**27**	**11**	**4**	**3**	**7**	**1**	**3**	**56**

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Euro 3

	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Bus Diesel	Bus	Diesel	Non-compliant	25	12	9	11	11	2	1	**71**
Car Diesel	Car	Diesel	Non-compliant	1384	469	258	166	152	80	35	**2546**
Car Electric	Car	Electric	Non-compliant	4	2	1	2	2	2	0	**13**
Car Other	Car	Other	Non-compliant	197	59	42	22	28	11	2	**361**
Car Petrol	Car	Petrol	Non-compliant	4933	1750	954	663	624	324	138	**9387**
Hackney Other	Hackney	Other	Non-compliant	14	1	0	0	0	0	0	**15**
Hackney Diesel	Hackney	Diesel	Non-compliant	79	33	28	28	21	27	43	**259**
HGV Diesel	HGV	Diesel	Non-compliant	228	74	42	26	20	5	1	**395**
PHV Other	PHV	Other	Non-compliant	15	2	0	0	0	0	0	**17**
PHV Diesel	PHV	Diesel	Non-compliant	15	10	11	5	3	3	2	**48**
PHV Other	PHV	Other	Non-compliant	4	4	1	1	0	1	0	**10**
PHV Petrol	PHV	Petrol	Non-compliant	6	4	2	1	0	2	0	**16**
Van Diesel	Van	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
	Grand Total			**6904**	**2420**	**1348**	**924**	**862**	**457**	**222**	**13137**

Euro 4

	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Bus Diesel	Bus	Diesel	Non-compliant	17	9	7	6	10	11	11	**71**
Car Diesel	Car	Diesel	Non-compliant	12058	4350	2279	1591	1454	803	374	**22910**
Car Electric	Car	Electric	Non-compliant	3	2	0	0	2	0	0	**7**
Car Other	Car	Other	Non-compliant	644	233	123	75	84	46	31	**1236**
Car Petrol	Car	Petrol	Compliant	35557	12955	7080	5085	4859	2333	966	**68836**
Hackney Diesel	Hackney	Diesel	Non-compliant	186	83	82	72	79	149	335	**986**
Hackney Other	Hackney	Other	Non-compliant	0	1	0	0	0	0	0	**1**
Hackney Petrol	Hackney	Petrol	Compliant	1	0	0	0	0	0	0	**1**
HGV Diesel	HGV	Diesel	Non-compliant	467	137	78	56	42	10	2	**791**
PHV Diesel	PHV	Diesel	Non-compliant	87	64	59	54	54	54	59	**429**
PHV Other	PHV	Other	Non-compliant	19	16	13	5	5	8	7	**73**
PHV Petrol	PHV	Petrol	Compliant	27	24	15	13	13	13	10	**115**
Van Diesel	Van	Diesel	Non-compliant	5810	2201	1266	799	669	297	97	**11139**
	Grand Total			**54877**	**20074**	**11002**	**7756**	**7270**	**3724**	**1892**	**106595**

Euro 5

	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Bus Diesel	Bus	Diesel	Non-compliant	229	94	48	72	91	133	143	**810**
Car Diesel	Car	Diesel	Non-compliant	39115	14131	7444	5158	4677	2241	1056	**73822**
Car Electric	Car	Electric	Non-compliant	143	57	31	21	16	11	6	**285**
Car Other	Car	Other	Non-compliant	1732	605	346	211	180	98	51	**3223**
Car Petrol	Car	Petrol	Compliant	54986	19999	10628	7956	7839	3599	1375	**106382**
Hackney Diesel	Hackney	Diesel	Non-compliant	69	31	28	36	36	80	192	**472**
Hackney Other	Hackney	Other	Non-compliant	0	0	0	0	0	0	0	**0**
Hackney Petrol	Hackney	Petrol	Compliant	0	2	1	0	1	0	0	**4**
HGV Diesel	HGV	Diesel	Non-compliant	2687	832	406	282	227	74	38	**4546**
PHV Diesel	PHV	Diesel	Non-compliant	150	152	138	164	206	244	329	**1384**
PHV Electric	PHV	Electric	Non-compliant	0	1	0	0	0	0	0	**1**
PHV Other	PHV	Other	Non-compliant	12	13	16	13	21	21	19	**113**
PHV Petrol	PHV	Petrol	Compliant	14	16	27	32	26	25	37	**177**
Van Diesel	Van	Diesel	Non-compliant	9382	3826	2309	1615	1419	576	180	**19308**
	Grand Total			**108519**	**39758**	**21423**	**15559**	**14740**	**7101**	**3426**	**210526**

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Euro 6

	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Bus Diesel	Bus	Diesel	Compliant	401	157	131	70	161	196	314	**1430**
Car Diesel	Car	Diesel	Compliant	29424	12844	7773	5616	4691	2263	1029	**63640**
Car Electric	Car	Electric	Compliant	9077	4715	2711	1768	2593	707	354	**21926**
Car Other	Car	Other	Compliant	630	333	188	137	140	60	23	**1511**
Car Petrol	Car	Petrol	Compliant	23871	10524	6340	4529	4758	2233	936	**53191**
Hackney Diesel	Hackney	Diesel	Compliant	3	1	2	3	7	7	17	**40**
HGV Diesel	HGV	Diesel	Compliant	7987	2745	1266	869	721	291	154	**14032**
PHV Diesel	PHV	Diesel	Compliant	67	94	111	122	178	205	416	**1193**
PHV Other	PHV	Other	Compliant	4	4	5	8	9	8	20	**56**
PHV Petrol	PHV	Petrol	Compliant	0	89	0	0	0	0	0	**89**
Van Diesel	Van	Diesel	Compliant	4321	2550	1730	1380	1240	510	150	**11882**
	Grand Total			**75784**	**34056**	**20256**	**14501**	**14498**	**6481**	**3413**	**168989**

Euro 6c

	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Car Diesel	Car	Diesel	Compliant	40017	17467	10571	7637	6379	3078	1400	**86550**
Car Electric	Car	Electric	Compliant	0	0	0	0	0	0	0	**0**
Car Other	Car	Other	Compliant	0	0	0	0	0	0	0	**0**
Car Petrol	Car	Petrol	Compliant	32296	14238	8577	6127	6437	3022	1267	**71964**
PHV Diesel	PHV	Diesel	Compliant	91	128	151	166	241	279	566	**1622**
PHV Other	PHV	Other	Compliant	5	5	7	10	12	10	27	**76**
PHV Petrol	PHV	Petrol	Compliant	0	120	0	0	0	0	0	**120**
	Grand Total			**72409**	**31959**	**19305**	**13940**	**13070**	**6389**	**3260**	**160332**

Euro 6d

	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Car Diesel	Car	Diesel	Compliant	2354	1027	622	449	375	181	82	**5091**
Car Electric	Car	Electric	Compliant	0	0	0	0	0	0	0	**0**
Car Other	Car	Other	Compliant	0	0	0	0	0	0	0	**0**
Car Petrol	Car	Petrol	Compliant	0	0	0	0	0	0	0	**0**
PHV Diesel	PHV	Diesel	Compliant	5	8	9	10	14	16	33	**95**
PHV Other	PHV	Other	Compliant	0	0	0	0	0	0	0	**0**
PHV Petrol	PHV	Petrol	Compliant	0	0	0	0	0	0	0	**0**
	Grand Total			**2359**	**1035**	**631**	**459**	**389**	**197**	**116**	**5187**

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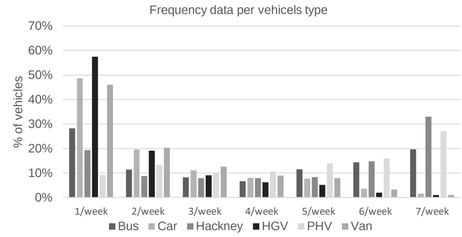
	Veh Type	Fuel	Compliance	1	2	3	4	5	6	7	Grand Total
Bus Diesel	Bus	Diesel	Compliant	401	157	131	70	161	196	314	**1430**
Bus Diesel	Bus	Diesel	Non-compliant	271	115	64	88	112	146	156	**953**
Car Diesel	Car	Diesel	Compliant	124353	50289	28947	20618	17729	8646	3977	**254558**
Car Diesel	Car	Diesel	Non-compliant	0	0	0	0	0	0	0	**0**
Car Electric	Car	Electric	Compliant	9230	4778	2744	1793	2614	720	360	**22240**
Car Electric	Car	Electric	Non-compliant	0	0	0	0	0	0	0	**0**
Car Other	Car	Other	Compliant	3239	1245	707	446	434	216	108	**6395**
Car Other	Car	Other	Non-compliant	0	0	0	0	0	0	0	**0**
Car Petrol	Car	Petrol	Compliant	151644	59466	33579	24360	24518	11511	4682	**309760**
Car Petrol	Car	Petrol	Non-compliant	0	0	0	0	0	0	0	**0**
Hackney Diesel	Hackney	Diesel	Compliant	3	1	2	3	7	7	17	**40**
Hackney Diesel	Hackney	Diesel	Non-compliant	342	153	138	138	140	256	573	**1740**
Hackney Other	Hackney	Other	Non-compliant	0	0	0	0	0	0	0	**0**
Hackney Petrol	Hackney	Petrol	Compliant	1	2	1	0	1	0	0	**5**
HGV Diesel	HGV	Diesel	Compliant	7987	2745	1266	869	721	291	154	**14032**
HGV Diesel	HGV	Diesel	Non-compliant	3382	1042	526	363	289	88	41	**5732**
PHV Diesel	PHV	Diesel	Compliant	162	230	271	298	433	501	1015	**2910**
PHV Diesel	PHV	Diesel	Non-compliant	252	225	208	223	263	301	390	**1861**
PHV Electric	PHV	Electric	Non-compliant	0	0	0	0	0	0	0	**0**
PHV Other	PHV	Other	Compliant	55	39	40	35	46	47	73	**335**
PHV Other	PHV	Other	Non-compliant	0	0	0	0	0	0	0	**0**
PHV Petrol	PHV	Petrol	Compliant	47	253	45	46	39	40	47	**516**
PHV Petrol	PHV	Petrol	Non-compliant	0	0	0	0	0	0	0	**0**
Van Diesel	Van	Diesel	Compliant	4321	2550	1730	1380	1240	510	150	**11882**
Van Diesel	Van	Diesel	Non-compliant	15192	6027	3575	2414	2088	874	277	**30447**
Grand Total				**320881**	**129319**	**73973**	**53144**	**50837**	**24349**	**12332**	**664835**

	1	2	3	4	5	6	7	Grand Total
Bus	673	272	195	158	274	342	470	2383
Car	288466	115778	65977	47217	45296	21094	9127	592953
Hackney	346	156	141	141	148	263	590	1785
HGV	11369	3787	1792	1233	1010	379	195	19764
PHV	516	747	563	602	781	888	1524	5622
Van	19512	8578	5305	3794	3328	1384	427	42328

	1/week	2/week	3/week	4/week	5/week	6/week	7/week	Grand Total
Bus	28%	11%	8%	7%	11%	14%	20%	100%
Car	49%	20%	11%	8%	8%	4%	2%	100%
Hackney	19%	9%	8%	8%	8%	15%	33%	100%
HGV	58%	19%	9%	6%	5%	2%	1%	100%
PHV	9%	13%	10%	11%	14%	16%	27%	100%
Van	46%	20%	13%	9%	8%	3%	1%	100%



No. of Vehicles by euro standards and vehicle type

	Car Petrol	Car Diesel	Car Electric	Car Other	Hackney Petrol	Hackney Diese	Hackney Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	Van Petrol	Van Diesel	Van Other	HGV Petrol	HGV Diesel	HGV Other	Bus Petrol	Bus Diesel	Bus Other
2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	2	12					-				0			0			0	
1	-	-	2	24				-	-				0			0			0	
2	-	-	5	28		23		-	-		0		0			0			0	
3	9,387	2,546	13	361		259	15	16	48		17		0			395			71	
4	68,836	22,910	7	1236	1	986	1	115	429		72.82		11139			791			71	
5	106,382	73,822	285	3223	4	472	0	177	1,384	1	112.54		19308			4546			810	
6	53,191	63,640	21926	1511		40		89	1,193		56.27		11882			14032			1430	
6c	71,964	86,550	0	0				120	1,622		76.13									
6d	-	5,091	0	0				-	95		0									
Sub-total	**309,760**	**254,558**	**22,240**	**6,395**	**5**	**1,780**	**16**	**516**	**4,771**	**1**	335	-	**42,328**	-	-	**19,764**	-	-	**2,383**	-
Total	**Car Total**			**592,953**	**Taxi Total**		**1801**	**PHV Total**			**5623**	**LGV Total**		**42328.2**	**HGV Total**		**19764**	**Bus Total**		**2383**

Proportion of Vehicles by vehicle type

	Car Petrol	Car Diesel	Car Electric	Car Other	Hackney Petrol	Hackney Diese	Hackney Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	Van Petrol	Van Diesel	Van Other	HGV Petrol	HGV Diesel	HGV Other	Bus Petrol	Bus Diesel	Bus Other
2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%	0%	0%	0%					0%				0%			0%			0%	
1	0%	0%	0%	0%				0%	0%				0%			0%			0%	
2	0%	0%	0%	0%		1%		0%	0%		0%		0%			0%			0%	
3	2%	0%	0%	0%		14%	1%	0%	1%		0%		0%			2%			3%	
4	12%	4%	0%	0%	0%	55%	0%	2%	8%		1%		26%			4%			3%	
5	18%	12%	0%	1%	0%	26%	0%	3%	25%	0%	2%		46%			23%			34%	
6	9%	11%	4%	0%		2%		2%	21%		1%		28%			71%			60%	
6c	12%	15%	0%	0%				2%	29%		1%									
6d	0%	1%	0%	0%				0%	2%		0%									
Sub-total	**52%**	**43%**	**4%**	**1%**	**0%**	**99%**	**1%**	9%	**85%**	**0%**	**6%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**100%**	**Taxi Total**		**100%**	**PHV Total**			**100%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

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Expansion Factors

AADT/AAWT Road Traffic Annualisation Factors (Air Quality - 24 hour Period)						
Hour to Period Factors						
	Motorways			Other Roads		
	AM Peak Hour to AM Peak Period	Inter-Peak Hour to Off-Peak Period	PM Peak Hour to PM Peak Period	AM Peak Hour to AM Peak Period	Inter-Peak Hour to Off-Peak Period	PM Peak Hour to PM Peak Period
Cars/Motorcycles	2.871	9.944	2.862	2.693	9.649	2.807
LGVS	3.117	9.944	3.116	3.125	9.649	3.071
Rigid HGVS	3.055	9.944	3.1	3.04	9.649	3.472
Articulated HGVS	3.167	9.944	3.044	3.018	9.649	3.049
Buses	3.648	9.944	3.15	2.941	9.649	3.098

Source:
\\EDIFIL01\Data\Environmental\Jobs\Economics\TfGM CAP\0_Project Works\Data and Downloads\2019-01-28 From Adam James

Notes:
AM peak period = 0700-1000
PM peak period = 1600-1900
Off-peak period = 0000-0700 + 1000-1600 + 1900-2400

The off-peak period to weekend factors convert weekday off-peak period flows to all day Saturday/Sunday/Bank Holiday flows. (Bank holiday flows are assumed to be similar to Sunday flows).

draft for approval

Behavioural Response (trips)

Response	Car	Taxis	PHVs	LGVs	HGVs	Buses/Coaches
Pay Charge	0.00%	0.00%	30.20%	9.60%	9.40%	0%
Change Mode	0.00%	0.00%	0.00%	7.50%	0.00%	0%
Cancel Trip	0.00%	0.00%	0.00%	7.50%	4.20%	0%
Upgrade Vehicle	0.00%	100.00%	69.80%	75.40%	86.50%	100%

Source: Behavioural Response (Adam James-Jon Addy, Jacobs)

Car Response to charging

Charge Level	£3.00	£3.50	£4.00	£4.50	£5.00	£5.50	£6.00	£6.50	£7.00	£7.50	£8.00	£8.50	£9.00	£9.50	£10.00	£10.50	£11.00	£11.50	£12.00	£12.50
Pay Charge	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Change Mode	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cancel Trip	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Upgrade Vehicle	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Private Hire taxi response to charging

Charge Level	£3.00	£3.50	£4.00	£4.50	£5.00	£5.50	£6.00	£6.50	£7.00	£7.50	£8.00	£8.50	£9.00	£9.50	£10.00	£10.50	£11.00	£11.50	£12.00	£12.50
Pay Charge	53.70%	51.30%	48.70%	46.10%	43.50%	40.80%	38.10%	35.40%	32.80%	30.20%	27.60%	25.20%	22.80%	20.50%	18.40%	16.40%	14.50%	12.80%	11.20%	9.80%
Change Mode	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cancel Trip	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Upgrade Vehicle	46.30%	48.80%	51.30%	53.90%	56.50%	59.20%	61.90%	64.60%	67.20%	69.80%	72.40%	74.80%	77.20%	79.50%	81.60%	83.60%	85.50%	87.20%	88.80%	90.20%

LGV response to charging:

Charge Level	£3.00	£3.50	£4.00	£4.50	£5.00	£5.50	£6.00	£6.50	£7.00	£7.50	£8.00	£8.50	£9.00	£9.50	£10.00	£10.50	£11.00	£11.50	£12.00	£12.50
Pay Charge	24.50%	22.50%	20.60%	18.80%	17.00%	15.30%	13.70%	12.30%	10.90%	9.60%	8.50%	7.40%	6.50%	5.60%	4.90%	4.20%	3.60%	3.10%	2.60%	2.20%
Change Mode	4.40%	4.80%	5.10%	5.50%	5.90%	6.20%	6.60%	6.90%	7.20%	7.50%	7.80%	8.10%	8.30%	8.50%	8.60%	8.80%	8.90%	9.00%	9.00%	9.00%
Cancel Trip	5.10%	5.50%	5.80%	6.10%	6.40%	6.60%	6.90%	7.10%	7.30%	7.50%	7.60%	7.70%	7.80%	7.80%	7.80%	7.80%	7.70%	7.60%	7.50%	7.40%
Upgrade Vehicle	66.00%	67.20%	68.50%	69.60%	70.70%	71.80%	72.80%	73.70%	74.60%	75.40%	76.10%	76.80%	77.50%	78.10%	78.70%	79.20%	79.80%	80.30%	80.80%	81.30%

HGV response to charging

Response	HGV	
Pay Charge	9.4%	
Change Mode	0.0%	Avoid
Cancel Trip	4.2%	
Upgrade Vehicle	86.5%	

Hackney cab response to charging

Upgrade Vehicle	100%

Buses/Coaches

Upgrade	100%

draft for approval

Modelled Two-Way Cordon Crossing Flows (PCUs per Hour)

Do Minimum

AM Peak Hour

Vehicle Type	MCC	%	IRR	%	M60	%	Ashton	%	Bolton	%	Bury	%	Oldham	%	Rochdale	%	Stockport	%	Wigan	%	Total Cordon Crossings
Compliant Car	21,430	57.9%	29,802	59.6%	56,184	58.1%	5,885	56.4%	7,942	56.7%	9,308	59.7%	3,907	54.0%	6,410	56.5%	2,876	57.2%	4,401	51.1%	96,912
Non-Compliant Car	5,974	16.1%	8,308	16.6%	15,662	16.2%	1,640	15.7%	2,214	15.8%	2,595	16.6%	1,089	15.1%	1,787	15.7%	802	15.9%	1,227	14.2%	27,015
All Car	**27,404**	**74.0%**	**38,110**	**76.3%**	**71,846**	**74.4%**	**7,525**	**72.1%**	**10,155**	**72.6%**	**11,903**	**76.3%**	**4,996**	**69.1%**	**8,197**	**72.2%**	**3,678**	**73.2%**	**5,628**	**65.3%**	123,927
Compliant LGV	2,493	6.7%	3,036	6.1%	7,104	7.4%	869	8.3%	1,062	7.6%	986	6.3%	506	7.0%	946	8.3%	313	6.2%	819	9.5%	12,606
Non-Compliant LGV	1,820	4.9%	2,217	4.4%	5,187	5.4%	635	6.1%	776	5.5%	720	4.6%	370	5.1%	690	6.1%	228	4.5%	598	6.9%	9,203
All LGV	**4,313**	**11.7%**	**5,253**	**10.5%**	**12,291**	**12.7%**	**1,504**	**14.4%**	**1,838**	**13.1%**	**1,706**	**10.9%**	**876**	**12.1%**	**1,636**	**14.4%**	**541**	**10.8%**	**1,417**	**16.4%**	21,809
Compliant OGV	1,245	3.4%	1,547	3.1%	4,151	4.3%	467	4.5%	443	3.2%	478	3.1%	203	2.8%	475	4.2%	141	2.8%	323	3.7%	6,680
Non-Compliant OGV	506	1.4%	629	1.3%	1,687	1.7%	190	1.8%	180	1.3%	194	1.2%	82	1.1%	193	1.7%	57	1.1%	131	1.5%	2,715
All OGV	**1,751**	**4.7%**	**2,175**	**4.4%**	**5,838**	**6.0%**	**656**	**6.3%**	**623**	**4.4%**	**672**	**4.3%**	**285**	**3.9%**	**668**	**5.9%**	**198**	**3.9%**	**454**	**5.3%**	9,395
Compliant Taxi	1,187	3.2%	1,634	3.3%	3,005	3.1%	313	3.0%	429	3.1%	519	3.3%	209	2.9%	338	3.0%	147	2.9%	235	2.7%	5,196
Non-Compliant Taxi	858	2.3%	1,182	2.4%	2,173	2.2%	226	2.2%	310	2.2%	376	2.4%	151	2.1%	245	2.2%	106	2.1%	170	2.0%	3,758
All Taxi	**2,045**	**5.5%**	**2,815**	**5.6%**	**5,178**	**5.4%**	**540**	**5.2%**	**740**	**5.3%**	**895**	**5.7%**	**360**	**5.0%**	**583**	**5.1%**	**253**	**5.0%**	**405**	**4.7%**	8,954
Bus	1,498	4.0%	1,615	3.2%	1,472	1.5%	209	2.0%	641	4.6%	417	2.7%	718	9.9%	262	2.3%	357	7.1%	713	8.3%	4,789
Total	**37,011**	**100.0%**	**49,969**	**100.0%**	**96,626**	**100.0%**	**10,434**	**100.0%**	**13,997**	**100.0%**	**15,593**	**100.0%**	**7,234**	**100.0%**	**11,347**	**100.0%**	**5,026**	**100.0%**	**8,617**	**100.0%**	168,874

Inter-Peak Hour

Vehicle Type	MCC	%	IRR	%	M60	%	Ashton	%	Bolton	%	Bury	%	Oldham	%	Rochdale	%	Stockport	%	Wigan	%	Total Cordon Crossings
Compliant Car	14,996	51.5%	20,399	53.8%	40,083	53.5%	5,354	52.6%	7,143	55.4%	8,377	58.2%	3,137	51.9%	7,198	56.1%	2,312	53.0%	4,205	52.4%	77,808
Non-Compliant Car	4,180	14.4%	5,686	15.0%	11,172	14.9%	1,492	14.7%	1,991	15.5%	2,335	16.2%	874	14.5%	2,006	15.6%	644	14.8%	1,172	14.6%	21,688
All Car	**19,175**	**65.9%**	**26,084**	**68.8%**	**51,256**	**68.4%**	**6,846**	**67.3%**	**9,134**	**70.9%**	**10,712**	**74.5%**	**4,011**	**66.4%**	**9,204**	**71.8%**	**2,956**	**67.8%**	**5,377**	**67.0%**	99,496
Compliant LGV	2,857	9.8%	3,494	9.2%	6,922	9.2%	1,034	10.2%	1,087	8.4%	1,048	7.3%	467	7.7%	1,123	8.8%	332	7.6%	675	8.4%	12,688
Non-Compliant LGV	2,086	7.2%	2,551	6.7%	5,054	6.7%	755	7.4%	794	6.2%	765	5.3%	341	5.6%	820	6.4%	242	5.6%	493	6.1%	9,264
All LGV	**4,944**	**17.0%**	**6,044**	**15.9%**	**11,975**	**16.0%**	**1,789**	**17.6%**	**1,881**	**14.6%**	**1,813**	**12.6%**	**807**	**13.4%**	**1,943**	**15.1%**	**574**	**13.2%**	**1,168**	**14.6%**	21,951
Compliant OGV	1,562	5.4%	1,740	4.6%	4,764	6.4%	637	6.3%	482	3.7%	484	3.4%	176	2.9%	557	4.3%	203	4.6%	305	3.8%	7,608
Non-Compliant OGV	635	2.2%	707	1.9%	1,936	2.6%	259	2.5%	196	1.5%	197	1.4%	71	1.2%	226	1.8%	82	1.9%	124	1.5%	3,092
All OGV	**2,196**	**7.5%**	**2,447**	**6.5%**	**6,700**	**8.9%**	**896**	**8.8%**	**679**	**5.3%**	**680**	**4.7%**	**247**	**4.1%**	**784**	**6.1%**	**285**	**6.5%**	**430**	**5.4%**	10,700
Compliant Taxi	807	2.8%	1,103	2.9%	2,143	2.9%	283	2.8%	370	2.9%	469	3.3%	172	2.8%	389	3.0%	125	2.9%	224	2.8%	4,174
Non-Compliant Taxi	583	2.0%	797	2.1%	1,549	2.1%	204	2.0%	267	2.1%	339	2.4%	124	2.1%	281	2.2%	90	2.1%	162	2.0%	3,017
All Taxi	**1,390**	**4.8%**	**1,900**	**5.0%**	**3,692**	**4.9%**	**487**	**4.8%**	**637**	**4.9%**	**808**	**5.6%**	**297**	**4.9%**	**670**	**5.2%**	**215**	**4.9%**	**386**	**4.8%**	7,191
Bus	1,400	4.8%	1,455	3.8%	1,295	1.7%	160	1.6%	552	4.3%	371	2.6%	679	11.2%	227	1.8%	332	7.6%	663	8.3%	4,279
Total	**29,105**	**100.0%**	**37,931**	**100.0%**	**74,918**	**100.0%**	**10,178**	**100.0%**	**12,883**	**100.0%**	**14,384**	**100.0%**	**6,041**	**100.0%**	**12,828**	**100.0%**	**4,362**	**100.0%**	**8,023**	**100.0%**	143,617

PM-Peak

Vehicle Type	MCC	%	IRR	%	M60	%	Ashton	%	Bolton	%	Bury	%	Oldham	%	Rochdale	%	Stockport	%	Wigan	%	Total Cordon Crossings
Compliant Car	22,758	62.9%	32,212	63.9%	62,943	63.0%	6,916	62.6%	9,054	62.3%	11,042	63.0%	4,458	60.4%	7,039	61.8%	2,096	58.1%	5,488	57.9%	109,035
Non-Compliant Car	6,344	17.5%	8,979	17.8%	17,546	17.6%	1,928	17.4%	2,523	17.4%	3,078	17.6%	1,243	16.8%	1,962	17.2%	584	16.2%	1,530	16.1%	30,394
All Car	**29,102**	**80.5%**	**41,191**	**81.7%**	**80,488**	**80.5%**	**8,844**	**80.1%**	**11,577**	**79.7%**	**14,120**	**80.5%**	**5,700**	**77.2%**	**9,002**	**79.0%**	**2,680**	**74.3%**	**7,018**	**74.0%**	139,429
Compliant LGV	1,697	4.7%	2,325	4.6%	5,592	5.6%	647	5.9%	783	5.4%	1,019	5.8%	355	4.8%	692	6.1%	210	5.8%	614	6.5%	9,913
Non-Compliant LGV	1,239	3.4%	1,698	3.4%	4,083	4.1%	473	4.3%	572	3.9%	744	4.2%	259	3.5%	505	4.4%	153	4.3%	448	4.7%	7,237
All LGV	**2,935**	**8.1%**	**4,023**	**8.0%**	**9,674**	**9.7%**	**1,120**	**10.1%**	**1,355**	**9.3%**	**1,762**	**10.1%**	**615**	**8.3%**	**1,198**	**10.5%**	**364**	**10.1%**	**1,063**	**11.2%**	17,150
Compliant OGV	439	1.2%	544	1.1%	1,985	2.0%	167	1.5%	212	1.5%	172	1.0%	52	0.7%	245	2.1%	42	1.2%	223	2.4%	3,098
Non-Compliant OGV	179	0.5%	221	0.4%	807	0.8%	68	0.6%	86	0.6%	70	0.4%	21	0.3%	99	0.9%	17	0.5%	91	1.0%	1,259
All OGV	**618**	**1.7%**	**765**	**1.5%**	**2,792**	**2.8%**	**235**	**2.1%**	**298**	**2.0%**	**242**	**1.4%**	**74**	**1.0%**	**344**	**3.0%**	**59**	**1.6%**	**314**	**3.3%**	4,357
Compliant Taxi	1,257	3.5%	1,772	3.5%	3,374	3.4%	397	3.6%	489	3.4%	618	3.5%	245	3.3%	374	3.3%	105	2.9%	301	3.2%	5,902
Non-Compliant Taxi	909	2.5%	1,281	2.5%	2,439	2.4%	287	2.6%	353	2.4%	447	2.6%	177	2.4%	270	2.4%	76	2.1%	217	2.3%	4,267
All Taxi	**2,166**	**6.0%**	**3,053**	**6.1%**	**5,813**	**5.8%**	**683**	**6.2%**	**842**	**5.8%**	**1,066**	**6.1%**	**421**	**5.7%**	**644**	**5.7%**	**181**	**5.0%**	**518**	**5.5%**	10,169
Bus	**1,336**	**3.7%**	**1,400**	**2.8%**	**1,156**	**1.2%**	**165**	**1.5%**	**458**	**3.2%**	**342**	**2.0%**	**575**	**7.8%**	**202**	**1.8%**	**323**	**9.0%**	**567**	**6.0%**	3,788
Total	**36,156**	**100.0%**	**50,432**	**100.0%**	**99,924**	**100.0%**	**11,048**	**100.0%**	**14,530**	**100.0%**	**17,532**	**100.0%**	**7,385**	**100.0%**	**11,389**	**100.0%**	**3,606**	**100.0%**	**9,479**	**100.0%**	174,892

Do Something

AM Peak Hour

Vehicle Type	MCC	%	IRR	%	M60	%	Ashton	%	Bolton	%	Bury	%	Oldham	%	Rochdale	%	Stockport	%	Wigan	%	Total Cordon Crossings
Compliant Car	24,007	66.6%	32,484	67.1%	59,389	63.6%	6,325	61.2%	8,402	61.7%	9,888	64.7%	4,003	57.8%	6,759	60.8%	3,007	61.8%	4,646	55.0%	102,419
Non-Compliant Car	2,948	8.2%	4,843	10.0%	11,007	11.8%	1,232	11.9%	1,651	12.1%	1,981	13.0%	800	11.5%	1,361	12.2%	596	12.2%	931	11.0%	19,559
All Car	**26,955**	**74.8%**	**37,326**	**77.1%**	**70,395**	**75.4%**	**7,557**	**73.1%**	**10,053**	**73.8%**	**11,869**	**77.6%**	**4,803**	**69.3%**	**8,120**	**73.0%**	**3,602**	**74.0%**	**5,577**	**66.0%**	121,976
Compliant LGV	3,022	8.4%	3,481	7.2%	7,716	8.3%	962	9.3%	1,135	8.3%	1,058	6.9%	541	7.8%	1,034	9.3%	332	6.8%	881	10.4%	13,659
Non-Compliant LGV	1,187	3.3%	1,636	3.4%	4,349	4.7%	552	5.3%	647	4.7%	627	4.1%	318	4.6%	612	5.5%	196	4.0%	522	6.2%	7,823
All LGV	**4,209**	**11.7%**	**5,116**	**10.6%**	**12,064**	**12.9%**	**1,514**	**14.7%**	**1,781**	**13.1%**	**1,685**	**11.0%**	**859**	**12.4%**	**1,647**	**14.8%**	**529**	**10.9%**	**1,403**	**16.6%**	21,482
Compliant OGV	1,667	4.6%	2,067	4.3%	5,552	5.9%	595	5.8%	562	4.1%	622	4.1%	268	3.9%	618	5.6%	189	3.9%	414	4.9%	8,820
Non-Compliant OGV	51	0.1%	62	0.1%	167	0.2%	50	0.5%	42	0.3%	26	0.2%	7	0.1%	21	0.2%	5	0.1%	31	0.4%	349
All OGV	**1,719**	**4.8%**	**2,128**	**4.4%**	**5,719**	**6.1%**	**645**	**6.2%**	**604**	**4.4%**	**648**	**4.2%**	**275**	**4.0%**	**639**	**5.7%**	**194**	**4.0%**	**445**	**5.3%**	9,169
Compliant Taxi	1,495	4.1%	1,990	4.1%	3,295	3.5%	357	3.5%	465	3.4%	580	3.8%	242	3.5%	402	3.6%	161	3.3%	268	3.2%	5,770
Non-Compliant Taxi	154	0.4%	215	0.4%	466	0.5%	51	0.5%	82	0.6%	87	0.6%	30	0.4%	53	0.5%	23	0.5%	38	0.4%	830
All Taxi	**1,649**	**4.6%**	**2,205**	**4.6%**	**3,762**	**4.0%**	**408**	**3.9%**	**547**	**4.0%**	**667**	**4.4%**	**272**	**3.9%**	**454**	**4.1%**	**184**	**3.8%**	**306**	**3.6%**	6,600
Bus	1,509	4.2%	1,625	3.4%	1,479	1.6%	209	2.0%	642	4.7%	419	2.7%	720	10.4%	263	2.4%	358	7.4%	715	8.5%	4,805
Total	**36,040**	**100.0%**	**48,401**	**100.0%**	**93,419**	**100.0%**	**10,333**	**100.0%**	**13,628**	**100.0%**	**15,288**	**100.0%**	**6,929**	**100.0%**	**11,122**	**100.0%**	**4,867**	**100.0%**	**8,446**	**100.0%**	164,032

Inter-Peak Hour

Vehicle Type	MCC	%	IRR	%	M60	%	Ashton	%	Bolton	%	Bury	%	Oldham	%	Rochdale	%	Stockport	%	Wigan	%	Total Cordon Crossings
Compliant Car	16,294	58.6%	21,851	60.1%	42,081	58.3%	5,687	56.8%	7,558	60.1%	8,858	62.9%	3,311	55.8%	7,621	60.4%	2,445	57.4%	4,438	56.4%	81,999
Non-Compliant Car	2,059	7.4%	3,346	9.2%	7,898	10.9%	1,142	11.4%	1,504	12.0%	1,780	12.6%	664	11.2%	1,540	12.2%	482	11.3%	898	11.4%	15,908
All Car	**18,353**	**66.0%**	**25,197**	**69.3%**	**49,979**	**69.2%**	**6,829**	**68.2%**	**9,062**	**72.0%**	**10,638**	**75.5%**	**3,975**	**67.0%**	**9,161**	**72.6%**	**2,928**	**68.7%**	**5,336**	**67.8%**	97,908
Compliant LGV	3,523	12.7%	4,086	11.2%	7,609	10.5%	1,119	11.2%	1,166	9.3%	1,136	8.1%	507	8.5%	1,208	9.6%	356	8.4%	726	9.2%	13,827
Non-Compliant LGV	1,210	4.4%	1,700	4.7%	4,060	5.6%	657	6.6%	673	5.4%	663	4.7%	291	4.9%	715	5.7%	206	4.8%	432	5.5%	7,697
All LGV	**4,733**	**17.0%**	**5,785**	**15.9%**	**11,670**	**16.2%**	**1,776**	**17.7%**	**1,839**	**14.6%**	**1,799**	**12.8%**	**798**	**13.5%**	**1,923**	**15.2%**	**562**	**13.2%**	**1,158**	**14.7%**	21,525
Compliant OGV	2,076	7.5%	2,296	6.3%	6,359	8.8%	818	8.2%	604	4.8%	637	4.5%	234	3.9%	738	5.8%	278	6.5%	399	5.1%	10,067
Non-Compliant OGV	67	0.2%	73	0.2%	192	0.3%	52	0.5%	39	0.3%	24	0.2%	6	0.1%	26	0.2%	7	0.2%	17	0.2%	363
All OGV	**2,144**	**7.7%**	**2,369**	**6.5%**	**6,551**	**9.1%**	**870**	**8.7%**	**642**	**5.1%**	**660**	**4.7%**	**240**	**4.1%**	**763**	**6.1%**	**285**	**6.7%**	**416**	**5.3%**	10,427
Compliant Taxi	1,067	3.8%	1,405	3.9%	2,368	3.3%	332	3.3%	428	3.4%	556	3.9%	221	3.7%	485	3.8%	134	3.1%	270	3.4%	4,794
Non-Compliant Taxi	92	0.3%	128	0.4%	323	0.4%	45	0.4%	58	0.5%	65	0.5%	19	0.3%	52	0.4%	19	0.5%	30	0.4%	611
All Taxi	**1,159**	**4.2%**	**1,534**	**4.2%**	**2,691**	**3.7%**	**377**	**3.8%**	**486**	**3.9%**	**621**	**4.4%**	**240**	**4.0%**	**537**	**4.3%**	**153**	**3.6%**	**300**	**3.8%**	5,405
Bus	1,403	5.0%	1,457	4.0%	1,296	1.8%	160	1.6%	553	4.4%	371	2.6%	679	11.4%	227	1.8%	332	7.8%	664	8.4%	4,282
Total	**27,792**	**100.0%**	**36,342**	**100.0%**	**72,186**	**100.0%**	**10,012**	**100.0%**	**12,583**	**100.0%**	**14,089**	**100.0%**	**5,934**	**100.0%**	**12,612**	**100.0%**	**4,260**	**100.0%**	**7,874**	**100.0%**	139,550

PM-Peak

Vehicle Type	MCC	%	IRR	%	M60	%	Ashton	%	Bolton	%	Bury	%	Oldham	%	Rochdale	%	Stockport	%	Wigan	%	Total Cordon Crossings
Compliant Car	25,410	72.9%	35,151	72.1%	66,724	68.9%	7,446	68.2%	9,589	68.0%	11,691	68.0%	4,744	65.4%	7,426	66.6%	2,176	62.7%	5,813	62.4%	115,609
Non-Compliant Car	2,742	7.9%	4,949	10.1%	12,324	12.7%	1,424	13.0%	1,880	13.3%	2,341	13.6%	937	12.9%	1,494	13.4%	426	12.3%	1,171	12.6%	21,997
All Car	**28,152**	**80.7%**	**40,099**	**82.2%**	**79,048**	**81.7%**	**8,870**	**81.2%**	**11,469**	**81.3%**	**14,032**	**81.6%**	**5,680**	**78.3%**	**8,921**	**80.0%**	**2,602**	**74.9%**	**6,984**	**75.0%**	137,606
Compliant LGV	2,080	6.0%	2,663	5.5%	6,082	6.3%	701	6.4%	797	5.7%	1,104	6.4%	365	5.0%	744	6.7%	226	6.5%	656	7.0%	10,675
Non-Compliant LGV	738	2.1%	1,204	2.5%	3,383	3.5%	407	3.7%	468	3.3%	655	3.8%	213	2.9%	439	3.9%	131	3.8%	388	4.2%	6,084
All LGV	**2,818**	**8.1%**	**3,867**	**7.9%**	**9,465**	**9.8%**	**1,108**	**10.1%**	**1,265**	**9.0%**	**1,759**	**10.2%**	**578**	**8.0%**	**1,183**	**10.6%**	**357**	**10.3%**	**1,044**	**11.2%**	16,759
Compliant OGV	584	1.7%	723	1.5%	2,643	2.7%	217	2.0%	251	1.8%	227	1.3%	69	0.9%	326	2.9%	56	1.6%	285	3.1%	4,074
Non-Compliant OGV	20	0.1%	23	0.0%	76	0.1%	10	0.1%	16	0.1%	8	0.0%	2	0.0%	11	0.1%	1	0.0%	23	0.3%	147
All OGV	**603**	**1.7%**	**746**	**1.5%**	**2,719**	**2.8%**	**227**	**2.1%**	**267**	**1.9%**	**234**	**1.4%**	**71**	**1.0%**	**337**	**3.0%**	**57**	**1.7%**	**309**	**3.3%**	4,221
Compliant Taxi	1,832	5.3%	2,467	5.1%	3,925	4.1%	491	4.5%	570	4.0%	742	4.3%	328	4.5%	460	4.1%	116	3.3%	364	3.9%	6,996
Non-Compliant Taxi	119	0.3%	177	0.4%	484	0.5%	58	0.5%	76	0.5%	90	0.5%	25	0.3%	53	0.5%	16	0.5%	42	0.5%	844
All Taxi	**1,951**	**5.6%**	**2,644**	**5.4%**	**4,409**	**4.6%**	**549**	**5.0%**	**646**	**4.6%**	**832**	**4.8%**	**353**	**4.9%**	**513**	**4.6%**	**132**	**3.8%**	**406**	**4.4%**	7,840
Bus	**1,349**	**3.9%**	**1,406**	**2.9%**	**1,162**	**1.2%**	**165**	**1.5%**	**459**	**3.3%**	**343**	**2.0%**	**576**	**7.9%**	**202**	**1.8%**	**324**	**9.3%**	**568**	**6.1%**	3,799
Total	**34,873**	**100.0%**	**48,763**	**100.0%**	**96,802**	**100.0%**	**10,919**	**100.0%**	**14,106**	**100.0%**	**17,201**	**100.0%**	**7,259**	**100.0%**	**11,155**	**100.0%**	**3,472**	**100.0%**	**9,311**	**100.0%**	170,225

Draft for approval

Charges and Penalties

This worksheet presents the charge level assumptions used.

CHARGES ASSUMPTIONS

Charging Levels (£s, 2021 prices)

Vehicle	Low	Medium	High
Car Petrol	5	7.5	10
Car Diesel	5	7.5	10
PHV Petrol	5	7.5	10
PHV Diesel	5	7.5	10
Taxi Petrol	5	7.5	10
Taxi Diesel	5	7.5	10
LGV petrol	5	7.5	10
LGV diesel	5	7.5	10
HGV	100	100	100
HGV	100	100	100
Bus	100	100	100
Coach	100	100	100

Source: GM CAZ Charges Analysis v1.1.docx, Jacobs

draft for approval

No. of Unique Vehicles

This worksheet presents the number of unique vehicles in GM

Growth factor of car ownership (2016-2021)	1.0533	source: TEMPro
Growth factor of car ownership (2018-2021)	1.0313	source: TEMPro

Total Number of Unique Vehicles

	Year	Base	2021	ANPR	ratio	Source:
Cars	2016	1,139,980	1,200,741	592,953	2.03	*DVLA*
LGV	2016	111,872	117,835	42,328	2.78	*DVLA*
HGV	2016	30,525	32,152	19,764	1.63	*DVLA*
bus	2016	2,739	2,885	2,383	1.21	*DVLA*
Taxi	2018	2135	2,202			*DfT statistics, Table TAXI0104 "Taxis, Private Hire Vehicles (PHVs) and their drivers: England and Wales by licensing area"*
PHV	2018	11681	12,047			*DfT statistics, Table TAXI0104 "Taxis, Private Hire Vehicles (PHVs) and their drivers: England and Wales by licensing area"*

Note: as we are using the number of unique vehicles registered in GM, we will not be able to account for the vehicles which are not registered outside of GM

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Baseline Vehicle Data

Vehicle Proportion - Do Min

Proportion e

Year		2016	2016	2016	2016	2016	2016	2017	2017	2017	2017	2017	2017	2018	2018	2018	2018	2018	2018	2019	2019	2019	2019	2019	2019	2020	2020	2020	2020	2020	2020	2021	2021	2021	2021	2021	2021	2022
Type		DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus
Pre-Euro	Pre-Euro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Euro I	Euro 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Euro II	Euro 2	0.03	0.01	0.02	0.00	0.03	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Euro III	Euro 3	0.09	0.09	0.11	0.15	0.22	0.00	0.05	0.06	0.07	0.11	0.18	0.00	0.05	0.04	0.05	0.07	0.12	0.00	0.05	0.03	0.03	0.04	0.08	0.00	0.04	0.02	0.03	0.01	0.04	0.00	0.03	0.01	0.02	0.00	0.03	0.00	0.02
Euro IV	Euro 4	0.28	0.29	0.16	0.26	0.34	0.00	0.12	0.26	0.14	0.25	0.34	0.00	0.10	0.22	0.12	0.25	0.33	0.00	0.07	0.17	0.09	0.23	0.31	0.00	0.03	0.13	0.06	0.19	0.27	0.00	0.03	0.09	0.04	0.15	0.22	0.00	0.02
Euro V	Euro 5	0.45	0.48	0.44	0.56	0.32	0.00	0.52	0.42	0.37	0.48	0.31	0.00	0.42	0.38	0.30	0.37	0.30	0.00	0.42	0.35	0.26	0.32	0.31	0.00	0.41	0.32	0.24	0.29	0.33	0.00	0.34	0.29	0.23	0.26	0.34	0.00	0.27
Euro VI	Euro 6	0.15	0.12	0.27	0.02	0.08	0.00	0.29	0.25	0.41	0.16	0.16	0.00	0.42	0.34	0.52	0.28	0.22	0.00	0.46	0.33	0.61	0.26	0.21	0.00	0.52	0.28	0.67	0.20	0.18	0.00	0.60	0.25	0.71	0.16	0.17	0.00	0.68
Euro VI	Euro 6c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.01	0.00	0.00	0.12	0.00	0.16	0.08	0.00	0.00	0.25	0.00	0.30	0.16	0.00	0.00	0.34	0.00	0.39	0.23	0.00	0.00
Euro VI	Euro 6d	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00

Source: ANPR Summary for TfGMv2_160118.xlsx

Bus	Diesel	BusDiesel	DBus
Car	Diesel	CarDiesel	DCar
HGV	Diesel	HGVDiesel	DHGV
LGV	Diesel	VanDiesel	DVan
Car	Petrol	CarPetrol	PCar
Car	Other	CarOther	DCar
PHV	Diesel	PHVDiesel	DCar
PHV	Petrol	PHVPetrol	PCar

Vehicle proportion-Do Minimum

CarPetrol CarDiesel CarElectric CarOther HackneyPetr HackneyDies HackneyOth PHVPetrol PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

	2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
		PCar	DCar	CarElectric	DCar	HackneyPe	HackneyDi	HackneyOt	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
Pre-Euro	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 1	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 2	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 3	3	3%	1%	0%	1%	0%	0%	0%	3%	1%	0%	0%	0%	0%	0%	0%	2%	0%	0%	3%	0%
Euro 4	4	22%	9%	0%	9%	0%	0%	0%	22%	9%	0%	0%	0%	15%	0%	0%	4%	0%	0%	3%	0%
Euro 5	5	34%	29%	0%	29%	0%	0%	0%	34%	29%	0%	0%	0%	26%	0%	0%	23%	0%	0%	34%	0%
Euro 6	6	17%	25%	0%	25%	0%	0%	0%	17%	25%	0%	0%	0%	16%	0%	0%	71%	0%	0%	60%	0%
Euro 6c	6c	23%	34%	0%	34%	0%	0%	0%	23%	34%	0%	0%	0%	39%	0%	0%	0%	0%	0%	0%	0%
Euro 6d	6d	0%	2%	0%	2%	0%	0%	0%	0%	2%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Sub-total		**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**

CarPetrol CarDiesel CarElectric CarOther HackneyPetr HackneyDies HackneyOth PHVPetrol PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

	2022	Car				Taxi			PHV				LGV		
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other
		PCar	DCar	CarElectric	DCar	HackneyPe	HackneyDi	HackneyOt	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther
Pre-Euro	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 1	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 2	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 3	3	2%	1%	0%	1%	0%	0%	0%	2%	1%	0%	0%	0%	0%	0%
Euro 4	4	18%	7%	0%	7%	0%	0%	0%	18%	7%	0%	0%	0%	12%	0%
Euro 5	5	32%	25%	0%	25%	0%	0%	0%	32%	25%	0%	0%	0%	25%	0%
Euro 6	6	18%	23%	0%	23%	0%	0%	0%	18%	23%	0%	0%	0%	15%	0%
Euro 6c	6c	29%	31%	0%	31%	0%	0%	0%	29%	31%	0%	0%	0%	34%	0%
Euro 6d	6d	0%	13%	0%	13%	0%	0%	0%	0%	13%	0%	0%	0%	14%	0%
Sub-total		**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**0%**	**100%**	**0%**

Vehicle proportion-Do Minimum. Index

CarPetrol CarDiesel CarElectric CarOther HackneyPetr HackneyDies HackneyOth PHVPetrol PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

	2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
		PCar	DCar	CarElectric	DCar	HackneyPe	HackneyDi	HackneyOt	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
Pre-Euro	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Euro 1	1	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Euro 2	2	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Euro 3	3	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Euro 4	4	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Euro 5	5	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Euro 6	6	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Euro 6c	6c	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Euro 6d	6d	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

CarPetrol CarDiesel CarElectric CarOther HackneyPetr HackneyDies HackneyOth PHVPetrol PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

	2022	Car				Taxi			PHV				LGV		
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other
		PCar	DCar	CarElectric	DCar	HackneyPe	HackneyDi	HackneyOt	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther
Pre-Euro	0	75.0	75.0	0.0	75.0	0.0	0.0	0.0	75.0	75.0	0.0	0.0	0.0	86.4	0.0
Euro 1	1	88.5	96.9	0.0	96.9	0.0	0.0	0.0	88.5	96.9	0.0	0.0	0.0	79.6	0.0
Euro 2	2	81.6	77.4	0.0	77.4	0.0	0.0	0.0	81.6	77.4	0.0	0.0	0.0	76.0	0.0
Euro 3	3	80.8	85.0	0.0	85.0	0.0	0.0	0.0	80.8	85.0	0.0	0.0	0.0	95.9	0.0
Euro 4	4	79.9	79.6	0.0	79.6	0.0	0.0	0.0	79.9	79.6	0.0	0.0	0.0	77.4	0.0
Euro 5	5	95.3	86.3	0.0	86.3	0.0	0.0	0.0	95.3	86.3	0.0	0.0	0.0	93.3	0.0
Euro 6	6	104.6	92.7	0.0	92.7	0.0	0.0	0.0	104.6	92.7	0.0	0.0	0.0	92.0	0.0
Euro 6c	6c	125.7	91.5	0.0	91.5	0.0	0.0	0.0	125.7	91.5	0.0	0.0	0.0	86.3	0.0
Euro 6d	6d	0.0	656.4	0.0	656.4	0.0	0.0	0.0	0.0	656.4	0.0	0.0	0.0	665.8	0.0
				non-compliant	**0%**		non-compliant	**83%**		non-compliant		**83%**		non-compliant	**0%**

Do Minimum non-compliant fleet relative to intervention year

Type	Fuel		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car	Petrol	**CarPetrol**	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Car	Diesel	**CarDiesel**	100%	83%	67%	50%	33%	27%	18%	9%	4%	3%
Car	Other	**CarOther**	100%	83%	67%	50%	33%	27%	18%	9%	4%	3%
PHV	Petrol	**PHVPetrol**	100%	81%	63%	44%	26%	21%	14%	7%	4%	3%
PHV	Diesel	**PHVDiesel**	100%	83%	67%	50%	33%	27%	18%	9%	4%	3%
LGV	Diesel	**LGVDiesel**	100%	85%	70%	54%	39%	32%	20%	10%	4%	3%
HGV	Diesel	**HGVDiesel**	100%	81%	61%	42%	23%	19%	13%	7%	4%	3%
Bus	Diesel	**BusDiesel**	100%	83%	66%	48%	31%	25%	16%	7%	3%	2%
	Average		**88%**	**72%**	**57%**	**42%**	**27%**	**22%**	**14%**	**7%**	**3%**	**3%**

Do Minimum non-compliant fleet relative to intervention year

Type	Fuel		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car	Petrol	**CarPetrol**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Car	Diesel	**CarDiesel**	100%	83%	67%	50%	33%	27%	18%	9%	4%	3%
Car	Other	**CarOther**	100%	83%	67%	50%	33%	27%	18%	9%	4%	3%
PHV	Petrol	**PHVPetrol**	100%	81%	63%	44%	26%	21%	14%	7%	4%	3%
PHV	Diesel	**PHVDiesel**	100%	83%	67%	50%	33%	27%	18%	9%	4%	3%
LGV	Diesel	**LGVDiesel**	100%	85%	130%	115%	100%	32%	20%	10%	4%	3%
HGV	Diesel	**HGVDiesel**	100%	81%	61%	42%	23%	19%	13%	7%	4%	3%
Bus	Diesel	**BusDiesel**	100%	83%	66%	48%	31%	25%	16%	7%	3%	2%
	Average		**100%**	**72%**	**65%**	**50%**	**35%**	**22%**	**14%**	**7%**	**3%**	**3%**

DS non-compliant profile

Option 8

Vehicle	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car	100%	84%	68%	52%	37%	30%	19%	9%	5%	3%
LGV	100%	83%	2348%	1949%	1526%	1272%	814%	407%	204%	153%
HGV	100%	83%	66%	48%	31%	26%	16%	8%	3%	2%
PHVs	100%	78%	57%	35%	13%	11%	8%	4%	2%	2%
Hackneys	100%	82%	64%	46%	28%	22%	14%	6%	3%	2%

Source: TfGM CAZ Revised trip profile v0.4

Draft for approval

xtrapolated between 2021 and 2025

2022	2022	2022	2022	2022	2023	2023	2023	2023	2023	2023	2024	2024	2024	2024	2024	2025	2025	2025	2025	2025	2025	2026	2026	2026	2026	2026	2026	2027	2027	2027	2027	2027	2027	2028	2028	2028	2028	2028
DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.02	0.00	0.02	0.00	0.02	0.01	0.01	0.00	0.02	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.07	0.03	0.12	0.18	0.00	0.02	0.05	0.02	0.08	0.13	0.00	0.02	0.03	0.02	0.05	0.09	0.00	0.01	0.02	0.01	0.01	0.04	0.00	0.01	0.01	0.01	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
0.25	0.19	0.25	0.32	0.00	0.20	0.21	0.15	0.23	0.31	0.00	0.13	0.17	0.11	0.21	0.29	0.00	0.05	0.13	0.07	0.19	0.27	0.00	0.05	0.11	0.06	0.16	0.23	0.00	0.03	0.07	0.04	0.10	0.15	0.00	0.02	0.04	0.02	0.05	0.09
0.23	0.76	0.15	0.18	0.00	0.76	0.21	0.81	0.14	0.19	0.00	0.85	0.19	0.86	0.12	0.20	0.00	0.93	0.18	0.91	0.11	0.21	0.00	0.94	0.15	0.93	0.10	0.19	0.00	0.96	0.11	0.95	0.08	0.17	0.00	0.97	0.07	0.97	0.06	0.15
0.31	0.00	0.34	0.29	0.00	0.00	0.28	0.00	0.29	0.35	0.00	0.00	0.25	0.00	0.23	0.41	0.00	0.00	0.22	0.00	0.18	0.47	0.00	0.00	0.21	0.00	0.17	0.54	0.00	0.00	0.18	0.00	0.16	0.64	0.00	0.00	0.15	0.00	0.15	0.74
0.13	0.00	0.14	0.00	0.00	0.00	0.23	0.00	0.26	0.00	0.00	0.00	0.34	0.00	0.38	0.00	0.00	0.00	0.45	0.00	0.50	0.00	0.00	0.00	0.52	0.00	0.56	0.00	0.00	0.00	0.63	0.00	0.65	0.00	0.00	0.00	0.73	0.00	0.73	0.00

HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

HGV			Bus		
Petrol	Diesel	Other	Petrol	Diesel	Other
HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%
0%	2%	0%	0%	2%	0%
0%	3%	0%	0%	2%	0%
0%	19%	0%	0%	27%	0%
0%	76%	0%	0%	68%	0%
0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%
0%	**100%**	**0%**	**0%**	**100%**	**0%**

CarPetrol CarDiesel CarElectric CarOther HackneyPetr HackneyDies HackneyOth PHVPetrol PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

	2023	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
		PCar	DCar	CarElectric	DCar	HackneyP	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
Pre-Euro	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 1	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 2	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 3	3	2%	1%	0%	1%	0%	0%	0%	2%	1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	2%	0%
Euro 4	4	13%	5%	0%	5%	0%	0%	0%	13%	5%	0%	0%	0%	8%	0%	0%	2%	0%	0%	2%	0%
Euro 5	5	31%	21%	0%	21%	0%	0%	0%	31%	21%	0%	0%	0%	23%	0%	0%	15%	0%	0%	20%	0%
Euro 6	6	19%	21%	0%	21%	0%	0%	0%	19%	21%	0%	0%	0%	14%	0%	0%	81%	0%	0%	76%	0%
Euro 6c	6c	35%	28%	0%	28%	0%	0%	0%	35%	28%	0%	0%	0%	29%	0%	0%	0%	0%	0%	0%	0%
Euro 6d	6d	0%	23%	0%	23%	0%	0%	0%	0%	23%	0%	0%	0%	26%	0%	0%	0%	0%	0%	0%	0%
Sub-total		**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**

CarPetrol CarDiesel CarElectric CarOther HackneyPetr HackneyDies HackneyOth PHVPetrol

	2024	Car				Taxi			
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol
		PCar	DCar	CarElectric	DCar	HackneyP	HackneyD	HackneyO	PCar
Pre-Euro	0	0%	0%	0%	0%	0%	0%	0%	0%
Euro 1	1	0%	0%	0%	0%	0%	0%	0%	0%
Euro 2	2	0%	0%	0%	0%	0%	0%	0%	0%
Euro 3	3	1%	1%	0%	1%	0%	0%	0%	1%
Euro 4	4	9%	3%	0%	3%	0%	0%	0%	9%
Euro 5	5	29%	17%	0%	17%	0%	0%	0%	29%
Euro 6	6	20%	19%	0%	19%	0%	0%	0%	20%
Euro 6c	6c	41%	25%	0%	25%	0%	0%	0%	41%
Euro 6d	6d	0%	34%	0%	34%	0%	0%	0%	0%
Sub-total		**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**0%**	**100%**

HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

HGV			Bus		
Petrol	Diesel	Other	Petrol	Diesel	Other
HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
0.0	75.0	0.0	0.0	75.0	0.0
0.0	83.8	0.0	0.0	104.2	0.0
0.0	78.9	0.0	0.0	75.7	0.0
0.0	80.6	0.0	0.0	78.0	0.0
0.0	83.0	0.0	0.0	84.7	0.0
0.0	82.7	0.0	0.0	79.0	0.0
0.0	107.1	0.0	0.0	113.8	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
non-compliant		**81%**	non-compliant		**83%**

CarPetrol CarDiesel CarElectric CarOther HackneyPetr HackneyDies HackneyOth PHVPetrol PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

	2023	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
		PCar	DCar	CarElectric	DCar	HackneyP	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
Pre-Euro	0	50	50	0	50	0	0	0	50	50	0	0	0	73	0	0	50	0	0	50	0
Euro 1	1	77	94	0	94	0	0	0	77	94	0	0	0	59	0	0	68	0	0	108	0
Euro 2	2	63	55	0	55	0	0	0	63	55	0	0	0	52	0	0	58	0	0	51	0
Euro 3	3	62	70	0	70	0	0	0	62	70	0	0	0	92	0	0	61	0	0	56	0
Euro 4	4	60	59	0	59	0	0	0	60	59	0	0	0	55	0	0	66	0	0	69	0
Euro 5	5	91	73	0	73	0	0	0	91	73	0	0	0	87	0	0	65	0	0	58	0
Euro 6	6	109	85	0	85	0	0	0	109	85	0	0	0	84	0	0	114	0	0	128	0
Euro 6c	6c	151	83	0	83	0	0	0	151	83	0	0	0	73	0	0	0	0	0	0	0
Euro 6d	6d	0	1213	0	1213	0	0	0	0	1213	0	0	0	1232	0	0	0	0	0	0	0
		non-compliant			**0%**	non-compliant		**67%**	non-compliant			**67%**	non-compliant		**70%**	non-compliant		**61%**	non-compliant		**66%**

CarPetrol CarDiesel CarElectric CarOther HackneyPetr HackneyDies HackneyOth PHVPetrol

	2024	Car				Taxi			
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol
		PCar	DCar	CarElectric	DCar	HackneyP	HackneyD	HackneyO	PCar
Pre-Euro	0	25	25	0	25	0	0	0	25
Euro 1	1	65	91	0	91	0	0	0	65
Euro 2	2	45	32	0	32	0	0	0	45
Euro 3	3	43	55	0	55	0	0	0	43
Euro 4	4	40	39	0	39	0	0	0	40
Euro 5	5	86	59	0	59	0	0	0	86
Euro 6	6	114	78	0	78	0	0	0	114
Euro 6c	6c	177	74	0	74	0	0	0	177
Euro 6d	6d	0	1769	0	1769	0	0	0	0
		non-compliant			**0%**	non-compliant		**50%**	

draft

2028	2029	2029	2029	2029	2029	2029	2030	2030	2030	2030	2030	2030
PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV	DBus	DCar	DHGV	DVan	PCar	PLGV
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00
0.00	0.02	0.02	0.02	0.02	0.05	0.00	0.01	0.02	0.01	0.01	0.04	0.00
0.00	0.98	0.05	0.98	0.06	0.14	0.00	0.99	0.05	0.98	0.05	0.14	0.00
0.00	0.00	0.14	0.00	0.14	0.79	0.00	0.00	0.13	0.00	0.14	0.81	0.00
0.00	0.00	0.78	0.00	0.78	0.00	0.00	0.00	0.80	0.00	0.79	0.00	0.00

PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

PHV			LGV			HGV			Bus		
Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
DCar	PHVElectric	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
3%	0%	0%	0%	5%	0%	0%	2%	0%	0%	2%	0%
17%	0%	0%	0%	21%	0%	0%	11%	0%	0%	13%	0%
19%	0%	0%	0%	12%	0%	0%	86%	0%	0%	85%	0%
25%	0%	0%	0%	23%	0%	0%	0%	0%	0%	0%	0%
34%	0%	0%	0%	38%	0%	0%	0%	0%	0%	0%	0%
100%	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**

PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

PHV			LGV			HGV			Bus		
Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
DCar	PHVElectric	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
25	0	0	0	59	0	0	25	0	0	25	0
91	0	0	0	39	0	0	51	0	0	113	0
32	0	0	0	28	0	0	37	0	0	27	0
55	0	0	0	88	0	0	42	0	0	34	0
39	0	0	0	32	0	0	49	0	0	54	0
59	0	0	0	80	0	0	48	0	0	37	0
78	0	0	0	76	0	0	121	0	0	141	0
74	0	0	0	59	0	0	0	0	0	0	0
1769	0	0	0	1797	0	0	0	0	0	0	0
non-compliant		**50%**	non-compliant		**54%**	non-compliant		**42%**	non-compliant		**48%**

CarPetrol CarDiesel CarElectric CarOther HackneyPetrol HackneyDiesel HackneyOther PHVPetrol PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

	2025	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
		PCar	DCar	CarElectric	DCar	HackneyPetrol	HackneyDiesel	HackneyOther	PCar	DCar	PHVElectric	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
Pre-Euro	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 1	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 2	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 3	3	1%	1%	0%	1%	0%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 4	4	4%	2%	0%	2%	0%	0%	0%	4%	2%	0%	0%	0%	1%	0%	0%	1%	0%	0%	1%	0%
Euro 5	5	27%	13%	0%	13%	0%	0%	0%	27%	13%	0%	0%	0%	19%	0%	0%	7%	0%	0%	5%	0%
Euro 6	6	21%	18%	0%	18%	0%	0%	0%	21%	18%	0%	0%	0%	11%	0%	0%	91%	0%	0%	93%	0%
Euro 6c	6c	47%	22%	0%	22%	0%	0%	0%	47%	22%	0%	0%	0%	18%	0%	0%	0%	0%	0%	0%	0%
Euro 6d	6d	0%	45%	0%	45%	0%	0%	0%	0%	45%	0%	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%
Sub-total		**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**

CarPetrol CarDiesel CarElectric CarOther HackneyPetrol HackneyDiesel HackneyOther PHVPetrol PHVDiesel PHVElectric PHVOther VanPetrol VanDiesel VanOther HGVPetrol HGVDiesel HGVOther BusPetrol BusDiesel BusOther

	2025	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
		PCar	DCar	CarElectric	DCar	HackneyPetrol	HackneyDiesel	HackneyOther	PCar	DCar	PHVElectric	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
Pre-Euro	0	0	0	0	0	0	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0
Euro 1	1	54	88	0	88	0	0	0	54	88	0	0	0	19	0	0	35	0	0	117	0
Euro 2	2	27	9	0	9	0	0	0	27	9	0	0	0	4	0	0	15	0	0	3	0
Euro 3	3	23	40	0	40	0	0	0	23	40	0	0	0	84	0	0	22	0	0	12	0
Euro 4	4	20	19	0	19	0	0	0	20	19	0	0	0	10	0	0	32	0	0	39	0
Euro 5	5	81	45	0	45	0	0	0	81	45	0	0	0	73	0	0	31	0	0	16	0
Euro 6	6	118	71	0	71	0	0	0	118	71	0	0	0	68	0	0	128	0	0	155	0
Euro 6c	6c	203	66	0	66	0	0	0	203	66	0	0	0	45	0	0	0	0	0	0	0
Euro 6d	6d	0	2325	0	2325	0	0	0	0	2325	0	0	0	2363	0	0	0	0	0	0	0
		non-compliant			**0%**	non-compliant		**33%**	non-compliant			**33%**	non-compliant		**39%**	non-compliant		**23%**	non-compliant		**31%**

CarPetrol CarDiesel

	2026	C
Euro Class	Euro Class	Petrol	Diesel
		PCar	DCar
Pre-Euro	0	0%	0%
Euro 1	1	0%	0%
Euro 2	2	0%	0%
Euro 3	3	1%	0%
Euro 4	4	4%	1%
Euro 5	5	23%	11%
Euro 6	6	19%	15%
Euro 6c	6c	54%	21%
Euro 6d	6d	0%	52%
		non-	

	2026	C
Euro Class	Euro Class	Petrol	Diesel
		PCar	DCar
Pre-Euro	0	0	0
Euro 1	1	43	70
Euro 2	2	23	9
Euro 3	3	20	33
Euro 4	4	16	16
Euro 5	5	67	37
Euro 6	6	111	60
Euro 6c	6c	232	60
Euro 6d	6d	0	2685
		non-	

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CarElectric	CarOther	HackneyPetr	HackneyDies	HackneyOth	PHVPetrol	PHVDiesel	PHVElectric	PHVOther	VanPetrol	VanDiesel	VanOther	HGVPetrol	HGVDiesel	HGVOther	BusPetrol	BusDiesel	BusOther
ar		Taxi			PHV				LGV			HGV			Bus		
Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	1%	0%	0%	0%	4%	1%	0%	0%	0%	1%	0%	0%	1%	0%	0%	1%	0%
0%	11%	0%	0%	0%	23%	11%	0%	0%	0%	16%	0%	0%	6%	0%	0%	5%	0%
0%	15%	0%	0%	0%	19%	15%	0%	0%	0%	10%	0%	0%	93%	0%	0%	94%	0%
0%	21%	0%	0%	0%	54%	21%	0%	0%	0%	17%	0%	0%	0%	0%	0%	0%	0%
0%	52%	0%	0%	0%	0%	52%	0%	0%	0%	56%	0%	0%	0%	0%	0%	0%	0%
0%	**100%**	**0%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**

CarElectric	CarOther	HackneyPetr	HackneyDies	HackneyOth	PHVPetrol	PHVDiesel	PHVElectric	PHVOther	VanPetrol	VanDiesel	VanOther	HGVPetrol	HGVDiesel	HGVOther	BusPetrol	BusDiesel	BusOther
ar		Taxi			PHV				LGV			HGV			Bus		
Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
0	0	0	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0
0	70	0	0	0	43	70	0	0	0	15	0	0	28	0	0	93	0
0	9	0	0	0	23	9	0	0	0	4	0	0	13	0	0	3	0
0	33	0	0	0	20	33	0	0	0	68	0	0	19	0	0	10	0
0	16	0	0	0	16	16	0	0	0	8	0	0	27	0	0	31	0
0	37	0	0	0	67	37	0	0	0	60	0	0	26	0	0	14	0
0	60	0	0	0	111	60	0	0	0	61	0	0	130	0	0	157	0
0	60	0	0	0	232	60	0	0	0	43	0	0	0	0	0	0	0
0	2685	0	0	0	0	2685	0	0	0	2635	0	0	0	0	0	0	0
-compliant	**0%**	non-compliant		**27%**	non-compliant			**27%**	non-compliant		**32%**	non-compliant		**19%**	non-compliant		**25%**

	2027	Car				Taxi			PHV				LGV			HGV			Bus			
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Euro Class
		PCar	DCar	CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther	
Pre-Euro	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	Pre-Euro
Euro 1	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	Euro 1
Euro 2	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	Euro 2
Euro 3	3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	Euro 3
Euro 4	4	2%	1%	0%	1%	0%	0%	0%	2%	1%	0%	0%	0%	1%	0%	0%	1%	0%	0%	1%	0%	Euro 4
Euro 5	5	15%	7%	0%	7%	0%	0%	0%	15%	7%	0%	0%	0%	10%	0%	0%	4%	0%	0%	3%	0%	Euro 5
Euro 6	6	17%	11%	0%	11%	0%	0%	0%	17%	11%	0%	0%	0%	8%	0%	0%	95%	0%	0%	96%	0%	Euro 6
Euro 6c	6c	64%	18%	0%	18%	0%	0%	0%	64%	18%	0%	0%	0%	16%	0%	0%	0%	0%	0%	0%	0%	Euro 6c
Euro 6d	6d	0%	63%	0%	63%	0%	0%	0%	0%	63%	0%	0%	0%	65%	0%	0%	0%	0%	0%	0%	0%	Euro 6d
Sub-total		**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**Sub-**

	2027	Car				Taxi			PHV				LGV			HGV			Bus			
Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Euro Class
		PCar	DCar	CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther	
Pre-Euro	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	Pre-Euro
Euro 1	1	26	42	0	42	0	0	0	26	42	0	0	0	9	0	0	17	0	0	56	0	Euro 1
Euro 2	2	17	7	0	7	0	0	0	17	7	0	0	0	5	0	0	10	0	0	3	0	Euro 2
Euro 3	3	14	21	0	21	0	0	0	14	21	0	0	0	42	0	0	12	0	0	6	0	Euro 3
Euro 4	4	11	12	0	12	0	0	0	11	12	0	0	0	6	0	0	19	0	0	19	0	Euro 4
Euro 5	5	46	25	0	25	0	0	0	46	25	0	0	0	38	0	0	18	0	0	10	0	Euro 5
Euro 6	6	100	44	0	44	0	0	0	100	44	0	0	0	50	0	0	134	0	0	160	0	Euro 6
Euro 6c	6c	278	52	0	52	0	0	0	278	52	0	0	0	40	0	0	0	0	0	0	0	Euro 6c
Euro 6d	6d	0	3261	0	3261	0	0	0	0	3261	0	0	0	3071	0	0	0	0	0	0	0	Euro 6d
		non-compliant			**0%**	non-compliant			**18%**	non-compliant			**20%**	non-compliant		**13%**	non-compliant		**16%**	non-compliant		

draft

	CarPetrol	CarDiesel	CarElectric	CarOther	HackneyPetr	HackneyDies	HackneyOth	PHVPetrol	PHVDiesel	PHVElectric	PHVOther	VanPetrol	VanDiesel	VanOther	HGVPetrol	HGVDiesel	HGVOther	BusPetrol	BusDiesel	BusOther
2028	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
	PCar	DCar	CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	1%	1%	0%	1%	0%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
5	9%	4%	0%	4%	0%	0%	0%	9%	4%	0%	0%	0%	5%	0%	0%	2%	0%	0%	2%	0%
6	15%	7%	0%	7%	0%	0%	0%	15%	7%	0%	0%	0%	6%	0%	0%	97%	0%	0%	97%	0%
6c	74%	15%	0%	15%	0%	0%	0%	74%	15%	0%	0%	0%	15%	0%	0%	0%	0%	0%	0%	0%
6d	0%	73%	0%	73%	0%	0%	0%	0%	73%	0%	0%	0%	73%	0%	0%	0%	0%	0%	0%	0%
total	**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**

	CarPetrol	CarDiesel	CarElectric	CarOther	HackneyPetr	HackneyDies	HackneyOth	PHVPetrol	PHVDiesel	PHVElectric	PHVOther	VanPetrol	VanDiesel	VanOther	HGVPetrol	HGVDiesel	HGVOther	BusPetrol	BusDiesel	BusOther
2028	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
	PCar	DCar	CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0
1	10	17	0	17	0	0	0	10	17	0	0	0	4	0	0	7	0	0	22	0
2	11	6	0	6	0	0	0	11	6	0	0	0	5	0	0	6	0	0	3	0
3	8	10	0	10	0	0	0	8	10	0	0	0	19	0	0	7	0	0	3	0
4	6	8	0	8	0	0	0	6	8	0	0	0	3	0	0	11	0	0	9	0
5	26	13	0	13	0	0	0	26	13	0	0	0	19	0	0	11	0	0	6	0
6	89	29	0	29	0	0	0	89	29	0	0	0	40	0	0	136	0	0	163	0
6c	320	44	0	44	0	0	0	320	44	0	0	0	37	0	0	0	0	0	0	0
6d	0	3779	0	3779	0	0	0	0	3779	0	0	0	3463	0	0	0	0	0	0	0
	non-compliant			**0%**	non-compliant		**9%**	non-compliant			**9%**	non-compliant		**10%**	non-compliant		**7%**	non-compliant		**7%**

	CarPetrol	CarDiesel	CarElectric	CarOther	HackneyPetr	HackneyDies	HackneyOth	PHVPetrol	PHVDiesel	PHVElectric	PHVOther	VanPetrol	VanDiesel	VanOther	HGVPetrol	HGVDiesel	HGVOther	BusPetrol	BusDiesel	BusOther
2029	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
	PCar	DCar	CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
Pre-Euro	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 4	1%	1%	0%	1%	0%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Euro 5	5%	2%	0%	2%	0%	0%	0%	5%	2%	0%	0%	0%	2%	0%	0%	0%	0%	0%	2%	0%
Euro 6	14%	5%	0%	5%	0%	0%	0%	14%	5%	0%	0%	0%	6%	0%	0%	98%	0%	0%	98%	0%
Euro 6c	79%	14%	0%	14%	0%	0%	0%	79%	14%	0%	0%	0%	14%	0%	0%	0%	0%	0%	0%	0%
Euro 6d	0%	78%	0%	78%	0%	0%	0%	0%	78%	0%	0%	0%	78%	0%	0%	0%	0%	0%	0%	0%
Sub-total	**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**

	CarPetrol	CarDiesel	CarElectric	CarOther	HackneyPetr	HackneyDies	HackneyOth	PHVPetrol	PHVDiesel	PHVElectric	PHVOther	VanPetrol	VanDiesel	VanOther	HGVPetrol	HGVDiesel	HGVOther	BusPetrol	BusDiesel	BusOther
2029	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
	PCar	DCar	CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
Pre-Euro	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Euro 1	2	3	0	3	0	0	0	2	3	0	0	0	1	0	0	1	0	0	0	4
Euro 2	8	5	0	5	0	0	0	8	5	0	0	0	6	0	0	5	0	0	0	3
Euro 3	5	4	0	4	0	0	0	5	4	0	0	0	7	0	0	4	0	0	0	1
Euro 4	4	6	0	6	0	0	0	4	6	0	0	0	2	0	0	7	0	0	0	3
Euro 5	16	7	0	7	0	0	0	16	7	0	0	0	8	0	0	7	0	0	0	5
Euro 6	84	22	0	22	0	0	0	84	22	0	0	0	35	0	0	138	0	0	0	164
Euro 6c	343	40	0	40	0	0	0	343	40	0	0	0	36	0	0	0	0	0	0	0
Euro 6d	0	4055	0	4055	0	0	0	0	4055	0	0	0	3672	0	0	0	0	0	0	0
	non-compliant			**0%**	non-compliant		**4%**	non-compliant			**4%**	non-compliant		**4%**	non-compliant		**4%**	non-compliant		

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[redacted]

BusOther			CarPetrol	CarDiesel	CarElectric	CarOther	HackneyPetr	HackneyDies	HackneyOth	PHVPetrol	PHVDiesel	PHVElectric	PHVOther	VanPetrol	VanDiesel	VanOther	HGVPetrol	HGVDiesel	HGVOther	BusPetrol	BusDiesel	BusOther
		2030	Car				Taxi			PHV				LGV			HGV			Bus		
Other	Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
BusOther			PCar	DCar	CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
0%	Pre-Euro	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	Euro 1	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	Euro 2	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	Euro 3	3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	Euro 4	4	1%	1%	0%	1%	0%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	Euro 5	5	4%	2%	0%	2%	0%	0%	0%	4%	2%	0%	0%	0%	1%	0%	0%	1%	0%	0%	1%	0%
0%	Euro 6	6	14%	5%	0%	5%	0%	0%	0%	14%	5%	0%	0%	0%	5%	0%	0%	98%	0%	0%	99%	0%
0%	Euro 6c	6c	81%	13%	0%	13%	0%	0%	0%	81%	13%	0%	0%	0%	14%	0%	0%	0%	0%	0%	0%	0%
0%	Euro 6d	6d	0%	80%	0%	80%	0%	0%	0%	0%	80%	0%	0%	0%	79%	0%	0%	0%	0%	0%	0%	0%
0%	**Sub-total**		**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**

BusOther			CarPetrol	CarDiesel	CarElectric	CarOther	HackneyPetr	HackneyDies	HackneyOth	PHVPetrol	PHVDiesel	PHVElectric	PHVOther	VanPetrol	VanDiesel	VanOther	HGVPetrol	HGVDiesel	HGVOther	BusPetrol	BusDiesel	BusOther
		2030	Car				Taxi			PHV				LGV			HGV			Bus		
Other	Euro Class	Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
BusOther			PCar	DCar	CarElectric	DCar	HackneyPe	HackneyD	HackneyO	PCar	DCar	PHVElectri	PHVOther	VanPetrol	DVan	VanOther	HGVPetrol	DHGV	HGVOther	BusPetrol	DBus	BusOther
0	Pre-Euro	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	Euro 1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	Euro 2	2	8	5	0	5	0	0	0	8	5	0	0	0	6	0	0	4	0	0	3	0
0	Euro 3	3	4	3	0	3	0	0	0	4	3	0	0	0	4	0	0	3	0	0	0	0
0	Euro 4	4	3	6	0	6	0	0	0	3	6	0	0	0	2	0	0	6	0	0	2	0
0	Euro 5	5	13	6	0	6	0	0	0	13	6	0	0	0	6	0	0	6	0	0	4	0
0	Euro 6	6	82	20	0	20	0	0	0	82	20	0	0	0	33	0	0	138	0	0	164	0
0	Euro 6c	6c	348	39	0	39	0	0	0	348	39	0	0	0	35	0	0	0	0	0	0	0
0	Euro 6d	6d	0	4124	0	4124	0	0	0	0	4124	0	0	0	3724	0	0	0	0	0	0	0
3%			non-compliant			**0%**	non-compliant		**3%**	non-compliant			**3%**	non-compliant		**3%**	non-compliant		**3%**	non-compliant		**2%**

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Vehicle Upgrade Assumptions

Upgrade Response

Response	Assumption	Explanation
Scrap	25.00%	A proportion, 25%, of those people taking the upgrade response will scrap their old vehicle
Buy new	25.00%	A proportion, 25%, of those people choosing to upgrade will buy a new vehicle
Switch	56.25%	A proportion, (75%*75%), of those people who elect to upgrade will sell their old vehicle and buy the cheapest unaffected one
Keep fuel	18.75%	A proportion, (25%*75%), of those people who decide to upgrade will sell their old vehicle and buy the cheapest unaffected one of the same fuel type
Redistribute	100.00%	A business will be able to relocate some of their fleet so as to vary their exposure to a measure
Substitute		Businesses will change operating areas, with those (un)affected by a measure substituting those (un)affected (for a cost raising / lowering measure)

Source: Shifting tool. Jacobs

Costs to purchase new Euro 6 compliant vechicle (Car price info year. Price 2018)

Vehicle	Cost	Assumption	Source
Car Petrol	£ 12,997		*ANPR Weighted Costs_Rev2.xlsx*
Car Diesel	£ 12,078		*ANPR Weighted Costs_Rev2.xlsx*
PHV Petrol	£ 12,997		*ANPR Weighted Costs_Rev2.xlsx*
PHV Diesel	£ 12,078		*ANPR Weighted Costs_Rev2.xlsx*
Taxi Petrol	£ 46,000		*http://www.levc.com/new-taxis/new_tx4_taxi/*
Taxi Diesel	£ 46,000	Only used for residual value	
LGV petrol	£ 13,328		*ANPR Weighted Costs_Rev2.xlsx*
LGV diesel	£ 13,328		*ANPR Weighted Costs_Rev2.xlsx*
Rigid HGV	£ 51,300	Average across a number of HGV types	*Source: "Road Haulage Association Cost Tables 2014", DFF International Ltd, 2014*
Artic HGV	£ 80,100	Average across a number of HGV types	*Source: "Road Haulage Association Cost Tables 2014", DFF International Ltd, 2014*
Buses	£ 160,000		*JAQU*
Coach	£ 250,000		*JAQU*

Other Upgrade Costs

Vehicle	Cost	Source
Bus cost of retrofit	£ 20,000	*TfL Bus Retrofit Programme - £86m/5000 buses (Euro VI)* https://www.airqualitynews.com/2017/06/28/86-1-million-london-bus-retrofit-programme-announced/

Derived Parameters

PHV proportion of Taxi	76%

%age of planned upgrades by year (Do-Min). Assumed only for non complaint

	Vehicle	Fuel	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car Petrol	Car	petrol	7%	6%	6%	6%	6%	7%	11%	10%	5%	1%
Car Diesel	Car	diesel	9%	11%	11%	11%	11%	7%	11%	10%	5%	1%
PHV Petrol	PHV	petrol	7%	6%	6%	6%	6%	7%	11%	10%	5%	1%
PHV Diesel	PHV	diesel	9%	11%	11%	11%	11%	7%	11%	10%	5%	1%
Taxi Petrol	Taxi	petrol	7%	6%	6%	6%	6%	7%	11%	10%	5%	1%
Taxi Diesel	Taxi	diesel	9%	11%	11%	11%	11%	7%	11%	10%	5%	1%
LGV petrol	LGV	petrol	11%	12%	12%	12%	12%	6%	9%	8%	4%	1%
LGV diesel	LGV	diesel	11%	12%	12%	12%	12%	6%	9%	8%	4%	1%
HGV	HGV	rigid	4%	5%	5%	5%	5%	1%	2%	2%	1%	1%
HGV	HGV	artic	4%	5%	5%	5%	5%	1%	2%	2%	1%	1%
Bus	Bus	diesel	8%	8%	8%	8%	8%	1%	2%	2%	2%	2%

Source: GM Vehicle Data.xlsx

Upgrade Response

Vehicles scrapped	50%

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Health and Environmental Impact

2018 prices, undiscounted

Summary	**Total**	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Nox Saved	**11,274**	1,419	1,335	1,251	1,167	1,083	1,056	1,022	995	978	967
NO2 Savings (£)	**66,548,893**	8,386,835	7,887,721	7,388,608	6,889,494	6,390,381	6,230,470	6,032,157	5,869,002	5,767,021	5,707,204
Total PM Saved	**497**	52	52	52	52	52	50	49	47	47	46
PM Savings (£)	**62,464,423**	6,593,651	6,556,800	6,519,949	6,483,098	6,446,248	6,284,938	6,084,892	5,920,310	5,817,438	5,757,098
Health and Environmental Impact	**129,013,316**	14,980,485	14,444,521	13,908,557	13,372,593	12,836,629	12,515,408	12,117,049	11,789,312	11,584,460	11,464,302

Source: Bryony Kershaw, Jacobs. Received 05/02/2018. \\EDIFIL01\Data\Environmental\Jobs\Economics\TfGM CAP\Incoming Data and Downloads

		0.9019	0.8714	0.8420	0.8135	0.7860	0.7594	0.7337	0.7089	0.6849	0.6618
Discounted	**Total**	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
NO2 Savings (£)	**52,331,683**	7,564,444	6,873,693	6,221,010	5,604,608	5,022,782	4,731,491	4,425,980	4,160,646	3,950,097	3,776,932
PM Savings (£)	**48,720,415**	5,947,095	5,713,872	5,489,622	5,274,005	5,066,692	4,772,855	4,464,674	4,197,019	3,984,629	3,809,951
Health and Environmental Impact	**101,052,098**	13,511,540	12,587,566	11,710,632	10,878,613	10,089,474	9,504,346	8,890,654	8,357,665	7,934,726	7,586,884

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Trips Cancelled or Re-moded 2021

This worksheet presents the AM, IP and PM peak hour trips either cancelled or re-moded, and converted into AADTs

Source: Adam James, Jacobs. Received 30/01/2018. \\EDIFIL01\Data\Environmental\Jobs\Economics\TfGM CAP\Incoming Data and Downloads

	Other Roads		
	AM Peak Hour to AM Peak Period	Inter-Peak Hour to Off-Peak Period	PM Peak Hour to PM Peak Period
Cars/Motorcycles	2.693	9.649	2.807
LGVS	3.125	9.649	3.071
Rigid HGVS	3.04	9.649	3.472
Articulated HGVS	3.018	9.649	3.049
Buses	2.941	9.649	3.098

Divisor for Trips to unique vehicles

	Total	Cars	Taxi	LGVs	HGV
Trips per day	2.82	2.63	9.65	2.79	2.95

AM Trips

	Non-Compliant Car	Non-Compliant LGV	Non-Compliant HGV	Non-Compliant Taxi	Non-Compliant PHV
Cancel Trip			118	22	
Switch to PT					
Switch to Active Mode					

IP Trips

	Non-Compliant Car	Non-Compliant LGV	Non-Compliant HGV	Non-Compliant Taxi	Non-Compliant PHV
Cancel Trip			128	29	
Switch to PT					
Switch to Active Mode					

PM Trips

	Non-Compliant Car	Non-Compliant LGV	Non-Compliant HGV	Non-Compliant Taxi	Non-Compliant PHV
Cancel Trip			58	45	
Switch to PT					
Switch to Active Mode					

AADT Conversion (non-compliant vehicles)

	AM			IP			PM		
	Cancel	Re-mode (PT)	Re-mode (Active trave	Cancel	Re-mode (PT)	Re-mode (Active travel)	Cancel	Re-mode (PT)	Re-mode (Active travel)
Cars	-	-	-	-	-	-	-	-	-
LGVs	-	-	-	-	-	-	-	-	-
HGV	121	-	-	418	-	-	64	-	-
Taxi	6	-	-	29	-	-	13	-	-

Total Trips PT			
AM	IP	PM	Total
0	0	0	0
0	0	0	0
			0

Total AADTs

	Vehicles cancelling	Vehicles remoding
Cars	-	-
LGVs	-	-
HGV	603	-
Taxi	49	-

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Trips Cancelled or Re-moded 2025

This worksheet presents the AM, IP and PM peak hour trips either cancelled or re-moded, and converted into AADTs

Source: Adam James, Jacobs. Received 30/01/2018. \\EDIFIL01\Data\Environmental\Jobs\Economics\TfGM CAP\Incoming Data and Downloads

	Other Roads		
	AM Peak Hour to AM Peak Period	Inter-Peak Hour to Off-Peak Period	PM Peak Hour to PM Peak Period
Cars/Motorcycles	2.693	9.649	2.807
LGVS	3.125	9.649	3.071
Rigid HGVS	3.04	9.649	3.472
Articulated HGVS	3.018	9.649	3.049
Buses	2.941	9.649	3.098

Divisor for Trips to unique vehicles

User Class	Total	Cars	Taxi	LGVs	HGV
Trips per day	2.82	2.63	9.65	2.79	2.95

AM Trips

	Non-Compliant Car	Non-Compliant LGV	Non-Compliant HGV	Non-Compliant Taxi	Non-Compliant PHV
Cancel Trip		822	37	6	
Switch to PT		651	-		
Switch to Active Mode		180	-		

IP Trips

	Non-Compliant Car	Non-Compliant LGV	Non-Compliant HGV	Non-Compliant Taxi	Non-Compliant PHV
Cancel Trip		794	40	8	
Switch to PT		612	-		
Switch to Active Mode		190	-		

PM Trips

	Non-Compliant Car	Non-Compliant LGV	Non-Compliant HGV	Non-Compliant Taxi	Non-Compliant PHV
Cancel Trip		686	18	12	
Switch to PT		536	-		
Switch to Active Mode		157	-		

AADT Conversion (non-compliant vehicles)

	AM			IP			PM		
	Cancel	Re-mode (PT)	Re-mode (Active trave	Cancel	Re-mode (PT)	Re-mode (Active travel)	Cancel	Re-mode (PT)	Re-mode (Active travel)
Cars	-	-	-	-	-	-	-	-	-
LGVs	920	729	202	2,744	2,117	658	755	590	173
HGV	38	-	-	130	-	-	20	-	-
Taxi	2	-	-	8	-	-	4	-	-

Total AADTs

	Vehicles cancelling	Vehicles remoding
Cars	-	-
LGVs	4,420	4,469
HGV	188	-
Taxi	13	-

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Carbon reduction

This page summarises the carbon reduction data due to the CAP

Table 3 - Carbon benefits of DS (central case CO2e price selected)

Source: \\EDIFIL01\Data\Environmental\Jobs\Economics\TfGM CAP\0_Project Works\Economic model\CO2 reduction

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
CO2e (t)	- 141,737	- 141,324	- 140,911	- 140,499	- 140,086	- 139,673	- 139,262	- 138,851	- 138,442	- 138,034	- 1,398,819
Value (£, 2018 prices)	9,960,534	10,094,342	10,227,199	10,359,105	10,490,060	10,620,064	10,749,212	10,877,506	11,004,950	11,131,550	105,514,522

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Vehicle Upgrade Response

This sheet takes frequency data and converts the behavioural reponse (modelled on a per-trip basis) to vehicles, based on he assumption tha more frequent CAZ users will be the first to upgrade

Data coming from ANPR data projected to 2021

Non-compliant vehicles		Frequency (abs) - non-compliant vehicles							Total
Vehicle	Fuel	1	2	3	4	5	6	7	
Car	Car	Diesel	-	-	-	-	-	-	-	-
Car	Car	Petrol	-	-	-	-	-	-	-	-
Car	Car	Other	-	-	-	-	-	-	-	-
Hackney	Taxi	Diesel	342	153	138	138	140	256	573	1,740
Hackney	Taxi	Petrol	-	-	-	-	-	-	-	-
PHV	PHV	Diesel	252	225	208	223	263	301	390	1,861
PHV	PHV	Petrol	-	-	-	-	-	-	-	-
PHV	PHV	Other	-	-	-	-	-	-	-	-
Van	LGV	Diesel	15,192	6,027	3,575	2,414	2,088	874	277	30,447
Van	LGV	Petrol	-	-	-	-	-	-	-	-
HGV	HGV	Diesel	3,382	1,042	526	363	289	88	41	5,732
HGV	HGV	Petrol	-	-	-	-	-	-	-	-
Bus	Bus	Diesel	271	115	64	88	112	146	156	953
Bus	Bus	Petrol	-	-	-	-	-	-	-	-

Non-compliant vehicles		Frequency (abs) - non-compliant vehicles							Total
Vehicle		1	2	3	4	5	6	7	
Car		-	-	-	-	-	-	-	-
Taxi		342	153	138	138	140	256	573	1,740
PHV		252	225	208	223	263	301	390	1,861
LGV		15,192	6,027	3,575	2,414	2,088	874	277	30,447
HGV		3,382	1,042	526	363	289	88	41	5,732
Bus		271	115	64	88	112	146	156	953

Non-compliant vehicles		Frequency (proportion) - non-compliant vehicles							Total
Vehicle		1	2	3	4	5	6	7	
Car		0%	0%	0%	0%	0%	0%	0%	0%
Taxi		20%	9%	8%	8%	8%	15%	33%	100%
PHV		14%	12%	11%	12%	14%	16%	21%	100%
LGV		50%	20%	12%	8%	7%	3%	1%	100%
HGV		59%	18%	9%	6%	5%	2%	1%	100%
Bus		28%	12%	7%	9%	12%	15%	16%	100%

DM Non-compliant vehicle flows

	Area	AM Peak Hour	IP Peak Hour	PM Peak Hour	AM Period	IP Period	PM Period	AADT
Car	GM	27,015	21,688	30,394	72,751	209,267	85,315	367,333
Taxi	GM	3,758	3,017	4,267	10,121	29,113	11,977	51,211
LGV	GM	9,203	9,264	7,237	28,761	89,384	22,226	140,370
HGV	GM	2,715	3,092	1,259	8,224	29,837	4,106	42,166
Bus	GM	1,915	1,712	1,515	5,633	16,516	4,694	26,843

DM Non-compliant vehicle flows (AADT)

Non-compliant vehicles		Frequency (abs) - non-compliant vehicles							Total
Vehicle	Total	1	2	3	4	5	6	7	
Car	367,333	-	-	-	-	-	-	-	-
Taxi	12,342	2,426	1,085	979	979	993	1,816	4,064	12,342
PHV	38,869	5,258	4,707	4,335	4,663	5,484	6,284	8,138	38,869
LGV	140,370	70,040	27,789	16,482	11,128	9,628	4,027	1,278	140,370
HGV	42,166	24,880	7,669	3,872	2,673	2,125	647	300	42,166
Bus	26,843	7,645	3,236	1,811	2,490	3,166	4,111	4,384	26,843

DM Non-compliant vehicle flows (weekly)

Non-compliant vehicles		Frequency (abs) - non-compliant vehicles							Total
Vehicle	Total	1	2	3	4	5	6	7	
Car	-	-	-	-	-	-	-	-	-
Taxi	55,759	2,426	2,170	2,937	3,915	4,965	10,895	28,450	55,759
PHV	168,420	5,258	9,414	13,006	18,650	27,422	37,706	56,965	168,420
LGV	300,819	70,040	55,577	49,445	44,510	48,138	24,165	8,945	300,819
HGV	79,136	24,880	15,338	11,616	10,690	10,626	3,885	2,101	79,136
Bus	100,694	7,645	6,471	5,434	9,961	15,831	24,665	30,685	100,694

Behaviour response - Upgrade

Assumption: The first to upgrade will be the ones that make the trip more often

					Number of times entering CAZ																	
					7		6		5		4		3		2		1					
Vehicle	Fuel	% of all trips that upgrade	Weekly trips	No. trips to upgrade	Vehicles that enter CAZ	Remaining trips	Vehicles that enter CAZ	Remaining trips	Vehicles that enter CAZ	Remaining trips	Vehicles that enter CAZ	Remaining trips	Vehicles that enter CAZ	Remaining trips	Vehicles that enter CAZ	Remaining trips	Vehicles that enter CAZ	Remaining trips without vehicle upgrade	Total Vehicle Upgrade	Vehicle upgrade as a proportion of total daily non-compliant vehicles
Car	Petrol	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%
Car	Diesel	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%
Taxi	Petrol	100%	55,759	55,759	4,064	27,308	1,816	16,413	993	11,448	979	7,533	979	4,596	1,085	2,426	2,426	-	12,342	100%
Taxi	Diesel	100%	55,759	55,759	4,064	27,308	1,816	16,413	993	11,448	979	7,533	979	4,596	1,085	2,426	2,426	-	12,342	100%
PHV	Petrol	70%	168,420	117,557	8,138	60,593	6,284	22,887	4,577	-	-	-	-	-	-	-	-	-	19,000	49%
PHV	Diesel	70%	168,420	117,557	8,138	60,593	6,284	22,887	4,577	-	-	-	-	-	-	-	-	-	19,000	49%
LGV	Petrol	75%	300,819	226,817	1,278	217,873	4,027	193,708	9,628	145,571	11,128	101,060	16,482	51,616	25,808	-	-	-	68,350	49%
LGV	Diesel	75%	300,819	226,817	1,278	217,873	4,027	193,708	9,628	145,571	11,128	101,060	16,482	51,616	25,808	-	-	-	68,350	49%
HGV	Diesel	87%	79,136	68,453	300	66,351	647	62,467	2,125	51,841	2,673	41,151	3,872	29,535	7,669	14,197	14,197	-	31,483	75%
Bus	Diesel	100%	100,694	100,694	4,384	70,008	4,111	45,343	3,166	29,512	2,490	19,550	1,811	14,117	3,236	7,645	7,645	-	26,843	100%
Coach	Diesel	100%	100,694	100,694	4,384	70,008	4,111	45,343	3,166	29,512	2,490	19,550	1,811	14,117	3,236	7,645	7,645	-	26,843	100%

Summary of Response

Vehicle Type	Vehicles upgrading
Car	0%
Taxi	100%
PHV	49%
LGV	49%
HGV	75%
Bus	100%
Coach	100%

Draft for approval

Assumptions
1)Age planned upgrade are assumed to be done all at the beginning of the year
2)Fuel type "Other" is assumed not to upgrade for the scheme
3)Car,Taxi and PHV upgrading the vehicles for the age and that will choice a second hand vehicle, will buy a euro class 2 level higher than the current class
4)EV are assumed to upgrade due to age planned upgrade at the same rate of petrol vehicles
5)The DM scenario includes only the age planned upgrade
6)Total number of vehicles is assumed to be constant along the appraisal period 2021-2030
7) compliant vehicles will upgrade due to planned age upgrading
-up to Euro 5 and below until 2025
-up to Euro 6 and below from 2026 to 2027
-up to Euro 6c and below from 2028 to 2030

DO SOMETHING CALCULATION >>

Do Minimum - Fleet composition. Percentage

2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%	0%	0%	0%					0%				0%			0%			0%	
1	0%	0%	0%	0%				0%	0%				0%			0%			0%	
2	0%	0%	0%	0%		1%		0%	0%		0%		0%			0%			0%	
3	2%	0%	0%	0%		14%	1%	0%	1%		0%		0%			2%			3%	
4	12%	4%	0%	0%	0%	55%	0%	2%	8%		1%		26%			4%			3%	
5	18%	12%	0%	1%	0%	26%	0%	3%	25%	0%	2%		46%			23%			34%	
6	9%	11%	4%	0%		2%		2%	21%		1%		28%			71%			60%	
6c	12%	15%	0%	0%				2%	29%		1%									
6d	0%	1%	0%	0%				0%	2%		0%									
Sub-total	**52%**	**43%**	**4%**	**1%**	**0%**	**99%**	**1%**	**9%**	**85%**	**0%**	**6%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**100%**	**Taxi Total**		**100%**	**PHV Total**			**100%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Sum of non-compliant	2%	17%		1%	0%	97%	1%	0%	33%		4%		72%			29%			40%	

Method
Do Minimum - Fleet composition. Vehicles

2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
Min. Compliance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	0	6	6	0
0	-	-	4	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	4	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	10	57	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	19,008	5,155	26	731	-	317	18	33	102	-	36	-	-	-	-	643	-	-	87	-
4	139,393	46,394	14	2,503	1	1,205	1	246	920	-	156	-	31,009	-	-	1,286	-	-	87	-
5	215,426	149,491	577	6,527	5	577	-	380	2,964	2	241	-	53,749	-	-	7,395	-	-	981	-
6	107,713	128,871	44,401	3,060	-	49	-	190	2,556	-	121	-	33,076	-	-	22,828	-	-	1,731	-
6c	145,729	175,265	-	-	-	-	-	257	3,476	-	163	-	-	-	-	-	-	-	-	-
6d	-	10,310	-	-	-	-	-	-	204	-	-	-	-	-	-	-	-	-	-	-
Compliant	627,270	515,485	45,036	12,950	6	49	20	1,105	6,235	-	284	-	33,076	-	-	22,828	-	-	1,731	-
Non-Compliant	-	-	-	-	-	2,127	-	-	3,987	2	434	-	84,758	-	-	9,324			1,154	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Do minimum - Compliant vehicles. Percentage

2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	3%		0%	6%	0%		94%	3%		0%	5%									
4	22%		0%	19%	20%		6%	22%		0%	22%									
5	34%		1%	50%	80%		0%	34%		100%	34%									
6	17%	41%	99%	24%	0%	100%	0%	17%	41%	0%	17%		100%			100%			100%	
6c	23%	56%	0%	0%	0%	0%	0%	23%	56%	0%	23%		0%			0%			0%	
6d	0%	3%	0%	0%	0%	0%	0%	0%	3%	0%	0%		0%			0%			0%	
Sub-total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**300%**	**PHV Total**			**400%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to the scheme

Start sunset period

2020	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-				-		-	-							-			-	
1	-	-				-		-	-							-			-	
2	-	-				28		-	-							-			-	
3	-	-				317		16	50							480.12			87	
4	-	-				1,205			450							960			87	
5	-	-				577			1,449							5,521			981	
6	-	-																		
6c	-	-																		
6d	-	-																		
Sub-total	**-**	**-**	**-**	**-**	**-**	**2,127**	**-**	**16**	**1,949**	**-**	**-**	**-**	**-**	**-**	**-**	**6,962**	**-**	**-**	**1,154**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**2,127**	**PHV Total**			**1,965**	**LGV Total**		**-**	**HGV Total**		**6,962**	**Bus Total**		**1153.99548**

Vehicles upgrading due to age planned upgrade

2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0					-	-	-		-	-			-				
1	-	-	0					-	-	-		-	-			-				
2	-	-	1					-	-	-		-	-			-				
3	1,308	460	2					2	9	-		-	-			27				
4	9,589	4,136	1					17	82	-		-	3,455			54				
5	14,819.19	13,326	40					26	264	0		-	5,989			313				
6																				
6c																				
6d																				
Sub-total	**25,716**	**17,922**	**44**	**-**	**-**	**-**	**-**	**45**	**355**	**0**	**-**	**-**	**9,444**	**-**	**-**	**395**	**-**	**-**	**-**	**-**
Total	**Car Total**			**43,681**	**Taxi Total**		**-**	**PHV Total**			**401**	**LGV Total**		**9,444**	**HGV Total**		**395**	**Bus Total**		**0**

Vehicles fleet - Do Something

2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	4	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	4	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	10	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	17,701	4,695	25	731	-	0	18	15	43	-	36	-	-	-	-	136			-	
4	129,804	42,258	14	2,503	1	0	1	229	388	-	156	-	27,554	-	-	271			-	
5	201,588	136,509	539	6,527	5	0	-	367	1,251	2	241	-	47,760	-	-	1,561			-	
6	114,905	131,973	44,401	3,060	-	1,644	-	202	3,264	-	121	-	35,668	-	-	28,345			2,596	
6c	156,844	185,260	30	-	-	-	-	276	4,439	0	163	-	4,492	-	-	-			-	
6d	6,429	14,790	11	-	-	532	-	15	837	0	-	-	2,361	-	-	1,839			288	
Compliant	627,270	515,485	45,036	12,950	6	2,176	20	1,105	8,540	0	284	-	42,520	-	-	30,184	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	1,683	2	434	-	75,314	-	-	1,968			-	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Vehicle proportion, calculation to fit into carbon emission external spreadsheet

2021	DM		DS	
	Nr Vehicles	% Vehicles	Nr Vehicles	% Vehicles
Car Petrol	627,270	99.8%	627,270	99.8%
PHVPetrol	1,105	0.2%	1,105	0.2%
Total	628,375	100%	628,375	100%
Car Diesel	515,485	98.1%	515,485	98.1%
PHV Diesel	10,222	1.9%	10,222	1.9%
Total	525,707	100%	525,707	100%
Taxi Diesel	2,176	99.7%	2,176	99.7%
Taxi petrol	6	0.3%	6	0.3%
Total	2,182	100%	2,182	100%

Vehicles upgrading due to age planned upgrade

2022	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0					-	-	-		-	-			-				
1	-	-	0					-	-	-		-	-			-				
2	-	-	1					-	-	-		-	-			-				
3	1,053	505	1					1	5	-		-	-			7				
4	7,721	4,544	1					14	42	-		-	3,302			14				
5	11,991	14,678	32					22	135	0		-	5,724			79				
6																				
6c																				
6d																				
Sub-total	**20,765**	**19,727**	**35**	**-**	**-**	**-**	**-**	**36**	**181**	**0**	**-**	**-**	**9,026**	**-**	**-**	**99**	**-**	**-**	**-**	**-**
Total	**Car Total**			**40,527**	**Taxi Total**		**-**	**PHV Total**			**217**	**LGV Total**		**9,026**	**HGV Total**		**99**	**Bus Total**		**0**

Vehicles fleet - Do Something

2022	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	4	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	4	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	9	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	16,648	4,190	23	731	-	0	18	14	39	-	36	-	-	-	-	129			-	
4	122,083	37,714	13	2,503	1	0	1	215	347	-	156	-	24,252	-	-	258			-	
5	190,386	122,209	508	6,527	5	0	-	346	1,120	2	241	-	42,036	-	-	1,482			-	
6	120,695	135,381	44,402	3,060	-	1,644	-	213	3,295	-	121	-	38,144	-	-	28,415			2,596	
6c	165,837	196,268	54	-	-	-	-	293	4,540	0	163	-	8,785	-	-	-			-	
6d	11,620	19,722	20	-	-	532	-	25	882	0	-	-	4,618	-	-	1,868			288	
Compliant	627,270	515,485	45,036	12,950	6	2,176	20	1,105	8,717	0	284	-	51,547	-	-	30,283	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	1,505	2	434	-	66,288	-	-	1,869			-	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

2023	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	0%		0%	2%									
4	7%		0%	0%	7%		0%	7%		0%	1%									
5	11%		0%	1%	29%		0%	11%		31%	2%									
6	8%	39%	33%	0%	0%	76%	0%	8%	38%	0%	1%		74%			94%			90%	
6c	12%	56%	0%	0%	0%	0%	0%	12%	52%	3%	1%		17%			0%			0%	
6d	1%	6%	0%	0%	0%	24%	0%	1%	10%	1%	0%		9%			6%			10%	
Sub-total	**39%**	**100%**	**34%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**34%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**180%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2023	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0					-	-	-			-			-				
1	-	-	0					-	-	-			-			-				
2	-	-	1					-	-	-			-			-				
3	990.24	451	1					1	4	-			-			6				
4	7,261.77	4,055	1					13	37	-			2,907			13				
5	11,324.57	13,141	30					21	120	0			5,038			75				
6																				
6c																				
6d																				
Sub-total	**19,577**	**17,647**	**33**	**-**	**-**	**-**	**-**	**34**	**162**	**0**	**-**	**-**	**7,945**	**-**	**-**	**94**	**-**	**-**	**-**	**-**
Total	**Car Total**			**37,257**	**Taxi Total**		**-**	**PHV Total**			**196**	**LGV Total**		**7,945**	**HGV Total**		**94**	**Bus Total**		**0**

Vehicles upgrading due to the scheme

End sunset period

2023	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0													-							
1													-							
2													-							
3													-							
4													11,809							
5													20,468							
6																				
6c																				
6d																				
Sub-total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**32,277**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**-**	**PHV Total**			**-**	**LGV Total**		**32,277**	**HGV Total**		**-**	**Bus Total**		**0**

Vehicles fleet - Do Something

2023	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	3	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	3	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	9	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	15,657	3,740	22	731	-	0	18	13	34	-	36	-	-	-	-	122			-	
4	114,822	33,659	13	2,503	1	0	1	202	309	-	156	-	9,536	-	-	245			-	
5	179,804	109,406	479	6,527	5	0	-	326	1,003	2	241	-	16,530	-	-	1,407			-	
6	126,142	138,422	44,402	3,060	-	1,644	-	222	3,323	-	121	-	60,468	-	-	28,481			2,596	
6c	174,330	206,124	76	-	-	-	-	308	4,630	0	163	-	13,926	-	-	-			-	
6d	16,514	24,134	28	-	-	532	-	33	923	0	-	-	17,375	-	-	1,896			288	
Compliant	627,270	515,485	45,036	12,950	6	2,176	20	1,105	8,876	0	284	-	91,769	-	-	30,377	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	1,346	2	434	-	26,066	-	-	1,775			-	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

2023	DM		DS	
	Nr Vehicles	% Vehicles	Nr Vehicles	% Vehicles
Car Petrol	627,270	99.8%	627,270	99.8%
PHVPetrol	1,105	0.2%	1,105	0.2%
Total	628,375	100%	628,375	100%
Car Diesel	515,485	98.1%	515,485	98.1%
PHV Diesel	10,222	1.9%	10,222	1.9%
Total	525,707	100%	525,707	100%
Taxi Diesel	2,176	99.7%	2,176	99.7%
Taxi petrol	6	0.3%	6	0.3%
Total	2,182	100.0%	2,182	100.0%

Compliant vehicles percentage

2024	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	0%		0%	2%									
4	6%		0%	0%	7%		0%	6%		0%	1%									
5	10%		0%	1%	29%		0%	11%		31%	2%									
6	8%	38%	33%	0%	0%	76%	0%	8%	37%	0%	1%		66%			94%			90%	
6c	12%	56%	0%	0%	0%	0%	0%	12%	52%	3%	1%		15%			0%			0%	
6d	1%	7%	0%	0%	0%	24%	0%	1%	10%	1%	0%		19%			6%			10%	
Sub-total	**39%**	**100%**	**34%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**34%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**180%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2024	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0					-	-	-		-	-			-				
1	-	-	0					-	-	-		-	-			-				
2	-	-	1					-	-	-		-	-			-				
3	931.34	402	1					1	4	-		-	-			6				
4	6,829.83	3,619	1					12	33	-			1,143			12				
5	10,695.14	11,764	28					19	108	0			1,981			71				
6																				
6c																				
6d																				
Sub-total	**18,456**	**15,785**	**31**	-	-	-	-	**32**	**145**	**0**	-	-	**3,124**	-	-	**89**	-	-	-	-
Total	**Car Total**			**34,273**	**Taxi Total**		**-**	**PHV Total**			**177**	**LGV Total**		**3,124**	**HGV Total**		**89**	**Bus Total**		**0**

Vehicles fleet - Do Something

2024	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	3	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	3	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	8	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	14,726	3,338	21	731	-	0	18	12	31	-	36	-	-	-	-	116			-	
4	107,992	30,040	13	2,503	1	0	1	190	276	-	156	-	8,393	-	-	232			-	
5	169,808	97,944	451	6,527	5	0	-	307	898	2	241	-	14,549	-	-	1,337			-	
6	131,264	141,137	44,403	3,060	-	1,644	-	231	3,348	-	121	-	61,325	-	-	28,544			2,596	
6c	182,352	214,947	98	-	-	-	-	323	4,711	0	163	-	15,411	-	-	-			-	
6d	21,128	28,080	36	-	-	532	-	41	959	0	-	-	18,156	-	-	1,923			288	
Compliant	627,270	515,485	45,036	12,950	6	2,176	20	1,105	9,018	0	284	-	94,893	-	-	30,467	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	1,204	2	434	-	22,942	-	-	1,685			-	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

2024	DM		DS	
	Nr Vehicles	% Vehicles	Nr Vehicles	% Vehicles
Car Petrol	627,270	99.8%	627,270	99.8%
PHVPetrol	1,105	0.2%	1,105	0.2%
Total	628,375	100%	628,375	100%
Car Diesel	515,485	98.1%	515,485	98.1%
PHV Diesel	10,222	1.9%	10,222	1.9%
Total	525,707	100%	525,707	100%
Taxi Diesel	2,176	99.7%	2,176	99.7%
Taxi petrol	6	0.3%	6	0.3%
Total	2,182	100.0%	2,182	100.0%

Compliant vehicles percentage

2025	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	0%		0%	2%									
4	6%		0%	0%	7%		0%	6%		0%	1%									
5	10%		0%	1%	29%		0%	10%		31%	2%									
6	8%	37%	33%	0%	0%	76%	0%	8%	37%	0%	1%		65%			94%			90%	
6c	13%	56%	0%	0%	0%	0%	0%	13%	52%	3%	1%		16%			0%			0%	
6d	2%	7%	0%	0%	0%	24%	0%	2%	11%	1%	0%		19%			6%			10%	
Sub-total	**39%**	**100%**	**34%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**34%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**180%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2025	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0					-	-	-		-	-			-				
1	-	-	0					-	-	-		-	-			-				
2	-	-	1					-	-	-		-	-			-				
3	875.94	359	1					1	3	-		-	-			6				
4	6,423.57	3,230	1					11	30	-		-	1,006			12				
5	10,100.52	10,532	27					18	97	0		-	1,744			67				
6																				
6c																				
6d																				
Sub-total	**17,400**	**14,121**	**30**	-	-	-	-	**30**	**130**	**0**	-	-	**2,750**	-	-	**85**	-	-	-	-
Total	**Car Total**			**31,550**	**Taxi Total**		**-**	**PHV Total**			**160**	**LGV Total**		**2,750**	**HGV Total**		**85**	**Bus Total**		**0**

Vehicles fleet - Do Something

2025	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	3	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	3	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	8	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	13,850	2,979	20	731	-	0	18	12	27	-	36	-	-	-	-	110			-	
4	101,568	26,809	12	2,503	1	0	1	179	246	-	156	-	7,388	-	-	221			-	
5	160,364	87,681	425	6,527	5	0	-	290	804	2	241	-	12,805	-	-	1,269			-	
6	136,082	143,559	44,404	3,060	-	1,644	-	240	3,370	-	121	-	62,079	-	-	28,604			2,596	
6c	189,927	222,846	118	-	-	-	-	336	4,783	0	163	-	16,719	-	-	-			-	
6d	25,478	31,610	43	-	-	532	-	49	991	0	-	-	18,844	-	-	1,948			288	
Compliant	627,270	515,485	45,036	12,950	6	2,176	20	1,105	9,145	0	284	-	97,642	-	-	30,552	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	1,077	2	434	-	20,193	-	-	1,600			-	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

2025	DM		DS	
	Nr Vehicles	% Vehicles	Nr Vehicles	% Vehicles
Car Petrol	627,270	99.8%	627,270	99.8%
PHVPetrol	1,105	0.2%	1,105	0.2%
Total	628,375	100%	628,375	100%
Car Diesel	515,485	98.1%	515,485	98.1%
PHV Diesel	10,222	1.9%	10,222	1.9%
Total	525,707	100%	525,707	100%
Taxi Diesel	2,176	99.7%	2,176	99.7%
Taxi petrol	6	0.3%	6	0.3%
Total	2,182	100.0%	2,182	100.0%

Compliant vehicles percentage

2026	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	0%		0%	2%									
4	5%		0%	0%	7%		0%	5%		0%	1%									
5	9%		0%	1%	29%		0%	9%		31%	2%									
6	8%	36%	33%	0%	0%	76%	0%	8%	37%	0%	1%		64%			94%			90%	
6c	13%	56%	0%	0%	0%	0%	0%	13%	52%	3%	1%		17%			0%			0%	
6d	2%	8%	0%	0%	0%	24%	0%	2%	11%	1%	0%		19%			6%			10%	
Sub-total	**39%**	**100%**	**34%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**34%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**180%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2026	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0					-	-	-		-	-			-				
1	-	-	0					-	-	-		-	-			-				
2	-	-	1					-	-	-		-	-			-				
3	931	207	1					1	2	-		-	-			6				
4	6,824	1,864	1					12	17	-		-	426			11				
5	10,775	6,095	29					19	56	0		-	739			64				
6	9,143.37	9,979.46	2,983		-	114.31		16	234	-		-	3,581			1,441			215	
6c																				
6d																				
Sub-total	**27,673**	**18,145**	**3,015**	-	-	**114**	-	**48**	**309**	**0**	-	-	**4,745**	-	-	**1,522**	-	-	**215**	-
Total	**Car Total**			**48,834**	**Taxi Total**		**114**	**PHV Total**			**358**	**LGV Total**		**4,745**	**HGV Total**		**1,522**	**Bus Total**		**215.123946**

Vehicles fleet - Do Something

2026	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	3	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	3	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	8	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	12,920	2,772	19	731	-	0	18	11	25	-	36	-	-	-	-	105			-	
4	94,744	24,946	12	2,503	1	0	1	167	229	-	156	-	6,961	-	-	210			-	
5	150,287	81,742	398	6,527	5	0	-	271	749	2	241	-	12,066	-	-	1,205			-	
6	132,057	134,978	41,421	3,060	-	1,530	-	233	3,149	-	121	-	58,818	-	-	28,660			2,596	
6c	198,008	227,417	139	-	-	-	-	351	4,825	0	163	-	17,273	-	-	-			-	
6d	39,254	43,631	3,035	-	-	646	-	73	1,244	0	-	-	22,716	-	-	1,972			288	
Compliant	627,270	515,485	45,036	12,950	6	2,176	20	1,105	9,218	0	284	-	98,807	-	-	30,632	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	1,004	2	434	-	19,028	-	-	1,520			-	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

2026	DM		DS	
	Nr Vehicles	% Vehicles	Nr Vehicles	% Vehicles
Car Petrol	627,270	99.8%	627,270	99.8%
PHVPetrol	1,105	0.2%	1,105	0.2%
Total	628,375	100%	628,375	100%
Car Diesel	515,485	98.1%	515,485	98.1%
PHV Diesel	10,222	1.9%	10,222	1.9%
Total	525,707	100%	525,707	100%
Taxi Diesel	2,176	99.7%	2,176	99.7%
Taxi petrol	6	0.3%	6	0.3%
Total	2,182	100.0%	2,182	100.0%

Compliant vehicles percentage

2027	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	0%		0%	2%									
4	5%		0%	0%	7%		0%	5%		0%	1%									
5	8%		0%	1%	29%		0%	9%		29%	2%									
6	8%	33%	31%	0%	0%	70%	0%	8%	34%	0%	1%		60%			94%			90%	
6c	13%	56%	0%	0%	0%	0%	0%	13%	52%	5%	1%		17%			0%			0%	
6d	3%	11%	3%	0%	0%	30%	0%	3%	13%	2%	0%		23%			6%			10%	
Sub-total	**39%**	**100%**	**35%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**35%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**180%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2027	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0					-	-	-		-	-			-				
1	-	-	0					-	-	-		-	-			-				
2	-	-	1					-	-	-		-	-			-				
3	1,389	308	2					1	3	-		-	-			5				
4	10,185	2,775	1					18	25	-		-	642			11				
5	16,157	9,092	43					29	83	0		-	1,114			61				
6	14,197	15,013	4,453		-	170		25	350	-		-	5,428			1,444			215	
6c																				
6d																				
Sub-total	**41,927**	**27,187**	**4,500**	-	-	**170**	-	**73**	**462**	**0**	-	-	**7,184**	-	-	**1,520**	-	-	**215**	-
Total	**Car Total**			**73,615**	**Taxi Total**		**170**	**PHV Total**			**535**	**LGV Total**		**7,184**	**HGV Total**		**1,520**	**Bus Total**		**215.123946**

Vehicles fleet - Do Something

2027	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	2	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	2	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	7	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	11,531	2,463	17	731	-	0	18	10	23	-	36	-	-	-	-	100			-	
4	84,558	22,171	11	2,503	1	0	1	149	204	-	156	-	6,319	-	-	199			-	
5	135,172	72,881	356	6,527	5	0	-	243	668	2	241	-	10,953	-	-	1,145			-	
6	125,499	122,046	36,969	3,060	-	1,360	-	221	2,818	-	121	-	53,872	-	-	28,714			2,596	
6c	210,126	234,236	171	-	-	-	-	373	4,888	0	163	-	18,108	-	-	-			-	
6d	60,384	61,687	7,500	-	-	816	-	110	1,623	0	-	-	28,583	-	-	1,995			288	
Compliant	627,270	515,485	45,036	12,950	6	2,176	20	1,105	9,328	0	284	-	100,563	-	-	30,709	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	894	2	434	-	17,272	-	-	1,443			-	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

2027	DM		DS	
	Nr Vehicles	% Vehicles	Nr Vehicles	% Vehicles
Car Petrol	627,270	99.8%	627,270	99.8%
PHVPetrol	1,105	0.2%	1,105	0.2%
Total	628,375	100%	628,375	100%
Car Diesel	515,485	98.1%	515,485	98.1%
PHV Diesel	10,222	1.9%	10,222	1.9%
Total	525,707	100%	525,707	100%
Taxi Diesel	2,176	99.7%	2,176	99.7%
Taxi petrol	6	0.3%	6	0.3%
Total	2,182	100.0%	2,182	100.0%

Compliant vehicles percentage

2028	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	0%		0%	2%									
4	5%		0%	0%	7%		0%	5%		0%	1%									
5	8%		0%	1%	29%		0%	8%		26%	2%									
6	8%	29%	27%	0%	0%	62%	0%	8%	30%	0%	1%		54%			94%			90%	
6c	14%	56%	0%	0%	0%	0%	0%	14%	52%	8%	1%		18%			0%			0%	
6d	5%	15%	8%	0%	0%	38%	0%	5%	17%	3%	0%		28%			6%			10%	
Sub-total	**39%**	**100%**	**36%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**36%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**181%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2028	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0					-	-	-		-	-			-				
1	-	-	0					-	-	-		-	-			-				
2	-	-	1					-	-	-		-	-			-				
3	1,116	247	2					1	2	-		-	-			5				
4	8,181	2,219	1					14	20	-			525			10				
5	13,078	7,295	34					23	67	0			910			58				
6	12,143	12,217	3,577		-	136		21	282	-			4,474			1,447			215	
6c	20,330	23,447	17		-	-		36	489	0			1,504			-			-	
6d																				
Sub-total	**54,848**	**45,426**	**3,632**	**-**	**-**	**136**	**-**	**96**	**861**	**0**	**-**	**-**	**7,413**	**-**	**-**	**1,519**	**-**	**-**	**215**	**-**
Total	**Car Total**			**103,906**	**Taxi Total**		**136**	**PHV Total**			**957**	**LGV Total**		**7,413**	**HGV Total**		**1,519**	**Bus Total**		**215.123946**

Vehicles fleet - Do Something

2028	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	2	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	2	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	7	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	10,415	2,217	15	731	-	0	18	9	20	-	36	-	-	-	-	95			-	
4	76,377	19,952	11	2,503	1	0	1	135	183	-	156	-	5,794	-	-	189			-	
5	122,931	65,771	323	6,527	5	0	-	220	603	1	241	-	10,043	-	-	1,087			-	
6	119,493	111,493	33,393	3,060	-	1,224	-	211	2,551	-	121	-	49,791	-	-	28,765			2,596	
6c	199,604	216,260	181	-	-	-	-	354	4,448	0	163	-	17,287	-	-	-			-	
6d	98,450	99,792	11,090	-	-	952	-	177	2,416	0	-	-	34,920	-	-	2,017			288	
Compliant	627,270	515,485	45,024	12,950	6	2,176	20	1,105	9,416	1	284	-	101,997	-	-	30,782	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	807	1	434	-	15,837	-	-	1,370			-	
Sub-total	**627,270**	**515,485**	**45,024**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,728**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

2028	DM		DS	
	Nr Vehicles	% Vehicles	Nr Vehicles	% Vehicles
Car Petrol	627,270	99.8%	627,270	99.8%
PHVPetrol	1,105	0.2%	1,105	0.2%
Total	628,375	100%	628,375	100%
Car Diesel	515,485	98.1%	515,485	98.1%
PHV Diesel	10,222	1.9%	10,222	1.9%
Total	525,707	100%	525,707	100%
Taxi Diesel	2,176	99.7%	2,176	99.7%
Taxi petrol	6	0.3%	6	0.3%
Total	2,182	100.0%	2,182	100.0%

Compliant vehicles percentage

2029	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	0%		0%	2%									
4	4%		0%	0%	7%		0%	4%		0%	1%									
5	7%		0%	1%	29%		0%	7%		24%	2%									
6	7%	26%	25%	0%	0%	56%	0%	7%	27%	0%	1%		49%			93%			90%	
6c	13%	51%	0%	0%	0%	0%	0%	13%	47%	9%	1%		17%			0%			0%	
6d	7%	23%	11%	0%	0%	44%	0%	7%	26%	4%	0%		34%			7%			10%	
Sub-total	**39%**	**100%**	**36%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**37%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**182%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2029	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0		-	-		-	-	-		-	-			-			-	
1	-	-	0		-	-		-	-	-		-	-			-			-	
2	-	-	0		-	0		-	-	-		-	-			-			-	
3	537.44	118	0.80		-	0.00		0	1	-		-	-			5			-	
4	3,941.22	1,065	0.55		0.06	0.00		7	10	-		-	257			10			-	
5	6,343.48	3,511	16.68		0.25	0.00		11	32	0		-	445			55			-	
6	6,166.07	5,952	1,723.13		-	65.33		11	136	-		-	2,206			1,449			215	
6c	10,299.98	11,546	9.33		-	-		18	237	0		-	766			-			-	
6d																				
Sub-total	**27,288**	**22,193**	**1,751**	**-**	**0**	**65**	**-**	**48**	**417**	**0**	**-**	**-**	**3,673**	**-**	**-**	**1,518**	**-**	**-**	**215**	**-**
Total	**Car Total**			**51,232**	**Taxi Total**		**66**	**PHV Total**			**465**	**LGV Total**		**3,673**	**HGV Total**		**1,518**	**Bus Total**		**215.123946**

Vehicles fleet - Do Something

2029	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	2	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	2	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	6	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	9,878	2,099	15	731	-	0	18	8	19	-	36	-	-	-	-	90			-	
4	72,436	18,887	10	2,503	1	0	1	128	174	-	156	-	5,537	-	-	179			-	
5	116,990	62,348	307	6,527	5	0	-	209	571	1	241	-	9,598	-	-	1,032			-	
6	116,282	106,340	31,670	3,060	0	1,158	-	205	2,422	-	121	-	47,778	-	-	28,813			2,596	
6c	194,062	207,348	184	-	0	0	-	345	4,235	0	163	-	16,854	-	-	-			-	
6d	117,622	118,463	12,820	-	0	1,018	-	211	2,801	0	-	-	38,067	-	-	2,037			288	
Compliant	627,270	515,485	45,017	12,950	6	2,176	20	1,105	9,458	1	284	-	102,699	-	-	30,851	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	764	1	434	-	15,136	-	-	1,301			-	
Sub-total	**627,270**	**515,485**	**45,017**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,721**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

2029	DM		DS	
	Nr Vehicles	% Vehicles	Nr Vehicles	% Vehicles
Car Petrol	627,270	99.8%	627,270	99.8%
PHVPetrol	1,105	0.2%	1,105	0.2%
Total	628,375	100%	628,375	100%
Car Diesel	515,485	98.1%	515,485	98.1%
PHV Diesel	10,222	1.9%	10,222	1.9%
Total	525,707	100%	525,707	100%
Taxi Diesel	2,176	99.7%	2,176	99.7%
Taxi petrol	6	0.3%	6	0.3%
Total	2,182	100.0%	2,182	100.0%

Compliant vehicles percentage

2030	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	0%		0%	2%									
4	4%		0%	0%	6%		0%	4%		0%	1%									
5	7%		0%	1%	27%		0%	7%		22%	2%									
6	7%	25%	24%	0%	0%	53%	0%	7%	26%	0%	1%		47%			93%			90%	
6c	12%	48%	0%	0%	2%	0%	0%	12%	45%	10%	1%		16%			0%			0%	
6d	9%	27%	12%	0%	1%	47%	0%	9%	30%	4%	0%		37%			7%			10%	
Sub-total	**39%**	**100%**	**36%**	**3%**	**36%**	**100%**	**31%**	**39%**	**100%**	**37%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**182%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2030	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0		-	-		-	-	-		-	-			-			-	
1	-	-	0		-	-		-	-	-		-	-			-			-	
2	-	-	0		-	0		-	-	-		-	-			-			-	
3	127	28	0		-	0		0	0	-		-	-			5			-	
4	934	252	0		0	0		2	2	-			61			9			-	
5	1,509	832	4		0	0		3	8	0			106			52			-	
6	1,500	1,419	409		0	15		3	32	-			529			1,452			215	
6c	2,503	2,767	2		0	0		4	57	0			187			-			-	
6d																				
Sub-total	**6,575**	**5,299**	**415**	**-**	**0**	**15**	**-**	**12**	**99**	**0**	**-**	**-**	**883**	**-**	**-**	**1,517**	**-**	**-**	**215**	**-**
Total	**Car Total**			**12,289**	**Taxi Total**		**16**	**PHV Total**			**111**	**LGV Total**		**883**	**HGV Total**		**1,517**	**Bus Total**		**215.123946**

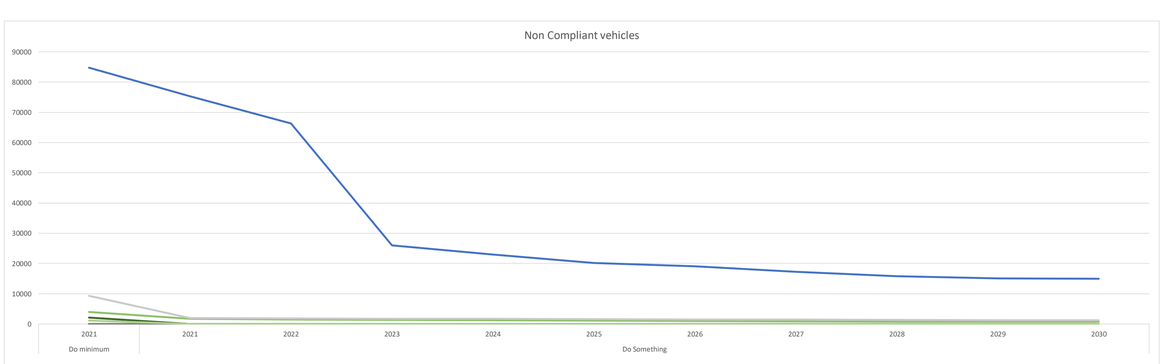
Vehicles fleet - Do Something

2030	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	2	24	-	-	-	-	-	-	-	-	-	-	-	-			-	
1	-	-	2	49	-	-	-	-	-	-	-	-	-	-	-	-			-	
2	-	-	6	57	-	0	-	-	-	-	-	-	-	-	-	-			-	
3	9,750	2,071	15	731	-	0	18	8	19	-	36	-	-	-	-	85			-	
4	71,501	18,635	10	2,503	1	0	1	126	171	-	156	-	5,476	-	-	170			-	
5	115,577	61,537	303	6,527	5	0	-	206	564	1	241	-	9,492	-	-	980			-	
6	115,483	105,110	31,262	3,060	0	1,143	-	203	2,391	-	121	-	47,295	-	-	28,859			2,596	
6c	192,690	205,205	185	-	0	0	-	342	4,184	0	163	-	16,748	-	-	-			-	
6d	122,268	122,928	13,231	-	0	1,033	-	219	2,850	0	-	-	38,824	-	-	2,057			288	
Compliant	627,270	515,485	45,015	12,950	6	2,176	20	1,105	9,425	1	284	-	102,867	-	-	30,916	-	-	2,885	-
Non-Compliant	-	-	-	-	-	-	-	-	754	1	434	-	14,968	-	-	1,236			-	
Sub-total	**627,270**	**515,485**	**45,015**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,180**	**2**	**717**	**-**	**117,835**	**-**	**-**	**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,720**	**Taxi Total**		**2,202**	**PHV Total**			**12,004**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

2030	DM		DS	
	Nr Vehicles	% Vehicles	Nr Vehicles	% Vehicles
Car Petrol	627,270	99.8%	627,270	99.8%
PHVPetrol	1,105	0.2%	1,105	0.2%
Total	628,375	100%	628,375	100%
Car Diesel	515,485	98.1%	515,485	98.1%
PHV Diesel	10,222	1.9%	10,180	1.9%
Total	525,707	100%	525,664	100%
Taxi Diesel	2,176	99.7%	2,176	99.7%
Taxi petrol	6	0.3%	6	0.3%
Total	2,182	100.0%	2,182	100.0%

Annual vehicle fleet composition by fuel type

			Do minimum	Do Something									
Vehicle	Fuel	Compliance	2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car	Petrol	Compliant	627270	627270	627270	627270	627270	627270	627270	627270	627270	627270	627270
Car	Petrol	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Petrol	Total	627270	627270	627270	627270	627270	627270	627270	627270	627270	627270	627270
Car	Diesel	Compliant	515485	515485	515485	515485	515485	515485	515485	515485	515485	515485	515485
Car	Diesel	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Diesel	Total	515485	515485	515485	515485	515485	515485	515485	515485	515485	515485	515485
Taxi	Petrol	Compliant	6	6	6	6	6	6	6	6	6	6	6
Taxi	Petrol	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Petrol	Total	6	6	6	6	6	6	6	6	6	6	6
Taxi	Diesel	Compliant	49	2176	2176	2176	2176	2176	2176	2176	2176	2176	2176
Taxi	Diesel	Non-compliant	2127	0	0	0	0	0	0	0	0	0	0
	Diesel	Total	2176	2176	2176	2176	2176	2176	2176	2176	2176	2176	2176
PHV	Petrol	Compliant	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105
PHV	Petrol	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Petrol	Total	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105
PHV	Diesel	Compliant	6235	8540	8717	8876	9018	9145	9218	9328	9416	9458	9425
PHV	Diesel	Non-compliant	3987	1683	1505	1346	1204	1077	1004	894	807	764	754
	Diesel	Total	10222	10222	10222	10222	10222	10222	10222	10222	10222	10222	10180
LGV	Petrol	Compliant	0	0	0	0	0	0	0	0	0	0	0
LGV	Petrol	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Petrol	Total	0	0	0	0	0	0	0	0	0	0	0
LGV	Diesel	Compliant	33076	42520	51547	91769	94893	97642	98807	100563	101997	102699	102867
LGV	Diesel	Non-compliant	84758	75314	66288	26066	22942	20193	19028	17272	15837	15136	14968
	Diesel	Total	117835	117835	117835	117835	117835	117835	117835	117835	117835	117835	117835
HGV	Diesel	Compliant	22828	30184	30283	30377	30467	30552	30632	30709	30782	30851	30916
HGV	Diesel	Non-compliant	9324	1968	1869	1775	1685	1600	1520	1443	1370	1301	1236
	Diesel	Total	32152	32152	32152	32152	32152	32152	32152	32152	32152	32152	32152
Bus	Diesel	Compliant	1731	2885	2885	2885	2885	2885	2885	2885	2885	2885	2885
Bus	Diesel	Non-compliant	1154	0	0	0	0	0	0	0	0	0	0
Bus	Diesel	Total	2885	2885	2885	2885	2885	2885	2885	2885	2885	2885	2885



Annual vehicle fleet composition

			Do minimum	Do Something									
Vehicle	Fuel	Compliance	2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car		Compliant	1142755	1142755	1142755	1142755	1142755	1142755	1142755	1142755	1142755	1142755	1142755
Car		Non-compliant	0	0	0	0	0	0	0	0	0	0	0
Car		**Total**	**1142755**	**1142755**	**1142755**	**1142755**	**1142755**	**1142755**	**1142755**	**1142755**	**1142755**	**1142755**	**1142755**
Taxi		Compliant	55	2182	2182	2182	2182	2182	2182	2182	2182	2182	2182
Taxi		Non-compliant	2127	0	0	0	0	0	0	0	0	0	0
Taxi		**Total**	**2182**	**2182**	**2182**	**2182**	**2182**	**2182**	**2182**	**2182**	**2182**	**2182**	**2182**
PHV		Compliant	7341	9645	9822	9981	10123	10250	10323	10433	10521	10563	10531
PHV		Non-compliant	3987	1683	1505	1346	1204	1077	1004	894	807	764	754
PHV		**Total**	**11327**	**11327**	**11327**	**11327**	**11327**	**11327**	**11327**	**11327**	**11327**	**11327**	**11285**
LGV		Compliant	33076	42520	51547	91769	94893	97642	98807	100563	101997	102699	102867
LGV		Non-compliant	84758	75314	66288	26066	22942	20193	19028	17272	15837	15136	14968
LGV		**Total**	**117835**	**117835**	**117835**	**117835**	**117835**	**117835**	**117835**	**117835**	**117835**	**117835**	**117835**
HGV		Compliant	22828	30184	30283	30377	30467	30552	30632	30709	30782	30851	30916
HGV		Non-compliant	9324	1968	1869	1775	1685	1600	1520	1443	1370	1301	1236
HGV		**Total**	**32152**	**32152**	**32152**	**32152**	**32152**	**32152**	**32152**	**32152**	**32152**	**32152**	**32152**
Bus		Compliant	1731	2885	2885	2885	2885	2885	2885	2885	2885	2885	2885
Bus		Non-compliant	1154	0	0	0	0	0	0	0	0	0	0
Bus		**Total**	**2885**	**2885**	**2885**	**2885**	**2885**	**2885**	**2885**	**2885**	**2885**	**2885**	**2885**

Fleet composition - percentual reduction

			Do minimum	Do Something									
Vehicle	Fuel	Compliance	2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car		Compliant	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Car		Non-compliant	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Car		**Total**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Taxi		Compliant	3%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Taxi		Non-compliant	97%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Taxi		**Total**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
PHV		Compliant	65%	85%	87%	88%	89%	90%	91%	92%	93%	93%	93%
PHV		Non-compliant	35%	15%	13%	12%	11%	10%	9%	8%	7%	7%	7%
PHV		**Total**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
LGV		Compliant	28%	36%	44%	78%	81%	83%	84%	85%	87%	87%	87%
LGV		Non-compliant	72%	64%	56%	22%	19%	17%	16%	15%	13%	13%	13%
LGV		**Total**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
HGV		Compliant	71%	94%	94%	94%	95%	95%	95%	96%	96%	96%	96%
HGV		Non-compliant	29%	6%	6%	6%	5%	5%	5%	4%	4%	4%	4%
HGV		**Total**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Bus		Compliant	60%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Bus		Non-compliant	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus		**Non-compliant**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Do Something Not compliant percentage

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PHV	15%	13%	12%	11%	10%	9%	8%	7%	7%	7%
LGV	64%	56%	22%	19%	17%	16%	15%	13%	13%	13%
HGV	6%	6%	6%	5%	5%	5%	4%	4%	4%	4%
Bus	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Taxi	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Do Something Not compliant percentage (2021=100%)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PHV	100%	89%	80%	72%	64%	60%	53%	48%	45%	45%
LGV	100%	88%	35%	30%	27%	25%	23%	21%	20%	20%
HGV	100%	95%	90%	86%	81%	77%	73%	70%	66%	63%
Bus	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Taxi	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Summary of no. of vehicles to upgrade

	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	317	-	16	50	-	-	-	-	-	-	480	-	-	87	-
4	-	-	-	-	-	1,205	-	-	450	-	-	-	11,809	-	-	960	-	-	87	-
5	-	-	-	-	-	577	-	-	1,449	-	-	-	20,468	-	-	5,521	-	-	981	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	-	-	-	-	-	**2,127**	-	**16**	**1,949**	-	-	-	**32,277**	-	-	**6,962**	-	-	**1,154**	-
Total	**Car Total**			-	**Taxi Total**		**2,127**	**PHV Total**			**1,965**	**LGV Total**		**32,277**	**HGV Total**		**6,962**	**Bus Total**		**1153.99548**

DO MINIMUM CALCULATION >>

Do Minimum fleet composition (taked into account only the age planned upgrade)

Method

Vehicle fleet - Do Minimum

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	4	24	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
1	-	-	4	49	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
2	-	-	10	57	-	28	-	-	-	-	-	-	-	-		-	-	-	-	-
3	19,008	5,155	26	731	-	317	18	33	102	-	36	-	-	-		643	-	-	87	-
4	139,393	46,394	14	2,503	1	1,205	1	246	920	-	156	-	31,009	-		1,286	-	-	87	-
5	215,426	149,491	577	6,527	5	577	-	380	2,964	2	241	-	53,749	-		7,395	-	-	981	-
6	107,713	128,871	44,401	3,060	-	49	-	190	2,556	-	121	-	33,076	-		22,828	-	-	1,731	-
6c	145,729	175,265	-	-	-	-	-	257	3,476	-	163	-	-	-		-	-	-	-	-
6d	-	10,310	-	-	-	-	-	-	204	-	-	-	-	-		-	-	-	-	-
Compliant	627,270	515,485	45,036	12,950	6	49	20	1,105	6,235	2	717	-	33,076	-		22,828			1,731	
Non-Compliant	-	-	-	-	-	2,127	-	-	3,987	-	-	-	84,758	-		9,324			1,154	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**	**-**	**117,835**	**-**		**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	1%		0%	2%									
4	7%		0%	0%	7%		0%	7%		0%	1%									
5	13%		0%	1%	29%		0%	13%		33%	2%									
6	7%	41%	33%	0%	0%	100%	0%	7%	41%	0%	1%		100%			100%			100%	
6c	10%	56%	0%	0%	0%	0%	0%	10%	56%	0%	1%		0%			0%			0%	
6d	0%	3%	0%	0%	0%	0%	0%	0%	3%	0%	0%		0%			0%			0%	
Sub-total	**39%**	**100%**	**34%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**33%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**178%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

	Car Petrol	Car Diesel	Car Electric	Car Petrol	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Diesel	PHV Diesel	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2022	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0			-		-	-	-			-			-			-	
1	-	-	0			-		-	-	-			-			-			-	
2	-	-	1			3		-	-	-			-			-			-	
3	1,307.58	460	2			28		2	9	-			-			27			7	
4	9,588.89	4,136	1			107		16.89	82	-			3,455			54			7	
5	14,819.19	13,326	40			51		26.11	264	0			5,989			313			79	
6																				
6c																				
6d																				
Sub-total	**25,716**	**17,922**	**44**	**-**		**190**		**45**	**355**	**0**	**-**	**-**	**9,444**	**-**	**-**	**395**	**-**	**-**	**93**	**-**
Total	**Car Total**			**43,681**	**Taxi Total**		**190**	**PHV Total**			**401**	**LGV Total**		**9,444**	**HGV Total**		**395**	**Bus Total**		**92.8773063**

Vehicles fleet - Do Minimum with age planne

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	4	24	-	-	-	-	-	-	-	-	-	-		-			-	
1	-	-	4	49	-	-	-	-	-	-	-	-	-	-		-			-	
2	-	-	10	57	-	26	-	-	-	-	-	-	-	-		-			-	
3	17,701	4,695	25	731	-	288	18	31	93	-	36	-	-	-		616			80	
4	129,804	42,258	14	2,503	1	1,100	1	229	838	-	156	-	27,554	-		1,232			80	
5	201,588	136,509	539	6,527	5	547	-	355	2,707	2	241	-	47,760	-		7,082			902	
6	114,905	131,973	44,401	3,060	-	129	-	202	2,617	-	121	-	35,668	-		23,124			1,801	
6c	156,844	185,260	30	-	-	39	-	276	3,674	0	163	-	4,492	-		-			-	
6d	6,429	14,790	11	-	-	47	-	11	293	0	-	-	2,361	-		99			23	
Compliant	627,270	515,485	45,036	12,950	6	215	20	1,105	6,584	2	717	-	42,520	-		23,222			1,824	
Non-Compliant	-	-	-	-	-	1,961	-	-	3,638	-	-	-	75,314	-		8,930			1,061	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**		**117,835**			**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	1%		0%	2%									
4	7%		0%	0%	7%		0%	7%		0%	1%									
5	12%		0%	1%	29%		0%	12%		30%	2%									
6	7%	40%	33%	0%	0%	60%	0%	7%	40%	0%	1%		84%			100%			99%	
6c	11%	56%	0%	0%	0%	18%	0%	11%	56%	3%	1%		11%			0%			0%	
6d	1%	4%	0%	0%	0%	22%	0%	1%	4%	1%	0%		6%			0%			1%	
Sub-total	**39%**	**100%**	**34%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**35%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**180%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

	Car Petrol	Car Diesel	Car Electric	Car Petrol	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Diesel	PHV Diesel	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2022	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0			-		-	-	-			-			-			-	
1	-	-	0			-		-	-	-			-			-			-	
2	-	-	1			3		-	-	-			-			-			-	
3	1,052.87	505	1			31		2	10	-			-			31			7	
4	7,721.03	4,544	1			118		13.60	90	-			3,302			62			7	
5	11,990.84	14,678	32			59		21.13	291	0			5,724			357			75	
6																				
6c																				
6d																				
Sub-total	**20,765**	**19,727**	**35**	**-**	**-**	**211**	**-**	**37**	**391**	**0**	**-**		**9,026**		**-**	**450**	**-**	**-**	**88**	**-**
Total	**Car Total**			**40,527**	**Taxi Total**		**211**	**PHV Total**			**428**	**LGV Total**		**9,026**	**HGV Total**		**450**	**Bus Total**		**87.9155874**

Vehicles fleet - Do Minimum

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2023	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	4	24	-	-	-	-	-	-	-	-	-	-		-			-	
1	-	-	4	49	-	-	-	-	-	-	-	-	-	-		-			-	
2	-	-	9	57	-	23	-	-	-	-	-	-	-	-		-			-	
3	16,648	4,190	23	731	-	257	18	29	83	-	36	-	-	-		585			73	
4	122,083	37,714	13	2,503	1	984	1	215	748	-	156	-	24,252	-		1,170			73	
5	190,386	122,209	508	6,527	5	511	-	335	2,423	2	241	-	42,036	-		6,725			827	
6	120,695	135,381	44,402	3,060	-	218	-	213	2,685	-	121	-	38,144	-		23,460			1,866	
6c	165,837	196,268	54	-	-	83	-	292	3,892	0	163	-	8,785	-		-			-	
6d	11,620	19,722	20	-	-	100	-	20	391	0	-	-	4,618	-		213			46	
Compliant	627,270	515,485	45,036	12,950	6	401	20	1,105	6,968	2	717	-	51,547	-		23,672			1,912	
Non-Compliant	-	-	-	-	-	1,775	-	-	3,254	-	-	-	66,288	-		8,480			973	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**		**117,835**			**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2023	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	1%		0%	2%									
4	7%		0%	0%	7%		0%	7%		0%	1%									
5	11%		0%	1%	29%		0%	11%		27%	2%									
6	8%	39%	33%	0%	0%	54%	0%	8%	39%	0%	1%		74%			99%			98%	
6c	12%	56%	0%	0%	0%	21%	0%	12%	56%	6%	1%		17%			0%			0%	
6d	1%	6%	0%	0%	0%	25%	0%	1%	6%	2%	0%		9%			1%			2%	
Sub-total	**39%**	**100%**	**34%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**36%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**181%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

	Car Petrol	Car Diesel	Car Petrol	Car Petrol	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Diesel	PHV Diesel	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2024	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0			-		-	-	-			-			-			-	
1	-	-	0			-		-	-	-			-			-			-	
2	-	-	1			2		-	-	-			-			-			-	
3	931.34	402	1			25		2	8	-			-			28			6	
4	6,829.83	3,619	1			95		12.03	72	-			2,558			56			6	
5	10,695.14	11,764	28			51		18.84	233	0			4,434			322			63	
6																				
6c																				
6d																				
Sub-total	**18,456**	**15,785**	**31**	**-**	**-**	**173**	**-**	**33**	**313**	**0**	**-**		**6,992**		**-**	**406**	**-**	**-**	**74**	**-**
Total	**Car Total**			**34,273**	**Taxi Total**		**173**	**PHV Total**			**346**	**LGV Total**		**6,992**	**HGV Total**		**406**	**Bus Total**		**73.9511421**

Vehicles fleet - Do Minimum

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2024	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	3	24	-	-	-	-	-	-	-	-	-	-		-			-	
1	-	-	3	49	-	-	-	-	-	-	-	-	-	-		-			-	
2	-	-	8	57	-	18	-	-	-	-	-	-	-	-		-			-	
3	14,726	3,338	21	731	-	205	18	26	66	-	36	-	-	-		527			61	
4	107,992	30,040	13	2,503	1	787	1	190	596	-	156	-	18,787	-		1,055			61	
5	169,808	97,944	451	6,527	5	444	-	299	1,942	1	241	-	32,564	-		6,065			696	
6	131,264	141,137	44,403	3,060	-	368	-	231	2,799	-	121	-	42,243	-		24,077			1,978	
6c	182,352	214,947	98	-	-	162	-	321	4,262	1	163	-	15,889	-		-			-	
6d	21,128	28,080	36	-	-	191	-	37	557	0	-	-	8,352	-		428			88	
Compliant	627,270	515,485	45,036	12,950	6	722	20	1,105	7,618	2	717	-	66,484	-		24,505			2,066	
Non-Compliant	-	-	-	-	-	1,454	-	-	2,604	-	-	-	51,351	-		7,647			819	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**		**117,835**			**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2025	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	1%		0%	2%									
4	6%		0%	0%	7%		0%	6%		0%	1%									
5	10%		0%	1%	29%		0%	10%		22%	2%									
6	8%	37%	33%	0%	0%	51%	0%	8%	37%	0%	1%		64%			98%			96%	
6c	13%	56%	0%	0%	0%	22%	0%	13%	56%	11%	1%		24%			0%			0%	
6d	2%	7%	0%	0%	0%	26%	0%	2%	7%	4%	0%		13%			2%			4%	
Sub-total	**39%**	**100%**	**34%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**37%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**182%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2025	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0			-		-	-	-			-			-			-	
1	-	-	0			-		-	-	-			-			-			-	
2	-	-	1			2		-	-	-			-			-			-	
3	875.94	359	1			22		2	7	-			-			27			5	
4	6,423.57	3,230	1			85		11.32	64	-			2,252			53			5	
5	10,100.52	10,532	27			48		17.79	209	0			3,903			306			58	
6																				
6c																				
6d																				
Sub-total	**17,400**	**14,121**	**30**	**-**	**-**	**156**	**-**	**31**	**280**	**0**	**-**		**6,154**		**-**	**385**	**-**	**-**	**68**	**-**
Total	**Car Total**			**31,550**	**Taxi Total**		**156**	**PHV Total**			**311**	**LGV Total**		**6,154**	**HGV Total**		**385**	**Bus Total**		**67.8241543**

Vehicles fleet - Do Minimum

2025	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	3	24	-	-	-	-	-	-	-	-	-	-		-			-	
1	-	-	3	49	-	-	-	-	-	-	-	-	-	-		-			-	
2	-	-	8	57	-	16	-	-	-	-	-	-	-	-		-			-	
3	13,850	2,979	20	731	-	183	18	24	59	-	36	-	-	-		501			56	
4	101,568	26,809	12	2,503	1	704	1	179	532	-	156	-	16,535	-		1,002			56	
5	160,364	87,681	425	6,527	5	413	-	283	1,739	1	241	-	28,661	-		5,759			638	
6	136,082	143,559	44,404	3,060	-	432	-	240	2,847	-	121	-	43,932	-		24,361			2,027	
6c	189,927	222,846	118	-	-	198	-	335	4,419	1	163	-	18,816	-		-			-	
6d	25,478	31,610	43	-	-	230	-	45	627	0	-	-	9,890	-		529			107	
Compliant	627,270	515,485	45,036	12,950	6	860	20	1,105	7,893	2	717	-	72,638	-		24,890			2,134	
Non-Compliant	-	-	-	-	-	1,316	-	-	2,329	-	-	-	45,197	-		7,262			751	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**		**117,835**			**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

2026	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	1%		0%	2%									
4	5%		0%	0%	7%		0%	5%		0%	1%									
5	9%		0%	1%	29%		0%	9%		19%	2%									
6	8%	36%	33%	0%	0%	50%	0%	8%	36%	0%	1%		60%			98%			95%	
6c	13%	56%	0%	0%	0%	23%	0%	13%	56%	13%	1%		26%			0%			0%	
6d	2%	8%	0%	0%	0%	27%	0%	2%	8%	5%	0%		14%			2%			5%	
Sub-total	**39%**	**100%**	**34%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**37%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**183%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2026	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0			-		-	-	-			-			-			-	
1	-	-	0			-		-	-	-			-			-			-	
2	-	-	1			1		-	-	-			-			-			-	
3	931	207	1			13		2	4	-			-			7			1	
4	6,824	1,864	1			49		12	37	-			954			14.20			1	
5	10,775	6,095	29			29		19	121	0			1,653			82			7	
6	9,143	9,979	2,983			30		16	198	-			2,534			345			22	
6c																				
6d																				
Sub-total	**27,673**	**18,145**	**3,015**	**-**	**-**	**121**	**-**	**49**	**360**	**0**	**-**		**5,141**		**-**	**448**	**-**	**-**	**30**	**-**
Total	**Car Total**			**48,834**	**Taxi Total**		**121**	**PHV Total**			**409**	**LGV Total**		**5,141**	**HGV Total**		**448**	**Bus Total**		**30.4578087**

Vehicles fleet - Do Minimum

2026	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	3	24	-	-	-	-	-	-	-	-	-	-		-			-	
1	-	-	3	49	-	-	-	-	-	-	-	-	-	-		-			-	
2	-	-	8	57	-	15	-	-	-	-	-	-	-	-		-			-	
3	12,920	2,772	19	731	-	170	18	23	55	-	36	-	-	-		494			56	
4	94,744	24,946	12	2,503	1	656	1	167	495	-	156	-	15,582	-		987			56	
5	150,287	81,742	398	6,527	5	394	-	265	1,621	1	241	-	27,008	-		5,678			631	
6	132,057	134,978	41,421	3,060	-	439	-	233	2,677	-	121	-	42,113	-		24,437			2,033	
6c	198,008	227,417	139	-	-	220	-	349	4,510	1	163	-	20,056	-		-			-	
6d	39,254	43,631	3,035	-	-	283	-	69	865	0	-	-	13,076	-		556			110	
Compliant	627,270	515,485	45,036	12,950	6	941	20	1,105	8,052	2	717	-	75,245	-		24,993			2,142	
Non-Compliant	-	-	-	-	-	1,235	-	-	2,171	-	-	-	42,590	-		7,159			743	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**		**117,835**			**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

2027	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	1%		0%	2%									
4	5%		0%	0%	7%		0%	5%		0%	1%									
5	8%		0%	1%	29%		0%	8%		18%	2%									
6	8%	33%	31%	0%	0%	47%	0%	8%	33%	0%	1%		56%			98%			95%	
6c	13%	56%	0%	0%	0%	23%	0%	13%	56%	14%	1%		27%			0%			0%	
6d	3%	11%	3%	0%	0%	30%	0%	3%	11%	5%	0%		17%			2%			5%	
Sub-total	**39%**	**100%**	**35%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**37%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**183%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2027	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0			-		-	-	-			-			-			-	
1	-	-	0			-		-	-	-			-			-			-	
2	-	-	1			2		-	-	-			-			-			-	
3	1,389	308	2			19		2	6	-			-			11			1	
4	10,185	2,775	1			73		18	55	-			1,438			22.40			1	
5	16,157	9,092	43			44		28	180	0			2,492			129			11	
6	14,197	15,013	4,453			49		25	298	-			3,886			554			36	
6c																				
6d																				
Sub-total	**41,927**	**27,187**	**4,500**	**-**	**-**	**186**	**-**	**74**	**539**	**0**	**-**		**7,817**		**-**	**717**	**-**	**-**	**49**	**-**
Total	**Car Total**			**73,615**	**Taxi Total**		**186**	**PHV Total**			**613**	**LGV Total**		**7,817**	**HGV Total**		**717**	**Bus Total**		**48.6909514**

Vehicles fleet - Do Minimum

2027	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	2	24	-	-	-	-	-	-	-	-	-	-		-			-	
1	-	-	2	49	-	-	-	-	-	-	-	-	-	-		-			-	
2	-	-	7	57	-	13	-	-	-	-	-	-	-	-		-			-	
3	11,531	2,463	17	731	-	151	18	20	49	-	36	-	-	-		482			55	
4	84,558	22,171	11	2,503	1	584	1	149	440	-	156	-	14,144	-		965			55	
5	135,172	72,881	356	6,527	5	364	-	238	1,445	1	241	-	24,516	-		5,549			620	
6	125,499	122,046	36,969	3,060	-	444	-	221	2,420	-	121	-	39,305	-		24,556			2,042	
6c	210,126	234,236	171	-	-	253	-	370	4,645	1	163	-	21,925	-		-			-	
6d	60,384	61,687	7,500	-	-	366	-	106	1,223	0	-	-	17,945	-		600			113	
Compliant	627,270	515,485	45,036	12,950	6	1,063	20	1,105	8,288	2	717	-	79,175	-		25,156			2,155	
Non-Compliant	-	-	-	-	-	1,113	-	-	1,934	-	-	-	38,659	-		6,996			730	
Sub-total	**627,270**	**515,485**	**45,036**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**		**117,835**			**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

2028	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	1%		0%	2%									
4	5%		0%	0%	7%		0%	5%		0%	1%									
5	8%		0%	1%	29%		0%	8%		16%	2%									
6	8%	29%	27%	0%	0%	42%	0%	8%	29%	0%	1%		50%			98%			95%	
6c	14%	56%	0%	0%	0%	24%	0%	14%	56%	16%	1%		28%			0%			0%	
6d	5%	15%	8%	0%	0%	34%	0%	5%	15%	6%	0%		23%			2%			5%	
Sub-total	**39%**	**100%**	**36%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**38%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**183%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

2028	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0			-		-	-	-			-			-			-	
1	-	-	0			-		-	-	-			-			-			-	
2	-	-	1			1		-	-	-			-			-			-	
3	1,116	247	2			15		2	5	-			-			10			1	
4	8,181	2,219	1			58		14	44	-			1,175			20			1	
5	13,078	7,295	34			36		23	145	0			2,036			113			10	
6	12,143	12,217	3,577			44		21	242	-			3,265			501			32	
6c	20,330.48	23,447.21	16.59			25.28		35.82	464.96	0.08			1,821.06			-			-	
6d																				
Sub-total	**54,848**	**45,426**	**3,632**	**-**	**-**	**181**	**-**	**97**	**901**	**0**	**-**		**8,297**		**-**	**644**	**-**	**-**	**44**	**-**
Total	**Car Total**			**103,906**	**Taxi Total**		**181**	**PHV Total**			**998**	**LGV Total**		**8,297**	**HGV Total**		**644**	**Bus Total**		**43.7625502**

Vehicles fleet - Do Minimum

2028	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	2	24	-	-	-	-	-	-	-	-	-	-		-			-	
1	-	-	2	49	-	-	-	-	-	-	-	-	-	-		-			-	
2	-	-	7	57	-	12	-	-	-	-	-	-	-	-		-			-	
3	10,415	2,217	15	731	-	136	18	18	44	-	36	-	-	-		473			54	
4	76,377	19,952	11	2,503	1	526	1	135	396	-	156	-	12,969	-		945			54	
5	122,931	65,771	323	6,527	5	339	-	217	1,304	1	241	-	22,479	-		5,435			610	
6	119,493	111,493	33,393	3,060	-	444	-	211	2,211	-	121	-	36,922	-		24,159			2,018	
6c	199,604	216,260	181	-	-	255	-	352	4,288	1	163	-	21,631	-		-			-	
6d	98,450	99,792	11,090	-	-	464	-	173	1,979	0	-	-	23,834	-	-	1,139	-	-	149	-
Compliant	627,270	515,485	45,024	12,950	6	1,162	20	1,105	8,478	2	717	-	82,386	-		25,299			2,167	
Non-Compliant	-	-	-	-	-	1,014	-	-	1,744	-	-	-	35,448	-		6,853			718	
Sub-total	**627,270**	**515,485**	**45,024**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**		**117,835**			**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,728**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

2029	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	1%		0%	2%									
4	4%		0%	0%	7%		0%	4%		0%	1%									
5	7%		0%	1%	29%		0%	7%		14%	2%									
6	7%	26%	25%	0%	0%	38%	0%	7%	26%	0%	1%		45%			95%			93%	
6c	13%	51%	0%	0%	0%	22%	0%	13%	51%	15%	1%		26%			0%			0%	
6d	7%	23%	11%	0%	0%	40%	0%	7%	23%	8%	0%		29%			5%			7%	
Sub-total	**39%**	**100%**	**36%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**38%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**0%**	**PHV Total**			**0%**	**LGV Total**		**0%**	**HGV Total**		**0%**	**Bus Total**		**0%**

Vehicles upgrading due to age planned upgrade

2029	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0			-		-	-	-			-			-			-	
1	-	-	0			-		-	-	-			-			-			-	
2	-	-	0			1		-	-	-			-			-			-	
3	537	118	1			7		1	2	-			-			5			1	
4	3,941	1,065	1			28		7	21	-			574			10.29			1	
5	6,343	3,511	17			18		11	70	0			996			59			10	
6	6,166	5,952	1,723			24		11	118	-			1,636			263			32	
6c	10,299.98	11,545.51	9.33			13.60		18.15	228.95	0.04			958.21			-			-	
6d																				
Sub-total	**27,288**	**22,193**	**1,751**	**-**	**-**	**91**	**-**	**48**	**440**	**0**	**-**	**-**	**4,164**		**-**	**338**	**-**	**-**	**43**	**-**
Total	**Car Total**			**51,232**	**Taxi Total**		**91**	**PHV Total**			**488**	**LGV Total**		**4,164**	**HGV Total**		**338**	**Bus Total**		**43.2008175**

Vehicles fleet - Do Minimum

2029	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	2	24	-	-	-	-	-	-	-	-	-	-		-			-	
1	-	-	2	49	-	-	-	-	-	-	-	-	-	-		-			-	
2	-	-	6	57	-	11	-	-	-	-	-	-	-	-		-			-	
3	9,878	2,099	15	731	-	129	18	17	42	-	36	-	-	-		468			53	
4	72,436	18,887	10	2,503	1	499	1	128	375	-	156	-	12,394	-		935			53	
5	116,990	62,348	307	6,527	5	326	-	206	1,236	1	241	-	21,484	-		5,376			601	
6	116,282	106,340	31,670	3,060	-	441	-	205	2,109	-	121	-	35,717	-		23,950			1,994	
6c	194,062	207,348	184	-	-	255	-	342	4,112	1	163	-	21,420	-		-			-	
6d	117,622	118,463	12,827	-	-	515	-	207	2,349	0	-	-	26,820	-	-	1,424	-	-	184	-
Compliant	627,270	515,485	45,024	12,950	6	1,210	20	1,105	8,570	2	717	-	83,957	-		25,373			2,178	
Non-Compliant	-	-	-	-	-	966	-	-	1,653	-	-	-	33,878	-		6,779			707	
Sub-total	**627,270**	**515,485**	**45,024**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**		**117,835**			**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,728**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Compliant vehicles percentage

2030	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	0%		0%	0%	0%		0%	0%		0%	0%									
1	0%		0%	0%	0%		0%	0%		0%	0%									
2	0%		0%	0%	0%		0%	0%		0%	0%									
3	1%		0%	2%	0%		31%	1%		0%	2%									
4	4%		0%	0%	7%		0%	4%		0%	1%									
5	7%		0%	1%	29%		0%	7%		14%	2%									
6	7%	25%	24%	0%	0%	36%	0%	7%	25%	0%	1%		43%			94%			92%	
6c	12%	48%	0%	0%	0%	21%	0%	12%	48%	15%	1%		26%			0%			0%	
6d	9%	27%	12%	0%	0%	43%	0%	9%	27%	9%	0%		32%			6%			8%	
Sub-total	**39%**	**100%**	**36%**	**3%**	**35%**	**100%**	**31%**	**39%**	**100%**	**38%**	**7%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**
Total	**Car Total**			**0%**	**Taxi Total**		**167%**	**PHV Total**			**183%**	**LGV Total**		**100%**	**HGV Total**		**100%**	**Bus Total**		**100%**

Vehicles upgrading due to age planned upgrade

	Car Petrol	Car Diesel	Car Petrol	Car Petrol	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Diesel	PHV Diesel	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2030	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	0			-		-	-	-			-			-			-	
1	-	-	0			-		-	-	-			-			-			-	
2	-	-	0			0		-	-	-			-			-			-	
3	127	28	0			2		0	1	-			-			5			1	
4	934	252	0			7		2	5	-			137			10.18			1	
5	1,509	832	4			4		3	17	0			238			59			9	
6	1,500	1,419	409			6		3	28	-			396			261			31	
6c	2,503.50	2,767.43	2.37			3.40		4.41	54.88	0.01			237.21			-			-	
6d																				
Sub-total	**6,575**	**5,299**	**415**	**-**	**-**	**22**	**-**	**12**	**105**	**0**	**-**		**1,008**		**-**	**335**	**-**	**-**	**43**	**-**
Total	**Car Total**			**12,289**	**Taxi Total**		**22**	**PHV Total**			**117**	**LGV Total**		**1,008**	**HGV Total**		**335**	**Bus Total**		**42.643747**

Vehicles fleet - Do Minimum

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV Petrol	HGV Diesel	HGV Other	Bus		
2030	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	2	24	-	-	-	-	-	-	-	-	-	-		-			-	
1	-	-	2	49	-	-	-	-	-	-	-	-	-	-		-			-	
2	-	-	6	57	-	11	-	-	-	-	-	-	-	-		-			-	
3	9,750	2,071	15	731	-	127	18	17	41	-	36	-	-	-		462			52	
4	71,501	18,635	10	2,503	1	492	1	126	370	-	156	-	12,257	-		925			52	
5	115,577	61,537	303	6,527	5	323	-	204	1,220	1	241	-	21,246	-		5,318			591	
6	115,483	105,110	31,262	3,060	-	440	-	203	2,084	-	121	-	35,424	-		23,741			1,970	
6c	192,690	205,205	185	-	-	255	-	339	4,069	1	163	-	21,361	-		-			-	
6d	122,268	122,928	13,239	-	-	527	-	215	2,438	0	-	-	27,546	-	-	1,706	-	-	219	-
Compliant	627,270	515,485	45,024	12,950	6	1,222	20	1,105	8,591	2	717	-	84,332	-		25,447			2,189	
Non-Compliant	-	-	-	-	-	954	-	-	1,631	-	-	-	33,503	-		6,705			696	
Sub-total	**627,270**	**515,485**	**45,024**	**12,950**	**6**	**2,176**	**20**	**1,105**	**10,222**	**2**	**717**		**117,835**			**32,152**	**-**	**-**	**2,885**	**-**
Total	**Car Total**			**1,200,728**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2884.9887**

Annual vehicle fleet composition by fuel type

			Do minimum	Do Something									
Vehicle	Fuel	Compliance	2021	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car	Petrol	Compliant	627270	627270	627270	627270	627270	627270	627270	627270	627270	627270	627270
Car	Petrol	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Petrol	Total	627270	627270	627270	627270	627270	627270	627270	627270	627270	627270	627270
Car	Diesel	Compliant	515485	515485	515485	515485	515485	515485	515485	515485	515485	515485	515485
Car	Diesel	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Diesel	Total	515485	515485	515485	515485	515485	515485	515485	515485	515485	515485	515485
Taxi	Petrol	Compliant	6	6	6	6	6	6	6	6	6	6	6
Taxi	Petrol	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Petrol	Total	6	6	6	6	6	6	6	6	6	6	6
Taxi	Diesel	Compliant	49	215	401	569	722	860	941	1063	1162	1210	1222
Taxi	Diesel	Non-compliant	2127	1961	1775	1607	1454	1316	1235	1113	1014	966	954
	Diesel	Total	2176	2176	2176	2176	2176	2176	2176	2176	2176	2176	2176
PHV	Petrol	Compliant	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105
PHV	Petrol	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Petrol	Total	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105	1105
PHV	Diesel	Compliant	6235	6584	6968	7311	7618	7893	8052	8288	8478	8570	8591
PHV	Diesel	Non-compliant	3987	3638	3254	2911	2604	2329	2171	1934	1744	1653	1631
	Diesel	Total	10222	10222	10222	10222	10222	10222	10222	10222	10222	10222	10222
LGV	Petrol	Compliant	0	0	0	0	0	0	0	0	0	0	0
LGV	Petrol	Non-compliant	0	0	0	0	0	0	0	0	0	0	0
	Petrol	Total	0	0	0	0	0	0	0	0	0	0	0
LGV	Diesel	Compliant	33076	42520	51547	59491	66484	72638	75245	79175	82386	83957	84332
LGV	Diesel	Non-compliant	84758	75314	66288	58343	51351	45197	42590	38659	35448	33878	33503
	Diesel	Total	117835	117835	117835	117835	117835	117835	117835	117835	117835	117835	117835
HGV	Diesel	Compliant	22828	23222	23672	24099	24505	24890	24993	25156	25299	25373	25447
HGV	Diesel	Non-compliant	9324	8930	8480	8052	7647	7262	7159	6996	6853	6779	6705
	Diesel	Total	32152	32152	32152	32152	32152	32152	32152	32152	32152	32152	32152
Bus	Diesel	Compliant	1731	1824	1912	1992	2066	2134	2142	2155	2167	2178	2189
Bus	Diesel	Non-compliant	1154	1061	973	893	819	751	743	730	718	707	696
Bus	Diesel	Total	2885	2885	2885	2885	2885	2885	2885	2885	2885	2885	2885

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Cumulative Active travel impact

Type	2021
Walking	1,940,000
Cycling	24,200,000
Total	26,140,000

Source: \\EDIFIL01\Data\Environmental\Jobs\Economics\TfGM CAP\0_Project Works\Economic model\Active travel

Cumulative Upgraded vehicles (2018 prices, in Euro).

Type	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Walking	194,000	194,000	194,000	194,000	194,000	194,000	194,000	194,000	194,000	194,000	1,940,000
Cycling	2,420,000	2,420,000	2,420,000	2,420,000	2,420,000	2,420,000	2,420,000	2,420,000	2,420,000	2,420,000	24,200,000
Total	2,614,000	2,614,000	2,614,000	2,614,000	2,614,000	2,614,000	2,614,000	2,614,000	2,614,000	2,614,000	26,140,000

Cumulative Upgraded vehicles (2018 prices, in £)

Type	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Walking	172,955	172,955	172,955	172,955	172,955	172,955	172,955	172,955	172,955	172,955	1,729,549
Cycling	2,157,478	2,157,478	2,157,478	2,157,478	2,157,478	2,157,478	2,157,478	2,157,478	2,157,478	2,157,478	21,574,781
Total	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	23,304,329

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Consumer Welfare Loss - Trips Foregone

This worksheet calculates the welfare loss associated with trips being cancelled

Assumptions

1)Due to the sunset period in 2021 and 2022, the interpolation between 2021 and 2025 is not linear for LGVs

2)Bus are assumed not to cancel/remode any trips

ROH	0.5

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cars	100%	84%	68%	52%	37%	30%	19%	9%	5%	3%
LGVs	100%	83%	2348%	1949%	1526%	1272%	814%	407%	204%	153%
HGV	100%	83%	66%	48%	31%	26%	16%	8%	3%	2%
Taxi	100%	82%	64%	46%	28%	22%	14%	6%	3%	2%

Number of trips foregone

	2021		2025	
	Cancelled trips	Trips (Annual)	Cancelled trips	Trips (Annual)
Cars	-	-	-	-
LGVs	-	-	4,419.78	1,118,204.37
HGV	602.63	152,466.52	187.87	47,530.15
Taxi	48.57	12,288.26	13.04	3,299.83
Total	651.20		4,620.69	

CAZ Charge (2021 prices)

	Low	Medium	High
Cars	5.00	7.50	10.00
LGVs	5.00	7.50	10.00
HGV	100.00	100.00	100.00
Taxi	5.00	7.50	10.00

Welfare Loss

	2021			2025		
	Low	Medium	High	Low	Medium	High
Cars	-	-	-	-	-	-
LGVs	-	-	-	2,795,511	4,193,266	5,591,022
HGV	7,623,326	7,623,326	7,623,326	2,376,507	2,376,507	2,376,507
Taxi	30,721	46,081	61,441	8,250	12,374	16,499

Welfare Loss (appraisal period) - Medium Charge (2021 prices)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Cars	-	-	-	-	-	-	-	-	-	-	-
LGVs	-	-	6,451,179	5,354,479	4,193,266	3,494,389	2,236,409	1,118,204	559,102	419,327	23,826,355
HGV	7,623,326	6,311,621	4,999,917	3,688,212	2,376,507	1,949,955	1,218,722	609,361	243,744	182,808	29,204,174
Taxi	46,081	37,654	29,228	20,801	12,374	9,979	6,387	2,794	1,198	798	167,294

Welfare Loss (appraisal period) - Medium Charge (2018 prices)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Cars	-	-	-	-	-	-	-	-	-	-	-

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LGVs	-	-	5,904,605	4,795,325	3,674,535	2,996,196	1,876,287	917,949	449,094	329,570	20,943,561
HGV	7,260,822	5,903,962	4,576,300	3,303,062	2,082,520	1,671,951	1,022,475	500,232	195,786	143,678	26,660,788
Taxi	43,890	35,222	26,751	18,629	10,844	8,557	5,358	2,294	962	627	153,134
Total	**7,304,711**	**5,939,185**	**10,507,656**	**8,117,016**	**5,767,898**	**4,676,704**	**2,904,121**	**1,420,475**	**645,842**	**473,876**	**47,757,483**

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Consumer Welfare Loss - Trips Remoded

This worksheet calculates the welfare loss associated with trips being re-moded

Assumptions

1)Due to the sunset period in 2021 and 2022, the interpolation between 2021 and 2025 is not linear for LGVs

2)Bus are assumed not to cancel/remode any trips

ROH	0.5

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cars	100%	84%	68%	52%	37%	30%	19%	9%	5%	3%
LGVs	100%	83%	2348%	1949%	1526%	1272%	814%	407%	204%	153%
HGV	100%	83%	66%	48%	31%	26%	16%	8%	3%	2%
Taxi	100%	82%	64%	46%	28%	22%	14%	6%	3%	2%

Number of trips re-moded

	2021		2025	
	Remoded trips	Trips (Annual)	Remoded trips	Trips (Annual)
Cars	-	-	-	-
LGVs	-	-	4,469	1,130,717
HGV	-	-	-	-
Taxi	-	-	-	-
Total	-		4,469.24	

CAZ Charge (2021 prices)

	Low	Medium	High
Cars	5.00	7.50	10.00
LGVs	5.00	7.50	10.00
HGV	100.00	100.00	100.00
Taxi	5.00	7.50	10.00

Welfare Loss (2021)

	2021			2025		
	Low	Medium	High	Low	Medium	High
Cars	-	-	-	-	-	-
LGVs	-	-	-	2,826,791	4,240,187	5,653,583
HGV	-	-	-	-	-	-
Taxi	-	-	-	-	-	-

Welfare Loss (appraisal period) - Medium Charge (2021 prices)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Cars	-	-	-	-	-	-	-	-	-	-	-
LGVs	-	-	6,523,365	5,414,393	4,240,187	3,533,489	2,261,433	1,130,717	565,358	424,019	24,092,960
HGV	-	-	-	-	-	-	-	-	-	-	-
Taxi	-	-	-	-	-	-	-	-	-	-	-

Welfare Loss (appraisal period) - Medium Charge (2018 prices)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Cars	-	-	-	-	-	-	-	-	-	-	-
LGVs	-	-	5,970,674	4,848,982	3,715,651	3,029,722	1,897,282	928,220	454,119	333,258	21,177,910
HGV	-	-	-	-	-	-	-	-	-	-	-
Taxi	-	-	-	-	-	-	-	-	-	-	-
Total	**-**	**-**	**5,970,674**	**4,848,982**	**3,715,651**	**3,029,722**	**1,897,282**	**928,220**	**454,119**	**333,258**	**21,177,910**

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Cost of Bus Retrofitting

This worksheet calculates the welfare loss of bus operators choosing to retrofit their non-compliant buses

Assumptions

1)Bus euro 6 are assumed not to need retrofitting

ROH	0.5

Bus fleet retrofitting

2021	Bus		
Euro Class	Petrol	Diesel	Other
0			
1			
2			
3			
4		87	
5		981	
6			
6c			
6d			
Total	**Bus Total**		**1,067**

Assumption: only euro 4 and 5s can be retrofitted (source: Alec Curley and Clare Sheffield)

Cost of Bus Retrofitting Bus Bus Bus

2021	Bus		
Euro Class	Petrol	Diesel	Other
0	-	-	-
1	-	-	-
2	-	-	-
3	-	-	-
4	-	865,497	-
5	-	9,808,962	-
6	-	-	-
6c	-	-	-
6d	-	-	-
Total	**Bus Total**		**10,674,458**

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Cost of Upgrading

Calculates total cost of upgrading based on the fleet that would upgrade
Takes the number of cars upgrading and multiplies by the cost calculated in Dif in Depreciation

Total Vehicles upgrading due to the scheme (2021 plus 2023)

	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	317	-	16	50	-	-	-	-	-	-	480	-	-	87	-
4	-	-	-	-	-	1,205	-	-	450	-	-	-	11,809	-	-	960	-	-	87	-
5	-	-	-	-	-	577	-	-	1,449	-	-	-	20,468	-	-	5,521	-	-	981	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	**-**	**-**	**-**	**-**	**-**	**2,127**	**-**	**16**	**1,949**	**-**	**-**	**-**	**32,277**	**-**	**-**	**6,962**	**-**	**-**	**1,154**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**2,127**	**PHV Total**			**1,965**	**LGV Total**		**32,277**	**HGV Total**		**6,962**	**Bus Total**		**1153.99548**

Vehicles upgrading to new vehicles

	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	79	-	4	12	-	-	-	-	-	-	120	-	-	22	-
4	-	-	-	-	-	301	-	-	112	-	-	-	2,952	-	-	240	-	-	22	-
5	-	-	-	-	-	144	-	-	362	-	-	-	5,117	-	-	1,380	-	-	245	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	**-**	**-**	**-**	**-**	**-**	**532**	**-**	**4**	**487**	**-**	**-**	**-**	**8,069**	**-**	**-**	**1,740**	**-**	**-**	**288**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**532**	**PHV Total**			**491**	**LGV Total**		**8,069**	**HGV Total**		**1,740**	**Bus Total**		**288.49887**

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Vehicles upgrading to used vehicles - same fuel

	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	59	-	3	9	-	-	-	-	-	-	90	-	-	16	-
4	-	-	-	-	-	226	-	-	84	-	-	-	2,214	-	-	180	-	-	16	-
5	-	-	-	-	-	108	-	-	272	-	-	-	3,838	-	-	1,035	-	-	184	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	**-**	**-**	**-**	**-**	**-**	**399**	**-**	**3**	**365**	**-**	**-**	**-**	**6,052**	**-**	**-**	**1,305**	**-**	**-**	**216**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**399**	**PHV Total**			**368**	**LGV Total**		**6,052**	**HGV Total**		**1,305**	**Bus Total**		**216.3741525**

Vehicles upgrading to used vehicles - change fuel (cheapest option)

	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	178	-	9	28	-	-	-	-	-	-	270	-	-	49	-
4	-	-	-	-	-	678	-	-	253	-	-	-	6,642	-	-	540	-	-	49	-
5	-	-	-	-	-	325	-	-	815	-	-	-	11,514	-	-	3,106	-	-	552	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	**-**	**-**	**-**	**-**	**-**	**1,197**	**-**	**9**	**1,096**	**-**	**-**	**-**	**18,156**	**-**	**-**	**3,916**	**-**	**-**	**649**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**1,197**	**PHV Total**			**1,105**	**LGV Total**		**18,156**	**HGV Total**		**3,916**	**Bus Total**		**649.1224575**

Cost of Upgrading due to loss in vehicle value

Cost for vehicles upgrading to new vehi Car Petrol Car Diesel Car Electric Car Other Taxi Petrol Taxi Diesel Taxi Other PHV Petrol PHV Diesel PHV Electric PHV Other LGV Petrol LGV Diesel LGV Other HGV HGV HGV Bus Bus Bus

	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	142,672	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	1,589,406	-	15,726	58,363	-	-	-	-	-	-	1,754,282	-	-	1,017,246	-
4	-	-	-	-	-	5,869,279	-	-	508,312	-	-	-	13,545,257	-	-	3,446,286	-	-	999,104	-
5	-	-	-	-	-	2,659,008	-	-	1,543,193	-	-	-	22,147,859	-	-	19,024,090	-	-	10,868,404	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	**-**	**-**	**-**	**-**	**-**	**10,260,365**	**-**	**15,726**	**2,109,868**	**-**	**-**	**-**	**35,693,116**	**-**	**-**	**24,224,658**	**-**	**-**	**12,884,754**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**10,260,365**	**PHV Total**			**2,125,594**	**LGV Total**		**35,693,116**	**HGV Total**		**24,224,658**	**Bus Total**		**12884753.87**

Cost fot Vehicles upgrading to used veh Car Petrol Car Diesel Car Electric Car Other Taxi Petrol Taxi Diesel Taxi Other PHV Petrol PHV Diesel PHV Electric PHV Other LGV Petrol LGV Diesel LGV Other HGV HGV HGV Bus Bus Bus

	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	9,434	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	101,378	-	116	3,152	-	-	-	-	-	-	135,058	-	-	77,647	-
4	-	-	-	-	-	334,730	-	-	24,603	-	-	-	685,667	-	-	243,275	-	-	69,931	-
5	-	-	-	-	-	117,738	-	-	58,251	-	-	-	873,279	-	-	1,057,486	-	-	599,152	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	**-**	**-**	**-**	**-**	**-**	**563,281**	**-**	**116**	**86,007**	**-**	**-**	**-**	**1,558,946**	**-**	**-**	**1,435,819**	**-**	**-**	**746,729**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**563,281**	**PHV Total**			**86,122**	**LGV Total**		**1,558,946**	**HGV Total**		**1,435,819**	**Bus Total**		**746729.4156**

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Cost for vehicles upgrading to used veh

	Car Petrol	Car Diesel	Car Electric	Car Other	Taxi Petrol	Taxi Diesel	Taxi Other	PHV Petrol	PHV Diesel	PHV Electric	PHV Other	LGV Petrol	LGV Diesel	LGV Other	HGV	HGV	HGV	Bus	Bus	Bus
	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	5,052	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	25,347	-	1,132	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	**-**	**-**	**-**	**-**	**-**	**30,399**	**-**	**1,132**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**30,399**	**PHV Total**			**1,132**	**LGV Total**		**-**	**HGV Total**		**-**	**Bus Total**		**0**

Total cost of upgrade

	Car Petrol	Car Diesel				Taxi Diesel		PHV Petrol	PHV Diesel				LGV Diesel			HGV		Bus		
	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	157,159	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	1,716,131	-	16,973	61,515	-	-	-	-	-	-	1,889,340	-	-	1,094,893	-
4	-	-	-	-	-	6,204,009	-	-	532,915	-	-	-	14,230,924	-	-	3,689,561	-	-	1,069,035	-
5	-	-	-	-	-	2,776,747	-	-	1,601,445	-	-	-	23,021,139	-	-	20,081,576	-	-	11,467,556	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	**-**	**-**	**-**	**-**	**-**	**10,854,045**	**-**	**16,973**	**2,195,875**	**-**	**-**	**-**	**37,252,062**	**-**	**-**	**25,660,477**	**-**	**-**	**13,631,483**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**10,854,045**	**PHV Total**			**2,212,848**	**LGV Total**		**37,252,062**	**HGV Total**		**25,660,477**	**Bus Total**		**13631483.29**

Vehicle type	New vehicles	used vehicles - same fuel	used vehicles - change fuel (cheapest option)	Total
Car	-	-	-	-
LGV	35,693,116	1,558,946	-	37,252,062
HGV	24,224,658	1,435,819	-	25,660,477
PHV	2,125,594	86,122	1,132	2,212,848
Taxi	10,260,365	563,281	30,399	10,854,045
Bus	12,884,754	746,729	-	13,631,483
Coach				-
Total	85,188,487	4,390,898	31,531	**89,610,916**

2021 prices	Total
Car Petrol	-
Car Diesel	-
Car Electric	
Car Other	
Taxi Diesel	10,854,044.89
PHV Petrol	16,973.46
PHV Diesel	2,195,874.72
PHV Electric	
PHV Other	
LGV Diesel	37,252,062.36
HGV	25,660,477.14
Bus	13,631,483.29
Coach	
Total	**89,610,916**

2018 prices (undiscounted)	Total
Car Petrol	-
Car Diesel	-
Car Electric	-
Car Other	-
Taxi Diesel	10,337,913
PHV Petrol	16,166
PHV Diesel	2,091,456
PHV Electric	-
PHV Other	-
LGV Diesel	35,480,651
HGV	24,440,269
Bus	12,983,279
Coach	-
Total	**85,349,735**

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Fuel switch cost

Calculates change in cost of fuel consumption for the users that switch to a difference fuel vehicle

Vehicle fleet - vehicles upgrading

2020	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	317	-	16	50	-	-	-	-	-	-	480	-	-	87	-
4	-	-	-	-	-	1,205	-	-	450	-	-	-	11,809	-	-	960	-	-	87	-
5	-	-	-	-	-	577	-	-	1,449	-	-	-	20,468	-	-	5,521	-	-	981	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Compliant	-	-	-		-	-		-	-			-	-			-			-	
Non-Compliant	-	-	-		-	2,127		16	1,949			-	32,277			6,962			1,154	
Sub-total	**-**	**-**	**-**	**-**	**-**	**2,127**	**-**	**16**	**1,949**	**-**	**-**	**-**	**32,277**	**-**	**-**	**6,962**	**-**	**-**	**1,154**	**-**
Total	**Car Total**			**1,200,741**	**Taxi Total**		**2,202**	**PHV Total**			**12,047**	**LGV Total**		**117,835**	**HGV Total**		**32,152**	**Bus Total**		**2,885**

Vehicle changing fuel type FROM

2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0		-							-											
1		-							-											
2		-							-											
3		-							28											
4		-							253											
5		-							815											
6																				
6c																				
6d																				
Compliant	-	-	-		-	-		-	-			-	-			-			-	
Non-Compliant	-	-	-		-	-		-	1,096			-	-			-			-	
Sub-total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1,096**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**Car Total**			**117,835**	**Taxi Total**		**-**	**PHV Total**			**1,096**	**LGV Total**		**-**	**HGV Total**		**-**	**Bus Total**		**-**

Vehicle km Diesel

2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0		-							-											
1		-							-											
2		-							-											
3		-							1,130,799											
4		-							10,177,191											
5		-							32,793,170											
6		-							-											
6c		-							-											
6d		-							-											
Compliant	-	-	-		-	-		-	-			-	-			-			-	
Non-Compliant	-	-	-		-	-		-	44,101,159			-	-			-			-	
Sub-total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**44,101,159**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**-**	**PHV Total**			**44,101,159**	**LGV Total**		**-**	**HGV Total**		**-**	**Bus Total**		**-**

Vehicle changing fuel type TO

2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0																				
1																				
2																				
3								33.22												
4	-							243.59												
5	-							376.45												
6	-							188												
6c	-							254.66												
6d	-							-												
Compliant	-	-	-		-	-		1,063	-			-	-			-			-	
Non-Compliant	-	-	-		-	-		33	-			-	-			-			-	
Sub-total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1,096**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**-**	**PHV Total**			**1,096**	**LGV Total**		**-**	**HGV Total**		**-**	**Bus Total**		**-**

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Vehicle km Petrol

2021	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0																				
1																				
2																				
3								1,336,399												
4	-							9,800,258												
5	-							15,145,853												
6	-							7,572,926												
6c	-							10,245,724												
6d	-							-												
Compliant																				
Non-Compliant																				
Sub-total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**44,101,159**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**-**	**PHV Total**			**44,101,159**	**LGV Total**		**-**	**HGV Total**		**-**	**Bus Total**		**-**

Assumption: the annual vehicle km are the one related to the diesel category in both cases

Average consumption per euro class (Year 2021)

Vehicle	Fuel	Euro class	Average year	fuel consumption (litres per km)	Vehicle km	fuel consumption (litres)	fuel cost (2018 price)(£/litre)	Fuel cost (2018 price)
Car	Petrol	Euro 0	0	-	-	-	£ 1.089	£ -
Car	Petrol	Euro 1	1995	-	-	-	£ 1.089	£ -
Car	Petrol	Euro 2	1999	-	-	-	£ 1.089	£ -
Car	Petrol	Euro 3	2004	0.076	-	-	£ 1.089	£ -
Car	Petrol	Euro 4	2008	0.070	-	-	£ 1.089	£ -
Car	Petrol	Euro 5	2013	0.056	-	-	£ 1.089	£ -
Car	Petrol	Euro 6 / Electric	2016	0.054	-	-	£ 1.089	£ -
Car	Petrol	Euro 6c	2016	0.054	-	-	£ 1.089	£ -
Car	Petrol	Euro 6d	2016	0.054	-	-	£ 1.089	£ -
Car	Diesel	Euro 0	0	-	-	-	£ 1.128	£ -
Car	Diesel	Euro 1	1995	-	-	-	£ 1.128	£ -
Car	Diesel	Euro 2	1999	-	-	-	£ 1.128	£ -
Car	Diesel	Euro 3	2004	0.062	-	-	£ 1.128	£ -
Car	Diesel	Euro 4	2008	0.059	-	-	£ 1.128	£ -
Car	Diesel	Euro 5	2013	0.049	-	-	£ 1.128	£ -
Car	Diesel	Euro 6 / Electric	2016	0.045	-	-	£ 1.128	£ -
Car	Diesel	Euro 6c	2016	0.045	-	-	£ 1.128	£ -
Car	Diesel	Euro 6d	2016	0.045	-	-	£ 1.128	£ -
PHV	Petrol	Euro 0	0	-	-	-	£ 1.089	£ -
PHV	Petrol	Euro 1	1995	-	-	-	£ 1.089	£ -
PHV	Petrol	Euro 2	1999	-	-	-	£ 1.089	£ -
PHV	Petrol	Euro 3	2004	0.076	1,336,399	101,967	£ 1.089	£ 111,043
PHV	Petrol	Euro 4	2008	0.070	9,800,258	683,078	£ 1.089	£ 743,875
PHV	Petrol	Euro 5	2013	0.056	15,145,853	852,712	£ 1.089	£ 928,607
PHV	Petrol	Euro 6 / Electric	2016	0.054	7,572,926	409,695	£ 1.089	£ 446,160
PHV	Petrol	Euro 6c	2016	0.054	10,245,724	554,294	£ 1.089	£ 603,629
PHV	Petrol	Euro 6d	2016	0.054	-	-	£ 1.089	£ -
PHV	Diesel	Euro 0	0	-	-	-	£ 1.128	£ -
PHV	Diesel	Euro 1	1995	-	-	-	£ 1.128	£ -
PHV	Diesel	Euro 2	1999	-	-	-	£ 1.128	£ -
PHV	Diesel	Euro 3	2004	0.062	1,130,799	69,996	£ 1.128	£ 78,971
PHV	Diesel	Euro 4	2008	0.059	10,177,191	603,507	£ 1.128	£ 680,887
PHV	Diesel	Euro 5	2013	0.049	32,793,170	1,597,027	£ 1.128	£ 1,801,793
PHV	Diesel	Euro 6 / Electric	2016	0.045	-	-	£ 1.128	£ -
PHV	Diesel	Euro 6c	2016	0.045	-	-	£ 1.128	£ -
PHV	Diesel	Euro 6d	2016	0.045	-	-	£ 1.128	£ -

Summary of fuel cost 2021

	fuel cost (2018 price)				
Vehicle	Diesel		Petrol		Difference
Car	£	-	£ -	£	-
PHV	£	2,561,652	£ 2,833,314	£	271,662
Total	£	2,561,652	£ 2,833,314	£	271,662

Summary of fuel cost saving 2021 to 2030 +ve saving, -ve cost

Vehicle	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Car	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
PHV	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 2,716,620
Total	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 271,662	-£ 2,716,620

Profiling (non-compliant vehicles)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car	100%	84%	68%	52%	37%	30%	19%	9%	5%	3%
PHV	100%	78%	57%	35%	13%	11%	8%	4%	2%	2%

Car	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -
PHV	-£ 271,662	-£ 212,869	-£ 154,075	-£ 95,282	-£ 36,488	-£ 30,142	-£ 20,624	-£ 11,105	-£ 6,346	-£ 4,759	-£ 843,352
Total	-£ 271,662	-£ 212,869	-£ 154,075	-£ 95,282	-£ 36,488	-£ 30,142	-£ 20,624	-£ 11,105	-£ 6,346	-£ 4,759	-£ 843,352

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Depreciation

This page calculates the difference in depreciation, when non-compliant vehicles upgrade earlier than planned. The values are used to calculate the welfare loss to vehicle upgrades

Sale Year	2021
ROH	0.5

Euro standards effective

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	1993	1997	2001	2006	2010	2015	2019	2021
Car Diesel	1993	1997	2001	2006	2010	2015	2019	2021
PHV Petrol	1993	1997	2001	2006	2010	2015	2019	2021
PHV Diesel	1993	1997	2001	2006	2010	2015	2019	2021
Taxi Petrol	1993	1997	2001	2006	2010	2015	2019	2021
Taxi Diesel	1993	1997	2001	2006	2010	2015	2019	2021
LGV petrol	1995	1999	2001	2006	2010	2015	2019	2021
LGV diesel	1995	1999	2001	2006	2010	2015	2019	2021
HGV Rigid	1993	1997	2001	2006	2009	2014	2019	2021
HGV Artic	1993	1997	2001	2006	2009	2014	2019	2021
Buses	1993	1997	2001	2006	2009	2014	2019	2021
Coach	1993	1997	2001	2006	2009	2014	2019	2021
Taxi Electric	N/A	N/A	N/A	N/A	N/A	2014	2019	2021
PHV Electric	N/A	N/A	N/A	N/A	N/A	2014	2019	2021

Source: JAQU

Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Ele	Euro 6c	Euro 6d
Car Petrol	1995	1999	2003.5	2008	2012.5	2017	2020	2021
Car Diesel	1995	1999	2003.5	2008	2012.5	2017	2020	2021
PHV Petrol	1995	1999	2003.5	2008	2012.5	2017	2020	2021
PHV Diesel	1995	1999	2003.5	2008	2012.5	2017	2020	2021
Taxi Petrol	1995	1999	2003.5	2008	2012.5	2017	2020	2021
Taxi Diesel	1995	1999	2003.5	2008	2012.5	2017	2020	2021
LGV petrol	1997	2000	2003.5	2008	2012.5	2017	2020	2021
LGV diesel	1997	2000	2003.5	2008	2012.5	2017	2020	2021
HGV	1995	1999	2003.5	2007.5	2011.5	2016.5	2020	2021
Buses	1995	1999	2003.5	2007.5	2011.5	2016.5	2020	2021
Coach	1995	1999	2003.5	2007.5	2011.5	2016.5	2020	2021
Taxi Electric					2014	2016.5	2020	2021
PHV Electric					2014	2016.5	2020	2021

Source: JAQU

New vehicle price

Vehicle	Cost
Cars	12,997
Car Electric	
Taxi	46,000
PHV	12,997
LGV	13,328
LGV Electric	
HGV	65,700
Bus	160,000
Coach	250,000

DEPRECIATION ASSUMPTIONS

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Car	37%	18%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
LGV	37%	18%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
HGV	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Bus	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Coach	35%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%

	Residual Value	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Car	Car Petrol	12,997	8,188	6,714	5,640	4,738	3,980	3,343	2,808	2,359	1,981	1,664	1,398	1,174	986	829	696	585	491	413	347	291	245	205	173	145	122	102	86	72	61	51	43	36	30	25	21
Car	Car Diesel	12,997	8,188	6,714	5,640	4,738	3,980	3,343	2,808	2,359	1,981	1,664	1,398	1,174	986	829	696	585	491	413	347	291	245	205	173	145	122	102	86	72	61	51	43	36	30	25	21
Car	Car Electric																																				
Car	PHV Petrol	12,997	8,188	6,714	5,640	4,738	3,980	3,343	2,808	2,359	1,981	1,664	1,398	1,174	986	829	696	585	491	413	347	291	245	205	173	145	122	102	86	72	61	51	43	36	30	25	21
Car	PHV Diesel	12,997	8,188	6,714	5,640	4,738	3,980	3,343	2,808	2,359	1,981	1,664	1,398	1,174	986	829	696	585	491	413	347	291	245	205	173	145	122	102	86	72	61	51	43	36	30	25	21
Car	Taxi Petrol	46,000	28,980	23,764	19,961	16,768	14,085	11,831	9,938	8,348	7,012	5,890	4,948	4,156	3,491	2,933	2,463	2,069	1,738	1,460	1,226	1,030	865	727	611	513	431	362	304	255	215	180	151	127	107	90	75
Car	Taxi Diesel	46,000	28,980	23,764	19,961	16,768	14,085	11,831	9,938	8,348	7,012	5,890	4,948	4,156	3,491	2,933	2,463	2,069	1,738	1,460	1,226	1,030	865	727	611	513	431	362	304	255	215	180	151	127	107	90	75
LGV	LGV petrol	13,328	8,397	6,885	5,784	4,858	4,081	3,428	2,879	2,419	2,032	1,707	1,434	1,204	1,012	850	714	600	504	423	355	298	251	211	177	149	125	105	88	74	62	52	44	37	31	26	22
LGV	LGV diesel	13,328	8,397	6,885	5,784	4,858	4,081	3,428	2,879	2,419	2,032	1,707	1,434	1,204	1,012	850	714	600	504	423	355	298	251	211	177	149	125	105	88	74	62	52	44	37	31	26	22
HGV	HGV	65,700	42,705	35,018	28,715	23,546	19,308	15,832	12,983	10,646	8,730	7,158	5,870	4,813	3,947	3,236	2,654	2,176	1,784	1,463	1,200	984	807	662	542	445	365	299	245	201	165	135	111	91	75	61	50
Bus	Bus	160,000	104,000	85,280	69,930	57,342	47,021	38,557	31,617	25,926	21,259	17,432	14,295	11,722	9,612	7,882	6,463	5,300	4,346	3,563	2,922	2,396	1,965	1,611	1,321	1,083	888	728	597	490	402	329	270	221	182	149	122
Coach	Coach	250,000	162,500	133,250	109,265	89,597	73,470	60,245	49,401	40,509	33,217	27,238	22,335	18,315	15,018	12,315	10,098	8,281	6,790	5,568	4,566	3,744	3,070	2,517	2,064	1,693	1,388	1,138	933	765	628	515	422	346	284	233	191
Car	Taxi Electric	46,000	28,980	23,764	19,961	16,768	14,085	11,831	9,938	8,348	7,012	5,890	4,948	4,156	3,491	2,933	2,463	2,069	1,738	1,460	1,226	1,030	865	727	611	513	431	362	304	255	215	180	151	127	107	90	75
Car	PHV Electric																																				

%age of planned upgrades by year (Do-Min+vehicle upgrade post-intervention)

	Vehicle	Fuel	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Car Petrol	Car	petrol	7%	6%	6%	6%	6%	7%	11%	10%	5%	1%
Car Diesel	Car	diesel	9%	11%	11%	11%	11%	7%	11%	10%	5%	1%
PHV Petrol	PHV	petrol	56%	6%	6%	6%	6%	7%	11%	10%	5%	1%
PHV Diesel	PHV	diesel	58%	11%	11%	11%	11%	7%	11%	10%	5%	1%
Taxi Petrol	Taxi	petrol	100%	6%	6%	6%	6%	7%	11%	10%	5%	1%
Taxi Diesel	Taxi	diesel	100%	11%	11%	11%	11%	7%	11%	10%	5%	1%
LGV petrol	LGV	petrol	60%	12%	12%	12%	12%	6%	9%	8%	4%	1%
LGV diesel	LGV	diesel	60%	12%	12%	12%	12%	6%	9%	8%	4%	1%
HGV	HGV	diesel	79%	5%	5%	5%	5%	1%	2%	2%	1%	1%
Bus	Bus	diesel	100%	8%	8%	8%	8%	1%	2%	2%	2%	2%

2021

Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	26	22	18	13	9	4	1	0
Car Diesel	26	22	18	13	9	4	1	0
PHV Petrol	26	22	18	13	9	4	1	0
PHV Diesel	26	22	18	13	9	4	1	0
Taxi Petrol	26	22	18	13	9	4	1	0
Taxi Diesel	26	22	18	13	9	4	1	0
LGV petrol	24	21	18	13	9	4	1	0
LGV diesel	24	21	18	13	9	4	1	0
HGV	26	22	18	14	10	5	1	0
Buses	26	22	18	14	10	5	1	0
Coach	26	22	18	14	10	5	1	0
Taxi Electric					7	5	1	0
PHV Electric					7	5	1	0

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	102	205	413	986	1,981	4,738	8,188	12,997
Car Diesel	102	205	413	986	1,981	4,738	8,188	12,997
PHV Petrol	102	205	413	986	1,981	4,738	8,188	12,997
PHV Diesel	102	205	413	986	1,981	4,738	8,188	12,997
Taxi Petrol	362	727	1,460	3,491	7,012	16,768	28,980	46,000
Taxi Diesel	362	727	1,460	3,491	7,012	16,768	28,980	46,000
LGV petrol	149	251	423	1,012	2,032	4,858	8,397	13,328
LGV diesel	149	251	423	1,012	2,032	4,858	8,397	13,328
HGV	299	662	1,463	3,236	7,158	19,308	42,705	65,700
Bus	728	1,611	3,563	7,882	17,432	47,021	104,000	160,000
Coach	1,138	2,517	5,568	12,315	27,238	73,470	162,500	250,000

draft report

2022

Average Age by Euro Standard

Conc	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	27	23	19	14	10	5	2	1
Car Diesel	27	23	19	14	10	5	2	1
PHV Petrol	27	23	19	14	10	5	2	1
PHV Diesel	27	23	19	14	10	5	2	1
Taxi Petrol	27	23	19	14	10	5	2	1
Taxi Diesel	27	23	19	14	10	5	2	1
LGV petrol	25	22	19	14	10	5	2	1
LGV diesel	25	22	19	14	10	5	2	1
HGV	27	23	19	15	11	6	2	1
Buses	27	23	19	15	11	6	2	1
Coach	27	23	19	15	11	6	2	1
Taxi Electric					8	6	2	1
PHV Electric					8	6	2	1

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
Car Petrol	86	173	347	829	1,664	3,980	6,714	8,188
Car Diesel	86	173	347	829	1,664	3,980	6,714	8,188
PHV Petrol	86	173	347	829	1,664	3,980	6,714	8,188
PHV Diesel	86	173	347	829	1,664	3,980	6,714	8,188
Taxi Petrol	304	611	1,226	2,933	5,890	14,085	23,764	28,980
Taxi Diesel	304	611	1,226	2,933	5,890	14,085	23,764	28,980
LGV petrol	125	211	355	850	1,707	4,081	6,885	8,397
LGV diesel	125	211	355	850	1,707	4,081	6,885	8,397
HGV	245	542	1,200	2,654	5,870	15,832	35,018	42,705
Bus	597	1,321	2,922	6,463	14,295	38,557	85,280	104,000
Coach	933	2,064	4,566	10,098	22,335	60,245	133,250	162,500

Consumer Welfare Loss - new upgrade

Upgrade		Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
7%	Car Petrol	165	164	163	160	154	139	115	-
9%	Car Diesel	214	213	211	207	200	181	149	-
56%	PHV Petrol	1,336	1,332	1,322	1,297	1,252	1,129	930	-
58%	PHV Diesel	1,385	1,380	1,371	1,344	1,298	1,171	964	-
100%	Taxi Petrol	8,481	8,452	8,393	8,231	7,949	7,169	5,902	-
100%	Taxi Diesel	8,481	8,452	8,393	8,231	7,949	7,169	5,902	-
60%	LGV petrol	1,468	1,463	1,455	1,427	1,378	1,243	1,023	-
60%	LGV diesel	1,468	1,463	1,455	1,427	1,378	1,243	1,023	-
79%	HGV	9,050	9,024	8,967	8,841	8,563	7,700	6,039	-
100%	Bus	27,934	27,855	27,679	27,291	26,431	23,768	18,640	-
100%	Coach	43,648	43,523	43,249	42,642	41,299	37,138	29,125	-

Consumer Welfare Loss - second hand, same fuel type

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
7%	Petrol	Car Petrol	5	4	3	-	-	-
9%	Diesel	Car Diesel	33	32	31	27	20	-
56%	Petrol	PHV Petrol	39	35	26	-	-	-
58%	Diesel	PHV Diesel	214	210	200	173	127	-
100%	Petrol	Taxi Petrol	250	221	162	-	-	-
100%	Diesel	Taxi Diesel	1,312	1,283	1,225	1,062	780	-
60%	Petrol	LGV petrol	41	36	28	-	-	-
60%	Diesel	LGV diesel	225	221	212	184	135	-
79%	Diesel	HGV	1,350	1,324	1,267	1,141	863	-
100%	Diesel	Bus	4,166	4,087	3,911	3,523	2,663	-
100%	Diesel	Coach	6,510	6,386	6,111	5,504	4,161	-

Consumer Welfare Loss - second hand, different fuel type (cheapest option)

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
7%	Petrol	Car Petrol	5	4	3	-	-	-
9%	Diesel	Car Diesel	-	-	-	-	-	-
56%	Petrol	PHV Petrol	39	35	26	-	-	-
58%	Diesel	PHV Diesel	-	-	-	-	-	-
100%	Petrol	Taxi Petrol	250	221	162	-	-	-
100%	Diesel	Taxi Diesel	-	-	-	-	-	-
60%	Petrol	LGV petrol	41	36	28	-	-	-
60%	Diesel	LGV diesel	-	-	-	-	-	-
79%	Diesel	HGV						
100%	Diesel	Bus						
100%	Diesel	Coach						

2023

Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	28	24	20	15	11	6	3	2
Car Diesel	28	24	20	15	11	6	3	2
PHV Petrol	28	24	20	15	11	6	3	2
PHV Diesel	28	24	20	15	11	6	3	2
Taxi Petrol	28	24	20	15	11	6	3	2
Taxi Diesel	28	24	20	15	11	6	3	2
LGV petrol	26	23	20	15	11	6	3	2
LGV diesel	26	23	20	15	11	6	3	2
HGV	28	24	20	16	12	7	3	2
Buses	28	24	20	16	12	7	3	2
Coach	28	24	20	16	12	7	3	2
Taxi Electric					9	7	3	2
PHV Electric					9	7	3	2

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	72	145	291	696	1,398	3,343	5,640	6,714
Car Diesel	72	145	291	696	1,398	3,343	5,640	6,714
PHV Petrol	72	145	291	696	1,398	3,343	5,640	6,714
PHV Diesel	72	145	291	696	1,398	3,343	5,640	6,714
Taxi Petrol	255	513	1,030	2,463	4,948	11,831	19,961	23,764
Taxi Diesel	255	513	1,030	2,463	4,948	11,831	19,961	23,764
LGV petrol	105	177	298	714	1,434	3,428	5,784	6,885
LGV diesel	105	177	298	714	1,434	3,428	5,784	6,885
HGV	201	445	984	2,176	4,813	12,983	28,715	35,018
Bus	490	1,083	2,396	5,300	11,722	31,617	69,930	85,280
Coach	765	1,693	3,744	8,281	18,315	49,401	109,265	133,250

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Consumer Welfare Loss - new upgrade

Upgrade		Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
6%	Car Petrol	186	185	183	178	170	145	111	-
11%	Car Diesel	336	335	331	322	306	263	201	-
6%	PHV Petrol	186	185	183	178	170	145	111	-
11%	PHV Diesel	336	335	331	322	306	263	201	-
6%	Taxi Petrol	658	655	649	631	600	515	393	-
11%	Taxi Diesel	1,190	1,184	1,172	1,140	1,085	930	711	-
12%	LGV petrol	383	382	379	368	350	300	229	-
12%	LGV diesel	383	382	379	368	350	300	229	-
5%	HGV	770	767	761	746	714	614	420	-
8%	Bus	3,085	3,073	3,047	2,988	2,859	2,457	1,684	-
8%	Coach	4,821	4,802	4,761	4,669	4,467	3,839	2,631	-

Consumer Welfare Loss - second hand, same fuel type

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
6%	Petrol	Car Petrol	4	3	2	-	-	-
11%	Diesel	Car Diesel	33	33	31	27	20	-
6%	Petrol	PHV Petrol	4	3	2	-	-	-
11%	Diesel	PHV Diesel	33	33	31	27	20	-
6%	Petrol	Taxi Petrol	13	11	8	-	-	-
11%	Diesel	Taxi Diesel	119	116	111	96	70	-
12%	Petrol	LGV petrol	7	6	5	-	-	-
12%	Diesel	LGV diesel	38	37	36	31	23	-
5%	Diesel	HGV	71	69	66	60	45	-
8%	Diesel	Bus	283	278	266	239	181	-
8%	Diesel	Coach	442	434	415	374	283	-

Consumer Welfare Loss - second hand, different fuel type (cheapest option)

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
6%	Petrol	Car Petrol	8	7	5	-	-	-
11%	Diesel	Car Diesel	-	-	-	-	-	-
6%	Petrol	PHV Petrol	8	7	5	-	-	-
11%	Diesel	PHV Diesel	-	-	-	-	-	-
6%	Petrol	Taxi Petrol	27	24	18	-	-	-
11%	Diesel	Taxi Diesel	-	-	-	-	-	-
12%	Petrol	LGV petrol	15	13	10	-	-	-
12%	Diesel	LGV diesel	-	-	-	-	-	-
5%	Diesel	HGV						
8%	Diesel	Bus						
8%	Diesel	Coach						

2024

Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	29	25	21	16	12	7	4	3
Car Diesel	29	25	21	16	12	7	4	3
PHV Petrol	29	25	21	16	12	7	4	3
PHV Diesel	29	25	21	16	12	7	4	3
Taxi Petrol	29	25	21	16	12	7	4	3
Taxi Diesel	29	25	21	16	12	7	4	3
LGV petrol	27	24	21	16	12	7	4	3
LGV diesel	27	24	21	16	12	7	4	3
HGV	29	25	21	17	13	8	4	3
Buses	29	25	21	17	13	8	4	3
Coach	29	25	21	17	13	8	4	3
Taxi Electric					10	8	4	3
PHV Electric					10	8	4	3

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	61	122	245	585	1,174	2,808	4,738	5,640
Car Diesel	61	122	245	585	1,174	2,808	4,738	5,640
PHV Petrol	61	122	245	585	1,174	2,808	4,738	5,640
PHV Diesel	61	122	245	585	1,174	2,808	4,738	5,640
Taxi Petrol	215	431	865	2,069	4,156	9,938	16,768	19,961
Taxi Diesel	215	431	865	2,069	4,156	9,938	16,768	19,961
LGV petrol	88	149	251	600	1,204	2,879	4,858	5,784
LGV diesel	88	149	251	600	1,204	2,879	4,858	5,784
HGV	165	365	807	1,784	3,947	10,646	23,546	28,715
Bus	402	888	1,965	4,346	9,612	25,926	57,342	69,930
Coach	628	1,388	3,070	6,790	15,018	40,509	89,597	109,265

Consumer Welfare Loss - new upgrade

Upgrade		Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
6%	Car Petrol	218	216	214	207	195	161	116	-
11%	Car Diesel	393	391	387	374	352	292	210	-
6%	PHV Petrol	218	216	214	207	195	161	116	-
11%	PHV Diesel	393	391	387	374	352	292	210	-
6%	Taxi Petrol	770	766	757	732	689	571	411	-
11%	Taxi Diesel	1,392	1,384	1,368	1,323	1,246	1,033	743	-
12%	LGV petrol	448	446	442	427	403	334	240	-
12%	LGV diesel	448	446	442	427	403	334	240	-
5%	HGV	928	924	915	895	851	713	449	-
8%	Bus	3,718	3,701	3,665	3,585	3,407	2,857	1,798	-
8%	Coach	5,809	5,783	5,727	5,601	5,324	4,465	2,810	-

Consumer Welfare Loss - second hand, same fuel type

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
6%	Petrol	Car Petrol	3	3	2	-	-	-
11%	Diesel	Car Diesel	28	28	26	23	17	-
6%	Petrol	PHV Petrol	3	3	2	-	-	-
11%	Diesel	PHV Diesel	28	28	26	23	17	-
6%	Petrol	Taxi Petrol	11	9	7	-	-	-
11%	Diesel	Taxi Diesel	100	97	93	81	59	-
12%	Petrol	LGV petrol	6	5	4	-	-	-
12%	Diesel	LGV diesel	32	31	30	26	19	-
5%	Diesel	HGV	58	57	54	49	37	-
8%	Diesel	Bus	232	228	218	196	148	-
8%	Diesel	Coach	363	356	340	307	232	-

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Consumer Welfare Loss - second hand, different fuel type (cheapest option)

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
6%	Petrol	Car Petrol	11	9	7	-	-	-
11%	Diesel	Car Diesel	-	-	-	-	-	-
6%	Petrol	PHV Petrol	11	9	7	-	-	-
11%	Diesel	PHV Diesel	-	-	-	-	-	-
6%	Petrol	Taxi Petrol	38	33	25	-	-	-
11%	Diesel	Taxi Diesel	18	2	-	-	-	-
12%	Petrol	LGV petrol	21	19	14	-	-	-
12%	Diesel	LGV diesel	-	-	-	-	-	-
5%	Diesel	HGV						
8%	Diesel	Bus						
8%	Diesel	Coach						

2025

Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	30	26	22	17	13	8	5	4
Car Diesel	30	26	22	17	13	8	5	4
PHV Petrol	30	26	22	17	13	8	5	4
PHV Diesel	30	26	22	17	13	8	5	4
Taxi Petrol	30	26	22	17	13	8	5	4
Taxi Diesel	30	26	22	17	13	8	5	4
LGV petrol	28	25	22	17	13	8	5	4
LGV diesel	28	25	22	17	13	8	5	4
HGV	30	26	22	18	14	9	5	4
Buses	30	26	22	18	14	9	5	4
Coach	30	26	22	18	14	9	5	4
Taxi Electric					11	9	5	4
PHV Electric					11	9	5	4

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	51	102	205	491	986	2,359	3,980	4,738
Car Diesel	51	102	205	491	986	2,359	3,980	4,738
PHV Petrol	51	102	205	491	986	2,359	3,980	4,738
PHV Diesel	51	102	205	491	986	2,359	3,980	4,738
Taxi Petrol	180	362	727	1,738	3,491	8,348	14,085	16,768
Taxi Diesel	180	362	727	1,738	3,491	8,348	14,085	16,768
LGV petrol	74	125	211	504	1,012	2,419	4,081	4,858
LGV diesel	74	125	211	504	1,012	2,419	4,081	4,858
HGV	135	299	662	1,463	3,236	8,730	19,308	23,546
Bus	329	728	1,611	3,563	7,882	21,259	47,021	57,342
Coach	515	1,138	2,517	5,568	12,315	33,217	73,470	89,597

Consumer Welfare Loss - new upgrade

Upgrade		Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
6%	Car Petrol	244	243	239	231	216	175	120	-
11%	Car Diesel	441	439	433	417	391	316	218	-
6%	PHV Petrol	244	243	239	231	216	175	120	-
11%	PHV Diesel	441	439	433	417	391	316	218	-
6%	Taxi Petrol	864	859	848	817	765	619	426	-
11%	Taxi Diesel	1,562	1,552	1,532	1,477	1,382	1,119	771	-
12%	LGV petrol	503	500	495	477	446	361	249	-
12%	LGV diesel	503	500	495	477	446	361	249	-
5%	HGV	1,058	1,053	1,042	1,017	963	795	472	-
8%	Bus	4,236	4,216	4,172	4,074	3,857	3,185	1,892	-
8%	Coach	6,619	6,588	6,518	6,365	6,027	4,977	2,957	-

Consumer Welfare Loss - second hand, same fuel type

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
6%	Petrol	Car Petrol	2	2	2	-	-	-
11%	Diesel	Car Diesel	24	23	22	19	14	-
6%	Petrol	PHV Petrol	2	2	2	-	-	-
11%	Diesel	PHV Diesel	24	23	22	19	14	-
6%	Petrol	Taxi Petrol	9	8	6	-	-	-
11%	Diesel	Taxi Diesel	84	82	78	68	50	-
12%	Petrol	LGV petrol	5	4	3	-	-	-
12%	Diesel	LGV diesel	27	26	25	22	16	-
5%	Diesel	HGV	48	47	45	40	30	-
8%	Diesel	Bus	190	187	179	161	122	-
8%	Diesel	Coach	297	292	279	251	190	-

Consumer Welfare Loss - second hand, different fuel type (cheapest option)

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
6%	Petrol	Car Petrol	13	12	9	-	-	-
11%	Diesel	Car Diesel	-	-	-	-	-	-
6%	Petrol	PHV Petrol	13	12	9	-	-	-
11%	Diesel	PHV Diesel	-	-	-	-	-	-
6%	Petrol	Taxi Petrol	47	41	30	-	-	-
11%	Diesel	Taxi Diesel	42	25	-	-	-	-
12%	Petrol	LGV petrol	26	23	18	-	-	-
12%	Diesel	LGV diesel	-	-	-	-	-	-
5%	Diesel	HGV						
8%	Diesel	Bus						
8%	Diesel	Coach						

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Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	31	27	23	18	14	9	6	5
Car Diesel	31	27	23	18	14	9	6	5
PHV Petrol	31	27	23	18	14	9	6	5
PHV Diesel	31	27	23	18	14	9	6	5
Taxi Petrol	31	27	23	18	14	9	6	5
Taxi Diesel	31	27	23	18	14	9	6	5
LGV petrol	29	26	23	18	14	9	6	5
LGV diesel	29	26	23	18	14	9	6	5
HGV	31	27	23	19	15	10	6	5
Buses	31	27	23	19	15	10	6	5
Coach	31	27	23	19	15	10	6	5
Taxi Electric					12	10	6	5
PHV Electric					12	10	6	5

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	43	86	173	413	829	1,981	3,343	3,980
Car Diesel	43	86	173	413	829	1,981	3,343	3,980
PHV Petrol	43	86	173	413	829	1,981	3,343	3,980
PHV Diesel	43	86	173	413	829	1,981	3,343	3,980
Taxi Petrol	151	304	611	1,460	2,933	7,012	11,831	14,085
Taxi Diesel	151	304	611	1,460	2,933	7,012	11,831	14,085
LGV petrol	62	105	177	423	850	2,032	3,428	4,081
LGV diesel	62	105	177	423	850	2,032	3,428	4,081
HGV	111	245	542	1,200	2,654	7,158	15,832	19,308
Bus	270	597	1,321	2,922	6,463	17,432	38,557	47,021
Coach	422	933	2,064	4,566	10,098	27,238	60,245	73,470

Upgrade
6%
11%
6%
11%
6%
11%
12%
12%
5%
8%
8%

Consumer Welfare Loss - new upgrade

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
Car Petrol	266	265	261	251	234	186	124	-
Car Diesel	482	478	472	454	423	337	224	-
PHV Petrol	266	265	261	251	234	186	124	-
PHV Diesel	482	478	472	454	423	337	224	-
Taxi Petrol	943	937	924	889	828	659	439	-
Taxi Diesel	1,705	1,693	1,670	1,607	1,497	1,191	794	-
LGV petrol	549	545	539	519	483	385	256	-
LGV diesel	549	545	539	519	483	385	256	-
HGV	1,164	1,158	1,145	1,117	1,055	863	492	-
Bus	4,661	4,638	4,587	4,475	4,226	3,455	1,969	-
Coach	7,283	7,247	7,168	6,992	6,603	5,398	3,077	-

Consumer Welfare Loss - second hand, same fuel type

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
6%	Petrol	Car Petrol	2	2	1	-	-	-
11%	Diesel	Car Diesel	20	19	19	16	12	-
6%	Petrol	PHV Petrol	2	2	1	-	-	-
11%	Diesel	PHV Diesel	20	19	19	16	12	-
6%	Petrol	Taxi Petrol	7	7	5	-	-	-
11%	Diesel	Taxi Diesel	70	69	66	57	42	-
12%	Petrol	LGV petrol	4	4	3	-	-	-
12%	Diesel	LGV diesel	22	22	21	18	13	-
5%	Diesel	HGV	39	38	37	33	25	-
8%	Diesel	Bus	156	153	147	132	100	-
8%	Diesel	Coach	244	239	229	206	156	-

Consumer Welfare Loss - second hand, different fuel type (cheapest option)

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
6%	Petrol	Car Petrol	15	14	10	-	-	-
11%	Diesel	Car Diesel	-	-	-	-	-	-
6%	Petrol	PHV Petrol	15	14	10	-	-	-
11%	Diesel	PHV Diesel	-	-	-	-	-	-
6%	Petrol	Taxi Petrol	54	48	35	-	-	-
11%	Diesel	Taxi Diesel	62	45	9	-	-	-
12%	Petrol	LGV petrol	30	27	21	-	-	-
12%	Diesel	LGV diesel	-	-	-	-	-	-
5%	Diesel	HGV						
8%	Diesel	Bus						
8%	Diesel	Coach						

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Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	32	28	24	19	15	10	7	6
Car Diesel	32	28	24	19	15	10	7	6
PHV Petrol	32	28	24	19	15	10	7	6
PHV Diesel	32	28	24	19	15	10	7	6
Taxi Petrol	32	28	24	19	15	10	7	6
Taxi Diesel	32	28	24	19	15	10	7	6
LGV petrol	30	27	24	19	15	10	7	6
LGV diesel	30	27	24	19	15	10	7	6
HGV	32	28	24	20	16	11	7	6
Buses	32	28	24	20	16	11	7	6
Coach	32	28	24	20	16	11	7	6
Taxi Electric					13	11	7	6
PHV Electric					13	11	7	6

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	36	72	145	347	696	1,664	2,808	3,343
Car Diesel	36	72	145	347	696	1,664	2,808	3,343
PHV Petrol	36	72	145	347	696	1,664	2,808	3,343
PHV Diesel	36	72	145	347	696	1,664	2,808	3,343
Taxi Petrol	127	255	513	1,226	2,463	5,890	9,938	11,831
Taxi Diesel	127	255	513	1,226	2,463	5,890	9,938	11,831
LGV petrol	52	88	149	355	714	1,707	2,879	3,428
LGV diesel	52	88	149	355	714	1,707	2,879	3,428
HGV	91	201	445	984	2,176	5,870	12,983	15,832
Bus	221	490	1,083	2,396	5,300	14,295	31,617	38,557
Coach	346	765	1,693	3,744	8,281	22,335	49,401	60,245

Consumer Welfare Loss - new upgrade

Upgrade		Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
7%	Car Petrol	322	320	315	303	281	221	144	-
7%	Car Diesel	333	331	326	313	291	229	149	-
7%	PHV Petrol	322	320	315	303	281	221	144	-
7%	PHV Diesel	333	331	326	313	291	229	149	-
7%	Taxi Petrol	1,140	1,132	1,116	1,072	995	782	508	-
7%	Taxi Diesel	1,179	1,171	1,155	1,109	1,030	810	526	-
6%	LGV petrol	283	281	278	267	248	195	126	-
6%	LGV diesel	283	281	278	267	248	195	126	-
1%	HGV	352	350	346	338	318	258	143	-
1%	Bus	663	660	652	636	599	486	269	-
1%	Coach	1,036	1,031	1,019	993	936	760	420	-

Consumer Welfare Loss - second hand, same fuel type

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
7%	Petrol	Car Petrol	2	2	1	-	-	-
7%	Diesel	Car Diesel	11	11	10	9	6	-
7%	Petrol	PHV Petrol	2	2	1	-	-	-
7%	Diesel	PHV Diesel	11	11	10	9	6	-
7%	Petrol	Taxi Petrol	7	6	5	-	-	-
7%	Diesel	Taxi Diesel	38	37	36	31	23	-
6%	Petrol	LGV petrol	2	1	1	-	-	-
6%	Diesel	LGV diesel	9	9	9	7	5	-
1%	Diesel	HGV	9	9	8	8	6	-
1%	Diesel	Bus	17	17	16	14	11	-
1%	Diesel	Coach	26	26	25	22	17	-

Consumer Welfare Loss - second hand, different fuel type (cheapest option)

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
7%	Petrol	Car Petrol	19	17	13	-	-	-
7%	Diesel	Car Diesel	-	-	-	-	-	-
7%	Petrol	PHV Petrol	19	17	13	-	-	-
7%	Diesel	PHV Diesel	-	-	-	-	-	-
7%	Petrol	Taxi Petrol	68	60	44	-	-	-
7%	Diesel	Taxi Diesel	51	40	16	-	-	-
6%	Petrol	LGV petrol	16	14	11	-	-	-
6%	Diesel	LGV diesel	-	-	-	-	-	-
1%	Diesel	HGV						
1%	Diesel	Bus						
1%	Diesel	Coach						

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Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	33	29	25	20	16	11	8	7
Car Diesel	33	29	25	20	16	11	8	7
PHV Petrol	33	29	25	20	16	11	8	7
PHV Diesel	33	29	25	20	16	11	8	7
Taxi Petrol	33	29	25	20	16	11	8	7
Taxi Diesel	33	29	25	20	16	11	8	7
LGV petrol	31	28	25	20	16	11	8	7
LGV diesel	31	28	25	20	16	11	8	7
HGV	33	29	25	21	17	12	8	7
Buses	33	29	25	21	17	12	8	7
Coach	33	29	25	21	17	12	8	7
Taxi Electric					14	12	8	7
PHV Electric					14	12	8	7

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	30	61	122	291	585	1,398	2,359	2,808
Car Diesel	30	61	122	291	585	1,398	2,359	2,808
PHV Petrol	30	61	122	291	585	1,398	2,359	2,808
PHV Diesel	30	61	122	291	585	1,398	2,359	2,808
Taxi Petrol	107	215	431	1,030	2,069	4,948	8,348	9,938
Taxi Diesel	107	215	431	1,030	2,069	4,948	8,348	9,938
LGV petrol	44	74	125	298	600	1,434	2,419	2,879
LGV diesel	44	74	125	298	600	1,434	2,419	2,879
HGV	75	165	365	807	1,784	4,813	10,646	12,983
Bus	182	402	888	1,965	4,346	11,722	25,926	31,617
Coach	284	628	1,388	3,070	6,790	18,315	40,509	49,401

Consumer Welfare Loss - new upgrade

Upgrade		Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
11%	Car Petrol	544	540	532	510	473	368	234	-
11%	Car Diesel	563	559	550	528	489	381	242	-
11%	PHV Petrol	544	540	532	510	473	368	234	-
11%	PHV Diesel	563	559	550	528	489	381	242	-
11%	Taxi Petrol	1,925	1,911	1,883	1,806	1,673	1,303	829	-
11%	Taxi Diesel	1,991	1,977	1,948	1,869	1,731	1,348	858	-
9%	LGV petrol	477	474	468	449	416	324	206	-
9%	LGV diesel	477	474	468	449	416	324	206	-
2%	HGV	595	592	585	570	537	434	234	-
2%	Bus	1,121	1,116	1,103	1,074	1,011	817	441	-
2%	Coach	1,752	1,743	1,723	1,678	1,580	1,276	690	-

Consumer Welfare Loss - second hand, same fuel type

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
11%	Petrol	Car Petrol	3	2	2	-	-	-
11%	Diesel	Car Diesel	14	14	14	12	9	-
11%	Petrol	PHV Petrol	3	2	2	-	-	-
11%	Diesel	PHV Diesel	14	14	14	12	9	-
11%	Petrol	Taxi Petrol	9	8	6	-	-	-
11%	Diesel	Taxi Diesel	51	50	48	41	30	-
9%	Petrol	LGV petrol	2	2	2	-	-	-
9%	Diesel	LGV diesel	12	12	12	10	7	-
2%	Diesel	HGV	12	12	11	10	8	-
2%	Diesel	Bus	22	22	21	19	14	-
2%	Diesel	Coach	35	34	33	29	22	-

Consumer Welfare Loss - second hand, different fuel type (cheapest option)

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
11%	Petrol	Car Petrol	34	30	22	-	-	-
11%	Diesel	Car Diesel	-	-	-	-	-	-
11%	Petrol	PHV Petrol	34	30	22	-	-	-
11%	Diesel	PHV Diesel	-	-	-	-	-	-
11%	Petrol	Taxi Petrol	119	105	77	-	-	-
11%	Diesel	Taxi Diesel	97	78	40	-	-	-
9%	Petrol	LGV petrol	28	25	19	-	-	-
9%	Diesel	LGV diesel	-	-	-	-	-	-
2%	Diesel	HGV						
2%	Diesel	Bus						
2%	Diesel	Coach						

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Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	34	30	26	21	17	12	9	8
Car Diesel	34	30	26	21	17	12	9	8
PHV Petrol	34	30	26	21	17	12	9	8
PHV Diesel	34	30	26	21	17	12	9	8
Taxi Petrol	34	30	26	21	17	12	9	8
Taxi Diesel	34	30	26	21	17	12	9	8
LGV petrol	32	29	26	21	17	12	9	8
LGV diesel	32	29	26	21	17	12	9	8
HGV	34	30	26	22	18	13	9	8
Buses	34	30	26	22	18	13	9	8
Coach	34	30	26	22	18	13	9	8
Taxi Electric					15	13	9	8
PHV Electric					15	13	9	8

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	25	51	102	245	491	1,174	1,981	2,359
Car Diesel	25	51	102	245	491	1,174	1,981	2,359
PHV Petrol	25	51	102	245	491	1,174	1,981	2,359
PHV Diesel	25	51	102	245	491	1,174	1,981	2,359
Taxi Petrol	90	180	362	865	1,738	4,156	7,012	8,348
Taxi Diesel	90	180	362	865	1,738	4,156	7,012	8,348
LGV petrol	37	62	105	251	504	1,204	2,032	2,419
LGV diesel	37	62	105	251	504	1,204	2,032	2,419
HGV	61	135	299	662	1,463	3,947	8,730	10,646
Bus	149	329	728	1,611	3,563	9,612	21,259	25,926
Coach	233	515	1,138	2,517	5,568	15,018	33,217	40,509

Consumer Welfare Loss - new upgrade

Upgrade		Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
10%	Car Petrol	511	507	500	479	443	342	214	-
10%	Car Diesel	529	525	517	495	458	354	222	-
10%	PHV Petrol	511	507	500	479	443	342	214	-
10%	PHV Diesel	529	525	517	495	458	354	222	-
10%	Taxi Petrol	1,808	1,795	1,768	1,694	1,566	1,211	759	-
10%	Taxi Diesel	1,871	1,857	1,830	1,753	1,621	1,253	785	-
8%	LGV petrol	448	445	440	421	390	301	189	-
8%	LGV diesel	448	445	440	421	390	301	189	-
2%	HGV	560	557	550	536	504	405	215	-
2%	Bus	1,054	1,048	1,036	1,009	949	763	405	-
2%	Coach	1,647	1,638	1,619	1,576	1,483	1,192	633	-

Consumer Welfare Loss - second hand, same fuel type

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
10%	Petrol	Car Petrol	2	2	1	-	-	-	-	-
10%	Diesel	Car Diesel	11	11	10	9	7	-	-	-
10%	Petrol	PHV Petrol	2	2	1	-	-	-	-	-
10%	Diesel	PHV Diesel	11	11	10	9	7	-	-	-
10%	Petrol	Taxi Petrol	7	6	5	-	-	-	-	-
10%	Diesel	Taxi Diesel	39	38	36	31	23	-	-	-
8%	Petrol	LGV petrol	2	1	1	-	-	-	-	-
8%	Diesel	LGV diesel	9	9	9	8	6	-	-	-
2%	Diesel	HGV	9	9	8	7	6	-	-	-
2%	Diesel	Bus	16	16	15	14	10	-	-	-
2%	Diesel	Coach	26	25	24	22	16	-	-	-

Consumer Welfare Loss - second hand, different fuel type (cheapest option)

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6 / Electric	Euro 6 / Electric
10%	Petrol	Car Petrol	32	28	21	-	-	-	-	-
10%	Diesel	Car Diesel	-	-	-	-	-	-	-	-
10%	Petrol	PHV Petrol	32	28	21	-	-	-	-	-
10%	Diesel	PHV Diesel	-	-	-	-	-	-	-	-
10%	Petrol	Taxi Petrol	114	101	74	-	-	-	-	-
10%	Diesel	Taxi Diesel	98	81	47	-	-	-	-	-
8%	Petrol	LGV petrol	27	24	18	-	-	-	-	-
8%	Diesel	LGV diesel	-	-	-	-	-	-	-	-
2%	Diesel	HGV								
2%	Diesel	Bus								
2%	Diesel	Coach								

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Average Age by Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	35	31	27	22	18	13	10	9
Car Diesel	35	31	27	22	18	13	10	9
PHV Petrol	35	31	27	22	18	13	10	9
PHV Diesel	35	31	27	22	18	13	10	9
Taxi Petrol	35	31	27	22	18	13	10	9
Taxi Diesel	35	31	27	22	18	13	10	9
LGV petrol	33	30	27	22	18	13	10	9
LGV diesel	33	30	27	22	18	13	10	9
HGV	35	31	27	23	19	14	10	9
Buses	35	31	27	23	19	14	10	9
Coach	35	31	27	23	19	14	10	9
Taxi Electric					16	14	10	9
PHV Electric					16	14	10	9

Average residual (depreciated) value of vehicle in each Euro Standard

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	Euro 6d
Car Petrol	21	43	86	205	413	986	1,664	1,981
Car Diesel	21	43	86	205	413	986	1,664	1,981
PHV Petrol	21	43	86	205	413	986	1,664	1,981
PHV Diesel	21	43	86	205	413	986	1,664	1,981
Taxi Petrol	75	151	304	727	1,460	3,491	5,890	7,012
Taxi Diesel	75	151	304	727	1,460	3,491	5,890	7,012
LGV petrol	31	52	88	211	423	1,012	1,707	2,032
LGV diesel	31	52	88	211	423	1,012	1,707	2,032
HGV	50	111	245	542	1,200	3,236	7,158	8,730
Bus	122	270	597	1,321	2,922	7,882	17,432	21,259
Coach	191	422	933	2,064	4,566	12,315	27,238	33,217

Consumer Welfare Loss - new upgrade

Upgrade		Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric	Euro 6c	New (Euro 6d)
5%	Car Petrol	282	280	276	264	244	187	116	-
5%	Car Diesel	292	290	285	273	252	194	120	-
5%	PHV Petrol	282	280	276	264	244	187	116	-
5%	PHV Diesel	292	290	285	273	252	194	120	-
5%	Taxi Petrol	999	991	976	935	863	663	410	-
5%	Taxi Diesel	1,033	1,025	1,010	967	893	686	424	-
4%	LGV petrol	248	246	243	232	215	165	102	-
4%	LGV diesel	248	246	243	232	215	165	102	-
1%	HGV	309	307	304	296	278	223	117	-
2%	Bus	1,091	1,085	1,072	1,043	981	786	412	-
2%	Coach	1,704	1,695	1,675	1,630	1,532	1,229	644	-

Consumer Welfare Loss - second hand, same fuel type

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
5%	Petrol	Car Petrol	1	1	1	-	-	-
5%	Diesel	Car Diesel	5	5	5	4	3	-
5%	Petrol	PHV Petrol	1	1	1	-	-	-
5%	Diesel	PHV Diesel	5	5	5	4	3	-
5%	Petrol	Taxi Petrol	3	3	2	-	-	-
5%	Diesel	Taxi Diesel	17	17	16	14	10	-
4%	Petrol	LGV petrol	1	1	1	-	-	-
4%	Diesel	LGV diesel	4	4	4	3	2	-
1%	Diesel	HGV	4	4	4	3	2	-
2%	Diesel	Bus	13	13	13	11	9	-
2%	Diesel	Coach	21	21	20	18	13	-

Consumer Welfare Loss - second hand, different fuel type (cheapest option)

Upgrade			Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 / Electric
5%	Petrol	Car Petrol	18	16	12	-	-	-
5%	Diesel	Car Diesel	-	-	-	-	-	-
5%	Petrol	PHV Petrol	18	16	12	-	-	-
5%	Diesel	PHV Diesel	-	-	-	-	-	-
5%	Petrol	Taxi Petrol	64	56	41	-	-	-
5%	Diesel	Taxi Diesel	57	48	30	-	-	-
4%	Petrol	LGV petrol	15	13	10	-	-	-
4%	Diesel	LGV diesel	-	-	-	-	-	-
1%	Diesel	HGV						
2%	Diesel	Bus						
2%	Diesel	Coach						

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All Year Average

Consumer Welfare Loss - new upgrade

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Euro 6c	New (Euro 6d)
Car Petrol	2,738	2,720	2,684	2,583	2,409	1,926	1,295	-
Car Diesel	3,582	3,559	3,513	3,385	3,162	2,546	1,734	-
PHV Petrol	3,909	3,887	3,843	3,720	3,507	2,916	2,110	-
PHV Diesel	4,754	4,727	4,672	4,521	4,260	3,536	2,549	-
Taxi Petrol	17,588	17,497	17,314	16,807	15,928	13,493	10,078	-
Taxi Diesel	20,404	20,296	20,078	19,476	18,432	15,539	11,514	-
LGV petrol	4,808	4,782	4,738	4,588	4,328	3,608	2,621	-
LGV diesel	4,808	4,782	4,738	4,588	4,328	3,608	2,621	-
HGV	14,786	14,733	14,615	14,356	13,782	12,005	8,581	-
Bus	47,564	47,392	47,013	46,175	44,320	38,575	27,511	-
Coach	74,318	74,051	73,458	72,148	69,250	60,274	42,986	-

Consumer Welfare Loss - second hand, same fuel type

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Euro 6c	New (Euro 6d)
Car Petrol	24	21	15	-	-	-	-	-
Car Diesel	179	175	167	145	107	-	-	-
PHV Petrol	58	51	38	-	-	-	-	-
PHV Diesel	361	353	336	292	214	-	-	-
Taxi Petrol	316	280	205	-	-	-	-	-
Taxi Diesel	1,830	1,789	1,708	1,481	1,088	-	-	-
LGV petrol	69	61	47	-	-	-	-	-
LGV diesel	379	371	357	310	228	-	-	-
HGV	1,598	1,568	1,500	1,351	1,021	-	-	-
Bus	5,097	5,000	4,785	4,309	3,258	-	-	-
Coach	7,964	7,812	7,476	6,733	5,090	-	-	-

Consumer Welfare Loss - second hand, different fuel type (cheapest option)

	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6	Euro 6c	New (Euro 6d)
Car Petrol	155	137	100	-	-	-	-	-
Car Diesel	-	-	-	-	-	-	-	-
PHV Petrol	189	167	123	-	-	-	-	-
PHV Diesel	-	-	-	-	-	-	-	-
Taxi Petrol	781	690	507	-	-	-	-	-
Taxi Diesel	426	319	142	-	-	-	-	-
LGV petrol	220	194	150	-	-	-	-	-
LGV diesel	-	-	-	-	-	-	-	-
HGV	-	-	-	-	-	-	-	-
Bus	-	-	-	-	-	-	-	-
Coach	-	-	-	-	-	-	-	-

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Loss of Asset Value

This sheet calculate the loss of asset value as a result of induced early upgrade of compliant vehicles post-intervention. The clean air credit scheme requires the applicant to scrap the older vehicle.

Assumptions
1)The depreciation of the fleet is assumed to start from 2019, so in 2021 a 2 years depreciation will be considered

Total number of vehicles upgrading

	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	158	-	8	25	-	-	-	-	-	-	240	-	-	43	-
4	-	-	-	-	-	603	-	-	225	-	-	-	5,904	-	-	480	-	-	43	-
5	-	-	-	-	-	289	-	-	725	-	-	-	10,234	-	-	2,761	-	-	490	-
6																				
6c																				
6d																				
Sub-total	**-**	**-**	**-**	**-**	**-**	**1,064**	**-**	**8**	**974**	**-**	**-**	**-**	**16,139**	**-**	**-**	**3,481**	**-**	**-**	**577**	**-**
Total	**Car Total**			**-**	**Taxi Total**		**1,064**	**PHV Total**			**983**	**LGV Total**		**16,139**	**HGV Total**		**3,481**	**Bus Total**		**576.9977**

Average residual (depreciated) value of vehicle in each Euro Standard

	0	*1*	*2*	*3*	*4*	*5*	*6*	*6c*	*6d*
	Euro 0	**Euro 1**	**Euro 2**	**Euro 3**	**Euro 4**	**Euro 5**	**Euro 6 / Electric**	**Euro 6c**	**Euro 6d**
Car Petrol	72	72	145	291	696	1,398	3,343	5,640	6,714
Car Diesel	72	72	145	291	696	1,398	3,343	5,640	6,714
PHV Petrol	72	72	145	291	696	1,398	3,343	5,640	6,714
PHV Diesel	72	72	145	291	696	1,398	3,343	5,640	6,714
Taxi Petrol	255	255	513	1,030	2,463	4,948	11,831	19,961	23,764
Taxi Diesel	255	255	513	1,030	2,463	4,948	11,831	19,961	23,764
LGV petrol	105	105	177	298	714	1,434	3,428	5,784	6,885
LGV diesel	105	105	177	298	714	1,434	3,428	5,784	6,885
HGV	201	201	445	984	2,176	4,813	12,983	28,715	35,018
Bus	490	490	1,083	2,396	5,300	11,722	31,617	69,930	85,280
Coach	765	765	1,693	3,744	8,281	18,315	49,401	109,265	133,250

Total loss of residual value *Car Petrol Car Diesel Car Electric Car Other Taxi Petrol Taxi Diesel Taxi Other PHV Petrol PHV Diesel PHV Electric PHV Other LGV Petrol LGV Diesel LGV Other HGV HGV HGV Bus Bus Bus*

	Car				Taxi			PHV				LGV			HGV			Bus		
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	7,211	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	163,109	-	2,382	7,272	-	-	-	-	-	-	236,189	-	-	103,689	-
4	-	-	-	-	-	1,484,770	-	-	156,503	-	-	-	4,214,252	-	-	1,044,802	-	-	229,338	-
5	-	-	-	-	-	1,427,601	-	-	1,012,888	-	-	-	14,671,871	-	-	13,287,600	-	-	########	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	**-**	**-**	**-**	**-**	**-**	**3,082,692**	**-**	**2,382**	**1,176,664**	**-**	**-**	**-**	**18,886,123**	**-**	**-**	**14,568,591**	**-**	**-**	########	**-**
Total	**Car Total**			**-**	**Taxi Total**		**3,082,692**	**PHV Total**			**1,179,046**	**LGV Total**		**18,886,123**	**HGV Total**		**14,568,591**	**Bus Total**		**6081848**

2018 prices (undiscounted)	2,021	Total
Car Petrol	-	-
Car Diesel	-	-
Car Electric		
Car Other		
Taxi Diesel	3,082,692	3,082,692
PHV Petrol	2,382	2,382
PHV Diesel	1,176,664	1,176,664
PHV Electric		
PHV Other		
LGV Diesel	18,886,123	18,886,123
HGV	14,568,591	14,568,591
Bus	6,081,848	6,081,848
Coach		
Total	**43,798,300**	**43,798,300**

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Total transaction costs

This worksheet presents the costs associated with search for vehicle upgrades

Assumptions

1)Euro 6, 6c and 6d transaction cost is assumed to be the same as euro 5

	Weighted Transaction Costs		
Euro Standard	Car	LGV	HGV
Euro 5	£5.77	£10.13	£6.71
Euro 4	£3.40	£7.89	£7.70
Euro 3	£3.38	£9.65	£6.67
Euro 2	£6.07	£12.17	£5.58
Euro 1	£6.07	£12.17	£5.58

Source: Transaction costs-National data inputs for Local Economic Models

Number of vehicles upgraded by Euro Class

	Car				Taxi			PHV				LGV			HGV			Bus			
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	-	-	-	-	-	317	-	16	50	-	-	-	-	-	-	480	-	-	87	-	
4	-	-	-	-	-	1,205	-	-	450	-	-	-	-	-	-	960	-	-	87	-	
5	-	-	-	-	-	577	-	-	1,449	-	-	-	-	-	-	5,521	-	-	981	-	
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sub-total	**-**	**-**	**-**	**-**	**-**	**2,127**	**-**	**16**	**1,949**	**-**	**-**	**-**	**-**	**-**	**-**	**6,962**	**-**	**-**	**1,154**	**-**	
Total	**Car Total**			**-**	**Taxi Total**		**2,127**	**PHV Total**			**1,965**	**LGV Total**		**-**	**HGV Total**		**6,962**	**Bus Total**		**1153.9955**	**12,208**

Total transaction costs

	Car				Taxi			PHV				LGV			HGV			Bus			
Euro Class	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Electric	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	Petrol	Diesel	Other	
0																					
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	-	-	-	-	-	171	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	-	-	-	-	-	1,070	-	55	169	-	-	-	-	-	-	3,202	-	-	577	-	
4	-	-	-	-	-	4,094	-	-	1,527	-	-	-	-	-	-	7,397	-	-	667	-	
5	-	-	-	-	-	3,330	-	-	8,361	-	-	-	-	-	-	37,055	-	-	6,583	-	
6																					
6c																					
6d																					
Sub-total	**-**	**-**	**-**	**-**	**-**	**8,665**	**-**	**55**	**10,058**	**-**	**-**	**-**	**-**	**-**	**-**	**47,655**	**-**	**-**	**7,827**	**-**	
Total	**Car Total**			**-**	**Taxi Total**		**8,665**	**PHV Total**			**10,113**	**LGV Total**		**-**	**HGV Total**		**47,655**	**Bus Total**		**7827.1364**	**74,260**

2021 prices	2021	Total
Car Petrol	-	-
Car Diesel	-	-
Car Electric		-
Car Other		-
Taxi Diesel	8,665	8,664.69
PHV Petrol	55	55.31
PHV Diesel	10,058	10,057.64
PHV Electric		-
PHV Other		-
LGV Diesel	-	-
HGV	47,655	47,655.16
Bus	7,827	7,827.14
Coach		-
Total	**74,260**	**74,260**

2018 prices (undiscounted)	2021	Total
Car Petrol	-	-
Car Diesel	-	-
Car Electric	-	-
Car Other	-	-
Taxi Diesel	8,253	8,252.66
PHV Petrol	53	52.68
PHV Diesel	9,579	9,579.37
PHV Electric	-	-
PHV Other	-	-
LGV Diesel	-	-
HGV	45,389	45,389.07
Bus	7,455	7,454.94
Coach	-	-
Total	**70,729**	**70,729**

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Summary of Vehicle Upgrade

This worksheet presents the summary of the vehicle upgrades

Undiscounted 2018 prices	Car	LGV	HGV	PHV	Taxi	Bus	Total
Number of Vehicles Upgrading	-	32,277	6,962	1,965	2,127	1,154	**44,485**
of which are scrapping	-	32,277	6,962	1,965	2,127	87	**43,418**
of which are retrofitting						1,067	**1,067**
Welfare Loss of Upgrading	-	35,480,651	24,440,269	2,107,623	10,337,913	12,983,279	**85,349,735**
Welfare Loss of Retrofitting						10,674,458	**10,674,458**
Transaction Cost	-	-	45,389	9,632	8,253	7,455	**70,729**
Loss of Asset Value	-	18,886,123	14,568,591	1,179,046	3,082,692	6,081,848	**43,798,300**
Fuel Switch Cost	-			843,352			**843,352**
Total							**140,736,574**

Proportion of non-compliant vehicles upgrading

Vehicle Type	Vehicles upgrading
Car	0%
Taxi	100%
PHV	49%
LGV	49%
HGV	75%
Bus	100%
Coach	100%

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Discounting

This page summarises the impact and discounts to base year 2018

Discount Year	2018

Undiscounted Impacts (2018 prices)

	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Impact to Transport Users (+ve indicates benefit, -ve indicates disbenefits)													
Financial cost to upgrade	-96,024,193			-96,024,193			-	-	-	-	-	-	-
Financial subsidy (vehicle upgrades)	127,651,285	14,175,603	46,268,494	41,981,109	25,226,079	-	-	-	-	-	-	-	-
Loss of asset value	-43,798,300			-43,798,300									
Transaction cost	-70,729			-70,729									
Travel time savings	176,901,682			16,054,697	16,177,871	16,390,528	16,619,048	16,869,346	17,507,646	18,187,756	18,913,784	19,684,804	20,496,201
Vehicle operating cost	96,096,442			6,673,601	7,476,332	8,336,344	9,229,602	10,165,588	10,384,369	10,606,682	10,830,332	11,074,406	11,319,185
Fuel switch costs	-843,352			-271,662	-212,869	-154,075	-95,282	-36,488	-30,142	-20,624	-11,105	-6,346	-4,759
Charge Payments	-281,633,161	-	-	-54,337,771	-43,501,276	-61,024,008	-45,204,025	-30,036,860	-24,161,270	-15,454,857	-7,913,093	-	-
Welfare Loss (cancelled trips)	-47,757,483			-7,304,711	-5,939,185	-10,507,656	-8,117,016	-5,767,898	-4,676,704	-2,904,121	-1,420,475	-645,842	-473,876
Welfare Loss (re-mode)	-21,177,910			-	-	-5,970,674	-4,848,982	-3,715,651	-3,029,722	-1,897,282	-928,220	-454,119	-333,258
Sub-total	**-90,655,719**	**14,175,603**	**46,268,494**	**-137,097,960**	**-773,047**	**-52,929,542**	**-32,416,654**	**-12,521,963**	**-4,005,824**	**8,517,554**	**19,471,223**	**29,652,903**	**31,003,493**
Air Quality/Environment (+ve indicates benefit, -ve indicates disbenefits)													
Health and environmental impact	129,013,316			14,980,485	14,444,521	13,908,557	13,372,593	12,836,629	12,515,408	12,117,049	11,789,312	11,584,460	11,464,302
Health and social impact													
Carbon reduction	105,514,522			9,960,534	10,094,342	10,227,199	10,359,105	10,490,060	10,620,064	10,749,212	10,877,506	11,004,950	11,131,550
Active travel	23,304,329			2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433	2,330,433
Sub-total	**257,832,167**	**-**	**-**	**27,271,452**	**26,869,296**	**26,466,189**	**26,062,131**	**25,657,122**	**25,465,905**	**25,196,693**	**24,997,250**	**24,919,843**	**24,926,285**
Implementation cost (+ve cost, -ve saving)													
Implementation cost	293,634,541	34,381,938	157,969,450	56,687,836	38,407,198	1,429,246	1,230,592	1,125,203	1,071,943	1,063,117	268,019	-	-
Sub-total	293,634,541	**34,381,938**	**157,969,450**	**56,687,836**	**38,407,198**	**1,429,246**	**1,230,592**	**1,125,203**	**1,071,943**	**1,063,117**	**268,019**	**-**	**-**
Operating & Maintenance cost (+ve cost, -ve saving)													
Operating & Maintenance cost	183,719,408	987,756	1,167,021	24,136,311	24,714,917	25,520,575	23,512,054	21,495,362	20,556,813	19,329,201	18,196,106	4,103,293	-
Sub-total	**183,719,408**	**987,756**	**1,167,021**	**24,136,311**	**24,714,917**	**25,520,575**	**23,512,054**	**21,495,362**	**20,556,813**	**19,329,201**	**18,196,106**	**4,103,293**	**-**
Revenue to the Public Sector (+ve cost, -ve saving)													
Clean Air Zone	-281,633,161	-	-	-54,337,771	-43,501,276	-61,024,008	-45,204,025	-30,036,860	-24,161,270	-15,454,857	-7,913,093	-	-

Discounted Impacts (2018 prices)

	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Discounting Factor		*0.966*	*0.934*	*0.902*	*0.871*	*0.842*	*0.814*	*0.786*	*0.759*	*0.734*	*0.709*	*0.685*	*0.662*
Impact to Transport Users (+ve indicates benefit, -ve indicates disbenefits)													
Financial cost to upgrade	-86,608,321	-	-	-86,608,321	-	-	-	-	-	-	-	-	-
Financial subsidy (vehicle upgrades)	116,735,995	13,696,235	43,192,134	37,864,555	21,983,071	-	-	-	-	-	-	-	-
Loss of asset value	-39,503,558	-	-	-39,503,558	-	-	-	-	-	-	-	-	-
Transaction cost	-63,793	-	-	-63,793	-	-	-	-	-	-	-	-	-
Travel time savings	136,253,473	-	-	14,480,417	14,098,080	13,800,385	13,519,606	13,259,154	13,295,508	13,344,920	13,408,338	13,483,022	13,564,044
Vehicle operating cost	73,474,225	-	-	6,019,206	6,515,192	7,018,978	7,508,288	7,990,060	7,886,010	7,782,451	7,677,826	7,585,367	7,490,848
Fuel switch costs	-719,836	-	-	-245,024	-185,503	-129,727	-77,512	-28,679	-22,890	-15,132	-7,873	-4,347	-3,150
Charge Payments	-233,978,982	-	-	-49,009,556	-37,908,849	-51,380,577	-36,773,504	-23,608,700	-18,348,348	-11,339,707	-5,609,740	-	-
Welfare Loss (cancelled trips)	-39,193,323	-	-	-6,588,431	-5,175,656	-8,847,165	-6,603,197	-4,533,516	-3,551,543	-2,130,843	-1,007,001	-442,367	-313,603
Welfare Loss (re-mode)	-16,774,791	-	-	-	-	-5,027,148	-3,944,650	-2,920,468	-2,300,806	-1,392,095	-658,033	-311,047	-220,545
Sub-total	**-90,378,911**	**13,696,235**	**43,192,134**	**-123,654,505**	**-673,666**	**-44,565,254**	**-26,370,969**	**-9,842,150**	**-3,042,069**	**6,249,593**	**13,803,517**	**20,310,629**	**20,517,594**
Air Quality/Environment (+ve indicates benefit, -ve indicates disbenefits)													
Health and environmental impact	101,052,098	-	-	13,511,540	12,587,566	11,710,632	10,878,613	10,089,474	9,504,346	8,890,654	8,357,665	7,934,726	7,586,884
Health and social impact	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon reduction	81,631,490	-	-	8,983,831	8,796,636	8,611,027	8,427,139	8,245,093	8,065,000	7,887,029	7,711,268	7,537,794	7,366,674
Active travel	18,092,642	-	-	2,101,917	2,030,838	1,962,162	1,895,809	1,831,699	1,769,758	1,709,911	1,652,088	1,596,220	1,542,242
Sub-total	**200,776,230**	**-**	**-**	**24,597,287**	**23,415,039**	**22,283,821**	**21,201,560**	**20,166,266**	**19,339,103**	**18,487,594**	**17,721,021**	**17,068,740**	**16,495,799**
Implementation cost (+ve cost, -ve saving)													
Implementation cost	270,157,234	33,219,263	147,466,171	51,129,180	33,469,654	1,203,387	1,001,087	884,400	814,046	780,042	190,004	-	-
Sub-total	**270,157,234**	**33,219,263**	**147,466,171**	**51,129,180**	**33,469,654**	**1,203,387**	**1,001,087**	**884,400**	**814,046**	**780,042**	**190,004**	**-**	**-**
Operating & Maintenance cost (+ve cost, -ve saving)													
Operating & Maintenance cost	148,364,452	954,354	1,089,426	21,769,569	21,537,622	21,487,639	19,127,071	16,895,160	15,611,081	14,182,433	12,899,562	2,810,533	-
Sub-total	**148,364,452**	**954,354**	**1,089,426**	**21,769,569**	**21,537,622**	**21,487,639**	**19,127,071**	**16,895,160**	**15,611,081**	**14,182,433**	**12,899,562**	**2,810,533**	**-**
Revenue to the Public Sector (+ve cost, -ve saving)													
Clean Air Zone	-233,978,982	-	-	-49,009,556	-37,908,849	-51,380,577	-36,773,504	-23,608,700	-18,348,348	-11,339,707	-5,609,740	-	-

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Summary of CBA

This worksheet summarises the costs and benefits of the CAP, presenting the Net Present Value

Discounted 2018 prices	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Impact to Transport Users (+ve indicates benefit, -ve indicates disbenefits)													
Financial cost to upgrade	- 86,608,321	-	-	- 86,608,321	-	-	-	-	-	-	-	-	-
Financial subsidy (vehicle upgrades)	116,735,995	13,696,235	43,192,134	37,864,555	21,983,071	-	-	-	-	-	-	-	-
Loss of asset value	- 39,503,558	-	-	- 39,503,558	-	-	-	-	-	-	-	-	-
Transaction cost	- 63,793	-	-	- 63,793	-	-	-	-	-	-	-	-	-
Travel time savings	136,253,473	-	-	14,480,417	14,098,080	13,800,385	13,519,606	13,259,154	13,295,508	13,344,920	13,408,338	13,483,022	13,564,044
Vehicle operating cost	73,474,225	-	-	6,019,206	6,515,192	7,018,978	7,508,288	7,990,060	7,886,010	7,782,451	7,677,826	7,585,367	7,490,848
Fuel switch costs	- 719,836	-	-	- 245,024	- 185,503	- 129,727	- 77,512	- 28,679	- 22,890	- 15,132	- 7,873	- 4,347	- 3,150
Charge Payments	- 233,978,982	-	-	- 49,009,556	- 37,908,849	- 51,380,577	- 36,773,504	- 23,608,700	- 18,348,348	- 11,339,707	- 5,609,740	-	-
Welfare Loss (cancelled trips)	- 39,193,323	-	-	- 6,588,431	- 5,175,656	- 8,847,165	- 6,603,197	- 4,533,516	- 3,551,543	- 2,130,843	- 1,007,001	- 442,367	- 313,603
Welfare Loss (re-mode)	- 16,774,791	-	-	-	-	- 5,027,148	- 3,944,650	- 2,920,468	- 2,300,806	- 1,392,095	- 658,033	- 311,047	- 220,545
Sub-total	**- 90,378,911**	**13,696,235**	**43,192,134**	**- 123,654,505**	**- 673,666**	**- 44,565,254**	**- 26,370,969**	**- 9,842,150**	**- 3,042,069**	**6,249,593**	**13,803,517**	**20,310,629**	**20,517,594**
Air Quality/Environment (+ve indicates benefit, -ve indicates disbenefits)													
Health and environmental impact	101,052,098	-	-	13,511,540	12,587,566	11,710,632	10,878,613	10,089,474	9,504,346	8,890,654	8,357,665	7,934,726	7,586,884
Health and social impact	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon reduction	81,631,490	-	-	8,983,831	8,796,636	8,611,027	8,427,139	8,245,093	8,065,000	7,887,029	7,711,268	7,537,794	7,366,674
Active travel	18,092,642	-	-	2,101,917	2,030,838	1,962,162	1,895,809	1,831,699	1,769,758	1,709,911	1,652,088	1,596,220	1,542,242
Sub-total	**200,776,230**	**-**	**-**	**24,597,287**	**23,415,039**	**22,283,821**	**21,201,560**	**20,166,266**	**19,339,103**	**18,487,594**	**17,721,021**	**17,068,740**	**16,495,799**
Present Value of Benefits (PVB)	**110,397,319**	**13,696,235**	**43,192,134**	**- 99,057,218**	**22,741,373**	**- 22,281,433**	**- 5,169,409**	**10,324,116**	**16,297,034**	**24,737,188**	**31,524,538**	**37,379,369**	**37,013,393**
Implementation cost (+ve cost, -ve saving)													
Implementation cost	270,157,234	33,219,263	147,466,171	51,129,180	33,469,654	1,203,387	1,001,087	884,400	814,046	780,042	190,004	-	-
Sub-total	**270,157,234**	**33,219,263**	**147,466,171**	**51,129,180**	**33,469,654**	**1,203,387**	**1,001,087**	**884,400**	**814,046**	**780,042**	**190,004**	**-**	**-**
Operating & Maintenance cost (+ve cost, -ve saving)													
Operating & Maintenance cost	148,364,452	954,354	1,089,426	21,769,569	21,537,622	21,487,639	19,127,071	16,895,160	15,611,081	14,182,433	12,899,562	2,810,533	-
Sub-total	**148,364,452**	**954,354**	**1,089,426**	**21,769,569**	**21,537,622**	**21,487,639**	**19,127,071**	**16,895,160**	**15,611,081**	**14,182,433**	**12,899,562**	**2,810,533**	**-**
Revenue to the Public Sector (+ve cost, -ve saving)													
Clean Air Zone	- 233,978,982	-	-	- 49,009,556	- 37,908,849	- 51,380,577	- 36,773,504	- 23,608,700	- 18,348,348	- 11,339,707	- 5,609,740	-	-
Sub-total	**- 233,978,982**	**-**	**-**	**- 49,009,556**	**- 37,908,849**	**- 51,380,577**	**- 36,773,504**	**- 23,608,700**	**- 18,348,348**	**- 11,339,707**	**- 5,609,740**	**-**	**-**
Present Value of Costs (PVC)	**184,542,704**	**34,173,617**	**148,555,598**	**23,889,193**	**17,098,427**	**- 28,689,552**	**- 16,645,346**	**- 5,829,141**	**1,923,220**	**3,622,768**	**7,479,825**	**2,810,533**	**-**
Net Present Value (NPV)	**- 74,145,385**	**- 20,477,383**	**- 105,363,463**	**- 122,946,411**	**5,642,946**	**6,408,118**	**11,475,937**	**16,153,256**	**18,220,254**	**21,114,420**	**24,044,712**	**34,568,836**	**37,013,393**

Analysis of Monetised Costs and Benefits - 2021-2030	Total	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Transport Users Impacts	- 90,378,911	13,696,235	43,192,134	- 123,654,505	- 673,666	- 44,565,254	- 26,370,969	- 9,842,150	- 3,042,069	6,249,593	13,803,517	20,310,629	20,517,594
Health and Environmental Impact	200,776,230	-	-	24,597,287	23,415,039	22,283,821	21,201,560	20,166,266	19,339,103	18,487,594	17,721,021	17,068,740	16,495,799
Present Value of Benefits (PVB)	110,397,319	13,696,235	43,192,134	- 99,057,218	22,741,373	- 22,281,433	- 5,169,409	10,324,116	16,297,034	24,737,188	31,524,538	37,379,369	37,013,393
Implementation Cost	270,157,234	33,219,263	147,466,171	51,129,180	33,469,654	1,203,387	1,001,087	884,400	814,046	780,042	190,004	-	-
O&M Cost	148,364,452	954,354	1,089,426	21,769,569	21,537,622	21,487,639	19,127,071	16,895,160	15,611,081	14,182,433	12,899,562	2,810,533	-
Revenue	- 233,978,982	-	-	- 49,009,556	- 37,908,849	- 51,380,577	- 36,773,504	- 23,608,700	- 18,348,348	- 11,339,707	- 5,609,740	-	-
Present Value of Costs (PVC)	184,542,704	34,173,617	148,555,598	23,889,193	17,098,427	- 28,689,552	- 16,645,346	- 5,829,141	- 1,923,220	3,622,768	7,479,825	2,810,533	-
Net Present Value	**- 74,145,385**	**- 20,477,383**	**- 105,363,463**	**- 122,946,411**	**5,642,946**	**6,408,118**	**11,475,937**	**16,153,256**	**18,220,254**	**21,114,420**	**24,044,712**	**34,568,836**	**37,013,393**

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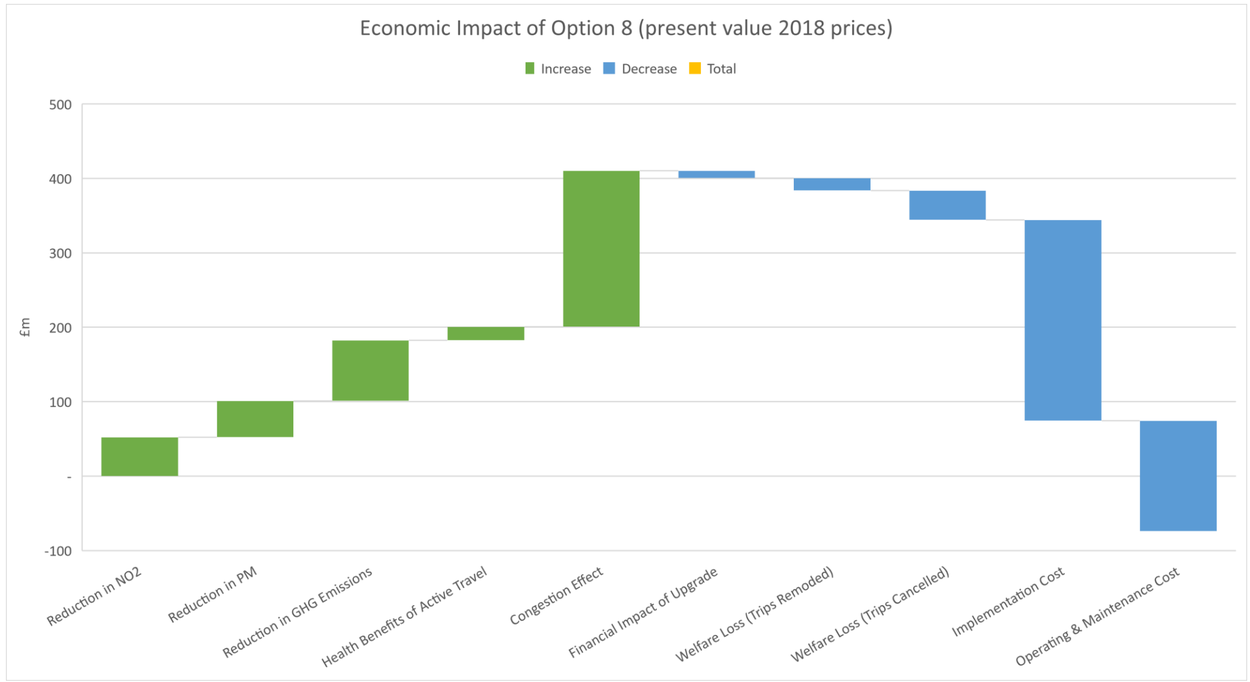
Visual Summary of the Economic Impact

£m	1000000

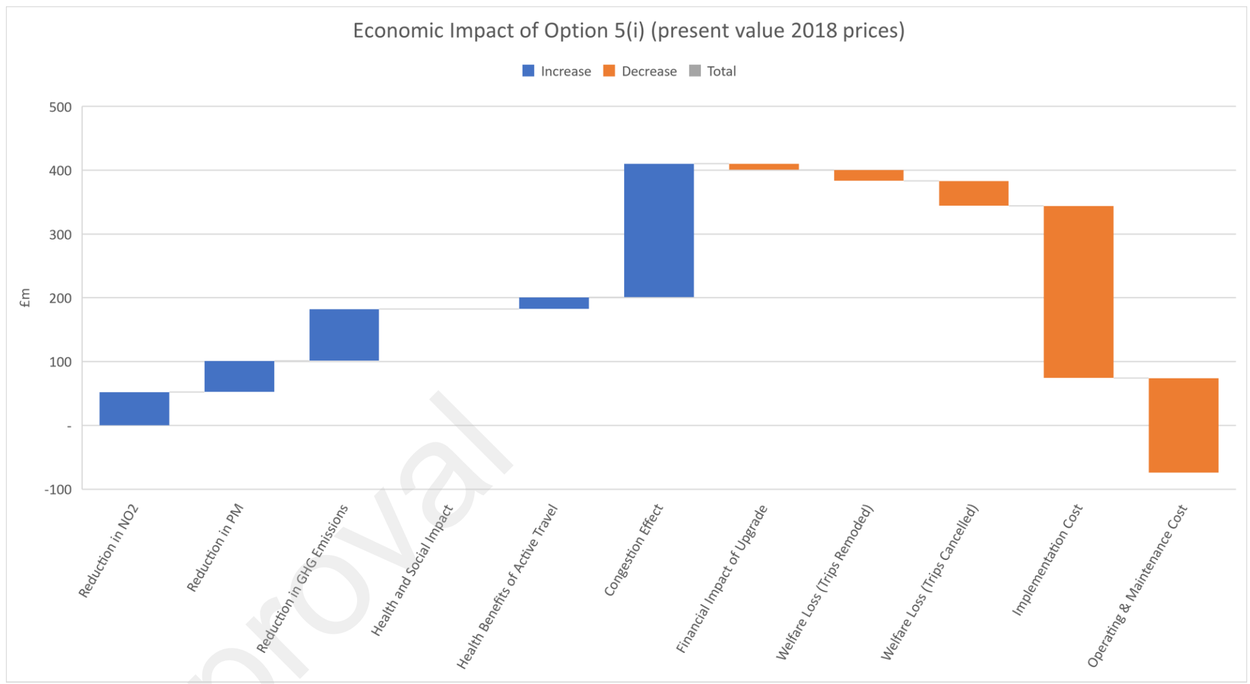
Version 1

Discounted		
Economic Impact	£	£m
Reduction in NO2	52,331,683	52
Reduction in PM	48,720,415	49
Reduction in GHG Emissions	81,631,490	82
Health Benefits of Active Travel	18,092,642	18
Congestion Effect	209,727,698	210
Financial Impact of Upgrade	- 10,159,513	- 10
Welfare Loss (Trips Remoded)	- 16,774,791	- 17
Welfare Loss (Trips Cancelled)	- 39,193,323	- 39
Implementation Cost	- 270,157,234	- 270
Operating & Maintenance Cost	- 148,364,452	- 148



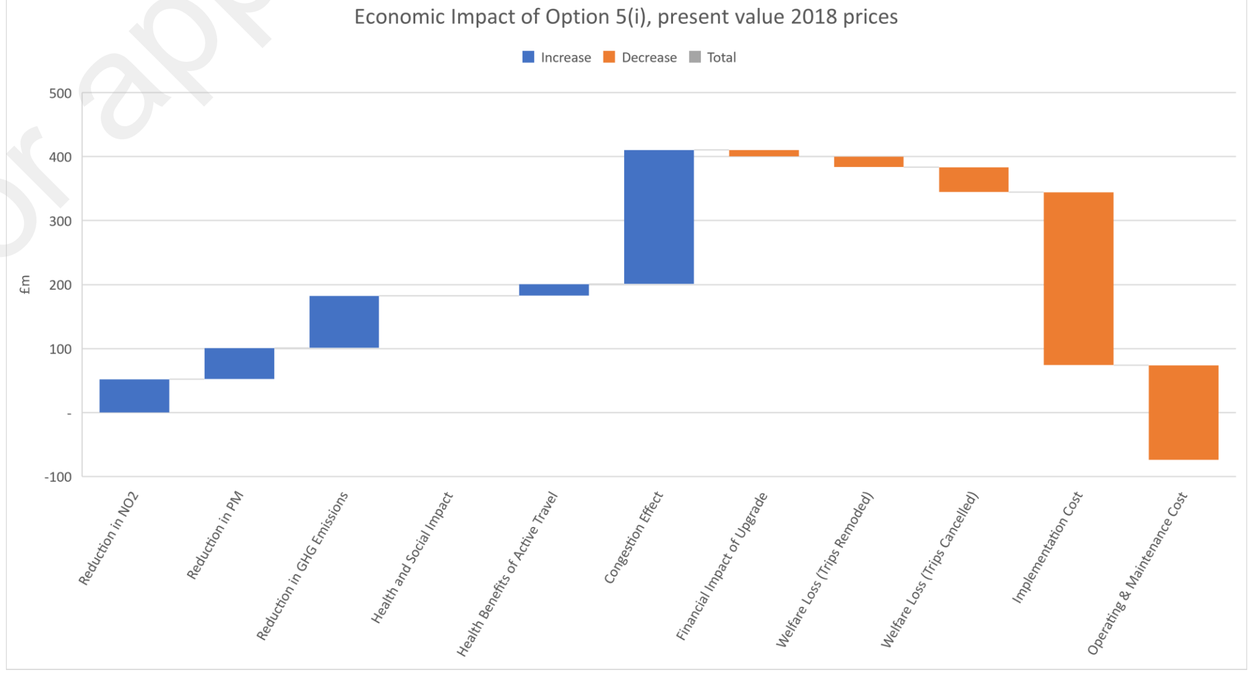
Version 2

Discounted		
Economic Impact	£	£m
Reduction in NO2	52,331,683	52
Reduction in PM	48,720,415	49
Reduction in GHG Emissions	81,631,490	82
Health and Social Impact		
Health Benefits of Active Travel	18,092,642	18
Congestion Effect	209,727,698	210
Financial Impact of Upgrade	- 10,159,513	- 10
Welfare Loss (Trips Remoded)	- 16,774,791	- 17
Welfare Loss (Trips Cancelled)	- 39,193,323	- 39
Implementation Cost	- 270,157,234	- 270
Operating & Maintenance Cost	- 148,364,452	- 148

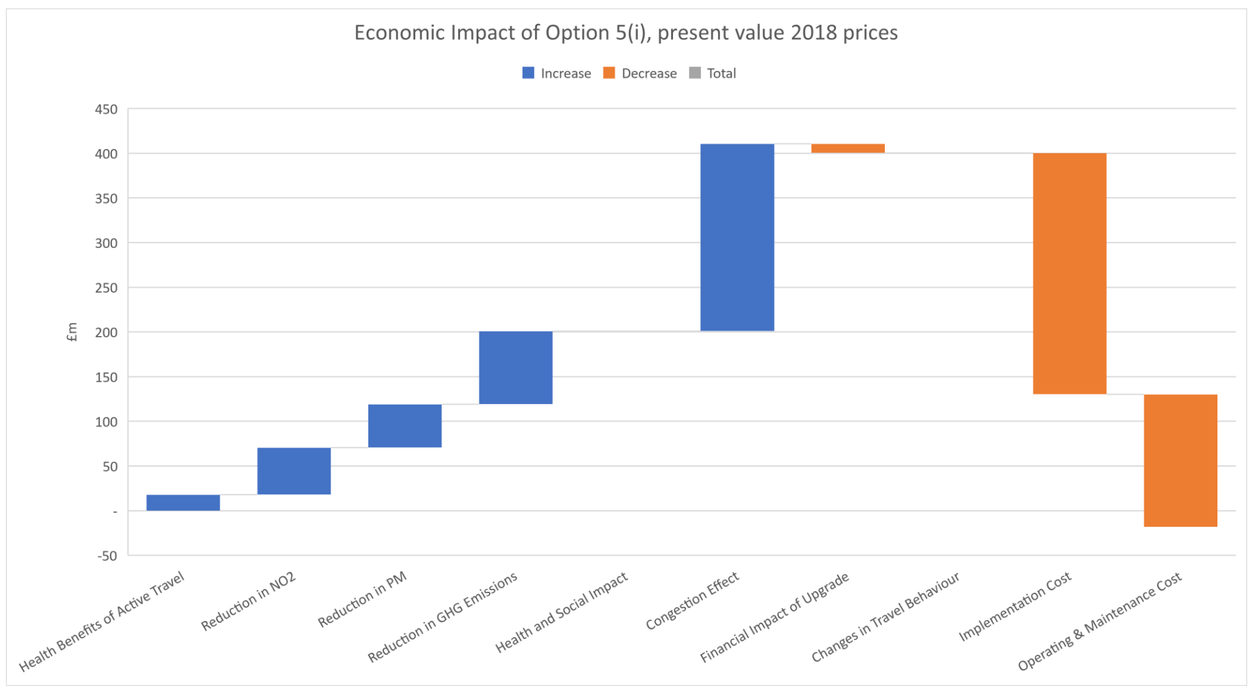


Version 3 - without revenue

Discounted		
Economic Impact	£	£m
Reduction in NO2	52,331,683	52
Reduction in PM	48,720,415	49
Reduction in GHG Emissions	81,631,490	82
Health and Social Impact		
Health Benefits of Active Travel	18,092,642	18
Congestion Effect	209,727,698	210
Financial Impact of Upgrade	- 10,159,513	- 10
Welfare Loss (Trips Remoded)	- 16,774,791	- 17
Welfare Loss (Trips Cancelled)	- 39,193,323	- 39
Implementation Cost	- 270,157,234	- 270
Operating & Maintenance Cost	- 148,364,452	- 148



Discounted		
Economic Impact	£	£m
Health Benefits of Active Travel	18,092,642	18
Reduction in NO2	52,331,683	52
Reduction in PM	48,720,415	49
Reduction in GHG Emissions	81,631,490	82
Health and Social Impact		
Congestion Effect	209,727,698	210
Financial Impact of Upgrade	- 10,159,513	- 10
Changes in Travel Behaviour		
Implementation Cost	- 270,157,234	- 270
Operating & Maintenance Cost	- 148,364,452	- 148



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No. of Vehicles Upgrades

No. of Vehicles Upgrades	Cars	PHVs	Taxis	Vans	HGVs	Bus/Coaches*	Total
Option 8	-	1,965	2,127	32,277	6,962	2,221	45,553

Welfare Loss due to Cancelled Trips and Trips Re-moded, PV 2018 prices

Welfare Impact	Trips Re-moded	Trips Cancelled	Total
			0
Option 8	17	39	56

Travel Time Savings and VOC

	Travel Time Savings	Vehicle Operating Costs	Total
Option 8	136	73	210

Health and Environmental Impact, PV 2018 prices

	NOx Tonnes Saved (2021)	PM Tonnes Saved (2021)	Monetised AQ Impact (2021)	Monetised AQ Impact (2021-2030)
Option 8	1,419	52	14	101

GHG Emissions, £, PV 2018 prices

Options	Tonnes CO_2e	GHG emission impact, £m
Option 8	1,398,819	82

Upgrade Impact, £m, PV 2018 prices

Options	Welfare Loss	Benefits from VRF	Fuel switch	Transaction cost	Loss of asset value	Total (by vehicle type)
Option 8	- 87	117	- 1	- 0	- 40	**- 10**

User Charges, £m, PV 2018 prices

		Option 8	
User Charges, £m		-234	

Implementation cost of the options, £m, present value 2018 prices

		Option 8	
Total Implementation Cost		270	

O&M costs of the options, £m, present value 2018 prices

		Option 8	
Total O&M Cost		148	

Active Travel Health Benefits, £m, present value 2018 prices

Health Benefits	£m
Option 8	18

Health and Social Care Cost Savings, present value 2018 prices

Options	£m
Option 8	0

Summary of the total costs and benefits of the GM CAP, £m, present value 2018 prices

Primary/Secondary Success Factors	Impact		Option 8	
Health and Environmental Impacts				
• Reduction in NO2 Emissions	NO2 Reduction		52	
• Strategic fit with local strategies and plans	PM Reduction		49	
• Value for Money	Avoided Health and Social Cost		0	
	GHG Emission Reduction		82	
User Costs and Benefits				
• Strategic fit with local strategies and plans • Value for Money	Health Benefits of Active Travel		18	
	Welfare Loss (Trips Remoded)		-17	
	Welfare Loss (Trips Cancelled)		-39	
• Value for Money	Vehicle Upgrade *includes cost of upgrade, loss of asset value, transaction cost and fuel switch costs, less any financial subsidy from the funding measures*		-10	
	User Charges			
	Congestion Effects *Includes travel time and vehicle operating costs*		210	
	Present Value of Benefits (PVB)		**344**	
Cost to the Public Sector				
• Affordability	Implementation Cost		270	
• Value for Money	Operating and Maintenance		148	
	Revenue			
	Present Value of Costs (PVC)		**419**	
	Net Present Value (NPV)		**-74**	

This is the first mention of these options in the chapter – useful if they could be mentioned in the section around para 1.2.5

Summary of the total costs and benefits incurred by GM, present value 2018 prices

Impact		Option 8	
NO2 Reduction		52	
PM Reduction		49	
Avoided Health and Social Cost		0	
GHG Emission Reduction		82	
Health Benefits of Active Travel		18	
Congestion Effects *Includes travel time and vehicle operating costs*		210	
Total beneficial effects		411	
Changes in Travel Behaviour (welfare loss)		-17	
Vehicle Upgrade *includes cost of upgrade, loss of asset value, transaction cost and fuel switch costs, less any financial subsidy from the funding measures*		-10	
User Charges		0	
Total costs / disbenefits		-27	
Net Present Value (NPV)		**£384**	

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Nox savings per £

This worksheet presents the the abatement cost of every Nox tonne saved

	2021-2030
Total Nox Saved	11,274
Total Cost PV	£ 184,542,704
Nox/£	**£ 16,369**

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E2 Programme and Project Procedures
E2.1 – Overview of TfGM's Programme and Project Lifecycle Stages

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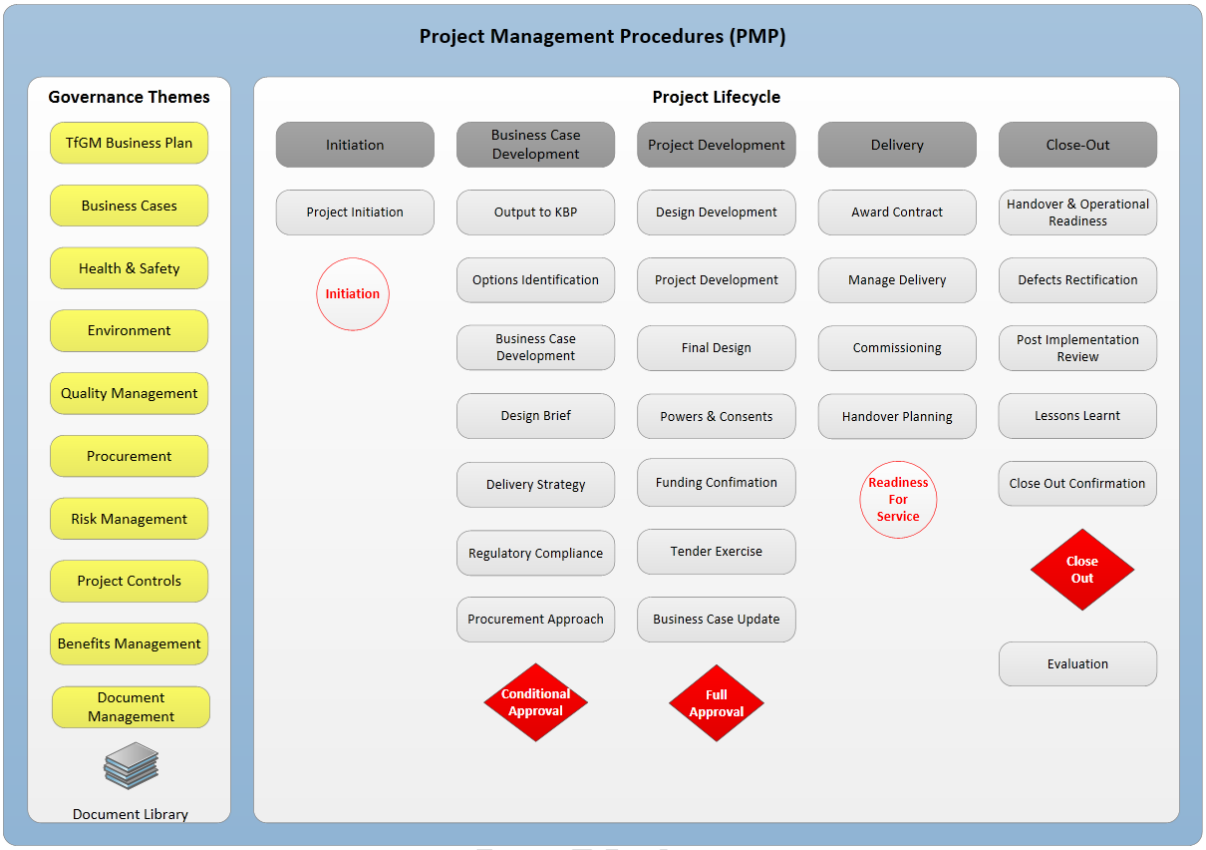
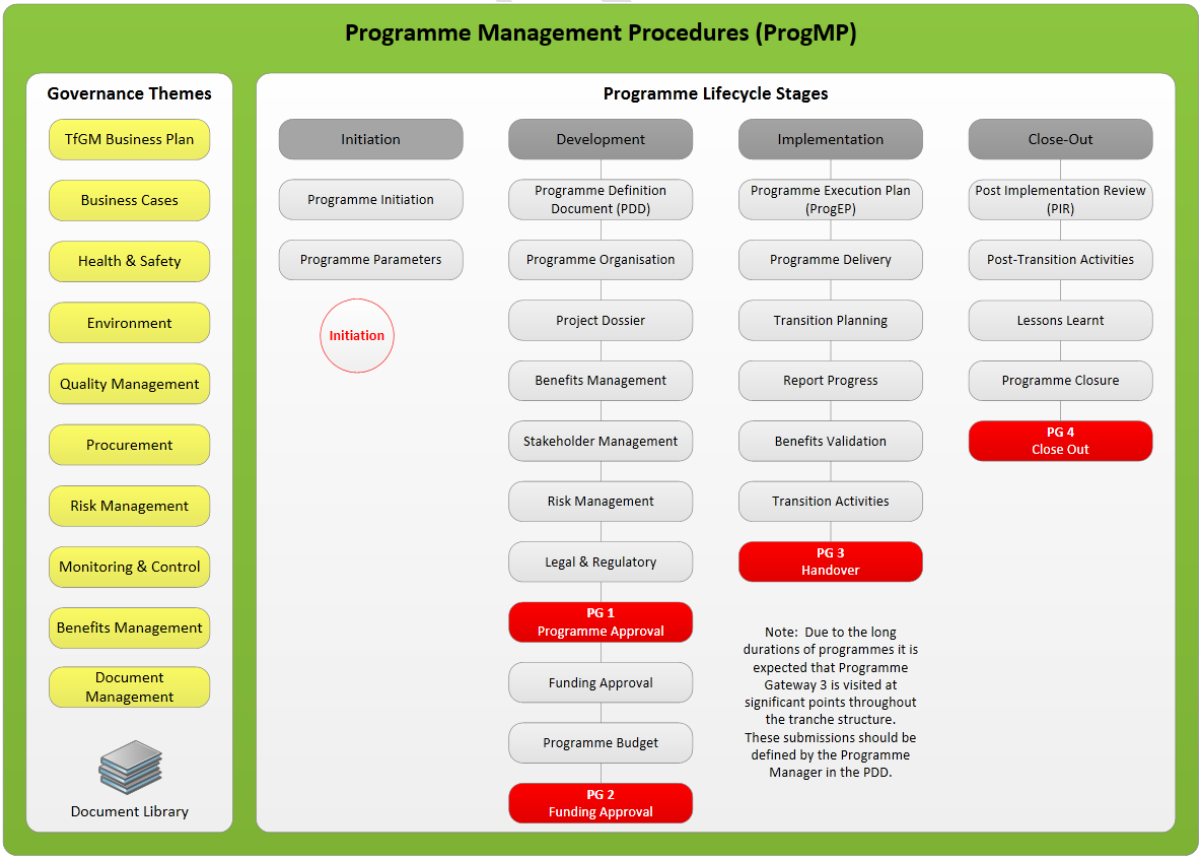
Authorised by: **Date:**	Simon Warburton 28th February 2019		

Appendix E.2.1 - TfGM's Project and Programme Lifecycle Stages – Working Draft Confidential





Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E2 Programme and Project Procedures E2.2 - TfGM's Four Lines of Defence Model

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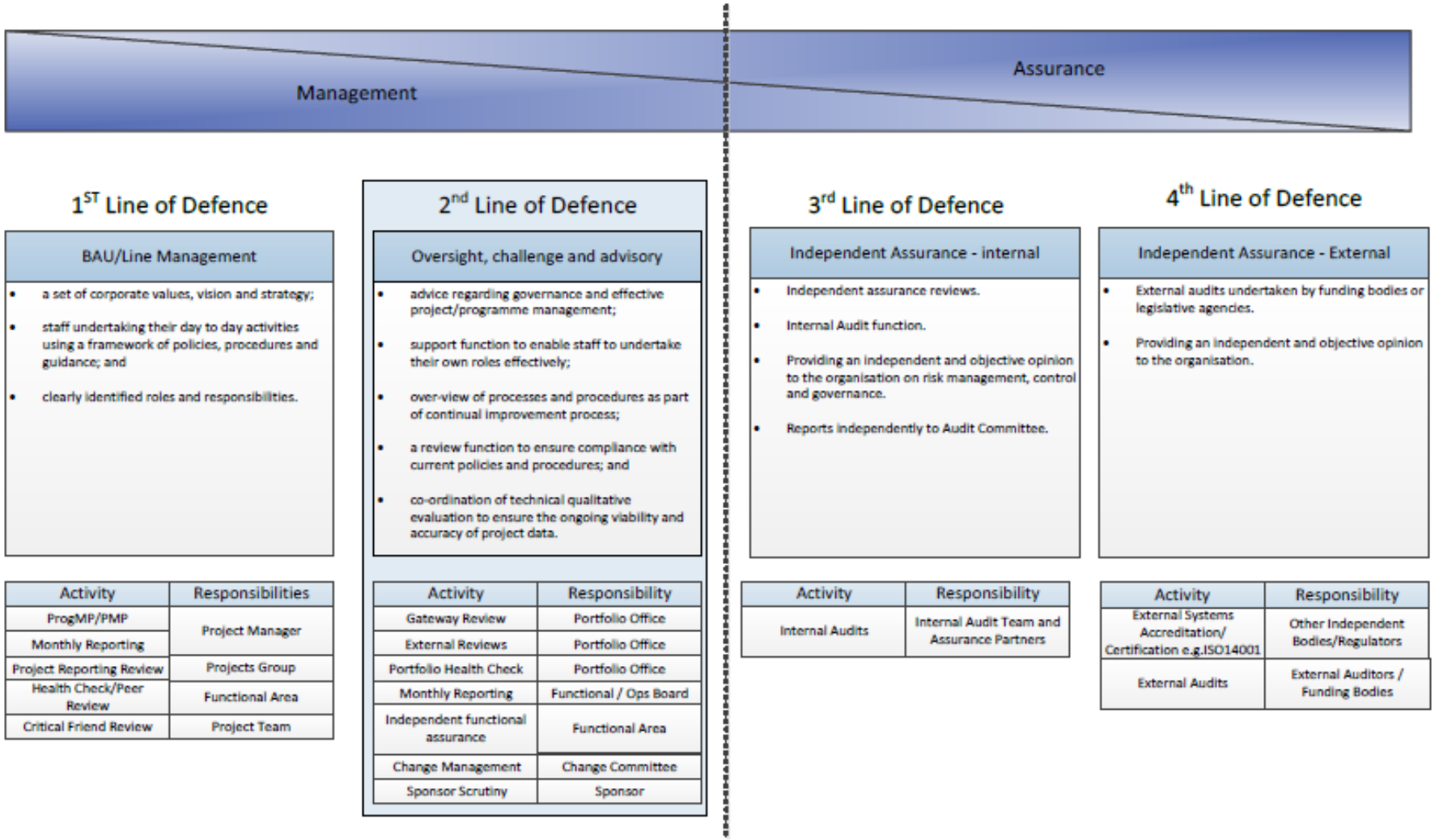
Authorised by: **Date:**	Simon Warburton 28th February 2019		

Appendix E.2.2 - TfGM's Four Lines of Defence Model – Working Draft Confidential



1ST Line of Defence

BAU/Line Management

- a set of corporate values, vision and strategy;
- staff undertaking their day to day activities using a framework of policies, procedures and guidance; and
- clearly identified roles and responsibilities.

Activity	Responsibilities
ProgMP/PMP	Project Manager
Monthly Reporting	
Project Reporting Review	Projects Group
Health Check/Peer Review	Functional Area
Critical Friend Review	Project Team

2nd Line of Defence

Oversight, challenge and advisory

- advice regarding governance and effective project/programme management;
- support function to enable staff to undertake their own roles effectively;
- over-view of processes and procedures as part of continual improvement process;
- a review function to ensure compliance with current policies and procedures; and
- co-ordination of technical qualitative evaluation to ensure the ongoing viability and accuracy of project data.

Activity	Responsibility
Gateway Review	Portfolio Office
External Reviews	Portfolio Office
Portfolio Health Check	Portfolio Office
Monthly Reporting	Functional / Ops Board
Independent functional assurance	Functional Area
Change Management	Change Committee
Sponsor Scrutiny	Sponsor

3rd Line of Defence

Independent Assurance - internal

- Independent assurance reviews.
- Internal Audit function.
- Providing an independent and objective opinion to the organisation on risk management, control and governance.
- Reports independently to Audit Committee.

Activity	Responsibility
Internal Audits	Internal Audit Team and Assurance Partners

4th Line of Defence

Independent Assurance - External

- External audits undertaken by funding bodies or legislative agencies.
- Providing an independent and objective opinion to the organisation.

Activity	Responsibility
External Systems Accreditation/ Certification e.g.ISO14001	Other Independent Bodies/Regulators
External Audits	External Auditors / Funding Bodies

Document Pack Page 750

Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E3 Equality Impact Assessment (EQIA)

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Authorised by: **Date:**	Simon Warburton 28th February 2019		

Transport for Greater Manchester

Equality Impact Analysis

Section one: Initial Screening

Analysis Reference	260219

Department	Logistics & Environment
Team or Service Area	Clean Air Project
Officer completing the analysis	Interim Head of Environment & Logistics
Phone	-
Email	-

Type of activity	Project
Title of activity	Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Under current equality legislation, TfGM is required in the exercise of our functions to have due regard for the need to:

eliminate unlawful discrimination, harassment and victimisation;
advance equality of opportunity between persons who share a relevant characteristic, and persons who do not share it; and
foster good relations between those who have a protected characteristic and those who don't.

Equality Analysis (formally referred to as Equality Impact Analysis (EQIA)) is a tool that will help you to consider equalities issues when drawing up or reviewing a strategy, project, policy, process or procedure which affects the delivery of services and the employment practice of Transport for Greater Manchester (TfGM). Equality Analysis will improve the work of TfGM by making sure it does not unlawfully discriminate against people and that it fulfils its duties under current equality legislation and where possible, it promotes equality.
You will need to demonstrate where appropriate that there has been engagement with beneficiary groups and at the end of this analysis you will need to provide documentary evidence of all the information you have taken into account during this process.

Question 1
Is this a new or existing activity?

New

Question 2
What is the main aim and purpose of the activity?

The main aim of this activity is to undertake a feasibility study and produce a region wide plan to address exceedances of nitrogen dioxide. Greater Manchester is taking a collaborative and collective approach to meet the Government requirement to produce a feasibility study in accordance with the HM Treasury's Green Book, identifying the measures that will deliver compliance within the shortest possible time.

This is an overarching high level impact assessment and the local authorities will carry out their own impact assessments at full business case stage.

Question 3
List the main elements of the activity. (for strategies list the main policy areas):

The feasibility study which will include:
a) Strategic outline case;
b) Initial evidence and target determination;
c) Outline business case; and
d) Full business case

Question 4
If this is a new/proposed activity or a change to an existing activity please explain why the proposal being made for what reason?

The feasibility study is at the Outline Business Case stage and there is a proposed package of measures to tackle nitrogen dioxide exceedances. These include:

- A chargeable Class C Clean Air Zone across GM
  - Phase 1: (assumed from 2021) daily penalty for non-compliant buses, taxis/PHV and HGVs
  - Phase 2: (assumed from 2023) expanding to non-compliant LGVs

- Vehicle Renewal Schemes (financial incentives to upgrade non-compliant vehicles) for Freight, Taxis and Private Hire Vehicles and Buses.

- Loan Finance – provision of FSA regulated loans for those taking advantage of the Vehicle Renewal Schemes (Gap funding)

- Electric Vehicle Infrastructure and Promotion

- Sustainable Journeys (behaviour change activity)

The proposal DOES NOT IMPACT THE USE OF PRIVATE CARS.

The proposal is being made now to comply with a government requirement. It is being coordinated centrally to ensure consistency across the region and compliance with government guidance.

Question 5
What outcomes does the activity aim to achieve?

A feasibility study that sets out the measures proposed to address nitrogen dioxide exceedances in Greater Manchester which has been developed collectively by all Greater Manchester local authorities, and co-ordinated by TfGM, in line with Government direction and guidance.

Question 6
Who are, or will be, the main beneficiaries of the activity?

Please tick one or more of the following

Travelling public	No
TfGM staff	No
Partners including Operators	No
Suppliers	No
Others - please specify	Yes
	People living, working and travelling in Greater Manchester

Question 7
Do you need to consult with people who might be affected by it directly or indirectly? Please justify your response

Plan to consult - Who do you plan to consult and when?

A public ‘conversation’ is proposed to run between early May and mid-June (for six weeks) to help further inform the work, and this will supplement the more targeted stakeholder engagement that is ongoing with affected businesses. In addition, further deliberative research is proposed to take place during March and April 2019.

The key audience groups for the public conversation are those who will be most affected by the proposed measures.

This engagement will all inform the further development and detailed design of the measures and will help to refine the

proposals that will comprise the Full Business Case.

As required by Transport Act 2000, a statutory consultation relating to the proposed introduction of a charging Clean Air Zone is proposed to run between August and October 2019. In the statutory consultation the obligation is to consult local persons, and such representatives of local persons, as Greater Manchester consider appropriate about the proposed charging scheme.

Question 8
Having due regard for equality duty involves:

Removing or minimising disadvantages suffered by people due to their protected characteristics;Taking steps to meet the needs of people with certain protected characteristics where these are different from the needs of other people;Encourage people with certain protected characteristics to participate in public life or in other activities where their participation is disproportionately low.Please complete the table below and give reasons, evidence and comment, where appropriate, to support your judgement(s).

Use the table below to record where you think that the activity could have a positive impact on any of the target groups or contribute to promoting equality, equal opportunities or improving relations within equality target groups.Use the table below to record where you think that the activity could have an adverse impact on any of the equality target groups i.e. it could disadvantage them and impact is high. Use the last column in the table below to give reason/comments/evidence where appropriate to support your judgement

Age			
Target Group	Positive	Adverse	Comment/Evidence

Children and Young People (aged 19 and under)	High	Medium	At this stage of the feasibility study (Outline Business Case) there is evidence to suggest equalities issues impacting this target group. The positive health impact of reducing nitrogen dioxide exceedances is outlined in the strategic case. Breathing in polluted air contributes to the equivalent of 1,200 deaths a year in Greater Manchester. It affects people's lungs in the short and long term, worsening respiratory issues such as asthma or bronchitis, as well as cardiovascular problems and reduces life expectancy. Health damage caused by air pollution can begin as early as a baby's first few weeks in the womb and exposure over a long time can lead to heart and lung disease. The most vulnerable in society are hit hardest – children, older people and those already in poor health. There could be a negative impact on this target group as they are more likely to be dependent on public transport services including school and community transport [as concessionary card holders] if action to clean up the bus fleet has the unintended consequence of reducing the number or frequency of bus services in the region. Buses are an essential component of the public transport offer, and in many parts of the region are the only public transport available. It is assumed that the Clean Bus Fund (as part of the Vehicle Renewal Scheme) will support the operators to upgrade their fleets and mitigate unintended consequences. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Older People (aged 60 and over)	High	Medium	At this stage of the feasibility study (Outline Business Case) there is evidence to suggest equalities issues impacting this target group. The positive health impact of reducing nitrogen dioxide exceedances is outlined in the strategic case. Breathing in polluted air contributes to the equivalent of 1,200 deaths a year in Greater Manchester. It affects people's lungs in the short and long term, worsening respiratory issues such as asthma or bronchitis, as well as cardiovascular problems and reduces life expectancy. Health damage caused by air pollution can begin as early as a baby's first few weeks in the womb and exposure over a long time can lead to heart and lung disease. The most vulnerable in society are hit hardest – children, older people and those already in poor health. There could be a negative impact on this target group as they are more likely to be dependent on public transport (including taxis and PHVs, community transport). Buses are an essential component of the public transport offer, and in many parts of the region are the only public transport available. Action to clean up the bus / taxi / PHV fleet could have unintended consequence of reducing the number or frequency of bus and /or the number of accessible taxi/PHV services in the region. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Disability			
Target Group	Positive	Adverse	Comment/Evidence
People with physical impairments (Includes mobility, co-ordination, lifting and carrying, manual dexterity, wheelchair user)	Medium	Medium	At this stage of the feasibility study (Outline Business Case) there is evidence to suggest equalities issues impacting this target group. There could be a negative impact on this target group as they are more likely to be dependent on public transport (including taxis and PHVs, community transport) if they have not already accessed the national Mobility Scheme. Buses are an essential component of the public transport offer, and in many parts of the region are the only public transport available. Action to clean up the bus / taxi / PHV fleet could have unintended consequence of reducing the number or frequency of bus and /or the number of accessible taxi/PHV services in the region. It is assumed that the Clean Bus/ Tax Funds (as part of the Vehicle Renewal Scheme) will support the operators to upgrade their fleets and mitigate unintended consequences. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

People with communication or sensory impairments (Includes blind/partially sighted, deaf/hard or hearing, difficulty speaking)	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is evidence to suggest equalities issues impacting this target group. There could be a negative impact on this target group as they are more likely to be dependent on public transport (including taxis and PHVs, community transport). Buses are an essential component of the public transport offer, and in many parts of the region are the only public transport available. Action to clean up the bus / taxi / PHV fleet could have unintended consequence of reducing the number or frequency of bus and /or the number of accessible taxi/PHV services in the region. It is assumed that the Clean Bus/ Tax Funds (as part of the Vehicle Renewal Scheme) will support the operators to upgrade their fleets and mitigate unintended consequences. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

People with a learning disability or cognitive impairment (Includes conditions which affect ability to learn, understand, read, remember, and concentrate eg. Downs Syndrome, autism, ADA)	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is evidence to suggest equalities issues impacting this target group. There could be a negative impact on this target group as they are more likely to be dependent on public transport (including taxis and PHVs, community transport). Buses are an essential component of the public transport offer, and in many parts of the region are the only public transport available. Action to clean up the bus / taxi / PHV fleet could have unintended consequence of reducing the number or frequency of bus and /or the number of accessible taxi/PHV services in the region. It is assumed that the Clean Bus/ Tax Funds (as part of the Vehicle Renewal Scheme) will support the operators to upgrade their fleets and mitigate unintended consequences. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

People with mental health problems (Includes depression, schizophrenia)	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. However, there could be a negative impact on this target group as frequent users of bus services [concessionary card holders] if action to clean up the bus fleet has the unintended consequence of reducing the number or frequency of bus services in the region. Buses are an essential component of the public transport offer, and in many parts of the region are the only public transport available. It is assumed that the Clean Bus Fund will support the operators to upgrade their fleets and mitigate unintended consequences. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.
People with long standing illness/health condition (Includes cancer, HIV, MS, diabetes, heart disease, epilepsy, continence)	High	Low	At this stage of the feasibility study (Outline Business Case) there is evidence to suggest equalities issues impacting this target group. The positive health impact of reducing nitrogen dioxide exceedances is outlined in the strategic case. Breathing in polluted air contributes to the equivalent of 1,200 deaths a year in Greater Manchester. It affects people's lungs in the short and long term, worsening respiratory issues such as asthma or bronchitis, as well as cardiovascular problems and reduces life expectancy. Health damage caused by air pollution can begin as early as a baby's first few weeks in the womb and exposure over a long time can lead to heart and lung disease. The most vulnerable in society are hit hardest – children, older people and those already in poor health.

Other disability/impairment not covered by any of the above	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest any equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Gender			
Target Group	Positive	Adverse	Comment/Evidence
Men	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest any equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Women	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest any equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.
Transgender People	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest any equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Race			
Target Group	Positive	Adverse	Comment/Evidence

Asian or Asian British Backgrounds (This includes Pakistani, Indians and Bangladeshi, Chinese or any other Asian background)	Medium	Medium	At this stage of the feasibility study (Outline Business Case) there is some evidence to suggest equalities issues impacting this target group. In some Greater Manchester Local Authority areas there is a higher percentage of drivers of taxis and private hire vehicles from black and minority ethnic communities. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures. The positive health impact of reducing nitrogen dioxide exceedances is outlined in the strategic case. Around 7% of the Greater Manchester population, nearly 200,000 people, live in areas containing roads close to or in exceedance of the EU Limit Value for NO2 and many more people will regularly spend time visiting areas or travelling on roads in exceedance of EU Limit Value. People living in areas impacted by poor air quality are more likely to be unemployed, not own a car/van, and live in rented or overcrowded housing. People from black and minority ethnic backgrounds are also over-represented in areas of poor air quality.

Black or Black British Backgrounds (This includes Caribbean, African or any other black background)	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is some evidence to suggest equalities issues impacting this target group. In some Greater Manchester Local Authority areas there is a higher percentage of drivers of taxis and private hire vehicles from black and minority ethnic communities. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures. The positive health impact of reducing nitrogen dioxide exceedances is outlined in the strategic case. Around 7% of the Greater Manchester population, nearly 200,000 people, live in areas containing roads close to or in exceedance of the EU Limit Value for NO2 and many more people will regularly spend time visiting areas or travelling on roads in exceedance of EU Limit Value. People living in areas impacted by poor air quality are more likely to be unemployed, not own a car/van, and live in rented or overcrowded housing. Ethnic minority groups are also over-represented in areas of poor air quality.

Mixed /Multiple Ethnic Groups (This includes White and Black Caribbean, White and Black African, White and Asian or any other mixed background)	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is some evidence to suggest equalities issues impacting this target group. In some Greater Manchester Local Authority areas there is a higher percentage of drivers of taxis and private hire vehicles from black and minority ethnic communities. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures. The positive health impact of reducing nitrogen dioxide exceedances is outlined in the strategic case. Around 7% of the Greater Manchester population, nearly 200,000 people, live in areas containing roads close to or in exceedance of the EU Limit Value for NO2 and many more people will regularly spend time visiting areas or travelling on roads in exceedance of EU Limit Value. People living in areas impacted by poor air quality are more likely to be unemployed, not own a car/van, and live in rented or overcrowded housing. People from black and minority ethnic backgrounds are also over-represented in areas of poor air quality.
White British Background (This includes English, Scottish & Welsh, Irish and Gypsy or Irish Travellers)	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Non-British White Backgrounds (This includes Irish, Polish, Spanish, Romanians and other White backgrounds)	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.
Arabs	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.
Any other background not covered by any of the above	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Religion/Belief			
Target Group	Positive	Adverse	Comment/Evidence
Buddhists	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.
Christians	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Hindus	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.
Jews	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Muslims	Medium	Medium	At this stage of the feasibility study (Outline Business Case) there is evidence to suggest equalities issues impacting this target group. Any loan financing arrangements being proposed to support drivers/businesses/ operators to upgrade their fleets will need to be acceptable to potential applicants. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.
Sikhs	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Others	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Sexual orientation			
Target Group	Positive	Adverse	Comment/Evidence
Gay men	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Lesbians	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.
Bisexual	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Other			
Target Group	Positive	Adverse	Comment/Evidence

Gender Reassignment	Medium	Low	At this stage of the feasibility study (Outline Business Case) there is no evidence to suggest equalities issues impacting this target group. A further and fuller assessment of economic and equalities impact will be required at Full Business Case stage. A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Question 9
If this activity involves new build or alteration to existing building, has any consideration been given to provision of a multi-faith room?

Not applicable

Question 10
Have you identified two or more high adverse impacts in the table above?

No

Question 11
If you have identified one high adverse impact or any medium/low adverse impacts, what improvements to the activity would/could you make to mitigate high/medium/ low adverse impact? Please give details of the improvements you plan to make.

Current mitigation measures are set out in the comment boxes. Engagement activity - described in Q7 - will all help to refine the proposals that will be set out in the Full Business Case.

Question 12
Have you set up equality monitoring systems to carry out regular checks on the effects your activity has on:

Equality Group		Details
Age	No	Not applicable at this stage - monitoring activity will be developed at the Full Business Case.
Disability	No	Not applicable at this stage - monitoring activity will be developed at the Full Business Case.
Gender	No	Not applicable at this stage - monitoring activity will be developed at the Full Business Case.
Race	No	Not applicable at this stage - monitoring activity will be developed at the Full Business Case.

Religion/Belief	No	Not applicable at this stage - monitoring activity will be developed at the Full Business Case.
Sexual orientation	No	Not applicable at this stage - monitoring activity will be developed at the Full Business Case.
Other	No	Not applicable at this stage - monitoring activity will be developed at the Full Business Case.

Question 13
How will you measure the success of this activity? (Including any corporate performance measures)

Measure of success of the effects of the proposed Greater Manchester Plan to tackle nitrogen dioxide exceedances are contained in the Monitoring & Evaluation Plan which is an appendix to the Management Case of the Outline Business Case.

Question 14
In question 10 above you may have outlined improvements to the activity which will mitigate a high, medium and/or low adverse impact/s. How will you ensure that everyone involved in the activity knows and understands what improvements you intend make and is able to put the activity into practice with those improvements?

Current mitigation measures are set out in the comment boxes. Engagement activity - described in Q7 - will all help to refine the proposals that will be set out in the Full Business Case.

Question 15
Are there any elements within this activity that require a separate Equality Impact Analysis?

Yes - Please list the elements.

Each measure will require an individual impact assessment as the Full Business Case is developed. This will allow the authority to carry out their own impact assessments at Full Business Case stage.

Question 16
Please confirm that during the implementation of this activity, where appropriate, TfGM's corporate strategies and procedures will be followed. If your answer to any of these questions is "no", explain why you will not be following the strategy or procedure.

Strategy/Policy		Details
Communication with members of the public - TfGM's Corporate Communications Strategy will be followed	Yes	During the development of the Full Business Case that TfGM's corporate strategies and procedures will be followed.
Procurement - TfGM's Procurement Strategy will be followed	Yes	During the development of the Full Business Case that TfGM's corporate strategies and procedures will be followed.
Consultation and Engagement - TfGM's Consultation and Engagement Strategy will be followed	Yes	During the development of the Full Business Case that TfGM's corporate strategies and procedures will be followed.

Projects - Project Management Procedures will be followed	Yes	During the development of the Full Business Case that TfGM's corporate strategies and procedures will be followed.

Question 17
Is a Full Impact Analysis needed? If in question 8 you identified two or more adverse impacts then you should either abort the activity, or carry out a full analysis

No (not required)

Question 18
List all of the information that you have taken into account in carrying out this Equality Analysis

The Outline Business Case that sets out the measures proposed to address nitrogen dioxide exceedances in Greater Manchester the shortest possible time.

From 1st March 2019 this document can be found at www.CleanAirGM.com.

Question 19
Additional comments

This is an Equality Impact Assessment for the Outline Business Case. A further and fuller assessment of economic and equalities impacts will be required at Full Business Case stage.

A programme of research, analysis, public and stakeholder engagement has commenced and will be continued throughout 2019. This will give us more information and identify potential impact of the proposal on low income workers; key business sectors such as retail and leisure, transport and distribution; and on small local businesses. Research information and the feedback from the engagement activity will influence the detailed design of the package of measures.

Supporting documents

None

Process signed off by	Interim Head of Logistics & Environment
Date completed	26th February, 2019

Validator's Comments	
Validated by	TfGM's Diversity and Inclusion Manager
Date validated	2019-02-26
Next Review Date	2020-02-28

Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

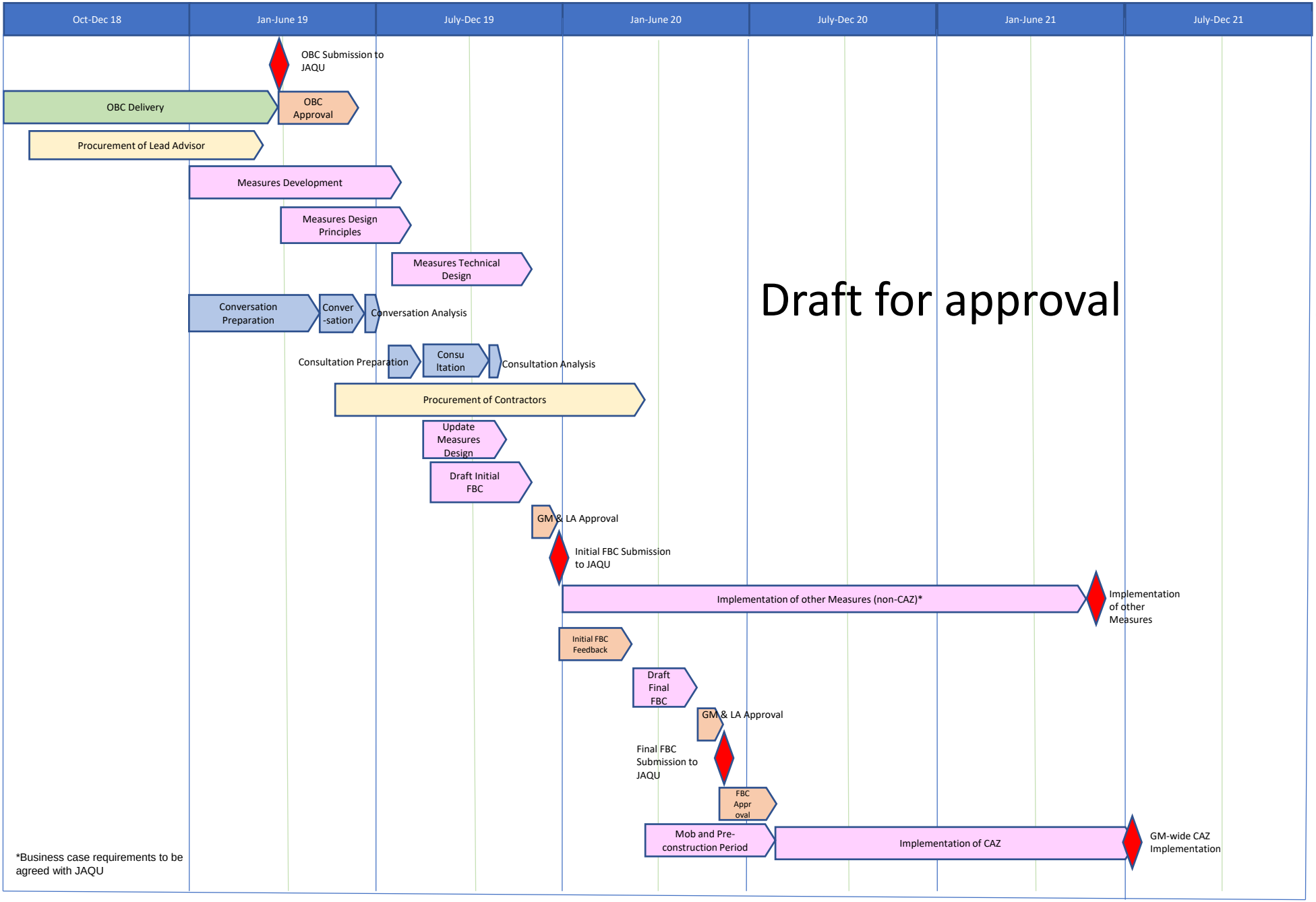
E3 Programme and Delivery Schedule

E3.1 – Plan on a Page

Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

Appendix E.3.1 – Greater Manchester Clean Air Plan (GM CAP) Plan on a Page



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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E4 Plans
E4.1 Stakeholder Management Plan

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Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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1 Governance

1.1 A Greater Manchester Clean Air Plan (GM CAP) Communications and Marketing Delivery Group has been created and liaises regularly.

1.2 The group's remit is to plan corporate communications and marketing activity and ensure appropriate oversight of this activity from all key organisations responsible for delivering the GM CAP. The group comprises:

- TfGM Director of Corporate Affairs; Head of Corporate Communications and Stakeholder Engagement; Senior Strategic Communications and Consultations Manager; and Strategic Marketing Manager;
- Greater Manchester Combined Authority (GMCA) Communications Director;
- Heads of Communications for Manchester City Council, Salford Council, and Stockport Council (as local authority for Green City Region Lead);
- Communications lead for Greater Manchester Health and Social Care Partnership; and
- TfGM Legal.

1.3 A tiered approval process has been developed for communications planning, activities and materials. Where appropriate, communications materials may also be shared with all Greater Manchester local authority Heads of Communications for approval with their relevant senior political and officer stakeholders.

2 Communications materials

2.1 TfGM is responsible for the development and production of all communications materials, with support from local authority and health partners as appropriate.

2.2 TfGM will also lead on the development and delivery of GM-wide marketing and communications campaigns in close collaboration with partners.

2.3 The following core content will be regularly updated by TfGM and should be used by all partners to ensure consistency:

- media FAQs;
- Clean Air Plan briefing note;
- key messages document;
- customer services brief;
- social media toolkit; and
- media management.

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2.4 TfGM will lead on media relations, in close liaison with GMCA and other partners. It will develop media materials; coordinate the approvals process; act as a central point of contact for media; issue news releases, coordinate media interviews and briefings; and respond to media enquiries.

2.5 TfGM will be informed of any relevant media enquiries to local authorities and partner organisations and will provide appropriate support to manage and respond to these.

2.6 The following roles have been identified as key spokespeople for national and regional media activity:

- Greater Manchester Mayor;
- Greater Manchester Green City Region Lead; and
- Greater Manchester Lead Director of Public Health.

2.7 In addition, local authorities may provide their leader or relevant executive member spokesperson for local media where appropriate. Additional health spokespeople, speaking on behalf of Greater Manchester or individual local authorities, may also be used as required.

3 Stakeholder approach

3.1 TfGM will coordinate the stakeholder engagement activity for the GM CAP on behalf of the 10 Local Authorities. By having a centralised approach we hope to ensure consistent messaging and engagement activity, whilst providing material which can be localised for each Local Authority in support of local engagement plans.

3.2 TfGM will be responsible for:

- creating and sharing a centralised plan for stakeholder engagement activity which is regularly updated;
- creating and sharing central content which can be localised for each Local Authority;
- creating and sharing central materials, resources and toolkits, which can be localised for each Local Authority;
- promoting and leading GM-wide stakeholder engagement activity;
- hosting and promoting any online materials;
- providing Local Authorities with support and resources for events and promoting any events; and
- recording all stakeholder engagement activity.

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3.3 Local Authorities are asked to:

- add their own stakeholder engagement activity to the central stakeholder engagement plan;
- lead engagement with local stakeholders;
- share central content through their channels to promote stakeholder engagement activity;
- provide local resources for promotional work (for example events venues / officers); and
- keep records of their stakeholder engagement activity and provide feedback to TfGM.

Stakeholder Plan - Approach			
Sector	**Purpose/desired outcome**	**Activity/ channels**	**Timings, dependencies/ opportunities**
Business & Economy **Community groups & Networks** **Education & Skills** **Housing & Developers** **Trade unions** **Third sector** **Transport – other**	**Stage 1: Inform/engage** Prior to any consultation activity that may go ahead – speak to representative groups about the GM CAP and ask them to share with their members. **Stage 2: Consult** Communicate directly with all groups/organisations to gain their views on the proposals. **Stage 3: Follow-up** Share the outcome of the consultation activity and continue engagement to share plans for implementation. **Stage 4: Implement** Share information on the implementation of the measures and how stakeholders will be affected.	• Verbal and written briefings • Emails and newsletters • Website / online information • Providing toolkits to representative groups to share with their members • Providing toolkits and events materials for local authority colleagues to support their engagement with stakeholders • Direct mail • Events	**Timings** The timings are split into four periods: 1. Pre-consultation 2. Consultation period 3. Post-consultation 4. Implementation **Dependencies/ opportunities** 1. Willingness from representative groups to share our messages 2. Ability to get employers' contact details 3. Relationships local authorities already have with their local businesses 4. Consistency of messages – by providing toolkits to local authorities and stakeholder representative groups.

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Stakeholder Plan - Approach			
Sector	**Purpose/desired outcome**	**Activity/ channels**	**Timings, dependencies/ opportunities**
Environment & Sustainability **Health & Wellbeing**	As above and alongside sharing the information on the GM CAP activity, we will also share any air quality campaign material, so they can advocate the campaign and it continues.	As above and also include campaign material toolkit to share on their own channels.	As above.
Local Authority political	**Stage 1: Decision-making** Support Greater Manchester governance and decision-making **Stage 2: Supporting the consultation** Encouraging constituents and interested parties to respond **Stage 3: Decision-making on final GM CAP** Support Greater Manchester governance and decision-making **Stage 4: Follow-up** Explaining the outcome to the public consultation and any decisions that have been made **Stage 5: Implementation** Work with stakeholders to explain the final GM CAP and what is available for stakeholders / public.	• Verbal and written briefings • Website / online information • Providing toolkits to share with their constituents / stakeholders • Events	**Timings** Timings need to be aligned to the GM CAP governance and approvals. **Dependencies/ opportunities** 1. Willingness to share messages with public and stakeholders 2. Positive working relationships with individuals, groups and organisations

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Stakeholder Plan - Approach			
Sector	**Purpose/desired outcome**	**Activity/ channels**	**Timings, dependencies/ opportunities**
Political other	**Stage 1: Inform/engage** Prior to any consultation activity that may go ahead provide regular, up to date information on the GM CAP. **Stage 2: Consult** Encouraging constituents and interested parties to respond. **Stage 3: Follow-up** Share the outcome of the consultation activity and continue engagement to share plans for implementation. **Stage 4: Implement** Share information on the implementation of the measures and how stakeholder groups will be affected.	1. Verbal and written briefings 2. Website / online information 3. Providing toolkits to share with their constituents / stakeholders 4. Events	**Timings** The timings are split into four periods: 1. Pre-consultation 2. Consultation period 3. Post-consultation 4. Implementation **Dependencies/ opportunities** 1. Willingness to share messages with public and stakeholders 2. Positive working relationships with individuals, groups and organisations
Transport	**Stage 1: OBC development** Initial targeted activity to inform development of proposed GM CAP to understand any impacts to this group during development and to engage them in the detailed options design. **Stage 2: Build awareness** Prior to any consultation activity that may go ahead provide regular, up to date information on the GM CAP. **Stage 3: Consult Encourage** all to respond to the	• Verbal and written briefings • Emails and newsletters • Website / online information • Providing toolkits to representative groups to share with their members • Providing toolkits and events materials for local authority colleagues to support their engagement with stakeholders • Direct mail • Events	**Timings** The timings are split into four periods: 1. Pre-consultation 2. Consultation period 3. Post-consultation 4. Implementation **Dependencies/ opportunities** Initial activity delivered summer 2018 – aligned to options development and was dependent on stakeholders providing information to inform the development.

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Stakeholder Plan - Approach			
Sector	**Purpose/desired outcome**	**Activity/ channels**	**Timings, dependencies/ opportunities**
	consultation and provide their views. **Stage 4: Follow-up** Share the outcome of the consultation activity and continue engagement to share plans for implementation and how it can be best developed. **Stage 5: Implement Encourage** stakeholders to take up any relevant incentives and understand the operational delivery of the GM CAP.		Ongoing engagement linked to FBC delivery will likely have some similar dependencies.

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Stakeholder List			
Business & Economy	Representative bodies: • Chamber of Commerce • City Co • Federation of Small Businesses • Business Growth Hub • Business Leadership Council • Forum of Private Business • Freelance and Contractor Services Association • Institute of Directors • Manchester's Inward Investment Agency (MIDAS) • Large Greater Manchester Employers • Pro-Manchester • Visit Manchester • Local Enterprise Partnership • Large employers • Small and Medium Enterprises (SMEs)	**Community groups & Networks**	Youth groups Sports & recreation groups Bishop of Manchester Citizens Advice Faith Network for Manchester Greater Manchester Poverty Action Joseph Rowntree Foundation Age UK
Education & Skills	Greater Manchester High Schools & Colleges	**Environment & Sustainability**	Client Earth Campaign for better transport Chartered institute of Environmental Health Friends of the Earth Living Streets Sustrans
Health & Wellbeing	Clinical Commissioning Groups (CCGs) via Greater Manchester Health and Social Care Partnership (GMHSCP) monthly meetings Doctors against diesel Health Professionals - general Health Professionals - maternity Health Professionals - older care	**Housing & Developers**	Housing associations / groups Bruntwood Federation of Master Builders Greater Manchester property developers National Federation of Builders

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Stakeholder List			
Local Authority political	GMCA LA Leaders All Councilors	**Political**	Greater Manchester Members of Parliament (MPs) Neighbouring MPs
Third sector	Greater Manchester Centre for Voluntary Organisation (GMCVO) British Heart Foundation British Lung Foundation	**Trade unions**	Unison Unite Greater Manchester Trades Union Congress (GM TUC)
Transport - targeted	Bus & Coach operators Taxis/Private Hire Vehicles (PHVs) Freight	**Transport - other**	Rail Manchester Airport

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4 Stakeholder engagement activity to date

June 2018 – February 2019: targeted stakeholder engagement

4.1 During this time we have engaged with representative bodies and individual operators/drivers for bus and coach, within the freight sector and the taxi and private hire trade.

4.2 The purpose of this activity (meetings, calls and emails) has been to inform these three sectors of the scope, delivery plans and timescales of the GM CAP.

4.3 As well as this, we have asked for insights and input to the feasibility of some of the measures to inform the scope of the Programme which is set out in the OBC.

4.4 This included asking for fleet information from bus operators to understand the feasibility and costs associated with bus retrofit. We also asked for information from the freight industry around the potential usage of gas to liquid fuels, and asked for feedback on scrappage schemes and electric vehicle usage for the taxi and private hire trade.

Wider stakeholder engagement – to date

4.5 Following the publication of the October 2018 GMCA report outlining the revised target determination analysis, stakeholder engagement activity is planned to take place more widely. This is includes organisations from each of the sectors outlined in the stakeholder list. At this stage this activity will focus on the progress to date and next steps for the project. For representative groups, we hope they will share this information with their members.

4.6 As well as this, there has been a range of engagement with local councilors across Greater Manchester, including portfolio leads. In addition, there has been engagement with MPs within Greater Manchester and those with constituencies which border Greater Manchester. This activity will continue as the GM CAP is further developed and implemented.

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E4 Plans
E4.2 – Risk Management Plan

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1 Programme Details and Risk Environment

1.1 TfGM has a comprehensive Risk Management Policy and Strategy. The policy provides assurance that appropriate controls are in place to deliver a securely run organisation. It is part of the delivery mechanism for TfGM strategic objectives and key business priorities. The policy includes the management of strategic, operational, project and programme risks and it is from this that the Risk Management approach for the programme and projects has been defined.

1.2 This Risk Management Plan (RMP) describes the approach and processes to be employed to effectively manage risk on this Programme, its constituent projects and interfaces with other schemes.

1.3 It will illustrate the risk management techniques and standards to be applied to the delivery of this project and the responsibilities for achieving an effective risk management process. The RMP is based on the corporately agreed Risk and Issue Management procedures which are part of the Programme Management Plan (ProgMP) and Project Management Plan (PMP) processes. Further guidance can be found in ProgMP/ PMP sections of the TfGM Projects Group intranet website[1].

1.4 A fundamental element of the Risk Management process is establishing the context, which includes establishing the objectives of the Programme and associated projects.

1.5 The objectives of this Programme are:

- The primary aim of the Greater Manchester Clean Air Plan (GM CAP) is to reduce Nitrogen Dioxide (NO_2) concentrations in Greater Manchester, in the shortest possible time, to below the EU Limit Value.
- The secondary aims are to ensure that the GM CAP strategically fits with Greater Manchester's local strategies and plans; provides Value for Money (VfM); it is Affordable, Acheivable; there is Supply side capacity and capability to deliver; and the Distributional Impact (DI) is understood.

2 Risk Management Process

2.1 In terms of the overall delivery timings and structure of the Programme and projects, a multi-level approach will be required. This is summarised in the following table:

[1] Link to ProgMP/ PMP sections of the TfGM intranet website: https://edrms.tfgm.com:85/departmental/pms/pmo/PMP/Pages/default.aspx

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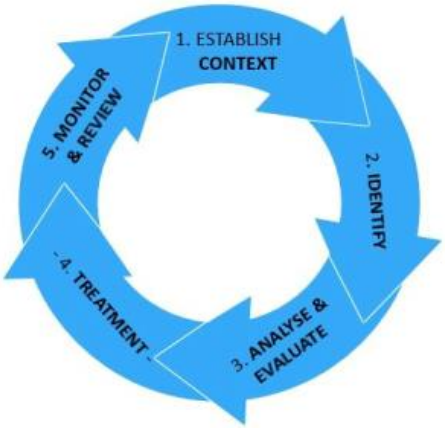
Risk Management Plan Hierarchy	Plan Owner	Risk Management Process
Primary - Risk Potential Assessment	TfGM – Portfolio Office	
Secondary: Programme RMP	TfGM – Programme Manager	
Tertiary TfGM Project RMP	TfGM – Project Manager	
Note: Risks related to Health & Safety are managed in line with the TfGM Integrated Management System (IMS)		

2.2 Identified programme and project risks are captured in the appropriate Risk Register. The relationship between the registers is illustrated in the following diagram:

2.3 The risk management process is in accordance with the guidance in the TfGM Risk Management Policy & Strategy. The high-level Risk Management Process is illustrated in the section above.

2.4 TfGM maintains a central Risk Decisions “Predict! Risk Controller” Risk Management System, which holds the information relating to its project and programme level risks. Each Risk Register is a live document - if necessary, reference to the live information held on Predict! should be made.

2.5 Both a Programme level Risk Register (Appendix E.5.1) and a Project level Risk Register (Appendix E.5.2) for the proposed Measures have been developed. These are currently assessed qualitatively, but will be assessed quantitatively as the programme develops. They will then be modelled using Monte Carlo methods[2] of simulation to provide a Quantified Cost Risk Analysis (QCRA) of risk exposure to both the Programme and Projects. In the interim, appropriate Contingency and allowances for optimism bias have been made within the Commercial and Financial Cases of the Business Case.

3 Risk Identification

3.1 A risk is ‘any future event, or set of circumstances that, should it occur, will have a positive (opportunity) or an adverse effect (threat) on the achievement of TfGM objectives’.

3.2 Risk identification is about collating information on relevant threats and opportunities. The test of relevance is the ability of the threat to impact achievements of strategic objectives, finances, services, health & safety, legal requirements and reputation.

3.3 A series of risk workshops have been held in order to identify the programme and project risks. When identifying these risks, the short-term / ‘close at hand’ risks as well as the longer-term / ‘over the horizon’ risks have been captured.

3.4 The outcome of these workshops has been a qualitative Programme Risk Register and qualitative Project Risk Registers, which contain all foreseeable risks. The registers have been peer reviewed to ensure there are no obvious omissions and appropriate assessments. The risk registers draw risks and mitigation actions together into a co-ordinated package and enables the review of the adequacy of existing controls.

3.5 Each risk has been assigned a Risk Owner. The Risk Owner is the person ultimately accountable for the mitigation status and eventual outcome of the risk. They will have the ability to command the resources required to mitigate the risk. The Risk Action Owner is allocated responsibility by the Risk Owner for implementing the mitigating actions. There can be several Action Owners assigned to a risk; but only one Risk Owner per risk.

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4 Risk Assessment

4.1 For the qualitative Programme and Project Risk Registers a tiered scoring system has been used to assess the potential likelihood and impact of each risk, across a number of impacts, including Cost, Schedule, Reputation & Legal, Service Disruption and Policy/ Benefit Realisation. A standard TfGM Risk Assessment Criteria has been used to ensure a consistent approach has been adopted. Details of the criteria are set out in in Annex 4.5 of this document.

4.2 Assumptions are detailed to underpin the reasoning for the assessment, however the table contained in Annex 4.5 provides an overview of the levels related to a project using TfGM's scoring system.

4.3 Once actions have been identified, the post-mitigation assessment will then take place using the same criteria which will generate a post-mitigation risk exposure score and RAG status, also in line with the risk matrix.

4.4 Any Risks scoring above 13 (the organisation's Risk Tolerance) i.e. 'Critical' or 'High' risks need to be actively mitigated.

Probability	**Low**	**Medium**	**High**	**Critical**	
Very High	5	10	15	20	25
High	4	8	14	19	20
Medium	3	7	11	15	18
Low	2	6	8	10	17
Very Low	1	2	4	8	13
Impact	Very Low	Low	Medium	High	Very High

The dotted line is the risk tolerance threshold.

[2] Monte Carlo method on Wikipedia - https://en.wikipedia.org/wiki/Monte_Carlo_method

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5 Risk Treatment

5.1 The approach aims to allocate risk to ensure that it is borne by the organisation that is best placed to monitor and manage it. TfGM will take responsibility for the appropriate programme level risks and will need to minimise the impacts of programme level risks on the associated projects.

5.2 TfGM's approach to risk management is proactive and focuses on avoidance, transfer or taking mitigating action, rather than solely making financial provision for risk impacts. Throughout the Outline Business Case (OBC) stage, risks have been identified, recorded and actively managed. Risk owners have been allocated and tasked with eliminating risks or identifying mitigation measures for residual risks. The same ethos will be taken through to the Full Business Case (FBC), implementation and operational stages of the programme/ projects and any activities to facilitate risk avoidance, transfer or mitigation will be included within the planned activities and incorporated into the appropriate cost-plans.

5.3 If Delivery Agreements are utilised, these will be used to set out risk ownership. This will be determined on a package by package basis as each Delivery Agreement is being drafted. Measures to reduce the overall risk accruing to the scheme promoter via risk transfer will be investigated at the appropriate time.

6 Monitor & Review

6.1 Reviews of the Programme/ Project Risk Registers are undertaken regularly, at a frequency detailed in the Risk Management Plan Annex of this document.

7 Quantitative Cost Risk Analysis (QCRA)

7.1 A QCRA simulation on the risk registers has not yet been undertaken.

7.2 The method of QCRA that will be adopted uses Monte Carlo methods of random number generation to select values of probability and cost (within defined ranges) for each risk. A minimum number of 5,000 model iterations are carried out to develop an overall risk profile for the project. The output from the QCRA model is used to provide an assessment of risk exposure on the Programme/ Project and a measure of the capital risk allowance required.

7.3 Risk exposure outputs are reported at both the 50% confidence level (P50) and the 80% confidence level (P80), for the current state (pre-mitigation) and future state following the implementation of planned actions (post-mitigation).

- The P50 figure represents a risk exposure with a 50% confidence level of not being exceeded.
- The P80 figure represents a risk exposure with a greater confidence level (80%) of not being exceeded.

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8 Risk Reporting

8.1 Appropriate and effective reporting arrangements reinforce and support risk management and allow up to date and accurate performance information to be passed to risk owners and senior managers. Risk Reporting follows the TfGM governance arrangements. Further information can be found in the TfGM Risk Management Policy & Strategy.

9 Roles and Responsibilities

9.1 The table below shows the RACI matrix for risk management. These are defined as:

- **Responsible** (R) – The job role that is responsible for producing the product, or undertaking a task. Responsibility for a product or task may be delegated.
- **Accountable** (A) – The job role that is ultimately responsible for a product or task. Accountability cannot be delegated.
- **Consulted** (C) – Job roles that need to be consulted during the development of a product or task. Often this will include both internal and external stakeholders.
- **Informed** (I) – Job roles that need to be informed about the product or task. This will often be in the reporting line for progress on mitigating risk.

Outputs/ Tasks	**Project Manager**	**Risk Owner**	**Risk Action Owner**	**Risk Manager**	**Project Sponsor**	**Project Board**	**Internal/ External Stakeholders**
Risk Management Plan	R			C	A	I	
Risk Register	A	C	C	R	I	I	C
Risk review workshops through the project lifecycle	R	C	C	C	A	I	C
Delay and Cost Assumptions	A	C	C	R	I	I	C
Qualitative Risk Assessment	A	C	C	R	I	I	C
Quantitative Risk Assessment (QRA)	A	C	C	R	I	I	C
Risk management actions	A	C	R	C		I	C/R 1
Risk escalation	R	C	C	R/C 2	A	I	I
Allocation of Risk Allowance (P80)	R	I		I	A		
Allocation of Contingency	C	I		I	R	A/R 3	

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Note[1]: Stakeholders are generally consulted during risk reviews and when developing mitigation actions; they may also be responsible for them. For example, contractors may be responsible for shared risks identified on joint risk registers.

Note[2]: Risk managers are consulted over escalation of risk and are also responsible for updating the risk register.

Note[3]: The Project Board is both accountable and responsible for allocating the risk budget.

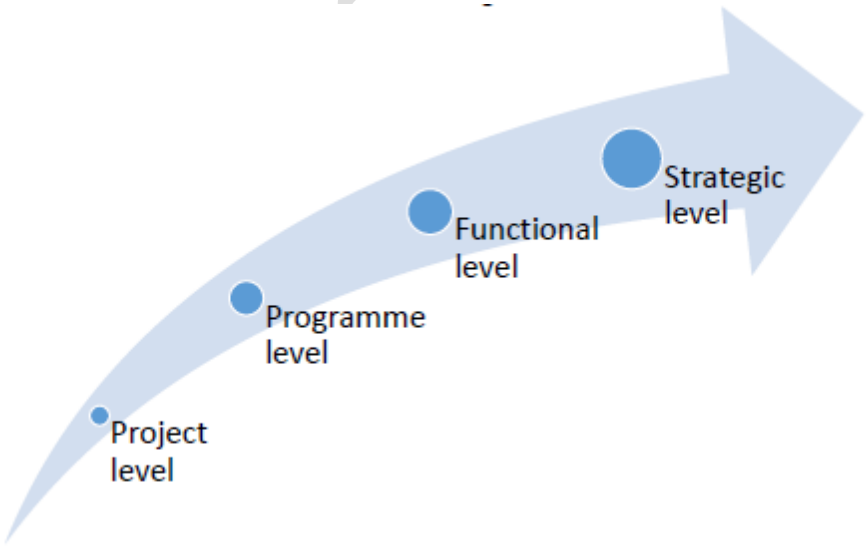
10 Risk Escalation

10.1 Where an individual does not have appropriate level of authority to manage a risk, the risk will be escalated in accordance with TfGM procedures.

10.2 A single risk or group of risks may need to be escalated to a higher level if the risk(s):

- exceed an agreed threshold / defined tolerances;
- cannot be controlled / managed within the current level;
- remain very high even after mitigations are implemented;
- will impact on more than one Function / or across a programme; or
- are crosscutting in nature and require further collaboration.

10.3 The escalation levels are illustrated in the diagram below:



10.4 In most cases risks will be escalated from Project Manager to Programme Manager.

10.5 The exposure level is one of the key factors in escalating risks. The risk score helps to focus attention on risks which are of greatest concern.

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11 Issue Management

11.1 The Issue Management process is initiated when an event occurs that is expected will have an adverse effect on the project's ability to meet its objectives within the planned cost and timescales. This is the result of either an existing risk materialising or a new issue not previously identified being raised.

11.2 Issues are held on an issues register within the Risk Report until they have been resolved, which will be primarily through the Change Control process.

11.3 Change Control is conducted through TfGM's Change Control procedures and receiving approval from the Change Control Committee.

11.4 All issues are reviewed at monthly risk review meetings and the status updated as required. As part of the ongoing review, the estimated impact of the issue is updated to reflect the latest information available to ensure accurate forecasting. Resolution plans will be developed and progressed in order to minimise the impact of the issue.

12 Lessons Learned

12.1 At programme closeout, a final review and lessons learned will be undertaken and any operational risks will be transferred out of the projects.

12.2 A risk section will be provided for the appropriate end of project report(s), detailing generic risks (both opportunities and threats) that might affect other similar programmes/ projects, together with responses that have been found to be effective.

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13 Risk Management Plan Annex

13.1 The basis for the Risk Management of the Scheme is in accordance with the current TfGM Risk Management Policy and Procedures.

Programme Name	GM Clean Air Plan (CAP)
SAP Reference	PRJ 15927
Functional Board Reported to	Transport Strategy Functional Board
RPA Score	Very High
PMP or PMP Lite	TBC
Programme Lifecycle Stage	Development
Description	The primary aim of the GM CAP is to reduce Nitrogen Dioxide (NO_2) concentrations in Greater Manchester, in the shortest possible time, to below the EU Limit Value. The secondary aims are to ensure that the GM CAP strategically fits with Greater Manchester's local strategies and plans; provides Value for Money (VfM); it is Affordable, Acheivable; there is Supply side capacity and capability to deliver; and the Distributional Impact (DI) is understood. In order to deliver the outputs as described, the Programme requires the delivery of a number of independent projects and work packages within the programme. The Project has close links with the Greater Manchetser Communications and EV Early Measures Project3 and also the Oldham Feasibility Study4
Key Constraints	Key Constraints are set out in the Outline Business Case (OBC) – Strategic Case (section 1.8.9).
Key Milestones	Key Milestones are set out in the OBC – Management Case (Appendix E.3.1).

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[3] The GM Communications and EV Early Measures Project was funded after a successful bid developed through this project to the JAQU Early Measures Fund.
[4] The Oldham Feasibility Project was commissioned as a Wave 3 National Plan Project after the initiation of this Project.

13.2 Escalation of risk is in accordance with the TfGM Policy and Procedure

Level	Escalating Risk Register	Receiving Risk Register	Inform	Escalation Criteria
2	Project Manager / Programme Manager	Project Sponsor	Risk Manager for the receiving register.	Interface or interdependency risks that affect multiple projects in a programme/ mode. Critical (Zone 1) risks that require the PgM's intervention.
3	Project Sponsor	Strategic Lead	TfGM Head of Risk and Assurance	Interface or interdependency risks that affect projects across multiple programmes. Critical (Zone 1) funding and finance risks. Where mitigating actions need to be ratified e.g. external stakeholder risks. Where mitigation costs are outside the contingency budget and require a drawdown from General contingency.

13.3 The Cost Impact Criteria for the main Programme and projects are set out below:

Programme/ Project	Cost Impact Scoring Criteria
Programme	T4
All other projects and work packages	TBC

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13.4 The risk impacts can be defined as follows:

Likelihood criteria	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
	≤5%	6-25%	26-50%	51-75%	>75%
	May occur in exceptional circumstances	May occur in the next 3 years	Likely to happen in the next 2 years	Likely to happen in the next year	Risk is frequently encountered
Impact Criteria	**Very Low (VL)**	**Low (L)**	**Medium (M)**	**High (H)**	**Very High (VH)**
Project Cost					
T1 = < £1m	£0 - £5k	>£5k - £10k	>£10k - £30k	>£30k - £50k	>£50k
T2 = £1-10m	£0 - £30k	>£30k - £75k	>£75k - £200k	>£200k - £500k	>£500k
T3 = £10-50m	£0 - £50k	>£50k - £300k	>£300k - £500k	>£500k - £1m	>£1m
T4 = £50-400m	£0 - £100k	>£100k - £400k	>£400k - £1m	>£1m - £5m	>£5m
T5 = >£400m	£0 - £1m	>£1m - £5m	>£5m - £25m	>£25m - £50m	>£50m
Schedule	<2 weeks delay **OR** no impact on end date/ deadline.	2-4 weeks delay **OR** low impact on key activities; no impact on the end date (occurs at development stage and can be accommodated in schedule).	4-8 weeks delay **OR** significant impact to key milestones or activities but no impact on end date (requires changes to schedule to meet end date).	8-12 weeks delay **OR** significant impact to key milestone or activities and delays to the end date. No knock-on effect on other schemes / activities/ revenues.	>12 weeks delay **OR** significant impact significant impact to key milestone or activities and delays to the end date. Knock on effects on other schemes / activities/ revenues.
Health & Safety	Minor injuries; cuts and bruises (First Aid Case).	RIDDOR Reportable (Over Three Day Injury)	Serious Injury (Non Life Threatening)	Major injury (Life Threatening)	Fatality
Reputation & Legal	Isolated local complaints e.g. noise complaints; unlikely to lead to a loss in customer patronage / affect scheme. No legal concerns.	Local complaints by a local group: will reduce affection for TfGM in that locality. Minor legal concerns.	Serious local poor publicity that curtails TfGM's ability to operate effectively in that area without active stakeholder engagement OR region-wide poor publicity from not meeting additional customer expectations (e.g. cleanliness, ticketing & information accuracy); will reduce affection for TfGM network wide. Manageable legal concerns.	Region-wide poor publicity from not meeting minimum customer expectations (e.g. journey times and reliability); will seriously reduce affection for TfGM, gradually erode network patronage or ability to attract funding & customers from other modes (car). Potentially serious legal concerns.	Serious poor publicity and legal concerns: will affect public trust in TfGM, likely to have an immediate impact on customer patronage, or lead to the closure of a route or voiding of a scheme. E.g. serious H&S incident or violation of competition or other laws.
Service Disruption	Up to 1 day disruption to a non-critical route or system outside peak period.	> 2 days disruption to a non-critical route or to an IS system with restricted usage (e.g. SAP Financials) outside peak period.	> 1 day disruption to a restricted IS system or to a widely used but non-critical IS system (e.g. Intranet) during peak period. Up to 3 hours disruption to a critical route outside peak period.	Up to 3 hours disruption to a critical IS system (e.g. Hardrives/ Signalling) during peak usage. Up to 1 hour disruption to a critical route during peak period.	> 3 hours disruption to a critical IS system or > 1 hour disruption to a critical route during peak period.
Policy / Benefit realisation	Minimal delay or interruption to the realisation of a benefit / objective or loss of less than 10% of predicted benefits	Minor delay or interruption to the realisation of a benefit / objective or loss of 10-25% of predicted benefits	Reduces viability/ impacts on efficiency, output, and quality of benefits / objectives or loss of 25-50% of predicted benefits	Major impact on objectives. Serious impact on output and/or quality or loss of 50-80% of predicted benefits	Critical impact on the achievement of objectives and overall performance or loss of more than 80% of predicted benefits

*Reference to TfGM Risk Management Policy and Strategy V1.9

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13.5 The timetable below provides details of specific risk meetings and workshops that will be used to manage risk on the programme, projects and work packages. This table will be reviewed and amended as necessary to accommodate additional projects or work packages.

Workshop/ Meeting	Programme	Projects/ work packages
Regular Risk Meetings with core team	Monthly as part of reporting process	TBC
Risk Workshops with Wider team/key stakeholders	As and when required	TBC
Reporting	Monthly as part of reporting process	TBC
Programme Board	Monthly as part of reporting process	TBC
Qualitative Risk Scoring	Monthly as part of reporting process	TBC
Quantitative Cost Risk Analysis (QCRA)	TBC	TBC
Quantitative Schedule Risk Analysis (QSRA)	If and when required	TBC

13.6 Approved Risk Allowance

	Date	Risk Allowance Contingency (£k)	Contingency (£k)
Approved Budget	26/03/2018	0	0
Rebaseline #1			
Rebaseline #2			
Rebaseline #3			
Rebaseline #4			

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13.7 This issue log is to be reviewed bi-annually with any risks which have materialised to later inform the Close Out Report.

Date	Risk ID	Risk Name	Management of the Risk	Lessons Learnt

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E4 Plans
E4.3 Monitoring and Evaluation Plan

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Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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1 Impacts[1]

1.1 These are the ultimate effects of the proposed Greater Manchester Clean Air Plan (GM CAP) on the three elements of sustainable development: environment, society and economy. The interventions in the proposed GM CAP are designed to act on air quality and that will therefore be the main variable of interest. However, in the sustainable development model, the three elements should be in balance and there is a requirement to understand the extent to which each has changed.

Environment

1.2 Air Quality might generally be understood as the extent of all pollution and particularly those with a known impact on human health. In the more specific context of the GM CAP, this means Nitrogen Dioxide (NO_2) because of the legal judgement referred to in the Strategic Case.

1.3 Air quality changes rapidly with distance from a road, and also along discrete sections of road between junctions, as vehicle behaviour and emissions can be altered by many factors such as congestion, gradients, merge/diverges/ pedestrian crossings, and road widths and curvature. The dispersion of these emissions can also be affected by the surrounding buildings, surfaces and topography.

1.4 Air quality, and particularly NO_2 concentrations, can vary within the year and between years due to a large number of factors, most notably meteorological conditions. Therefore, obtaining multiple baseline years before scheme commissioning is critical.

1.5 NO_2 can be measured using a range of techniques. Continuous Monitors (CMs) record minute-by-minute data but are relatively expensive to install and operate, whilst passive Diffusion Tubes (DTs) are very cheap and can therefore be deployed at a large number of locations readily and cost effectively, but only measure monthly concentrations meaningfully. A critical aspect of the prediction of NO_2 from vehicle traffic emissions is a parameter known as primary- NO_2 (the fraction of overall nitrogen oxides (NO_x) that are emitted directly as NO_2). This is very difficult to directly measure, but can be inferred if an ozone (O3) analyser is co-located with the NO_x/ NO_2 CM.

1.6 LAQM TG(16)[2] sets out the principles for designing a monitoring survey which utilise both types of analyser with co-location of DTs at CMs sites to understand systematic bias.

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[1] For the purposes of this document, “evaluation” refers to ex-post outcomes (travel behaviour) and impacts (non-transport effects on economy, society & environment), whereas “monitoring” is about delivery and proper operation of the interventions. They are, however, part of the same programme so the distinction is mainly relevant to expectations of reporting frequency: monitoring tends to short-term and frequent; evaluation has to wait for effects to materialise that do not change rapidly.

[2] Defra, Local Air Quality Management Technical Guidance (TG16), February 2018

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1.7 The approach to monitoring set out in this project has been designed to understand the key influences on roadside NO_2 concentrations across a large and spatially diverse study area where exceedances are caused by complex and differing conditions. Locations of canyons, congestion and gradients are recognised as being more susceptible to uncertainty in emissions estimates and therefore additional monitoring is targeted in these locations, along with the key exceedance locations across the districts in Greater Manchester.

1.8 Additionally, the monetisation of the Air Quality impacts from the scheme includes changes to emissions of Particulate Matter (PM_{10}/$PM_{2.5}$) in relation to health, and carbon in relation to climate change. These pollutants and other environmental impacts such as noise are the subject of other Greater Manchester strategies with their own monitoring regimes and will be incorporated in the GM CAP evaluation.

Society

1.9 There is a challenge around the distribution of the costs and benefits of the transport system, and in the specific case of the GM CAP, the contribution of NO_2 to ill-health and the accessibility and financial costs resulting from the interventions experienced by different segments of the population.

1.10 The segments of most concern as identified in the Distributional Impacts (DI) Assessment were people on low incomes, children and the elderly.

1.11 Whilst there is an agreed relationship between NO_2 concentrations and human health, actual measurement of health such as life expectancy or incidence of disease is affected by many variables and it would be impractical to isolate any change in NO_2 as a cause. The best proxy will be a measure of exposure, which will be analysed spatially, particularly with respect to areas of deprivation and current exposure. Baseline data of this type has already been analysed in the DI Assessment.

1.12 Distribution of financial and other behavioural consequences that can be attributed to the GM CAP will not be detectable from any large-scale economic data and so will require specific surveys of firms and individuals, according to their circumstances and response to GM CAP Measures (see sections 4 & 5 below).

Economy

1.13 As with health, whilst relationships between transport and economic costs and activity might be understood well enough to model, observing the effects directly is difficult due to the strength of other variables. However, it should be possible to make some estimates of costs to business and barriers to employment from surveys of firms and workers, subject to the usual reservations about self-reporting of possibly controversial effects. These would be part of the after-only survey programme discussed below.

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1.14 Health-related economic costs such as the National Health Service (NHS) and social care, productivity and absenteeism similarly have an assumed, modelled, relationship with air quality but not one that could be observed directly. Extrapolating from actual air quality outcomes will suffice.

1.15 The image of Greater Manchester is likely to be a contributing factor to economic growth and, although that relationship would be beyond the scope of the GM CAP, it may be worth measuring as an indicator of attractiveness of Greater Manchester as a place to invest or work. Awareness is required of whether cleaner air has become a selling point or whether the interventions are seen as an undue burden. The scope of a survey asking about the image of Greater Manchester would be businesses and residents both inside and outside Greater Manchester; perception questions would include transport and non-transport aspects of Greater Manchester, including environment in general and air quality in particular.

2 Outcomes

2.1 The first level of outcome down from impacts that should be measured are those with the most direct relationship with NO_2 concentrations. There is a requirement to understand how the product of volume of traffic, traffic composition, fuel type and speed has led to a change, or not, in air quality readings.

Traffic volumes

2.2 It is proposed that recording of traffic flows via Automatic Traffic Counters (ATCs) which are currently deployed across the Greater Manchester highway network as Business-as-Usual (BAU). Baseline data of this type has already been analysed in the preparation of the business case.

Traffic composition

2.3 The camera network deployed as part of the proposed GM CAP will provide the base level of data to assess changing traffic composition. Depending on the scope for avoiding cameras (whether intentionally or not), some random sampling using a mobile Automatic Number Plate Recognition (ANPR) cameras will be required to check that the traffic composition and fuel types in general use across the network matches those that are presented to static enforcement cameras or the highly-visible mobile cameras. A single mobile camera, separate (i.e. unmarked) from the enforcement fleet should be sufficient to collect an adequate sample covering multiple locations.

2.4 Baseline data used in the business case has been collected from a combination of existing traffic management and a short-term installation of cameras for the specific purpose of measuring composition.

3 Intermediate outcomes

3.1 There is a requirement to understand how the above factors have changed in response to the interventions. The main factor that the proposed GM CAP

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is meant to act on is fuel type and vehicle age/Euro standard. The intention is not to reduce the amount of traffic or increase speeds, but these may vary independently and some interventions may incidentally affect the outcome. Use of ATCs and mobile data will provide the context for an understanding of the effect of the interventions that are mainly intended to affect vehicle emissions characteristics.

Observable responses to CAZs

3.2 The extent to which non-compliant vehicles continue to use zones through the payments system plus enforcement and random sampling will be measured. The baseline exists as described above.

Observable responses to fuel change initiatives

3.3 The operation of schemes will provide data on the extent of take-up, including payments and usage of Electric Vehicle (EV) charging points. The only baseline data relevant in this case is that on the current membership and usage of the GMEV scheme.

4 Behavioural & attitudinal responses

4.1 At this level there is a requirement to understand what is behind the observable responses to the interventions. There is a need to identify why people did what they did, which will require quantitative surveys and/or qualitative methods such as in-depth interviews or focus groups. There is an assumption that there are no practical baseline equivalents to these.

4.2 In each of the following cases several waves of surveys will need to be undertaken, possibly over several years, to allow for some responses to be made before the interventions, immediate upon implementation and in the short and long term post-implementation.

Clean Air Zones (CAZs)

4.3 The survey approach will depend on the type of user and how their travel changes, including whether they can choose to avoid the all-Greater Manchester zone.

4.4 Those making the same trips as previously that now enter a CAZ may:

1. have already been using a compliant vehicle and have changed nothing, and so don’t pay;
2. not have had a compliant vehicle but have one now, so don’t pay;
3. not have had a compliant vehicle and don’t have one now, so pay; or
4. not have had a compliant vehicle and don’t have one now, and cheat the system.

4.5 Of these, category 3 is of most interest and respondents will be identifiable through the penalty scheme contact details and an on-line survey is

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proposed to ask about their reasons for paying. This would include what alternatives they had (awareness, availability, affordability, their proportion of discretionary trips) and, if they had plausible alternatives, why they rejected them in favour of paying. Trip-making frequency should also be collected and compared with the current frequencies in existing travel diary data to test for the possibility of trip-chaining that minimises the cost per trip of a fixed daily penalty.

4.6 Similar questions for category 2 will be required to understand the trade-offs they made and what sort of vehicle or fuel they switched to. Some of them may be easily contactable if they have participated in any of the incentives, but in the main there is a need to look for respondents in the general population. It is currently assumed that category 4 will be too small to affect outcomes, so it can be safely ignore it for evaluation purposes.

4.7 Of those who did something else, the proportions of trips diverted or supressed in response to a CAZ in the absence of changing a vehicle will need to be understood.

4.8 In each case, separate surveys will need to be designed for people travelling in the course of business, and transport providers (buses, taxis, own-account freight and haulage/logistics).

4.9 Questionnaire design will need to be informed by some qualitative work, to ensure that a full range of real-world responses and motivations are provided for. It is expected that depth interviews, either face-to-face or by phone would be appropriate for most businesses.

Response to incentives

4.10 Those who at least make contact in respect of any of the incentives should be easily contactable for the purpose of asking them about trade-offs they have made, similar to the general population of category 2 above.

5 Customer experiences and consequences

5.1 Following on from collecting insight into why people responded to the proposed GM CAP in the way they did, it is proposed that the same interviewing opportunity is used to measure how the interventions worked for people and to probe the consequences of the proposed GM CAP on the respondents and/or their organisations.

CAZs

5.2 For those in category 3 above, there is a requirement to check that they are satisfied with the operation of the penalty system in terms of things like accuracy of billing and ease of paying. For all others it needs be ensured that the zones and their rules were widely understood. A question on approval of the programme may be appropriate.

5.3 Category 1 may report faster journeys or less stress in the event of a general reduction in traffic. Businesses such as truck or bus operators may

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have had more than one vehicle but not all compliant and in options where non-compliant vehicles from outside GM could make some trips without charge, it would be useful to observe whether re-allocating vehicles between tasks depending on their trip destinations might contribute to a shift in emissions away from CAZs to other locations.

5.4 In planning for the future, it will be important to understand the extent to which those in category 1 believe they make little or no contribution to air pollution and expect to continue to drive their class of vehicle indefinitely.

5.5 For those reporting diverting or supressing trips, the consequences of these in terms of cost, access to business opportunities or other changes will need to be explored.

5.6 Businesses or institutions who aren't directly involved in travel or freight movement have not been considered above but might nevertheless experience consequences at the end of the chain. Retailers would be a particular target for research to see whether effects of GM CAP on suppliers had translated into changes in trade. Getting at such effects would best be achieved through qualitative approaches: probably focus groups for retailers around particular locations and individual depths for large organisations.

Incentives

5.7 At the same time as asking those who responded to incentives about their decision-making, the operation of the incentive scheme was as expected should be tested with respect to its ease of use and satisfaction with delivery. It is proposed that insight from people is sought who didn't take advantage of an incentive to test awareness and perceived attractiveness of the offer.

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Table 1: Summary of indicators and sources

	Indicators & Insights	Reporting frequency	Source	Indicative Cost to CAP
Impacts				
Environment	(1&2) Annual average NO_2 concentrations: (1) actual and (2) as modelled. Number exceeding 35/40/45/50 µg/m^3 Actual primary - NO_2 concentration for a variety of fleet mix sites to cross reference with JAQU sensitivity tests	6 monthly	(1) Diffusion tubes and continuous analysers at monitoring sites (2) Reference model (3) Continuous analysers with NOx/ NO_2/O_3	(1) 14 existing road traffic & 6 background stations £0, BAU (2) 4 New CMs with NO_x/ NO_2/O_3 @ £25k per unit for the first year, £5k per site maintenance pa thereafter. (3) 160 supplementary Diffusion Tube sites for GM CAP £100k for the first year, £60k pa thereafter
Society	Ratio of proportion of Lower Layer Support Output Analysis (LSOAs) having highest quintile of low incomes, children and elderly with exceedances to proportion of LSOAs having lowest quintile of low incomes, children and elderly with exceedances	Annual	Modelled & actual exceedances as above plus census. In-depth study of vulnerable groups (2 waves)	(1) Exceedances supplied by above. (2) Distribution analysis £20k (3) £30k per wave
Outcomes level 1: Air quality factors				
Traffic volumes	Total vehicle-kms by class	Annual	Existing stock of ATCs, manual counts and mobile data	£0, BAU
Traffic composition	Proportions of each vehicle class and fuel type observed: (1) on the Greater Manchester road network (2) crossing into CAZs	Monthly	(1) Mobile ANPR for Monitoring and Evaluation (M&E) only (2) Enforcement ANPR	(1) £50k purchase + £50k/year operation (2) As per Financial case
Traffic speed	Average link speeds, all vehicles		Existing mobile data	£0, BAU

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	Indicators & Insights	Reporting frequency	Source	Indicative Cost to CAP
Outcomes level 2: Observable responses to interventions				
CAZ	Volume of non-compliant vehicles entering	Monthly	CAZ payments & enforcement system	Within Financial Case
	Regional and District Centre traffic composition	Annual	Cordon counts	£0, BAU
Incentives & other initiatives	Numbers taking up fuel change assistance	Monthly	System administration	£0, part of operations
Outcomes level 3: Behaviours and attitudes				
CAZ	Proportions of respondents who modify their behaviour in various ways (e.g. switch fuel, travel less) and who don't. Proportions of respondents who change behaviour citing GM CAP as principal reason.	Within 3 months post-implementation; Repeat 1 or 2 years after.	Survey of businesses	£150k
	Understanding of ranges of changes and reasons to inform survey design above.	One-off, post-implementation	Qualitative methods: focus groups and depth interviews	£50k
Incentives & other initiatives	Proportions of those taking up incentives of those enquiring. Proportions of reasons cited for taking up/not.	1, 2 and 3 years post-intervention	On-line survey of people who register an interest.	£15k

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	Indicators & Insights	Reporting frequency	Source	Indicative Cost to CAP
Outcomes level 4: Customer experiences & consequences				
CAZ	(1) Proportions satisfied with their interaction with various aspects of the system. (2) In-depth understanding of impact on businesses and how they have responded. (3) Quantify effects on business	(1) Within 3 months post-implementation Repeat 1 and 2 years after. (2) Within 3 months post-implementation Plus one year later (3) 2 or 3 years post-implementation	(1) On-line survey using contact details from customer database (2) ca. 30 Qualitative interviews in each wave (3) On-line survey through business forums plus background local economic data e.g. business rates, retail vacancy rates, employment.	(1) Included in Incentives survey above (2) £24k (3) £15k
Incentives	Proportions satisfied with their interaction with various aspects of the system.	Within 3 months post-implementation	On-line survey using contact details from customer database	Included in £15k above

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E5 Registers

E5.1 – Programme Risk Register

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Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

Title:		Appendix E.5.1 - OBC Programme Risk Register (Qualitative) CONFIDENTIAL WORKING DRAFT
Review Date:		2/25/2019

Category/ Workstream	Risk ID	Risk Name	Risk Description	Risk Cause	Risk Consequence	Risk Owner	Pre-Mitigation (VL-VH)							Assessment Assumptions	Action ID	Action Name	Action Description	Action Owner	Post-Mitigation (VL-VH)						
							Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Pre-Mit)						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Post-Mit)
Governance & Policy	Prog-2	Delays with the Local Authority approval process	Ten Local Authorities with differing constitutional arrangements need to reach agreement on the preferred option.	Approval process, number of interfaces. New interventions being introduced by stakeholders.	Delays to decision making resulting in AQ compliance not being achieved in the mandated timescales. Additional legal advice may be required.	Programme Manager	H	H	H	-	-	H	19	Cost impact is additional resource or resource extension.	A-4	Agree alignment and hold regular meetings	Agree strategic alignment within the Steering Group, Chief Legal Officers, Council Leaders and regular meetings to address.	SRO	M	M	H	-	-	H	15
	Prog-2														A-5	Investigate and confirm whether the option to apply non-uniform solutions is feasible	Although an holistic approach is planned, investigate and confirm whether the option to apply non-uniform solutions across the Local Authorities is feasible.	Project Sponsor							
	Prog-2														A-6	Early and continued engagement	Early and continued engagement with elected members at each local authority	SRO							
	Prog-2														A-7	Provide sufficient support	Provide sufficient support to members of the steering group to brief key stakeholders in a timely fashion.	SRO							
	Prog-2														A-8	COMPLETE- sought specialist legal advice to agree governance route.	COMPLETE- sought specialist legal advice to agree governance route.	Project Sponsor							
Governance & Policy	Prog-3	Public consultation/ decision making in Pre-Election Periods	Potential for delays to the schedule if consultation or governance is required during Pre-Election Periods causes issues.	Internal/ external (e.g. Local Authorities) governance requirements, additional rework. JAQU advice/ requirements are subject to change.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	L	VH	-	-	H	18	Cost impact is resource extension for delivery teams.	A-9	Schedule appropriately and monitor	Schedule established which avoids clashes with Pre-election period and this to be monitored weekly to track progress and ensure no delays.	Governance & Policy Lead	M	L	H	-	-	H	15
Governance & Policy	Prog-4	Additional decisions/ governance required throughout the development of the business case & programme delivery	Additional decisions/ governance required or takes longer than anticipated - internal, local authority (High level governance, not specific powers or consents - the required governance could vary significantly depending on the content of the business case and/or the scope of the preferred option.).	Varied governance processes, uncertainty around governance, overlap with other strategies. Unforeseen government requirements	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	M	VH	-	-	H	18	Cost impact is resource extension.	A-10	Regular communication and engagement	Regular communication with all political stakeholders.	Governance & Policy Lead	M	M	H	-	-	H	15
	Prog-4														A-11	Agreement w/ JAQU & Government as to flexibility to scope requirements/ timescales	Continued liaison with JAQU and Government regarding decisions and governance requirements.	Governance & Policy Lead							
	Prog-4														A-12	COMPLETE - Develop a detailed schedule to ID all formal & informal approvals required	Develop a detailed schedule to identify all formal & informal approvals required and agree with all stakeholders.	Governance & Policy Lead							
	Prog-4														A-13	Ask for appropriate delegations	Appropriate delegations to officers will be sought in order to expedite.	Governance & Policy Lead							
	Prog-4														A-14	Briefing sessions being held with councillors	Briefing sessions being held with councillors	Governance & Policy Lead							
Governance & Policy	Prog-5	Political mandate	Political changes impact on schedule or vary scope.	Outcome of the 2019 local & Euro elections, changes nationally.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	M	H	H	-	M	15		A-15	Regular communication and engagement	Regular communication with all political stakeholders.	Governance & Policy Lead	M	M	H	H	-	M	15
	Prog-5														A-16	Develop a handover Briefing & Comms plan.	Develop a handover Briefing & Comms plan, ready for if/ when this risk impacts.	Governance & Policy Lead							
Programme & Project Business Case	Prog-6	JAQU guidance changes	Guidance not available within the required timescales, insufficient JAQU guidance or changes to the guidance.	The guidance is not issued, is insufficient, or changed by JAQU. Potential difference between drafts and advice because of timescales of submissions.	AQ compliance not being achieved in the desired timescales and impact on costs. Reputational impact to Greater Manchester authorities	Programme Manager	M	M	M	-	-	M	11		A-17	Regular review of requirements (every 2 weeks)	Regular review of requirements within the project team and communication with JAQU for any potential areas of concern.	Programme Manager	L	M	M	-	-	M	8
	Prog-6														A-18	Understanding of the 'fixed' documentation	Understanding of the 'fixed' documentation, despite requirements being addressed.	Programme Manager							
	Prog-6														A-19	Agree pragmatic working agreements with JAQU	Agree pragmatic working agreements with JAQU without the need for retrospective amendments.	Programme Manager							
	Prog-6														A-20	Additional briefing sessions	Additional briefing sessions are to be provided by JAQU, as required, which should help mitigate the delays to the issuing of full documented guidance.	Programme Manager							
	Prog-6														A-21	Concerns to be raised with JAQU	Concerns should be documented in writing to JAQU.	Programme Manager							
	Prog-6														A-22	Provide meeting minutes to JAQU	Provide meeting minutes to JAQU	Programme Manager							
	Prog-6														A-23	Communicate updates on Huddle	Ensure updates on the Huddle portal are communicated around the project team.	Programme Manager							
Marketing, Communications, Stakeholder Engagement & Consultation	Prog-7	Low public awareness of the issue of air pollution.	Low public awareness of the impact of air pollution may increase objections to the implementation of the GM CAP.	Current level of public understanding and awareness.	Reluctance to change travel behaviour and adopt sustainable, clean, transport options. AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	L	L	-	-	M	11	Consultation may increase.	A-24	Raise awareness of the issue of air pollution.	Raise awareness where possible through media campaigns, early and continued engagement with all stakeholder (including the general public) to promote the importance of clean air. Highlight Public Health benefits of cleaner air.	Communications Lead	L	L	L	-	-	L	6

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Title:		Appendix E.5.1 - OBC Programme Risk Register (Qualitative) CONFIDENTIAL WORKING DRAFT
Review Date:		2/25/2019

Category/ Workstream	Risk ID	Risk Name	Risk Description	Risk Cause	Risk Consequence	Risk Owner	Pre-Mitigation (VL-VH)							Assessment Assumptions	Action ID	Action Name	Action Description	Action Owner	Post-Mitigation (VL-VH)						
							Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Pre-Mit)						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Post-Mit)
Legal	Prog-8	Legal challenge	Legal challenge about the approach taken	Objections to the approach and/ or timescales.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	VH	H	H	-	M	18		A-25	Tolerate	Ensure compliance with all legal requirements.	Legal Lead	M	H	H	-	-	M	15
	Prog-8														A-26	Potential areas for challenge to be raised to JAQU	Potential areas for challenge to be raised to JAQU for their consideration.	Legal Lead							
	Prog-8														A-27	Determine realistic timescales for public consultation.	Determine realistic timescales for public consultation. Engage with JAQU. Engage with legal advisors.	Legal Lead							
Legal	Prog-9	Impact to climate change strategy	Changes in fleet composition impacts ambitions related to climate change strategy.	Clean Air Plan (as defined by Government) is focussed on reduction of NO_2.	Impacts Carbon Plan and other emission reduction strategies	Programme Manager	VL	L	L	M	-	M	4		A-28	Preferred option to consider all potential negative implications.	Preferred option to consider all potential negative implications.	Legal Lead	VL	L	L	M	-	M	4
Data, Evidence & Modelling	Prog-10	Target Determination is not agreed in the required timescales	Target Determination is not agreed.	Differences between JAQU and local data	AQ compliance not being achieved in the desired timescales or impact on costings.	Programme Manager	M	M	H	-	-	H	15		A-29	COMPLETE - Consult with JAQU	Consult with JAQU to ensure accurate guidance is available for Target Determination.	Programme Manager	L	M	H	-	-	H	10
Data, Evidence & Modelling	Prog-11	Modelling / information	Predictive nature of modelling leading to potential uncertainty	Predictive nature of modelling leading to potential uncertainty	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	VH	H	H	-	H	18		A-30	Use experienced resources, input of Technical Leads, independent verification & check JAQU assumptions	Experienced in-house capability, added input from the Technical Lead, independent verification and cross check against JAQU data.	Modelling Lead	L	VH	H	H	-	H	17
Programme & Project Business Case	Prog-12	Effectiveness of GM CAP following implementation	Implementation of the preferred option does not reduce NO2 to levels predicted within the model. This risk cannot be determined to have impacted immediately - it is a long-term risk, over several years.	Behaviour change expected in modelling process is not achieved in real life.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	VH	-	-	-	VH	18		A-31	Robust modelling and engagement with partner organisations and other areas of work during implementation	Further modelling and identification of interventions that can have the greatest impact or combinations of interventions. Engagement with partner organisations such as Highways England and Public Health England (PHE). Alignment with other relevant areas of work, such as the development of the congestion plan.	Programme Manager	L	VH	-	-	-	VH	17
	Prog-12														A-32	Implement appropriate monitoring	Implement appropriate monitoring for compliance and evaluation.	Monitoring and Evaluation Lead							
	Prog-12														A-33	Review feedback from monitoring	Feedback from monitoring should inform the effectiveness of the solutions implemented and give an opportunity to address any shortcomings.	Monitoring and Evaluation Lead							
	Prog-12														A-34	Review sensitivity ranges	Consider flexibility or sufficient sensitivity ranges to improve effectiveness.	Modelling Lead							
	Prog-12														A-35	Consider further projects	Consideration may be given to including further projects within the programme if compliance is not achieved.	Monitoring and Evaluation Lead							
	Prog-12														A-36	Ensure robust process and adequate assurance	Ensure the modelling design process is robust with adequate assurance during implementation	Modelling Lead							
	Prog-12														A-37	Ensure competent designer is appointed.	Ensure competent designer is appointed and that adequate checks and assurance are in place during the design phase, and that procurement process assigns liability appropriately. Appointments will be made under the existing Transport Professional Services framework.	Procurement Lead							
Governance & Policy	Prog-13	Positioning of Greater Manchester approach impacts working relationship with Highways England.	Lack of Highways England direction to act is highlighted by Greater Manchester AQ issue.	Highways England are operating under a different statutory framework and are not working under the same direction as Local Authorities.	Impact to working relationship with Highways England and partnership with the wider Steering Group.	Programme Manager	M	M	L	-	-	M	11		A-38	Highways England included in the Steering Group.	Highways England included in the Steering Group.	Governance & Policy Lead	M	L	L	-	-	L	7
	Prog-13														A-39	Close liaison with Highways England	Continued and on-going liaison with Highways England to ensure that any interventions are included within the modelling process.	Governance & Policy Lead							
	Prog-13														A-40	Close liaison with JAQU	Close liaison with JAQU.	Governance & Policy Lead							
	Prog-13														A-41	COMPLETE - Political escalation to highlight this situation.	Political escalation to highlight this situation.	Governance & Policy Lead							

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Category/ Workstream	Risk ID	Risk Name	Risk Description	Risk Cause	Risk Consequence	Risk Owner	Pre-Mitigation (VL-VH)							Assessment Assumptions	Action ID	Action Name	Action Description	Action Owner	Post-Mitigation (VL-VH)						
							Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Pre-Mit)						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Post-Mit)
Project & Work Package Development	Prog-14	Interaction with other Greater Manchester initiatives	Interfaces with other near-term Greater Manchester initiatives. Unforeseen impacts of Greater Manchester initiatives, or of the proposed solutions to the Greater Manchester initiatives.	Extent and wide-range of scope and interfaces.	Unforeseen complexities around interfaces and/ or interactions many result in AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	L	M	H	-	M	15		A-42	GM CAP to consider all Greater Manchester policies, strategies and initiatives.	GM CAP to consider all Greater Manchester policies, strategies and initiatives and amend if necessary.	Programme Manager	L	L	M	H	-	M	10
	Prog-14														A-43	Early engagement to ensure alignment of initiatives.	Early engagement to ensure alignment of initiatives, with on-going monitoring, updates and briefings to Local Authorities.	Programme Manager							
	Prog-14														A-44	Representatives from Strategy and Policy to lead on the interfaces with other Greater Manchester initiatives	Representatives from Strategy and Policy to lead on the interfaces with other Greater Manchester initiatives as soon as possible, to ensure that this risk is mitigated.	Programme Manager							
	Prog-14														A-45	2040 Delivery Plan	The 2040 Delivery Plan will need to be updated to reflect the CAP work.	Programme Manager							
Project & Work Package Development	Prog-15	Decision makers require a level of information that is not feasible to produce	Additional research and evaluation of preferred option is required (and possibly at multiple stages), but may prove to be insufficient to support decision makers	Insufficient information is available to make key decisions.	Delays to achieving AQ compliance. Further investigation and research required leading to delays and additional costs.	Programme Manager	H	H	H	H	-	M	19		A-46	Consider research and evaluation requirement for each intervention.	FBC research and evaluation requirement for each intervention as they are developed.	Programme Manager	M	H	H	H	-	M	15
	Prog-15														A-47	Early feedback, through Public conversation activity.	Drawing out of early feedback through Public conversation activity.	Programme Manager							
	Prog-15														A-48	Liaison with JAQU	Liaison with JAQU around the scope of their central evaluation to ensure that Greater Manchester are aware of any requirements that may need to be met.	Programme Manager							
Project & Work Package Development	Prog-16	Technology required within timescales available	Technology required to deliver the required improvements is not available within the timescales to support the preferred option.	Technology required is not defined and still needs to be confirmed.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	VH	M	-	-	M	18	Cost impact assumes technology is across CAZ infrastructure and back office technology, EV's and bus retrofit.	A-49	Work with academia and technology development organisations.	Work with academia and other technology development organisations to support and accelerate innovation.	Programme Manager	L	VH	M	-	-	M	17
Legal	Prog-17	Public Inquiry	A Public Inquiry may be required during the development and implementation of the GM CAP	Local Authority discretionary decision. Feedback by local resident groups, local businesses etc. identifying significant objection to proposed measures	AQ compliance not being achieved in the mandated timescales. Cost/schedule implications	Programme Manager	M	M	VH	VH	-	VH	18		A-50	Seek advice as required.	As the GMCAP develops, seek advice from Legal Advisers, Technical Lead, other authorities and JAQU.	Legal Lead	M	M	VH	VH	-	VH	18
	Prog-17														A-51	On-going engagement with Districts	On-going engagement with Districts to determine their position and take further legal advice as required.	Legal Lead							
Human Resources	Prog-18	Resources	Uncertainty around resourcing requirements - extent of work / teams is underestimated, increasing costs / duration of activities. Availability of internal/ external resources with competing demands for time. Capability of internal/ external resources to meet the requirements Retention of critical staff - Key/ Critical/ Specialist resources may become unavailable, at short notice.	Uncertainty around the resource requirements. Emerging requirements. Experience of available staff. Market forces/ staff churn.	AQ compliance not being achieved in the desired timescales costings are not credible.	Programme Manager	H	M	M	-	-	L	14		A-52	Monitor costs and schedule	Costs monitored on a weekly basis and schedule monitored on a weekly basis, so any trends can be identified and mitigations implemented. Issues escalated to JAQU and included in reassessment.	Programme Manager	M	M	M	-	-	L	11
	Prog-18														A-53	Consider procurement strategy	Consider the procurement strategy during development of interventions to identify where risk can be transferred if appropriate.	Procurement Lead							
	Prog-18														A-54	Proactively manage the resource levels within the team	Proactively manage the resource levels within the team	Programme Manager							
	Prog-18														A-55	Continue monthly Project Leads meetings.	Continue the monthly Project Leads meetings to assess and prioritise resource requirements.	Programme Manager							
	Prog-18														A-56	Utilise external resource	Utilise external resource if internal resource is not available.	HR Lead							
	Prog-18														A-57	Consider recruitment of new dedicated internal resource	Consider recruitment of new dedicated internal resource	HR Lead							
	Prog-18														A-61	Appropriate resource planning.	Pay due consideration to potential availability of resources during the development and delivery of GM CAP.	Programme Manager							

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							Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Pre-Mit)						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Post-Mit)
	Prog-18														A-78	On-going engagement of staff	On-going engagement of staff, fostering good working environment and team atmosphere. Regular resource reviews to ensure that workload is appropriate.	HR Lead							
Project & Work Package Development	Prog-20	Highways England Interventions	Interventions / changes by Highways England that impact the GM CAP.	Highways England is a separate entity who may implement their own interventions to meet their requirements, within the prescribed timescales. Alternatively, Highways England may undertake significant infrastructure changes and influence flows, and therefore vehicles move to Local Authority roads and cause unforeseen exceedances.	AQ compliance not being achieved in the desired timescales or impact on costings.	Programme Manager	L	H	M	-	-	H	10		A-58	COMPETE - Include Highways England in the Steering Group.	Ensure Highways England included in the Steering Group and establish regular engagement.	Programme Manager	L	H	M	-	-	H	10
Finance	Prog-23	Whole life costs	Whole life costs have yet to be finalised and JAQU have yet to review the funding proposal.	How whole life costs are to be managed has yet to be confirmed at this stage.	Unexpected potential financial liabilities flowing to GM.	Finance Manager	M	VH	L	-	-	L	18		A-62	Gain confirmation from JAQU around whole life costs.	Gain confirmation from JAQU as to how whole life costs are expected to be managed.	Finance Lead	L	VH	L	-	-	L	17
Data, Evidence & Modelling	Prog-24	Fleet redeployment	Older fleet being redeployed in Greater Manchester from other areas because of the differences in approach and timescales between different authorities that may be taken.	If solution implemented in Greater Manchester is more favourable than other areas.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	L	L	L	VH	-	H	17		A-63	Lobby Government	Lobby Government for funding for Green Buses in the Greater Manchester area	Modelling Lead	L	L	L	H	-	H	10
Audit and Assurance	Prog-25	Assurance requirements	Additional assurance may be required, depending on the scope of the programme as it develops.	Full scope of the programme/ projects is yet to be determined.	Additional resource requirements. Potential delays to meet assurance requirements - AQ compliance not being achieved in the mandated timescales.	Programme Manager	H	M	L	-	-	L	14		A-64	Undertake a further Risk Potential Assessment (RPA).	RPA arrangements will be confirmed once the preferred option is agreed and assurance plans developed.	Assurance Lead	M	M	L	-	-	L	11
Procurement	Prog-26	Procurement strategies	Procurement Strategies are developed in isolation from similar schemes across the UK and obvious areas of synergy are missed.	Lack of national framework leads to multiple frameworks being utilised.	AQ compliance not being achieved in the mandated timescales. Increased costs due to market demand	Procurement Manager	M	H	H	-	-	H	15		A-65	Share procurement strategy across work streams	The Procurement team will share the Scope and Procurement Strategy for each work stream across each of the other Clean Air work streams and with JAQU – in order that dependencies/ synergies can be identified and managed effectively and to facilitate the development of effective procurement strategies/ frameworks.	Procurement Lead	M	M	H	-	-	H	15
Finance	Prog-27	Commodity price increases	Rise of commodity prices as a result of Brexit or other unforeseen exchange rate fluctuations drives significant cost increases.	Market forces	Impact on costings.	Finance Manager	M	M	L	-	-	L	11		A-66	Contractual arrangements	Wherever practicable, contractual arrangements will be drafted to favour 'fixed-price' or 'manage risk' agreements with contractors.	Finance Lead	L	M	L	-	-	L	8
Programme & Project Business Case	Prog-28	JAQU reviews and governance requirements	JAQU reviews and governance requirements not achieved within the scheduled time scales/ requiring multiple iterations.	JAQU guidance unavailable at the time of drafting. JAQU estimation of the level of work required to close out.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	L	VH	-	-	H	18		A-67	Liaise with JAQU	Liaise with JAQU to agree submission requirements in advance of drafting documents and have discussion at submission and review stages in addition to formal submission. Allow JAQU to have early sight of documentation, for review.	Programme Manager	M	L	H	-	-	H	15
Project & Work Package Development	Prog-30	Local Authority may be responsible for managing Highways England attributable emissions.	Some Local Authority exceedances may be attributable to emissions from the Strategic Road Network (SRN) (Highways England), where the exceedance is measured on the LA road but attributable to emissions from the SRN. Compliance cannot be delivered because emissions from the SRN cannot be reduced sufficiently.	Clarification/ confirmation from JAQU indicate that where some exceedances are on the Local Authority network and are partly attributable to SRN emissions, the expectation is that the Local Authority proposals will be expected to deliver compliance on that link.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	H	VH	L	-	-	H	20		A-69	COMPLETE - Modelling to identify if there are any examples of this situation.	Modelling to identify if there are any examples of this situation, and discuss with JAQU and Highways England.	Modelling Lead	H	H	L	-	-	H	19
	Prog-30														A-70	COMPLETE - Political escalation to highlight this situation.	Political escalation to highlight this situation.	Governance & Policy Lead							
	Prog-30														A-71	Engage with Highways England.	Engage with Highways England to collaborate on a suitable approach.	Stakeholder Lead							
Procurement	Prog-31	Implementation funding not secured prior to procurement.	Good quality tenders will not be received, or prices will be inflated because funding will not be secured before the procurement exercise needs to begin.	Procurement exercise must be undertaken before funding can be secured to be able to pay suppliers.	AQ compliance not being achieved in the desired timescales and impact on costing.	Procurement Manager	M	VH	H	-	-	H	18		A-72	Funding for Suppliers	Seek clarification from JAQU as to whether there is any flexibility over this. Ensure JAQU are in broad agreement with procurement approach before going to market.	Procurement Lead	M	VH	H	-	-	H	18
	Prog-31														A-116	SRO to agree approach with JAQU and gain approval	SRO to discuss and agree approach with counterpart at JAQU and gain approval to procure as part of OBC approval	SRO							
Legal	Prog-32	Developing information is released early.	Early release of developing information to the public domain may impact plans for consultation, engagement, and reputation, leading to delays to GM CAP development or consultation plans.	Early release of developing information to public domain e.g. press, social media.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	H	L	M	H	-	M	19		A-73	Contractual Arrangements	Ensure appropriate contractual arrangements are in place (Non Disclosure Agreements etc.) and follow information management processes.	Procurement Lead	M	L	M	H	-	M	15

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							Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Pre-Mit)						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Post-Mit)
Legal	Prog-33	Legal scope	Legal scope is unclear at this stage. If the legal scope is not understood, then Greater Manchester risk not complying with the remit of the programme, or having to change the scope of the programme/ projects to address any shortcomings.	Lack of clarity around the full legal scope - due to the timescales to-date.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	H	-	M	-	-	L	14		A-74	Engagement of QC	Engagement of legal expertise to clarify legal questions and on-going engagement with JAQU	Legal Lead	M	-	M	-	-	L	11
Procurement	Prog-34	Procurement of the next phase Lead Advisor	Schedule is delayed as a result of delays in the procurement of the next phase Lead Advisor.	Procurement process takes longer than anticipated.	AQ compliance not being achieved in the mandated timescales.	Procurement Manager	M	M	H	-	-	M	15		A-76	COMPLETE - Issue tender documentation	Tender documentation is scheduled for release in Dec-18, with return Jan-19 in-line with the procurement timetable.		M	M	H	-	-	M	15
	Prog-34														A-111	Liaise with JAQU regarding procurement process.	Liaise with JAQU regarding procurement process of the next phase Lead Advisor and revise procurement timescale estimates accordingly.								
Finance	Prog-35	JAQU may not agree the revised cost plan	JAQU may not agree the revised cost plan. Time taken to reach agreement may cause funding issues for Greater Manchester.	Long-term costs are difficult to estimate until scope is fully clarified.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	H	VL	M	-	-	M	14	Assumes that JAQU pressure will be to reduce costs.	A-77				H	VL	M	-	-	M	14
Programme & Project Business Case	Prog-37	Outline Business Case (OBC) not approved by Government	OBC not approved by Government, leading to delays.	OBC not approved by Government.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	M	VH	-	-	VH	18		A-79				M	M	VH	-	-	VH	18
Programme & Project Business Case	Prog-38	Full Business Case (FBC) not approved by Government	FBC not approved by Government, leading to delays.	FBC not approved by Government.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	M	VH	-	-	VH	18		A-80				M	M	VH	-	-	VH	18
Programme & Project Business Case	Prog-39	Timescales of Greater Manchester submission of approved FBC for Implementation/ Clean Air Fund	As per the schedule, Greater Manchester will be submitting an approved FBC for funding towards the end of the JAQU funding deadline.	Proposed scheme is complex to deliver and may not meet JAQU's expectations with regard to the FBC submission (the point at which funding is released).	AQ compliance not being achieved in the mandated timescales.	Programme Manager	H	VL	H	VH	-	H	20		A-81	Review schedule	Review schedule and optimise to comply with JAQU deadlines	Programme Manager	M	VL	M	VH	-	H	18
	Prog-39														A-112	Seek agreement from JAQU	Seek agreement from JAQU to extend deadline.	Project Sponsor							
Finance	Prog-40	Optimism Bias	As recommended, HM Treasury Green Book guidance is followed, but does not prove appropriate for this scheme.	Clean Air Plans are novel and there are few 'lessons learned' to inform the guidance. There are no available case studies for reference.	Differing cost of Implementation - a request for more funding is required	Finance Manager	M	VH	M	-	-	L	18		A-82	Cost refinement	Costs and revenue will be refined, alongside the scope of the scheme, as part of the Financial Case for FBC	Finance Lead	M	H	M	-	-	L	15
Customer	Prog-41	Public Transport Capacity/ Active travel infrastructure	Limited public transport capacity/ active travel infrastructure to compliment a modal shift, as a result of potential CAZ schemes	Insufficient timescales to implement.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	L	VL	M	H	-	H	10		A-83	Liaison with Bus Operators	Liaison with Bus Operators about routes where extra capacity may be required.	Programme Manager	VL	VL	M	H	-	H	8
	Prog-41														A-84	Liaison with Mayors Challenge Fund	Liaison with Mayors Challenge Fund cycling and walking team to ensure infrastructure is targeted at appropriate locations.	Programme Manager							
	Prog-41														A-85	Targeted interventions by Sustainable Journeys team	Targeted interventions by Sustainable Journeys team to make people aware of alternative options for travel.	Programme Manager							
Finance	Prog-42	Inflation forecasts	Inflation forecasts for 10 years are incorrect and this leads to increased operational costs.	Various, including uncertainty around Brexit.	Increased operational costs	Finance Manager	VH	VH	-	-	-	L	25		A-86	Gain confirmation from JAQU around whole life costs.	Gain confirmation from JAQU as to how whole life costs are expected to be managed.	Finance Lead	M	VH	-	-	-	L	18
Programme & Project Business Case	Prog-43	JAQU funding	JAQU require Greater Manchester Combined Authority (GMCA) to reduce ongoing operational cost	Decision by JAQU	Greater Manchester have to absorb some costs as part of their Business As Usual (BAU) Reputational risk if spending on other areas is impacted.	Programme Manager	L	VL	-	H	-	H	10	Assumes that JAQU pressure will be to reduce costs. However, the impact to district affordability could be significant.	A-87				L	VL	-	H	-	H	10
Programme & Project Business Case	Prog-44	FBC activities are to be run in parallel.	Streamlining of the FBC schedule requires activities to be run in parallel.	Timescales for delivery of the GM CAP. (see related threat Prog-39 and the requirement to meet funding timescales).	AQ compliance not being achieved in the mandated timescales. Re-work and increased costs.	Programme Manager	VH	H	VH	-	-	M	25		A-88	On-going programme and project reviews	On-going programme and project reviews to ensure that this is being managed effectively.	Programme Manager	H	H	VH	-	-	M	20

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Programme & Project Business Case	Prog-45	Availability of affordable compliant vehicles.	The cumulative effect of multiple schemes across the UK drives up the cost of new/second hand vehicles considerably and/or causes delay to compliance due to lengthy wait times (new vehicles).	National approach influences whole market	Costs to upgrade fleet are higher or upgrade process takes longer than anticipated. AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	VH	-	H	-	H	18		A-89				M	VH	-	H	-	H	18
Programme & Project Business Case	Prog-46	Leaving the European Union (BREXIT)	Risk due to potential outcomes of the consultation regarding the plans for European Union Withdrawal; unknown at this stage whether this will have impact on the GM CAP.	Change of Governmental priorities.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	VH	M	M	-	-	M	17		A-90	Stay abreast of consultations.	Stay abreast of consultations; unknown at this stage whether there will be impact on the GM CAP.	Governance & Policy Lead	VH	M	M	-	-	M	17
Procurement	Prog-47	Framework Agreements	Complexity of using various framework agreements and uncertainty over whether full scope of proposals will be covered by existing frameworks.	Complexity of using a number of existing frameworks.	AQ compliance not being achieved in the mandated timescales.	Procurement Manager	L	L	H	H	-	M	10		A-91	Early engagement with the Legal team.	Legal review and involvement in the procurement process.	Procurement Lead	L	L	H	M	-	M	10
	Prog-47														A-92	Engagement with the procurement team	The procurement team to undertake a review of the most suitable frameworks to use for goods/services that need to be procured.	Procurement Lead							
Procurement	Prog-48	Risk that a supplier/ preferred supplier goes into administration	Risk that a supplier/ preferred supplier goes into administration.	Market forces	AQ compliance not being achieved in the mandated timescales.	Procurement Manager	L	L	VH	-	-	H	17		A-93	Implementation of procurement process	Review the tender list, seek financial statements/references, manage Contractor watch lists, formulate a robust procurement strategy on the best available data at the time and before contracts are let, insert suitable clauses regarding step-in rights and termination rights if the supplier/contractor goes into administration. Existing frameworks will be utilised as much as possible.	Procurement Lead	VL	L	VH	-	-	H	13
Marketing, Communications, Stakeholder Engagement & Consultation	Prog-49	Further Consultation work required	Risk that further consultation required above the level currently anticipated	Timescales do not support serial development.	Retrospective changes may be required, increasing the cost to the LA's.	Programme Manager	L	M	VH	-	-	M	17		A-94	Robust stakeholder engagement strategy.	Robust stakeholder engagement strategy; regular updates/reviews of the budgets and efforts required for the consultation	Communications Lead	L	M	H	-	-	M	10
Procurement	Prog-50	Returned tenders are over the estimated Cost Plan.	Risk that the returned tenders are over the estimated Cost Plan or do not represent appropriate Value for Money (VfM).	Market forces/ demand. Procurement timescales for the implementation.	AQ compliance not being achieved in the desired timescales and impact on costing.	Procurement Manager	H	H	-	-	-	H	19		A-95	Competitive tendering/ framework utilisation	Market engagement for competitive tenders and use of framework as much as possible.	Procurement Lead	M	H	-	-	-	H	15
	Prog-50														A-96	Liaison with JAQU	Liaise with JAQU with regard to developing national frameworks.	Programme Manager							
Finance	Prog-51	Maintenance of assets	Maintenance costs of assets are higher than anticipated.	Underestimation of maintenance requirements/ market forces	Increased operational costs	Finance Manager	M	M	-	-	-	M	11		A-97	Work with asset owners and suppliers	Work with asset owners and suppliers to understand the maintenance requirements and include this within cost plans.	Finance Lead	M	L	-	-	-	M	11
Programme & Project Business Case	Prog-52	GM CAP exacerbates AQ issues on the Highways England network	GM CAP interventions impact AQ issues on the Highways England network.	Interventions planned lead to re-routing onto Highways England network.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	L	VL	-	-	-	M	8	VL cost impact as outside the scope of this programme.	A-98	Highways England included in the Steering Group.	Highways England included in the Steering Group.	SRO	L	VL	-	-	-	M	8
	Prog-52														A-99	Close liaison with Highways England	Continued and on-going liaison with Highways England to ensure that any interventions are included within the modelling process.	Governance & Policy Lead							
Programme & Project Business Case	Prog-53	Clean Air Fund - fund provision	Clean Air Funding is not adequately supported by the Government	Funds not available to support the Programme	AQ compliance not being achieved in the mandated timescales.	Programme Manager	H	H	H	VH	-	VH	20		A-100	Clean Air Fund scoping	Ensure during FBC the Clean Air Funds are fully scoped and work with JAQU to establish fund availability.	Programme Manager	H	H	H	VH	-	VH	20
Finance	Prog-54	Cost estimation uncertainty across all projects	Cost of design and implementation of proposals are inaccurate	Scope development at OBC stage	AQ compliance not being achieved in the mandated timescales.	Finance Manager	M	VH	M	M	-	M	18		A-101	Robust financial model	Robust financial model with robust assumptions and strategy is in place to deal with the costs outcome being higher than anticipated.	Finance Lead	M	H	M	M	-	M	15
	Prog-54														A-102	Parking costs	Review scope and associated costs at FBC stage	Finance Lead							
Data, Evidence & Modelling	Prog-55	Fleet mix	Fleet mix changes ahead of proposed scheme being implemented are not accounted for in Clean Air Fund incentives	Greater Manchester ends up with an old fleet of vehicles	AQ compliance not being achieved in the mandated timescales.	Modelling Lead	M	H	M	H	-	H	15		A-103	Benchmarking of fleets	Build on fleet composition analysis already undertaken to establish an indication of number of retrofits required. Consider imposing a limit or restriction on bringing older vehicles into Greater Manchester service network against the incentives funds	Modelling Lead	VL	L	L	H	-	H	8
Project & Work Package Development	Prog-56	National approach to Clean Air Projects	Inconsistencies between different cities policies with regard to exemptions/approaches with proposed CAZs	No clear national approach to charging and national modes of transport	AQ compliance not being achieved in the mandated timescales.	JAQU	M	H	-	M	-	H	15		A-104	Engagement on national strategy	Liaise with JAQU to understand national approach to charging and Heavy Good Vehicles (HGV) strategy	Programme Manager	L	M	-	M	-	M	8
Project & Work Package Development	Prog-57	Infrastructure technology	Life extension of scheme results in infrastructure installed becoming redundant (technologically)	Upgrade costs not currently factored for could be significant (e.g. ANPR)	AQ compliance not being achieved in the mandated timescales.	Programme Manager	L	M	-	-	-	M	8		A-105	Infrastructure Innovation	Keep abreast with technology changes and market trends on key infrastructure	Programme Manager	L	L	-	-	-	L	6
Project & Work Package Development	Prog-58	Technological changes	Technology develops in market impacting the chargers/ connections	Innovation in market	AQ compliance not being achieved in the mandated timescales.	Programme Manager	L	-	-	M	-	H	10		A-106	Innovation	To ensure best value for money the GMEV contract includes a requirement for bidders to keep pace with technological changes and provide a rate card for varying types of EV infrastructure	Programme Manager	L	-	-	L	-	L	6

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Title:		Appendix E.5.1 - OBC Programme Risk Register (Qualitative) CONFIDENTIAL WORKING DRAFT
Review Date:		2/25/2019

Category/ Workstream	Risk ID	Risk Name	Risk Description	Risk Cause	Risk Consequence	Risk Owner	Pre-Mitigation (VL-VH)							Assessment Assumptions	Action ID	Action Name	Action Description	Action Owner	Post-Mitigation (VL-VH)						
							Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Pre-Mit)						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruption	Policy / Benefit realisation	Risk Score (Post-Mit)
Project & Work Package Development	Prog-59	Lack of network capacity	Electricity North West unable to meet demand of proposed scheme	Electricity NW does not have the capacity to supply scheme	AQ compliance not being achieved in the mandated timescales.	Programme Manager	L	M	-	L	-	M	8		A-107	Engage with Electricity North West	Engage with Electricity North West to establish network capacity and scope for growth in future years	Programme Manager	L	M	-	L	-	L	8
Project & Work Package Development	Prog-60	Emissions	The current focus of the UK plan and direction for the GM CAP is achieving the EU Limit Value based solely on NO_2. There may be unintended consequences on CO_2 and Particulate Matter (PM) concentrations in Greater Manchester.	GM CAP focus is solely on NO_2.	AQ compliance not being achieved in the mandated timescales.	Programme Manager	M	L	L	H	-	H	15		A-108	To be considered during GM CAP and FBC development.	To be considered and taken into account during the development of the GM CAP and FBC.	Programme Manager	L	L	L	H	-	H	10
Programme & Project Business Case	Prog-61	Unforeseen economic effects	Implementing the GM CAP may have unforeseen economic effects.	Uncertainty around the economic effects of the implementation of the GM CAP	Effects will vary depending on area and sector. This may alter economic activity in a number of ways: investment, employment, and business viability (incl. HGV/ LGV). These effects may be both positive and negative, creating some opportunities whilst making others less attractive.	SRO	M	H	H	H	-	M	15		A-109	To be considered during GM CAP and FBC development.	Consultation and engagement with stakeholders to be considered and taken into account during the design development of the GM CAP and FBC. Economic Impact mitigated through current scheme where possible. Thorough further Distributional Impact assessments required in FBC to inform potential schemes and reduce socio-economic impact Review through Monitoring and Evaluation Plan	Programme Manager	M	L	L	H	-	L	15
Project & Work Package Development	Prog-63	Data management	GDPR compliance	Back office interfaces are not clear and are not scoped appropriately.	Reputational challenges Increased operational costs	Programme Manager	M	H	-	H	-	L	15		A-113	Establish clear policies and requirements.	Ensure that there is a clear scope, identified interfaces, policies and contractual requirements are established for GDPR compliant processes and behaviours.	Programme Manager	L	M	-	H	-	L	10
Procurement	Prog-64	Procurement responses	Proposed packages of work are not seen as attractive by the market and responses from tenderers/ bidders are not forthcoming.	Lack of market interest.	Re-tenders may be required, or a change to the procurement strategy. AQ compliance not being achieved in the mandated timescales.	Procurement Manager	L	H	H	M	-	H	10		A-114	Early engagement with the supply chain.	Engage with the supply chain to ensure that packages of work will be attractive to the marketplace.	Procurement Manager	VL	H	H	M	-	H	8
Procurement	Prog-65	Supplier capacity	Risk that due to a high level of national demand on a limited number of suppliers, a lack of supplier capacity could lead to long-lead times or increased costs.	Market forces	AQ compliance not being achieved in the mandated timescales.	Procurement Manager	L	M	H	H	-	H	10		A-115	Early engagement with the supply chain.	Early engagement with the supply chain to inform levels of anticipated demand and allow suppliers to plan for this.	Procurement Manager	VL	M	H	H	-	H	8

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GM CAP Top Risks Report (Confidential Working Draft)

PreMit Rank	PostMit Rank	Risk Score (Pre-Mit)	Risk Score (Post-Mit)	Category/ Workstream	Risk ID	Risk Name	Risk Description	Risk Cause	Risk Consequence
1	1	25	20	Programme & Project Business Case	Prog-44	FBC activities are to be run in parallel.	Streamlining of the FBC schedule requires activities to be run in parallel.	Timescales for delivery of the GM CAP. (see related threat Prog-39 and the requirement to meet funding timescales).	AQ compliance not being achieved in the mandated timescales. Re-work and increased costs.
1	4	25	18	Finance	Prog-42	Inflation forecasts	Inflation forecasts for 10 years are incorrect and this leads to increased operational costs.	Various, including uncertainty around Brexit.	Increased operational costs
3	1	20	20	Programme & Project Business Case	Prog-53	Clean Air Fund - fund provision	Clean Air Funding is not adequately supported by the Government	Funds not available to support the Programme	AQ compliance not being achieved in the mandated timescales.
3	3	20	19	Project & Work Package Development	Prog-30	Local Authority may be responsible for managing Highways England attributable emissions.	Some Local Authority exceedances may be attributable to emissions from the Strategic Road Network (SRN) (Highways England), where the exceedance is measured on the LA road but attributable to emissions from the SRN. Compliance cannot be delivered because emissions from the SRN cannot be reduced sufficiently.	Clarification/ confirmation from JAQU indicate that where some exceedances are on the Local Authority network and are partly attributable to SRN emissions, the expectation is that the Local Authority proposals will be expected to deliver compliance on that link.	AQ compliance not being achieved in the mandated timescales.
3	4	20	18	Programme & Project Business Case	Prog-39	Timescales of Greater Manchester submission of approved FBC for Implementation/ Clean Air Fund	As per the schedule, Greater Manchester will be submitting an approved FBC for funding towards the end of the JAQU funding deadline.	Proposed scheme is complex to deliver and may not meet JAQU's expectations with regard to the FBC submission (the point at which funding is released).	AQ compliance not being achieved in the mandated timescales.
6	16	19	15	Governance & Policy	Prog-2	Delays with the Local Authority approval process	Ten Local Authorities with differing constitutional arrangements need to reach agreement on the preferred option.	Approval process, number of interfaces. New interventions being introduced by stakeholders.	Delays to decision making resulting in AQ compliance not being achieved in the mandated timescales. Additional legal advice may be required.
6	16	19	15	Project & Work Package Development	Prog-15	Decision makers require a level of information that is not feasible to produce	Additional research and evaluation of preferred option is required (and possibly at multiple stages), but may prove to be insufficient to support decision makers	Insufficient information is available to make key decisions.	Delays to achieving AQ compliance. Further investigation and research required leading to delays and additional costs.
6	16	19	15	Legal	Prog-32	Developing information is released early.	Early release of developing information to the public domain may impact plans for consultation, engagement, and reputation, leading to delays to GM CAP development or consultation plans.	Early release of developing information to public domain e.g. press, social media.	AQ compliance not being achieved in the mandated timescales.
6	16	19	15	Procurement	Prog-50	Returned tenders are over the estimated Cost Plan.	Risk that the returned tenders are over the estimated Cost Plan or do not represent appropriate Value for Money (VfM).	Market forces/ demand. Procurement timescales for the implementation.	AQ compliance not being achieved in the desired timescales and impact on costing.
10	4	18	18	Legal	Prog-17	Public Inquiry	A Public Inquiry may be required during the development and implementation of the GM CAP	Local Authority discretionary decision. Feedback by local resident groups, local businesses etc. identifying significant objection to proposed measures	AQ compliance not being achieved in the mandated timescales. Cost/schedule implications
10	4	18	18	Procurement	Prog-31	Implementation funding not secured prior to procurement.	Good quality tenders will not be received, or prices will be inflated because funding will not be secured before the procurement exercise needs to begin.	Procurement exercise must be undertaken before funding can be secured to be able to pay suppliers.	AQ compliance not being achieved in the desired timescales and impact on costing.
10	4	18	18	Programme & Project Business Case	Prog-37	Outline Business Case (OBC) not approved by Government	OBC not approved by Government, leading to delays.	OBC not approved by Government.	AQ compliance not being achieved in the mandated timescales.
10	4	18	18	Programme & Project Business Case	Prog-38	Full Business Case (FBC) not approved by Government	FBC not approved by Government, leading to delays.	FBC not approved by Government.	AQ compliance not being achieved in the mandated timescales.
10	4	18	18	Programme & Project Business Case	Prog-45	Availability of affordable compliant vehicles.	The cumulative effect of multiple schemes across the UK drives up the cost of new/second hand vehicles considerably and/or causes delay to compliance due to lengthy wait times (new vehicles).	National approach influences whole market	Costs to upgrade fleet are higher or upgrade process takes longer than anticipated. AQ compliance not being achieved in the mandated timescales.
10	11	18	17	Data, Evidence & Modelling	Prog-11	Modelling / information	Predictive nature of modelling leading to potential uncertainty	Predictive nature of modelling leading to potential uncertainty	AQ compliance not being achieved in the mandated timescales.
10	11	18	17	Programme & Project Business Case	Prog-12	Effectiveness of GM CAP following implementation	Implementation of the preferred option does not reduce NO2 to levels predicted within the model. This risk cannot be determined to have impacted immediately - it is a long-term risk, over several years.	Behaviour change expected in modelling process is not achieved in real life.	AQ compliance not being achieved in the mandated timescales.
10	11	18	17	Project & Work Package Development	Prog-16	Technology required within timescales available	Technology required to deliver the required improvements is not available within the timescales to support the preferred option.	Technology required is not defined and still needs to be confirmed.	AQ compliance not being achieved in the mandated timescales.
10	11	18	17	Finance	Prog-23	Whole life costs	Whole life costs have yet to be finalised and JAQU have yet to review the funding proposal.	How whole life costs are to be managed has yet to be confirmed at this stage.	Unexpected potential financial liabilities flowing to GM.

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GM CAP Top Risks Report (Confidential Working Draft)

PreMit Rank	PostMit Rank	Risk Score (Pre-Mit)	Risk Score (Post-Mit)	Category/ Workstream	Risk ID	Risk Name	Risk Description	Risk Cause	Risk Consequence
10	16	**18**	**15**	Governance & Policy	Prog-3	Public consultation/ decision making in Pre-Election Periods	Potential for delays to the schedule if consultation or governance is required during Pre-Election Periods causes issues.	Internal/ external (e.g. Local Authorities) governance requirements, additional rework. JAQU advice/ requirements are subject to change.	AQ compliance not being achieved in the mandated timescales.
10	16	**18**	**15**	Governance & Policy	Prog-4	Additional decisions/ governance required throughout the development of the business case & programme delivery	Additional decisions/ governance required or takes longer than anticipated - internal, local authority (High level governance, not specific powers or consents - the required governance could vary significantly depending on the content of the business case and/or the scope of the preferred option.).	Varied governance processes, uncertainty around governance, overlap with other strategies. Unforeseen government requirements	AQ compliance not being achieved in the mandated timescales.
10	16	**18**	**15**	Legal	Prog-8	Legal challenge	Legal challenge about the approach taken	Objections to the approach and/ or timescales.	AQ compliance not being achieved in the mandated timescales.
10	16	**18**	**15**	Programme & Project Business Case	Prog-28	JAQU reviews and governance requirements	JAQU reviews and governance requirements not achieved within the scheduled time scales/ requiring multiple iterations.	JAQU guidance unavailable at the time of drafting. JAQU estimation of the level of work required to close out.	AQ compliance not being achieved in the mandated timescales.
10	16	**18**	**15**	Finance	Prog-40	Optimism Bias	As recommended, HM Treasury Green Book guidance is followed, but does not prove appropriate for this scheme.	Clean Air Plans are novel and there are few 'lessons learned' to inform the guidance. There are no available case studies for reference.	Differing cost of Implementation - a request for more funding is required
10	16	**18**	**15**	Finance	Prog-54	Cost estimation uncertainty across all projects	Cost of design and implementation of proposals are inaccurate	Scope development at OBC stage	AQ compliance not being achieved in the mandated timescales.
25	11	**17**	**17**	Programme & Project Business Case	Prog-46	Leaving the European Union (BREXIT)	Risk due to potential outcomes of the consultation regarding the plans for European Union Withdrawal; unknown at this stage whether this will have impact on the GM CAP.	Change of Governmental priorities.	AQ compliance not being achieved in the mandated timescales.
25	31	**17**	**13**	Procurement	Prog-48	Risk that a supplier/ preferred supplier goes into administration	Risk that a supplier/ preferred supplier goes into administration.	Market forces	AQ compliance not being achieved in the mandated timescales.
25	36	**17**	**10**	Data, Evidence & Modelling	Prog-24	Fleet redeployment	Older fleet being redeployed in Greater Manchester from other areas because of the differences in approach and timescales between different authorities that may be taken.	If solution implemented in Greater Manchester is more favourable than other areas.	AQ compliance not being achieved in the mandated timescales.
25	36	**17**	**10**	Marketing, Communications, Stakeholder Engagement & Consultation	Prog-49	Further Consultation work required	Risk that further consultation required above the level currently anticipated	Timescales do not support serial development.	Retrospective changes may be required, increasing the cost to the LA's.
29	16	**15**	**15**	Governance & Policy	Prog-5	Political mandate	Political changes impact on schedule or vary scope.	Outcome of the 2019 local & Euro elections, changes nationally.	AQ compliance not being achieved in the mandated timescales.
29	16	**15**	**15**	Procurement	Prog-26	Procurement strategies	Procurement Strategies are developed in isolation from similar schemes across the UK and obvious areas of synergy are missed.	Lack of national framework leads to multiple frameworks being utilised.	AQ compliance not being achieved in the mandated timescales. Increased costs due to market demand
29	16	**15**	**15**	Procurement	Prog-34	Procurement of the next phase Lead Advisor	Schedule is delayed as a result of delays in the procurement of the next phase Lead Advisor.	Procurement process takes longer than anticipated.	AQ compliance not being achieved in the mandated timescales.
29	16	**15**	**15**	Programme & Project Business Case	Prog-61	Unforeseen economic effects	Implementing the GM CAP may have unforeseen economic effects.	Uncertainty around the economic effects of the implementation of the GM CAP	Effects will vary depending on area and sector. This may alter economic activity in a number of ways: investment, employment, and business viability (incl. HGV/ LGV). These effects may be both positive and negative, creating some opportunities whilst making others less attractive.
29	36	**15**	**10**	Data, Evidence & Modelling	Prog-10	Target Determination is not agreed in the required timescales	Target Determination is not agreed.	Differences between JAQU and local data	AQ compliance not being achieved in the desired timescales or impact on costings.
29	36	**15**	**10**	Project & Work Package Development	Prog-14	Interaction with other Greater Manchester initiatives	Interfaces with other near-term Greater Manchester initiatives. Unforeseen impacts of Greater Manchester initiatives, or of the proposed solutions to the Greater Manchester initiatives.	Extent and wide-range of scope and interfaces.	Unforeseen complexities around interfaces and/ or interactions many result in AQ compliance not being achieved in the mandated timescales.
29	36	**15**	**10**	Project & Work Package Development	Prog-60	Emissions	The current focus of the UK plan and direction for the GM CAP is achieving the EU Limit Value based solely on NO2. There may be unintended consequences on CO2 and Particulate Matter (PM) concentrations in Greater Manchester.	GM CAP focus is solely on NO2.	AQ compliance not being achieved in the mandated timescales.
29	36	**15**	**10**	Project & Work Package Development	Prog-63	Data management	GDPR compliance	Back office interfaces are not clear and are not scoped appropriately.	Reputational challenges Increased operational costs

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GM CAP Top Risks Report (Confidential Working Draft)

PreMit Rank	PostMit Rank	Risk Score (Pre-Mit)	Risk Score (Post-Mit)	Category/ Workstream	Risk ID	Risk Name	Risk Description	Risk Cause	Risk Consequence
29	45	15	8	Data, Evidence & Modelling	Prog-55	Fleet mix	Fleet mix changes ahead of proposed scheme being implemented are not accounted for in Clean Air Fund incentives	Greater Manchester ends up with an old fleet of vehicles	AQ compliance not being achieved in the mandated timescales.
29	45	15	8	Project & Work Package Development	Prog-56	National approach to Clean Air Projects	Inconsistencies between different cities policies with regard to exemptions/approaches with proposed CAZs	No clear national approach to charging and national modes of transport	AQ compliance not being achieved in the mandated timescales.
39	30	14	14	Finance	Prog-35	JAQU may not agree the revised cost plan	JAQU may not agree the revised cost plan. Time taken to reach agreement may cause funding issues for Greater Manchester.	Long-term costs are difficult to estimate until scope is fully clarified.	AQ compliance not being achieved in the mandated timescales.
39	32	14	11	Human Resources	Prog-18	Resources	Uncertainty around resourcing requirements - extent of work / teams is underestimated, increasing costs / duration of activities. Availability of internal/ external resources with competing demands for time. Capability of internal/ external resources to meet the requirements Retention of critical staff - Key/ Critical/ Specialist resources may become unavailable, at short notice.	Uncertainty around the resource requirements. Emerging requirements. Experience of available staff. Market forces/ staff churn.	AQ compliance not being achieved in the desired timescales costings are not credible.
39	32	14	11	Audit and Assurance	Prog-25	Assurance requirements	Additional assurance may be required, depending on the scope of the programme as it develops.	Full scope of the programme/ projects is yet to be determined.	Additional resource requirements. Potential delays to meet assurance requirements - AQ compliance not being achieved in the mandated timescales.
39	32	14	11	Legal	Prog-33	Legal scope	Legal scope is unclear at this stage. If the legal scope is not understood, then Greater Manchester risk not complying with the remit of the programme, or having to change the scope of the programme/ projects to address any shortcomings.	Lack of clarity around the full legal scope - due to the timescales to-date.	AQ compliance not being achieved in the mandated timescales.
43	32	11	11	Finance	Prog-51	Maintenance of assets	Maintenance costs of assets are higher than anticipated.	Underestimation of maintenance requirements/ market forces	Increased operational costs
43	45	11	8	Programme & Project Business Case	Prog-6	JAQU guidance changes	Guidance not available within the required timescales, insufficient JAQU guidance or changes to the guidance.	The guidance is not issued, is insufficient, or changed by JAQU. Potential difference between drafts and advice because of timescales of submissions.	AQ compliance not being achieved in the desired timescales and impact on costs. Reputational impact to Greater Manchester authorities
43	45	11	8	Finance	Prog-27	Commodity price increases	Rise of commodity prices as a result of Brexit or other unforeseen exchange rate fluctuations drives significant cost increases.	Market forces	Impact on costings.
43	54	11	7	Governance & Policy	Prog-13	Positioning of Greater Manchester approach impacts working relationship with Highways England.	Lack of Highways England direction to act is highlighted by Greater Manchester AQ issue.	Highways England are operating under a different statutory framework and are not working under the same direction as Local Authorities.	Impact to working relationship with Highways England and partnership with the wider Steering Group.
43	55	11	6	Marketing, Communications, Stakeholder Engagement & Consultation	Prog-7	Low public awareness of the issue of air pollution.	Low public awareness of the impact of air pollution may increase objections to the implementation of the GM CAP.	Current level of public understanding and awareness.	Reluctance to change travel behaviour and adopt sustainable, clean, transport options. AQ compliance not being achieved in the mandated timescales.
48	36	10	10	Project & Work Package Development	Prog-20	Highways England Interventions	Interventions / changes by Highways England that impact the GM CAP.	Highways England is a separate entity who may implement their own interventions to meet their requirements, within the prescribed timescales. Alternatively, Highways England may undertake significant infrastructure changes and influence flows, and therefore vehicles move to Local Authority roads and cause unforeseen exceedances.	AQ compliance not being achieved in the desired timescales or impact on costings.
48	36	10	10	Programme & Project Business Case	Prog-43	JAQU funding	JAQU require Greater Manchester Combined Authority (GMCA) to reduce ongoing operational cost	Decision by JAQU	Greater Manchester have to absorb some costs as part of their Business As Usual (BAU) Reputational risk if spending on other areas is impacted.

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GM CAP Top Risks Report (Confidential Working Draft)

PreMit Rank	PostMit Rank	Risk Score (Pre-Mit)	Risk Score (Post-Mit)	Category/ Workstream	Risk ID	Risk Name	Risk Description	Risk Cause	Risk Consequence
48	36	10	10	Procurement	Prog-47	Framework Agreements	Complexity of using various framework agreements and uncertainty over whether full scope of proposals will be covered by existing frameworks.	Complexity of using a number of existing frameworks.	AQ compliance not being achieved in the mandated timescales.
48	45	10	8	Customer	Prog-41	Public Transport Capacity/ Active travel infrastructure	Limited public transport capacity/ active travel infrastructure to compliment a modal shift, as a result of potential CAZ schemes	Insufficient timescales to implement.	AQ compliance not being achieved in the mandated timescales.
48	45	10	8	Procurement	Prog-64	Procurement responses	Proposed packages of work are not seen as attractive by the market and responses from tenderers/ bidders are not forthcoming.	Lack of market interest.	Re-tenders may be required, or a change to the procurement strategy. AQ compliance not being achieved in the mandated timescales.
48	45	10	8	Procurement	Prog-65	Supplier capacity	Risk that due to a high level of national demand on a limited number of suppliers, a lack of supplier capacity could lead to long-lead times or increased costs.	Market forces	AQ compliance not being achieved in the mandated timescales.
48	55	10	6	Project & Work Package Development	Prog-58	Technological changes	Technology develops in market impacting the chargers/ connections	Innovation in market	AQ compliance not being achieved in the mandated timescales.
55	45	8	8	Programme & Project Business Case	Prog-52	GM CAP exacerbates AQ issues on the Highways England network	GM CAP interventions impact AQ issues on the Highways England network.	Interventions planned lead to re-routing onto Highways England network.	AQ compliance not being achieved in the mandated timescales.
55	45	8	8	Project & Work Package Development	Prog-59	Lack of network capacity	Electricity North West unable to meet demand of proposed scheme	Electricity NW does not have the capacity to supply scheme	AQ compliance not being achieved in the mandated timescales.
55	55	8	6	Project & Work Package Development	Prog-57	Infrastructure technology	Life extension of scheme results in infrastructure installed becoming redundant (technologically)	Upgrade costs not currently factored for could be significant (e.g. ANPR)	AQ compliance not being achieved in the mandated timescales.
58	58	4	4	Legal	Prog-9	Impact to climate change strategy	Changes in fleet composition impacts ambitions related to climate change strategy.	Clean Air Plan (as defined by Government) is focussed on reduction of NO2.	Impacts Carbon Plan and other emission reduction strategies

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GM CAP Risk Probability Impact Grid Report (Confidential Working Draft)

Pre-Mitigation *58 / 58*

Probability	Low	Medium	High	Critical	
Very High			1		2
High			4	4	3
Medium			5	10	15
Low			3	7	3
Very Low			1		
Impact	Very Low	Low	Medium	High	Very High

Post-Mitigation *58 / 58*

Probability	Low	Medium	High	Critical	
Very High			1		
High			1	1	2
Medium		1	4	14	7
Low		3	5	9	4
Very Low			1	4	1
Impact	Very Low	Low	Medium	High	Very High

TfGM Risk Assessment Criteria

Likelihood criteria	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
	≤5%	6-25%	26-50%	51-75%	>75%

Impact Criteria	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
Project Cost					
T1 = < £1m	£0 - £5k	>£5k - £10k	>£10k - £30k	>£30k - £50k	>£50k
T2 = £1-10m	£0 - £30k	>£30k - £75k	>£75k - £200k	>£200k - £500k	>£500k
T3 = £10-50m	£0 - £50k	>£50k - £300k	>£300k - £500k	>£500k - £1m	>£1m
T4 = £50-400m	£0 - £100k	>£100k - £400k	>£400k - £1m	>£1m - £5m	>£5m
T5 = >£400m	£0 - £1m	>£1m - £5m	>£5m - £25m	>£25m - £50m	>£50m
Schedule	<2 weeks delay **OR** no impact on end date/ deadline.	2-4 weeks delay **OR** low impact on key activities; no impact on the end date (occurs at development stage and can be accommodated in schedule).	4-8 weeks delay **OR** significant impact to key milestones or activities but no impact on end date (requires changes to schedule to meet end date).	8-12 weeks delay **OR** significant impact to key milestone or activities and delays to the end date. No knock-on effect on other schemes / activities/ revenues.	>12 weeks delay **OR** significant impact significant impact to key milestone or activities and delays to the end date. Knock on effects on other schemes / activities/ revenues.
Health & Safety	Minor injuries; cuts and bruises (First Aid Case).	RIDDOR Reportable (Over Three Day Injury)	Serious Injury (Non Life Threatening)	Major injury (Life Threatening)	Fatality
Reputation & Legal	Isolated local complaints e.g. noise complaints; unlikely to lead to a loss in customer patronage / affect scheme. No legal concerns.	Local complaints by a local group: will reduce affection for TfGM in that locality. Minor legal concerns.	Serious local poor publicity that curtails TfGM's ability to operate effectively in that area without active stakeholder engagement OR region-wide poor publicity from not meeting additional customer expectations (e.g. cleanliness, ticketing & information accuracy); will reduce affection for TfGM network wide. Manageable legal concerns.	Region-wide poor publicity from not meeting minimum customer expectations (e.g. journey times and reliability); will seriously reduce affection for TfGM, gradually erode network patronage or ability to attract funding & customers from other modes (car). Potentially serious legal concerns.	Serious poor publicity and legal concerns: will affect public trust in TfGM, likely to have an immediate impact on customer patronage, or lead to the closure of a route or voiding of a scheme. E.g. serious H&S incident or violation of competition or other laws.
Service Disruption	Up to 1 day disruption to a non-critical route or system outside peak period.	> 2 days disruption to a non-critical route or to an IS system with restricted usage (e.g. SAP Financials) outside peak period.	> 1 day disruption to a restricted IS system or to a widely used but non-critical IS system (e.g. Intranet) during peak period. Up to 3 hours disruption to a critical route outside peak period.	Up to 3 hours disruption to a critical IS system (e.g. Hardrives/ Signalling) during peak usage. Up to 1 hour disruption to a critical route during peak period.	> 3 hours disruption to a critical IS system or > 1 hour disruption to a critical route during peak period.
Policy / Benefit realisation	Minimal delay or interruption to the realisation of a benefit / objective or loss of less than 10% of predicted benefits	Minor delay or interruption to the realisation of a benefit / objective or loss of 10-25% of predicted benefits	Reduces viability/ impacts on efficiency, output, and quality of benefits / objectives or loss of 25-50% of predicted benefits	Major impact on objectives. Serious impact on output and/or quality or loss of 50-80% of predicted benefits	Critical impact on the achievement of objectives and overall performance or loss of more than 80% of predicted benefits

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TfGM Risk Assessment Criteria

Risk Matrix: Probability X Impact

Probability	*Low*	*Medium*	*High*	*Critical*		**Showstopper**
Very High	**5**	**10**	**15**	**20**	**25**	
High	**4**	**8**	**14**	**19**	**20**	
Medium	**3**	**7**	**11**	**15**	**18**	
Low	**2**	**6**	**8**	**10**	**17**	
Very Low	**1**	**2**	**4**	**8**	**13**	
Impact	Very Low	Low	Medium	High	Very High	

Dotted line is Risk Tolerance score.

Risk Scores>>		
Score 19 - 25	**Zone 1**	*Critical*
Score 14 - 18	**Zone 2**	*High*
Score 7 - 13	**Zone 3**	*Medium*
Score < 6	**Zone 4**	*Low*

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

E5 Registers
E5.2 – Project Risk Register

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Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

Title:	Appendix E.5.2 - OBC Project Risk Register (Qualitative)
Review Date:	2/25/2019

Project Category	Risk ID	Risk Description	Risk Cause	Risk Consequence	Risk Owner	Pre-Mitigation (VL-VH)						Risk Score (Pre-Mit)	Action ID	Action Name	Action Description	Action Owner	Post-Mitigation (VL-VH)						Risk Score (Post-Mit)	Review Notes/ Reason for change (incl. date of update)
						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruptic	Policy / Benefit realisation						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruptic	Policy / Benefi realisation		
Clean Air Zone (CAZ)	PROJ-1	Feedback on the proposed Greater Manchester Clean Air Plan (GM CAP) design during consultation(s) and through stakeholder/political engagement significantly impacts project costs and schedule	Feedback on the scheme results in revisions to the design	Scheme design revision Reputational challenges Delays to implementation Air Quality (AQ) compliance not achieved in desired timescales	TfGM - CAZ Project Financial Lead	H	VH	VH	VH	-	VH	20	PROJ ACTION - 1	Scheme revisions	Provide robust evidence to support scheme design and the well thought through strategy Obtain feedback at a formative stage from consultations and inform technical and economic models if any changes are required Review conditions of proposed scheme, informed by additional data/information from other Local Authorities, DEFRA, consultation	TfGM - CAZ Project Financial Lead	M	H	VH	H	-	VH	18	
Clean Bus Fund	PROJ-2	Some buses cannot be retrofitted due to the age of vehicles within the Greater Manchester bus fleet	The proposed age of vehicle which is valid for retrofit only applies to part of the total Greater Manchester bus fleet.	AQ compliance not achieved in desired timescales Reputational challenges Disruption to services/customers Potentially charges passed to customers	TfGM - Clean Bus Fund Project Lead	H	L	-	M	VH	H	20	PROJ ACTION - 2	Stakeholder engagement with bus operators	Stakeholder engagement - work with bus operators throughout the Full Business Case (FBC) stage to ensure they are prepared for the proposed changes and understand the road to AQ compliance to minimise impact and disruption to customers Maximise other relevant funds, where available.	TfGM - Clean Bus Fund Project Lead	M	VL	-	M	M	VH	18	
Clean Freight Fund	PROJ-3	Lack of availability for affordable second hand compliant LGVs	Affordability of new and second hand LGVs	AQ compliance not achieved in desired timescales Economic impact on businesses/ customers	TfGM - Clean Freight Fund Project Lead	H	M	-	M	-	VH	20	PROJ ACTION - 3	Entry criteria and eligibility for funds Engagement with LGV owners	Establish in more detail at FBC stage to ensure that there are measures in place to ensure that the entry criteria and eligibility for the Clean Freight Fund addresses this risk through scheme design and mitigate against to any issues. Stakeholder engagement - work with small business and LGV owners throughout the FBC stage to ensure they are prepared for the proposed changes Proposed incentive scheme is designed to address this issue Work with JAQU on vehicle market (national) impacts of multiple schemes	TfGM - Clean Freight Fund Project Lead	M	M	-	L	-	H	15	
Clean Bus Fund	PROJ-4	Greater Manchester Bus fleet cannot be retrofitted in desired timescales	Lack of market capacity to carry out retrofits on the Greater Manchester bus fleet within the required timescales	AQ compliance not achieved in desired timescales Disruption to services/customers Delays to schedule Reputational challenges	TfGM - Clean Bus Fund Project Lead	H	H	VH	M	M	H	20	PROJ ACTION - 4	Market Engagement	During the FBC stage, engagement with potential suppliers for retrofitting of buses will be carried out to establish availability, costs and timescales -. These will be managed as appropriate to ensure compliance within the bus fleet in the shortest possible time Greater Manchester has written to the Secretary of State to request that national issues are addressed. Dialogue with the Government is ongoing on this issue.	TfGM - Clean Bus Fund Project Lead	M	M	M	M	-	M	11	
Clean Air Zone (CAZ)	PROJ-5	Interface between local system and Defra's Central Charging System (CCS) is unclear and therefore local system cannot be scoped	Uncertainty of scope from JAQU for FBC/Implementation with regard to IT infrastructure	AQ compliance not achieved in desired timescales Delays to schedule	JAQU	H	H	H	-	-	H	19	PROJ ACTION - 5	Engagement to understand CCS	Liaise with JAQU to understand scope of CCS and interface with local IT infrastructure	TfGM - CAZ Project Lead	M	H	M	-	-	H	15	
Clean Taxi Fund	PROJ-6	Lack of compliant vehicle availability in second hand hackney carriage market. Vehicles entering second hand market drop in value.	Hackney manufacturers have stopped making Euro 6 vehicles - now focuses on Electric Vehicle (EVs)	AQ compliance not achieved in desired timescales Delays to schedule Increase in project costs	TfGM - Clean Taxi Fund Project Lead	H	M	-	M	-	H	19	PROJ ACTION - 6	Taxi upgrades	Ensure that there are mechanisms in place to commence hackney upgrades and replacements Early engagement with the market is required Greater Manchester has written to the Secretary of State to request that national issues are addressed. Dialogue with the Government is ongoing on this issue.	TfGM - Clean Taxi Fund Project Lead	M	M	-	M	-	H	15	
Loan Finance	PROJ-7	Unable to collect payments and cover costs associated with repaying capital	Payment stops from those who have taken out the loan	Increased operational costs	TfGM - Loan Finance Lead	H	M		H		VL	19	PROJ ACTION - 7	Operational model (2)	Establish Loan Finance operational criteria in more detail at a FBC stage to ensure that there are measures in place to mitigate against this potential issue	TfGM - Loan Finance Lead	M	L	-	H	-	M	15	
Clean Air Zone (CAZ)	PROJ-8	The scale of a proposed CAZ IS infrastructure is significant and causes unforeseen delays and additional costs associated with implementation.	Scale of proposed scheme to achieve compliance	AQ compliance not achieved in desired timescales Delays to implementation Increase in project costs	TfGM - CAZ Project Lead	H	M	M	H	-	M	19	PROJ ACTION - 8	CAZ - scale of scheme	Design of scheme to consider risks associated with IS infrastructure implementation Coordinate Traffic Regulation Orders (TROs) centrally using a central resource to work with the Local Authorities	TfGM - CAZ Project Lead	M	M	M	M	-	M	11	
Electric Vehicle Infrastructure and Promotion	PROJ-9	Uptake of EV is lower than predicted in models	Lack of second hand market or attractiveness for vehicle users. Public perception of EV, results in reduced uptake	AQ compliance not achieved in desired timescales	TfGM - EV Project Lead	M	L	-	M	-	H	15	PROJ ACTION - 9	EV strategy	Ensure there is strategy for the EV infrastructure for owned assets in Greater Manchester and promote EV where possible Challenge Government to maintain/reintroduce support for EVs Build on existing EV promotion with business to encourage uptake through the early measures project	TfGM - EV Project Lead	M	L	-	M	-	M	11	
Loan Finance	PROJ-10	Operational costs are not covered by scheme	Admin costs are higher than anticipated Unable to recover costs from those taking out the loan	Increased operational costs	TfGM - Loan Finance Lead	M	H		M		VL	15	PROJ ACTION - 10	Operational model (1)	Establish Loan Finance operational criteria in more detail at FBC stage to ensure that there are measures in place to mitigate against this potential issue through systems and process and contingency funds	TfGM - Loan Finance Lead	M	M	-	M	-	VL	11	
LA & GM Fleet Upgrade	PROJ-11	Local Authority/Greater Manchester 'family' operational fleets are not compliant	Current Local Authority/Greater Manchester 'family' operational fleets are not 100% compliant	Reputational challenges AQ compliance not achieved in desired timescales	TfGM - LA & GM Fleet Upgrade Project Lead	M	-	-	H	-	M	15	PROJ ACTION - 11	Local Authority/Greater Manchester 'family' fleet upgrades	Ensure that the Local Authority/Greater Manchester 'family' operational fleet upgrades are scheduled during FBC stage	TfGM - LA & GM Fleet Upgrade Project Lead	L	-	-	H	-	M	10	
Loan Finance	PROJ-12	Loans are abused/not utilised to replace non-compliant vehicles with complaint vehicles	Processes are not robust enough to ensure full compliance	Increased operational costs AQ compliance not achieved in desired timescales	TfGM - Loan Finance Lead	M	L		H		H	15	PROJ ACTION - 12	Loan design	Ensure appropriate restrictions and checks are in place to ensure compliant vehicles are purchased from approved dealers. This could be mitigated by using a 3rd party assessing and administering criteria for successful applicants.	TfGM - Loan Finance Lead	L	-	-	H	-	L	10	
Loan Finance	PROJ-13	Scheme is not compliant with State Aid rules	Challenge from businesses/individuals Interest rate charges fluctuate	Increased costs AQ compliance not achieved in desired timescales	TfGM - Loan Finance Lead	M	M		H		L	15	PROJ ACTION - 13	Loan Design & Governance	Establish Loan Finance criteria in more detail at a FBC stage to ensure compliance and get informed legal opinion about structure of loan finance.	TfGM - Loan Finance Lead	L	M	-	H	-	L	10	

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Title:	Appendix E.5.2 - OBC Project Risk Register (Qualitative)
Review Date:	2/25/2019

Project Category	Risk ID	Risk Description	Risk Cause	Risk Consequence	Risk Owner	Pre-Mitigation (VL-VH)						Risk Score (Pre-Mit)	Action ID	Action Name	Action Description	Action Owner	Post-Mitigation (VL-VH)						Risk Score (Post-Mit)	Review Notes/ Reason for change (incl. date of update)
						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruptic	Policy / Benefit realisation						Likelihood	Project Cost	Schedule	Reputation & Legal	Service Disruptic	Policy / Benefi realisation		
Clean Air Zone (CAZ)	PROJ-14	Drivers seek out to alternative routes to avoid Automatic Number Plate Recognition (ANPR) cameras	Anticipation of drivers avoiding certain routes	AQ compliance not achieved in desired timescales	TfGM - CAZ Project Lead	M	M	-	H	-	H	15	PROJ ACTION - 14	Camera enforcement	Mobile enforcement is being considered an potential to install new cameras on identified alternative routes - capture in Monitoring and Evaluation approach	TfGM - CAZ Project Lead	L	M	-	M	-	M	8	
Clean Air Zone (CAZ)	PROJ-15	Assumed levels of non-compliance and non-payment are incorrect	Financial model predictions, not based on local data	Increased operational costs	TfGM - CAZ Project Financial Lead	M	H	-	M	-	H	15	PROJ ACTION - 15	Financial Model Refinement	Refine non compliance and non payment assumptions throughout FBC to inform Financial model	TfGM - CAZ Project Financial Lead	L	M	-	M	-	M	8	
Clean Air Zone (CAZ)	PROJ-16	Back office resources for CAZ operation need to reflect customer support requirements	Uncertainty of end user support scope	Increased operational costs Reputational challenges	TfGM - CAZ Project Lead	M	H	-	M	-	-	15	PROJ ACTION - 16	Back office scope	Refine back office scope and resources in FBC stage Confirm procurement approach and requirements are developed to ensure that peaks and troughs can be accommodated	TfGM - CAZ Project Lead	L	M	-	L	-	-	8	
Loan Finance	PROJ-17	Systems and processes that are designed do not adequately meet the required operational outputs	Approval and admin activities are more complex than anticipated	Increased operational costs AQ compliance not achieved in desired timescales	TfGM - Loan Finance Lead	M	L		H		M	15	PROJ ACTION - 17	Loan design	A FCA Regulated Organisation would be required to administer the scheme	TfGM - Loan Finance Lead	L	-	-	L	-	M	8	
Loan Finance	PROJ-18	Scheme is not FCA approved	Agreement between 3rd party and GMCA is not FCA approved	AQ compliance not achieved in desired timescales	TfGM - Loan Finance Lead	M	H		H		L	15	PROJ ACTION - 18	Loan regulator / administrator	An FCA Regulated Organisation would be required to administer the scheme.	TfGM - Loan Finance Lead	L	M	-	M	-	L	8	
Clean Air Zone (CAZ)	PROJ-19	Liaising with other Local Authorities outside of Greater Manchester to put up CAZ signage in advance of entering a CAZ	Feasibility process to date hasn't included extensive engagement with neighbouring authorities	AQ compliance not achieved in desired timescales Delays to schedule Increased costs	TfGM - CAZ Project Lead	H	M	M	L	-	L	14	PROJ ACTION - 19	Clean Air Zone - signs outside Greater Manchester	Liaise with connecting Local Authorities during FBC stage to ensure coordination and agreement to implement	TfGM - CAZ Project Lead	M	L	M	L	-	L	11	
Loan Finance	PROJ-20	Initial point of entry is through Vehicle Renewal Scheme is challenged. Increased risk of loan default if criteria for successful applicants is widened	Entry criteria is challenged	Increased operational costs. AQ compliance not achieved in desired timescales	TfGM - Loan Finance Lead	H	M		M		L	14	PROJ ACTION - 20	Vehicle Renewal Scheme	Develop scheme criteria in FBC design	TfGM - Loan Finance Lead	M	M	-	M	-	L	11	
LA & GM Fleet Upgrade	PROJ-21	Fleet compliance with Clean Vehicle Retrofit Accreditation Scheme (CVRAS)	Vehicles not currently CVRAS accredited	AQ compliance not achieved in desired timescales	TfGM - LA & GM Fleet Upgrade Project Lead	H	L	M			M	14	PROJ ACTION - 21	CVRAS accreditation	An industry delivered solution will have to be developed to ensure that the fleet is approved by the Clean Vehicle Retrofit Accreditation Scheme (CVRAS)	TfGM - LA & GM Fleet Upgrade Project Lead	M	L	M			M	11	
Clean Air Zone (CAZ)	PROJ-22	Implementation of CAZ signage on SRN	Feasibility process to date hasn't included extensive engagement with Highways England	AQ compliance not achieved in desired timescales Delays to schedule Increased costs	TfGM - CAZ Project Lead	M	M	M	M	-	L	11	PROJ ACTION - 22	Clean Air Zone - SRN	Engage with Highways England at the earliest opportunity to inform signage requirements and associated requirements to inform costs and timescales Highways England sit on the GM CAP Steering Group and will be kept informed of scheme developments	TfGM - CAZ Project Lead	M	L	M	L	-	L	11	
Loan Finance	PROJ-23	Level of interest/uptake is either very low or very high	Assumptions in financial model are incorrect	Increased operational costs AQ compliance not achieved in desired timescales	TfGM - Loan Finance Lead	M	L		M		M	11	PROJ ACTION - 23	Policy Design	Ensure policy design is undertaken following OBC approval to determine appropriate criteria. Consider communications strategy/advertisement of the loans	TfGM - Loan Finance Lead	L	L	-	M	-	H	10	
Electric Vehicle Infrastructure and Promotion	PROJ-24	Sites identified do not match the EV demand analysis	Charging point implementation doesn't meet EV site demand	AQ compliance not achieved in desired timescales	TfGM - Clean Taxi Fund Project Lead	M	M	-	M	-	M	11	PROJ ACTION - 24	EV site identification	Analysis is carried out to identify suitable and accessible sites for EV charging points currently and where to encourage uptake in the future. Build on site identification process for rapid charging points being carried out in Early Measures project	TfGM - Clean Taxi Fund Project Lead	L	M	-	L	-	M	8	
Clean Bus Fund	PROJ-25	Cross-boundary buses are non-compliant with proposed CAZ standards	Buses are not compliant to operate inside of Greater Manchester	AQ compliance not achieved in desired timescales	TfGM - Clean Bus Fund Project Lead	M	L	-	M	-	M	11	PROJ ACTION - 25	Liaise with Bus Team - cross boundary services	Liaise with bus team and engage with operators and neighbouring authorities to understand these cross boundary routes and the full impact to cost, retrofitting, service and timescales	TfGM - Clean Bus Fund Project Lead	L	L	-	M	-	L	8	
Sustainable Journeys	PROJ-26	Sustainable Journeys offerings (Public Transport and Active Travel) do not receive the desired uptake	Offer not attractive or suitable for targeted audience Communications campaign and promotion isn't effective	AQ compliance not achieved in desired timescales	TfGM - Sustainable Journeys Work Package Lead	M	-	-	L	-	M	11	PROJ ACTION - 26	Public awareness	Work with comms team to promote sustainable journeys and align with Made to Move Initiative	TfGM - Sustainable Journeys Work Package Lead	L	-	-	L	-	M	8	
Bus capacity	PROJ-27	Operators unable to meet capacity with compliant buses	Bus retrofit and upgrade of vehicles aren't achieved in the desired timescales	AQ compliance not achieved in desired timescales	TfGM - Bus Capacity Lead	M	L	L	M		L	11	PROJ ACTION - 27	Bus capacity	Liaise with bus operators early to establish capability and work with them to address any potential issues to delivery	TfGM - Bus Capacity Lead	L	VL	L	M	-	L	8	
Loan Finance	PROJ-28	Unable to access the required amount of capital to fund the measure	Capital availability is lower than anticipated	Increased operational costs AQ compliance not achieved in desired timescales	TfGM - Loan Finance Lead	L	L		H		M	10	PROJ ACTION - 28	Loan Finance Access	Post OBC risk appetite for GMCA in underwriting loans needs to be agreed so as to ensure a minimum loan default risk adjusted position is taken by GMCA.	TfGM - Loan Finance Lead	VL	L	-	H	-	M	8	

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TfGM Risk Assessment Criteria

Appendix E.5.2 - OBC Project Risk Register (Qualitative) CONFIDENTIAL WORKING DRAFT	
Review Date:	12/5/2018

Pre-Mitigation *28 / 28*

Probability	Low	Medium	High	Critical	
Very High					
High			3	4	4
Medium			6	10	
Low				1	
Very Low					
Impact	Very Low	Low	Medium	High	Very High

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Post-Mitigation *28 / 28*

Probability	Low	Medium	High	Critical	
Very High					
High					
Medium			8	4	2
Low			9	4	
Very Low				1	
Impact	Very Low	Low	Medium	High	Very High

TfGM Risk Assessment Criteria

Likelihood criteria	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
	≤5%	6-25%	26-50%	51-75%	>75%

Impact Criteria	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
Project Cost					
T1 = < £1m	£0 - £5k	>£5k - £10k	>£10k - £30k	>£30k - £50k	>£50k
T2 = £1-10m	£0 - £30k	>£30k - £75k	>£75k - £200k	>£200k - £500k	>£500k
T3 = £10-50m	£0 - £50k	>£50k - £300k	>£300k - £500k	>£500k - £1m	>£1m
T4 = £50-400m	£0 - £100k	>£100k - £400k	>£400k - £1m	>£1m - £5m	>£5m
T5 = >£400m	£0 - £1m	>£1m - £5m	>£5m - £25m	>£25m - £50m	>£50m
Schedule	<2 weeks delay **OR** no impact on end date/ deadline.	2-4 weeks delay **OR** low impact on key activities; no impact on the end date (occurs at development stage and can be accommodated in schedule).	4-8 weeks delay **OR** significant impact to key milestones or activities but no impact on end date (requires changes to schedule to meet end date).	8-12 weeks delay **OR** significant impact to key milestone or activities and delays to the end date. No knock-on effect on other schemes / activities/ revenues.	>12 weeks delay **OR** significant impact significant impact to key milestone or activities and delays to the end date. Knock on effects on other schemes / activities/ revenues.
Health & Safety	Minor injuries; cuts and bruises (First Aid Case).	RIDDOR Reportable (Over Three Day Injury)	Serious Injury (Non Life Threatening)	Major injury (Life Threatening)	Fatality
Reputation & Legal	Isolated local complaints e.g. noise complaints; unlikely to lead to a loss in customer patronage / affect scheme. No legal concerns.	Local complaints by a local group: will reduce affection for TfGM in that locality. Minor legal concerns.	Serious local poor publicity that curtails TfGM's ability to operate effectively in that area without active stakeholder engagement OR region-wide poor publicity from not meeting additional customer expectations (e.g. cleanliness, ticketing & information accuracy); will reduce affection for TfGM network wide. Manageable legal concerns.	Region-wide poor publicity from not meeting minimum customer expectations (e.g. journey times and reliability); will seriously reduce affection for TfGM, gradually erode network patronage or ability to attract funding & customers from other modes (car). Potentially serious legal concerns.	Serious poor publicity and legal concerns: will affect public trust in TfGM, likely to have an immediate impact on customer patronage, or lead to the closure of a route or voiding of a scheme. E.g. serious H&S incident or violation of competition or other laws.
Service Disruption	Up to 1 day disruption to a non-critical route or system outside peak period.	> 2 days disruption to a non-critical route or to an IS system with restricted usage (e.g. SAP Financials) outside peak period.	> 1 day disruption to a restricted IS system or to a widely used but non-critical IS system (e.g. Intranet) during peak period. Up to 3 hours disruption to a critical route outside peak period.	Up to 3 hours disruption to a critical IS system (e.g. Hardrives/ Signalling) during peak usage. Up to 1 hour disruption to a critical route during peak period.	> 3 hours disruption to a critical IS system or > 1 hour disruption to a critical route during peak period.
Policy / Benefit realisation	Minimal delay or interruption to the realisation of a benefit / objective or loss of less than 10% of predicted benefits	Minor delay or interruption to the realisation of a benefit / objective or loss of 10-25% of predicted benefits	Reduces viability/ impacts on efficiency, output, and quality of benefits / objectives or loss of 25-50% of predicted benefits	Major impact on objectives. Serious impact on output and/or quality or loss of 50-80% of predicted benefits	Critical impact on the achievement of objectives and overall performance or loss of more than 80% of predicted benefits

Risk Matrix: Probability X Impact

Probability	*Low*	*Medium*	*High*	*Critical*	

TfGM Risk Assessment Criteria

Very High	5	10	15	20	25	Showstopper
High	4	8	14	19	20	
Medium	3	7	11	15	18	
Low	2	6	8	10	17	
Very Low	1	2	4	8	13	
Impact	Very Low	Low	Medium	High	Very High	

Dotted line is Risk Tolerance score.

Risk Scores>>			
	Score 19 - 25	**Zone 1**	*Critical*
	Score 14 - 18	**Zone 2**	*High*
	Score 7 - 13	**Zone 3**	*Medium*
	Score < 6	**Zone 4**	*Low*

Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Glossary

Draft for Approval

Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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1 Acronyms & Abbreviations

Term	Description
ADMS	Air Dispersion Modelling System
AGMA	Association of Greater Manchester Authorities
ANPR	Automatic Number-Plate Recognition
AQ	Air Quality
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
BAME	Black, Asian and Minority Ethnic
BAU	Business As Usual
BC	Business Case
BCR	Benefit Cost Ratio
CAF	Clean Air Fund
CAP	Clean Air Plan
CAPEX	Capital Expenditure
CAZ	Clean Air Zone
CBA	Cost Benefit Analysis
CBTF	Clean Bus Technology Fund
CCG	Clinical Commissioning Group
CCS	Central Charging System
CCTV	Closed-circuit television (surveillance cameras)
CENTRO	Transport for West Midlands
CHD	Coronary Heart Disease
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
COAD	Certification of Approved Decision
COMEAP	Committee on the Medical Effects of Air Pollutants
COPD	Chronic Obstructive Pulmonary Disease

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Term	Description
CPZ	Controlled Parking Zones
CSF	Critical Success Factors
CSO	Charging Scheme Order
DBOM	Design Build Operate & Maintain
D-IRP	Delivery Independent Review Panel
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DI	Distributional Impacts
DM	Do Minimum
DT	Diffusion Tubes
DVLA	Driver and Vehicle Licensing Agency
ECI	Early Contractor Involvement
EEA	European Economic Area
EMIGMA	Emissions Inventory for Greater Manchester
EQIA	Equality Impact Assessment
EU	European Union
EV	Electric Vehicle
FBC	Full Business Case
FCA	Financial Conduct Authority
GBP	The Pound Sterling
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GM	Greater Manchester
GM CAP	Greater Manchester Clean Air Plan
GMAL	Greater Manchester Accessibility Levels
GMCA	Greater Manchester Combined Authority
GMEV	Greater Manchester Electric Vehicle (Network)
GMFM	Greater Manchester Forecasting Model

Draft for approval

Term	Description
GMFRS	Greater Manchester Fire and Rescue Service
GMLEP	Greater Manchester Local Enterprise Partnership
GMP	Greater Manchester Police
GMPTE	Greater Manchester Passenger Transport Executive
GMSF	Greater Manchester Spatial Framework
GRP	Gateway Review Panel
GtL	Gas to Liquid
GVA	Gross Value Added
HEAT	Health Economic Assessment Tool
HGV	Heavy Goods Vehicle
IAAP	Integrated Assurance and Approvals Plan
IMD	Index of Multiple Deprivation
IMS	Integrated Management System
IRR	Inner Relief Route
IS	Information Systems
ITT	Invitation to Tender
JAQU	Joint Air Quality Unit
KMs	Kilometres
KPI	Key Performance Indicator
LA	Local Authority
LAQM	Local Air Quality Management
LE	Life Expectancy
LEPs	Local Enterprise Partnerships
LES	Low Emission Strategy
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
LPG	Liquefied Petroleum Gas
LSOA	Lower Layer Super Output Area

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Term	Description
LSTF	Local Sustainable Transport Fund
MCA	Multiple Criteria Analysis
M&E	Monitoring and Evaluation
NHS	National Health Service
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
NPV	Net Present Value
O_3	Ozone
O&M	Operations & Maintenance
OB	Optimism Bias
OBC	Outline Business Case
OGV	Other Goods Vehicle
OJEU	Official Journal of the European Union
OLEV	Office for Low Emission Vehicles
ONS	Office for National Statistics
PCM	Pollution Climate Mapping
PCN	Penalty Charge Notice
PEP	Project Execution Plan
PHE	Public Health England
PHV	Private Hire Vehicles
PM	Particulate Matter
PM_{10}	Particulate Matter With An Aerodynamic Diameter Of Less Than 10 Microns
$PM_{2.5}$	Particulate Matter With An Aerodynamic Diameter Of Less Than 2.5 Microns
PMFDTS	Project Management & Full Design Team Services
PMM	Project Management Methodology
PMO	Project Management Office
PMP	Project Management Procedures
ProgMP	Programme Management Procedures

Draft for approval

Term	Description
PT	Public Transport
PVB	Present Value Benefits
PVC	Present Value Costs
PWLB	Public Works Loan Board
QC	Queen's Counsel
QCRA	Quantified Cost Risk Assessment
RMP	Risk Management Plan
RMS	Risk Management System
RPA	Risk Potential Assessment
SATURN	Simulation and Assignment of Traffic to Urban Road Networks
SMEs	Small and medium sized enterprises
SOC	Strategic Outline Case
SPV	Special Purpose Vehicle
SRN	Strategic Road Network
SRO	Senior Responsible Officer
T-IRP	Technical Independent Review Panel
TAG	Transport Analysis Guidance
TCF	Transforming Cities Fund
TfGM	Transport for Greater Manchester
TfGMC	Transport for Greater Manchester Committee
TNC	Transport Network Companies
TRO	Traffic Regulation Order
TUBA	Transport User Benefit Appraisal
UAZ	Urban Area Zone
UK	United Kingdom
ULEV	Ultra Low Emission Vehicles
ULEZ	Ultra Low Emission Zone
UNFCC	United Nations Framework Convention on Climate Change

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Term	Description
VCA	Vehicle Certification Agency
VfM	Value for Money
VOC	Vehicle Operating Costs
VOSA	Vehicle and Operator Services Agency
VPR	Vehicle Passage Records
WHO	World Health Organisation
µg/m^3	Microgramme per cubic metre

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2 Glossary

Term	Description
Air Quality Action Plan	Development of a local Air Quality Action Plan (AQAP) to improve air quality is a statutory requirement once an air quality management area (AQMA) has been declared.
Air Quality and Environment Portfolio	A portfolio comprising all TfGM's programmes, projects and business as usual activities required to achieve its objective to reduce carbon emissions and improve air quality.
Air Quality Management Area	An area where the National Air Quality Objectives are unlikely to be achieved. The Air Quality Management Area (AQMA) in Manchester is declared for predicted exceedances of the annual nitrogen dioxide (NO2) air quality objective.
Automatic Number Plate Recognition	Automatic Number Plate Recognition (ANPR) is surveillance technology which uses optical character recognition on camera images to read a vehicle's number plate.
Background Maps	Maps of modelled background concentrations at 1 km x 1 km resolution for a range of pollutants including oxides of nitrogen (NOx) and nitrogen dioxide (NO2), provided by JAQU. These will be used principally to define the contribution to ambient concentrations from non-local sources, such that only local sources need be modelled in detail. It is likely that road transport will be the most significant local source, although other local sources can be modelled if relevant.
Back Office	is the portion of a company made up of administration and support personnel who are not client facing. Back office functions include settlements, record maintenance, regulatory compliance, accounting and IS services.
Baseline Year	(As used in Options Appraisal) The projected outcomes under a no-action scenario, with no additional measures to improve air quality. This should draw on baseline projections for both air quality and transport models, with an appraisal period of 10 years from the scheme's implementation. Interpolation and/or extrapolation can be used if not all these years have been modelled.
Base year	The year used for validation of the transport and air quality dispersion models against recently collected real-world data. It is preferable for the same base year to be used in both transport and air quality models. The base year for the transport model should be no more than 5 years old and for the Air Quality model it should be 2015 or later (Local authorities should discuss with their account manager if you intend to use different base years for the models).
Benchmark option	A benchmark option is a policy that is likely to be effective at delivering compliance in the shortest possible time. A benchmark option is therefore an important tool in helping to define what 'shortest possible time' means for each local authority area and provides a tangible illustration of the minimum expected of other potential policy options.
Benefit Cost Ratio	An indicator used to show the relationship between the relative costs and benefits of a proposed project, expressed in monetary or qualitative terms.

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Term	Description
Bus capacity	Liaison with Bus Operators to agree routes with expected increase in demand for Bus Operators to plan increases to commercial services.
Business Case	A business case is a written or verbal value proposition that is intended to inform decision making.
Central Evaluation Programme	Evaluation Programme for Clean Air Plans nationally, commissioned and managed by JAQU.
Charging Scheme Order	An Order under the Transport Act 2000 and Road User Charging Scheme Regulations 2013, putting in law the imposing a charge for a defined class of vehicle and within a scheme.
Chronic obstructive pulmonary disease	Chronic obstructive pulmonary disease (COPD) is a type of obstructive lung disease characterized by long-term breathing problems and poor lung flow.
Clean Air Fund	A Clean Air Fund (CAF) allows local authorities to bid for additional money to support the implementation of measures to improve air quality. This could include interventions such as improvements to local bus fleets, support for concessionary travel and more sustainable modes of transport such as cycling, or infrastructure changes
Clean Air Plan	A Clean Air Plan (CAP) is a plan including targets and inputs designed to reduce congestion and improve air quality. Where an AQMA is designated, local authorities are required to produce a Clean Air Plan.
Clean Air Zone	A Clean Air Zone (CAZ) defines an area where targeted action is taken to improve air quality and resources are prioritised and coordinated in order to shape the urban environment in a way that delivers improved health benefits and supports economic growth.
Clean Air Zone - Non Charging	Defined geographic areas used as a focus for action to improve air quality. This action can take a range of forms including, but not limited to optimising traffic management, communications/publicising, traffic restrictions but does not include the use of charge based access restrictions.
Clean Air Zone - Charging	These are zones where, in addition to the Non-charge CAZ, vehicle owners are required to pay a charge to enter, or move within, a zone if they are driving a vehicle that does not meet the particular standard for their vehicle type in that zone. Clean Air Zone proposals are not required to include a charging zone, and local authorities may consider alternatives to charging such as access restrictions for certain types of vehicle.
Clean Bus Fund	Part of the Vehicle Renewal Scheme which would offer subsidies to retrofit the majority of existing Euro IV and V buses with flexibility for the move to an EV bus network, including financial assistance towards charging infrastructure, prioritised on Air Quality benefits and commercial contribution. In addition, coaches would be eligible under the Clean Freight Fund.

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Term	Description
Clean Freight Fund	Part of the Vehicle Renewal Scheme which would offer local small, micro businesses, sole traders and the voluntary sector, registered in Greater Manchester, with a discount on the purchase of a compliant commercial vehicle from an approved supplier when scrapping a non-compliant vehicle or retrofitting to make compliant. Priority for funding will be based primarily on-air quality impact such that the most polluting vehicles can be targeted. Vans, minibuses, HGV, coaches would be in scope for this fund.
Clean Taxi Fund	A fund that would offer Greater Manchester registered taxi and private hire drivers support to upgrade their non-compliant vehicles. The establishment of a Clean Taxi Fund would offer taxi and private hire drivers a discount on the purchase of a compliant vehicle from an approved supplier when trading in a non-compliant taxi. It will also provide funding for the retrofitting of taxis. It should be noted that the scheme would only be open to vehicles and drivers licensed within Greater Manchester.
Client Earth	A charity containing lawyers and environmental experts that are focussed on tackling climate change and protecting nature and the environment.
Company Watch	Provides risk analysis and data modelling tools to organisations around the world to understand and predict exposure to financial risk.
Conversation	An initial phase of informal consultation activity, the outputs from which will inform the ongoing detailed design of the measures, and build the understanding around impacts of the 'best performing option' from a public and stakeholder perspective
Consultation	Formal/statutory consultation on the preferred option as required. In terms of statutory this is with specific reference to the Charging Scheme Order.
Critical Success Factors	Critical Success Factors (CSF) for the CAP are project objectives/considerations, which are used to conduct a high-level assessment of the longlist of options as part of the strategic outline case stage and informing outline business case. The Critical Success Factors should include a pass/fail criterion on whether the proposed option achieves NO2 compliance in the shortest possible time.
Crown Commercial Service	The Crown Commercial Service (CCS) brings together policy, advice and direct buying; providing commercial services to the public sector and saving money for the taxpayer.
Delivery Agent	A sub-contractor or other public sector body tasked with delivering a Measure in whole or in part.
Delivery Body	The organisation established or formally instructed to procure and deliver the GM CAP Programme with accountability for the building of the Service(s).
Department for Environment, Food and Rural Affairs	The Department for Environment, Food and Rural Affairs (Defra) is the UK government department responsible for safeguarding the natural environment and supporting food and farming and the rural economy.
Discounting	A method used to convert future costs or benefits to present values using a discount rate.

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Term	Description
Discount rate	The annual percentage rate at which the present value of a £, or other unit of account, is assumed to fall away through time.
Discount value	Current worth of a future sum of money.
Distributional Analysis	Distributional analysis looks at the degree to which policies impact upon different groups of people or businesses. Distributional analysis is necessary to understand whether a particular policy unduly favours or disadvantages particular groups in society.
Distributional Impacts	(As above) are impacts that are distributed across different social and economic groups and geographies.
Do Minimum	The minimum intervention required to deliver core objectives. This excludes any additional features that may also be possible and bring additional benefits.
Early Measures	This funding is to support small, ambitious, good value for money measures that deliver air quality improvements. These are complementary to the feasibility study and larger local plan that delivers compliance.
Economic assessment (cost benefit analysis)	The economic assessment is essentially the detailed appraisal of a policy's value for money, looking at the monetised costs and benefits to society. This looks more widely than simply the direct financial impacts of a measure, considering the wider societal impacts.
Early Contractor Involvement	Early contractor involvement (ECI) allows the Contractor to be appointed under a two-stage ECC contract before details of what is to be constructed have been fully developed and priced. This enables the Contractor to take part in the design development and construction planning stage of a project.
Elasticity	Elasticities measure how one variable responds to changes in another. For example a fuel elasticity of demand shows how the number of vehicle trips taken would change in response to a change in the price of fuel.
Electric Vehicle (EV) Infrastructure and Promotion	Delivery of 300 additional Rapid Charging Points (Dual Headed) across Greater Manchester, including a proportion ring-fenced for taxi and private hire vehicles (PHVs) only. In addition to the charging points, TfGM would deliver a targeted marketing and engagement campaign with Greater Manchester businesses and residents that will showcase the benefits of EVs, highlight the support that is available and provide an opportunity for EVs to be compared across a range of suppliers.
Emission Factor Toolkit	A tool to allow calculations of pollutant emissions from road transport, including for NOx, and other pollutants for a specified year, road type, vehicle speed and vehicle fleet composition.
Enterprise Zone	Enterprise zones are designated areas across England where the Government grant special tax or regulatory exemptions in order to promote local economic development.
Equality Impact Assessment	A process by which the impact of policies and services on communities, users and non-users is assessed.

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Term	Description
European emission standards or Euro standards	EU-wide standards for exhaust emissions of air pollutants. Current standards for new vehicles are: 'Euro 6' for light duty vehicles (cars and vans) and 'Euro VI' for heavy duty vehicles.
Executive Board	The Executive Board is the ultimate decision-making body within TfGM and is responsible for determining strategic issues consistent with GMCA's policies.
Feasibility study	A feasibility study is the process from the local air quality assessment to the development of a final business case for the local plan.
Financial Conduct Authority	Conduct regulator for financial service firms and financial markets in the UK.
Full Business Case	Final iteration of the business case and the case that goes for Defra Secretary of State approval. This sets out the final preferred option in detail and include inputs from any consultation. The implementation and procurement route will be detailed, and how it will be managed and the benefits realised.
Gender pay gap	The gender pay gap is the difference in the average hourly wage of all men and women across a workforce.
Greater Manchester Highways Group	A forum for engagement by highways leads across the GM area, including key external Highways stakeholders, to drive the Highways element of the GM Transport Strategy and meet pan-GM Highways needs. Attended by senior level representatives from Highways England, TfGM, the 10 GMCA Local Authorities and Greater Manchester Police empowered with the authority of Highway Leads. The Group is accountable collectively to WLT and individuals are accountable to their WLT member for decisions taken.
Greater Manchester Passenger Transport Executive	The Greater Manchester Passenger Transport Executive (GMPTE) was the original name for the public body which is now Transport for Greater Manchester (changed in 2011).
Greater Manchester Spatial Framework	The Greater Manchester Spatial Framework (GMSF) is a joint plan for Greater Manchester that will provide the land for jobs and new homes needed across the city region up to 2035.
Greenhouse gases	The term Greenhouse gas (GHG) refers to carbon dioxide, nitrous oxide, methane, ozone and chlorofluorocarbons occurring naturally and resulting from human (production and consumption) that contribute to the greenhouse effect.
Gross Value Added	Gross Value Added (GVA) is the value generated by any unit engaged in the production of goods and services.
Heavy Goods Vehicle	A Heavy Goods Vehicle (HGV) is a large goods vehicle with a gross combination mass of over 3.5 tonnes.

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Term	Description
Impact Factor	Impact factors are provided by JAQU and capture the value in GBP per person of a 1 µgm-3 change in concentration of a pollutant. The impact factors represent the pathway between exposure to a pollutant and the ultimate health or environmental outcome.
Impact pathway	The impact pathway approach is a methodology recommended by Defra for the estimation of the health and environmental costs and benefits of air pollution. The approach depends on standard estimates of impacts and their valuation (impacts factors).
Impact variable	The variables that change as a result of the option (e.g. air quality or affordability).
Implementation Costs	Unit costs for land, construction, vehicles etc.
Implementation Fund	A Government fund of £255m to support local authorities to prepare their plans and deliver targeted action to improve air quality. This funding will support the immediate work to conduct feasibility studies, implement early measures and deliver local plans.
Inner Relief Route	The Inner Relief Route (IRR) is the geographic area which covers the city centre of Manchester and sits within the Manchester and Salford council areas. The IRR zone extends to Manchester Victoria station in the north, the Ring Road to the east and the A57 Mancunian way leading onto Trinity way to the south and east respectively.
Integrated Assurance Strategy	An effective framework to provide assurance across the TfGM portfolio of change activity, which builds on the existing TfGM Gateway Review Process, combined with nationally accepted best practice.
Joint Air Quality Unit (JAQU)	JAQU is the joint unit between two Government Departments, the Department of Environment, Food and Rural Affairs (Defra) and the Department for Transport (DfT) which has responsibility to deliver and implement the UK plan for tackling roadside nitrogen dioxide concentrations.
Loan Finance	In additional to centrally funded swappage or scrappage schemes which would be funded by JAQU, a Loan Finance scheme will provide loans at preferential rates for those who are taking advantage of the Vehicle Renewal Scheme-this could be through a loan for a vehicle or subsidy of a lease plan.
Local Air Quality Management	Through the Local Air Quality Management (LAQM) system local authorities are required to assess air quality in their area and designate Air Quality Management Areas (AQMA) if improvements are necessary.
Local Enterprise Partnerships	Local Enterprise Partnerships (LEPs) are locally-owned partnerships between local authorities and businesses. They play a central role in deciding local economic priorities and undertaking activities to drive economic growth and create local jobs.

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Term	Description
Low Emission Zone	A Low Emission Zone (LEZ) is a geographically defined area where the most polluting vehicles in the fleet are restricted or discouraged from entering.
Limit Value	European Union Limit Value regarding levels of NO2 in major urban areas (40 micrograms per cubic metre (µg/m3)) set by the European Ambient Air Quality Directive (2008/50/EC) as implemented into UK law by the 2010 Air Quality Standards Regulations (SI. 2010 No. 1001)
Light Goods Vehicle	A Light Goods Vehicle (LGV) is a goods vehicle weighing no more than 3.5 tonnes.
Local Authority Fleet Upgrade	Upgrade of the Local Authority and Greater Manchester family fleets to the lowest emitting vehicles. This will include all Local Authority operated cars/vans, refuse collection vehicles, HGVs, contracted services and the TfGM provided bus fleet.
Local Plan	The plan local authorities are developing as part of their feasibility studies. It is the local authorities plan to bring an area of exceedance into compliance required by government and does not refer to any already established local air quality action plans within a local authority area.
Longlist	A broad range of options, created to ensure that all realistic alternatives have been adequately considered, thereby justifying the selection of an option. The list should include a 'do nothing' (baseline) option (which will help to show why taking action is necessary) which is taken forward as the baseline.
Lower Layer Super Output Areas	Lower Layer Super Output Areas (LSOA) are geographical definitions used for the mapping of social and economic characteristics. Lower Super Output Areas typically have a resident population of around 1,500 people.
Main public transport modes	The combination of all public transport modes within the transport model. In choice hierarchy, this is mainly the composite mode modelled in higher choice level in the choice tree above public transport sub-modes.
Maintenance/Renewal Costs	Unit rates or simple models.
Major Projects Association	A membership association for organisations engaged in the delivery and the development of major projects, programmes and portfolios. The central aim is to share experience, knowledge and ideas about major projects – both successes and failures – to help others to avoid mistakes and to incorporate good practice, in order that future projects would be better initiated and delivered.
Marginal external costs	Change in the total cost incurred by households or businesses, associated with a unit-change in the consumption or output of other households or businesses.
Multiple Criteria Analysis	Multiple Criteria Analysis (MCA) aims to compare different actions or solutions according to a variety of criteria and policies.
Net Present Value	Net Present Value (NPV) is the sum of the discounted benefits of an option less the sum of its discounted costs, all discounted to the same base year.

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Term	Description
Office for Low Emission Vehicles	The Office for Low Emission Vehicles (OLEV) is a team working across government to support the early market for ultra-low emission vehicles (ULEV).
OJEU	The Official Journal of the European Union is the publication in which all tenders from the public sector which are valued above a certain financial threshold according to EU legislation must be published.
Operating Agent	A sub-contractor or other public-sector body tasked with operating (and decommissioning) one or more of the Measures in whole or in part over their lifetime.
Operating Body	The body accountable for the ongoing delivery of the Service(s) and to manage, govern and provide oversight of GM CAP Programme outputs.
Operating Costs	Models of the costs of operating public transport and charging systems.
Operations Board	The Operations Board will replace the Programme Board in the operational phase and will be response for the overall operations of the Programme.
Optimism bias	The demonstrated systematic tendency for appraisers to be over-optimistic about key project parameters, including capital costs, works duration and benefits realisation.
Options Appraisal	The process of defining objectives, examining options and weighing up the costs, benefits, risks and uncertainties of those options before a decision is made.
Outline Business Case	Second iteration of the business case. Provides additional detail and identifies the preferred option based on full analyses. It should set out the likely implementation and procurement route and demonstrate the affordability of the scheme.
Parking Standards and Local Authority Parking	Encompasses two key processes that can enable a mode shift to more sustainable transport options. A parking standards review that incorporates new developments, with the aim of replacing minimum with maximums standards in high density, accessible locations. In terms of Local Authority staff parking a review is to be undertaken on the provision of staff car parking and usage. The effort of Local Authorities is assumed to be a significant promoting force for the public.
Particulate matter	Airborne particulate matter is made up of a collection of solid and/or liquid materials of various sizes that range from a few nanometres in diameter (about the size of a virus) to around 100 micrometres.

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Term	Description
PM2.5/PM10	PM2.5 Airborne particulate matter with an aerodynamic diameter of 2.5µm (micrometres or microns) or less PM10 Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less Their potential for causing health problems is directly linked to the size of the particles. A growing body of research has pointed towards the smaller particles, in particular PM2.5, as a metric more closely associated with adverse health effects.
Penalty Charge Notice	Most councils have the power to enforce parking penalties under the Traffic Management Act 2004, which are often known as a 'Penalty Charge Notice' (PCN).
Project Execution Plan	The project execution plan (PEP) is the governing document that establishes the means to execute, monitor, and control projects. The plan serves as the main communication vehicle to ensure that everyone is aware and knowledgeable of project objectives and how they will be accomplished.
Project Management & Full Design Team Services	Project Management & Full Design Team Services (PMFDTS) will enable customers to access project management, design and advisory services to support delivery of property and construction projects. PMFDTS provides strategic, broad based advice across a wide range of disciplines and functions to support, guide and provide innovative solutions to public sector customers.
Pollution Climate Mapping	The PCM model is the UK's national air quality model and provides outputs of pollutant concentrations in the UK at a 1x1 km resolution and also at roadside locations for around 9,000 urban major roads (A and M class roads).
Programme Board	The Programme Board will report to the Steering Group and will be chaired by the Senior Reporting Officer. This group will be responsible for the day to day management and overall delivery of each project within the Programme.
Preferred option for a scheme	The preferred option is the one that fits the strategic aims of the intervention whilst delivering best value for money. This is from the shortlist of options modelled.
Primary Critical Success Factor	A pass/fail scoring mechanism for the assessment of options, or combination of options in the Clean Air Plan development. Any option that does not satisfy this criterion is automatically be excluded from the assessment. This specifically is: 'Delivery of compliance within the shortest possible time'
Project Management Methodology	A project management methodology is essentially a set of guiding principles and processes for managing a project.

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Term	Description
Project Management Procedures	Defining the processes that are performed throughout the life of a project to ensure the efficient and effective management of projects.
Public Contracting Regulations	The rules on the purchasing of goods and services by public sector bodies in the UK as set out through the Public Contract Regulations 2015.
Quantified Cost Risk Analysis	A process as part of cost estimation that helps decision makers to understand not only the potential funding exposure but also the nature of risks for a particular project or programme and possible responses to them.
Quintile	A quintile is one of five values that divide a range of data into five equal parts whereby quintile one represents the first fifth (0-20%) of the data and quintile five represents the last fifth (80-100%) of the data.
Receptors	The hypothetical points in the air quality dispersion modelling at which the concentrations of NO2 are calculated. These will include a grid of points across the model domain, and additional points as specified in the evidence package that enable comparisons with the national model and are consistent with the siting criteria defined in the Air Quality Directive.
Re-mode	To change travel mode from private vehicle use to active travel (walking or cycling) or public transport.
Risk	Specified uncertainties that arise in the design, planning and implementation of an intervention.
Risk Potential Assessment	Used to assess the strategic risk potential of programmes and projects and well as emerging policies and initiatives that are expected to be delivered through a programme or project.
Risk Register	A tool used to record the risks specified to a proposal, their likelihood and value and the assignment of risk management responsibility.
Routes	Roads outside the Inner Relief Route (IRR) and Urban Centres
Rule of Half	The Rule of Half is a restatement of the meaning of 'median' in statistics - in any population, and using any measure, half the people will be on one side of the median, half on the other.
Social Value	Net measure of total welfare resulting from an option or intervention. Alternatively, it is the sum of total benefits and total costs of an intervention, including private and social costs and benefits.
Scenario modelling	Modelling which accounts for the measures proposed in the feasibility study (also known as ‘with measures’ modelling).

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Term	Description
Secondary Critical Success Factors	Options that meet the primary CSF (above) are scored against the following CSFs in order to determine which option would be best relative to other considerations, these include: Value for Money Distributional Impacts Strategic and wider air quality fit Supply side capacity and capability Affordability Achievability
Senior Leadership Team	TfGM Executive management activity is co-ordinated through the Senior Leadership Team, which meets at least monthly and comprises the Chief Executive; the Director of Finance and Corporate Services; the Chief Operating Officer and other Senior Leaders.
Sensitivity testing	Testing which aims to determine the degree to which a model's outputs vary in response to 'plausible changes in individual assumptions.
Shortlist	A smaller range of options which have been assessed against the critical success factors and judged to be the options most likely to achieve the objectives of the project. The shortlist of options are then taken forward for more in-depth air quality, transport and economic modelling. The shortlist should include a 'do nothing' (baseline) option (which will help to show why taking action is necessary) and a benchmark option.
Small and medium sized enterprises	The definition of small and medium sized enterprises (SMEs) encompasses any business with fewer than 250 employees.
Social Benefits	The total increase in the welfare of society from an economic action – the sum of the benefit to the agent performing the action plus the benefit accruing to society as a result of the action (external benefits).
Social Cost	The total cost to society of an economic activity – the sum of the opportunity costs of the resources used by the agent carrying out the activity, plus any additional costs imposed on society from the activity (external costs).
Spending Objective	Main objective of the project, which the Green Book terms the 'spending objective.' See options appraisal package.
Steering Group	Developed as part of the GM CAP, the group contains senior representatives from each of the ten GM local authorities, GMCA, Public Health England, Highways England and JAQU.
Strategic Outline Case	First iteration of the business case. This presents a strong case for change, and will confirm the strategic content of the proposal to do this. Initial analysis should be used to refine a long list to a short list of options to take forward. It should include indicative management, procurement and costs.

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Term	Description
Study Area	The area expected to be affected significantly by measures to be implemented under the local plan. This should include the target area of the measures themselves and the additional surrounding area that is expected to be impacted by measures (e.g. such as diversion routes). We anticipate this will be a larger area than the road(s) in exceedance of 40µg/m3.
Sustainable Journeys	Package of engagement and education measures and incentives targeted using behavioural insights techniques and data to a range of different audiences designed to influence and enable a shift to more sustainable transport options. It adds value to the overall Clean Air Plan package by providing practical and targeted assistance to facilitate behaviour change, filling the gap between the wider communications activities and infrastructure / regulatory measures in order to lower emissions.
Target Area	The area which will be directly impacted by the measures under the local plan. This could be limited to a stretch of road, for individual road based measures, or the area where implementation occurs, for measures impacting a series of locations.
Target Determination	A process involving comparison of the outputs of the local and PCM air quality modelling, then agreeing the most appropriate concentration assessment to be compared to the limit value. This is needed to understand how big and improvement needs to be made in a particular location in order to determine how soon compliance can be achieved.
Terms of Reference	A description of the objectives and structure of a group or meeting; the GM CAP Steering Group Terms of Reference are attached to the OBC as an appendix.
Transaction Costs	Expenses incurred when buying or selling a good or service.
Transport for Greater Manchester Committee	The Transport for Greater Manchester Committee (TfGMC) is a joint committee of the Greater Manchester Combined Authority (GMCA) and the ten local authorities in Greater Manchester. It is responsible for advising the GMCA on transport policy, recommending how much money is spent on supporting public transport and monitoring the quality and performance of transport services. TfGM (formerly the GMPTE) carries out the decisions of GMCA and TfGMC.
TG16	Local Air Quality Management (LAQM) Technical Guidance developed by Government to support local authorities in carrying out their duties under the Environment Act 1995, the Environment (Northern Ireland) Order 2002, and subsequent regulations.
The Plan	Government's UK plan for tackling roadside nitrogen dioxide (NO2) concentrations (the Plan). This set out how Government would bring UK NO2 concentrations within the statutory annual limit of 40 micrograms per cubic metre (µg/m3) in the shortest possible time. The Plan sets out a number of national and local measures that need to be taken. Local authorities should note the UK plan for tackling roadside nitrogen dioxide (NO2) concentrations is Government's UK Plan and not Defra's Plan and so should be referred as such throughout the business cases.
Transport User Benefit Appraisal	TUBA (Transport User Benefit Appraisal) is a software tool that performs transport scheme economic appraisals in accordance with the Department for Transport (DfT) guidance.

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Term	Description
Ultra-low-emission vehicle	An ultra-low-emission vehicle (ULEV) is a car or van that emits 75g/km CO2 or less.
Uncertainty	An estimate characterising the range of values within which the true value of a measurement (or modelled output) lies.
UNFCCC	The United Nations Framework Convention on Climate Change (UNFCCC or FCCC) is an international environmental treaty negotiated at the United Nations Conference on Environment and Development (UNCED). The objective of the treaty is to "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."
Urban centres	Areas that met a definition used for the purposes of air quality modelling
V5C	Vehicle Registration Document registers a vehicle with the Driver and Vehicle Licensing Agency and contains information about the vehicle.
Vehicle and Operator Services Agency	The Vehicle and Operator Services Agency (VOSA) was an executive agency granted trading fund status in the United Kingdom sponsored by DfT. VOSA merged with the Driving Standards Agency into a single agency in 2014.
Vehicle Certification Agency	The Vehicle Certification Agency (VCA) is the designated UK national authority for approving new road vehicles, agricultural tractors, off-road vehicles and components. VCA is an executive agency, sponsored by the Department for Transport.
Vehicle Operator Costs	Vehicle Operator Costs (VOC) refer to costs that vary with vehicle usage, including fuel, tires, maintenance, repairs, and mileage-dependent depreciation costs.
WebTAG	Transport Analysis Guidance that provides information on the role of transport modelling and appraisal.
Welfare Loss	A loss of economic efficiency that can occur when the equilibrium for a good or a service is not achieved.

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Options Appraisal Report

DRAFT FOR APPROVAL

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Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

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1 Introduction

1.1 This document provides a summary of the optioneering process undertaken in the development of the Greater Manchester Clean Air Plan (GM CAP).

1.2 The process involved a combination of approaches, including:

- Internal workshops with Transport for Greater Manchester (TfGM), the Steering Group of local authority officers, and their consultants to draw up long list of measures;
- Extensive discussions with industry experts including vehicle fleet managers, manufacturers and air quality analysts, as well as with Joint Air Quality Unit (JAQU) specialists;
- Stakeholder engagement with local authorities (beyond the Steering Group), business groups and politicians;
- The development of bespoke tools to analyse the findings of this research including air quality modelling, traffic modelling and multi-criteria assessment toolkits.
- The application of an iterative approach as the team learned more about the priorities and concerns of the stakeholder groups, and the risks, impacts and effectiveness of the measures. A series of sifting processes were undertaken in working towards the final solution.

1.3 Nearly 100 separate measures have been considered in the development of the GM CAP under consideration for the Outline Business Case (OBC). These measures have been carefully tested and reviewed by industry experts through a high-level assessment process.

1.4 The measures have been narrowed down and combined into three Options of packages of measures for modelling and analysis in the OBC. This appendix describes the timeline and the processes that were undertaken to move from the initial identification of potential measures to the proposal of the three best performing options fully appraised in the OBC.

2 Critical Success Factors

2.1 Throughout the optioneering process, options have been assessed against the UK Government's Critical Success Factors (CSF). The Primary Critical Success Factors were set by the Joint Air Quality Unit (JAQU), whilst the Secondary Critical Success Factors were set during the Strategic Outline Case (SOC) process, to understand a wider range of impacts of different measures, beyond those considered critical within the JAQU guidance. The Secondary Critical Success Factors were developed in discussion with JAQU.

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Primary CSF

- **Reduction in NO2 emissions:** the likelihood that the measure/option will contribute significantly to a reduction in NO_2 concentrations, enough to achieve compliance with the EU Limit Values in the shortest possible time.
- Feasibility: the likelihood of the measure being implemented in the shortest possible time to deliver the desired NO_2 reduction and achieve compliance.

Secondary CSF

- **Strategic fit with local strategies and plans:** ensuring the alignment of the option with longer term economic, social and environmental goals and that the risk of unintended consequences is minimised.
- **Value for money:** an indication of the costs and benefits of each option.
- **Distributional impact:** in order to understand the potential impacts, both positive and negative on different groups within society, with a particular focus on the most vulnerable. It is of vital importance that the plan does not result in significant economic or social impacts for the region or those living, working or doing business within it.
- **Deliverability** - A series of measures assessing the deliverability of the options, in terms of:
  - Affordability of the cost of implementation,
  - Supply-side capacity and capability
  - Achievability of delivering the option

3 Timeline

3.1 The development of the Options and the individual measures has been ongoing for over a year and has progressed through four key phases. Table 1 summarises these, highlighting the process and approval decisions undertaken.

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Table 1: Timeline of option development process

Phase	Stage	Process Undertaken	When	Approval
Phase 1: **Strategic Outline Case**	Identification of a long list of nearly 100 measures in 12 categories. With shortlisting to 17 measures.	Brainstorming of all measures – shortlisting using professional judgment against the Critical Success Factors.	Winter / Spring 2018	LA governance and submitted to JAQU in Spring 2018.
Phase 2: **Target Determination**	Identification of the local air quality challenge.	Modelling & analysis to identify the scale of the challenge and points of exceedance of air quality levels in 2021, confirmation of locations of non-compliance to be addressed by the CAP.	Spring / Summer 2018	Submitted to JAQU and approved by them for publication as a GMCA paper in Autumn 2018. Final confirmation that Target Determination has been completed expected from JAQU by end February.
Phase 3: **High Level assessment**	a. Expansion of shortlisted measures to 95 implementation options.	Detail was added to the shortlisted measures, which were expanded to give multiple variants on how they could be delivered. Subsequently this provided a list of 95 implementation options.	Summer 2018	Steering Group and engagement with Executive Members and Leaders.
	b. Examination of the 95 implementation options and identification of measures	Stakeholder engagement - industry expert feedback -capacity assessments - traffic and air quality modelling – application of bespoke MCA toolkit.	Summer 2018	

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Phase	Stage	Process Undertaken	When	Approval
	c. Aggregation of measures into 6 Clean Air Plan Options.	Aggregation based on differing measures of incentives, parking and scales/severity of CAZ.	Autumn 2018	
Phase 4a: **Appraisal of 6 options and further shortlisting for full economic analysis**	a. Selection of 3 Clean Air Plan Options to progress to full analysis.	Modelling and appraisal.	Late 2018	Discussed with Steering Group, Executive members and Leaders Concerns were raised and the need for further refinement identified.
Phase 4b: **Re-evaluation**	b. Addition of two further Options, as the risk of unintended socio-economic consequences was not fully understood and other options have not been explored in sufficient depth to be ruled out.	Further analysis on the CAZ D Clean Air Plan Options was undertaken to understand socio-economic implications and further traffic and air quality modelling carried out to consider alternatives.	Early 2019	To be approved via full LA governance and submitted to JAQU in March 2019.

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4 Phase 1 Strategic Outline Case (SOC)

4.1 In developing the SOC a long list of nearly 100 measures were identified as potential interventions that could either be implemented in isolation or as a package of measures to support the delivery of the Primary CSF. The measures were identified through desk-top research, measures from other cities and input from a range of stakeholders. These measures were grouped in 12 categories as shown in Table 2 below.

Table 2: Categorisation of measures

Number	Category	Description
1	Clean Air Zone	Charge-based zones of different vehicle classes and geographies
2	Financial	Subsidy schemes, incentives, tax exemptions
3	Education / Awareness	Publicity, engagement, non-charge-based CAZ
4	Planning	Planning (developer) requirements, pedestrianisation
5	Business	Reward schemes or mandates that impact private businesses
6	Cycling & Walking	Active travel infrastructure, skills/training, cycle share
7	Parking	Parking provision and pricing, park & ride
8	Public Transportation	Public transport infrastructure, bus emissions standards or retrofitting, car sharing, concession fares, route restrictions
9	Alternative Fuel Infrastructure	Infrastructure to support uptake of non-petrol/diesel vehicles
10	Traffic Control Infrastructure	Traffic management strategies and infrastructure
11	Freight	Consolidation centres, permitting / restrictions
12	Taxis	Incentives / infrastructure to encourage transition to alternative / cleaner vehicles

4.2 The long list was reduced to 17 measures through qualitative impact scoring; a yes/no deliverability assessment; and an extensive document review, with the objective of applying the metrics that correspond to Primary and Secondary Success Factors. The documents contained within the review included:

- GM Air Quality Action Plan
- GM Low Emission Strategy
- GM 2040 Strategy
- Data shared from Birmingham City Council
- Birmingham City Council website
- Ricardo Evidence Review of measures 2014 (Edinburgh, Richmond, York)
- Air Quality Plan 2015 West Midlands UK0035

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- Air Quality Plan 2017 West Midlands UK0035
- Birmingham Connected Technical Package 1, 2, and 3
- UK Air Quality Plan 2017
- TfWM website
- Ongoing testing by Highways England/Department for Transport on Gas to Liquid (GtL) as an alternative fuel
- NICE guideline on Air Pollution: outdoor air quality and health
- Leicester integrated traffic management research
- Blueprint for low carbon fuel infrastructure
- West Yorkshire Low Emission Strategy (LES)
- TfGM Charge-based CAZ initial feasibility work 2017

4.3 Table 3 below provides a summary of the resulting shortlisted measures.

Table 3: Strategic Outline Case Shortlisted Measures

Reference	Measure	Description
	CAZ	
1	Charge-based CAZ - Category B or C; different geographical boundaries / time restrictions	Category B includes non-compliant bus, coach, taxi/PHV and HGV. Category C includes the above plus non-compliant LGV
2	Charge-based CAZ - Category D; different geographical boundaries / time restrictions	Category D includes all of Category C plus non-compliant private cars
	Parking	
3	Differential parking charges	Related to usage/capacity (e.g. different charges for times of day to reduce congestion); vehicle type (e.g. free for electric or reduced for car sharers or for emission standard/engine size); residential parking zones and; workplace parking levy
	Public Transport	
4	Retrofitting or upgrade of public transport fleet and introduction of stringent emissions standard through contracts or partnership	Retrofitting of public transport fleet to cleaner alternatives. Set stretching targets to improve the efficiency of fleet and specify emission standards in bus contracts

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Reference	Measure	Description
5	Increase capacity of public transport on specific routes	
	Infrastructure - Alternative Fuels	
6	Switch bus, HGV/LGV depot fuelling stations or GM fleet to GtL	Use of GtL fuel as a diesel alternative. (if Public Transport retrofit is standard measure then would not need GtL for commercial bus but could apply to community transport)
7	LGV – Electric Vehicle (EV) incentivisation	Additional EV charging points; promotion of EVs
8	Improve Local Authority fleet to electric/LPG/low emission through a procurement policy	
	Infrastructure - Traffic Control	
9	Congestion Plan traffic management – increased capacity	Providing more highway capacity – review of existing junction improvement plans. Assess existing schemes to understand potential benefit on specified links; with a view to bringing schemes forward sooner
10	Congestion Plan traffic management – encouraging alternatives	Encouraging alternative travel choices – road space reallocation in order to suppress latent car demand released through implementation of other measures
11	Congestion Plan traffic management – network management	Signal optimisation – changes to traffic signal timing to optimise flows in order to reduce congestion on specified links
	Taxis	
12	Incentives for private hire vehicles to change to EV vehicles. Installation of rapid EV infrastructure for taxi and private hire vehicles.	Incentivise private hire vehicles to changes to EV/ULEV vehicles through reduced licence fees/ free top up at taxi charge points
13	Retrofitting of Hackney Carriages to LPG/Euro 6. Increase LPG refuelling infrastructure	Retrofitting of Hackney Carriages to LPG/Euro 6
	Non-charge-based CAZ awareness activities	

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Reference	Measure	Description
14	Communications campaigns/awareness raising of health and cost benefits of different modes	Communications campaigns/awareness and signage
15	Travel choices programme (businesses & individuals)	Dependent on scale of programme
16	Active travel programme – engagement	Encouraging a switch to active travel modes
	Cycling & Walking	
17	Active travel programme – infrastructure	Provision of measures to encourage modal shift to active travel to PT hubs and for short journeys

5 Phase 2 - Target Determination

Government Air Quality Plans

5.1 Government Air Quality Plans have delegated responsibility for meeting legal Limit Values to local authorities where national Pollution Climate Mapping (PCM) modelling predicted concentrations of NO_2 on stretches of road would exceed the Limit Values beyond certain timeframes. Eight Greater Manchester local authorities have been directed to undertake feasibility studies to identify measures for reducing NO_2 concentrations within the "shortest possible time". These studies must produce a series of business cases for assessing and implementing the relevant measures in a Clean Air Plan.

5.2 The National Plan identified eleven areas of road, across seven local authorities within Greater Manchester, where the national Pollution Climate Model predicts NO_2 concentrations are likely to exceed the statutory NO_2 annual mean EU Limit Value beyond 2020. A further ministerial direction in March 2018 identified Oldham Metropolitan Borough Council as one of 33 local authorities with "shorter-term NO_2 problems" and required it to produce a feasibility study.

Local Air Quality Modelling

5.3 As the predictions in the national model are based on national scale assumptions and datasets, they must be verified against local evidence before any detailed assessment of options for reducing NO_2. Subsequently, during their feasibility studies, local authorities must submit 'Initial Evidence' to define and confirm the local air quality problem and model concentrations of NO_2 in 2021 based on a "do minimum" scenario.

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5.4 As part of their feasibility studies, local authorities must gather local evidence and conduct local modelling to confirm their NO_2 problem and model predicted concentrations of NO_2 beyond 2020 based on a "do minimum" scenario. This scenario is based on historical patterns of vehicle turnover, already planned junction improvements and road layout changes.

5.5 The analysis has revealed a wider NO_2 problem than that initially identified by the Government's National Plan. Whilst the local model is generally in agreement with the PCM exceedances, it predicts a greater spatial distribution of exceedances and higher concentrations of NO_2 than those initially identified. Sections of road with concentrations of NO_2 over 40 µg/m^3 are located across all 10 Greater Manchester local authorities, in a similar distribution to the air quality problems identified in the established Air Quality Management Area.

5.6 Local modelling identified 152 stretches of road (road links) where concentrations of NO_2 are forecast to exceed the legal Limit Value (40 µg/m^3) beyond 2020. 112 of these road links are on the national PCM model, which have the highest car use and heavy freight flows. 40 of these are shorter stretches of local roads, around town centres across Greater Manchester. These are routes that are frequently used by buses and vans, which are not included in the national model.

5.7 In total, there are 250 points of exceedance identified in the local modelling in 2021, including 62 with concentrations between 45 µg/m^3 and 50 µg/m^3, and 13 with concentrations over 50 µg/m^3.

5.8 The main reasons for the differences between local and national models include: the vehicles using Greater Manchester's roads are typically older than the national average (especially buses and taxis); local traffic data showed that, in some areas, vehicles are moving more slowly than the national modelling anticipated; and because local modelling also showed higher background concentrations of NO_2.

5.9 In addition, higher concentrations of NO_2 were identified in the regional centres (particularly Manchester city centre) due to the volume of demand on these roads, and to something referred to as the 'canyon effect'. This term refers to the reduced air flow and circulation caused by tall buildings or in densely built up areas that acts to reduce the diffusion and dissipation of air pollutants that occurs in more open or low-rise locations.

Implications for the Greater Manchester Clean Air Plan

5.10 After receiving the 'Initial Evidence' from Greater Manchester, JAQU undertook a process called 'Target Determination', which involves comparing the outputs of the local and national modelling, verifying the local modelling process and then agreeing the forecast exceedances. JAQU also ensures consistent approaches to local modelling are being used by different local authorities.

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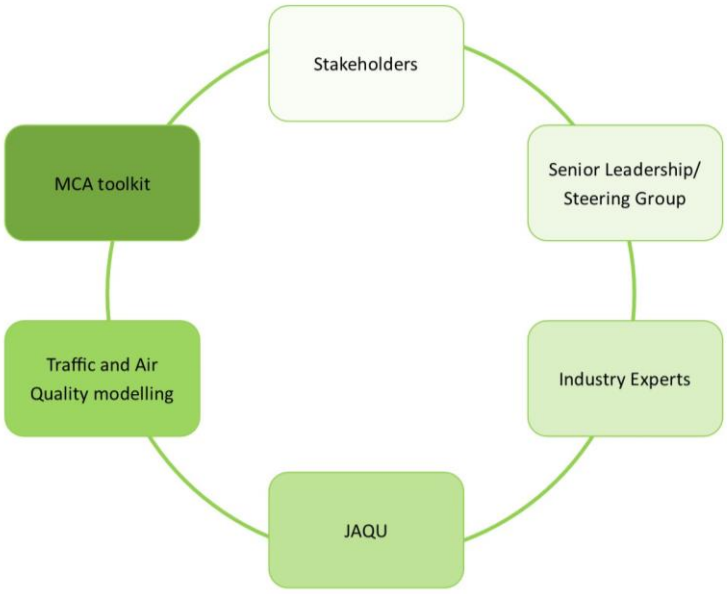
5.11 The outcome of this process is an agreement of the NO_2 exceedances that Greater Manchester must resolve when determining possible solutions. This agreement has been reached and GM awaits formal confirmation of this from JAQU. Once the Greater Manchester modelling is agreed by Government, illegal exceedances in all ten local authority areas need to be addressed.

5.12 The clear disjoint between the PCM modelling and the local air quality modelling raised implications for the Clean Air Plan as a whole. The area of coverage is more wide-ranging and the extent of exceedance more severe than envisaged during the development of the SOC. As such the feasibility study work going forward needed to embrace this data and the scope and scale of the interventions required. The Target Determination analysis very much set the scene for the development of the High-Level Assessment under Phase 3 of the process.

6 Phase 3 – Stages a & b – High Level Assessment and Refinement

6.1 Figure 1 illustrates the iterative and concurrent process undertaken in the high level assessment of the measures. The principle is that no one element took precedent and the information received as the assessments progressed fed back again to the other elements. This process was carried out at each stage of Phase 3.

Figure 1: Iterative relationship process diagram



6.2 Technical leads were appointed for the shortlisted measures, and these were examined in much greater detail. The key focus of the measure development was to understand the ability of each measure to address the CSF.

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6.3 To this end, where possible the measures were modelled through the traffic and air quality modelling suite to determine their fit with the air quality compliance CSF. Details of deliverability and achievability were developed to determine timeframes for implementation and the capacity of industry to achieve tight timescales. Associated costs were also considered in the assessment of each measure.

6.4 Table 4 below provides a summary of each of the measures, the assessment that has been carried out, and the implications for the CAP.

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Table 4: Measures Summaries and Optioneering Considerations

Measure - reference	Description	Discussion
Clean Air Zone (CAZ)		
1 CAZ - B or C; 2 CAZ - D;	The purpose of a Clean Air Zone (CAZ) is to create a financial disincentive to driving a non-compliant vehicle, by imposing a daily charge on those driving into, within or through a specified zone. The Government has specified four categories of CAZ: • Category A: buses, taxis and private hire vehicles • Category B: as Category A, plus HGVs and coaches • Category C: as Category B plus LGVs and minibuses • Category D: as Category C plus cars and motorcycles and moped Compliant vehicles are defined as: • Buses, coaches, HGVs and Vans – Euro 6 • Cars – Euro 4 or newer petrol or Euro 6 diesel • Motorcycles and mopeds – Euro 3 or newer CAZs differ from Congestion Charging Zones in that: • The objective of a CAZ is for a reduced number of the most polluting vehicles to travel in the zone, and to encourage vehicle upgrade. Thus, the charge is only applied to	Options were considered for CAZ categories B, C and D. And for geographic boundaries including: • Inner relief route • Intermediate ring road • M60 crossing points • Satellite zones around main GM town centres • GM wide boundary The potential for the measures to achieve compliance in the shortest possible time was strong but it was clear that no single measure could deliver compliance by 2021 GM-wide. It also became clear that any CAZ would need to be supported by measures to help upgrade the fleet, as there was a risk that a CAZ without such support would be ineffective, with high levels of non-compliance and the risk of perverse consequences such as a reduction in bus or taxi provision. It was considered that the socio-economic implications on GM could be significant, particularly of options including satellite zones around town centres and all CAZ D proposals. An initial assessment of the role of discounts and exemptions was undertaken, to be progressed further through stakeholder engagement at a later stage. Deliverability by 2021 was considered challenging for some measures. The effectiveness of the CAZ measures is described in more detail in Section 7 below.

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Measure - reference	Description	Discussion
	the most polluting vehicles. Over time, the revenue reduces as fewer vehicles are required to pay. • The objective of a Congestion Charge is to reduce the total volume of traffic within a zone, by encouraging people to travel by another mode or change their journey. Charges are applied to all vehicles and it is to be expected that most people will stay and pay. As such, schemes are highly profitable and provide resources for public transport, active travel and other measures.	
Parking		
3 Workplace Parking Levy (WPPL)	Free parking at workplaces acts as an incentive to travel by car. Placing a levy on that parking encourages workplaces and individuals to consider the value of that parking space and of their decision to travel by car. Limiting or charging for parking deters car travel. Workplace Parking Levies work by imposing a levy on all workplaces above a certain size within a specified area, based on the number of parking spaces available to staff, visitors and customers. Workplaces can opt to reduce the amount of parking offered or pay the levy. They are not required to pass on the levy to staff, visitors or customers but can choose to do so.	A WPPL has been shown to be effective in Nottingham in reducing the amount of parking offered to staff, visitors and customers at city centre workplaces, and has raised revenues to improve public transport provision in the city. However, a WPPL would be slow and complex to deliver and is not efficiently targeted at the core goal of reducing NOX emissions. Not all workplaces pass on the levy and the levy is applied to all parking spaces, regardless of the emissions standard of the vehicle parked in it. This would mean that workers/visitors/customers at sites where they charge was not passed on could continue to travel in a non-compliant vehicle unaffected, whereas someone with an EV may have to pay at a site where the charges are being passed on. In summary, WPPLs are an effective measure where the goal is to deter car travel in general and support public transport and active travel infrastructure improvements but are not likely to deliver compliance in the shortest possible time.

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Measure - reference	Description	Discussion
3 Differential Parking charges: Residents Parking	Limiting or charging for parking deters car travel. Applying higher or lower charges depending on the vehicle emissions could change purchasing patterns. Some local authorities in London have introduced differential charges for residents' parking permits based on the emissions of the vehicle. It is also possible to introduce differential parking charges into public car parks where a number plate is recorded, so that vehicles with worse emissions are charged at a higher rate.	While this may act as a deterrent to purchasing a dirtier vehicle/incentive to purchase a cleaner vehicle, it would be extremely difficult and expensive to implement in Greater Manchester, where the vast majority of on street parking is currently uncontrolled. In some districts, there are no controlled parking zones. Furthermore, the measure would be less effective in suburban areas where most households can park off street. In summary, it is unlikely that this measure can be implemented, and it would not deliver compliance in the shortest possible time. Differential parking charges in public car parks could be an effective deterrent if applied universally but a key issue is that the ownership of parking is not wholly within the powers of the local authority and there is a key risk that drivers would simply choose to park in an unaffected private car park, or travel elsewhere for example to out of town retail destinations offering free parking. The timescale for implementation would be long as changes could only be made at contract re-let stages. Contracts are let for many years. In summary, this measure would be very slow to implement and have only limited impact and so does not deliver compliance in the shortest possible time.
3 Differential Parking charges: Free or priority parking for ULEVs	Offering free or priority parking to ULEVs could be an effective incentive to help overcome the cost barrier to purchasing an EV. Free parking or parking spaces for ULEVs can only be provided in public car parks or on street where parking is controlled	This measure could act as an incentive, if implemented alongside promotion for EVs and the installation of charge points. However, there are some concerns that this benefit would go primarily to wealthier members of society. This measure has been included as an option for local authorities to consider when setting their parking strategies to ensure they align with the goals of the CAP.

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Measure - reference	Description	Discussion
3 Reduce parking availability	Readily available, low cost or free parking encourages people to travel by car by making it cheap and convenient. In some locations, where other options are available, it may be appropriate to re-consider the availability or cost of parking. This could include measures such as converting long stay to short stay parking; enforcing planning conditions so that land awaiting development cannot be used as 'infill parking; or removing free parking by implementing controlled parking zones.	This measure could act as a disincentive to travel by car, if applied in appropriate locations. This measure has been included as an option for local authorities to consider when setting their parking strategies to ensure they align with the goals of the CAP.
3 Act on parking at council worksites	There is an opportunity for local authorities to lead by example to encourage sustainable travel and cleaner vehicles through policies affecting council staff. GM's authorities are committed to leading the way and in some places are already exploring options to limit the availability of parking for staff, prioritise cleaner vehicles or encourage car sharing or travel by sustainable modes.	These measures would have a limited impact on air quality overall but are available to local authorities wishing to take local action and lead by example in support of the GM CAP.
Public Transport		
4 Public Transport fleet retrofit	The current bus fleet in GM is just under 2000 vehicles and less than 10% of these are compliant Euro VI. Of the remainder most (c1,300) are Euro IV and V with around 350 older buses still operating in the region. The current fleet replacement rate is around 7% per annum. Given the age of the fleet and the current replacement rate it will be far beyond 2021 before the bus fleet is compliant.	Greater Manchester has a deregulated bus service, and service provision is subject to commercial decisions made by private bus operators. Buses contribute significantly to poor air quality, but imposing charges without support to retrofit or renew the fleet creates the risk that operators will choose to reduce the frequency of bus services or withdraw routes altogether rather than upgrade their fleets. This is contrary to Greater Manchester's goal to increase the share of journeys made by public transport, and risks reducing accessibility for the poorest and most vulnerable members of society.

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Measure - reference	Description	Discussion
	Technology is available to retrofit buses older than Euro VI to comply with Euro VI emissions standards.	Greater Manchester secured £3m from the Clean Bus Technology Fund to upgrade around 170 buses, this activity is underway. The oldest buses cannot sensibly be retrofit as they are close to (or beyond) the end of their suitable operational life. The proposal is for a bus fund the replace / retrofit the fleet as appropriate through support to operators. Operators suggest they have the capacity to undertake the process within three years. This measure is both effective and necessary. Modelling suggests that delivering a compliant bus fleet could reduce exceedances by one third whilst protecting the bus service offer. This measure is therefore included in all Best Performing Options.
5 Public Transport Capacity	Reducing the need to travel by car by improving the quality of the alternatives has been proven to be effective in delivering mode shift from the car to sustainable modes and reducing traffic volumes. Lower traffic levels and reduced congestion lead to lower emissions. Consideration of increases in the capacity of all PT modes, including bus, Metrolink and rail.	In the longer term, improving the public transport offer in the region is the most sustainable way to reduce emissions. However, it was clear that it would not be possible to implement changes to the frequency and capacity of rail or Metrolink services, beyond the improvements already planned and underway, within the very short timescales required. The deregulated bus service means that GM's local authorities lack the powers to offer new or more frequent bus services. Consequently, no specific proposals are included in the GM Cap for public transport capacity improvements. GM has committed to providing bus operators with data to support the provision of additional commercial services where demand allows. The GM CAP is placed within the context of the ambitious plans for public transport improvements set out in GM's Transport Delivery Plan, published in January 2019.
Infrastructure – Alternative Fuels		

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Measure - reference	Description	Discussion
6 Gas to Liquid (GTL) conversion	GTL is an alternative synthetic fuel source that can be used in existing vehicles without the need for retrofitting or upgrading. Testing from DfT showed a 12.0% reduction in NOx emissions for GTL use in a Euro IV engine (416 mg/km) and an 18% (10 mg/km) reduction in a Euro VI engine, based on an 18t rigid truck. Equivalent results for Euro V and III were calculated at 278 mg/km (9%) lower for Euro V and 447 mg/km (9%) for a Euro III. Benefits are greater for older, heavier, more polluting vehicles. The concept was to provide incentive funds to elements of the HGV GM vehicle fleet to convert their vehicles.	Availability of the fuel is low at present, but discussions with industry have intimated that this should not be a problem if a GTL policy was pursued. GTL has a premium of between 5 and 10p per litre and this is likely to cause a barrier in a highly competitive haulage industry. Support to cover the premium direct to hauliers is likely to hit state aid issues, but central government taxation treatment could support sider implementation. However, stakeholder engagement indicated significant concerns within the industry about the implications of GTL retrofit in terms of the maintenance of vehicles and the risk of invalidating warranties. The decision was made not to progress with this measure
7 EV incentivisation	Electric vehicles emit zero NOx emissions. Conversion of the car and LGV fleet across Greater Manchester to EV would provide a positive impact on air quality. Currently less than 0.5% of the car and LGV fleet in GM are EV's Modelling suggests that the ambitious EV growth projections resulting from additional investment in EV charging infrastructure would lead to a 5% reduction in NOx emissions across GM. The proposed measure is to facilitate a shift to electric vehicles achieved via further expansion of the Greater Manchester Electric Vehicle charging network.	TfGM is currently progressing expansion of the GMEV EVCI network with plans for installing a minimum of 24 dual point rapid chargers by September 2019 as part of the Early Measures project funded by JAQU. The increasing appeal of EV and the provision of supporting infrastructure is expected to significantly increase the EV fleet across GM. The EV charging network is an important element of that. This measure is effective in supporting the delivery of compliance in the shortest possible time and is therefore included in all Best Performing Options.
8 Local Authority fleet to electric / LPG / low emission	A local authority fleet that operates with low emission vehicles can play a part in cleaner air for the region. Currently, less than 2% of the fleet is	It is not economic to upgrade the whole fleet given the highly specialized nature of some of the vehicles and their low usage (for example, gritting lorries). The ability to upgrade the fleet quickly is partly constrained by the

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Measure - reference	Description	Discussion
	EV and 57% is older than Euro IV. Most local authority vehicles are HGVs and LGVs. The proposal is to improve the emissions quality of the LA fleet and some emergency service vehicles through replacement and retrofit.	extent of existing leases entered into by the LA's. It will be challenging to ensure there are no Euro V or older vehicles and a reasonable take up of EV vehicles by 2021. The small size of the LA fleet in relation to the overall network (>0.1%) means that conversion is unlikely to have a significant impact on overall AQ. However, the marketing and messaging associated with LA compliance is a strong factor in support of the intervention.
Infrastructure – Traffic Control		
9 Congestion Plan traffic management – increased capacity	Increased vehicle speeds, reduced congestion and reduced idling time has a significant impact on local air quality. Many of the air quality exceedances are around key congested junctions and links, so reducing that congestion could be effective in tackling air quality. The intervention considered a variety of techniques to increase network capacity, typically involving additional road space or road space reallocation such as: • Increased turning lane length • Additional lane capacity • Road space reallocation • Access road closure	Traffic management measures could prove useful in the reduction of exceedances at key network points. But at a network level, the approach is likely to either reassign traffic to other parts of the network or improve road conditions such that additional traffic is generated. Therefore, whilst this approach may be successful for isolated sections of road, it does not provide a strategic approach to the region-wide air quality challenge facing GM. Traffic management measures are being progressed separately as part of the GM Congestion Deal. Implementation may also be challenging in some locations due to road space constraints, and there is a risk that this approach would conflict with the goal to improve conditions for cyclists and pedestrians. In summary, whilst this measure may be revisited at a later stage, it does not form part of the GM CAP strategic approach.
10 Congestion Plan traffic management	Reducing the number of car journeys by encouraging the use of alternative modes or more efficient use of vehicles (such as through car	In the long term, encouraging more sustainable methods of travel has the potential to reduce traffic and improve air quality. However, evidence suggests that in an urban

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Measure - reference	Description	Discussion
– encouraging alternatives	sharing) is an effective way to reduce traffic and therefore air quality. One way to achieve this is by prioritising road space for more sustainable modes (such as cyclists or pedestrians), for cleaner vehicles, or for vehicles with more than one occupant.	environment allocating road space to High Occupancy Vehicles or electric vehicles creates risks of traffic reassignment and therefore the redistribution of air quality hotpots. In the longer term, for example as the EV fleet becomes larger in number, such measures could become more suitable. The Streets for All programme has involved the reallocation of road space to more sustainable modes – these schemes have been successful in Manchester in key locations such as Oxford Road. The AQ benefits in the immediate location appear to be strong. However, the impact of displacement on adjacent roads is a potential concern and not yet fully understood. Implementation timetables are likely to be significant.
11 Congestion Plan traffic management – network management	This intervention considered a variety of Network Management techniques aimed at improving traffic flow: • Advanced warning (VMS) • Signal optimization • Scoot/MOVA signal flow systems • Priority Vehicle signal activation	Each of the options has the potential to improve AQ in the local vicinity and could prove useful in the reduction of exceedances at key network points. However, the approach is likely to reassign traffic to differing parts of the network and whilst successful for isolated sections of road, on balance may not provide significant AQ improvements.
Taxis		
12 Taxis / PHV to EV	There are more than 13k taxis and private hire vehicles (PHVs) licensed in GM at present. Of these, 85% of taxis and two thirds of PHVs are currently non-compliant. Taxis and PHV are typically older and more polluting than the average vehicle. They also drive higher mileages per annum, particularly in urban areas and the city	Stakeholder feedback suggests take up could be strong and modelling has considered a scenario with up to 30% uptake from the fleet. Vehicle availability (new vehicles) is widespread, but the second-hand market is still relatively immature. Measures to support the uptake of EVs by private hire and taxi drivers can be effective in supporting the delivery

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Measure - reference	Description	Discussion
	centre. Therefore they have a greater than average per-vehicle impact on air quality. The proposal is to provide financial incentives to operators to upgrade to a cleaner vehicle, as well as supporting EV charging infrastructure.	of compliance in the shortest possible time and are therefore included in all Best Performing Options.
13 Taxis - Retrofit to LPG/Euro 6	As described above, most hackney cabs operating in GM are older than Euro 6. For London-style hackney cabs (not required in all local authorities), the technology to retrofit to LPG or Euro 6 is well developed and operators have suggested they are keen on this approach.	Retrofit is a cost effective way of achieving compliance for London-style hackney cabs which are expensive to replace and have a long operational life. The key limitation is the industry capacity to undertake widespread retrofitting program, which is not well developed. It is more difficult to retrofit older diesel engines and the cost of the fitting process will be greater than the value of the vehicles making the VFM of such a process poor. It is therefore recommended that retrofit of newer non-compliant hackney cabs is included as part of a basket of measures to support fleet upgrade in all Best Performing Options.
Non-Charge based CAZ awareness activities		
14 Campaigns / awareness raising of health and cost benefits of different modes	Evidence suggests that awareness of air quality issues is growing, but people are still confused as to what poor air quality means, where pollution comes from and what solutions would be effective. Ongoing communications activity is proposed to help the residents and businesses of Greater Manchester understand the nature of the air quality challenge and what action they can take to reduce emissions. Communications will also be required to support each workstream, promoting	Initial research, including focus groups, was carried out in summer/autumn 2018 around perceptions of air pollution in Greater Manchester. This demonstrated that there was a fundamental lack of understanding of the causes and awareness of air quality issues. The outputs from this research highlighted the need to raise awareness and understanding of air pollution as a health issue through public campaign activities. An initial phase of activity was delivered during Autumn 2018, the “Lets clear the air” campaign. Communications will be embedded across the programme in all Best Performing Options.

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Measure - reference	Description	Discussion
	awareness and ensuring people understand the opportunities and implications for them.	
15 Travel choices programme (businesses & individuals)	Guidance on outdoor air quality and health (NG70) recommends taking a number of actions in combination, because multiple interventions, each producing a small benefit, are likely to act cumulatively to produce significant change. Addressing fleets, driver training, increasing walking and cycling, and awareness raising are recommended by the guidance, and are proposed. The Sustainable Journeys proposals are for a support programme of targeted, effective education, promotional, influencing and enabling measures and incentives to help people and businesses understand how they will be affected by air quality and the GMCAP and how best they can adapt in order to reduce their NOx emissions. The measure includes: • Business engagement • School and education engagement • Community engagement	Business, school and community engagement programmes have been proven to be effective in delivering mode shift to sustainable travel and raising awareness of sustainable choices. For example, evaluation of the LSTF project demonstrated that TfGM's Travel Choices business travel behaviour change programme achieved a 24% reduction in staff who drive to work alone for five days a week or more (from 46% to 35% of commuters) amongst other positive outcomes. Sustainable journeys measures will provide a positive means of interacting with those affected by the other CAP measures. Whilst it is not possible to calculate a quantified air quality benefit for this measure, it is clear that targeted behaviour change interventions could improve awareness of the GM CAP and of air quality more generally, and enhance the effectiveness of other interventions. A programme of sustainable journeys interventions is therefore included in all Best Performing Options.
Cycling and Walking		
16 Active travel programme – engagement	Investment in infrastructure to promote active travel is a sustainable way to deliver air quality improvements and healthier lifestyles. Engagement activity encourages uptake and	GM has an ambitious programme of investment in active travel underway, forming the Bee Network – a network that will guarantee quality and ease of use. The focus is

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Measure - reference	Description	Discussion
17 Active travel programme – infrastructure	makes investment in infrastructure more effective. Travelling by cycle and on foot is emission free. Measures could include improved crossings, cycle routing on quieter roads, pedestrian and cycle improvements at junctions and cycle parking.	on a network approach rather than piecemeal improvements to allow a safe end to end journey. The GM CAP is placed within the context of the £200m of improvements in cycling and walking planned for the same period.

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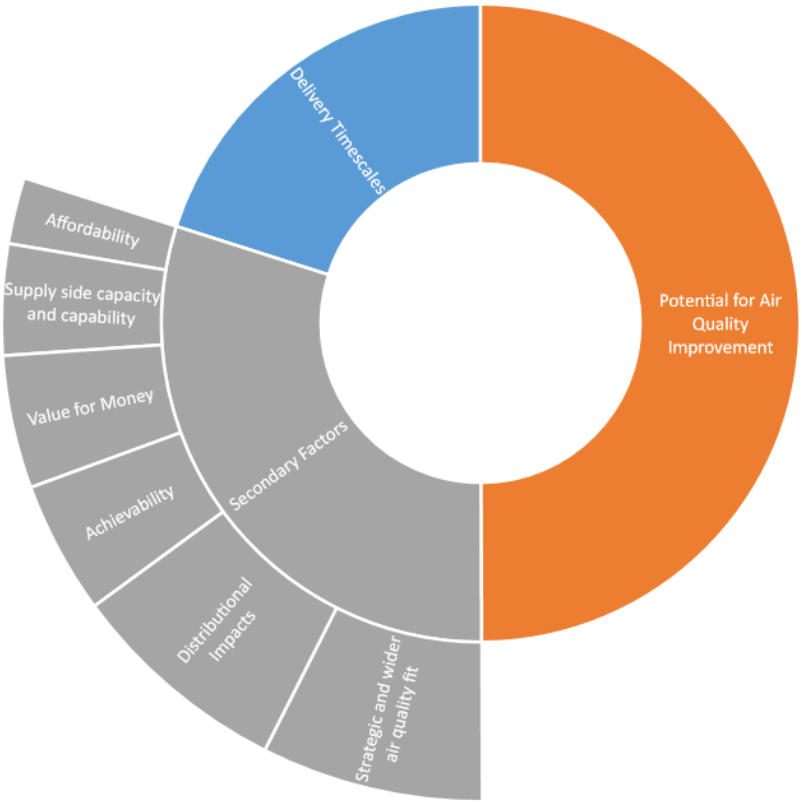
6.5 Many measures could be implemented in a number of ways and at different scales. The headline list of 17 measures was expanded to create several more specific delivery options, creating a full list of 95 implementation options.

6.6 Each of the 95 implementation options were scored on a scale of 1 to 5 as to how well it would deliver against the primary and secondary CSF. Figure 2 outlines the composition of the CSF in terms of primary and secondary factors.

Figure 2: Composition of Critical Success Factors

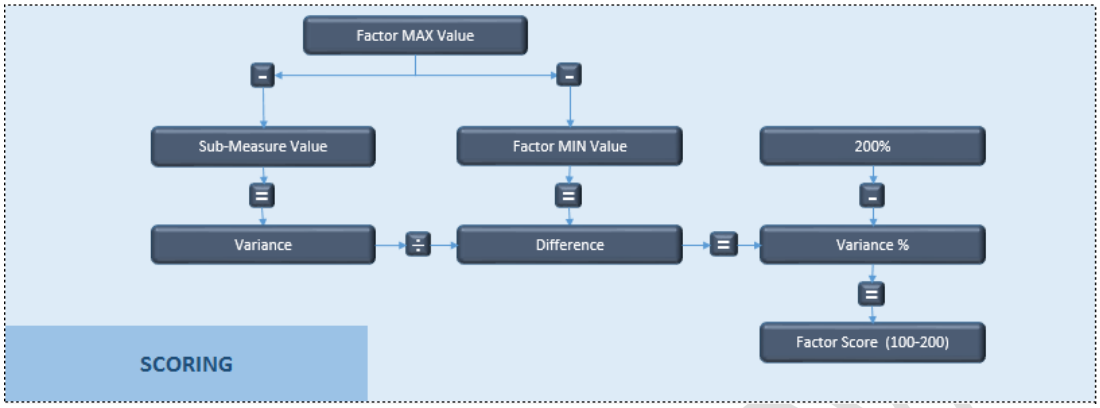


6.7 The 95 implementation options (covering the 17 measures) were then subject to Multi-Criteria Analysis (MCA). The MCA process is described in detail in a separate Multi-Criteria Analysis Model. A summary of the MCA toolkit is presented below.

Summary of multi-criteria analysis toolkit

6.8 The MCA toolkit uses a pro-rata scoring system whereby the Primary CSF input scores within each implementation measure/option are converted to their relative position on a 100-200 scale see Figure 3 below.

Figure 3: Pro-rata scoring of an implementation option (sub-measure) / Option at CSF level



6.9 Using this scoring mechanism, the best performing implementation measure / option scores 200 whilst the lowest performing scores 100. The rationale for adopting a 100-200 scale rather than 0-100 is that the lowest performing implementation measure / Options still contribute towards achieving a benefit, but this would not be recognised if a score of 0 was assigned.

6.10 To inform the pro-rata scoring of the 'Delivery Timescales' and 'Potential for Air Quality Improvements' CSF, the raw scoring (1-5 range) is either used directly (Coarse Filter Model) or averaged (Options Model) for pro-rata conversion.

6.11 To inform the pro-rata scoring of the 'Secondary Factor' CSF, an intermediate calculation is required. For the six Secondary CSF, the raw scoring is converted to the pro-rata range for each implementation option / Option. These scores are progressed to provide a '2nd Weighted Score'. The resultant score is then used to inform the overall 'Secondary Factors' score at the Primary CSF level for pro-rata conversion.

6.12 The MCA tool considered different scenarios with slightly changing prioritised ranking of the JAQU CSF. The purpose of the scenario testing was to sensitivity test the outputs and to improve the robustness of the rankings produced. The prioritisation always had the primary factors above the secondary factors but the prioritisation within these levels would change with each scenario.

6.13 The whole process was dynamic and iterative, using both the analytical team and the Steering Group to inform the process. Details of measures were fed into the MCA toolkit to support the optioneering and where new ideas or information were developed these were again fed back through the process.

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6.14 A key outcome of the iterative measure-development process was the development of a scrappage scheme measure. Scrappage/vehicle disposal emerged as a measure for consideration because:

- It became clear that a CAZ would be required, and at a much larger scale than initially anticipated. This meant that a large number of vehicle owners would be required to upgrade their vehicle.
- Analysis showed that the Greater Manchester vehicle fleet was older than the national average, reflecting many factors including deprivation in the region and the large number of very small businesses. This raised concerns about the affordability of upgrade and the validity of the behavioural response assumptions used (which were based on data from Bristol).
- Concerns were raised that residents and businesses could not have anticipated the measures and the message of the GM CAP, because Government policy had promoted diesel vehicles as a low carbon 'greener' option for many years.
- More recently, analysis has confirmed that older commercial vehicles are more likely to be owned by sole traders, who may find upgrade unaffordable.
- In summary, the goal of the GM CAP is to deliver a cleaner fleet and clean air, not to impose penalties on people who can't comply. Schemes that help small businesses, sole traders, not-for-profit organisations and residents to upgrade their vehicles can be beneficial for air quality and prevent socioeconomic damage as a result of the GM CAP.

6.15 The final result of the process was a shortlist of measures that had scored consistently well and now provided a more detailed description of the more valuable ways in which measures could be implemented in the Greater Manchester area. Figure 5 identifies the measures that were identified and the how they align with the behavioral changes being targeted.

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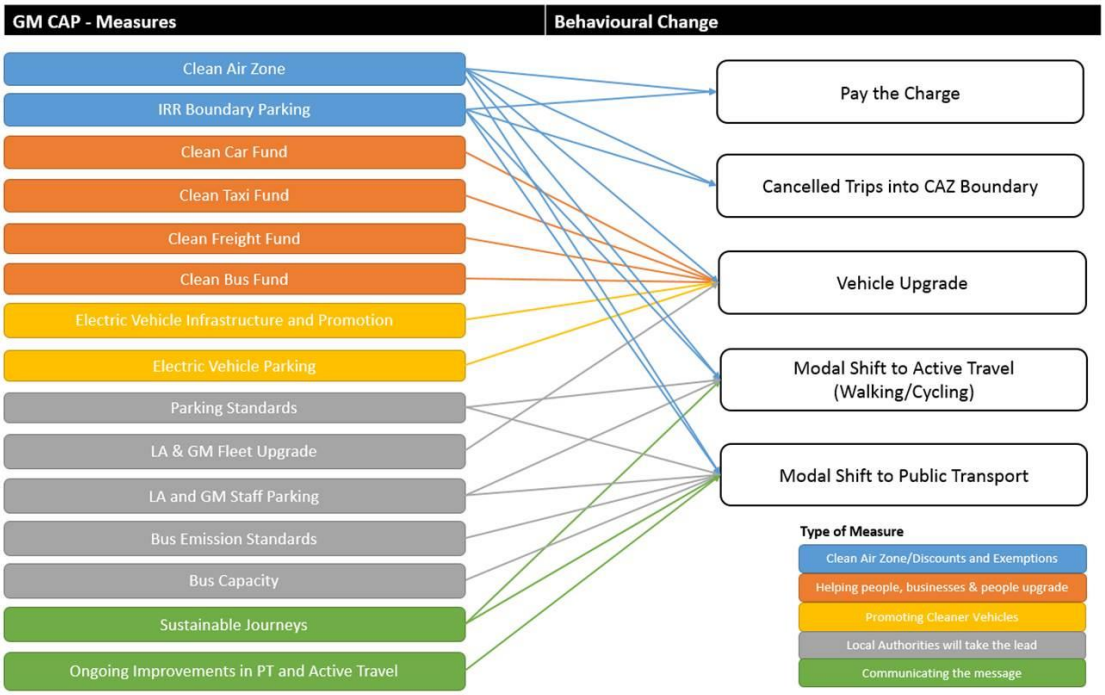
Figure 4: Shortlisted GM Clean Air Plan Measures and anticipated behavioural change



7 Phase 3 - Stage C - Identification of the 6 Clean Air Plan Options

7.1 The assessment of the measures as outlined in the section above and the packaging of the elements into CAP options was done concurrently, reflecting the challenging timescale to deliver the OBC. Creating 'packages' of measures was necessary as it was clear that no single measure would be able to deliver compliance in the shortest possible time, and instead the potential for many of the measures to support each other in achieving the aims of the CAP is a central theme, with the "whole" (Options) greater than the sum of the parts (Measures). Six Clean Air Plan Options were developed and are summarised in Figure 5.

7.2 What became apparent in the assessment of the measures is that undertaking individual measures in isolation risks unintended consequences and behaviours. As noted in the measures summary table (Table 4) many traffic management measures can cause re-routing and impact on alternative routes, additionally the age of the GM fleet and affordability to residents/businesses is such that wider incentives would be needed to ensure a CAZ delivered fleet upgrade rather than just enforcing penalties. Moreover, the paucity of infrastructure to support behavioural change (EV charging points, for example) all lead to the need to include measures beyond the wider constraints that may be proposed.

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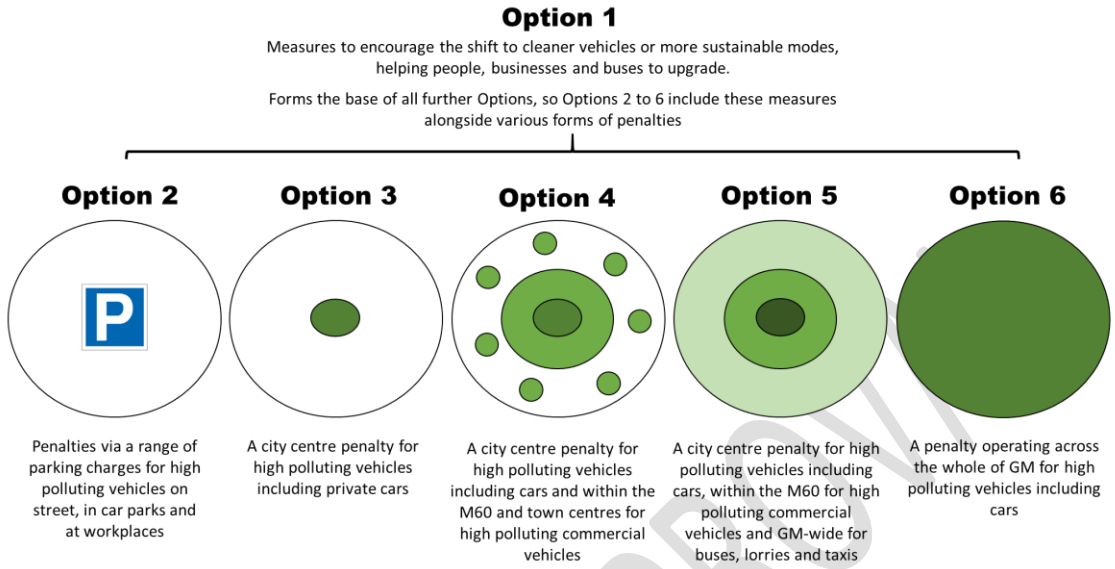
Figure 5: Clean Air Plan Options



7.3 The process behind the identification of these Clean Air Plan Options was to look at a range of options with a goal of:

- Establishing whether some sort of constraint measure would be necessary, or whether compliance could be achieved with incentive measures only.
- Establishing the forms of constraint measure that could be effective without employing a CAZ (for example, parking restraint).
- Testing different CAZ options to establish what scale of intervention might be necessary and develop an understanding of the high-level impacts (socio-economic / distributional) of such a scheme.

7.4 Options 1 and 2 seek to minimise emissions without a charging CAZ. Option 1 relies entirely on measures that provide active encouragement of cleaner vehicles and making sustainable modes more attractive. Option 2 adds in parking penalties and restrictions that dissuade the use of non-compliant vehicles. Options 3 – 6 all then include different forms of charging CAZs. In each case, the CAZ Options and Option 2 (parking) assumes the incentive measures (as per Option 1) are in place. This is considered an essential element of the CAP.

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7.5 To determine the preferred options and sifting for more detailed analysis, traffic and air quality modelling was carried out where it was possible to do so. The MCA toolkit was used in conjunction with the modelling to determine the best performing options. A key element at this stage was wider stakeholder engagement with fleet operators and industry experts; as well as continued dialogue with JAQU to gain their support, insight and knowledge of experiences in other cities. This wider engagement has proven invaluable to informing the structure of the measures and raising awareness of the CAP within Greater Manchester.

7.6 More detailed analysis was undertaken as data sets were further developed. Some examples of the type of questions that were asked were:

- What is the composition of the vehicle fleet in Greater Manchester?
- How much of the traffic is local (from within GM) and how much is travelling into or through the region from elsewhere? What is the impact of the Highways England network on traffic and air quality in GM?
- What is the price and availability of upgrade and retrofit options for each vehicle type?
- What discounts and exemptions could reasonably be considered and how could these work?
- What charge levels would be reasonable and effective? – comparison of actual/proposed charge levels in other cities and their demographics compared to those of GM
- Who owns non-compliant vehicles and what are the potential impacts on them of a CAZ?

7.7 In many cases, this work identified gaps in our data and knowledge that it was not possible to resolve within the time available, and many of these issues will need to be revisited at FBC. In particular, for example, Greater Manchester has concerns about the cost and availability of second hand LGVs and lacks information about LGV purchasing and ownership patterns. As a result, the decision was taken to delay the implementation of a CAZ C to 2023 as it appeared that the price and availability of LGVs would be prohibitive if implemented in 2021. If these concerns are accurate, it could mean that if implemented in 2021, a CAZ C may be ineffective in delivering its core goal of compliance in the shortest possible time, whilst imposing unacceptable costs and economic damage on small businesses across the region.

7.8 Similarly, Greater Manchester has serious concerns about the cost and availability of compliant London-style hackney cabs and has sought clarification from JAQU, not yet provided, that they have evidence that sufficient vehicles will be available to meet the national demand imposed by the potential CAPs in cities across the UK including London.

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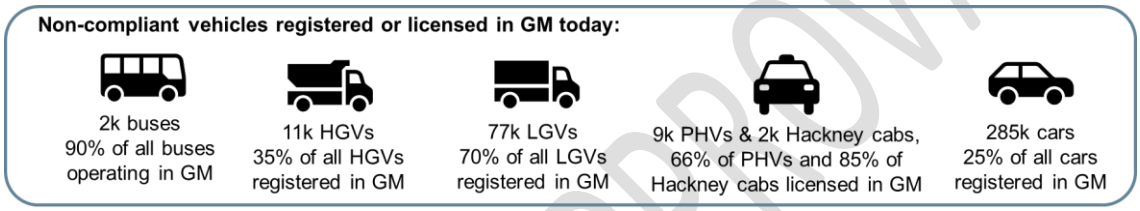
7.9 There also remains concern about the impact of the Highways England network, and of through traffic particularly HGVs travelling on the east-west corridor from Leeds – Liverpool. Discussions are underway with JAQU and Highways England to agree the evidence and identify a satisfactory resolution.

7.10 A key issue that was identified was the age and composition of the respective fleets that could be affected by the scheme. This highlighted that Greater Manchester has an older than the UK average fleet and this, allied with lower than average incomes, meant that the need for financial support to effect behavioural change was amplified. Figure 6 shows the number and proportion of non-compliant vehicles in Greater Manchester in 2018.

Figure 6 Composition of Greater Manchester vehicle fleet



8 Phase 4 - Stage a - Appraisal of 6 options and further shortlisting for full economic analysis

8.1 This stage involved the assessment of each option again against the CSF. Three 'best performing' options were selected and subjected to further refinement and appraisal.

8.2 A brief summary of the initial assessment is provided in Table 5 below.

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Table 5: Outcome of the Initial Appraisal of Six CAP Options

Option	Evaluation	Outcome
Option 1: Measures to encourage the shift to cleaner vehicles or more sustainable modes, helping people, businesses and buses to upgrade.	Assessment of a range of measures suggests that: 1. Some are not likely to be effective in tackling air quality, such as conversion from Gas to Liquid fuels or junction improvement schemes; 2. Some could be effective but are not deliverable within the timescale, such as new public transport capacity; and 3. Some could be effective with measures to deter the use of dirtier vehicles, such as incentives to upgrade & scrap vehicles, promotion of electric vehicles, and measures to promote sustainable travel choices.	On its own, does not deliver compliance in the shortest possible time. Effective and feasible measures have been incorporated into the Best Performing Options for full evaluation.
Option 2: Penalties via a range of parking charges for high polluting vehicles on street, in car parks and at workplaces	Parking measures have limited effect on the heaviest and dirtiest vehicles such as HGVs and buses and only affect those cars and vans that need to park in public places – so those with private off-street parking are not affected regardless of how dirty their vehicle is. In practice, would be expensive and slow to deliver due to existing contract restrictions.	Does not deliver compliance in the shortest possible time. Will not be progressed.
Option 3: A city centre penalty for high polluting vehicles including private cars	A city centre penalty for high polluting vehicles would be effective in the city centre and have some effect on approach roads but would leave around 200 sites non-compliant across the remainder of GM, with non-compliance remaining in the city centre at some sites. Does not deliver compliance in the shortest possible time.	Does not deliver compliance in the shortest possible time. Will not be progressed.
Option 4: A city centre penalty for high polluting vehicles including cars and within the M60 and town centres for high polluting commercial vehicles	Option 4 would reduce the number of non-compliant sites by around 80% in 2021. Concerns remain about whether customers would be able to understand and therefore respond to such a complex set of boundaries, and about the economic impact on town centres and deprived areas within the M60.	Initial evaluation suggests this Option may deliver compliance in the shortest possible time. A revised version of this Option, reflecting lessons learned, will be subject to a full evaluation as a Best Performing Option.
Option 5: A city centre penalty for high polluting vehicles including cars, within the M60 for high polluting commercial vehicles and GM-wide for buses, lorries and taxis	Option 5 would reduce the number of non-compliant sites by around 80% in 2021. Concerns remain about the appropriateness of a boundary at the M60, given the distribution and cause of AQ hotspots in the area and the level of deprivation. Concerns also remain about the viability & effectiveness of applying penalties to vans on a large scale given the limited availability/high cost of compliant vans in 2021.	Initial evaluation suggests this Option may deliver compliance in the shortest possible time. A revised version of this Option, reflecting lessons learned, will be subject to a full evaluation as a Best Performing Option.
Option 6: A penalty operating across the whole of GM for high polluting vehicles including cars	A GM-wide penalty for high polluting vehicles does not deliver compliance in 2021, with more than 20 sites remaining non-compliant despite significant trips per day being subjected to a penalty. Furthermore, the modelling results are not considered credible as the method is not appropriate for a region-wide scheme for car drivers, and it is likely that behavioural responses have been over-estimated. Delivery of a scheme on this scale would be slow, complex and risky, and very considerable social and economic impacts would be likely and need mitigating.	Does not deliver compliance in the shortest possible time and risk that contravenes GM's wider statutory duties. Will not be progressed.

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8.3 Those incentives measures found to be both effective and deliverable in the measures assessment exercise described in Table 4 were adopted for all further options. In isolation, **Option 1** does not achieve compliance in the shortest possible time. However, there are important elements within the package of measures that are required to support the success of the other Options. In particular, measures were taken forward to communicate the message and promote sustainable journeys; promote the uptake of the cleanest vehicles; and provide help to upgrade buses, taxis, commercial and private vehicles.

8.4 **Options 2 and 3** were ruled out as they did not deliver compliance in the shortest possible time:

- **Option 2** – Parking measures have a limited effect on the heaviest and dirtiest vehicles, such as HGVs and buses. They only affect those cars or vans that need to park in an area and not those passing through, or those with uncontrolled or off-street parking available. A Workplace Parking Levy has been shown to be effective in deterring car travel and supporting investment in more sustainable modes in the only UK example (in Nottingham), but the implementation timeframe is slow and the measure is poorly targeted in terms of its effect on the dirtiest vehicles. There are very few controlled parking zones or residents' parking permit schemes in place across the region and thus it would be difficult and expensive to deliver differential parking on-street. Off street, public parking is managed through contracts owned by the ten districts, running to different timescales and with limited flexibility in the short term. In summary, using parking as the constraint measure appeared challenging to implement, poorly targeted and not likely to deliver compliance in the shortest possible time.
- **Option 3** – A City Centre penalty for high polluting vehicles would be effective in the city centre and have some effect on the key radial routes into to the city centre. However, air quality modelling has shown that a city centre CAZ D, with no further CAZ measures across the remainder of GM, would leave around 200 sites non-compliant within the wider region in 2021, including some sites of non-compliance within the city centre itself. It has therefore been demonstrated that the option does not deliver compliance in the shortest possible time and has been rejected.

8.5 **Options 4 and 5** were the best performing options, based upon the initial assessment, although neither delivered compliance in the modelled year of 2021. Both removed around 80% of sites of non-compliance, with around 40-50 sites remaining non-compliant in these initial model runs for 2021. As a result, both Options 4 and 5 were progressed to full appraisal as the best performing options.

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8.6 **Option 6**, was developed initially as a theoretical 'maximum case', primarily to understand whether compliance could be achieved under any scenario by 2021. Importantly, the modelled scenario did not take account of the feasibility of delivering such a scheme or include the full package of supporting measures that would be required.

8.7 The assessment assumes that all of the options can be delivered by 2021. It is very unlikely that Option 6 could be delivered in that timescale. All aspects of the scheme, from the technical work required to design the scheme, to the scale of the infrastructure provision and customer service offer required to deliver it, would be slow, complex and subject to considerable risk. The 'all or nothing' nature of this proposal presents a risk that no real improvements to air quality would be achieved for quite some time, and the time to compliance would be highly uncertain.

8.8 Additionally, Option 6 has been ruled out for a number of reasons:

- The scale of the intervention across the whole of GM is considered to be potentially undeliverable in physical terms.
- The modelling undertaken is not considered credible, due to the required assumptions that have had to be made about behavioural change. The basis for the analysis has been figures based on JAQU evidence reassessed against GM conditions. However, in designing the analysis it was never envisaged that the scheme would roll out across such a wide geographic reach and it is likely given this that the behavioural responses would be very different. Specifically:
- The modelling assumes fixed values for the non-compliant cars to be sold and fixed costs of compliant cars to be purchased. A region-wide scheme for cars would have a material impact on the market, devaluing non-compliant cars and increasing the price of compliant cars. This means that the assumptions in terms of fleet upgrade are not valid and likely to be overly optimistic.
- The modelling also forecasts substantial mode shift from car to public transport, but for many of the diverse trips across the wider city-region there is simply not a viable public transport alternative available (at this time) and this mode shift is not likely to materialise.

8.9 In practice, therefore, mode shift has been over-estimated in the assessment of this GM-wide option, with more people expected not to switch modes and, rather, to choose to pay. It would not be possible in the required timescales to deliver transformative public transport improvements to facilitate this mode shift. This would therefore significantly delay compliance.

8.10 Clearly, a scheme on this scale would raise very significant issues in terms of the economic and social impact on the region, and widespread mitigation measures would be required that are not likely to be feasible.

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8.11 In summary, Option 6 would not deliver compliance in the shortest possible time, a fundamental CSF for the program, and would perform even more poorly in terms of reducing human exposure as there would be a long period without action on the ground; during which time considerable progress towards compliance would be expected with options 4 and 5.

Shortlisting of best performing options

8.12 The analysis found that no Option (not even a GM-wide CAZ D) could deliver compliance by 2021. Options 4 and 5 (incorporating the best performing incentives measures from Option 1) offer the best opportunity to deliver compliance in the shortest possible time and the Steering Group agreed that these Options should be progressed to full appraisal.

8.13 Some adaptations were made to the specification of the Options based on lessons learned throughout the high level assessment process:

- Various incentives measures were judged to be ineffective (e.g.: Park & Ride, GTL conversion for HGVs) or undeliverable in the timescale/with existing powers (e.g.: public transport improvements beyond the existing programme) and have been excluded. See Table 5 above for more detail.
- Vehicle Renewal Schemes to help businesses and residents upgrade their vehicle have been included, as discussed above.
- The initial assessment suggested that the second-hand van market would not be sufficiently mature by 2021 to support a large-scale CAZ for vans – a lack of available affordable compliant vehicles could result in a higher than predicted proportion of vehicles ‘staying and paying’ rather than upgrading and create substantial risk of economic damage. Therefore, implementation of the regional schemes has been divided into two phases: Phase 1 is a CAZ B encompassing buses, hackney cabs and PHVs, HGVs and coaches; and Phase 2 is a CAZ C including vans and minibuses. In practice, this may be delivered as a single scheme with a temporary exemption placed on Light Goods Vehicles for a period of perhaps two years.
- Finally, and related to the decision above, the M60 boundary in Option 5 has been abandoned, with the schemes being implemented within the IRR and GM-wide instead. Applying an additional boundary adds cost and complexity to the scheme, and risks customer confusion. Further analysis showed that the M60 boundary does not reflect where the outstanding locations of non-compliance remain post-2021, many of which are outside this zone. Therefore, it does not make sense in terms of delivering compliance in the shortest possible time to implement a second phase solely in this zone.

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- Two variants of option 5 were explored, one including a CAZ D within the IRR (Option 5(i)) and one where the CAZ D was enhanced so that all diesel cars and PHVs were considered non-compliant (Option 5(ii)).

8.14 Three CAP Options were taken forward to full appraisal, those considered most likely to deliver compliance in the shortest possible time, based on the initial 2021 modelling. These are outlined below and illustrated in

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8.15 Figure 7.

- **Option 4:** a Clean Air Zone category D within the Inner Relief Route (IRR) to be delivered in Phase 1 alongside a Clean Air Zone category B within the M60 and satellite towns. In Phase 2, the Clean Air Zone within the M60 and satellite towns extends to a category C. The CAZ proposals are supported by measures to communicate the message, promote cleaner vehicles and help people, businesses and buses upgrade.
- **Option 5(i):** a Clean Air Zone category D within the IRR to be delivered in Phase 1 alongside a Clean Air Zone category B across Greater Manchester. In Phase 2, the Clean Air Zone across Greater Manchester extends to a category C. The CAZ proposals are supported by measures to communicate the message, promote cleaner vehicles and help people, businesses and buses upgrade.
- **Option 5(ii):** an enhanced Clean Air Zone category D within the IRR such that all diesel cars and private hire vehicles would be subject to a penalty as well as non-compliant petrol vehicles and larger diesel vehicles older than Euro 6. To be delivered in Phase 1 alongside a Clean Air Zone category B across Greater Manchester. In Phase 2, the Clean Air Zone across Greater Manchester extends to a category C. The CAZ proposals are supported by measures to communicate the message, promote cleaner vehicles and help people, businesses and buses upgrade.

8.16 As none of the Options delivered compliance by 2021, it was necessary to develop new modelling tools to allow the assessment of traffic and air quality in later years. New models were developed in Autumn 2018 for 2023 and 2025. The modelling methodology was also re-vamped in Summer 2018 for 2021 based upon newly emerged JAQU guidance, and this revised methodology was applied to all three modelled years. Therefore, the best performing options were re-modelled for 2021, 2023 and 2025 as part of the full appraisal process in the next stage.

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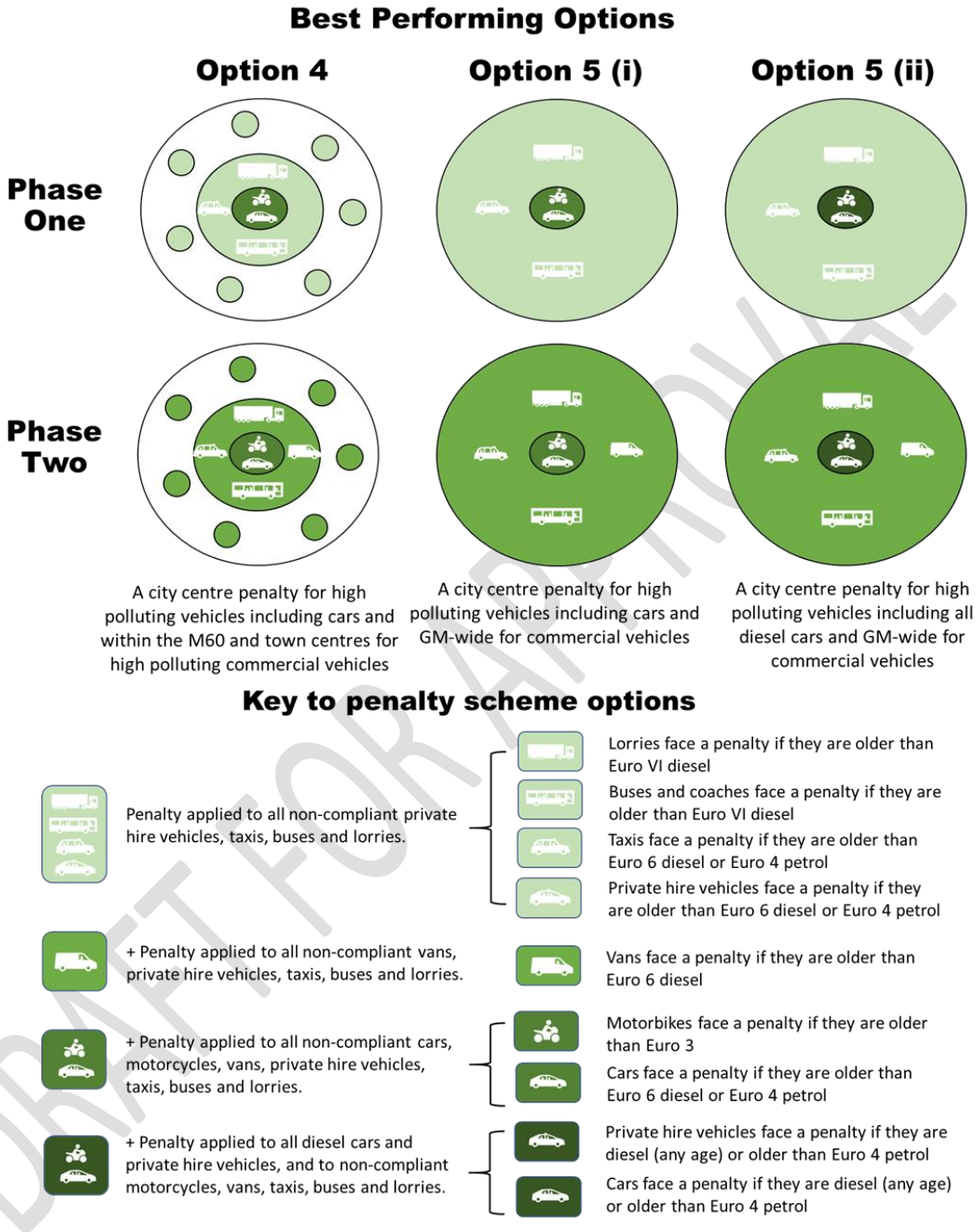
Figure 7: Three CAP Options for further analysis



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9 Phase 4 – Stage b – Re-evaluation, including addition of two new CAP Options

9.1 Throughout Autumn 2018, revised traffic and air quality modelling was carried out for the three best performing options (4, 5i and 5ii). The results were analysed through a full economic and financial evaluation. During this time key elements of the OBC were developed further in terms of the management and commercial delivery processes associated with these proposals; and the capital, operating and maintenance costs of the proposals.

9.2 This analysis showed that Option 5i was the preferred option, as it could deliver compliance in the shortest possible time, at the lowest cost, and was the most feasible of the three options. Option 5i was predicted to achieve compliance in 2024, three years prior to compliance being achieved in the do minimum (without action) scenario.

9.3 Government guidance stipulates that CAP schemes need to be assessed against a benchmark Option that has to include a CAZ. The benchmark scheme then acts as the measure against which other Options are assessed in terms of the CSF. Following consultation with JAQU, Option 5i was selected as the benchmark as it achieves compliance in the shortest possible time and at the lowest cost.

9.4 Following an initial evaluation in December 2018 by the ten local authorities of the appraisal results set out in brief above, concerns were raised that there was insufficient information to enable a decision to be made. In particular, the concerns were that:

- the risk of negative socio-economic impacts was not sufficiently understood
- other options had not been explored in sufficient depth to be ruled out

9.5 Further analysis was undertaken to better understand the risk of unintended socio-economic consequences arising from Option 5i and a decision was made to explore the potential effectiveness and impacts of two further options not previously considered. The options were assessed using the same process as applied to the six options considered in the high-level assessment stage.

9.6 The two additional CAP options are described below and illustrated in Figure 8:

- Option 7: a Clean Air Zone category B across Greater Manchester to be implemented in a single phase. The CAZ proposals are supported by measures to communicate the message, promote cleaner vehicles and help businesses and buses upgrade.

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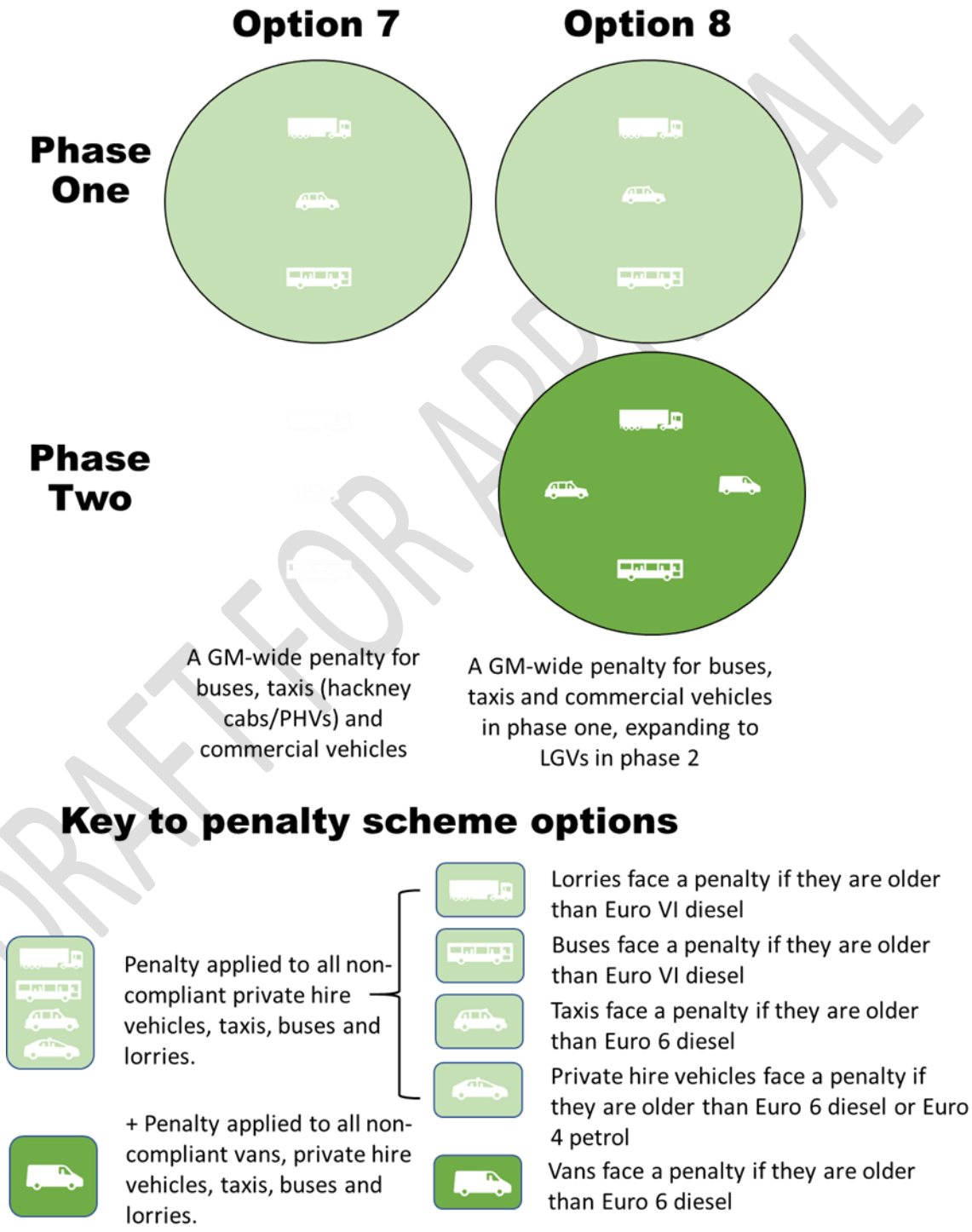
- Option 8: a Clean Air Zone category B across Greater Manchester implemented as Phase 1. In Phase 2, the Clean Air Zone across Greater Manchester extends to a category C. The CAZ proposals are supported by measures to communicate the message, promote cleaner vehicles and help businesses and buses upgrade.

Figure 8 – CAP Options 7 and 8



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9.7 Table 6 below provides a summary of the exceedance points across local authorities for each AQ modelled option and the number of exceedances identified in each year.

9.8 This indicates that the shortest possible time in which compliance can be achieved with any Option is 2024. Options 5i, 5ii and 8 are all predicted to deliver compliance in 2024.

9.9 The modelling indicated that Option 4 would achieve compliance in 2025 and Option 7 in 2026. Both options have therefore been ruled out as not delivering compliance in the shortest possible time and were not progressed to full appraisal.

Table 6: CAP Options summary of results (number of locations of exceedance by local authority)

Scheme Options	Compliant sites		Non-compliant sites			
	Very compliant (below 35 µg/m^3)	Compliant but close (35 to 40 µg/m^3)	Non-compliant (>40 to 45 µg/m^3)	Very non-compliant (>45 to 50 µg/m^3)	Extremely non-compliant (>50 µg/m^3)	Total non-compliant (>40 µg/m^3)
2021						
Do Minimum	16,281	603	175	62	13	**250**
Option 4	16,820	250	56	8	0	**64**
Option 5(i)	16,879	200	50	5	0	**55**
Option 5(ii)	16,892	193	44	5	0	**49**
Option 7	16,830	233	61	10	0	**71**
Option 8	16,836	227	62	9	0	**71**
2023						
Do Minimum	16,856	210	58	10	0	**68**
Option 4	17,056	69	9	0	0	**9**
Option 5(i)	17,081	51	2	0	0	**2**
Option 5(ii)	17,087	46	1	0	0	**1**
Option 7	17,037	85	12	0	0	**12**
Option 8	17,072	59	3	0	0	**3**
2025						
Do Minimum	17,068	58	8	0	0	**8**
Do Something	Options 5(i), 5(ii) and 8 are fully compliant by 2024, Option 4 by 2025 and Option 7 by 2026					

Summary of best performing options progressed to full appraisal

9.10 A full economic appraisal has been carried out for the three ‘best performing options’, encompassing the two refined CAP Options (5i and 5ii) that emerged from the high-level assessment process in Summer 2018, and the additional CAP Option 8 identified in January 2019. These are illustrated in Figure 9 below. The results of this assessment are provided in Section 1.7 of the Strategic Case and in the Economic Case.

9.11 Preliminary socio-economic analysis of the potential impacts of the Option 5 CAZ D schemes has been undertaken using Greater Manchester Travel Diary Survey Data. This suggests that the proportion of trips into the city centre that are made by car is relatively small and has been declining year-on-year in the morning peak period over the past two decades (only 2% of all GM car or van trips have a destination within the Manchester Salford Inner Relief Route (MSIRR)). The dominant trip purposes for travel into the city centre are commuting and shopping; but commuting is the trip purpose with the highest reliance on travel by car (44% of all car trips into MSIRR are journeys to work). Therefore, workers are likely to be the group most impacted by any city centre CAZ D scheme. Additional early analysis of census journey to work data and Acorn segmentation data, suggests that a small but significant proportion of these car trips are currently made by people from some of Greater Manchester's most deprived areas, who would be least able to upgrade their vehicle or pay a CAZ charge (we believe that at least 6,000 car driver commuters are currently travelling to the city centre from our most deprived communities). On that basis, there are some concerns about the potential socio-economic impacts of adopting a CAZ D scheme in the city centre, which is reflected in the "amber" rating of socio-economic impacts of the CAZ D options within the OBC economic case.

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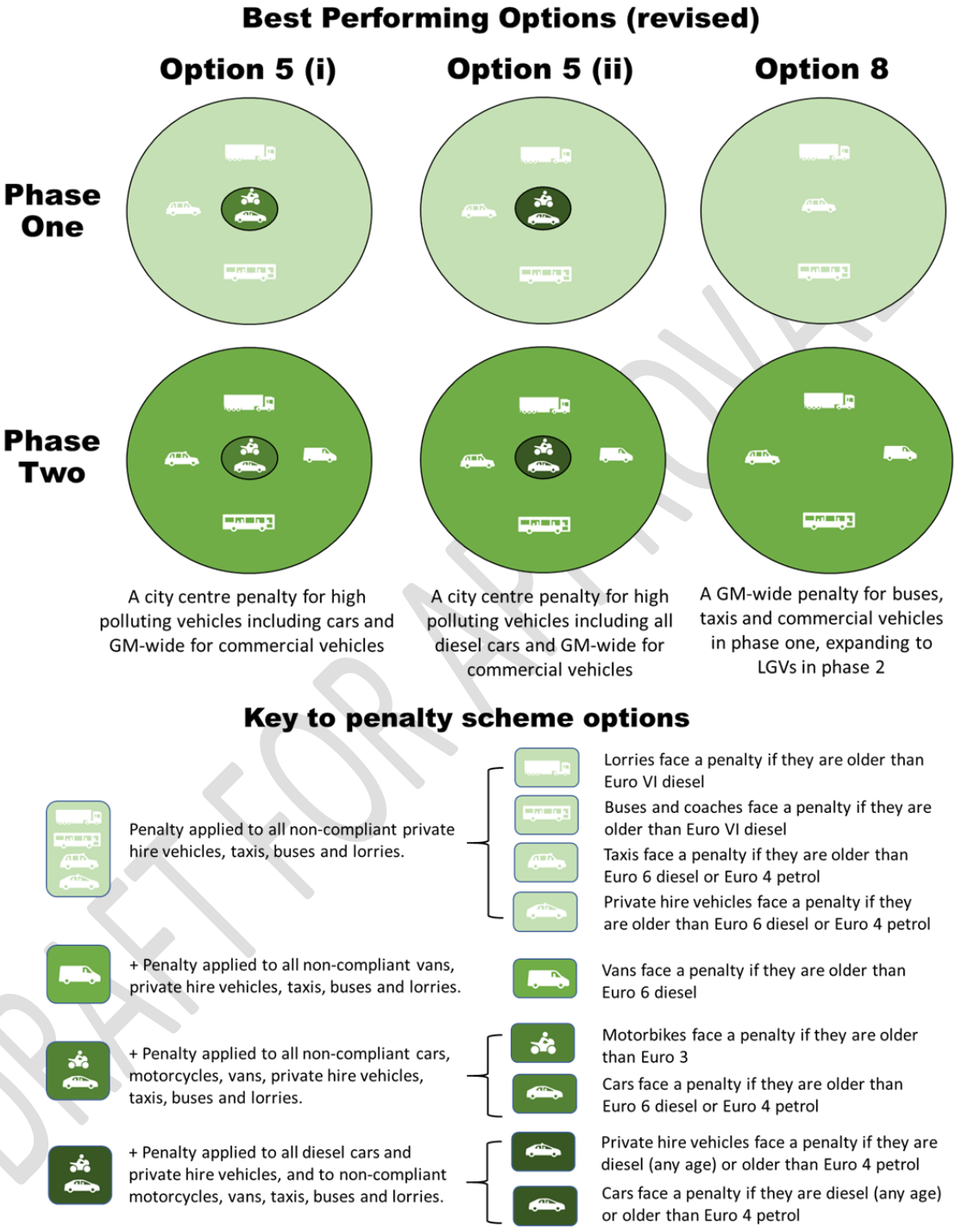
Figure 9: Best performing CAP Options for full appraisal



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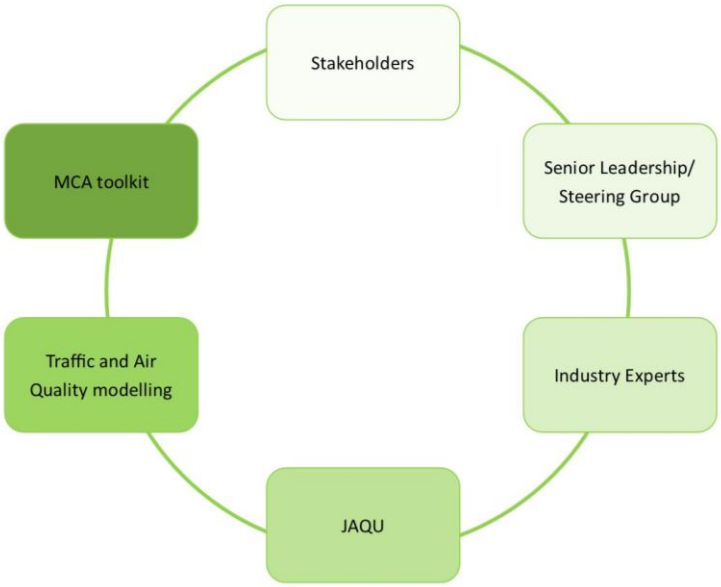
10 Conclusion

10.1 A rigorous process has been followed, which included a combination of engagement with stakeholders and industry experts; bespoke modelling of air quality / traffic; and multi criteria analysis. The process was iterative (see Figure 10 below) and during the development and analysis of Options, the identification of what is deliverable and the likely response from key stakeholders was an important element.

Figure 10: Iterative relationship process diagram



10.2 This process has encompassed an initial sifting exercise; Target Determination to identify the scale of the challenge; a high level assessment of options and measures; and a more detailed appraisal of the best performing options (set out in the main body of the OBC.

10.3 The output of this process has been to identify an effective and deliverable package of non-CAZ measures that form the foundation of all best performing options. Three options, with different CAZ proposals, have been identified as the best performing options, able to achieve compliance in the shortest possible time. These are Options 5i/ii, and 8. These have been subject to a full strategic and economic appraisal, costs have been developed, and a management and commercial approach to delivery has been identified.

10.4 As set out in the OBC, the outcome of this full appraisal was that Option 8, a GM-wide CAZ B in 2021 expanding to a CAZ C in 2023, has been identified as the best performing option and will proceed as the GM CAP.

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Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Individual Authority Compliance Summary: Bury Metropolitan Borough Council

Draft for approval

Warning: Printed copies of this document are uncontrolled

Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

1 Individual Authority Compliance Summary: Bury Metropolitan Borough Council

1.1 Introduction

1.1.1 This appendix summarises the GM local air quality modelling and status of compliance with the EU Limit Values within the district boundary of Bury Metropolitan Borough Council.

1.1.2 Whilst the local model is generally in agreement with the Pollution Climate Mapping Model (PCM) exceedances used by Government, it reveals a bigger problem than that initially identified by the PCM. It predicts a greater spatial distribution of NO_2 exceedances across roads in Greater Manchester and higher concentrations of NO_2 in many locations.

1.1.3 In 2021, local modelling identified 152 stretches of road (road links) or 250 modelled points, where concentrations of NO_2 are forecast to exceed the legal Limit Value (40 µg/m^3) beyond 2020 in GM as a whole. 112 of these link exceedances (or 207 modelled points) are on road links included in the national PCM model. Typically, these are roads which have the greatest car use and freight flows. 40 of the link exceedances (or 43 modelled points) are located on shorter stretches of local roads that are not represented in the national PCM model, mostly around town centres across Greater Manchester. These roads often have a greater proportion of bus and van usage.

1.1.4 Of these, within Bury there are predicted to be 23 model exceedance points, 19 on road links included in the national PCM model and 4 of the exceedances on shorter stretches of local roads that are not in the national model. These are shown in Figure 1 for 2021 and Figure 4 for 2023.

Preferred Option Effects in Bury Metropolitan Borough Council

1.1.5 Following the implementation of the GM Clean Air Plan (CAP) preferred option (Option 8), air quality is predicted to improve within Bury.

1.1.6 There is predicted to be a reduction in the number of modelled exceedances by -14 points in 2021 and -12 points in 2023. The location of these removed and remaining exceedances is presented in Figure 3 for 2021 and Figure 6 for 2023. These are categorised by the PCM and non-PCM road type of the modelled exceedance point in Table 1.

1.1.7 It is predicted that compliance is likely to occur by 2023 in Bury, and 2024 across the whole of GM, due to improvements as a result of the proposed measures.

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Individual Authority Compliance Summary:
Bury Metropolitan Borough Council

Table 1: Summary of Impacts of the GM CAP Exceedances in Bury

	Local Model point exceedances on PCM Links	Additional Local Model point exceedances on local roads (non-PCM links)	Total Local Model point exceedances
2021			
Without CAP measures	19	4	23
CAP Option 8 Phase 1	8	1	9
Change in exceedances	-11	-3	-14
2023			
Without CAP measures	10	2	12
CAP Option 8 Phase 2	0	0	0
Change in exceedances	-10	-2	-12

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Future Analysis and Uncertainty

1.1.8 The analysis underpinning the GM Clean Air Plan has been produced in line with JAQU guidance using the best data and tools available.

1.1.9 However, the nature of the air quality challenge means that there are many sources of uncertainty in the modelling, and further sensitivity testing is underway.

1.1.10 In addition, it is important to acknowledge that there are some key assumptions that will need testing at the Full Business Case stage. This will include bus/taxi compliance, the behavioural responses of drivers, and the impact of measures such as vehicle renewal funds.

1.1.11 Assumptions made in the context of advice from JAQU includes that by 2021 that the majority of vehicles are already compliant or upgrade to a compliant vehicle (for example buses and taxis) and the remaining non-compliant HGVs and PHVs are assumed to stay and pay, whilst LGVs are assumed to stay and pay, change mode or cancel their trip.

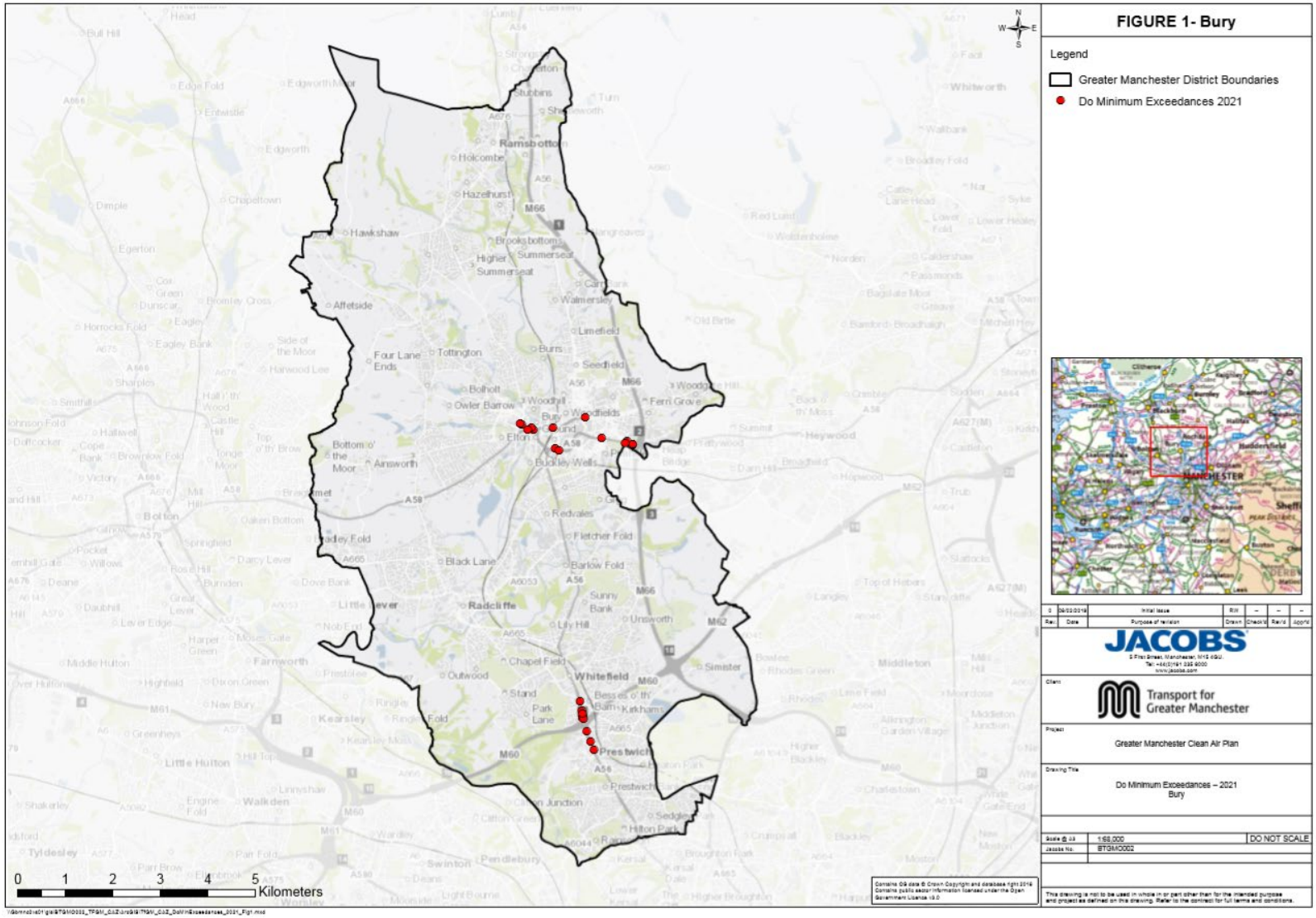

Figure 1: Predicted locations of exceedance of the annual mean nitrogen dioxide Limit Values without the CAP measures in Bury in 2021

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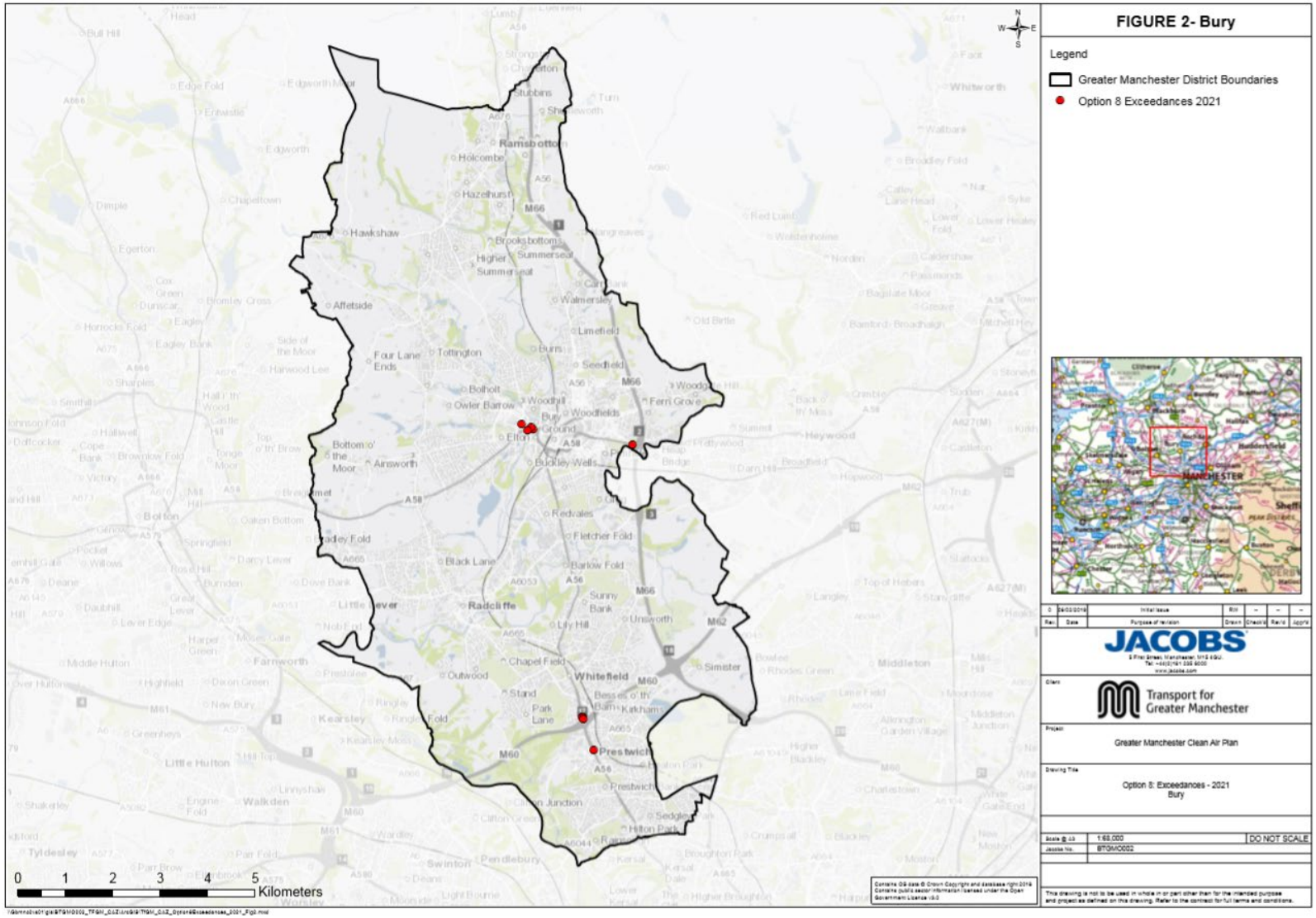

Figure 2: Predicted locations of exceedance of the annual mean nitrogen dioxide Limit Values with Option 8 Phase 1 in Bury in 2021

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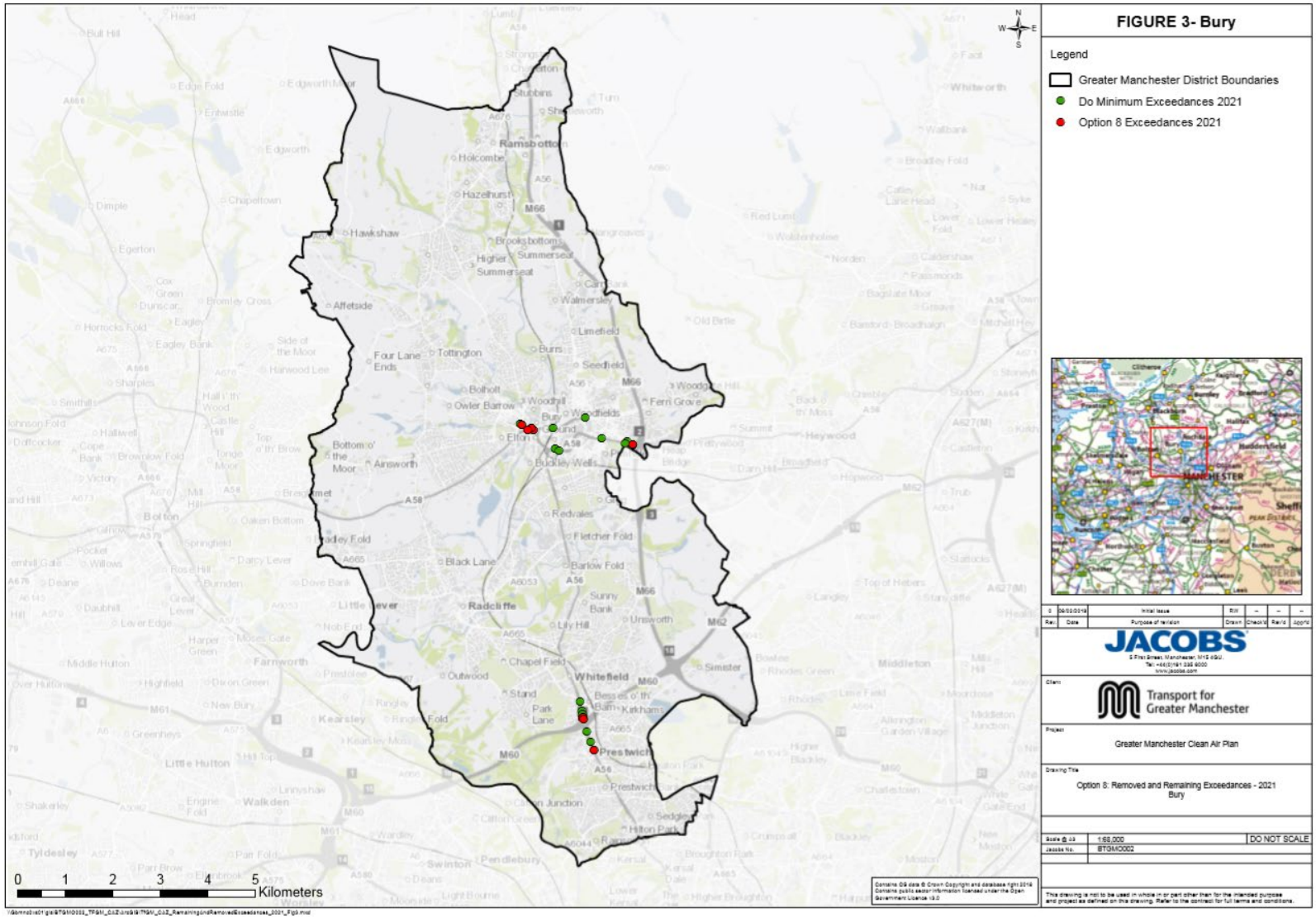

Figure 3: Predicted locations of removed and remaining exceedances of the annual mean nitrogen dioxide Limit Values with the CAP Option 8 in Bury in 2021

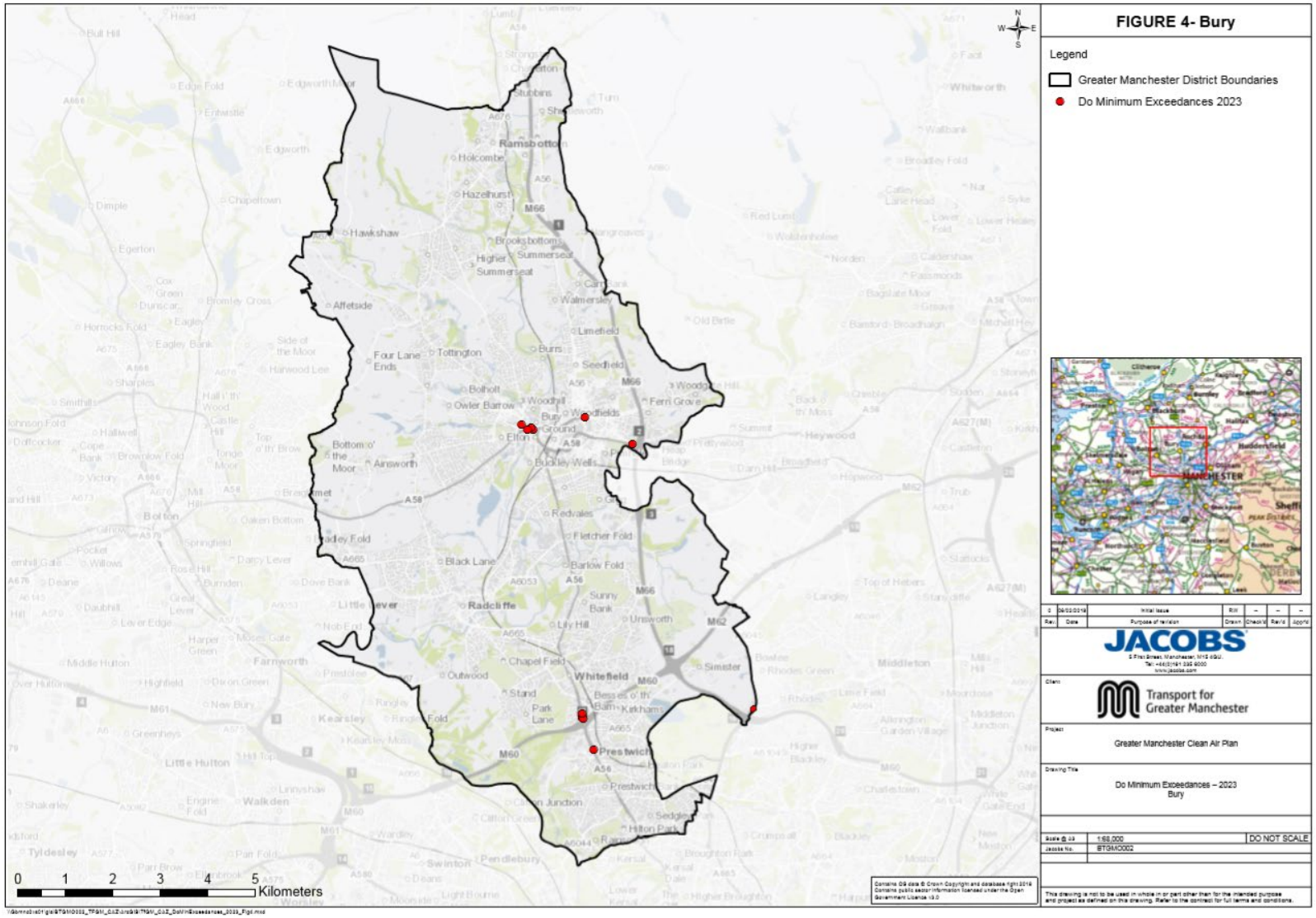

Figure 4: Predicted locations of exceedance of the annual mean nitrogen dioxide Limit Values without the CAP measures in Bury in 2023

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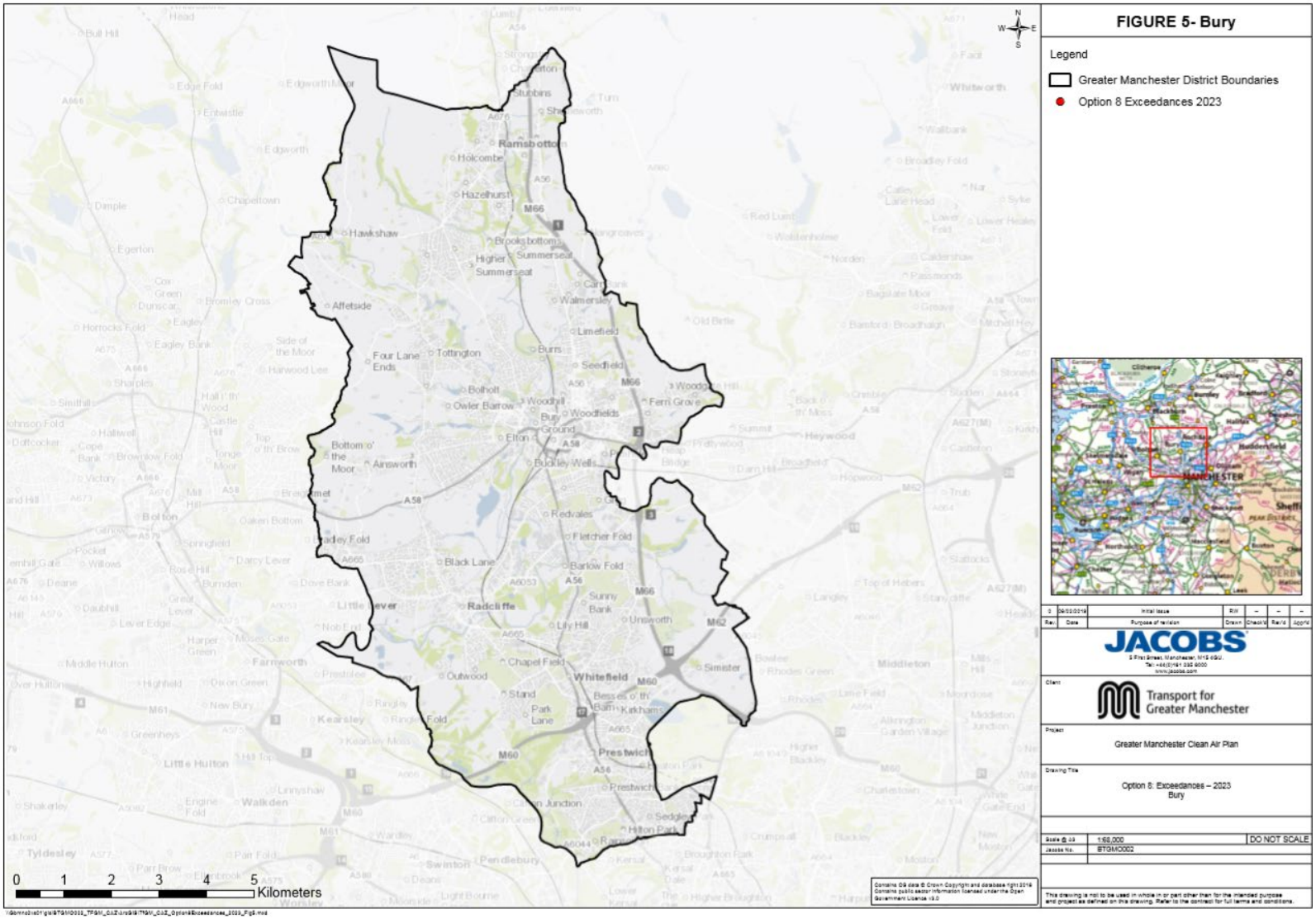

Figure 5: Predicted locations of exceedance of the annual mean nitrogen dioxide Limit Values with Option 8 Phase 2 in Bury in 2023

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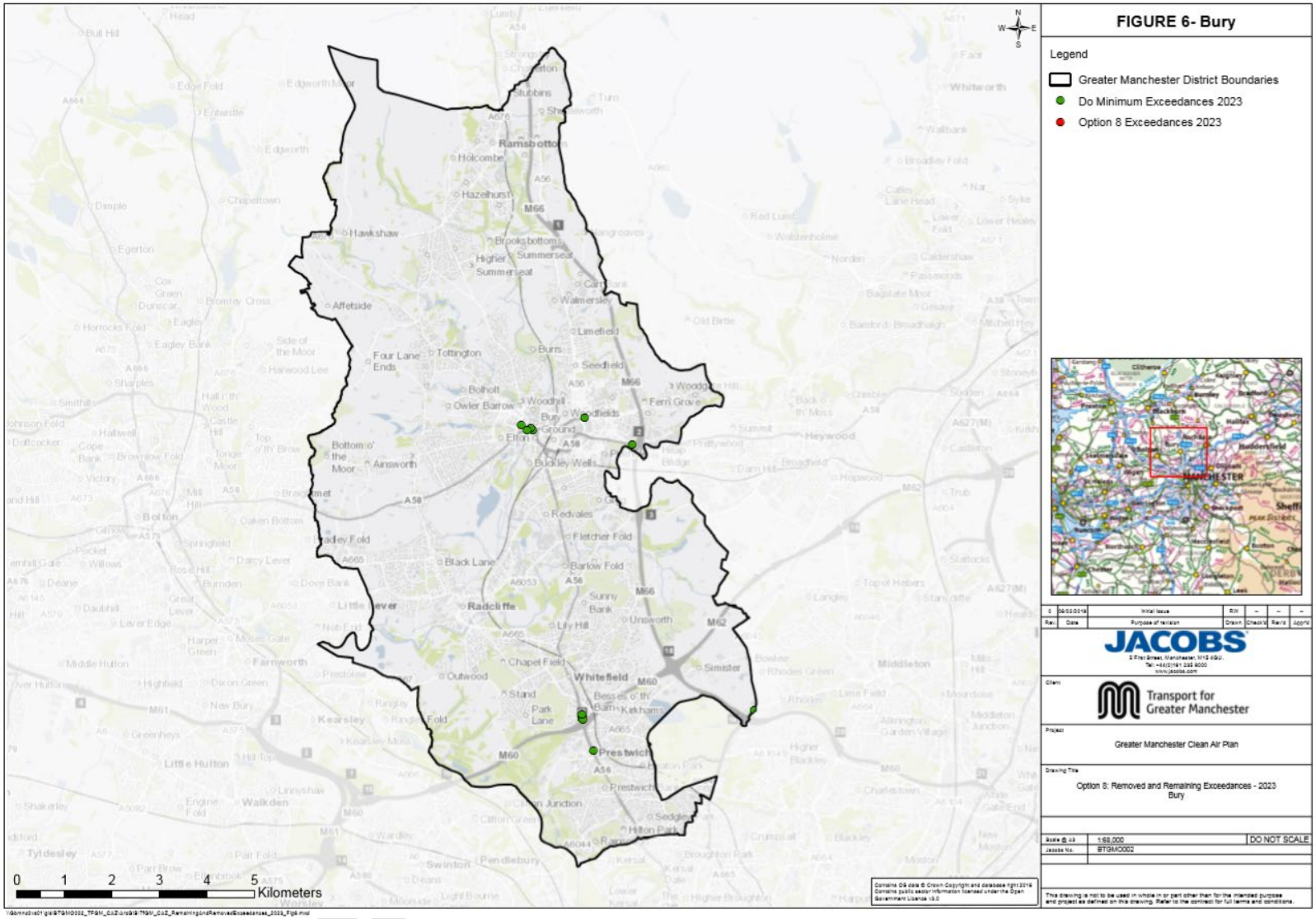

Figure 6: Predicted locations of removed and remaining exceedances of the annual mean nitrogen dioxide Limit Values with the CAP Option 8 in Bury in 2023

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Agenda Item 7

REPORT FOR DECISION

DECISION OF:	**CABINET**
DATE:	**12 March 2019**
SUBJECT:	**Mutually Binding Agreement 2019/20**
REPORT FROM:	**Councillor Simpson, Deputy Leader and Cabinet Member for Health and Wellbeing**
CONTACT OFFICER:	**Geoff Little, Chief Executive Bury Council and Accountable Officer NHS Bury Clinical Commissioning Group**
TYPE OF DECISION:	**Key**
FREEDOM OF INFORMATION/STATUS:	This report is in the public domain
SUMMARY:	This report sets out the collaboration agreement for the establishment and operation of the Local Care Organisation, as a formal alliance of organisations which have agreed to work together in a single delivery and accountability structure. The mutually binding agreement will drive development and improvements to the way health and care services are commissioned and delivered in Bury.
OPTIONS & RECOMMENDED OPTION	**Recommendation** 1. That Cabinet approve the mutually binding agreement as set out in appendix 1.

IMPLICATIONS:	
Corporate Aims/Policy Framework:	Do the proposals accord with the Policy Framework? Yes
Statement by the S151 Officer: Financial Implications and Risk Considerations:	This agreement is essential for the redesign of Health and Social Care Services, and the delivery of the Locality Plan. The Locality Plan will drive the reform of services, improve health outcomes, and ensure the wider Health & Social Care economy is sustainable.
Health and Safety Implications	There are no Health and Safety implications

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Statement by Executive Director of Resources (including Health and Safety Implications)	Wider resource implications e.g. IT, HR / OD are addressed in the Locality Plan.
Equality/Diversity implications:	There are no equality/diversity implications
Considered by Monitoring Officer:	Yes. This new Agreement marks a further stage in the development of a Local Care Organisation (LCO) to become a free standing and separate legal entity with a target date of the year 2020/21. Until then it will remain a contractual alliance between the participating bodies including the Council. Under the new Agreement for the purposes of budgetary control, direct employment and management of officers of the LCO and the holding of any new contracts on behalf of the LCO, the Northern Care Alliance NHS Group (itself a partnership of two NHS Trusts) will be the host body for the year 2019/20. The status of the staff employed by the participating bodies remains unchanged as does existing contracts, save that delivery by agreement of the participating bodies can be effected through the LCO. Certain functions are therefore delegated to the LCO and a number of matters are reserved to the respective participating bodies, including the Council.
Wards Affected:	All
Scrutiny Interest:	Health Scrutiny on 5th March 2019.

TRACKING/PROCESS **DIRECTOR:**

Chief Executive/ Strategic Leadership Team	Cabinet Member/Chair	Ward Members	Partners
Scrutiny Committee	Cabinet/Committee	Council	

1.0 Introduction

1.1 Strengthening health and care services for the people of Bury is a key aim of Bury's Locality Plan to help people lead healthier, happier lives. The Bury Locality Care Alliance was established to implement this plan, bringing together the separate organisations which provide health and care services in Bury.

1.2 Bury Locality Care Alliance (LCA) is currently underpinned by a Mutually Binding Agreement signed by the five partners (BARDOC Ltd, Bury Metropolitan Borough

Council, Bury GP Federation, Northern Care Alliance NHS Group and Pennine Care NHS Foundation Trust).

1.3 The parties are committed to strengthen their relationship further to facilitate the achievement of transformed health and social care services in Bury, which aim to secure benefits to patients, users, residents, the workforce and the health and social care economy. To reflect this strengthening of the relationship, the Bury Locality Care Alliance (LCA) will now instead be called the Bury Local Care Organisation (LCO).

1.4 A strengthened and more comprehensive Mutually Binding Agreement for 2019/20 on the establishment and operation of the Local Care Organisation (LCO) is set out in Appendix 1 for Cabinet Members' consideration. The mutually binding agreement will drive development and improvements to the way health and care services are commissioned and delivered in Bury.

2.0 The 2019/20 Mutually Binding Agreement (MBA)

2.1 Key areas to note within the 2019 MBA include:-

a) Explicit statements of what services are in scope and under the operational management of the LCO

b) Clarity on the governance and accountability arrangements to support operational management, underpinned by a workforce protocol

c) Clarity on the investment agreement between the Bury Local Care Organisation

d) Explicit statements of delegations and reserved powers from each of the partner organisations

e) Principles of risk and reward share

2.2 A further change is that two other organisations will become a full members of the LCO from 1 April 2019, namely the Bury Voluntary, Community and Faith Alliance and Persona Care.

List of Background Papers:

Mutually Binding Agreement 2019/20 – Appendix 1

Contact Details:-

Geoff Little
Chief Executive Bury Council and Accountable Officer NHS Bury Clinical Commissioning Group

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The Local Care Organisation for Bury

Mutually Binding Agreement 2019/20

Parties to the Agreement

(1) BARDOC Limited
(2) Bury GP Practices Limited
(3) Bury Metropolitan Borough Council
(4) Bury Voluntary, Community and Faith Alliance
(5) Northern Care Alliance NHS Group
(6) Pennine Care NHS Foundation Trust
(7) Persona Care and Support Ltd (to be confirmed)

Version	18.0
Status	Final draft for formal approval
Approval	Outstanding
Author	Chris O'Gorman
Version control	
v2	• Revision of schedules following meeting of task and finish group on 6 November 2018 • Rationalisation of numbering system
v3	• New clause on intellectual property • Diagram in terms of reference (schedule 1) to show

	relationship with partners
v4	• Significant revision in preparation for CEOs' summit meeting on 18 December 2018. Sections retained from previous version in italic
V5	• Amendments added following task and finish group on 3 December 2018 in yellow
V6	• Amendments to section on meaning of levels of in scope from Amy Lepiorz and Kath Wynne-Jones
V7	• Amendments made in response to comment from Andrew Hulcoop and Jo Purcell in blue • Revisions to scheme of delegations to include reserved matters in response to comment from Jayne Hammond • Revisions to terms of reference for LCO Board to harmonise with remainder of Agreement
V8	• 'Clean' copy produced for chief executives' sponsor group on 18 December 2018. Revised version of schedule 4 added.
V9	• Revised workforce protocol added; signature sheet added
V10	• New section on ambitions added; additions to section on purpose. Clarification that the document applies for 2019/20 only added.
V11	• Additions and amendments from Martin Clayton included • Amendment from Angela Schorah included
V12	• Amendments from Kath Wynne-Jones and Tyrone Roberts • General tidying up • Additional organisational parties added
V14	• Schedule 3 added • Amendments made following LCA Board meeting, 16 January 2019
V15	• Phrase added to end of 6.2 in workforce protocol (Schedule 5)

	at request of Keith Walker • Removal of LMC as observer member of Board following decision of CEOs.
V16	• V6 of investment agreement embedded
V17	• Minor corrections made to Schedule 1 and 5
V18	• Details of Bury VCFA office added • New schedule on actions agreed for 2019/20 added (details awaited) • Minor corrections made to Schedule 1 • Revised cashability statement • Revised statement at 7 on communications • Additions to PCFT delegations and reserved matters from Keith Walker • New schedule 7 (actions during 2019/20) as proposed by CEOs

Mutually Binding Agreement

1. Parties

This Agreement is made between the following parties:

(1) BARDOC Limited, 22 Derby Way, Bury, Lancashire, BL9 0NJ, an industrial and provident society
(2) Bury GP Practices Limited, Unit 1 - Europa House, Barcroft Street, Bury, Lancashire, England, BL9 5BT, a private limited company
(3) Bury Metropolitan Borough Council, Town Hall, Knowsley Street, Bury, BL9 0SW, a local authority
(4) Bury Voluntary, Community and Faith Alliance, St John's House, John Street, Bury, BL9 0NE, an applicant for community incorporated organisation status
(5) Northern Care Alliance NHS Group, Trust HQ, Level 3, Mayo Building, Salford Royal, Stott Lane, Salford, M6 8HD, an NHS group formed by bringing together two NHS bodies, Salford Royal NHS Foundation Trust and The Pennine Acute Hospitals NHS Trust
(6) Pennine Care NHS Foundation Trust, Trust HQ, 225 Old Street, Ashton-under-Lyne, OL6 7SR, an NHS foundation trust
(7) Persona Care and Support Limited, Grundy Centre, Wellington Road, Bury, BL9 9AH, a private limited company (to be confirmed)

2. Definitions

'Agreement'	means this collaboration Agreement between the parties for the establishment and operation of the Local Care Organisation;
'Board'	means the leadership board for the LCO established by the parties whose functions are described more fully in clause/schedule 28;
'Bury Locality Plan'	means the agreed Bury Locality Plan 2017/18-2020/21
'Greater Manchester Health and Social Care Partnership'	means the body made up of the 37 NHS organisations and councils in the Manchester region, which is overseeing devolution and taking charge of the £6bn health and social care budget;
' Local Care Organisation' or 'LCO'	means the health and care organisation formed by the parties to collaborate together to achieve the LCO objectives working in conjunction with the One Commissioning Organisation.

'LCO objectives'	means the objectives agreed by the parties and set out in clause 12 of this Agreement;
'One Commissioning Organisation' or 'OCO'	means the joint commissioning organisation established by Bury Metropolitan Borough Council and NHS Bury Clinical Commissioning Group to deliver whole system transformation of health and care services across Bury in line with the Bury Locality Plan.

2. Purpose of the Local Care Organisation

The LCO is a formal alliance of organisations which has agreed to work together in a single delivery and accountability structure to

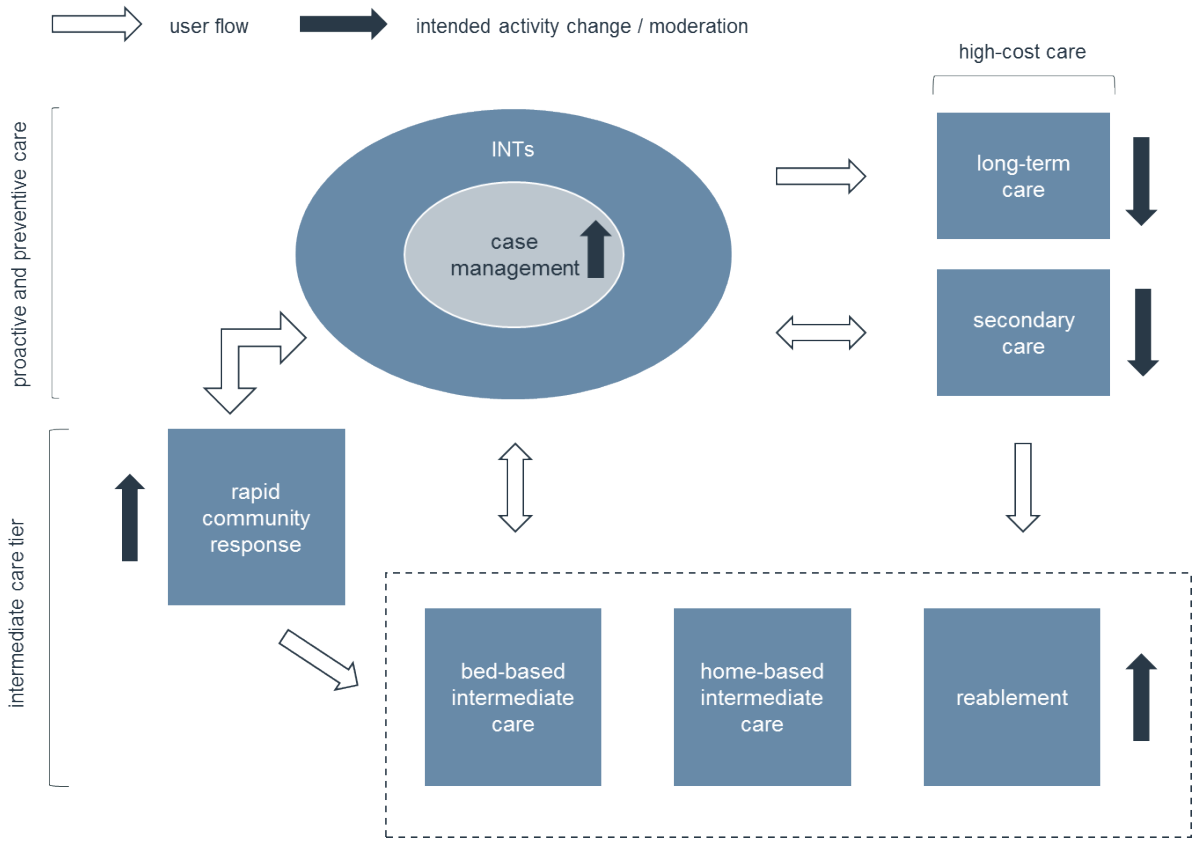
- provide integrated care and support to the people of Bury
- transform health and social care services in line with the Locality Plan and commissioners' intentions
- support improvements in population health, wellbeing and outcomes.

The LCO is responsible for the operational delivery and transformation of a group of services (the 'in scope' services at Schedule 1) which, starting in 2019-20 will ultimately include the large majority of health and social care services that are commissioned and provided in the borough.

The overall purpose of the LCO is to transform the ways in which health and social care is provided, and to transform the experience and expectations of, and relationship between Bury people and publicly-funded health and social care services.

A key aim of the LCO is to ensure that home and community are the principal place in which health and social care services are provided and that 'institutional'-type care, whether in hospital or in care homes, is 'right-sized' to meet the needs of those whose needs can only be met in such settings.

The anticipated system impact of the LCO is summarised in the graphic below.



3. Principles

The parties to this Agreement agree to act reasonably and in good faith in their dealings with one another. The parties will conduct themselves in the spirit of partnership with the intention of creating a substantial, long-term relationship based on:

- A shared intention to create a sustainable health and social care system in Bury
- A shared ambition to develop the opportunities offered by the Greater Manchester Devolution Agreement
- complementary capabilities in health and social care applied to common interests, specifically the health and wellbeing of the people of Bury
- fair and proportionate distribution of risk and reward
- shared values and culture of high quality service to the public

The parties to this contract agree that they will work at all times on the basis of the following principles:

- Decision-making at all times will be in the best interests of the people of Bury whose health and wellbeing will be the first priority of the parties

- Services will be designed and delivered without exceeding the financial resources available to the LCO by the OCO and in consistency with the investment agreement made between the LCO and OCO (Schedule 3)
- Notwithstanding the pre-eminence of organisational members' contractual, regulatory and statutory accountabilities, achievements and failures will be collective to the parties, and not to the individual organisations which constitute the LCO. Financial risks and rewards shall be determined and distributed in accordance with the risk and reward Agreement (Schedule 4)
- Financial sustainability and the sustainability of the services which make up the health and social care system as a whole is essential to the success of the LCO
- All parties will share relevant operational, financial, clinical, professional and workforce information with other parties on an open and transparent basis subject only to the statutory obligations placed on them, e.g., by the Data Protection Act 1998 and the General Data Protection Regulations

4. Services in scope

During 2019/20, the LCO has agreed with the OCO that a series of services will be in scope. Those services are listed in Schedule 1.

Services in scope at level 4 are directly managed by the LCO, and form part of the operational contract between the OCO and LCO (see section 6 below for details of the operational contract). The LCO Board and management team will be responsible for decision making about level 4 services as set out in section 5.a) below. Statutory responsibilities and regulatory accountability will remain with the organisation which employs the staff, as set out in the workforce protocol (Schedule 5). Monitoring arrangements for level 4 services are included within the operational contract, as are service budgets and all other resources.

Services in scope at level 2 are closely planned and delivered within the LCO management and governance arrangements, with staff, managers and professional leaders being members of the LCO management team. Operational models developed by the LCO may include services in scope at level 2, and there will be full integration between the LCO management team and services at level 4 and level 2. However, level 2 services will not form part of the operational contract between the OCO and LCO and will be primarily managed through existing bilateral contract arrangements. However, metrics relating to services in scope outside of level 4 may be included as required within the operational contract arrangements. Decisions of the kind described in 5.a) below remain the responsibility of the employing organisation which of course also retains statutory and regulatory accountability.

Services in scope at level 2 will cross refer to the LCO in their specifications. Formal contract performance and quality reporting remains through existing (i.e., 2018/19) bilateral reporting routes though relevant aspects of contract monitoring may be included in the LCO operational contract arrangements.

Services which are identified as in scope by virtue of being LCO commissioned (known as level 5 services) are those services which have been delegated for 'tactical' commissioning purposes by the OCO to the LCO. This delegation will include the commissioning budgets and such other resources (staff and infrastructure) as are

mutually agreed to discharge the commissioning responsibilities effectively. Level 5 services will be underpinned by an agreement between the OCO, LCO and whichever member organisation acts as the sub-contract holder. The agreement will specify resource availability, outcomes and standards. Level 5 services may include those services which are not provided wholly or partly by the LCO, i.e., where a service is part provided by the LCO (level 4) and part sub-contracted from an organisation (which may or may not be a party to this Agreement), for ease these arrangements shall be referred to as level 5. Priority will be accorded to establishing arrangements in 2019/20 for the locally commissioned services contract currently between NHS Bury CCG and Bury GP practices.

5. Objectives, goals and outcomes

a) The LCO will be granted autonomy and authority to make decisions and deliver the services in accordance with this Agreement. Decisions may include but are not limited to: transforming models of care and delivery, deploying and line managing staff; managing rotas; receiving referrals; assessing, treating, supporting and caring for patients/users; managing budgets; processing data; improving safety and quality; fulfilling contract obligations on behalf of partners; fulfilling statutory requirements on behalf of others (without change in accountability); entering into sub-contracts with suppliers; reporting on performance, quality and finance; delivering savings; managing and investigating or coordinating the investigation of complaints which are made about the LCO and/or co-operating in the investigation of complaints about in-scope services made to parties to this Agreement; supporting the health and wellbeing of staff

b) The LCO will, through the proper discharge or all obligations under this Agreement be empowered to pursue its agreed priorities to reshape how services work, individually and collectively, in line with agreed governance arrangements

c) To ensure services are safe, equitable and of a high standard with reduced variation

d) Co-ordinate health and social care, ensuring quality, safety, value for money and high standards for all

e) To enable people and neighbourhoods to be active partners in their health and wellbeing

f) Build on the strengths of communities, neighbourhoods, voluntary groups and social networks

g) Support, empower and invest in individuals and carers supporting them to manage their own health

h) To achieve a sustainable system in relation to finance, workforce and estate

i) Transform the health and social care system, moving the focus from hospital to home and the community

j) Reinvest savings into better care

k) Balance finances in each and every year within the resources allocated to the LCO

l) Develop the LCO workforce so that there are committed, skilled and motivated staff where and when they are needed

6. LCO longer-term ambitions

a) Scope of provision

The parties to this Agreement share the ambition of the Greater Manchester Health and Social Care Partnership that LCOs develop as the principal means by which health and social care services within a locality are integrated and delivered in a financially and clinically (professionally) sustainable manner. This means that the parties to this Agreement in Bury aim to ensure the inclusion of the large majority of services currently commissioned and provided to Bury people as services 'in scope' of the LCO. During 2019/20 the final plans for phased inclusion of health and social care services to be directly provided by the LCO (currently referred to as 'level 4') will be agreed and mobilised.

b) Scope of commissioning

The parties to this Agreement additionally share the ambition of ensuring that the LCO undertakes a range of commissioning and contracting functions currently (2019/20) undertaken by NHS Bury CCG and Bury Metropolitan Borough Council. This ambition is likely to lead to a new commissioning architecture in which the One Commissioning Organisation is responsible for setting overall strategy, outcomes and quality standards, whilst the LCO is responsible for translating strategy into operational practice and for providing assurance on outcomes and quality standards. The parties to this Agreement acknowledge that establishment of this new architecture will require the transfer of expertise and resources from the current OCO partners to the LCO in order to maximise effectiveness, retain skills, and maintain organisational 'memory' within the Bury health and social care system.

During 2019/20 the plans for phased transfer and transformation of health and social care commissioning from the OCO to the LCO (currently referred to as 'level 5') will be prepared and negotiated jointly with the OCO for mobilisation from 2020/21. A priority for this transfer will be the quality in primary care contract.

c) Organisational form

Whilst in 2019/20 the LCO is a formal alliance of organisations operating a relatively limited number of in scope services (though having an influence over many more), during this same year all parties to this Agreement confirm their commitment to engage in constructive discussion about the future state (sometimes described as the 'end state') of the LCO, namely the organisational form which the LCO might take from

2020/21. Discussion and agreement on organisational form from 2020/21 shall take into account the scope of the LCO as it has been agreed to include service provision and commissioning (see 6a) and 6b) above) as well as NHS contractual and supply chain management responsibilities together with the relevant legal and regulatory frameworks.

7. Contracts

In year 2019/20, commissioners will retain contracts with individual parties to the LCO including those services which are agreed to be fully 'in scope' of the LCO (i.e., level 4 and 5). These contracts will remain the legally binding obligations on each party to the LCO.

However, the delivery of contracts (in relation to level 4 services) held by individual parties shall be through the LCO, as if the LCO were the contract holder. The Board of the LCO shall be the body responsible for the fulfilment of individual contracts for services in scope. High-level contract management meetings will normally be held between commissioners and the Board (or agreed sub-committee of the Board) of the Local Care Organisation alone, though bilateral contract meetings may be required in addition. For ease, these arrangements and the documentation that supports them are referred to as the 'operational contract' in this Agreement. The LCO management team may be required to be involved in the contract management of contracts which cover services in the wider North East Sector, as agreed from time to time.

Commissioners will advise of their contract intentions in respect of year 2020/21 onwards. For the avoidance of doubt, no changes to contractual arrangements shall be made which create new VAT liabilities and nothing in this Agreement is intended to imply any change which creates new VAT liabilities.

8. Regulatory compliance

Each Partner is responsible for ensuring the regulatory compliance of the services provided under their respective contracts with the OCO. Each provider shall deal directly with the relevant regulatory body in relation to the services performed by that provider. LCO Management Team members may be accountable to one or more member organisations individually for the purpose of providing assurance of regulatory compliance.

It is acknowledged and agreed by Providers that it is not intended that there will be any collective responsibility or liability for any regulatory breaches or enforcement actions relation to the delivery of services pursuant to the terms of this Agreement.

9. Finance

It is the intention of the parties to this agreement to delegate to the LCO Board to the fullest possible extent agreed levels of budgetary control for relevant budgets relating to the services which are directly managed through the LCO management team. The risk and reward share agreement will guide the management of resources across the services in scope.

10. Staff – line management

Subject always to compliance with all relevant employment legislation, it is the intention of the Parties that the delivery of the in scope services within the LCO will not affect the employment status or terms and conditions of any employee of each Party, currently engaged in the provision of the services.

It is accepted that the line management of any staff employed by a provider may, if agreed by the relevant provider through this Agreement, be exercised through the LCO management team in accordance with the workforce protocol (Schedule 5)

The LCO management team and the parties shall ensure that each employee is appropriately managed and supervised in accordance with all relevant prevailing standards of professional accountability and shall at all times comply with the provisions of the workforce protocol (Schedule 5).

The LCO will develop a framework for staff and managers to secure appropriate assurance to employing organisations and to the LCO Board, e.g., through joint appointments.

11. The LCO Board

The Board of the LCO is a partnership board recognised by the Boards of each of the partner organisations as responsible for:

- Overseeing the LCO and the delivery of in scope services (Schedule 1)
- The achievement of the objectives, goals and outcomes set for the LCO (including system and service transformation objectives), through the management team and staff team
- Setting strategy and direction, in the context of available resources and the strategic intentions of commissioners
- Managing the effectiveness of the arrangements for the LCO, including the staffing agreement and the execution of delegated powers
- Holding the chief officer to account for the delivery of objectives, goals and outcomes
- Providing assurance to commissioners and to LCO partner organisations in relation to the effectiveness of the LCO's work and its achievement of goals and outcomes

The terms of reference of the LCO Board are set out at Schedule 6.

12. LCO management team

The role of the management team will be to:

a) Manage the in scope services as per the agreed definitions at sections 4 and 5 above on a day to day basis in a manner consistent with the scheme of delegations (Schedule 2)

b) Manage the design and mobilisation of transformation in line with the Locality Plan, and as agreed shall be the responsibility of the LCO through the Bury Health and Social Care Transformation Programme Board

c) Maintain system resilience in relation to services in scope, e.g., by supporting the winter resilience Gold command arrangements

d) Develop, seek approval for, and implement a consistent transformation operating model for Bury health and social care services

e) Report to the LCO Board on material aspects of the services such that the Board is enabled to fulfil its responsibilities set out in section 10, namely, the management team shall ensure the Board receives regular reports in relation to transformation mobilisation, quality, performance, risk, finance, workforce and contractual obligations

f) Identify, assess and manage risks associated with in scope services

g) Support the development of operational practice, values and culture which encourages and enables transformation

h) Direct the programme management office on behalf of the Bury health and social care system

i) Line manage staff for level 4 in scope services

j) Undertake, or oversee the delegated day-to-day commissioning of level 5 services

k) Supports the LCO Board in identifying and agreeing additional in scope services for 2019/20 onwards.

13. Role of the host

The host Partner for 2019/20 shall be Northern Care Alliance NHS Group. During this year the role of the host will be to:

- Co-ordinate, on behalf of the management team, infrastructure and corporate support and resource requirements for the LCO, e.g., business intelligence, finance and HR expertise to support the LCO board and management team or to support acquisition of this support from other parties

- Employ and provide formal line management to the chief officer, director of transformation and delivery and other staff as required. NB., The chief officer

shall be line managed by agreement with the host by LCO independent chair on behalf of the LCO board.

- Coordinate the effective management of the supply chain either directly or through delegation to LCO partners as agreed by the Board

- To collate, assess and report on business intelligence, performance and quality metrics associated with the in scope services as required by the LCO Board, management team and commissioners, through the PMO and other infrastructure support as required

- To propose, seek approval for, and manage the implementation of the LCO's budgetary control, contracting and integrated risk management processes including holding resources specifically supplied for the LCO and ensuring the timely payment of invoices submitted by parties to this agreement.

- To hold contracts on behalf of the LCO where this is agreed by the LCO Board, notwithstanding the potential for other Partners to hold contracts on behalf of the LCO, where that Partner is judged by the LCO Board to be best placed to be the contract holder

- Ensure the effective management and support of the system-wide transformation Programme Management Office, through the management team

For the avoidance of doubt, the host provider does not:

- Take executive decisions on behalf of the LCO, which are the responsibility of the LCO Board.

- Conflict with the statutory or contractual responsibilities or accountabilities of partner organisations.

- Determine the provision of 'in scope' services for the LCO and the shape of the future LCO supply chain.

- Incur any financial liability to the NCA beyond that which will be fully reimbursed through agreed transformation funding

The role of the host Partner will be reviewed for 2020/21 and may be further developed with agreement of all parties.

14. Intellectual property

Intellectual property developed under this Agreement shall belong to each party to the LCO jointly and severally. No sale of intellectual property, other commercial benefit, or the transfer of rights to another party outside of the parties to this Agreement shall be permitted only with the express written permission of the LCO board.

15. Dispute resolution

The Local Care Organisation shall operate a three-stage dispute resolution process, where disputes arise between parties to this Agreement.

Stage 1

Disputants who have been unable to resolve a dispute by informal negotiation shall invoke stage 1 of the dispute procedure. The disputant shall set out the dispute in writing together with a statement of the resolution the disputant seeks. The respondent(s) shall reply in writing setting out their response to the dispute and the proposed resolution. This exchange of documents shall be completed within 10 working days unless it is extended by mutual Agreement.

Stage 2

Where a dispute cannot be resolved at stage 1, the matter will be escalated to stage 2 and brought to the Board of the Local Care Organisation where each party to the dispute will have the opportunity to present their case. The independent chair shall negotiate an Agreement to resolve the dispute (and may in so doing need to meet with the parties separately prior to discussion at a Board meeting). This stage shall be completed within 30 days of being notified to the chair.

Stage 3

Where the dispute cannot be resolved at stage 2, the parties in dispute shall ask a suitably qualified and experienced elected member or non-executive director or equivalent of their respective organisations to meet to review the dispute and attempt to resolve the dispute. This stage shall be completed within 30 days of having been notified to the chair.

Stage 4

Where a dispute cannot be resolved at stage 3, the parties to the dispute shall take the case to the Centre for Effective Dispute Resolution, sharing the costs between the disputant and respondent(s).

16. Breach of the Agreement

The parties to this Agreement agree that the Board of the Local Care Organisation may (after taking appropriate advice and/or conducting an investigation, as appropriate) determine that one or more parties are in breach of the terms of this Agreement. The independent chair shall have the final say on breaches of this Agreement, having taken appropriate advice.

When such a breach is identified, the independent chair of the Board will write to the Chair of the party or parties deemed to be in breach, setting out the nature of the breach and the terms for remedying the breach. The party or parties in breach shall have the opportunity to confirm their willingness to remedy the breach, that

confirmation needing to be received within 15 working days of their receipt of the independent chair's letter.

Where the breach is not accepted by the party or parties said to be in beach, or the remedy is not implemented within an agreed timeframe, either

a) stage 3 of the dispute procedure may be invoked or
b) this Agreement may be deemed by the LCO Board to be terminated

17. Termination and renewal

This Agreement will terminate on 31 March 2020 unless

a) previously terminated by one or more party
b) all parties have agreed to terminate it in order to put in place a new or revised Agreement at an earlier date

All parties may agree to renew this Agreement for a maximum of a further 2 years (i.e., to 31 March 2022)

Any party to this Agreement may give notification to terminate this Agreement by giving no less than 6 months' notice.

This Agreement will be deemed to be terminated by the Board of the Local Care Organisation where any party is in irremediable breach of the terms of the Agreement.

18. Approvals

In respect of the entire Agreement including schedules

This Agreement was approved by the Boards of the parties to this Agreement and signed by their authorised representatives as follows:

Signed for and on behalf of BARDOC Limited:

Signature: _____ Name: _____

Signed for and on behalf of Bury GP Practices Limited

Signature: _____ Name: _____

Signed for and on behalf of Bury Metropolitan Borough Council (as provider)

Signature: _____ Name: _____

Signed for and on behalf of Bury Voluntary, Community and Faith Alliance

Signature: _____ Name: _____

Signed for and on behalf of Northern Care Alliance NHS Group

Signature: _____ Name: _____

Signed for and on behalf of Pennine Care NHS Foundation Trust

Signature: _____ Name: _____

Signed for and on behalf of Persona Care and Support Ltd (to be confirmed)

In respect of schedules 1, 3 and 4 only

Signed for and on behalf of Bury Metropolitan Borough Council (as commissioner)

Signature: _____ Name: _____

Signed for and on behalf of NHS Bury Clinical Commissioning Group

Signature: _____ Name: _____

Schedules

1. Services in scope for 2019/20
2. Scheme of delegations and reserved matters
3. Investment agreement
4. Risk and reward share
5. Workforce protocol
6. Terms of reference for LCO Board
7. Agreed actions in 2019/20 arising from the Mutually Binding Agreement

Schedule 1

In scope services

See section 4 for a definition of ‘in scope’ services at relevant levels.

This schedule shall be agreed by the parties to the Agreement and also by the One Commissioning Organisation.

Schedule 1.xlsx

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Schedule 2. Scheme of delegations and reserved matters

BARDOC Ltd	Bury GP Federation	Bury Voluntary Community and Faith Alliance	Bury MBC	Northern Care Alliance NHS Group	Pennine Care NHS Foundation Trust	Persona Care and Support Ltd
BARDOC Ltd will delegate to the LCO Board, and through the Board to the management team, the line management and resource management of the services in scope. The LCO is authorised to make those decisions set out in paragraph 4 of the Partnership Agreement with regard to the services in scope (levels 4 and 5).	Bury GP Federation will delegate to the LCO Board, and through the Board to the management team, the line management and resource management of the services in scope, where relevant staff are directly employed by the Federation. The LCO is authorised to make those decisions set out in paragraph 4 of the Partnership Agreement with regard to the	Bury Voluntary, Community and Faith Alliance (VCFA) will delegate to the LCO Board, and through the Board to the management team, the line management and resource management of the services in scope, where relevant staff are directly employed by the VCFA. The LCO is authorised to make those decisions set out in paragraph 4 of the Partnership	The majority of adult social care work will fall within scope of the LCO in the future. Work undertaken by adult social care staff needs to be authorised lawfully. Bury MBC needs to ensure that the Director of Adult Social Services (DASS) remains responsible for functions that cannot be delegated. Adult social care functions that are currently (November	The Northern Care Alliance will delegate to the LCO Board, and through the Board to the management team, the line management and resource management of the services in scope. The LCO is authorised to make those decisions set out in paragraph 4 of the Partnership Agreement with regard to the services in scope (levels 4 and 5).	Pennine Care NHS Foundation Trust will, insofar as PCFT is able to do so without breaching its Constitution or other regulatory restrictions, delegate to the LCO Board, and through the Board to the management team, the line management and resource management of the services in scope. The LCO is authorised to make those decisions set out in paragraph 4 of	Persona Care and Support Ltd will delegate to the LCO Board, and through the Board to the management team, the line management and resource management of the services in scope, where relevant staff are directly employed by Persona The LCO is authorised to make those decisions set out in paragraph 4 of the Partnership Agreement with regard to the

BARDOC Ltd will make available to the LCO those resources (people, estate, budgets, infrastructure) associated with the services in scope without undue let or hindrance in order to enable the Board and management team to fulfil the jointly agreed objectives of the LCO. BARDOC Ltd will remain accountable for all statutory and regulatory responsibilities, for compliance with all relevant laws and guidance, and for fulfilment of	services in scope (levels 4 and 5). Bury GP Federation will make available to the LCO those resources (people, estate, budgets, infrastructure) associated with the services in scope without undue let or hindrance in order to enable the Board and management team to fulfil the jointly agreed objectives of the LCO. Bury GP Federation will remain accountable for all statutory and regulatory responsibilities,	Agreement with regard to the services in scope (levels 4 and 5). Bury VCFA will make available to the LCO those resources (people, estate, budgets, infrastructure) associated with the services in scope without undue let or hindrance in order to enable the Board and management team to fulfil the jointly agreed objectives of the LCO. Bury VCFA will remain accountable for all statutory and regulatory responsibilities,	2018) delegated to the DASS under the Council's constitution remain with the DASS. Social care members of the LCO management team will have a dual reporting line to the chief officer of the LCO and to the DASS. The DASS will authorise the social care member(s) of the LCO management team to performs the majority of adult social care functions except those that remain with the	The NCA will make available to the LCO those resources (people, estate, budgets, infrastructure) associated with the services in scope without undue let or hindrance in order to enable the Board and management team to fulfil the jointly agreed objectives of the LCO. The NCA will remain accountable for all statutory and regulatory responsibilities, for compliance with all relevant laws and guidance, and for fulfilment of contracts with	the Partnership Agreement with regard to the services in scope (levels 4 and 5). Pennine Care NHS Foundation Trust will make available to the LCO those resources (people, estate, budgets, infrastructure) associated with the services in scope without undue let or hindrance in order to enable the Board and management team to fulfil the jointly agreed objectives of the LCO. Pennine Care NHS Foundation Trust will remain	services in scope (levels 4 and 5). Persona will make available to the LCO those resources (people, estate, budgets, infrastructure) associated with the services in scope without undue let or hindrance in order to enable the Board and management team to fulfil the jointly agreed objectives of the LCO. Persona will remain accountable for all statutory and regulatory responsibilities, for compliance with all relevant

contracts with commissioners insofar as they relate to services in scope. BARDOC Ltd members of the LCO management team will have a dual reporting line to the chief officer of the LCO and to BARDOC's Chief Executive	for compliance with all relevant laws and guidance, and for fulfilment of contracts with commissioners insofar as they relate to services in scope. Bury GP Federation members of the LCO management team will have a dual reporting line to the chief officer of the LCO and to Chief Officer of the Federation	for compliance with all relevant laws and guidance, and for fulfilment of contracts with commissioners insofar as they relate to services in scope. Bury VCFA members of the LCO management team will have a dual reporting line to the chief officer of the LCO and to Chief Officer or equivalent of the VCFA	DASS as a matter of statute or policy.	commissioners insofar as they relate to services in scope. NCA members of the LCO management team will have a dual reporting line to the chief officer of the LCO and the Chief Executive of the NCA	accountable for all statutory and regulatory responsibilities, for compliance with all relevant laws and guidance, and for fulfilment of contracts with commissioners insofar as they relate to services in scope. PCFT members of the LCO management team will have a dual reporting line to the chief officer of the LCO and to the Chief Executive of PCFT	laws and guidance, and for fulfilment of contracts with commissioners insofar as they relate to services in scope. Persona members of the LCO management team will have a dual reporting line to the chief officer of the LCO and to Chief Executive of Persona
RESERVED MATTERS The reserved matters for each party to this Agreement are shown below. These are the matters which organisations are not seeking to delegate to the LCO.						

BARDOC Ltd	Bury GP Federation	Bury Voluntary Community and Faith Alliance	Bury MBC	Northern Care Alliance NHS Group	Pennine Care NHS Foundation Trust	Persona Care and Support Ltd
The LCO has no powers to: Breach the responsibility of the company's directors in relation to statute and regulation	The LCO has no powers to: Breach the responsibility of the company's directors in relation to statute and regulation	The LCO has no powers to: Breach the responsibility of the company's directors in relation to statute and regulation	Adult social care matters to be retained by the DASS or the Council's executive management team are as follows: Discharge of the Supervisory Body function of the Council for the Deprivation of Liberty Safeguards (DoLS) in hospitals and registered care homes, pursuant to Schedule A1 of the Mental Capacity Act 2005 and the Deprivation of	The LCO has no powers to: Breach the provisions of the contract between NCA's constituent Trusts and commissioners Breach the terms of constituent Trusts' licences Breach or have an impact on the NCA's constituent Trusts' Oversight and Accountability Frameworks Breach or have an impact on NCA's policies	The LCO has no powers to: Breach the provisions of the contract between PCFT and commissioners Breach the terms of PCFT's licence Breach or have an impact on the PCFT's Oversight and Accountability Framework Breach or have an impact on PCFT's policies (which have been disclosed to the LCO, e.g.,	The LCO has no powers to: Breach the responsibility of the company's directors in relation to statute and regulation

			Liberty Code of Practice Confirmation of appointment of approved independent Mental Capacity Act advocates and Section 12 approved Mental Health Assessors to complete eligibility assessments pursuant to Schedule A1 of the Mental Capacity Act 2005 To be accountable for discharging the functions of the Council pursuant to sections 42-47 of the Care Act 2014, in relation to safeguarding	(which have been disclosed to the LCO, e.g., employment policies) or Affect NCA's business continuity	employment policies) or Affect PCFT's business continuity Breach any of PCFT's Standing Financial Instructions Take any action that would breach any undertaking between PCFT and NHS Improvement or between PCFT and the Care Quality Commission Make decisions in relation to clinical/ professional standards or decision making or alter the	

			adults at risk of abuse or neglect and to be accountable for discharging the functions of the Council in relation to: multi-agency risk assessment conferences; the Greater Manchester Multi-Agency Public Protection Arrangements (MAPPA) Discharge of the Council's statutory responsibilities in relation to the establishment and administration of the Safeguarding Adult Board pursuant to Section 43 of		governance arrangements within with PCFT staff work without approval from the PCFT Executive	

			the Care Act 2014 Confirmation of the appointment of Approved Mental Health Professionals (AMHPs) pursuant to Section 114 of the Mental Health Act (MHA) 1983 To be notified of matters that are considered appropriate to be placed on the Adult social Services or LCO risk register To retain responsibility for oversight of the Adult Social Services' risk register and reporting duty to the Council			

			To be consulted on the development and management of proposals of the LCO risk register To be consulted on and where appropriate approve any significant changes to the provision of adult social care services or changes to the Council's adult social care policies and procedures (to ensure the Council's compliance with Section 149 of the Equality Act (Public Equality Duty) and any statutory or			

			implied duty to consult with affected groups Finance, governance and HR matters Compliance with the Council's Constitution, Register of Delegation of Executive Functions, Standing Orders and Financial Regulations of the Council Key decisions as defined in Article 13 of the Council's Constitution which must be taken in accordance with the requirements of the Access to Information			

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			Procedure Rules set out in Part 4 Section B of the Constitution Discharge of the duty to make arrangements to ensure proper administration of the Council's financial affairs under section 151 of the Local Government Act 1972 Responsibility for assessing residents' ability to pay under The National Assistance Assessment of Resources Regulations 1992 which came into force 1 April 1993			

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			Responsibility for determining charges for adult recipients of non-residential services under Section 17 of the Health and Social Services and Social Security Adjudications Act 1983 Decisions on employee pensions, including flexible early retirement, voluntary early retirements and other decisions which impact on the employer pension liability are made in accordance with the LGPF requirements and authorised by the Council's			

			chief finance officer Decisions to dismiss Bury MBC employees and hearing of appeals against dismissal			

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Schedule 3

Investment agreement

This schedule shall be agreed by the parties to the Agreement and also by the One Commissioning Organisation.

Schedule 3.docx

NB. The issue around the cashability of efficiencies and the ability to move resource around the economy still presents itself as a challenge for the system as it does for elsewhere. Nonetheless, all partners to the MBA are unequivocally committed to delivering the benefits set out in the investment agreement and will work together to maximise the financial savings to the Bury health economy.

It is recognised that this is likely to entail service reconfiguration within the Locality and/or on a pan-sector footprint and therefore require the explicit support of commissioners.

This is being addressed in the contractual negotiations being led by the Directors of Finance and Chief Finance Officers.

Schedule 4

This schedule shall be agreed by the parties to the Agreement and also by the One Commissioning Organisation.

Principles for Risk and Reward Sharing

1. The overarching principle for the arrangements between Bury commissioners and the Local Care Organisation (LCO) is the promotion of a sustainable health and social care system in Bury that benefits the local population. Management of risks and rewards supports sustainability within total available resources. ("One pound to go round.") Risk and reward sharing remove or lessen organisational barriers and incentivise the right behaviours.

2. For a potential risk or reward to be considered for a sharing mechanism it must meet the following gateway requirements:

    a. Transformation: The services involved must be aligned to the aims of system transformation and new care models.
    b. Materiality: The potential gain or loss must have a material financial impact.
    c. Shared interest: The potential gain or loss must have an impact on or be influenced by multiple parties within the local system.

3. Risks and rewards that meet the gateway requirements will be worked up on a system-wide but case-by-case basis:

    a. System-wide: any financial distribution will be based on the net outcome to the whole system not to a single service.
    b. Case-by-case: there is no expectation that all gains and losses will be shared in the same proportions, and by all the same partners.

4. Point 3 notwithstanding, the total exposure to losses or risks of each individual organisation will be kept in view. The capacity to take and absorb risks, and the ability to control and influence them, will vary between organisations and between issues.

5. The development of any risk and rewards sharing mechanisms will take into account the availability of data for measurement, the possibility of perverse incentives and the existing governance arrangements for holding organisations to account. In other words, practical considerations may prevent the operation of a sharing mechanism when gateway requirements are met.

6. In assessing or quantifying potential risks, the Bury process will have some key considerations; for example, the possibility of stranded costs.

7. Any risk and reward sharing mechanisms developed and agreed under these arrangements will replace any prior risk sharing arrangements. For example, a gain-sharing mechanism will not be layered on top of a 'cap and collar' contract, which is itself designed to limit exposure to activity related gains and losses.

8. Gain and loss sharing arrangements can and will change over time.

9. There will be provision for partner organisations to review, update and if necessary terminate sharing mechanisms.

10. It is noted that an agreed financial plan between the LCO and commissioners may count expected rewards in changed service budgets. In this case there will be revised baselines – a new 'Business as Usual' – and these gains will not be available for a sharing mechanism.

11. The process for identifying and developing a gain and loss share arrangement in Bury will be documented through a specific example. The Risk and Reward Group has chosen Urgent Care and work is underway (February 2019) to describe this process.

Schedule 5

Workforce protocol

1 Introduction

1.1 As Bury Local Care Alliance works towards its next stage as a Local Care Organisation from 1 April 2019 consideration must be given to implementing a set of HR principles in order fully to support partnership and system working and to provide the basis for the LCO to manage services and their staff which are in scope, primarily those which are identified as being at level 4 in the 'in scope' schedule (see section 4 of the Mutually Binding Agreement for definitions)

1.2 The Workforce Protocol is a framework which all parties agree to, that recognises, complements and incorporates existing policies and procedures of the member organisations of the LCO.

1.3 Integral to the protocol is the assurance to staff within all of the in scope services, that the management of change will be transparent, equitable and consistent, and aligned to employing organisation policies and procedures.

1.4 The protocol represents the sharing of best practice, and aims to support our staff, managers, trade union/staff representatives, and HR professionals by providing information and guidance on the processes that will be adopted by the LCO from 1 April 2019.

2 Background and Context

2.1 The LCO is one of the pillars described in the Bury Locality Plan, being responsible for providing high quality, person-centred, integrated care and support to local people, enabling the greatest improvement in outcomes, whilst also reducing cost.

2.2 This will involve a fundamental shift in the way in which health and social care services interact, and the staff who are in scope of the LCO will work in a much more integrated way, delivering new models of care through integrated team working. Staff however, will remain employees of their respective organisations on their current terms and conditions of service.

3 Purpose

3.1 The development of a protocol creates a framework to ensure, in partnership with our trade union/staff representatives, that the necessary changes are facilitated, whilst ensuring that staff retain the security currently afforded to them by their relevant policies and procedures.

3.2 For clarity, the groups of staff to whom this document applies, are those identified and agreed by partner organisations to be in scope of the LCO. The details of in scope staff will be agreed between partner organisations, and

shared with trade union/staff representatives in advance of each phase of the LCO's development.

4 Governance

4.1 The following principles outline the approach that will be taken within the LCO development programme to underpin the management of the change. Relevant change management policies from partner organisations should also be read in conjunction with this document: -

- The LCO management team will consider workforce requirements that may exist. A pro forma has been developed to assist the management team. (See Appendix 1). The management team is responsible for the sign off of staff resources deployed to the LCO by the member organisations. Resourcing Principles (Appendix 2) will be adhered to where a vacancy is identified.
- The day to day management of resources deployed to the LCO and within the transformation bids sits with the management team where each organisational member is represented, reporting to the LCO Board (as set out in the management team's terms of reference which specifies the two-way accountability of management team members to the LCO and their employing organisation(s)).
- Roles that may be funded by any future pooled budget can be appointed on the terms and conditions of any employer within the pooled funding agreement.
- The Council takes responsibility for ensuring that the DASS statutory responsibility for the continuous professional development (CPD) of Social Workers, as a regulated provision, is met within agreed financial provision and does not breach delegated financial limits.
- Changes to deployed resources (i.e. restructures, role redesign etc.) must be made in line with substantive organisations' policies and procedures.
- Overarching principles will be designed where there is a need for a single process approach (i.e. for Integrated Neighbourhood Teams).
- Decision in respect of dismissals must be made by the employee's substantive employer.
- Access to occupational pension, including Voluntary Early Retirement (VER) and Flexible Retirement (FR), may only be determined by the substantive employer.

5 Clinical and Professional Governance

5.1 The majority of adult social care work will fall within the remit of the LCO. Work undertaken by social care workers needs to be authorised lawfully. The DASS Statutory responsibility will remain under the remit of the Council's Constitution. The current systems and processes in place within the Council to escalate concerns will remain the same.

5.2 All statutory, contractual and regulatory responsibilities for health and social care will remain under the remit of the employing organisation, through the organisational representative(s) on the management team e.g. safeguarding. The employer will ensure that mechanisms are in place to support staff to fulfil their professional responsibilities in accordance with their professional bodies

e.g. clinical supervision, mandatory training etc. Monitoring and reporting systems will continue to provide assurance that duties are being met.

5.3 Where professional concerns arise, these will be managed via the existing clinical governance systems and processes in each organisation. However the LCO management team and board will ensure that it has in place its own arrangements for monitoring and assurance quality and safety, which complement those of member organisations of the LCO.

6 Consultation with trade union/staff representatives

6.1 The LCO will operate effective partnership working, and initiate early consultation on options and proposals for change. This approach aims to promote positive relations with trade union/staff representatives to meet legal obligations and to ensure the views of trade union/staff representatives are fully considered when developing options for change.

6.2 Effective consultation will take place with trade union/staff representatives regarding organisational structures and change management plans to support the set-up of the LCO, allowing meaningful consultation and relevant discussions to take place. This will be managed via Locality Workforce Engagement meetings, and existing forums within partner organisations in line with the substantive employer's policies and procedures.

.

7 Communication to staff

7.1 Ongoing communication will take place to raise awareness and understanding of both the LCO and Locality Plan, in order to explain the context and benefits of any changes to services, processes, and ways of working for staff. This will be owned, planned and managed jointly by the Communications/Engagement Leads across LCO partners, via the Communications and Engagement Workstream Group. This activity will be supported by a suite of assets, including for example FAQs, presentations, staff newsletters etc, to ensure consistent messages, fill any gaps in understanding and minimise concerns.

7.2 Staff engagement sessions will be provided throughout the process of integration of the LCO and beyond, thus ensuring staff feel involved and have the opportunity to input into the process. These sessions will focus on any staff groups and teams who are likely to be directly impacted by changes.

7.3 Where formal consultation is required, clear documents will be drawn together for all proposals to ensure clarity, fill any gaps, reassure and minimise concerns. Alignment of timescales for consultation between different organisational change policies may need to be agreed to ensure individuals are treated consistently, and are not disadvantaged. Any consultation processes will involve and be supported by Communication and Engagement Leads, via the Workstream Group, to ensure consistency and clarity of messages, and where possible, ensure a period of engagement and discussion leading up to the consultation.

7.4 Leaders/Managers/Supervisors of teams within LCO partners, especially those teams directly impacted by changes, will be responsible for sharing information, briefing teams following any sessions they attend, as well as responding to queries and offering reassurance where needed. They will be supported by the relevant partner Communications and Engagement teams where needed, as well as their own direct managers.

7.5 All LCO partner leaders/senior executives will lead by example in terms of using straightforward language and plain English when communicating either verbally or in written format, avoiding terminology and acronyms wherever possible. They will encourage their own managers and teams to do the same in order to encourage a shared common language, understood by all partners and stakeholders, including the public.

8 Individual Consultation

8.1 In some instances, at a managerial level, staff may be directly affected by the transition. Where this is the case, in addition to formal consultation with trade union/staff representatives, there will be individual consultation with the staff concerned, in line with their substantive employer's policies and procedures.

9 Redeployment

9.1 In the event that a member of staff 'in scope' to transition to the LCO finds themselves without a substantive role, then the relevant redeployment policy of their employing organisation will apply.

9.2 Where transformation schemes are implemented and staff may no longer be required for a specific function, the LCO will use its best endeavours to find alternative employment for affected staff members through existing vacancies.

10 Pay Protection

10.1 Where an employee is redeployed into a suitable alternative role, on a lower grade, as a result of the transition to the LCO, the relevant pay protection policy of their employing organisation will apply.

11 Employment Matters

11.1 In the event of employee relations issues that may arise, the relevant policies and procedures of the individuals' substantive employer will be adhered to. In the case of relevant investigations, these matters can be progressed by a local line manager, in accordance with relevant policies. Decisions in relation to employee relations matters of any kind must be made by the substantive employer.

11.2 Decisions in respect of VER/FR must be made by the substantive employer.

11.3 Partner organisations commit to a review of HR policies and procedures, and where feasible, the content of policies and procedures across the partner

organisations should be mirrored, e.g., in relation to absence policies and procedures

12 Appointment Processes

12.1 In developing the LCO, a joint approach to recruitment needs to develop, to cover new appointments, and accounts for instances where the implementation of single line management arrangements may impact on staff. These arrangements will include: -

- The Resourcing Principles (Appendix 2) will be adhered to where a vacancy is identified.
- A joint commitment to equality and diversity through the adoption of fair, open and transparent recruitment processes.
- Appropriately constituted panels for all interviews.
- All new roles in the LCO leadership and management structures will be made initially available to identified 'in-scope' staff from partner organisations, regardless of their employer, subject to any relevant professional qualification that may apply.
- In relation to future recruitment across the partner organisations, where roles are funded wholly by one of the partner organisations of the LCO, the terms and conditions of that employer will apply. New employees appointed to these positions will take on the new terms and conditions. If the role is funded by multiple sources, a leadership decision must be made in respect of where the role sits (i.e. which organisation will host the role), and employees appointed to these positions will take on the terms and conditions of the host organisation.

Appendix 1

Workforce Considerations Pro-forma (applies to LCO infrastructure roles only)

To date, the majority of the roles that have been considered as essential for transformation have been recruited to on a secondment basis. Substantive roles, in the main have been backfilled, therefore resulting in an extra cost to the system as a whole. Work has been undertaken to consider the capacity and capability that is required in order to drive forward the transformation agenda. Therefore, rather than seconding more staff to undertake key roles/tasks, which could result in the system being de-stabilised, or adversely affecting business as usual, there should be a more detailed consideration of how to fill the workforce gaps that exist.
To determine how to approach each gap that is identified, it is important to consider the resourcing method: -

- What roles / tasks need to be undertaken?
- Why are the roles / tasks essential? / What are the key outputs / deliverables?
- Over what timeframe will the role / tasks need to be undertaken?
- What skills / experience are required from the individual undertaking the work?
- What options have already been considered / utilised?
- Is there a team / individual within the system that has the capacity to undertake the role/task?
- Is there a rationale to selecting an individual / team to undertake the role / task?
- Is there a rationale / fair method of selection?

In addition, arrangements to consider are as follows: -

- If input is required, the individual / team will be asked to provide this as part of their normal duties. Duration of input, and an agreement of what input is needed must be discussed and agreed.
- If a short term task is required, an employee(s) may be asked to undertake the full duties and responsibilities of a higher graded/banded position, for an agreed period and will therefore be paid an additional payment (an amount equal to the difference between their current salary and the salary of the higher graded post). If there is more than one person identified with the necessary skills / experience, the opportunity to undertake the task will be ring fenced to all those identified and a fair selection process must be used to allocate the task (interview).
- If there is a requirement for a role, approval is required to recruit, and then the Resourcing Principles must be adhered to.
- Any required backfill must be discussed and agreed by the Board. In agreeing a request, consideration must be given to whether a ‘like for like’ replacement is required, or whether a different role at a lower grade/band could be recruited.

After considering the questions and bullet points above, please complete the following boxes. The information will be considered and approved (where appropriate) at Transformation Board.

For Information: - Board should review the number of people per organisation that are already seconded to the LCO and the implication of any further secondments on the day to day operation. - Board should review the numbers of people that are already working on tasks for the transformation agenda (value in kind) against the agreement made in respect of hours/days per organisation?	**Y / N** ☐ ☐

Proposed resourcing method (please provide details)	**Approved by**
	Name -
	Job title -
	Date –
Proposed backfill method (please provide details)	**Approved by**
	Name -
	Job title -
	Date –

Appendix 2

Resourcing Principles

Principle 1
Any roles that are being formed as a result of transformation monies must receive the necessary approval to resource via Transformation Board.

Principle 2
Due to the length of the funding available, vacancies will be recruited to on a fixed term/secondment basis unless the roles are difficult to recruit to on such an arrangement

Principle 3
The host organisation is responsible for producing the necessary recruitment information. As standard, the recruitment information must comprise of: -

- Advert text, which includes the sentence – 'consideration will be given to redeployees in the first instance'.
- The grade / band and the actual salary for the role (the role will be evaluated against relevant partners job evaluation schemes to determine appropriate salary)
- The hours of work and rota (if required)
- The work base
- The nature of the contract (i.e. fixed term)
- A job description and person specification
- Details of how to apply for the role (each organisation will retain its current recruitment system)
- A two week closing date.

Principle 4
All organisations within the LCO must be notified of the vacancy on the same day. Notification will be co-ordinated via the Project Management Office.

a) The vacancy will be advertised to redeployees in the first instance for a period of 1 week.

b) If there are no redeployees, the vacancy will be advertised to internal staff and a two week closing date will apply.

Principle 5
If there are no redeploys or internal candidates, the vacancy will proceed to external recruitment.

Principle 6
The employee will be seconded into the role, and will remain on the terms and conditions, and salary arrangements of their substantive employer. If a secondment is not approved, the individual will be employed on a fixed term basis and will receive the terms and conditions, and salary arrangements of the host employer. External appointments will be made on the terms and conditions of the host organisation.

Schedule 6

Bury Local Care Organisation Board

Terms of reference

1. Purpose of the Board

The purpose of the Board are set out at Section 10 of the Mutually Binding Agreement:

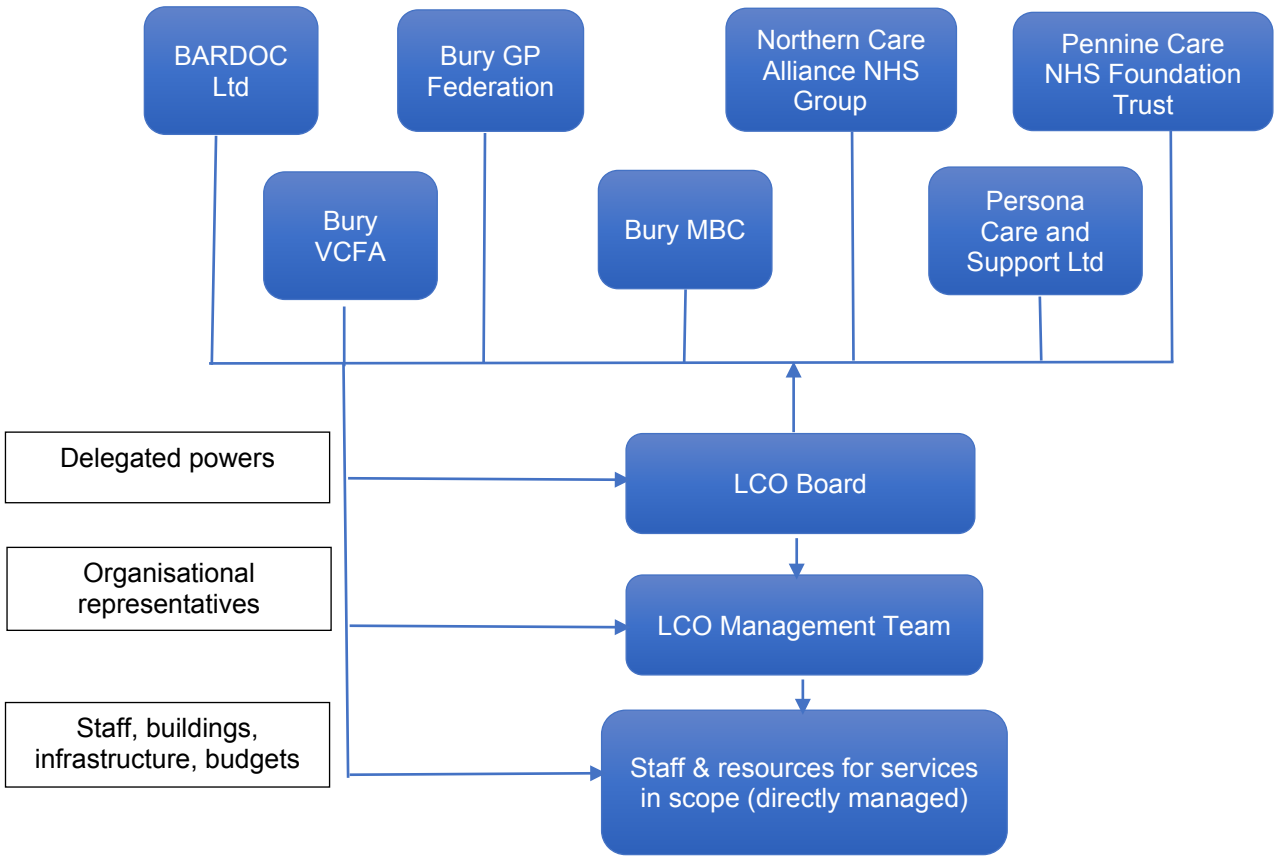
2. Principles

The principles by which the Board shall operate have been agreed in the Mutually Binding Agreement and are set out in Section 3 of the Mutually Binding Agreement:

3. Powers

The parties to the Mutually Binding Agreement have delegated specific powers to the LCO, and reserved specific matters from the LCO (Schedule 2). The Board of the LCO is responsible for exercising these powers, through the LCO management team, for the fulfilment of the objectives of the LCO (set out at Section 5 of the Mutually Binding Agreement).

The Board's relationship with the partners is described in the diagram below:



4. Membership

The membership of the LCO Board shall consist of one Director from each of the parties. This director should be a Board or equivalent level director from member organisations.

The LCO directors shall be:

LCO member organisation	LCO Director
BARDOC Ltd	Vicky Riding
Bury GP Federation	Martin Clayton
Bury Metropolitan Borough Council	
Bury Voluntary, Community and Faith Alliance	
Northern Care Alliance NHS Group	
Pennine Care NHS Foundation Trust	Keith Walker
Persona Care and Support Ltd	To be confirmed

Each LCO director shall have a nominated deputy who may attend on behalf of the LCO director when they are unavailable.

The nominated LCO deputy directors shall be:

LCO member organisation	LCO Deputy Director
BARDOC Ltd	Dr Zahid Chauhan
Bury GP Federation	Paul Juson
Bury Metropolitan Borough Council	
Bury Voluntary, Community and Faith Alliance	
Northern Care Alliance NHS Group	
Pennine Care NHS Foundation Trust	
Persona Care and Support Ltd	To be confirmed

Other representatives of member organisations may attend, e.g., to represent specialist areas of service, but no organisation should send more than 3 representatives to each meeting without the agreement of the Independent Chair.

Executive Officers of the LCO, as follows, shall be in attendance:

a) Chief Officer

b) Finance Lead

c) Clinical Director

At its discretion, the LCO Board may co-opt non-voting organisational representatives to the Board where to do so will assist the Board in advancing its purposes.

Co-opted members for the year 2019/20 shall include:

None specified

5. Meetings

The LCO Board shall meet monthly as a minimum and may call extraordinary meetings in addition to ordinary monthly meetings as required.

6. Voting

Each member organisation shall have one vote, to be cast by their Director or Deputy Director. Voting will take place on matters that are within the powers of the Board.

Whilst it will be the intention of the LCO Board to make decisions by consensus, where voting takes place a simple majority will be necessary to secure a decision.

Where relevant, the disputes procedure, set out in the Mutually Binding Agreement at Section 15, may be used by parties voting in the minority.

7. Quoracy

Board meetings will be quorate when each member organisation is represented either by their nominated Director or nominated Deputy Director.

Non-attendance by both a nominated Director or Deputy Director (twice or more per quarter) may lead to that party being excluded from the LCO.

8. Chairing

The Board shall be chaired by an Independent Chair, who shall be selected by the member organisations from time to time and engaged on terms agreed by those member organisations.

The Independent Chair shall not have a vote.

9. Accountability

The Board shall be accountable to the Boards or equivalent of the parties to the Mutually Binding Agreement and to the One Commissioning Organisation for the fulfilment of the LCO's operational contract.

All staff within in scope services shall be responsible to the Board through the Chief Officer and in line with the workforce protocol (Schedule 5).

10. Review

These terms of reference shall be reviewed in March 2020.

Schedule 7

Agreed actions or planned in 2019/20 arising from the Mutually Binding Agreement

Action	MBA reference	Commence	Final agreement	Date effective from	Involvement
Complete, agree and implement plans for phased inclusion of services at level 4 from 2020/21	Section 6 a)	2018/19	30 September 2019	1 April 2020	LCO OCO Non-LCO providers
Complete, agree and implement plans for the transfer of commissioning responsibilities for health and social care services to the LCO, with priority given to locally commissioning primary care services and the quality in primary care contract	Section 4 and Section 6 b)	2018/19	30 September 2019	1 April 2020	LCO OCO Non-LCO providers
Discuss the anticipated future organisational form of the LCO, negotiate and agree a proposal for organisational form from 1 April 2020	Section 6 c)	April 2019	December 2019	1 April 2020	LCO OCO
Contract intentions advised to the LCO by commissioners	Section 7	September 2019	31 March 2020	1 April 2020	LCO OCO
Review role of host organisation	Section 13	September 2019	December 2019	1 April 2020	LCO
Develop approach to cashability of savings arising from transformation	Schedule 3	2018/19	April 2020	2020/21	LCO OCO
Develop and apply a model of applying the risk and reward principles to urgent care	Schedule 4	2018/19	April 2020	2020/21	LCO OCO

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MINUTES OF THE MEETING OF THE GREATER MANCHESTER COMBINED AUTHORITY HELD ON 15 FEBRUARY 2019 AT BOLTON TOWN HALL

PRESENT:

Greater Manchester Mayor	Andy Burnham (In the Chair)
Bolton	Councillor Linda Thomas
Bury	Councillor Rishi Shori
Manchester	Councillor Richard Leese
Oldham	Councillor Sean Fielding
Rochdale	Councillor Allen Brett
Salford	City Mayor Paul Dennett
Stockport	Councillor Alex Ganotis
Tameside	Councillor Leanne Feeley
Trafford	Councillor Andrew Western
Wigan	Councillor David Molyneux

OTHER MEMBERS IN ATTENDANCE:

Bury	Councillor Sharon Brigg
Bolton	Councillor Ebrahim Adia
Manchester	Councillor Angeliki Stogia
Rochdale	Councillor Janet Emsley
TfGMC	Councillor Mark Aldred

OFFICERS IN ATTENDANCE:

GMCA – Chief Executive	Eamonn Boylan
GMCA - Deputy Chief Executive	Andrew Lightfoot
GMCA – Monitoring Officer	Liz Treacy
GMCA – Treasurer	Richard Paver
Office of the GM Mayor	Kevin Lee
Bolton	Tony Oakman
Bury	Steve Kenyon
Oldham	Carolyn Wilkins
Manchester	Fiona Fedden
Rochdale	Steve Rumbelow
Salford	Ben Dolan
Stockport	Pam Smith
Tameside	Steven Pleasant
Wigan	Donna Hall
TfGM	Simon Warburton
TfGM	Steve Warrener

GMFRS	Jim Wallace
GMFRS	Leon Parkes
GMCA	Julie Connor
GMCA	Sylvia Welsh
GMCA	Nicola Ward

APOLOGIES:

GMCA 31/19 APOLOGIES

RESOLVED /-

That apologies be received and noted from Deputy Mayor Bev Hughes, Cllr Andrea Simson (Bury), Cllr Sara Rowbotham (Rochdale), Cllr Paula Boshell (Salford), Cllr Brenda Warrington (Tameside) and Cllr Jenny Bullen (Wigan).

Apologies were also received from Geoff Little (Steve Kenyon in attendance) Bury, Jim Taylor (Ben Dolan in attendance) Salford, and Joanne Roney (Fiona Fedden in attendance) Manchester.

GMCA 32/19 CHAIR'S ANNOUNCEMENTS AND URGENT BUSINESS

There were no Chair's announcements or urgent business items.

GMCA 33/19 DECLARATIONS OF INTEREST

There were no declarations of interest made in relation to any item on the agenda.

GMCA 34/19 MINUTES OF THE GMCA MEETING HELD ON 25 JANUARY 2019

RESOLVED /-

That the minutes of the meeting of the GMCA held on 25 January 2019 be approved as a correct record, subject to the amendment of minute 20/19 – to reflect:

'That the GMCA agree the funding application for the total project cost of £139,200,000 with a skills capital funding request of £25,000,000 by the LTE Group be given conditional approval and progressed to due diligence.

GMCA 35/19 MINUTES OF THE GMCA WASTE & RECYCLING COMMITTEE HELD ON 24 JANUARY 2019

RESOLVED/-

That the minutes of the GMCA Waste and Recycling Committee held 24 January 2019 be noted.

GMCA 36/19 MINUTES OF GMCA CORPORATE ISSUES & REFORM OVERVIEW AND SCRUTINY COMMITTEE HELD ON 22 JANUARY 2019

RESOLVED /-

That the minutes of the Corporate Issues & Reform Overview and Scrutiny Committee held on 22 January 2019 be noted.

GMCA 37/19 MAYORAL GENERAL BUDGET OVERVIEW

The GM Mayor, Andy Burnham introduced a report setting out the background to the GMCA general budget, transport levy budget, Waste Budget and Mayoral Budget that were further set out in the accompanying papers that explained the interconnectivity of the various decisions that need to be taken.

Colleagues were reminded that in April 2018, the Mayor had called for a root and branch review of the Fire Service that was now coming towards a conclusion and a report on the next phase of the Fire Service Programme for Change would be submitted to a forthcoming meeting of the GMCA.

In conclusion, the GM Mayor also expressed his disappointment about the fact that GM was being asked to fund essential services exclusively from Council Tax, which was not acceptable given that Government has stated that austerity has ended. He also advised the meeting that a Fair Funding Review was underway, and that GM would collectively be making a submission, which would call for a better and fairer overall funding settlement.

RESOLVED/-

1. That it be noted that the Mayor had submitted a Mayoral General Budget and precept and Fire capital programme report, which would be considered later on the agenda.

2. That it be noted that a report on the Transport budget, to be funded by a levy on District Councils would be considered later on the agenda.

3. That it be noted that the level of the Waste Disposal budget, to be funded by a levy on District Councils and the allocation between the 9 authorities would be considered later on the agenda.

4. That it be noted that the level of the GMCA General budget to be funded through contributions from District Councils and a share of the retained Business Rates would be considered later on the agenda.

5. That it be noted that the projected outturn for the Mayoral General, GMCA and Transport budgets for 2018/19 and the proposed refund of £25m of Retained Business Rates to District Councils would be considered later on the agenda.

6. That it be noted that the draft capital programme relating to Transport, Waste disposal and other GMCA, non- Mayoral functions would be considered later on the agenda.

7. That the intention for GM to make a submission to the Fairer Funding Review of Local Authority Finances requesting a fairer and improved funding settlement be agreed.

8. That the intention to submit a report on the next phase of the Fire Service Programme for Change to a forthcoming meeting of the GMCA be noted.

GMCA 38/19 MAYORAL GENERAL BUDGET AND PRECEPT PROPOSALS

Councillor Richard Leese, Deputy Mayor took the Chair for this item of business, given the GMCA was considering the budget proposal from the GM Mayor.

Councillor Richard Leese, Deputy Chair of the GMCA introduced a report setting out the Mayor's proposals for the Mayoral General Budget (including Fire and Rescue) and seeking approval for the Mayoral General Precept for 2019/20.

The report recommended the setting of the Revenue Budget for 2019/20 as required under Section 42A of the Local Government Finance Act 1992 (updated in the Localism Act 2011) and the precepts and relevant levels of Council Tax required under sections 40, 42B and 47 of the Act.

The meeting was advised that a named vote was required to approve the revised proposals for the Mayoral General Budget. Members voted on the recommendations as follows:

	GMCA Member	
Bolton	Cllr Linda Thomas	Agreed
Bury	Cllr Rishi Shori	Agreed
Manchester	Cllr Richard Leese	Agreed
Oldham	Cllr Sean Fielding	Agreed

Rochdale	Cllr Allen Brett	Agreed
Salford	Mayor Paul Dennett	Agreed
Stockport	Cllr Alex Ganotis	Agreed
Tameside	Cllr Brenda Warrington	Not in attendance
Trafford	Cllr Andrew Western	Agreed
Wigan	Cllr David Molyneux	Agreed

RESOLVED/-

1. That the Mayor of GM's General budget for 2019/20, as set out in this report now submitted, together with the calculation of the precepts and Council Tax rates set out in Appendices 3 to 6, be approved.

2. That the overall Mayoral General Precept of £76.95 (Band D) comprising of £59.95 for functions previously covered by the Fire and Rescue Authority precept (no change) and £17 (an additional £9 for 2019/20 on the current £8) for other Mayoral General functions, specifically bus reform, be approved.

3. That it be noted that the proposal for the Mayoral General Precept for 2019/20 was the 2nd year of a 2-3 year strategy for setting the Mayoral precept baseline, which would be adjusted in future years, as further Mayoral functions were covered by the funding raised and that Government has again provided flexibility on the level of the Mayoral (General) precept.

4. That the use of £5.75 million of Earnback grant to support GMCA costs relating to bus-related activity, including bus reform, be approved.

5. That the following recommendations be approved:

    i. the overall budget for the Fire and Rescue Service, recognising that detailed proposals in relation to Programme for Change would be considered in the near future

    ii. the use of the reserves to support the revenue and capital budgets, and the assessment by the GMCA Treasurer that the reserves as at March 2020 were adequate

    iii. the Fire Service capital programme and proposals for funding

iv. the medium term financial position for all functions covered by the Mayoral precept

6. That the use of grants totalling £8.3m to District Councils to support their increased levy costs in relation to Bus Reform, be approved as follows:

District	**2019/20**
	£000
Bolton	845
Bury	562
Manchester	1,618
Oldham	693
Rochdale	648
Salford	745
Stockport	863
Tameside	665
Trafford	698
Wigan	963
Total	**8,300**

GMCA 39/19 GMCA TRANSPORT REVENUE BUDGET 2019/20

The GM Mayor, Andy Burnham took members through a report that set out the transport related Greater Manchester Combined Authority (GMCA) budget for 2019/20. The proposed Transport Levy to be approved for 2019/20 was included within the report together with the consequent allocations to the District Councils of Greater Manchester.

The GM Mayor thanked the GMCA Treasurer for securing a one-off payment from reserves to relieve pressure on the Transport Levy. He further reported that along with the Mayoral Precept, GM is proposing to use earn-back funding to support the reform of bus services, which will help build GM's case for change.

RESOLVED /-

1. That the issues, which affected the 2019/20 transport budgets, as detailed in the report now submitted, be noted.

2. That the GMCA budget relating to transport functions funded through the levy, as set out in this report now submitted, be approved.

3. That a Transport Levy on the district councils in 2019/20 of £192.473 million, plus an increase of £8.3 million relating to Bus Reform, less a one-off reduction of £5 million, as set on in paragraphs 3.4 – 3.5 of the report,

taking the total Levy proposed to £195.773 million, apportioned on the basis of mid-year population as at June 2017, be approved.

4. That it be noted that as the Transport Order was due to be in place for the 2019/20 financial year, then some £86.7m of monies raised through the levy would be treated as being due as a 'statutory charge' as specified in Part 4 of the draft Order.

5. That it be noted that the GM Mayor had proposed to make grants to districts totalling £8.3 million to offset the levy increase relating to Bus Reform.

6. That the use of £13.067 million of Earnback revenue grant for use on GMCA transport functions be approved.

7. That the use of reserves in 2019/20, as detailed in section 5 of the report now submitted, be approved.

8. That the position on reserves, as identified in the report, be noted and approved.

GMCA 40/19 GMCA REVENUE GENERAL BUDGET 2019/20

Councillor David Molyneux, Portfolio Lead for Resources, introduced a report setting out the GMCA General budget for 2019/20 that included the proposed District Council contributions to be approved for 2019/20, together with the consequent allocations to the District Councils.

RESOLVED /-

1. That the budget relating to the GMCA functions, excluding transport in 2019/20, as set out in section 2 of the report now submitted, be approved.

2. That the District Contributions of £8.848 million, as set out in section 3 of the report now submitted, be approved.

3. That the increases to the level of funding to MIDAS £0.2 million and Marketing Manchester £0.35 million, subject to confirmation that these additional sums would be matched by private sector contributions be approved.

4. That the overall funding to MIDAS and Marketing Manchester of £1.223 million and £0.727 million respectively be approved.

GMCA 41/19 OUTTURN 2018/19 AND BUDGET AND LEVY 2019/20 – WASTE SERVICES

Councillor David Molyneux, Portfolio Lead for Resources introduced a report providing the GMCA with an update on the projected outturn budget for 2018/19 and proposed Budget and Levy 2019/20 for waste and resource management services.

RESOLVED/-

1. That the base budget and levy totalling £174.634m for 2019/20, with the allocation to Districts as set out in paragraph 4.2.4 of the report now submitted, be approved.

2. That the planned levy refunds to Districts for 2018/19, as set at section 3.3 of the report now submitted be noted and that authority be delegated to the GMCA Treasurer to approve the final sums once actual tonnage information has been received.

3. That the 2020/21 Trade Waste rate at £99.50, to allow forward planning by Districts, as set out in paragraph 4.2.5 of the report now submitted, be approved.

GMCA 42/19 GMCA REVENUE UPDATE

Councillor David Molyneux, Portfolio Lead for Resources, took members through a report that informed members of the 2018/19 forecast revenue outturn position as at the end of December 2018.

The GM Mayor reminded members that Government had not yet guaranteed the funding required in response to the Moorland fires and the Arena.

RESOLVED/-

1. That the increase to the Mayoral General Budget of £13.1 million, as detailed in paragraph 3.1 of the report now submitted, be approved.

2. That the Mayoral General revenue outturn position for 2018/19, in line with budget after transfer of £1 million to earmarked reserves, be noted.

3. That the Mayoral General Budget – Fire revenue outturn position for 2018/19 which showed a budgeted underspend of £0.275 million after allowing for a reduction of £8.114m of reserves to support the Capital Programme, as at paragraph 3.3 of the report now submitted, be noted.

4. That the Economic Development and Regeneration revenue outturn position for 2018/19, which showed a balanced budget after transfers to earmarked reserves of £3.982 million, be noted.

5. That the transport revenue outturn position for 2018/19, which showed a balanced budget after transfer to/from earmarked reserves of £12.286 million be noted.

6. That the TfGM revenue outturn position for 2018/19, as at paragraph 4.1 of the report now submitted, be noted.

7. That the amendments to the GMCA General budget of £0.6 million, as detailed in paragraph 3.8 to 3.11, including allocations of ELENA grants, of the report now submitted be approved.

8. That the return of £25 million of Business Rates to GM Districts, as set out in the table detailed in paragraph 3.12 of the report now submitted, be approved.

9. That it be noted that confirmation from Government in relation to the financial support in response to the Moorland fires response was still awaited.

GMCA 43/19 GMCA CAPITAL PROGRAMME

Councillor David Molyneux, Portfolio Lead for Resources, presented an update in relation to the GMCA capital expenditure programme.

The GM Mayor thanked Councillor David Molyneux for his work in putting forward a good set of proposals. He also advised that this would be last budget to be prepared by the current GMCA Treasurer, Richard Paver, who was due to retire later this year, and thanked the GMCA Treasurer for his long years of service to both the GMCA and Manchester City Council.

RESOLVED/-

1. That the revisions to the capital budget as set out in appendix A of the report now submitted, be approved.

2. That the updated 2018/19 capital forecast compared to the previous 2018/19 capital forecast be noted.

3. That the capital programme budget for 2019/20 and the forward commitments as detailed in the report and Appendix A now submitted, be approved.

4. That it be noted that the capital programme was financed from a mixture of grants, external contributions and long-term borrowings.

5. That it be noted that provision had been made in the revenue budget for the associated financing costs of borrowing.

6. That the addition to the 2019/20 Capital Programme of the Local Full Fibre Network (LLFN), to be funded from the £21.3 million grant award by Department of Digital, Culture, Media and Sport (DDCMS) and £3.384 million from long term borrowings, be noted.

7. That it be noted that the capital programme would continue to be reviewed, noting that any new schemes, which have not yet received specific approval but were included within the programme would be the subject of future reports.

8. That the GMCA record its thanks to Councillor David Molyneux, Portfolio Lead for Resources and the GMCA Treasurer, Richard Paver, for all their work to date on the GMCA budget proposals.

GMCA 44/19 TROUBLED FAMILIES FUNDING ALLOCATION

The GM Mayor, Andy Burnham, introduced a report providing the GMCA with an update on the progress made since agreement was reached with MHCLG to re-profile the remainder of GM's allocation of Troubled Families Funding. The report included a recommendation to release the 2018/19's funding from the Reform Investment Fund to all GM Districts in line with the previously agreed process.

Members were reminded the current programme was coming to an end, with lots of families benefitting from the support the fund had provided, demonstrating the direct link between poverty and families with specific issues. It was acknowledged that there was a need to build a strong case to submit to Government with a view to extending the current programme of investment or alternatively to provide additional resources to maintain support to GM residents.

The GM Mayor acknowledged that a lack of funding had seen a considerable increase in the number of homeless people and families that were in temporary accommodation. Despite these challenges, the Bed Every Night scheme had proved to be a success through which 1400 individuals had been assisted. It was further proposed that subject to the necessary approvals being granted that the scheme would be extended from March to the end of April 2019, pending a discussion between stakeholders on securing longer term funding. It was also reported that Dame Louise Casey would be attending the GMCA meeting on 1 March 2019 to report her findings on the work of the GMCA and partner organisations to tackle homelessness and rough sleeping.

RESOLVED/-

1. That the progress that had been made by GM Districts in moving to more sustainable early help models, following the first set of Troubled Families investment plans produced in January 2018, be noted.

2. That the allocation of Troubled Families funding for 2018/19 to all GM districts, in line with the agreed process and as detailed in the table in section 1.5 of the report now submitted, be approved.

3. That it be noted that there would be similar process for the release 2019/20 funding, including a requirement for GM Districts to refresh the investment/implementation plans.

4. That there be further dialogue to consider the extension of the programme of funding in recognition of the continuing issues being faced by families.

5. That the GMCA note the GM Mayor's proposal, subject to the necessary approvals required, to extend the 'a bed every night' scheme until the end of April 2019, and the planned discussions with partner organisations seeking a longer term funding arrangement beyond April 2019.

6. That it be noted that Dame Louise Casey would attending the GMCA meeting on 1 March 2019 to report her findings on the work of the GMCA and partner organisations to tackle homelessness and rough sleeping.

GMCA 45/19 GREATER MANCHESTER DISABLED PEOPLES PANEL

The GM Mayor, Andy Burnham, extended a warm welcome to Caron Blake from the GM Coalition of Disabled People and thanked the Coalition for their work done till date. He further took members through a report setting out a proposal to realise the Mayoral commitment to establish a GM Disabled People's Panel including key principles, remit and required budget.

The GM Mayor advised that there was still much work required to support disabled individuals in the community to live independent, fulfilling and satisfying lives.

RESOLVED/-

1. That the recommended remit and key principles of the GM Disabled People's Panel be approved.

2. That the proposed funding to support the GM Disabled People's Panel of £80,000 from February 2019 until March 2020, subject to final approval of the GMCA budgets, be agreed.

3. That the GMCA records its thanks Caron Blake and the Coalition of Disabled People for the work undertaken in the lead up to the establishment of a permanent GM Disabled People's Panel.

GMCA 46/19 GREATER MANCHESTER BREXIT PREPARDNESS

Councillor Richard Leese, Portfolio Lead for the Economy gave a verbal update in relation to GM's preparedness for Brexit. It was reported that the North West was being represented regularly at meetings with MHCLG, with regular weekly bulletins in circulation to keep GM Districts abreast of ongoing developments.

In terms of Civil Contingency planning, it was reported that a co-ordinated effort by the GM Resilience Forum was underway, with GM Districts working within that framework to carry out District level planning against the known scenarios.

It was reported that Salford City Airport, Manchester Airport and Port Salford were considered as points of entry within GM, therefore measures were being considered through District arrangements. It was further highlighted that there might be severe implications on trading and health standards due to the lack or delay of goods coming into the UK and the potential loss of employment health expertise.

In terms of business support and competiveness the Growth Company, on behalf of the GMCA were having regular dialogue with businesses and have put together an online Brexit Toolkit.

The GM Mayor further reported that a number of Spanish staff working at the Royal Bolton Hospital would be leaving the UK in response to a decision of the Professional Regulator in Spain around their professional practice and informed colleagues that other Service regulators across the EU might develop a similar approach.

Members also noted the potential impact Brexit might have on the Social Care workforce. Concerns were raised around the threshold salary of £30,000 or more given that the average wage of a Social Care Worker and nurses, who were EU citizens would not meet the threshold.

The GM Mayor also raised concerns around the lack of clarity regarding intelligence sharing and security services across GM and the EU.

RESOLVED/-

That the verbal report and the issues raised in relation to the impact on employment, specifically in the health and social care sector and security issues be noted.

GMCA 47/19 GREATER MANCHESTER LOCAL INDUSTRIAL STRATEGY UPDATE

Councillor Richard Leese, Portfolio Lead for Economy, presented a report to the GMCA that updated members on progress with the development of the GM Local Industrial Strategy and the key next steps to ensure that a full strategy was produced by March 2019. He further went on to thank the members of the Independent Prosperity Review Panel for the analysis and evaluation undertaken.

It was reported that the findings provided a refreshed evidence base for future economic planning, whilst identifying gaps and providing ideas on how to stimulate the economy, which would allow for a more robust discussion with Government.

The dysfunction of the education system was also identified as a major obstacle for making progress. However, it was noted that there was a clear aim in the draft Local Industrial Strategy for GM to form a strategic partnership with DfES in order to attain more coherent pattern for education, skills and apprenticeships, which would assist in addressing skills shortages post Brexit.

Members welcomed the report and commented on the need to have a wholly integrated system based on a GM footprint linking to infrastructure. However, it was identified that the challenge moving forward was the delivery of infrastructure requirements.

Councillor Alex Ganotis reported that the 5-Year Environment Plan, due to launched at the next Green Summit was aligned with the Local Industrial Strategy. The Plan would also be submitted to the GMCA on 1 March 2019 for consideration. He added that the plan aimed to make significant reductions in carbon emissions across GM alongside supporting the wider agenda for economic growth.

The GM Mayor thanked Sir Richard Leese for leading on the establishment of the Independent Prosperity Review Panel. He further thanked members of the Independent Prosperity Review Panel for their diligence on this piece of work.

He acknowledged that poor productivity was linked to poor health across the labour market and needed to be addressed through health devolution to bring forward new thinking particularly linked to an ageing population, personalised treatment and assisted living.

He added that the Panel endorsed GM's call for further devolution in the area of Education, Skills, and training alongside supporting GM's case for a more integrated transport system, which was crucial to support the economy. Therefore, in conclusion he stated that both health and regional disparity needs to be the guiding theme for GM's Local Industrial Strategy.

RESOLVED/-

1. That it be noted that the Independent Prosperity Review had released its final report.

2. That it be noted that officers were in the process of developing a paper setting out the proposed response to each of the Panel's recommendations, for submission to the GMCA meeting in June.

3. That the results and key messages from the stakeholder consultation, to be fed into the draft Local Industrial Strategy, be noted.

4. That the overall framework for the GM Local Industrial Strategy, developed in response to the evidence-base and consultation, be agreed.

5. That authority be delegated to the Chief Executive of the GMCA and the GM Portfolio lead officer for Economy/Business, working with the Deputy Mayor for Business/Economy, the GM Mayor, and the Chair of the GM LEP – to agree the full Local Industrial Strategy with Government.

6. That the GMCA record its thanks to the members of the Independent Prosperity Review Panel for their thorough and challenging work.

7. That it be noted that a number of the Review Panel's research papers were due to be published on the 5 March 2019.

8. That it be noted that the 5 Year Environment Plan was aligned with the Local Industrial Strategy and would be submitted to the GMCA on 1 March 2019.

9. That the GMCA record its thanks to Councillor Richard Leese for seeking the establishment of the Independent Prosperity Review to highlight the strengths and weaknesses of GM in advance of the development of the GM Local Industrial Strategy and other key strategies.

GMCA 48/19 GREATER MANCHESTER ROAD ACTIVITY PERMIT SCHEME

The GM Mayor, Andy Burnham, introduced a report which provided an overview of the financial performance and operation of GM Road Activity Permit Scheme (GMRAPS) for 2017/18.

It was reported that the forthcoming periodic review of the scheme was due to be carried out during the summer this year and Districts were encouraged to use the GMRAPS scheme with a view to coordinating roadworks and reducing congestion.

RESOLVED/-

1. That the financial review and forecasts, as set out in Section 2 now submitted, be noted.

2. That it be agreed that, based upon the financial update, actions would be required to ensure the scheme continued to break even on an ongoing basis. Any proposals in this regard would be incorporated within a review of the scheme operation and permit charges to be carried out as part of the comprehensive sixth year performance update in Summer 2019.

GMCA 49/19 GREATER MANCHESTER HOUSING INFRASTRUCTURE FORWARD FUND SCHEME

Salford City Mayor, Paul Dennett, Portfolio Lead for Housing, Homelessness and Infrastructure, provided an update on the GM Housing Infrastructure Forward Fund business cases that were being prepared for submission to the Ministry of Housing, Communities and Local Government (MHCLG) and Homes England.

Members welcomed the report and recognised the impact the scheme would have on improving connectivity and reducing congestion particularly around Bolton and Wigan.

It was noted that the scheme will support the objectives of the GM Spatial Framework of building on Brownfield sites first and whilst seeking to draw additional capital into GM. He further thanked Homes England for their £240,000 investment to support districts.

Members acknowledged that there would be economic impact and that there was a need to have a conversation with Government about the Green Book appraisal and the cost to benefit ratio that the treasury operates around infrastructure money to deliver housing needs rather than meeting the requirement of Government housing figures.

RESOLVED /-

1. That the co-development process undertaken by the GM Districts and GMCA to prepare the GM Housing Infrastructure Forward Fund business cases be noted.

2. That authority be delegated to the GMCA Monitoring Officer, to agree any detail on funding agreements, and to the GMCA Treasurer, to make appropriate transfers of the Homes England business case support grant to the GM Districts, in line with the agreed support plans, upon successful draw down of the grant from Homes England.

3. That authority be delegated to the GMCA Chief Executive in consultation with Portfolio Leader for Housing, Homelessness and Infrastructure to work with the Housing Infrastructure Fund GM District leads to finalise business cases and submit by the 22nd March 2019 deadline.

4. To note that a further report would be submitted to the GMCA once the HIF Forward Funding amounts awarded for each scheme were known.

5. That the GMCA record its thanks to Homes England for their grant to support GM Districts to put forward schemes.

GMCA 50/19 GM SKILLS CAPITAL 2017-2020: WIGAN AND LEIGH COLLEGE

Councillor Sean Fielding, Portfolio Lead for Education, Skills, Work & Apprenticeships, introduced a report that updated the GMCA on the outcome of the appraisal of the Leigh College Strand 3b application.

Members welcomed the report and thanked Councillor Sean Fielding for securing a grant to support education at Leigh College.

RESOLVED /-

1. That that the funding application by Wigan & Leigh College (strand 3b) of total project cost of £805,000 with a skills capital grant funding of £225,000 be given conditional approval and progress to due diligence.

2. That authority be delegated to the GMCA Treasurer and GMCA Monitoring Officer to review the due diligence information and, subject to their satisfactory review and agreement of the due diligence information and the overall detailed commercial terms of the transactions, to sign off any outstanding conditions, issue final approvals and complete any necessary related documentation in respect of the grant at a) above

GMCA 51/19 GREATER MANCHESTER SKILLS CAPITAL 2017 – 2020: BOLTON COLLEGE

Councillor Sean Fielding, Portfolio Lead for Education, Skills, Work & Apprenticeships, took members through a report that provided an update on the outcome of the appraisal of the Bolton College Skills Capital application.

Members welcomed the report and commented on the benefits the college would have on young people attending and recognised that this would also see a boost in the health sector particularly in Royal Bolton Hospital with a significant number of apprenticeships being created.

RESOLVED/-

1. That it be agreed that the funding application by Bolton College of the total project cost £30,000,000 of which a Skills Capital funding request of £10,000,000 be given conditional approval and progress to due diligence.

2. That authority be delegated to the GMCA Treasurer and GMCA Monitoring Officer to review the due diligence information and, subject to their satisfactory review and agreement of the due diligence information and the overall detailed commercial terms of the transactions, to sign off any outstanding conditions, issue final approvals and complete any necessary related documentation in respect of the grant.

GMCA 52/19 PROCUREMENT OF WASTE AND RESOURCE SERVICES

Councillor Alex Ganotis, Portfolio Lead for Green City Region introduced a report which provided an update on the procurement of waste and resource management services.

He thanked members for their support and particularly officers from the waste and finance team at the GMCA, GM District lead Members and Treasurers for their work over the past two years to deliver a model of best practice.

RESOLVED /-

That the report be noted.

GMCA 53/19 DONNA HALL - RETIREMENT

That the GMCA noted that Donna Hall will be retiring as Chief Executive of Wigan MBC at the end of February. The Mayor expressed thanks on behalf of the GMCA for her leadership of the Reform Programme, and Place Based working amongst many roles she has undertaken on behalf of GM including as Secretary to AGMA and Clerk to the Fire Authority.

David Molyneux, Leader of Wigan Council further added his thanks for all her work, in particular the coordination of the Wigan Deal model leading to a transformation of services for the residents of Wigan.

GMCA 54/19 EXCLUSION OF THE PRESS AND PUBLIC

RESOLVED /-

That, under section 100 (A)(4) of the Local Government Act 1972 the press and public should be excluded from the meeting for the following items on business on the grounds that this involved the likely disclosure of exempt information, as set out in the relevant paragraphs of Part 1, Schedule 12A of the Local Government Act 1972

and that the public interest in maintaining the exemption outweighed the public interest in disclosing the information.

GMCA 55/19 OUTTURN 2018/19 AND BUDGET AND LEVY 2019/20 – WASTE SERVICES COMMERCIAL CONSIDERATIONS

Councillor David Molyneux, Portfolio Lead for Resources, introduced a report setting out the commercial considerations in respect of the outturn for 2018/19 and budget for 2019/20.

RESOLVED/-

1. That the budget assumptions for 2019/20 and the associated critical judgements be endorsed.

2. That the capital programme, as set out in Appendix A of the report now submitted, be approved.

3. That the commercial risk assessment and forecast General Balances position be noted.

GMCA 56/19 PROCUREMENT OF WASTE AND RESOURCE SERVICES

Councillor Alex Ganotis, Portfolio Lead for Green City Region, provided an update on procurement of waste and resource management services for GM and recommended the appointment of preferred bidders for Lots 1 and 2 based on the Most Economically Advantageous Tender (MEAT).

RESOLVED /-

1. That the appointment of Suez Recycling and Recovery UK Ltd as the preferred bidder in respect of the LOT 1 contract for waste services be approved.

2. That the appointment of Suez Recycling and Recovery UK Ltd as the preferred bidder in respect of the LOT 2 contract for waste services be approved.

3. That authority be delegated to the GMCA Head of Paid Service in consultation with the GMCA Treasurer and the Portfolio Lead for Green City Region, to finalise the commercial and contractual arrangements for the LOT 1 and LOT 2 contracts for waste services.

4. That authority be delegated to the GMCA Head of Paid Service in consultation with the GMCA Treasurer and the Chair of the Waste and Recycling Committee to conclude the procurement and finalise the contractual arrangements for the Bio-waste framework.

5. That authority be delegated to the GMCA Monitoring Officer to complete all necessary legal agreements for the LOT 1 contract, LOT 2 contract and Bio-waste framework agreement.

GMCA 57/19 GREATER MANCHESTER SKILLS CAPITAL 2017 – 2020: WIGAN & LEIGH STRAND 3B

CLERK'S NOTE: This item was considered in support of the report considered in Part A of the agenda (minute 50/19 above refers).

RESOLVED/-

That the report be noted.

GMCA 58/19 GREATER MANCHESTER SKILLS CAPITAL 2017 – 2020: BOLTON COLLEGE

CLERK'S NOTE: This item was considered in support of the report considered in Part A of the agenda (minute 5/19 above refers).

RESOLVED/-

That the report be noted.

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