REPORT TO: **COMMUNITY SAFETY AND PUBLIC PROTECTION COMMITTEE – 25 OCTOBER 2021**

REPORT ON: **DUNDEE LOW EMISSION ZONE**

REPORT BY: **EXECUTIVE DIRECTOR OF NEIGHBOURHOOD SERVICES**

REPORT NO: **286-2021**

1 PURPOSE OF REPORT

1.1 To advise Committee on the outcomes from the recent public consultation and stakeholder engagement on the preferred Low Emission Zone scheme for Dundee.

1.2 To advise Committee on the outcomes of the detailed environmental and impact assessments carried out as a part of the Low Emission Zone scheme process.

1.3 To seek approval to proceed with the publishing of a Notice for the Dundee Low Emission Zone scheme proposal in line with the Transport (Scotland) Act 2019, the Low Emission Zones (Scotland) Regulations 2021, and the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021.

1.4 To seek approval to utilise grant funding allocated to Dundee City Council for capital works related to the LEZ development.

2 RECOMMENDATION

2.1 It is recommended that Committee approves the report and to:

1. Remit the Executive Directors of Neighbourhood Services and City Development to proceed with the publication of a Notice for the Dundee Low Emission Zone scheme proposal as per Regulation 3 of Part 2 of the Low Emission Zones (Scotland) Regulations 2021 containing the information contained in Appendix D.

2. Agree to the Executive Directors of Neighbourhood Services and City Development to utilise the support funding allocated to Dundee City Council as outlined in Section 4.15 of this report to aid progression with the development of the LEZ through the procurement of associated infrastructure and enforcement technology.

3. Note that continued engagement with Scottish Government regarding future revenue costs is ongoing.

3 FINANCIAL IMPLICATIONS

3.1 Grant funding has been made available in this financial year from Transport Scotland in relation to capital expenditure for infrastructure required for the enforcement of the LEZ scheme as outlined in Section 4.14 of this report, and revenue funding for consultancy support to complete the National Low Emission Framework (NLEF) process for development and implementation of the LEZ scheme. Future funding for the ongoing costs of maintaining the LEZ enforcement system following its installation is the subject of discussion with Scottish Government, through the LEZ Leadership Group. The estimated cost for these elements is £322000 per annum once the enforcement commences in 2024/25, and a proportion of these costs will be incurred in 2023/24. Any shortfall in revenue costs will require to be factored in future year revenue budgets.

3.2 The following table provides a breakdown of the estimated annual revenue costs associated with the LEZ.

LEZ Revenue costs	Est. cost
Camera maintenance contract	£40,000
Spare camera kit wear and tear	£10,000
Fibre maintenance / UTC involvement maintenance	£10,000
LEZ signage maintenance	£10,000
Power costs ANPR cameras	£5,000
ANPR camera software licences	£77,000
PCN software license (Civica system)	£10,000
Back office administration 3.0 posts ((1.0) management)	£100,000
DVLA database fees	£40,000
Monitoring LEZ / annual reports	£20,000
Annual Revenue costs	**£322,000**

4 MAIN REPORT

4.1 Reference is made to Article 5 of the Community Safety and Public Protection Committee of 7 June 2021, and Committee Report 164-2021, which outlined the preferred scheme for the Dundee Low Emission Zone, and the statutory consultation period. This report includes the results and analysis from the statutory consultation process and the detailed environmental and impact assessments.

4.2 The Transport (Scotland) Act 2019 and the Low Emission Zones (Scotland) Regulations 2021 set out the procedure that Local Authorities are required to follow to introduce a Low Emission Zone Scheme. This includes a requirement to consult a range of stakeholders who may be affected by the introduction of the LEZ. The legislation sets out a list of the organisations that local authorities must consult when making, amending or revoking a scheme. A report on this consultation is included at Appendix A. The report also outlines responses to questions raised in statutory consultee representations.

4.3 The public consultation and stakeholder engagement was launched on 14 June 2021 and ran for a period of 8-weeks. This included the distribution of an information flyer directing people to the consultation information online and inviting comments on the proposals to approximately 4000 residential and business address points in total within and adjacent to the proposed LEZ scheme area. A total of 148 submissions were received during this period. This includes 124 submissions via the on-line portal, and 24 written submissions sent directly to the specific Dundee LEZ email address.

4.4 In general, responses from the stakeholders, businesses, and interest groups supported the introduction of the proposed LEZ in Dundee. However, some respondents believe the LEZ should be larger in size and scope, such as including Lochee Road and also include the three city centre car-parks specifically excluded in the proposed scheme. LEZ options with and without both Lochee Road and the city centre car parks have been examined in the Interim NLEF Stage 2 Report and after consideration, it was concluded that it was not viable to include them in the LEZ, primarily because access to them is immediately off the inner ring road.

4.5 Responses from the online consultation were analysed and categorised based on the content of the response. 36% of the responses were against the proposed scheme, 26% were in support of the LEZ with an additional 8% being broadly supportive of the LEZ in principle but believe it should cover a larger area. 4% of responses were neutral. 27% of the responses did not express an

opinion but used the survey to ask specific questions on the proposal. It is proposed that where possible, DCC will respond directly to these questions.

4.6 The NLEF process requires the local authority to consider the wider impacts of the preferred option (e.g. traffic and air quality modelling, Strategic Environmental Assessment (SEA), Equality Impact Assessment / Integrated Impact Assessment (IIA)). Committee report 164-2021 included the outcomes of the Paramics Transport Modelling of the proposed LEZ scheme, as well as the Scottish Environmental Protection Agency (SEPA) Dundee Emissions Analysis Report which analysed the impact the proposed LEZ on emissions from transport. This emissions analysis has now been used by SEPA in their Air Quality model. The outcome of this modelling is within the 'SEPA Low Emission Zone Dundee Evidence Report September 2021' included as Appendix B.

4.7 The SEPA LEZ Dundee Evidence Report indicates that all current NO_2 exceedances inside the proposed LEZ will be removed with the introduction of the LEZ. The predicted changes to roadside concentrations are expected to remove current exceedances of the NO_2 limit value in the city centre. Roadside points that previously exceeded or were close to exceeding an annual concentration of 40µgm-3, are predicted to fall to below 30µg/m-3. Localised exceedances may remain on Dock Street, despite a small decrease in NO_2 concentrations due to the LEZ. Given that the LEZ fleet is based on 2017 rates of compliance, it is expected that these areas of exceedance on Dock Street will not persist beyond the introduction of the LEZ. Reductions of between 1.5µgm-3 – 2µgm-3 are predicted in the region of the automatic monitor and the diffusion tubes on Lochee Road / Logie Street that exceeded NO_2 limit values in 2019.

4.8 The Strategic Environmental Assessment (SEA) process is ongoing with the proposed LEZ scheme having gone through the initial SEA screening and scoping phases. The proposed scheme is considered to provide a positive effect on the environment however, there is a requirement to undertake public consultation in relation to the SEA and this will run in line with the 28-day objection period for the LEZ scheme proposal Notice referred to in Section 4.13. The final SEA report will be included with the information to be submitted to the Scottish Ministers when applying to make the LEZ scheme.

4.9 An Integrated Impact Assessment (IIA) has also been completed for the proposed LEZ scheme. The IIA looks at how certain protected groups are potentially differentially affected, looking at positive and negative impacts of the introduction of the proposed LEZ scheme for Dundee. A copy of the IIA is available in Appendix C.

4.10 The IIA states that some protected members of society can be impacted by the LEZ in subtle ways that, although small in magnitude relative to the overall health benefits of the LEZ, can be removed or mitigated through considerate decision making at a national and local level. For example, the LEZ Support Fund, retrofitting schemes, and exemptions outlined in the LEZ Regulations all look to reduce any negative impacts of the proposed LEZ scheme. The two-year grace period gives sufficient time to ensure people are well informed and have time to prepare, prior to the start of enforcement of the LEZ is another way impact on those who may be adversely affected can be mitigated.

4.11 It is considered that the statutory consultation, IIA and SEPA LEZ Evidence report have not highlighted the need for DCC to reconsider any aspect of the LEZ as defined in the Statement of Scheme Proposal consulted upon. Taking in to account the outcomes of the consultation and stakeholder engagement, IIA and SEPA LEZ Evidence report, it is considered that the Statement of Scheme Proposal consulted upon does not need to be amended and as such should be the final design and scope of the Dundee LEZ.

4.12 Regulation 3 of Part 2 of the Low Emission Zones (Scotland) Regulations 2021 states that a local authority should publicise a notice for the making, amendment or revocation of a scheme after the formal public consultation, but before submitting the proposals for ministerial approval. Appendix D contains details of the Notice for the Dundee Low Emission Zone scheme proposal.

4.13 Regulation 4 of Part 2 of the Low Emission Zones (Scotland) Regulations 2021 states that any persons may object to the making, amendment or revocation of a LEZ scheme, and this should be done within the sphere of the 'Publication of notice of LEZ proposals. The Notice will include an end date of the objection period referred to in regulation 4(3) which will be 28 days after the Notice is published, the address at which objections to the scheme can be lodged, and a statement that all objections must be made in writing and must specify the grounds of objection.

4.14 Following the end of the 28-day objection period, as required by Regulation 4 a report will be submitted to the Committee, detailing the number of objections received, if any, the general nature of any objections and the response to the objections. This report must be submitted to Scottish Ministers and shall be made publicly available.

4.15 To assist local authorities with the introduction of LEZs in their cities, Scottish Ministers through Transport Scotland, have made further support funding available for the 2021/22 financial year. Dundee City Council has been awarded £722,000 for capital works involved in the purchase and installation of automated number plate recognition (ANPR) cameras and the purchase of a back-office enforcement system to be used for the enforcement of the LEZ. A further £40,500 was awarded for consultancy services to assist with the completion of LEZ consultation work, impact assessments and emissions modelling requirements.

5.0 POLICY IMPLICATIONS

5.1 This report has been subject to an assessment of any impacts on Equality & Diversity, Fairness & Poverty, Environment and Corporate Risk. A copy of the Impact Assessment is available on the Council's website at www.dundeecity.gov.uk/iia/reports.

6.0 CONSULTATIONS

6.1 The Council Management Team were consulted on the preparation of this report and agree with its contents.

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Executive Director of Neighbourhood Services

Tom Stirling
Head of Community Safety & Protection

8 October 2021

Appendices:

A) "Dundee Low Emission Zone - Outcomes from Statutory Consultation on the proposed LEZ scheme for Dundee" SYSTRA

B) Scottish Environmental Protection Agency "**Low Emission Zone Dundee Evidence Report September 2021'**

C) "Dundee Low Emission Zone – Integrated Impact Assessment" SYSTRA

D) Notice of Dundee Low Emission Zone scheme proposal

Appendix A

1. INTRODUCTION

1.1 Statutory Consultation

1.1.1 Section 11 of the Transport (Scotland) Act 2019 states that before a local authority submits its final Low Emission Zone (LEZ) proposals to Scottish Ministers for approval, it must consult with:

- the Scottish Environment Protection Agency,
- NatureScot
- Historic Environment Scotland,
- such persons as the authority considers represent the interests of—
    - **i.** the road haulage industry,
    - **ii.** the bus and coach industry,
    - **iii.** the taxi and private hire car industry,
    - **iv.** local businesses, and
    - **v.** drivers, likely to be affected by the proposal,
- such persons as are specified by the Scottish Ministers in regulations
    - **i.** neighbouring local authorities
    - **ii.** the Regional Transport Partnership (Tactran)
    - **iii.** the local Health Board
- such other persons as the authority considers appropriate

1.1.2 In line with The Act 2019, Dundee City Council (DCC) launched an eight-week consultation from 14th June 2021 to 9th August 2021 on its proposed LEZ scheme for the city, as agreed at the Community Safety and Public Protection Committee on 7th June 2021.

1.1.3 The statutory consultation period consisted of the following elements:

- Letter correspondence to statutory consultees advising of LEZ proposals
- Stakeholder workshops
- Online survey seeking views on the proposed LEZ option
- Information flyer delivered to residents and businesses in proposed LEZ area

1.1.4 This report summarises the outcomes from the eight-week statutory consultation on Dundee City Councils proposals for its LEZ and will form part of the submission of the LEZ Scheme to Scottish Ministers.

1.1.5 Prior to summarising the statutory consultation, the report will review the previous consultation events undertaken in support of the LEZ in Dundee.

2. PREVIOUS CONSULTATION SUPPORTING DUNDEE'S LEZ

2.1 Public and Stakeholder Consultation

2.1.1 Upon completion of the Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework Interim Stage 2 Report, SYSTRA 2019)* DCC's Community Safety and Public Protection Committee gave approval on 30th September 2019 to undertake a consultation exercise on five possible LEZ Options. The consultation took the form of an online public survey and face to face workshops with key (and statutory) stakeholders. The outcomes from the consultation period were reported to the Community Safety and Public Protection Committee in February 2020 and summarised here.

2.1.2 The online public survey ran for six weeks from 4th October to 19th November 2019 and was administered by DCC. The survey was viewed 1902 times and was completed a total of 1336 times. Most completions (96%) were by individuals and the greatest number of respondents (42%) live and work in Dundee. The survey included questions seeking to discover respondents' views on LEZs in general and specifically the potential options for Dundee that emerged from the Interim NLEF Stage 2 Report with:

- 65% of respondents supported the general principle of LEZs and
- 60% supported the principle of a LEZ for Dundee

- 64% considered that it should apply to all vehicle types
- 35% (the greatest percentage of respondents) favoured the LEZ option that has now been identified as the preferred LEZ Option for Dundee.

2.1.3 A range of workshops with key stakeholders were held concurrently with the live public survey dates during October and November 2019. Key stakeholders were also invited to submit a formal written response on their views on the LEZ proposals. The stakeholders represented at the workshops were as follows:

- Bus industry representatives:
  - Stagecoach East Scotland, Xplore Dundee, Moffat & Williamson and the Confederation of Passenger Transport (CPT)
- Freight industry representatives:
  - Logistics UK (Freight Transport Association), Road Haulage Association, United Parcel Service (UPS), local freight operators
- The Tayside and Central Regional Transport Partnership (Tactran)
- Business community:
  - DDOne, Federation of Small Businesses (FSB) and Dundee & Angus Chamber of Commerce, local businesses
- Community Councils:
  - Stobswell Forum, City Centre & Harbour, West End
- Environmental/interest groups
  - British Lung Foundation, Friends of the Earth Tayside (FoET), Friends of Riverside Nature Park, Scottish Wildlife Trust and Extension Rebellion, Dundee Civic Trust, Dundee Resource & Re-Use Centre
- Taxi representatives
- Car park operators (no response)

2.1.4 Further analysis of the results can be found in the second Interim NLEF Stage 2 Report. The consultation results show the level of support for the introduction of a LEZ in Dundee and specifically the final proposed LEZ area, including restrictions on all vehicles types as specified in the LEZ Regulations.

2.2 Focussed Covid-19 Consultation

2.2.1 In response to the Covid-19 pandemic, the national LEZ Leadership Group announced in May 2020 a temporary pause in plans to implement LEZs across Scotland. Plans were formally resumed in August 2020 and a new indicative timescale for the introduction of LEZs was published, that aims to see their introduction between February and May 2022.

2.2.2 In light of the difficulties faced by many throughout 2020 and 2021, DCC were keen to understand the level of support for the introduction of a LEZ in the city post pandemic and gauge the impact the pandemic may have had on businesses and bus operators in preparing for its introduction.

2.2.3 Major bus and coach operators in the city have been consulted regularly and kept up to date with ongoing proposals for the city's LEZ. Given the importance of bus compliance to the success of any LEZ, the operators were approached in March 2021 and all operators completed a questionnaire on the impact of Covid-19 on investment plans and likely future fleet compliance.

2.2.4 A questionnaire was also circulated to approximately 300 city centre businesses and members of the Dundee LEZ Delivery Group attended the Dundee Business Recovery meeting in February 2021 to present the current LEZ proposals and to seek views from the broad range of city businesses in attendance.

2.2.5 A key outcome from the focused consultation was to inform the length of the grace period. It was recognised that the Covid-19 pandemic has had an unprecedented impact on society, including on the wider environment and the economy. Cognisance of the difficulties faced by many throughout 2020 and 2021, particularly in the context of a Dundee city centre LEZ and its implications for city businesses and bus operators, suggested that a grace period greater than the required minimum was needed and a two year grace period was proposed.

2.3 Key outcomes from previous consultation

2.3.1 The preferred LEZ scheme for Dundee has been shaped by ongoing consultation with key stakeholders and members of the public in Dundee and surrounding area. Key outcomes from the consultation undertaken prior to the Statutory Consultation are:

- A majority of those surveyed in support of a LEZ in Dundee and in support of the final LEZ area proposed
- The grace period is required to be greater than the one year minimum, with a two year grace period proposed.

2.3.2 These findings and the wider appraisal outcomes allow DCC to approach the Statutory Consultation seeking views on the preferred scheme only.

3. SUMMARY OF STATUTORY CONSULTEE RESPONSES

3.1 Introduction

3.1.1 To seek views from the statutory stakeholders, the consultation consisted of the following elements:

- Letter correspondence to statutory consultees advising of LEZ proposals
- Stakeholder workshops on LEZ proposals with question and answer sessions

3.2 Written Submissions from Stakeholders

3.2.1 Table 3.1 lists the stakeholders contacted directly by DCC and shows those that have provided a written submission in response.

Table 3.1 : List of Stakeholder contacted by DCC and record of response

Stakeholder Type	Organisation	Response Received
Bus and coach industry	Moffatt & Williamson	
Bus and coach industry	Stagecoach East Scotland	Yes
Bus and coach industry	Xplore Dundee	Yes
Bus and coach industry	Stagecoach Citylink Coaches	Yes
National Body	Historic Environment Scotland	Yes
National Body	SEPA	
National Body	NatureScot	Yes
Neighbouring Local Authority	Angus Council	
Neighbouring Local Authority	Fife Council	Yes
Neighbouring Local Authority	Perth & Kinross Council	
Local Health Board	NHS Tayside	Yes
Regional Transport Partnership	SESTran	Yes
Regional Transport Partnership	TACTRAN	Yes
Freight Representative	Road Haulage Association	Yes
Freight Representative	Logistics UK	Yes
Local Business	Royal Mail	Yes
Local Business	UPS	Yes
Business Representative	Dundee & Angus Chamber of Commerce	N/A
Business Representative	Eco Stars	N/A
Taxi Operators	DCC Taxi Liaison Group	N/A

3.2.2 Note that Eco Stars, a free national environmental fleet management recognition scheme which operates a local scheme in Dundee, was utilised to send letters to its members from the local business and freight community. Dundee and Angus Chamber of Commerce facilitated a stakeholder workshop (as noted in 3.3 below) and sent correspondence to their members on DCC's behalf. The DCC taxi liaison group sent letters to its members to allow all taxi representatives the opportunity to respond.

3.2.3 In addition to the responses noted above, DCC received written submissions from the following individuals and organisations:

- Asthma UK & British Lung Foundation Scotland
- Dundee and Angus Green Party
- Enterprise Holdings
- Friends of the Earth Tayside
- Maggie Chapman, MSP for Scottish Green Party
- Paths for All
- RAC Motoring
- The National Union of Rail, Maritime and Transport Workers (RMT) Dundee Taxi Branch
- Tayside & Fife Greener Practice
- Unite Union Taxi Branch

3.2.4 . Each consultation response was assessed and the key themes and comments collated, as summarised below:

- Bus operators are broadly supportive or in favour of the LEZ, particularly one which restricts all vehicles and does not single out bus services.

- The two year grace period is supported by bus operators, with a view that any grace period less than this would not allow compliance of their fleets. This is caveated with:
  - The full impacts of the Covid-19 pandemic are not fully understood and investment plans may further be affected.
  - The occasional requirement to use non-compliant vehicles and likely fines as a results (e.g. when a bus requires urgent maintenance, replacement vehicles needed to cover breakdowns).
- The two year grace period will allow for a natural replacement of the freight fleet by which time the Euro VI emission standard will become standard for most operators

- All neighbouring authorities and regional transport partners that responded are supportive of the proposed LEZ scheme. Some comments expressed by the stakeholder were:
  - second hand non-compliant vehicles may increase in areas outside the LEZ, impacting on air quality
  - businesses serving Dundee may be adversely affected
  - Park and Ride proposals will complement the LEZ and serve wider communities
  - Dundee bus station is used by operators serving neighbouring authority areas (and beyond) and concerns that its inclusion in the LEZ will have a detrimental impact on service provision to local communities
- Several stakeholders encourage DCC to not implement the LEZ in isolation but alongside measures to promote and increase active travel and a shift to sustainable modes, such as improved cycle and walking infrastructure. While Dundee is relatively well served with electric vehicle infrastructure, this should be further promoted and provisions increased. Park and Ride options should be provided from all areas serving Dundee.

- Green groups and health bodies are generally supportive of the proposed zone that aims to improve air quality and reduce traffic associated emissions, however a number of concerns were expressed.
  - Lochee Road is excluded from the LEZ and therefore the LEZ does not address an area with high levels of air pollution close to the residential population.
  - The zone is not large enough and does not cover the majority of state schools and residential areas.
  - Major car parks are excluded and this does not promote the needed shift to sustainable and active travel modes.
  - The two-year grace period is too long and it should be as short as possible. The delay in LEZ implementation should mean a grace period is not required/should be minimal
- NHS Tayside are supportive of the LEZ in Dundee and understand why Lochee Road is not included in the LEZ. They are however concerned for people living in areas of deprivation and the risk in the health inequalities that an LEZ may bring.

- Wheelchair accessible taxis are predominately diesel cars and with a longer life and costs associated with replacement, users of wheelchair taxis may be unfairly impacted. A longer grace period for taxis would be preferred.

- Several stakeholders noted they are pleased with levels of engagement to date with many noting previous concerns have been taken into consideration

3.3 Stakeholder Workshops

3.3.1 SYSTRA and DCC organised seven virtual stakeholder workshops held in June, July and August 2021 during DCC's 8-week statutory consultation period on its LEZ proposals. A summary of the workshop groups and number of attendees is provided in Table 3.2.

Table 3.2 : Dundee LEZ Stakeholder Workshops 2021

Workshop Group	Date	Number of Attendees
Neighbouring authorities & regional transport partners	24/06/2021	20
Bus Operators	01/07/2021	6
Freight Operators	06/07/2021	4
Taxi Trade Representatives	07/07/2021	2
Stobswell Forum	08/07/2021	3
City centre & harbour community council	21/07/2021	4
Green Groups Forum	02/08/2021	4
Business Community	05/08/2021	15
Total No. of Stakeholders Consulted:		**58**

3.3.2 Each workshop was scheduled for 1 hour 30 minutes. At all stakeholder workshops, a presentation on the proposals for the LEZ in Dundee, including details on planned operation and enforcement timeline for its introduction, was given by the Dundee LEZ Delivery Group (LEZDG). This was followed by a question and answer session.

3.3.3 It should be noted that the sessions were held with representatives of each group or community with the reach of each session extending beyond the number of attendees listed in Table 3.2.

3.3.4 The feedback gathered at each session is summarised below. In general, the feedback was considered positive and in support of the LEZ with no stakeholder group expressing objections to the proposals.

Neighbouring Authorities and Regional Transport Partners

3.3.5 A joint session was attended by representatives from Dundee City Council, Perth and Kinross Council, Angus Council, Fife Council, Stirling Council, Tactran and SEStran. After the initial presentation, there were a number of queries and comments, as summarised below.

- The general response from a number of attendees was supportive of the proposals for the LEZ with no objections raised
- Is it likely that bus operators will move their non-compliant vehicles to neighbouring authorities?
- With all four cities having the same standard this could benefit across all of Scotland i.e. if driver changes to be compliant in Dundee, the benefits of this cleaner vehicle will be felt wherever it travels
- Awareness that money is being made available to all local authorities through bus alliance/bus priority/BSIP that will benefit all

Bus Operators

3.3.6 The session was attended by representatives from Xplore Dundee (McGills), Stagecoach East Scotland, Scottish Citylink Coaches and Moffat and Williamson. The invite was extended to the wider coach industry (through CPT) but no other operators attended. The key comments from the session were:

- The exclusion of the three car parks on the periphery does not seem logical and will results in no reduction in car trips to the city.

- All operators expect compliance of fleet by 2024 and welcome two year grace period, though it was noted this will require significant investment and if BEAR Retrofit not successful then compliance forecast may change.
- Concern about the future of LEZs. Will these be replace by Ultra LEZs or Zero Emission Zones for example, meaning the current investment in diesel Euro VI and retrofit buses will not offer value for money.
- With Lochee Road outside the LEZ, are there plans for improvements to the corridor?
- Bus operators should be included in early in all discussions around any bus priority measures in planned for the city

Freight Operators

3.3.7 The session was attended by two representatives from the Road Haulage Association (RHA) and one from Logistics UK (previously FTA). Both RHA and Logistics UK publicised the session to their members on a weekly basis but no local freight operators accepted the invite to the session. The key comments from the session were:

- Dundee have taken a sensible, pragmatic approach to introducing the LEZ
- Both RHA and Logistics UK voiced their support for the proposal and committed to circulating information to members as required
- The timeline for HGVs is considered fair, and allows for a natural fleet change to Euro VI by 2024, meaning very few non-compliant HGVs will be on the network.
- The retrofit funding for HGVs is not viable and does not work on articulated vehicles

Taxi Representatives

3.3.8 A session for taxi operators and drivers was organised by DCC, through the Taxi Liaison Group. 9 invites were accepted, including from 4 taxi firms, though the meeting was held with two attendees only, from the Unite Union and the Rail, Maritime and Transport Workers Union.

3.3.9 Neither attendee had objections to the scheme and offered to further publicise the proposed LEZ as required. It was noted that there should be clarity around the exemptions for disables users of taxi services and wheelchair accessible taxis.

Community Councils

3.3.10 In line with the stakeholder consultation held in 2019 on the emerging LEZ options, SYSTRA approached the following Community Councils:

- Stobswell Forum
- City Centre and Harbour
- West End
- Coldside

3.3.11 Briefing session were arranged with Stobswell Forum and City Centre and Harbour Community Council and key comments from the community council sessions were:

- Is this unfair on residents of the zone and should the grace period be extended for residents?
- Both community councils expressed desire to help publicise the LEZ, particularly funding that is available for households and businesses.
- Belief that stopping buses from idling at stops in the city would improve air quality and this should be enforced before any introduction of the LEZ

Dundee Green Groups Forum

3.3.12 A session was organised through the Dundee Green Groups Forum and was attended by Friends of the Earth Tayside, Dundee Climate Action Group and Extinction Rebellion. The following comments and questions were recorded:

- The online consultation appears more simple than other cities – why is this?
- 2022 is a “red herring”, the actual date that should be publicised is 2024 [noted by LEZDG that awareness of the LEZ has led to bus operators investing in their fleets in preparation so improvements are seen now]

- How does the proposed LEZ meet the LEZ objectives on sustainable travel and why have the council not set the LEZ out as part of the wider vision for changes to the city?
- Are the grace periods the same for other cities?
- How has the traffic and air quality modelling accounted for predicted changes in fleets by 2024 e.g. more second hand diesel cars on the road as a cheap alternative?
- When are the ANPR cameras being put in place and will they monitor from that date? Would there be an advantage to record as early as possible to capture a true real-time picture of compliance in the city?

Business Community

3.3.13 The briefing session was organised by DCC and Dundee and Angus Chamber of Commerce. The session was attended by business representative from across sectors. Following the presentation, the following comments were noted:

- Publicity is key. While the proposals are relatively simple and easy to understand there has to be continued publicity (in a simple manner) between now, declaration in 2022 and enforcement in 2024
- Business Gateway noted there has been relatively little questions received from small businesses about the LEZ. Does the show a lack of engagement with small businesses and what has been done to engage with these?

3.4 Response to Stakeholder Submissions and Comments

3.4.1 As noted in the previous sections, no stakeholders expressed objection or opposition to the proposed LEZ scheme however, there were a number of questions and concerns raised. This section provides a response to these concerns, utilising the evidence base and analysis undertaken to identify the preferred LEZ scheme.

3.4.2 **Comment:** Dundee bus station is used by operators service neighbouring authority area (and beyond) and concerns that its inclusion in the LEZ will have a detrimental impact on service provision to local communities.
Response: *Consultation with operators raised no concerns about impacts to services utilising the bus station. All current services are expected to utilise compliant vehicles by 2024 and the benefits from the cleaner buses will be felt in all communities they serve. Creating a dedicated route that allows non-compliant buses in / out of the bus station would likely impact on the air quality on Dock Street, where recorded levels of pollutants are high, as this section of road would be used to access the bus station. It was noted by one operator that pick-ups and drop-offs at the bus station may be impacted. This concern is mitigated with the location of the bus station in relation to the LEZ and the available parking in relative proximity (e.g. Olympia car park and Gallagher Retail Park (free for 2 hours))*

3.4.3 **Comment:** Lochee Road is excluded from the LEZ and therefore the LEZ does not address an area with high levels air pollution.
Response: *Lochee Road is a key transport corridor in Dundee and has had some of the highest recorded NO_2 levels in Dundee in recent years. The corridor was considered for inclusion in the LEZ from the outset and six Lochee Road Scenarios were tested for suitability in the Paramics traffic model. The results from this concluded that while there were benefits to Lochee Road there were significant disbenefits to surrounding areas and city-wide traffic conditions. Including the Lochee Road corridor effectively pushes the most polluting vehicles on to local roads that are more residential in nature and shifts the known problem on Lochee Road to other locations. The traffic modelling showed significant increase in traffic flows and journey times on adjacent routes such as City Road, Loon's Road and Perth Road/Hawkhill. Full details can be found in Chapter 9 of the second Interim NLEF Stage 2 Report and through SEPA's online visualisation tool. In addition to these negative effects, air quality modelling undertaken by SEPA showed that the preferred LEZ scheme (i.e. excluding Lochee Road) still brings an average 20% reduction in NOx on the corridor and predicts levels of NO_2 will reduced by 1-2 $\mu g/m^3$, primarily due to compliant cleaner buses serving the corridor (and all bus routes in the city). For these reasons, Lochee Road is not included in the proposed LEZ and DCC are exploring other options to further improve air quality and sustainable travel on the corridor.*

3.4.4 **Comment:** The zone is not wide enough and doesn't cover the majority of state schools and residential areas.

Response: *The Interim NLEF Stage 2 Report and accompanying model testing report details the appraisal and testing of possible LEZ scenarios encompassing areas larger than inner ring road area. Aside for the resulting detrimental impact to the network traffic conditions (including increased congestion, queueing and therefore emissions) the inclusion of residential areas where there are currently no air quality issues would be harmful and unfair to those living in these areas and increase the cost to comply with the LEZ.*

3.4.5 **Comment:** Major car parks are excluded and this does not promote the needed shift to sustainable and active travel modes.
Response: *From a legislative viewpoint it is not possible to include the three car parks on the periphery of the proposed LEZ area (Bell Street, West Marketgait NCP and Wellgate Centre) if the inner ring road is excluded from LEZ area, although options encompassing these car parks were considered in detail. See Chapter 10 of the Interim NLEF Stage 2 Report for a full explanation on the car park considerations.*

3.4.6 **Comment:** The two-year grace period is too long and it should be as short as possible.
Response: *The minimum grace period after the introduction of a LEZ is one year. Consultation with bus operators and local businesses informed that recovery from the unprecedented Covid-19 pandemic will take many years and many would not be able to comply with LEZ emission standards by 2023. Giving one year additional grace (when up to three years could have been given), allows for bus operators, businesses and residents of Dundee and surrounding areas to plan for the LEZ introduction and mitigates against any unintended consequences of enforcement at an earlier date. It has also been shown that bus operators have already commenced improving their fleet in order to be compliant by 2024 and therefore the benefits of the LEZ will be felt before enforcement begins.*

3.4.7 **Comment:** Concern for people living in areas of deprivation and the risk in the health inequalities that an LEZ may bring.
Response: *The LEZ proposals have been subject to an Integrated Impact Assessment and this concluded that when the LEZ is delivered with exemptions and funding support, the unintended impacts can be minimised and mitigated against. DCC will continue to promote and support opportunities as they become available.*

3.5 Online Consultation

3.5.1 DCC set out its proposals for the LEZ on its website (www.dundeecity.gov.uk/lez) where those wishing to provide feedback could do so through an online consultation form. Feedback was sought only on the proposals as defined in the *Statement of Scheme Proposal* and did not seek wider views (e.g. on whether a LEZ was supported or whether the scheme should change) as this was captured in the consultation exercise in 2019.

3.5.2 There were 124 completed responses to the online consultation. As the survey did not gather statistical information, the responses were categorised into one of the following categories, based on the content of their answer:

- Support for the LEZ 26%
- Neutral 30%
- Against the LEZ 36%
- Lacks Coverage/ Do more 8%

3.5.3 The majority of responses (36%) were against the introduction of the proposed LEZ. Given the nature of the online question, it is perhaps expected that those individuals with concerns on the LEZ take the time to complete the survey whereas those who agree with the proposals may be less inclined to do so. However, 26% of responses were in support of the LEZ with a further 8% broadly in support of the LEZ in principle but believe it should cover a larger area.

3.5.4 30% of responses were classed as neutral and did not express an opinion for or against the LEZ. Of these, the majority used the survey to ask specific questions on the proposal. Where possible, DCC will endeavour to answer these directly where contact details are available.

3.5.5 Those responding against the LEZ gave varying reasons for their objections. Each response was assessed and the key concerns emerging from the responses are detailed below, alongside a response to each:

- **Concern** that the LEZ will push traffic onto neighbouring residential streets
  Response: *The Interim NLEF Stage 2 Report and accompanying model testing report show that the road network in Dundee operates relatively similarly to existing conditions with proposed LEZ in place and that there is no increase in traffic on local routes. This is primarily because the LEZ does not include the key strategic inner ring road corridor and does not therefore displace traffic from these routes.*
- **Concern** that parking will be displaced into residential areas neighbouring the city centre
  Response: *Linked to the above response, the analysis has shown that the car parks excluded from the LEZ area will provide sufficient capacity for non-compliant vehicles that can no longer park in the city centre.*
- **Concern** the grace period doesn't provide enough time to update vehicles
- ***Response****: The grace period gives vehicle owners almost 3 years from the consultation dates before enforcement begins. There is no evidence to suggest a grace period greater than two years is required and this would be unlikely to be accepted by Scottish Ministers.*
- **Concern** about financial support for individuals/businesses to enable them to switch to compliant vehicle
  Response*: Means tested funding (LEZ Support Fund) is available for households and businesses to help those who most need it comply with the LEZ measures and it should be remembered that a compliant vehicle does not need to be a new vehicle (either conventional fuel or hybrid/electric).*
- **Concern** for impact on city centre businesses.
  Response: *The LEZ proposals have been subject to an Integrated Impact Assessment which considered the impact to city centre businesses*.

4. KEY OUTCOMES FROM CONSULTATION

4.1.1 In line with The Act 2019, Dundee City Council (DCC) held an eight-week consultation from 14th June 2021 to 9th August 2021 on its proposed LEZ scheme for the city, as agreed at the Community Safety and Public Protection Committee on 7th June 2021.

4.1.2 The statutory consultation period consisted of the following elements:

- Letter correspondence to statutory consultees advising of LEZ proposals
- Stakeholder workshops
- Online survey seeking views on the proposed LEZ option
- Information flyer delivered to residents and businesses in proposed LEZ area

4.1.3 DCC received written submission from 24 stakeholders, businesses or interest groups. In general all responses supported the introduction of the proposed LEZ in Dundee however some responses (notably those from health and green groups) believe the LEZ should be larger in size and scope.

4.1.4 DCC also set out its proposals for the LEZ on its website (www.dundeecity.gov.uk/lez) where those wishing to provide feedback could do so through an online consultation form. There were 124 completed responses to the online consultation. While 36% of responses were against the introduction of the proposed LEZ, 26% were for the proposals and a further 8% support the LEZ but feel it should extend further (in size and scope).

4.1.5 The statutory consultation has further informed the development of the LEZ in Dundee and has not highlighted the need for DCC to reconsider any aspect of the LEZ as defined in the *Statement of Scheme Proposal.*

Appendix B

CLEANER AIR FOR SCOTLAND – NATIONAL MODELLING FRAMEWORK

Low Emission Zone Dundee Evidence Report

September 2021

Scope of Report

Air Quality modelling for Dundee has been ongoing, supporting the Scottish Government Cleaner Air for Scotland strategy (CAFS). This report follows on from the previous SEPA report 'Dundee LEZ Emissions Report' which focused on calculated tail-pipe emissions of Nitrogen Oxide (NO_x). This work represents the final stages of the National Modelling Framework (NMF), providing modelled NO_2 concentrations to support Dundee City Council's (DCC) proposed Low Emission Zone (LEZ). Traffic modelling has been carried out by SYSTRA to predict changes in vehicle flows and fleet compositions, which was then used to calculate pollutant emissions and air quality concentrations. This report presents the results of air quality modelling work to examine the changes on emissions and concentrations associated with the implementation of the proposed LEZ. Calculated changes in Particulate Matter (PM_{10}) emissions are also presented.

Main Points to Note

- Earlier modelling identified that the highest concentrations of annual-average NO_2 occurred in the City Centre where vehicle emissions were dominated by buses, whilst diesel car emissions dominated other key routes around the city.
- Traffic model outputs indicated relatively low levels of displacement, with the inner ring road experiencing a small increase in car flow, whilst there are general reductions within the LEZ area.
- SEPA's emissions report identified that key bus routes within the LEZ boundary will experience the largest reductions in NO_x emissions by an average of 70%, whilst emissions on Lochee Road will reduce by an average of 20%.
- Air quality model results are based on the age of the Dundee fleet in 2017 and are therefore precautionary, given that further fleet improvements are expected before LEZ implementation.
- Air quality model results indicate that exceedances modelled inside the LEZ for the base year of 2017 would all be removed following LEZ implementation.
- Air quality concentrations increase very locally on Greenmarket, leading from the inner ring road to Greenmarket car park. Concentrations here remain low.

- Localised exceedances may remain on Dock Street, despite a small decrease in NO_2 concentrations due to the LEZ.
- There is a small decrease in NO_2 concentrations along Lochee Road and Logie Street, including at locations where NO_2 exceedances were observed in 2019.
- The LEZ is expected to lead to substantial reductions in tailpipe emissions of PM10, most notably on bus routes inside the LEZ.

List of Abbreviations

AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling System
ADMS	Urban Atmospheric Dispersion Modelling System for Urban Environments
ANPR	Automatic Number Plate Recognition
AQMA	Air Quality Management Area
ATC	Automatic Traffic Counters
CAFS	Cleaner Air for Scotland
CERC	Cambridge Environmental Research Consultants
DCC	Dundee City Council
DfT	Department for Transport
DEFRA	Department for Environment Food & Rural Affairs
DVLA	Driver and Vehicle Licensing Agency
EFTv8	Emissions Factors Toolkit v8.0
EMIT	CERC Emissions Tool
HGV	Heavy Goods Vehicle
JTC	Junction Turn Counts
LAQM	Local Air Quality Management
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
NAEI	National Atmospheric Emissions Inventory
NLEF	National Low Emission Framework
NMF	National Modelling Framework
PDT	Passive Diffusion Tube
SEPA	Scottish Environment Protection Agency
SG	Scottish Government
TS	Transport Scotland

List of Chemical Abbreviations

NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Particulate Matter less than 10µm in diameter

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Introduction

Background

As part of the National Modelling Framework (NMF) and National low Emission Framework (NLEF) process within the Cleaner Air for Scotland (CAFS) strategy, an air quality model was built using good quality data and performance validated against air quality monitoring data. The principals and methodology underpinning the model development is set out in the SEPA Aberdeen Pilot Project (SEPA, 2017). A consistent approach to air quality model development has been taken across all four cities implementing Low Emission Zones (LEZs).

Following on from the initial air quality modelling and evidence presented to Dundee City Council and SYSTRA (SYSTRA, 2019b) during the early stages of the LEZ development, the next step was to model LEZ scenarios. As part of this, further traffic surveys were carried out to identify if there are any significant changes in traffic flows and to detect improvements in the fleet composition due to fleet turnover. DCC commissioned SYSTRA consultants to carry out traffic modelling and predict changes to traffic flows in response to the introduction of an LEZ; the traffic model data was used to run the Air Quality models to assess potential changes in pollutant concentrations.

SEPA Cyberattack

On Christmas Eve 2020, SEPA was subject to a serious and complex criminal cyber-attack that significantly impacted our internal systems and our Air Quality modelling capabilities.

As part of our recovery plan, SEPA implemented a phased rollout programme to restore critical services, re-establish critical communication systems to continue providing our priority regulatory, monitoring, flood forecasting and warning services. Our priority regulatory work programme included the delivery of our NMF obligations to assist in the final assessments of the LEZ options for each city.

Due to SEPAs inability to carry out Air Quality modelling, an alternative approach to allow for local authorities to report to committee in Spring 2021 was discussed at the LEZ Leadership Group meeting held on the 3rd of February 2021. The following steps were recommended by Scottish Government and SEPA on a way forward:

- Continuation of traffic modelling to define potential LEZ options or a preferred LEZ option for each city.

- SEPA to carry out emissions analysis on the traffic model outputs using the established NMF methodology, assessing the impact of the LEZ by comparing traffic and emissions between the reference/base case and LEZ options.
- SEPA to continue detailed AQ modelling during the consultation phase over the summer of 2021 to support the local authorities in finalising the preferred LEZ scheme for Ministerial approval.

Since July 2021, SEPA's air modelling capacity has been restored, however the original modelling data for Dundee was not recoverable, therefore this has resulted in a significant delay to work plans, as some modelling parameters had to be regenerated.

National Modelling Framework

Modelling work presented here continues to follow the NMF approach and methods outlined in previous reports (SEPA, 2017) ensuring a consistent approach in air quality modelling. These include:

- The use of ADMS-Urban and EMIT as used in previous NMF work.
- Processing traffic model outputs in the same way that detailed data from traffic data collection surveys was processed earlier in the NMF process.
- Running the air quality models of each city using identical methods and default model settings as used previously.
- Using the same sources of data for input into the model, such as road layout, road width and building heights.
- Using appropriate meteorological and background emission data obtained from a common source.
- Combining traffic data with published emission information to derive consistent emission estimates.
- More accurate emission information, if available, will be applied in a consistent way.
- Ensure that observations and lessons learned from one city are applied in other cities.
- Process, visualise and report on modelling output in a consistent and informative way.

The model continues to be assessed against measurement data to ensure the model is performing well, which includes updating emission calculations based on Automatic Number Plate Recognition (ANPR) data to account for fleet turnover and localised bus fleet data.

It's important to note that some differences in methodology between the cities have arisen due to different approaches in traffic modelling for each city. DCC, along with Aberdeen and Glasgow, commissioned SYSTRA to carry out traffic modelling using Paramics (a microsimulation traffic model), whilst City of Edinburgh Council commissioned Jacobs to carry out traffic modelling using the VISUM model (a strategic traffic model). There are some differences in how the traffic data is processed into Annual Average Daily Traffic (AADT) as required by the air quality modelling. However, from that point the traffic data is treated in the same way when calculating emissions and processing within ADMS.

The ADMS-Urban software has been updated recently. The main difference compared to the previous version is an update to the way ADMS-Urban deals with canyons, which may lead to some differences between ADMS-Urban model versions. However, the new version of ADMS-Urban (version 5) has been used to re-model Dundee.

Modelling Methodology

Scope of Traffic Modelling

The initial Base Model development is detailed in the report *Dundee Greater City Centre Base Paramics Model Development Report* (SYSTRA, 2019a) and the development of the Reference Case model is detailed in the technical note *Dundee Greater City Centre Reference Case Note* (SYSTRA, 2020). The development of each of the LEZ option models, as defined by DCC are outlined in the Technical Note *Dundee Microsimulation Model LEZ Option Testing Note* (SYSTRA, 2021).

The Reference Case Model for Dundee includes infrastructure changes and committed Local Development Plan forecasts to 2023 as identified by DCC. Following discussion with DCC, it was determined that the full waterfront development would not be completed by 2023 although some components of the project and associated vehicle trips on the existing road network were included in the model. The Reference Case model has been built with the expectation that there will be no background traffic growth (SYSTRA, 2020).

The Reference Case Model was used as a basis to develop three core inner ring road LEZ option tests (Figure 1), namely the three all vehicle LEZ options identified through the NLEF high level appraisal (SYSTRA, 2019b):

- LEZ Option 1 - Inner Ring Road area, including all car parks.
- LEZ Option 2 - Inner Ring Road area, excluding Bell Street and West Marketgait NCP car parks.
- LEZ Option 3 - Inner Ring Road area, excluding Bell Street, West Marketgait NCP and Wellgate car parks.

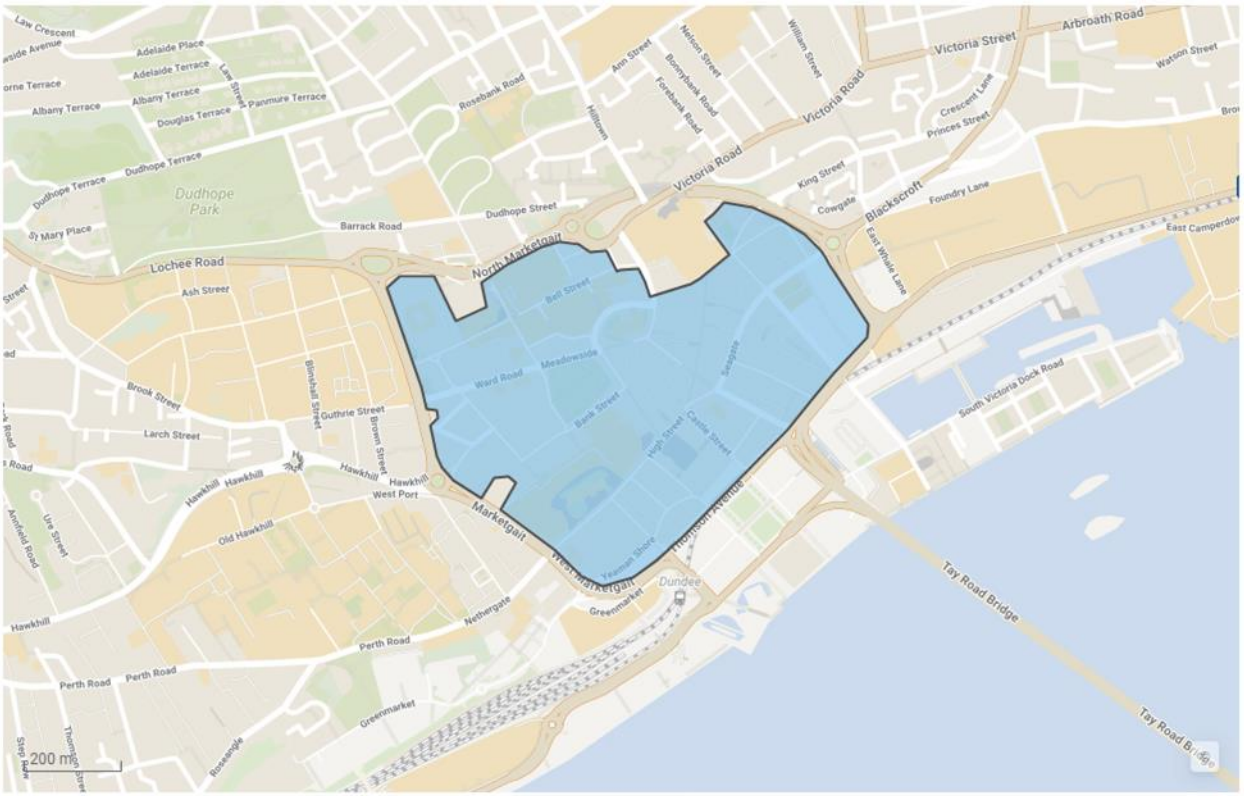

Table 1. Figure 1: Extent of the LEZ covering the area of Dundee City Centre within the inner ring road.

In addition to these three-core inner ring road options, two further variants were tested where the LEZ was extended along the Lochee Road corridor, as identified through the NLEF public and stakeholder consultation. The Lochee Road option tests were:

- LEZ Option 1/2/3 (above) plus West Marketgait between West Port Roundabout and Dudhope Roundabout and Lochee Road to Tullideph Road.
- LEZ Option 1/2/3 (above) plus West Marketgait between West Port Roundabout and Dudhope Roundabout and Lochee Road to Loon's Road.

During this LEZ model testing undertaken by SYSTRA, it was identified that the assessment of the Lochee Road corridor options was hindered by network congestion primarily resulting from the inclusion of West Marketgait between West Port Roundabout and Dudhope Roundabout in the LEZ area. It was agreed with DCC that SYSTRA would model further variants of the Lochee Road options, excluding West Marketgait, as follows:

- Lochee Road Variant 1 LEZ Option 1/2/3 (above) plus Lochee Road to Tullideph Road (excluding West Marketgait between West Port Roundabout and Dudhope Roundabout)
- Lochee Road Variant 2 LEZ Option 1/2/3 (above) plus Lochee Road to Loon's Road (excluding West Marketgait between West Port Roundabout and Dudhope Roundabout)

The existing air quality model domain was considered adequate for this piece of work as it covers the city centre in detail, where local displacement of traffic will need to be considered as part of the city centre LEZ. The LEZ rules also needed to be considered when planning this stage of the modelling work, where it is noted that regulations for petrol cars are different from all other vehicles (Table 3). This is because NO_x emissions from petrol vehicles are much lower than diesel vehicles.

Table 2. Table 3: LEZ rules for Vehicle Categories.

Vehicle category	Compliant	Non-Compliant
Cars (Petrol)	Euro 4, 5, 6	Euro 3 or earlier
All Vehicles (except Cars (Petrol))	Euro 6, Electric	Euro 5 or earlier

Traffic Modelling Methodology

The traffic modelling was carried out by SYSTRA using the Paramics microsimulation model. It is important to note that the traffic modelling carried out for Dundee (along with that carried out for Aberdeen and Glasgow) is a different approach to that used for Edinburgh that utilised the VISUM strategic traffic model. The traffic model was run for 2 scenarios:

1. Reference Case
2. City Centre LEZ

For the Reference Case the traffic model has 7 vehicle types represented; Car, Light Goods Vehicle (LGV), Medium Goods Vehicle (MGV), Heavy Goods Vehicle (HGV), Bus, Coach and Taxi that include both compliant and non-compliant vehicles. The MGV category in the Paramics model is split across the 3 Rigid-HGV classes and the HGV category is split across the 3 Artic-HGV classes.

For the LEZ scenario the 3 vehicle categories; Car, LGV and HGV were further split to provide Compliant and Non-Compliant sub-categories giving 11 vehicle types. Traffic entering, leaving, or travelling within either LEZ is 'Compliant'. Traffic which is 'Non-Compliant' is forced to divert around the LEZ. This may result in 'Compliant' traffic taking advantage of quieter roads within the LEZ and changing their route accordingly. Only the displacement of Cars, LGV's and HGV's are considered in the LEZ scenarios. It is assumed bus routes will remain unchanged and vehicles will become compliant. Following discussions with DCC and TS it was assumed that all taxis in the LEZ option are compliant (SYSTRA, 2021).

Traffic Flow

Traffic and air quality models must be underpinned by good quality traffic data to ensure traffic flows and the distribution of vehicle types are represented as accurately as possible (SEPA, 2017). Two detailed traffic data surveys were carried out in 2017 and again in 2019 with additional Junction Turn Count (JTC) sites to support the development of the traffic model. In both the Reference Case and LEZ scenario the traffic flows are based on those observed in 2019. Overall, there was a small increase in total traffic flows in the 2019 survey. It was decided that, as the LEZ traffic modelling will focus primarily on Cars, LGVs and HGV's, and that traffic flows for these vehicles are higher in the 2019 survey, the 2019 traffic data would be used for the LEZ scenarios (Figure 2).

Table 3. Figure 2: shows traffic flow based on the 2019 survey. Roads are coloured by total traffic flow.

ANPR and Fleet Composition

ANPR survey data provides information linking vehicle number plates to information on the DVLA database such as vehicle type, weight, engine size and fuel type. The DVLA also provide estimated Euro class, based on the age of the vehicle. This information can be processed to derive fleet composition tables, which are required to calculate the emission rates for each road link in the CERC emission database tool, EMIT.

Predicting future fleet composition introduces a level of uncertainty and the National Fleet projections that are published by the DfT are often optimistic. The 2017 traffic data collection survey included the collection of ANPR data, but this wasn't repeated during the 2019 survey. Although ANPR data was collected by Transport Scotland and DCC in 2018, DCC were keen to represent the worst-case scenario regarding displaced traffic volumes and the impacts of these upon emissions so it was agreed that the fleet composition would remain as 2017 for the Reference Case and LEZ scenario (SYSTRA, 2020) (SYSTRA, 2021). It is expected that over time, the fleet will become cleaner as older vehicles are scrapped and new vehicles enter the fleet.

Within the traffic model, Cars, LGV's and HGV's were split into 2 categories, compliant and non-compliant using the values in Table 2. The values are derived from the 2017 ANPR survey:

Table 4. Table 4: Compliant and Non-compliant percentages used in traffic modelling.

Vehicle Type	Compliance	Fuel Type	Percentage by Vehicle Class
Cars	Compliant	Petrol	51%
		Diesel	17%
	Non-Compliant	Petrol	3%
		Diesel	29%
LGV's	Compliant	Petrol	0%
		Diesel	16%
	Non-Compliant	Petrol	1%
		Diesel	83%
HGV's	Compliant	Petrol	0%
		Diesel	26%
	Non-Compliant	Petrol	0%
		Diesel	74%

In the Reference Case the proportion of bus journeys being made by the lowest-emitting Euro VI buses was 29.4% based on 2017 bus fleet data available in the Dundee Bus Operator tool (Table 3 and Figure 3). An average fleet has been used to represent the entire city, however, it should be noted that there is some fleet variation across the city. In the LEZ scenario the proportion of bus journeys being made by Euro VI buses was increased to 100%.

Table 5. Table 5: Percentage of Bus Euro Class taken from the Bus Operators fleet and the SEPA Bus Operators Tool (2017).

Bus Class	Percentage of Bus Fleet
Euro II	2.0%
Euro III	16.8%
Euro IV	4.6%
Euro V	47.2%
Euro VI	29.4%

The Dundee Bus Operators' tool was used to identify the main bus routes across the city (Figure 3), with a particular emphasis on bus dominated streets within the LEZ boundary.

Table 6. Figure 3: Main bus routes (shown in red) across Dundee city centre taken from the SEPA Bus Operator tool (pre-Covid 2017).

Each scenario was run over 3 time periods within the traffic model, with the flows for each period summed to provide a 12-hour flow:

- AM: 07:00 – 10:00
- Interpeak: 10:00 -16:00
- PM: 16:00-19:00

The road network in the traffic model consists of approx. 7000 links and is much more detailed than the network in the air quality model consisting of approx. 255 links (Figure 4). Links in the traffic model road network that did not overlap with links in the air quality model road network were removed and the remaining traffic model links were mapped and associated with the appropriate links in the air quality model.

Table 1. Figure 4: Paramics traffic model road network (grey) and air quality road network (blue).

Calculating Emission Inputs for Air Quality Modelling

The Emission Factor Toolkit version 8 (EfT8) emission factors within the CERC database tool EMIT have been used to calculate emission rates in this analysis which was the most up to date available at the time.

Vehicle categories from the Paramics model were converted into 11-vehicle classes required by EMIT:

- Motorcycle, Car, LGV, Bus/Coach, RHGV-2ax, RHGV-3ax, RHGV-4ax, AHGV-34ax, AHGV-5ax, AHGV-6ax and Taxi.

The goods vehicles were split in line with the proportions identified in the 2017 observed fleet data and counts for buses and coaches were added together. The taxi flows taken from the Paramics model are included in the taxi category in EMIT as black cabs (which assumes emissions are similar to LGV's). This is likely to result in an overestimate in emissions in the Reference Case giving a precautionary approach. In the LEZ scenario all taxis are assumed to be compliant.

To calculate emission rates, 24-hour traffic flows (known as Annual Average Daily Traffic, or AADT) are required, which is not provided by the traffic model. In previous modelling work, traffic flows were calculated using 12-hour and 24-hour JTC data. The junctions that had 24-hour data were already AADT flows. Where data was collected over a 12-hour period, these values were factored up to AADT using conversion factors derived from the 24-hour JTC data, with different factors used for each traffic category.

In this case, new conversion factors had to be derived to convert the traffic model output from 12 hour to AADT and these were derived from Automatic Traffic Count (ATC) data for all road links in the model. Due to the SEPA cyber attack it was not possible to derive these factors from Junction Turn Count (JTC) data as described in the technical report (SEPA, 2017).

Finally, the 2017 fleet composition tables and traffic flow data were used in the CERC EMIT database tool to generate NO_x, NO_2 and PM_{10} emission rates for each road link. These emission rates were analysed to provide information on emission rate changes for each road and were also ready to import into ADMS-Urban to predict NO_x and NO_2 concentrations.

Air Quality Modelling Methodology

The Aberdeen Pilot Project Technical report (SEPA, 2017) outlines the air quality modelling methodology and this remains the same to maintain consistency with previous modelling unless outlined in more detail below, which is mainly focused on the use of traffic model data to examine the effect on introducing an LEZ. The original ADMS air quality model contained approx. 550 road links but this was reduced to 255 links in the revised air quality model (Figure 5).

Table 7. Figure 5: The revised air quality model network.

The following AQ modelling parameters were used:

- Meteorology: 2017 data from Leuchars Met Office weather station
- Background data: Given uncertainties about the most appropriate source of background data for Dundee, four different methods have been explored. This is discussed in more detail in Appendix 1.
- Traffic Speed: These are based on output from the traffic model. This is discussed in more detail in Appendix 1
- Street Geometry (road widths and canyons): These features were re-calculated from Mastermap using the established NMF methodology (SEPA, 2017).
- 12-hr traffic flows were converted to 24-hr flow using ATC data, due to the unavailability of JTC data.

Results of air quality modelling using Reference case traffic flows were compared against air quality observation, in order to assess the performance of the model. The results of this verification are presented in Appendix 1.

Results

Traffic Model Output

The aim of the traffic model is to predict traffic flow changes in response to the introduction of an LEZ, which is likely to displace non-compliant traffic around the LEZ boundary. The first stage in assessing the effect of these changes on emissions involved processing the Traffic Model outputs to make them compatible with the CERC emissions database tool (EMIT) using conversion factors derived from observed traffic data. Emission rates (g/km/s) were calculated for the vehicle flows along every road in the traffic model for the Reference Case and LEZ scenarios. Comparing emissions between these 2 scenarios enabled any changes due to the LEZ to be identified (SEPA, 2021). Initial findings suggest that implementation of the proposed LEZ will reduce NO_x emissions on key bus routes inside the LEZ boundary by an average of 70% whilst there is an overall reduction of annual NO_x emissions within the LEZ of 78%. The proposed LEZ results in low levels of traffic displacement, except for an increase in car flow on the inner ring road and surrounding car parks, and a small increase in Goods vehicles on the Kingsway. This is linked to very localised increases in NO_x emissions on small sections of road around the edge of the LEZ boundary. These occur on roads that currently have low traffic levels.

The flows along each road in the traffic model used in the emission analysis have been incorporated into the air quality model to predict changes in roadside concentrations due to the LEZ. The absolute differences between Reference and LEZ cases may in some cases be smaller than previously presented in the Dundee LEZ Emissions Report. This is a consequence of aggregating the traffic data, whereby the maximum Reference and LEZ flows from the Paramics model are used in ADMS. The air quality modelling results for the LEZ case still represent a worst-case scenario as these are based on maximum traffic flows.

Predicted changes to road emissions

Inside the LEZ

There is a large reduction in emissions inside the LEZ due to its implementation. In the Reference case there are 8.1 tonnes of NO_x emitted annually, which reduces to 1.8 tonnes of NO_x in the LEZ case. This is due to all vehicles meeting EURO 6/VI standards. Buses remain the largest contributor to NO_x emissions, emitting 0.7 tonnes annually. Diesel cars are the next largest contributor to annual NO_x (0.5 tonnes/year).

In Figure 6, all roads in the model network are ranked by NO_x emission rate (g/km/s) for the Reference case, and in Figure 7 for the LEZ case. In both cases, roads inside the LEZ are highlighted in black, showing the scale of reduction following LEZ implementation. In the LEZ case the roads inside the LEZ have among the lowest emissions rates of this model network.

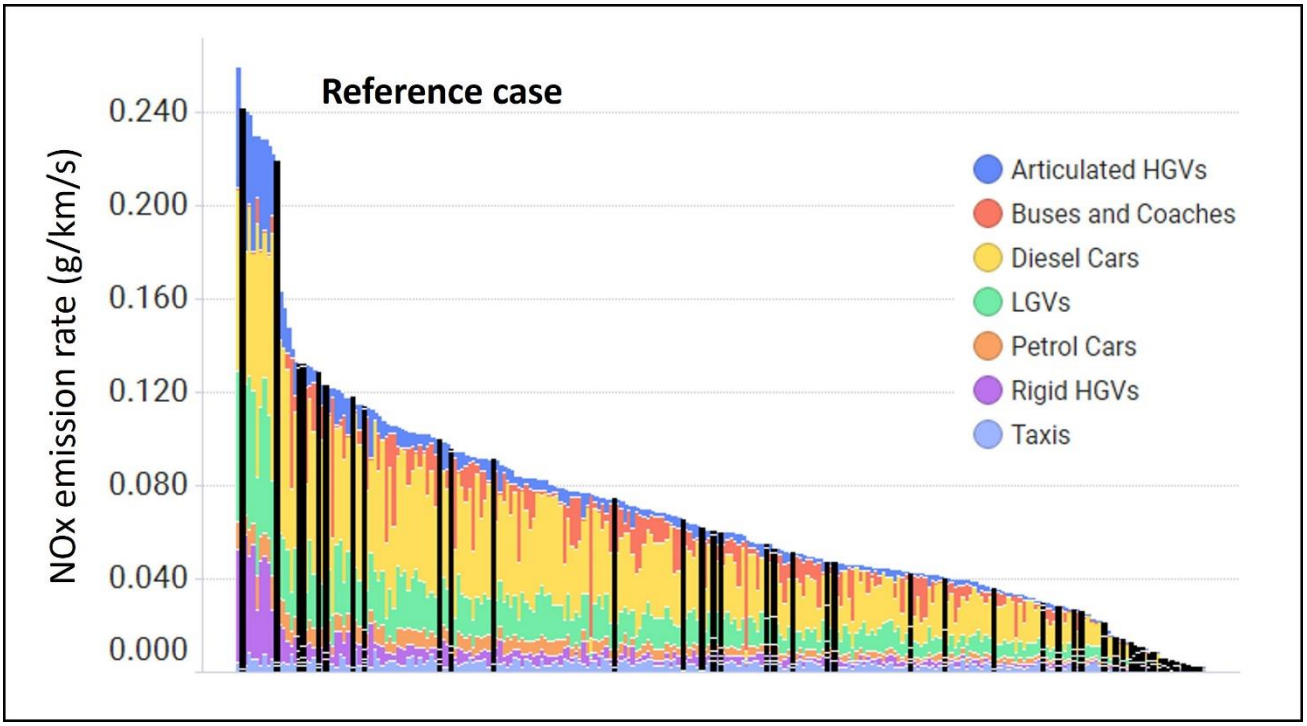

Table 8. Figure 6: Ranked emissions rates of NO_x (g/km/s) for all roads for the Reference case. Roads inside the LEZ are highlighted in black.

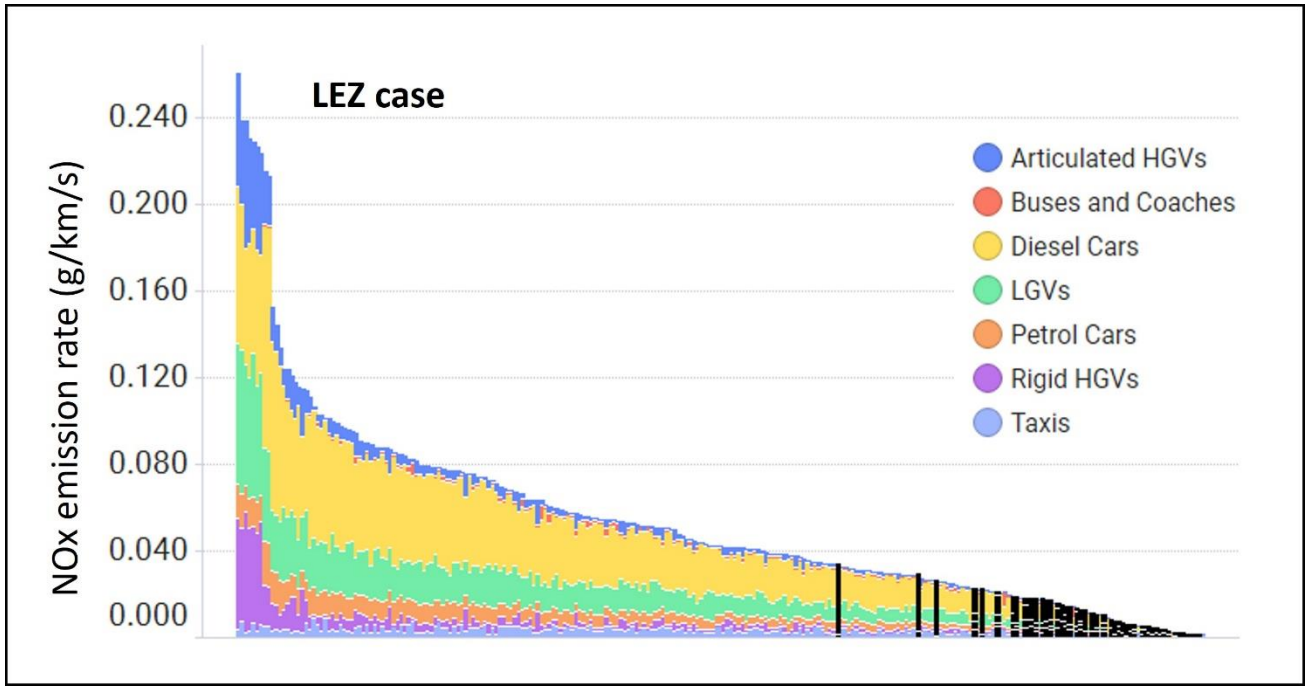

Table 9. Figure 7: Ranked emissions rates of NO_x (g/km/s) for all roads for the LEZ case. Roads inside the LEZ are highlighted in black.

In addition to cleaner vehicles inside the LEZ there is a small reduction in the number of vehicles entering the zone. In the Reference case there is a maximum traffic flow inside the LEZ of around 6000 vehicles per day. There is a maximum reduction of around 30% to give a daily flow in the LEZ case of around 4000 vehicles per day. This reduction is mainly achieved by fewer cars entering the LEZ.

Emissions inside the LEZ are explored in more detail below by focusing on two sections of road inside the LEZ that are dominated by bus emissions but occupy different positions within the ranking of all emission rates. Seagate is among the highest NOx emitters in the Reference case, while Meadowside is closer to the centre of the distribution. Their locations are shown on Figure 8 and their emissions are shown on Figure 9.

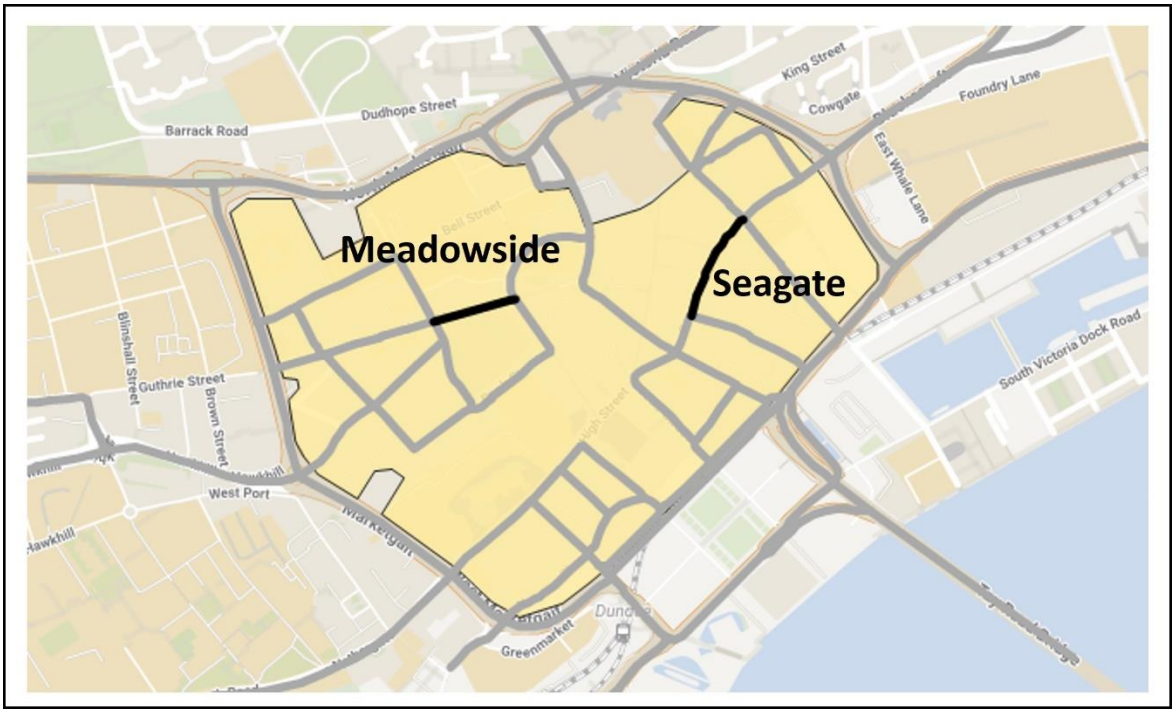

Table 10. Figure 8: The location of the sections of Meadowside and Seagate examined in more detail below.

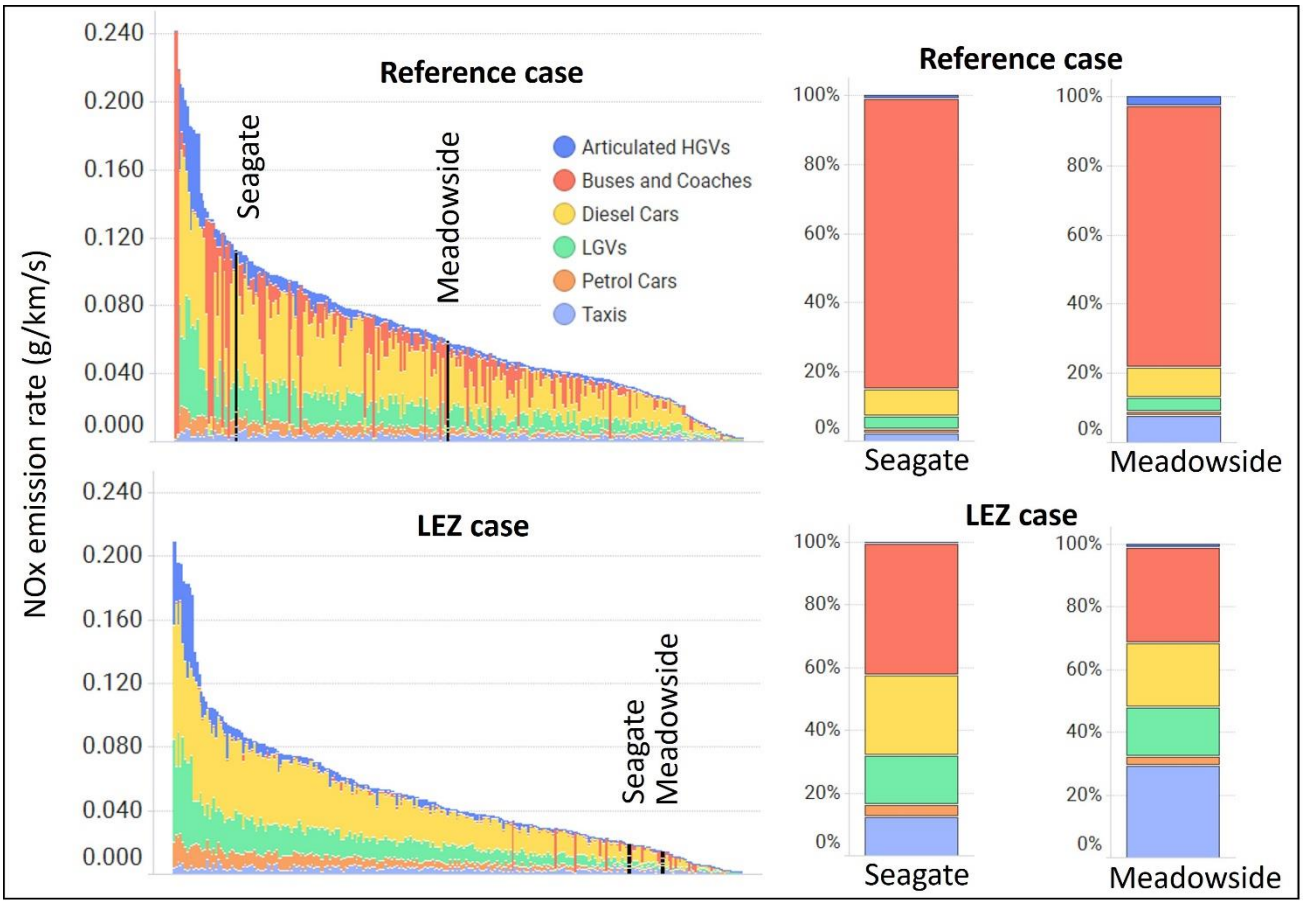

Table 11. Figure 9: Ranked emissions rates of NO_x (g/km/s) for all roads, with Seagate and Meadowside highlighted in black. Bar charts show the contribution to total NO_x from different vehicle types, for Reference and LEZ cases.

Table 12.

In Figure 9, all roads in the model network are ranked by NO_x emission rate (g/km/s) for the Reference and LEZ cases. Seagate and Meadowside are highlighted in black to demonstrate the scale of reduction in city centre emissions following implementation of the LEZ. This reduction is mainly driven by a cleaner bus fleet with additional reduction from diesel cars.

Inner ring road

Following implementation of the LEZ there is a small increase in the number of vehicles on the inner ring road. On the roads highlighted in black in Figure 10, there are on average around 1000 more vehicles per day, corresponding to an average increase in traffic of less than 10%. Along the section of West Marketgait highlighted on the map there is an increase due to the LEZ of over 2000 vehicles, corresponding to an increase of just under 20%.

Despite a small increase in the number of vehicles on the inner ring road there is a small reduction in total NO_x emissions, due to implementing the LEZ. In the Reference case there are 9.3 tonnes of NO_x emitted annually, compared with 8.5 tonnes of NO_x in the LEZ case. Following implementation of the LEZ just over half of emissions (4.4 tonnes of NO_x) are expected to be from non-compliant vehicles. The section of West Marketgait highlighted on the map experiences a small reduction (~3%) in total NO_x emissions, despite experiencing a larger increase in vehicle numbers.

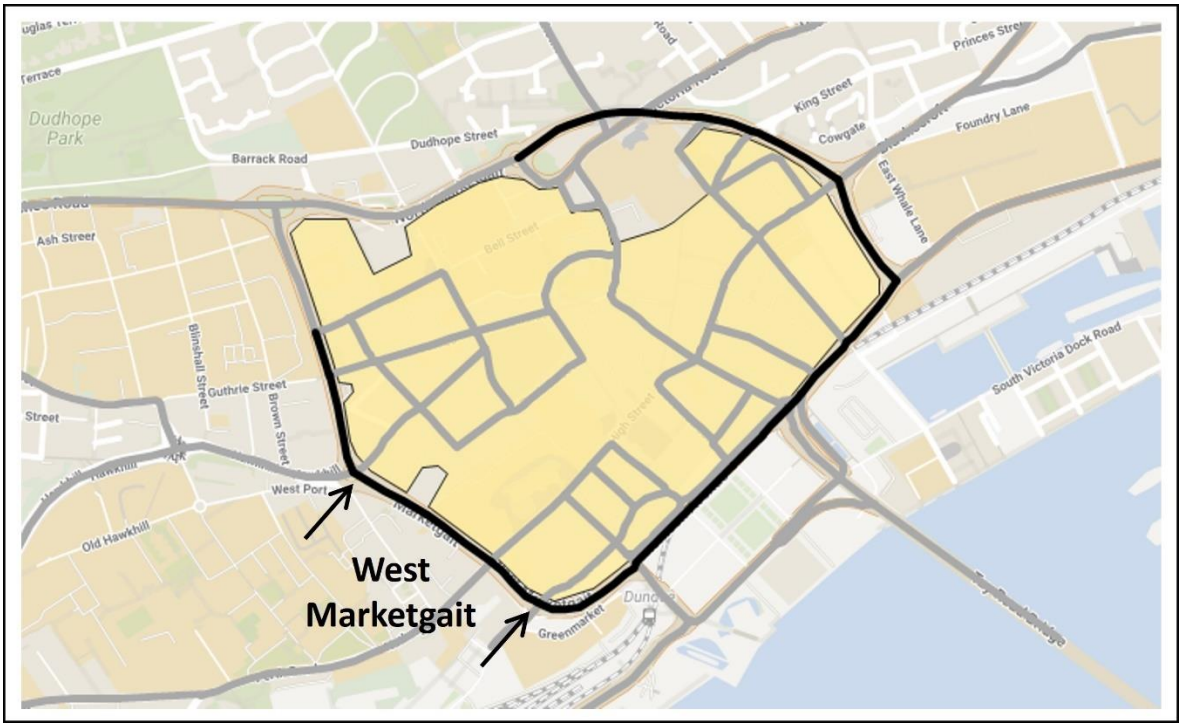

Table 13. Figure 10: Sections of the inner ring road highlighted in black experience a small increase in traffic volume and a small decrease in NO_x emissions. The section of West Marketgait highlighted is discussed in more detail below.

Source attribution data based on vehicle emissions shows that the contribution from different vehicles does not vary substantially around the inner ring road, with diesel cars the dominant source. On the section of West Marketgait highlighted in Figure 10 the overall reduction in emissions is driven by improvements in the bus fleet due to implementation of the LEZ (Figure 11).

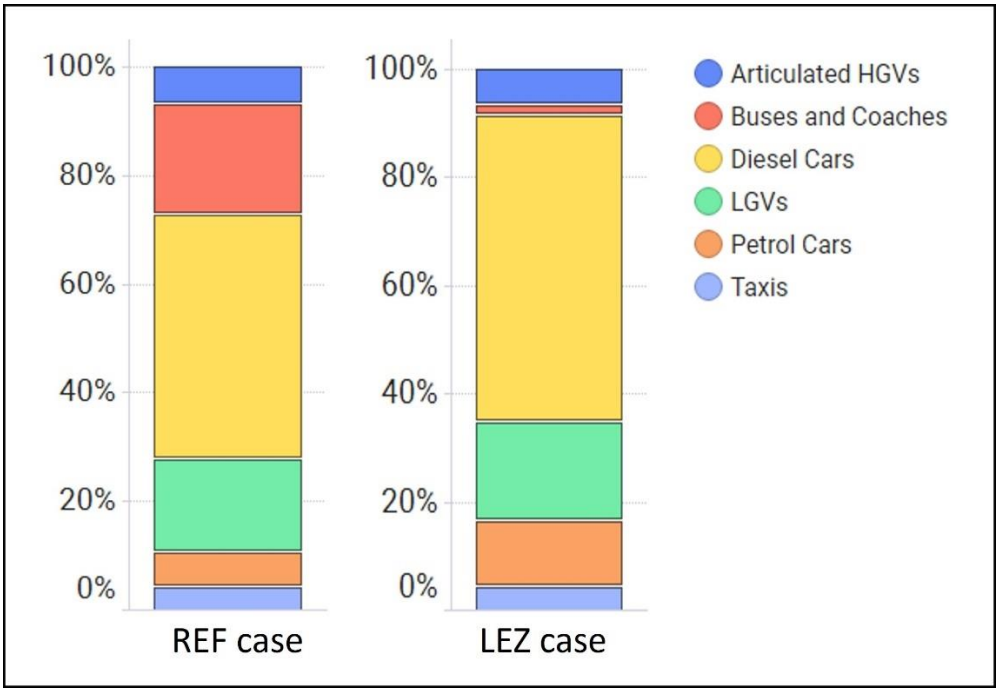

Table 14. Figure 11: Source attribution of vehicle emissions on a section of West Marketgait on the map.

Greenmarket

The largest percentage increase in traffic due to implementation of the LEZ occurs along Greenmarket, leading from the inner ring road (West Marketgait) to the Greenmarket car park. On this section of road there is an increase of around 60% in the number of cars, corresponding to an additional 1650 cars per day. However, given that the volume of traffic in the Reference case is very low (around 3000 vehicles per day), the emission rate following implementation of the LEZ remains low. This corresponds to low predicted concentrations of NO_2, as discussed in the following section.

In Figure 12, all roads in the model network are ranked by NO_x emission rate (g/km/s) for the LEZ case. Greenmarket is highlighted in black, showing that the emission rate remains low despite a large percentage increase in NO_x emissions.

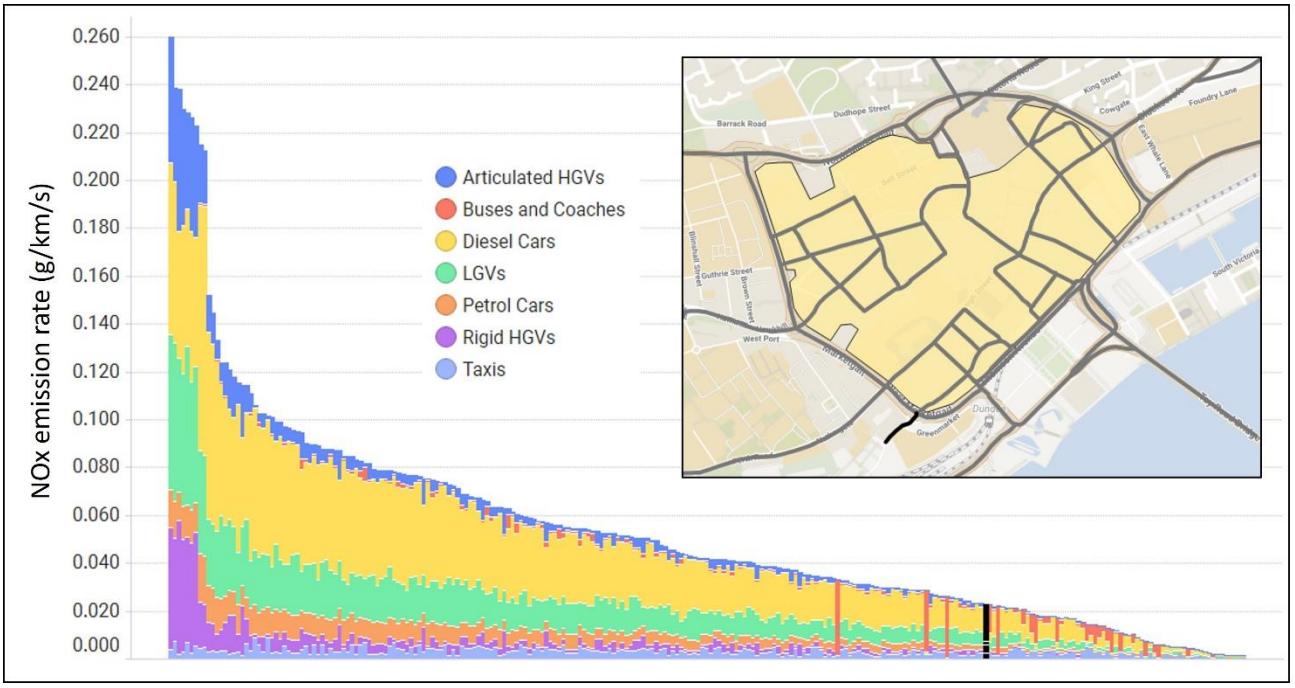

Table 15. Figure 12: Ranked emissions rates of NO_x (g/km/s) for all roads for the LEZ case, with Greenmarket Road highlighted in black.

Lochee Road

Lochee Road is an area identified as exceeding current AQ standards, with the automatic monitoring station recording an annual mean NO_2 concentration of 43µgm^{-3} in 2019. Passive diffusion tubes in this area have recorded higher concentrations of NO_2, with an annual mean of 46µgm^{-3} on Lochee Road and 47µgm^{-3} on Logie Street, in 2019. When developing the extent of the proposed LEZ, the SYSTRA traffic model was used to explore options that included and excluded Lochee Road (SYSTRA, 2021). Two Variants were tested that included the LEZ extending up Lochee Road. Variant 1 included Lochee Road as far as Tullideph Road, and Variant 2 included Lochee Road as far as Loon's Road (Figure 13).

These options were predicted to cause a significant increase in vehicle numbers on adjacent roads, including City Road. Variant 1 generated a localised impact on the road network, due to the shorter extent of the Lochee Road corridor included within the proposed LEZ. Variant 2 generated greater displacement of non-compliant vehicles over a wider network.

Due to limited capacity of these roads and wider impacts on the Dundee network the Lochee Road variants were not taken forward. The preferred option therefore included only the area inside the inner ring road.

The traffic model data used to help make these decisions can be explored via an online data tool:

https://informatics.sepa.org.uk/dundee-lez-traffic/

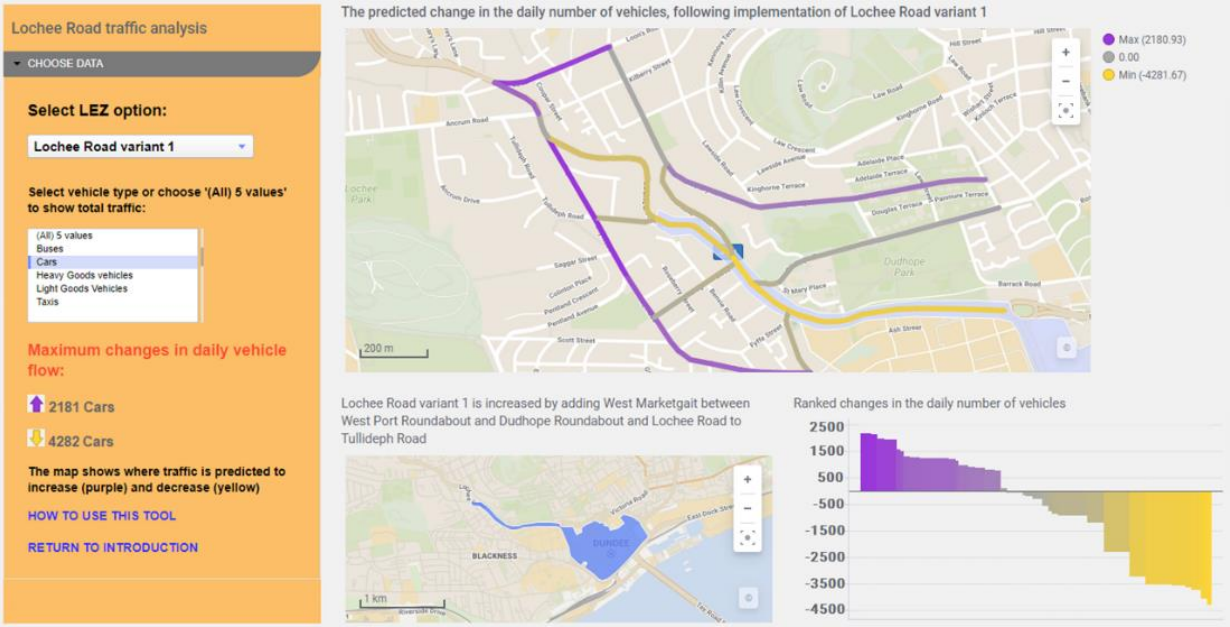

Table 16. Figure 13: Example from the Lochee Road online data tool, showing predicted traffic displacement of a Lochee Road variant.

The proposed LEZ inside the inner ring road is predicted to cause only small changes in the number of vehicles on Lochee Road, with a total reduction of about 200 vehicles per day. On the section of road highlighted in black in Figure 14 total NO_x vehicle emissions reduce by 19%. On the section of Logie Street located between this and Loon's Road there is a similar reduction in total NO_x emissions of 21%.

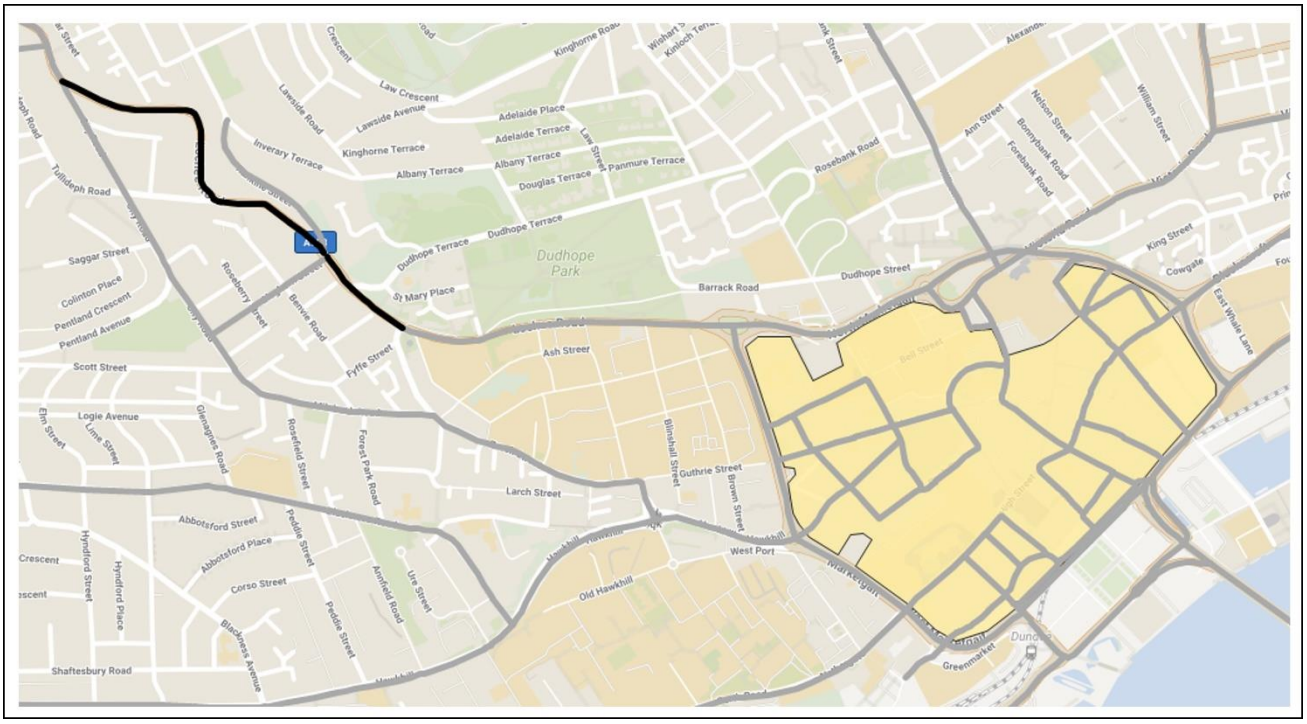

Table 17. Figure 14: A section of Lochee Road highlighted in black, for which data on changes in traffic and vehicle emissions are presented.

Source attribution data based on vehicle emissions shows that the reduction in emissions on this section of Lochee Road is mainly achieved by a reduction in the contribution from buses (Figure 15). All bus routes using Lochee Road also enter the LEZ and therefore meet the cleanest EURO VI standards. Figure 15 also confirms a small reduction in the emission rates on the sections of road highlighted in Figure 14, with only small changes in their position within the rank of all road emissions.

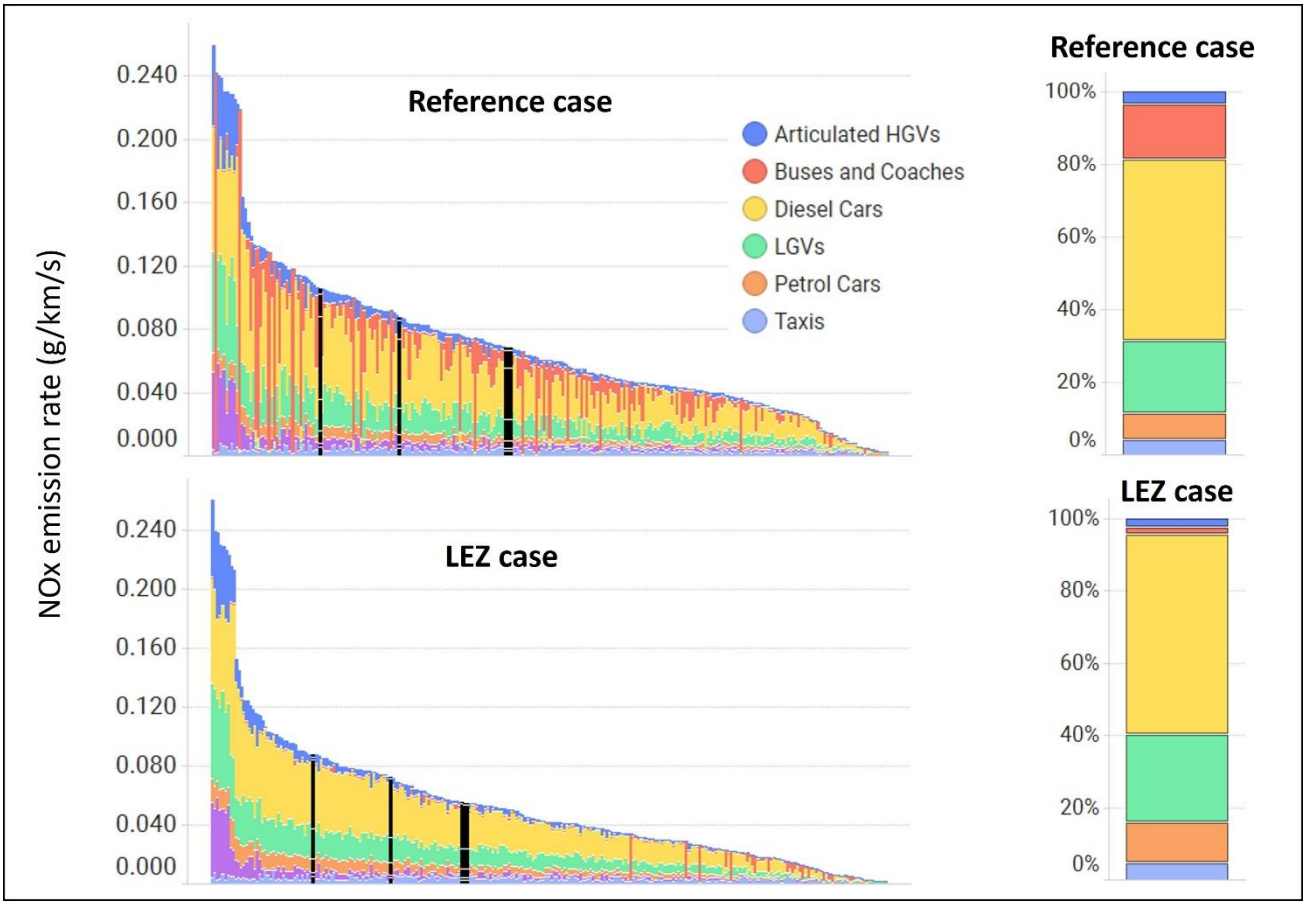

Table 18. Figure 15: Source attribution of vehicle emissions on Lochee Road as highlighted on the map.

Kingsway

There are only very small changes to traffic and emissions on the Kingsway, with an increase of no more than 100 cars on sections of the road highlighted in Figure 16. The overall effect on emissions is minimal, with an overall decrease in emissions along the total length of the Kingsway of less than 1%.

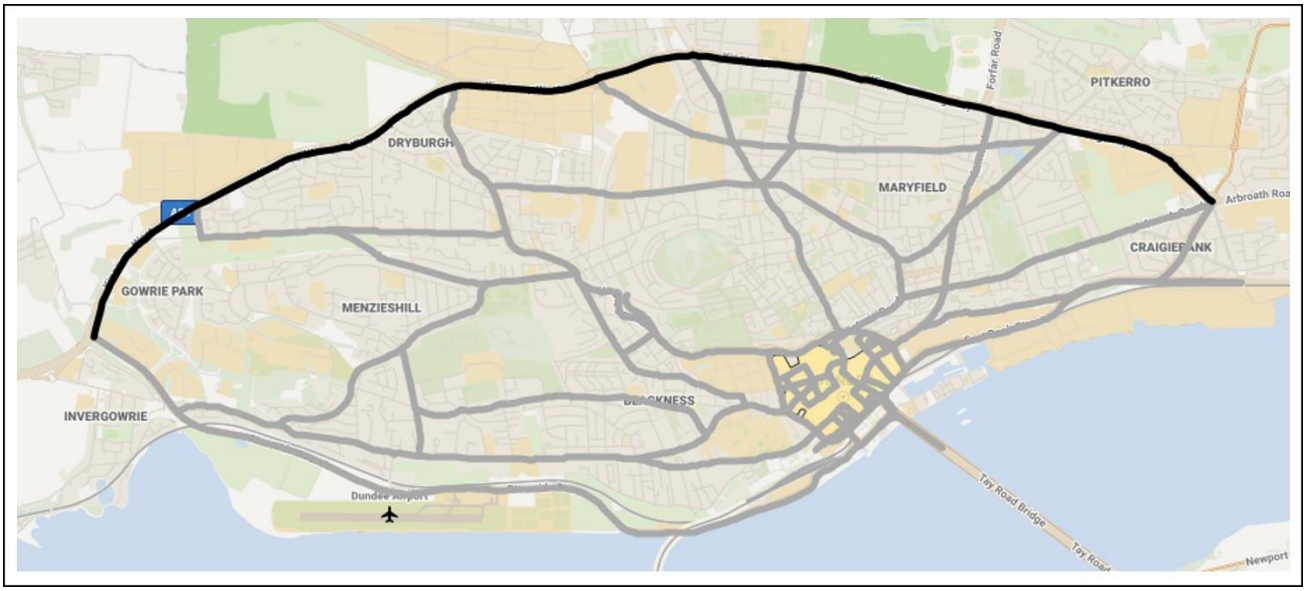

Table 19. Figure 16: The Kingsway experience small changes in vehicle numbers and emissions following LEZ implementation.

Predicted changes in NO_2 concentration due to the LEZ

The air-quality model has been used to assess the impact on roadside air quality of implementing the LEZ. Figure 17 shows the change in concentration between Reference and LEZ cases, in the city centre, and Figure 18 shows annual-mean NO_2 concentrations for the LEZ case.

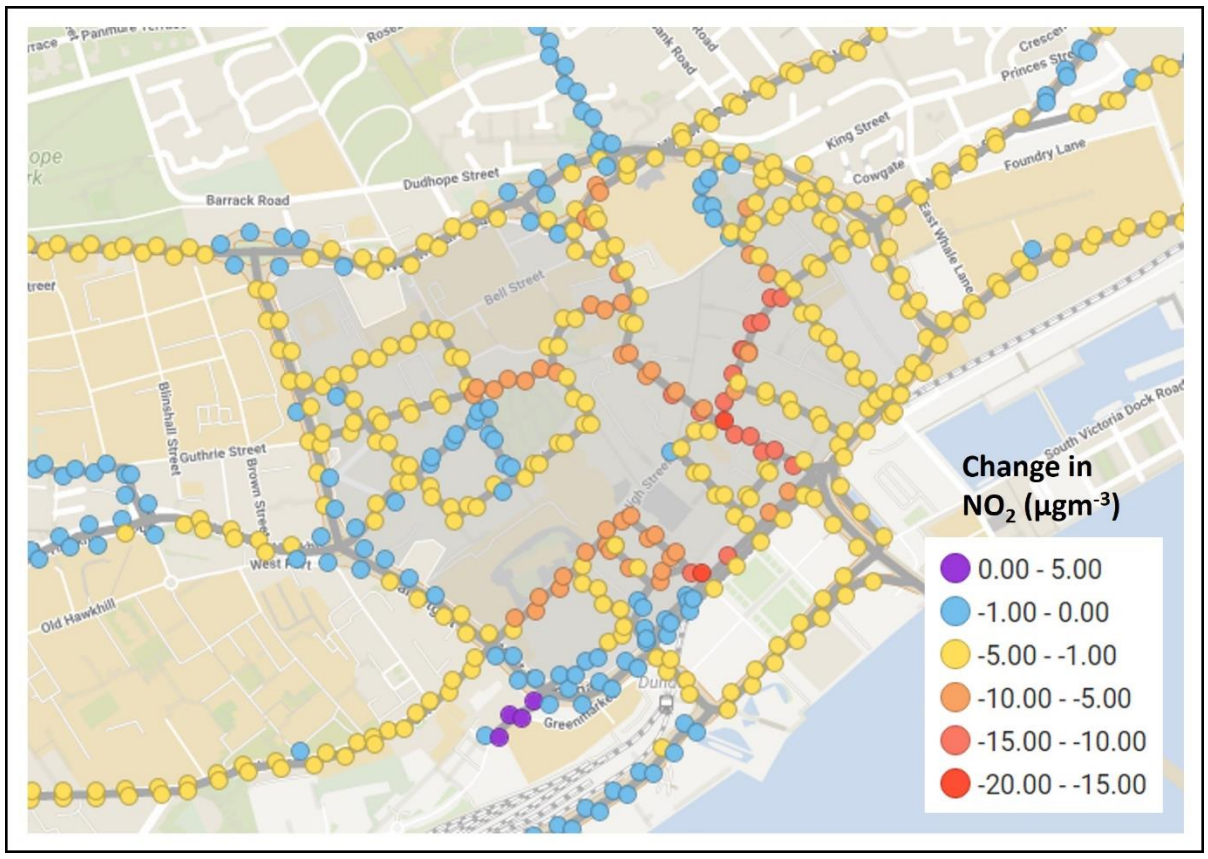

Table 20. Figure 17: Relative change in NO_2 concentration between Reference and LEZ cases in the city centre. The roadside points along Greenmarket are coloured in purple due to a small increase in NO_2 concentration.

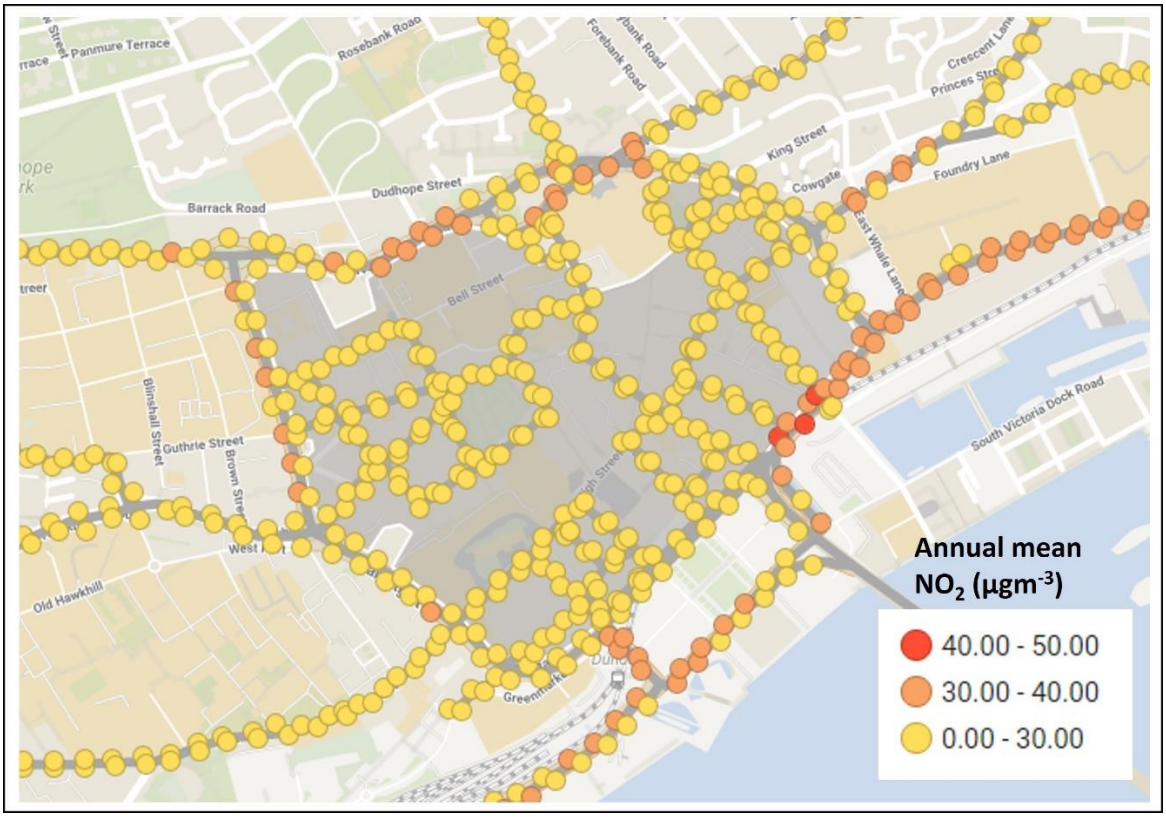

Table 21. Figure 18: Predicted NO_2 concentration for the LEZ case in the city centre.

Greenmarket

The roadside points on Greenmarket are the only points in the model where concentrations are predicted to increase as a result of implementing the LEZ, as indicated in Figure 17. Despite a large percentage increase in emissions on Greenmarket, the increase in roadside concentrations is less than 0.5µgm^{-3}.

This area of the city will be re-modelled when timescales and information on future developments are firmed up. Nevertheless, total emissions remain very low, corresponding to predicted total NO_2 following implementation of the LEZ of around 25µgm^{-3}. This means that concentrations along this street remain dominated by background.

Inside the LEZ

The largest reductions in roadside concentrations due to implementing the LEZ occurs along streets most dominated by bus emissions. This includes Commercial Street and Seagate, where there is an

average reduction in NO_2 of around 10µgm^{-3}. On other bus routes including Whitehall Street and Crichton Street there is an average reduction in NO_2 of around 6µgm^{-3} (Figure 17).

These predicted changes to roadside concentrations are expected to remove current exceedances of the NO_2 limit value in the city centre. Roadside points that previously exceeded or were close to exceeding an annual concentration of 40µgm^{-3}, are predicted to fall to below 30µgm^{-3} (Figure 18). The concentrations at the façade would be expected to be lower than these roadside concentrations.

Inner ring road

The small decrease in NO_x emissions around the inner ring road corresponds with a small decrease in predicted concentrations of NO_2, following implementation of the LEZ. On average there is a reduction at the kerbside of around 1µgm^{-3} (Figure 17).

There are a small number of points outside of the LEZ on Dock Street where there are predicted to be exceedances of NO_2 (Figure 18). These exceedances were present in the Reference case of the model and in Diffusion Tube observations. The LEZ is predicted to reduce concentrations on this road by ~3µgm^{-3}, such that the average concentration at roadside points along this section of road exceeds 40µgm^{-3} by less than 1µgm^{-3} for average traffic speeds. In the more precautionary reduced speed scenario, the average concentration along this section of road exceeds 42µgm^{-3} (see Appendix 1 for discussion vehicle speeds).

Given that the LEZ fleet is based on 2017 rates of compliance, it is expected that these areas of exceedance on Dock Street will not persist beyond the introduction of the LEZ.

Lochee Road

There are only small changes in predicted concentrations of NO_2 on Lochee Road, with a maximum decrease of 2µgm^{-3} (Figure 19) for the city centre only LEZ. Reductions of between 1.5µgm^{-3} – 2µgm^{-3} are predicted in the region of the automatic monitor and the diffusion tubes on Lochee Road / Logie Street that exceeded NO_2 limit values in 2019.

The potential for future NO_2 exceedances along Lochee Road will depend partly on the extent to which traffic levels return to pre-COVID levels.

Table 22. Figure 19: Relative change in NO_2 concentration between Reference and LEZ cases on Lochee Road.

Figure 20 shows predicted changes to concentrations of NO_2 across the entire model domain, confirming that there are only small changes outside of the inner-ring-road zone.

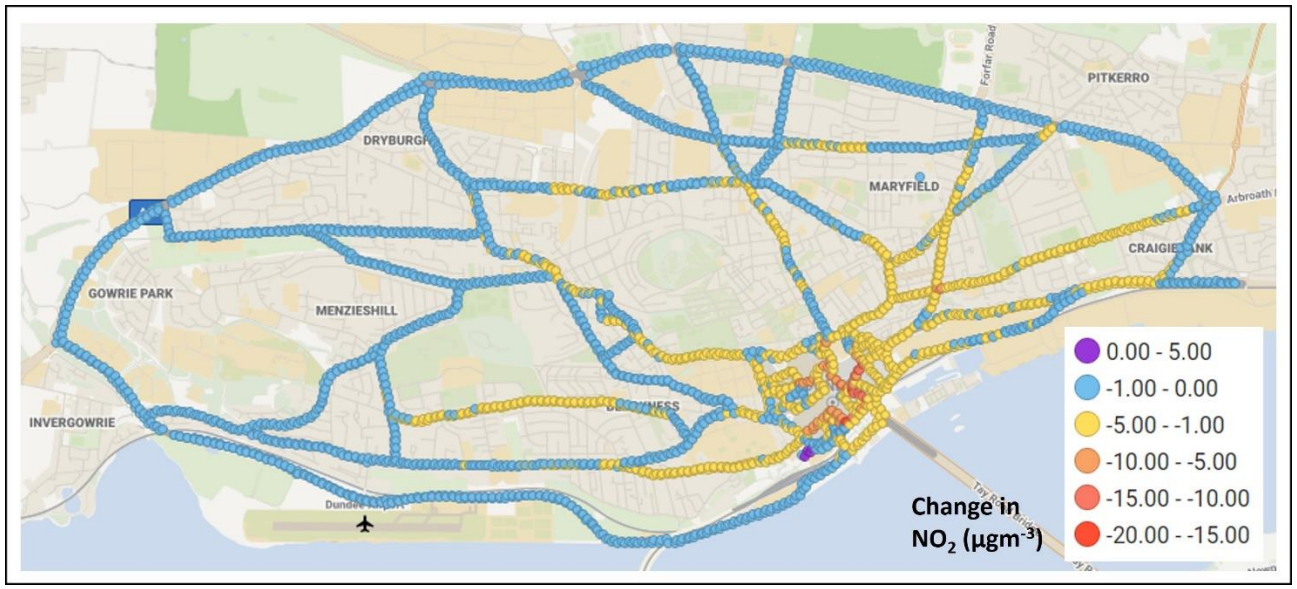

Table 23. Figure 20: Relative change in NO_2 concentration between Reference and LEZ cases across the entire model domain.

Detailed modelling at Façade receptors

The areas of exceedance on Dock Street have been investigated in more detail, due the presence of existing or planned ground/first floor residential properties. These have been represented in the model by additional receptors located 1m in distance from the edge of the building. This means that these receptors are 2 – 5m further away from the road than the roadside points (Figure 21). The annual mean NO_2 concentration does not exceed 40µgm^{-3} at any of these receptors. The average concentration along this stretch of road is just below 38µgm^{-3} for average traffic speeds and just under 40µgm^{-3} for the reduced speed scenario (see Appendix 1 for discussion vehicle speeds).

Natural turnover of the fleet that is expected to have occurred since the ANPR data was collected in 2017 will contribute to further reductions in NO_2 concentrations on this road.

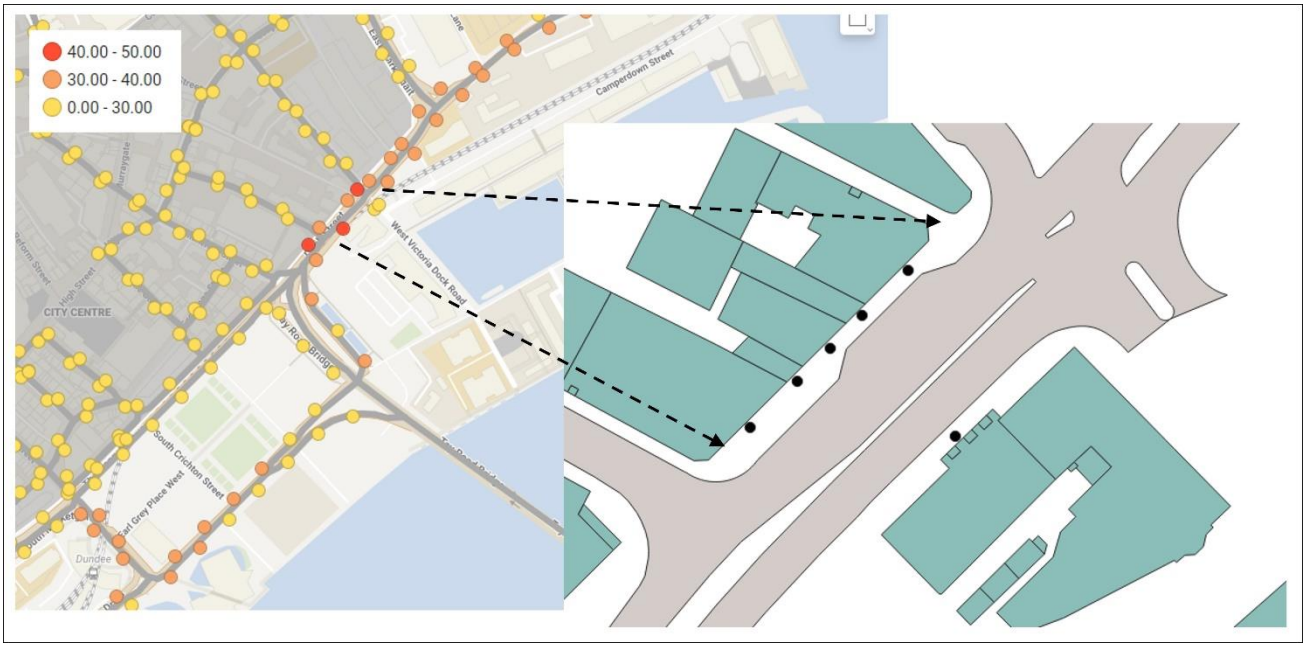

Table 24. Figure 21: Black markers show the location of detailed façade receptors in the model, located 1m from the building edge, at a height of 1.5m.

There is an additional development planned for a currently empty site north of Dock Street and east of Trades Lane. This will be located in a more open part of the road network where average roadside NO_2 concentrations in the 2017 model are 34µgm^{-3} for average traffic speeds, and 36µgm^{-3} for the more precautionary reduced speed scenario (see Appendix 1 for discussion vehicle speeds). The model will be re-run for a future fleet year to include this development when more information is available or when development timescales are firmed-up.

Contribution to NO_X by vehicle type following LEZ implementation

The air-quality model has been used to show how the annual mean concentration of NO_X is made up by contributions by different types of vehicles, following implementation of the LEZ.

Figure 22 shows roadside points that have been selected around Lochee Road, as highlighted in black. The corresponding bar charts show the NO_X contribution from different vehicles. Diesel cars contribute over half of the NO_X at these points, and over half of the NO_X can be attributed to non-compliant vehicles.

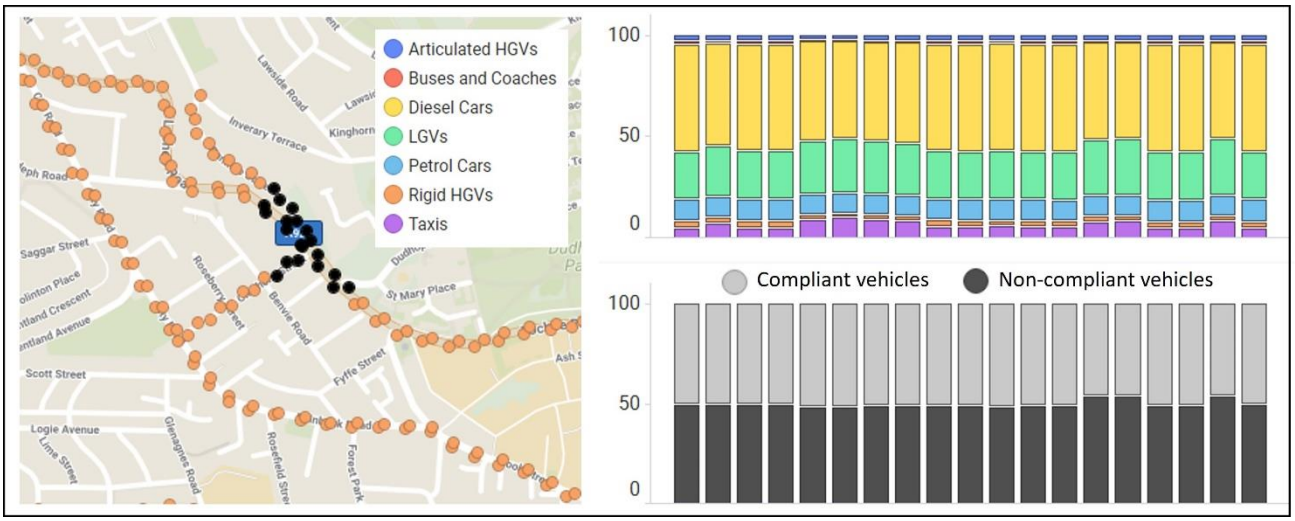

Table 25. Figure 22: The contribution to modelled NO_X concentrations from different types of vehicle, at roadside points on Lochee Road.

Along the Kingsway, the contribution from different types of vehicles is more evenly distributed between diesel cars, light good vehicles and heavy good vehicles (Figure 23). The overall contribution from non-compliant vehicles in around 75%.

Table 26. Figure 23: The contribution to modelled NO_x concentrations from different types of vehicle, at roadside points on the Kingsway.

All vehicle emissions inside the LEZ are from compliant vehicles. This has been shown to contribute to a significant reduction in predicted roadside NO_2 concentrations inside the LEZ. However, Figure 24 shows that roadside receptors inside the LEZ continue to receive a contribution of NO_x from non-compliant vehicles, outside of the LEZ. This varies depending on the distance of the receptor from the LEZ boundary, but remains in the region of 10 – 30%.

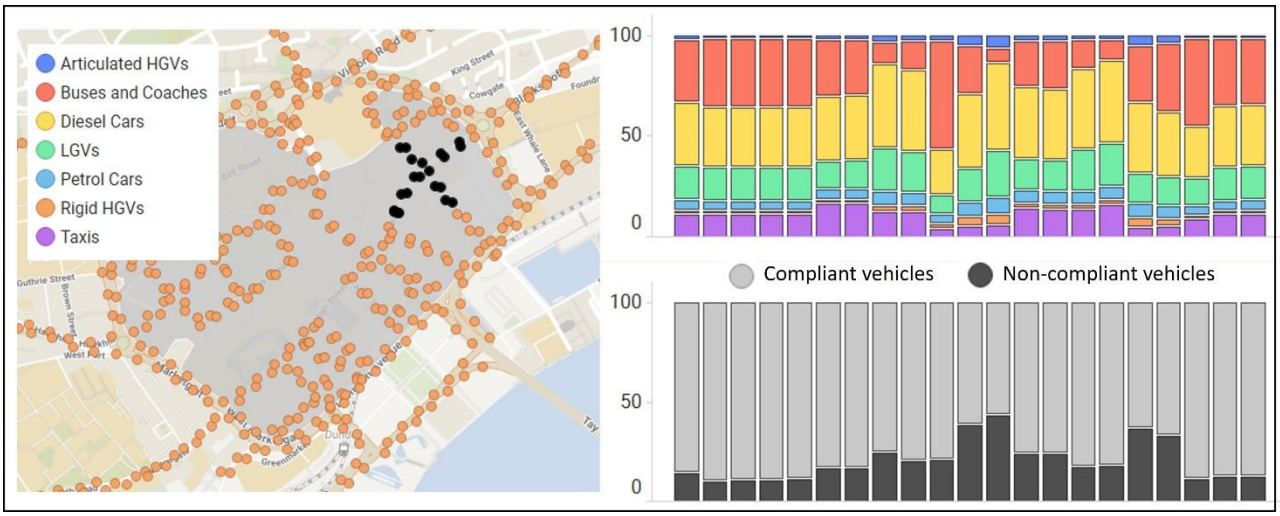

Table 27. Figure 24: The contribution to modelled NO_x concentrations from different types of vehicle, at roadside points near Seagate.

Predicted changes in PM_{10} emissions due to the LEZ

The predicted change in PM_{10} emissions due to implementing the LEZ have been explored by comparing rates of vehicle tailpipe emissions between the Reference and LEZ cases. However, these emissions have not been used to predict concentrations of PM_{10}. Roadside concentrations of PM_{10} are dominated by non-tailpipe emissions, including brake and tyre-wear and re-suspension from the road surface. It is difficult to quantify the rates of these 'non-tailpipe' emissions and therefore model predictions of PM_{10} concentrations would be associated with high levels of uncertainty.

There are large reductions in PM_{10} tailpipe emissions as a result of implementing the LEZ. The largest reductions occur inside the LEZ, as shown by the roads highlighted black in Figure 25. This scale of reduction is greater than would be expected to occur in PM_{10} concentration data, due to the contribution of non-tailpipe emissions, as discussed above.

Table 28. Figure 25: Ranked changes in PM_{10} emissions (%) on all roads. The greatest reductions occur inside the LEZ as highlighted in black.

Figure 26 shows the change in PM_{10} emission rates (g/km/s) between Reference and LEZ cases by vehicle type. This confirms that the largest reductions in tailpipe PM_{10} are associated with roads dominated by bus emissions.

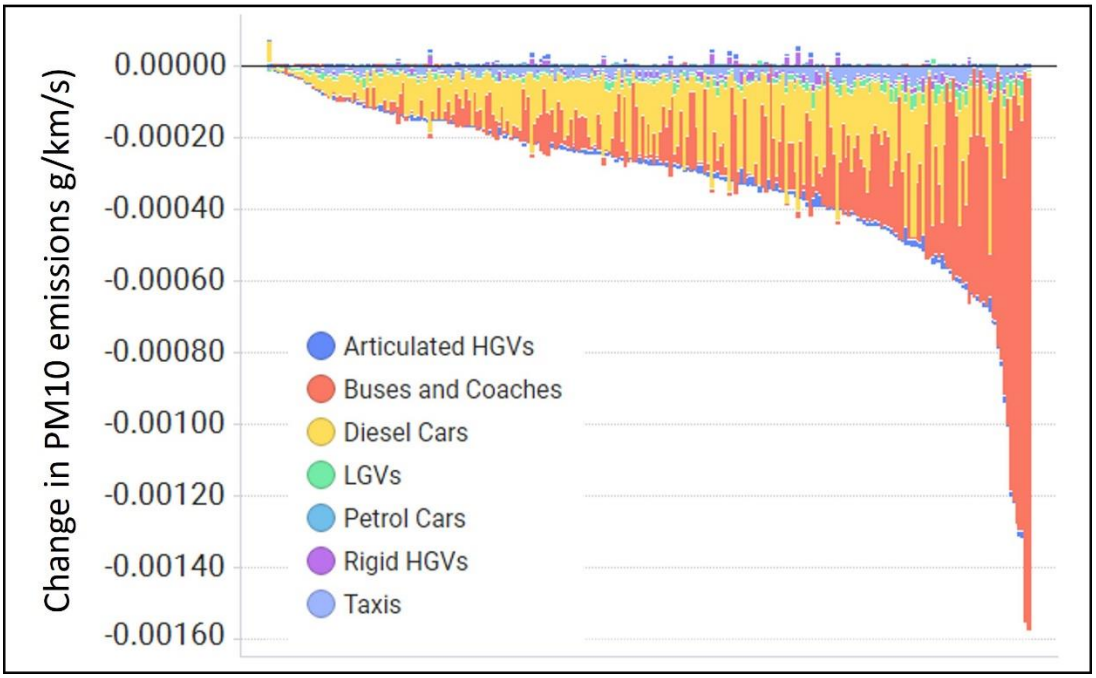

Table 29. Figure 26: Predicted change in PM_{10} emissions following implementation of the LEZ, by vehicle type.

Tailpipe PM_{10} emissions are predicted to increase only on Greenmarket, where previous analysis has shown that total traffic levels will remain low following implementation of the LEZ. The roads highlighted in black in Figure 27 show Greenmarket, along with the roads predicted to see the smallest reduction in PM_{10} tailpipe emissions.

Table 30.

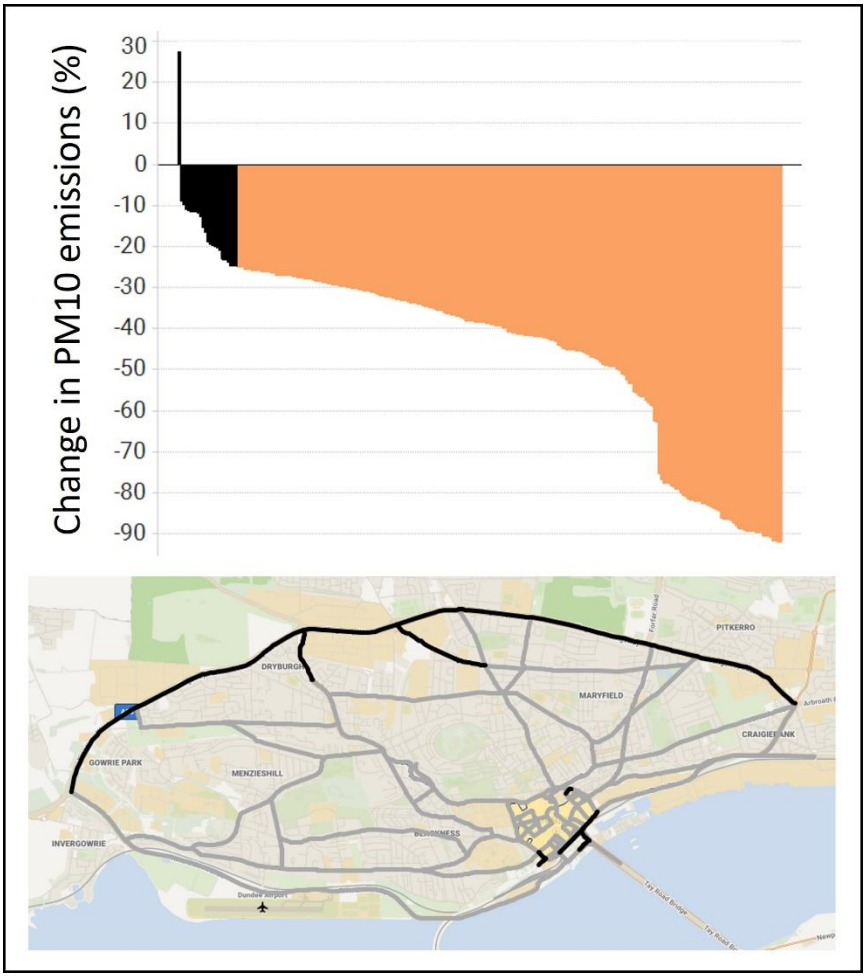

Table 31. Figure 27: Ranked changes in PM_{10} emissions (%) on all roads. The smallest reductions occur on the roads highlighted in black. Emissions are predicted to increase on Greenmarket only.

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APPENDIX 1

Air Quality Modelling Verification

The methods for air-quality modelling implemented here are outlined in the National Modelling Framework. This includes representing background concentrations to account for sources of NO_2/NO_X that are not explicitly modelled. The availability of appropriate background data in each city being examined under CAFS varies, and it may not be representative of all parts of the model domain. For this reason, the methodologies for representing background may also vary.

The Dundee model has been run for 4 different background scenarios:

1. Observed hourly concentrations from Dundee Mains Loan – the closest Urban background automatic monitor
2. Observed hourly concentrations from Bush Estate – the closest Rural background automatic monitor, in addition to 1km gridded emissions from the National Atmospheric Emissions Inventory (NAEI) to account for other local sources of pollution
3. Observed annual mean NO_2 from Murraygate – an Urban background diffusion tube located inside the proposed LEZ
4. Observed hourly concentrations from Errol Place – an Urban background monitor in Aberdeen.

In 2017, the annual-mean concentration of NO_2 at the Urban Background automatic monitor (Mains Loan) was 12µgm^{-3}. This is notably lower than the Urban Background diffusion tube located inside the proposed LEZ (Murraygate) which recorded an annual mean of 20µgm^{-3}. While it is expected that concentrations would vary between these two locations it highlights the uncertainty in identifying the most appropriate source of background data.

It is notable that the annual mean NO_2 concentration measured at Mains Loan is lower than all other Urban background sites across Scotland, including Falkirk and Grangemouth (Figure 28). This suggests that the Mains Loan automatic monitor may be less representative of city centre urban background concentrations than other urban background monitors are of their respective city centre urban areas.

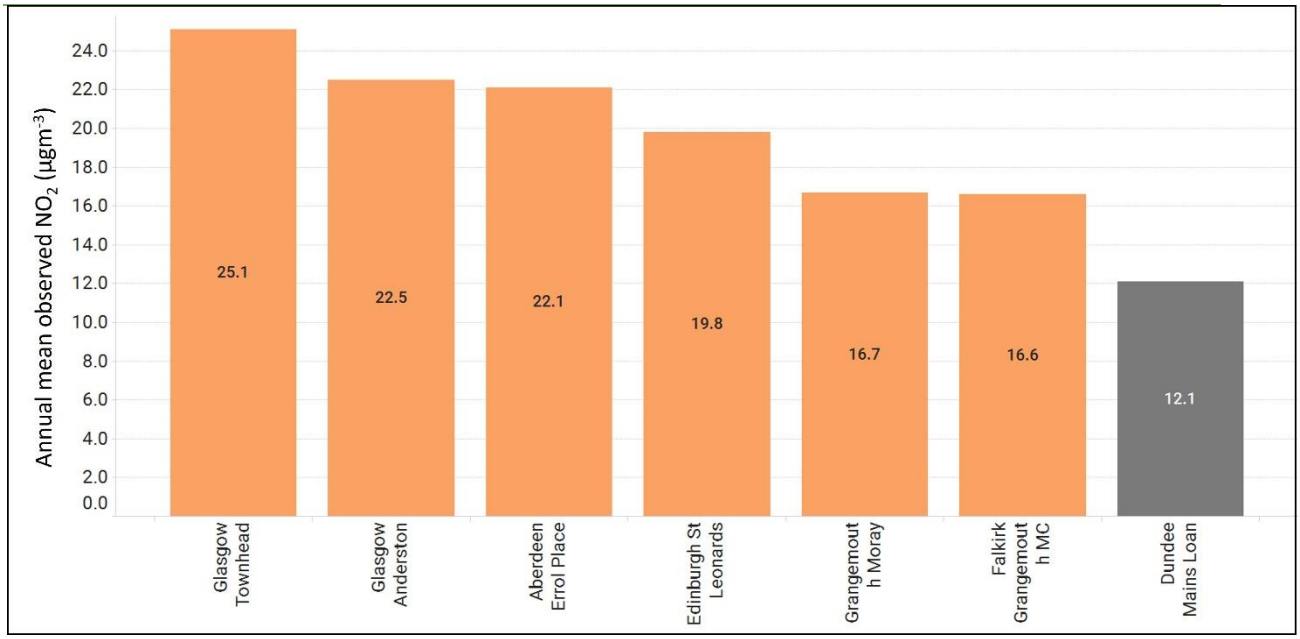

Table 32. Figure 28: Annual mean NO_2 in 2017 at all Scottish Urban background automatic monitors.

Scenario 4 listed above uses hourly data from Aberdeen Errol Place. This is the next closest Urban Background monitoring station that provides continuous hourly data. In 2017 it has an annual mean of 22µgm^{-3}, which is similar to the Murraygate Dundee Diffusion tube.

Figure 29 shows the predicted annual mean concentration of NO_2 at each of the roadside points in the model, ranked from high to low, for each of the 4 background scenarios described above. This confirms that predicted concentrations vary significantly depending on which background method is used. The annual mean concentrations used in the 4 scenarios are summarised in Table 1.

Table 33. Table 6: Annual mean concentrations used in the 4 scenarios described above. Note that scenario 2 includes an additional background concentration from gridded emissions.

Scenario	Annual mean NO_2	Monitor	Monitoring method
1	12µgm^{-3}	Dundee Mains Loan	Automatic monitor (Urban)
2	5µgm^{-3}	Bush Estate	Automatic monitor (Rural)
3	20µgm^{-3}	Dundee Murraygate	Diffusion tube (Urban)
4	22µgm^{-3}	Aberdeen Errol Place	Automatic monitor (Urban)

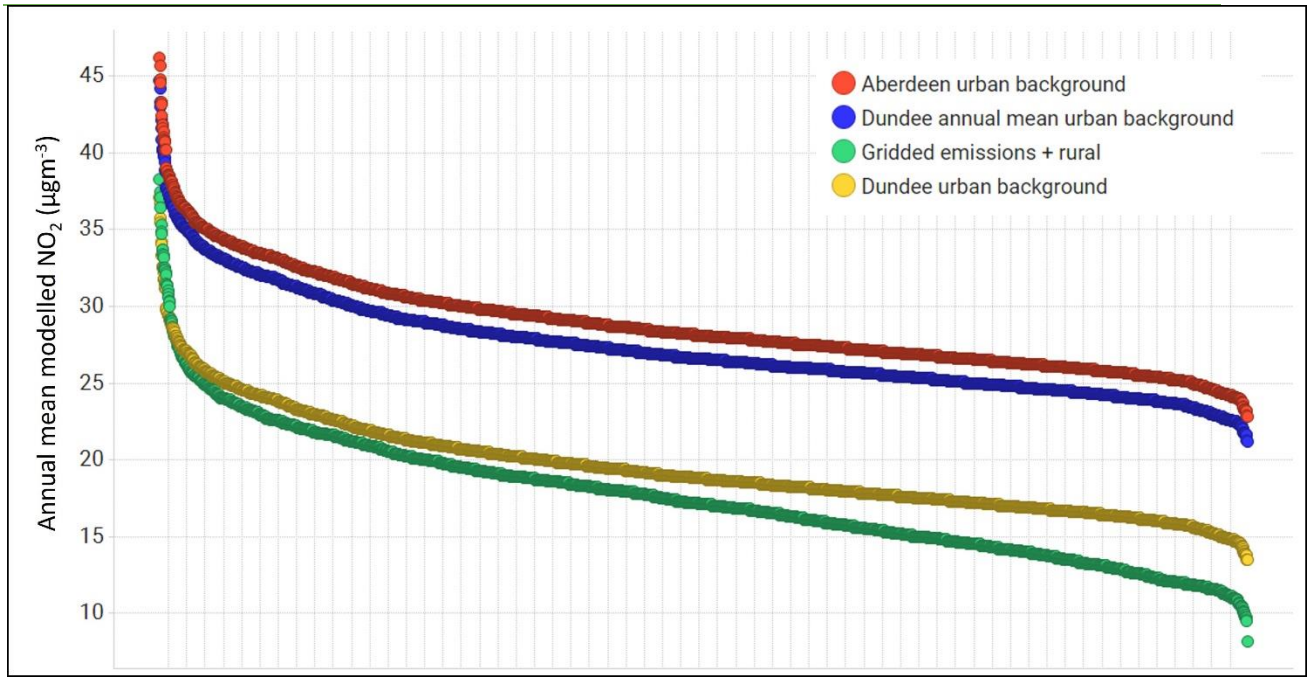

Table 34. Figure 29: Ranked NO_2 predictions of NO_2 at roadside points for 4 background scenarios.

Concentrations calculated using the Mains Loan Automatic monitor are comparable to the approach using gridded emissions (Scenario 2). However, these are notably lower when compared to the concentrations calculated using the Murraygate diffusion tube as background (Scenario 3). Given that the Murraygate diffusion tube is located inside the LEZ, but not directly impacted by nearby traffic, this is likely to be more representative of city centre background.

There is a preference to use data from Automatic monitoring stations where possible, due to Quality Assurance and Control procedures that are applied to the data, and the high temporal resolution of the measurements. The range of predicted concentrations calculated using Aberdeen Automatic monitor are similar to those using the Murraygate diffusion tube (Figure 29). For these reasons hourly background concentrations from Aberdeen Errol Place (Scenario 4) are used in all subsequent analyses.

Model performance has been evaluated for two traffic speed scenarios:

1. Average speed from the Paramics model
2. Average speeds from the Paramics model are used except where exceeding 20km/h. The speed on these roads is set to 20km/h. This has the effect of increasing vehicle emissions slightly to give a more precautionary approach. It may better reflect situations where there is frequent stopping and starting of traffic close to bus stops or junctions. This change in speed tends to be small inside the LEZ, e.g. a 2km/h reduction in Seagate, and no reduction on Meadowside where average speeds are 17km/h. The

change is greater outside the LEZ, e.g. part of Lochee Road where speed changes from 29 to 20km/h.

Performance at Automatic monitors

Model predictions of annual mean NO_2 are compared against 6 automatic monitors in Dundee, using background concentrations from Aberdeen Errol Place (Figure 30) and using Dundee Mains Loan (Figure 31). Results are presented for the average and reduced speed scenarios described above.

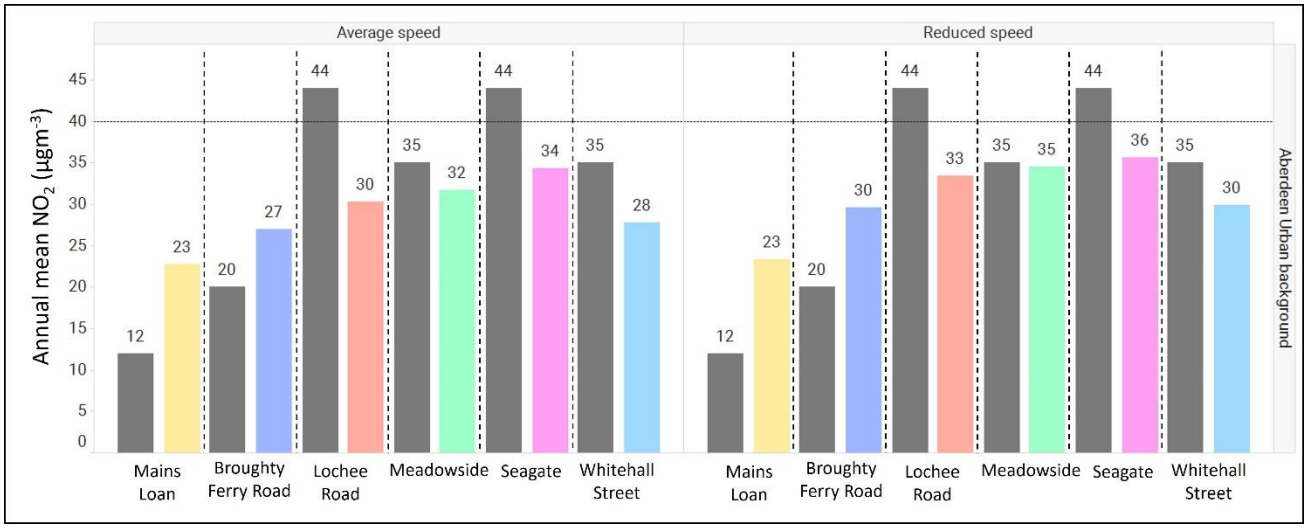

Table 35. Figure 30: The annual-mean NO_2 measured at the Automatic monitors (in grey) are compared against the model prediction at that location, using Aberdeen Urban Background (Errol Place) for 2 speed scenarios.

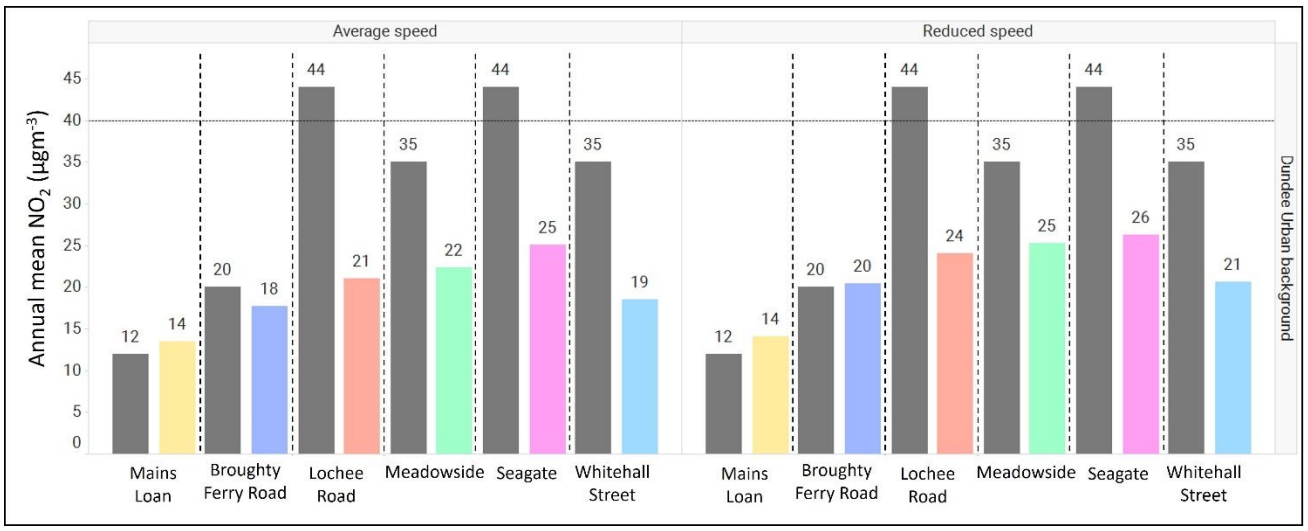

Table 36. Figure 31: The annual-mean NO_2 measured at the Automatic monitors (in grey) are compared against the model prediction at that location, using Dundee Urban Background (Mains Loan) for 2 speed scenarios.

The agreement between observations and model predictions shown in Figures 30 and 31 varies between monitoring stations, confirming that a single background monitoring station does not accurately represent all parts of the model domain. At the Broughty Ferry Road monitor, there is good model agreement when using Dundee Urban background. This location is not heavily trafficked and the annual mean NO_2 concentration is dominated by background. In other locations inside the inner-ring road and on more heavily trafficked roads the agreement is best when using Aberdeen Urban background.

There remains a general tendency to under-estimate concentrations at the automatic monitors, most significantly at Lochee Road. This is a complex part of the road network which would benefit from a separate more detailed model. This is a one-sided street canyon consisting of a 4-storey building, but with tall trees on the opposite side of the road. Lochee Road splits into 3 lanes adjacent to the monitor for allow for traffic to queue before turning into Rankine Street. There is also a gradient.

A previous version of the model adjusted emissions rates for gradients and investigated the use of model barriers to account for roadside trees. However, these did not substantially reduce the degree of model under-estimation at this location. A separate model also used Computation Fluid Dynamics (CFD) to investigate dispersion in the vicinity of the monitor, highlighting complex air flow. These factors will be investigated again in future work.

Some previous ADMS modelling studies in Dundee used an annual mean background concentration based on the average of more than 1 passive diffusion tube monitor. Through a process of model verification, these studies have applied correction factors to the modelled road-NO_x contribution in order to achieve better agreement between model results and observations in the Lochee Road region. These factors have been in the region of 3-6 (2005 and 2009 reports).

Performance at Diffusion tubes

Diffusion tube results from 2017 indicate that there are likely to be exceedances of the annual mean limit value of NO_2 in and around the LEZ area. Automatic monitoring stations in the LEZ confirm exceedances along Seagate but the station on Whitehall Street was below 40μgm^{-3} (35 μgm^{-3}) in 2017 (Figure 32).

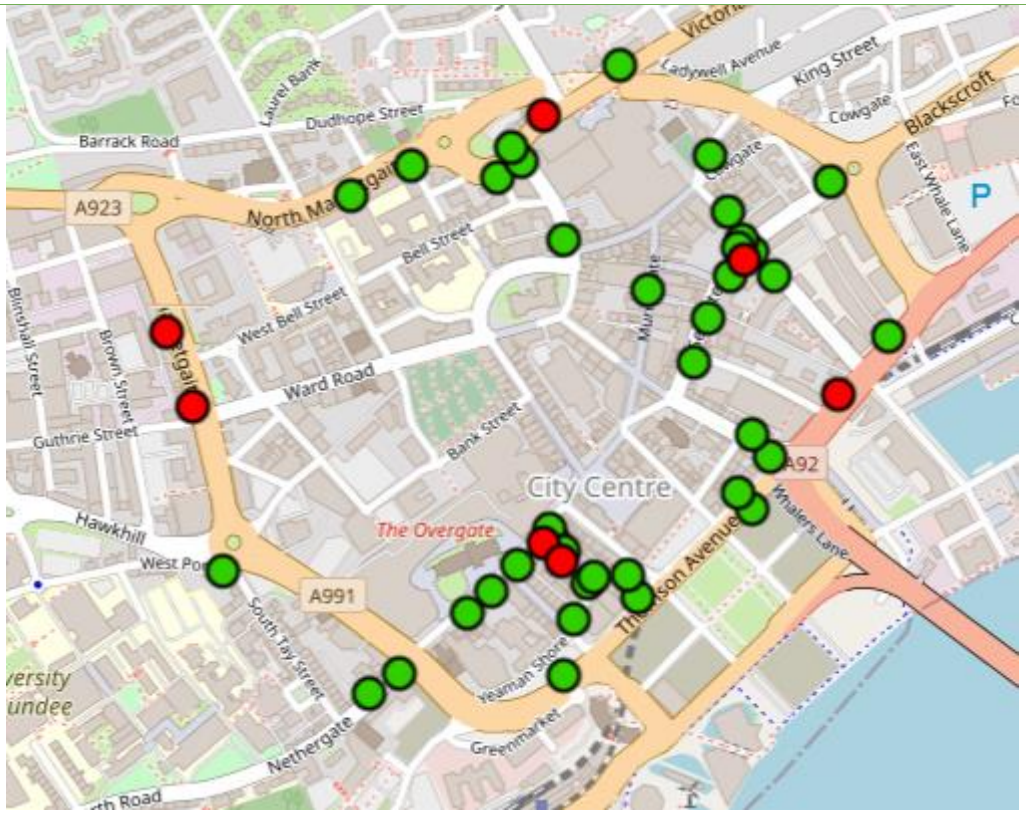

Table 37. Figure 32: Diffusion tubes results in 2017, from www.scottishairquality.scot.

Model predictions of annual average NO_2 are shown in Figure 33, using the average Paramics traffic speed and Figure 34 for the reduced speed scenario. The highest concentrations are found in areas also highlighted by air-quality monitoring, including part of Victoria Road, Seagate and parts of Dock Street. The model does not indicate exceedances along West Marketgait.

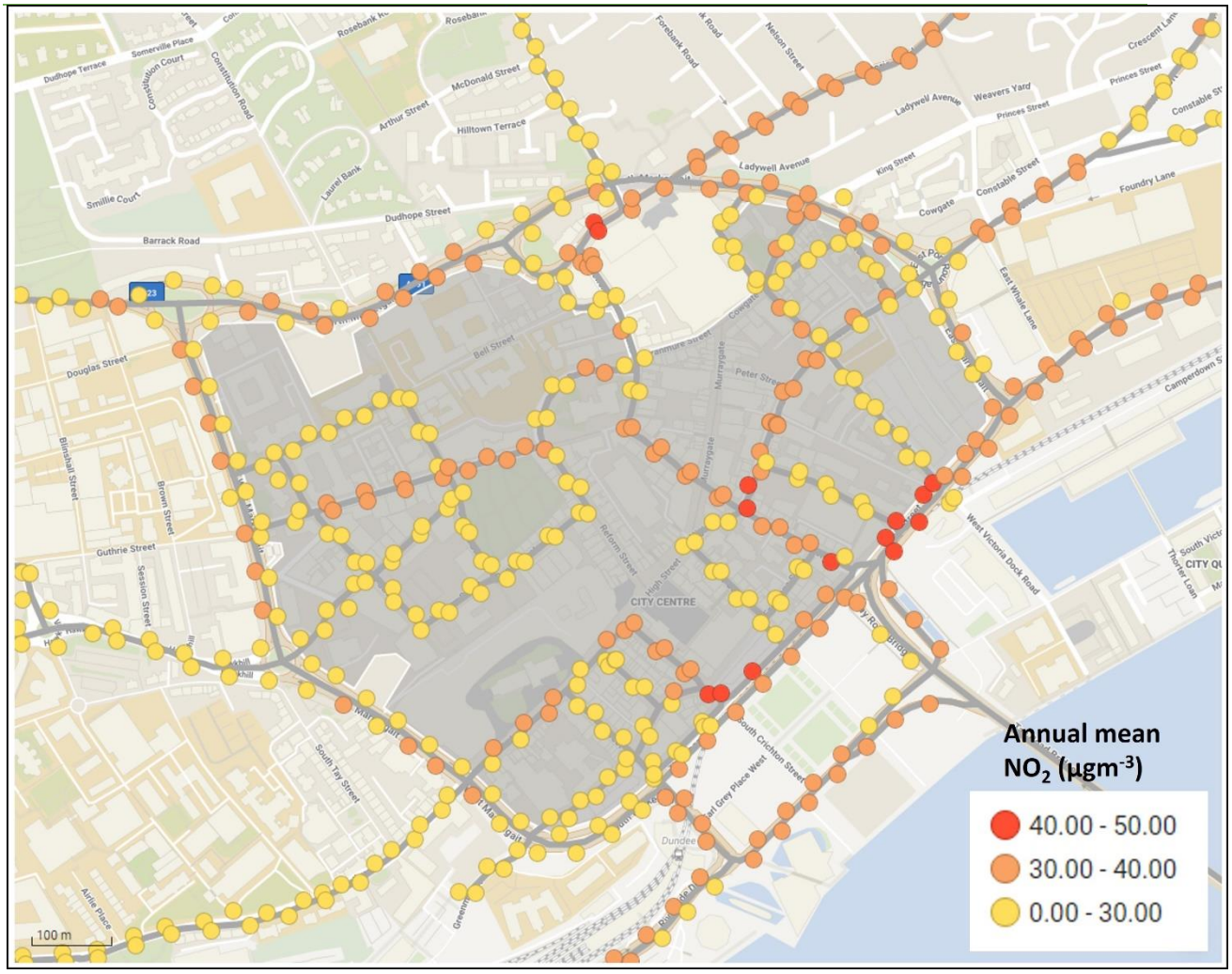

Table 38. Figure 33: Modelled annual-mean concentrations of NO_2 in 2017 (using Aberdeen Urban background) for the Reference case for average vehicle speeds.

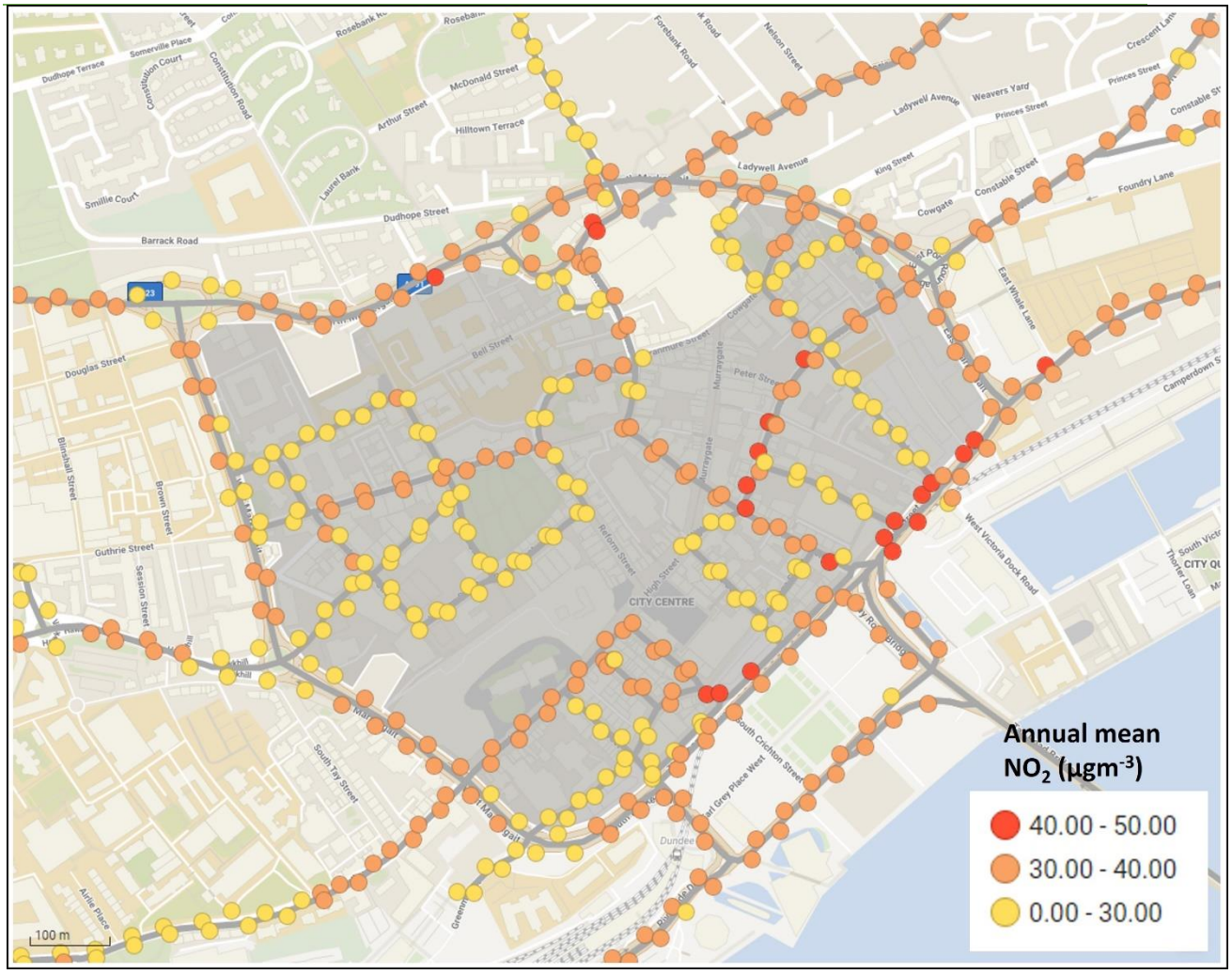

Table 39. Figure 34: Modelled annual-mean concentrations of NO_2 in 2017 (using Aberdeen Urban background) for the Reference case for reduced vehicle speeds.

Gaussian models such as ADMS are not able to replicate the full complexity of dispersion in an urban street canyon. Air-quality observations which have been made at a single point are therefore compared here against predicted concentrations at multiple nearby roadside points. This accounts for model uncertainties which means observed concentrations may not be re-produced by the model in the monitored location.

Table 40. Table 7: A comparison of NO_2 diffusion tube measurements (μgm^{-3}) against model predictions at roadside points.

Location	Observed NO_2 concentrations	Modelled concentrations: average speeds	Modelled concentrations: reduced speeds
Seagate	30 - 43	34 - 41	36 - 41
Dock St (57)	49	41 - 46	43 - 49
Victoria Rd / Hilltown	52	40 - 45	43 - 48
Whitehall Street	35 - 41	28 - 30	30 - 32
Lochee Road	35 - 48	28 - 34	31 - 37

The Murraygate diffusion tube is located on a pedestrianised street, around 90m from the nearest traffic source. It is not directly affected by vehicle emissions and is therefore representative of urban background concentrations. In 2017 it measured 20μgm^{-3}, whilst at this location the model predicts a value of 24μgm^{-3}. The background concentration used in the model was 22μgm^{-3}, confirming that this location is only minimally impacted by direct vehicle emissions.

A comparison of diffusion tube measurements and roadside point predictions confirms that the model generally tends to under-estimate concentrations, including on Whitehall Street and Lochee Road. However, when considering modelled concentrations at a range of roadside points it is evident that other areas of exceedance are captured by the model. Areas of exceedance on Seagate are predicted, as well as some of the highest concentrations in the city around Dock St and Victoria Street.

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Appendix C

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SYSTRA

IDENTIFICATION TABLE

Client/Project owner	Dundee City Council
Project	Dundee Low Emission Zone
Type of document	Dundee Low Emission Zone - Integrated Impact Assessment
Type of document	SYSTRA Ltd. Report
Date	30/09/2021
Reference number	GB01T19A08/210121
Number of pages	61

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EXECUTIVE SUMMARY

The Programme for Government (PfG) 2018 committed to the introduction of Low Emission Zones (LEZs) into Scotland's four biggest cities between 2018 and 2020 and into Air Quality Management Areas by 2023. This programme has been amended as a result of the COVID-19 pandemic, with the indicative timetable now aiming to introduce LEZs into the four cities between February to May 2022.

How might Dundee be affected by a LEZ?

The LEZ has the potential to cause a range of positive and negative impacts, from improving health of society to potentially reducing access to the city centre for those who rely on private vehicle transport. The most significant impact of the LEZ will be the improvement in air quality and the resulting health benefits, benefitting residents, visitors and workers. The LEZ also has a potential positive health impact through encouraging the use of active travel and public transport for certain trips and changing existing travel behaviours.

Given the focus of the IIA to look at how certain protected groups are potentially differentially affected, there are instances where the LEZ could disproportionately affect some groups in society. For example, those who have a diminished ability to upgrade to a compliant vehicle due to low income (including people on benefits, single parents, or disabled people). Those on lower incomes may experience reduced access to locations and in turn the goods, services, or employment opportunities available to them. Community transport providers that rely on cars and minibuses that may be subject to LEZ restrictions, therefore the services they provide to a range of protected groups (such as youth groups and those receiving care) may be affected. Mitigation can reduce these potential impacts. For example, the LEZ Support Fund, retrofitting schemes, and exemptions outlined in the LEZ Regulations all look to reduce any negative impacts of the proposed LEZ scheme.

It is estimated that by 2024 there will be approximately 3,000 daily non-compliant vehicles in Dundee's city centre area, around 12% of the total. While it is possible to estimate the total costs associated with upgrading this number of vehicles to compliant vehicle types, the expected impact of the LEZ in Dundee means a much smaller number of drivers of non-compliant vehicles will choose to upgrade their vehicles. It is anticipated that drivers of non-compliant cars will generally adjust their journey rather than replace their vehicles for a compliant model and utilise alternative parking locations or potentially change mode. The cost to comply with the LEZ for these drivers is considered relatively similar to a city without a LEZ, though there will be a cost associated with any additional time taken to complete their journey. HGVs and taxis are expected to naturally upgrade by 2024 such that the impact is minimal. The bus fleet is upgrading a quicker pace in anticipation of forthcoming LEZ restrictions but this investment is offset to some degree with retrofit funding available. LGV drivers, particularly those driven by individuals or small businesses (rather than larger logistics companies) face the prospect of having to upgrade their vehicles to continue their business needs inside the LEZ and these drivers represent the group most at risk of incurring costs to comply with the LEZ. However, funding opportunities for micro-businesses will mitigate against much of the impact on this particular group. On the whole therefore, the total number of vehicles required to upgrade is anticipated to be very small in comparison to the total number of trips entering the LEZ on a daily basis and with the provision of funding through the Low Emission Support Fund and the national exemptions for certain vehicles and users, the cost of compliance in Dundee is likely to be relatively small against the benefits the LEZ will bring.

What insights were gained through the analysis?

The IIA shows that protected members of society can be impacted by the LEZ in subtle ways that, although small in magnitude relative to the overall health benefits of the LEZ, can be removed or mitigated through considerate decision making at a national and local level.

1 INTRODUCTION

1.1 Purpose of this report

1.1.1 This report will inform the design of Dundee's Low Emission Zone (LEZ) by presenting potential impacts arising from its introduction. A LEZ in the city will restrict non-compliant vehicles from entering a defined area in the city centre and this report considers a range of consequential impacts including access, health, and financial. The analysis builds on a on the ongoing National Low Emission Framework (NLEF) appraisal, of which this Integrated Impact Assessment (IIA) is part and incorporates findings from public and stakeholder engagement undertaken by SYSTRA/Dundee City Council (DCC) and Transport Scotland.

1.1.2 Both quantitative and qualitative research approaches were adopted to identify the potential impacts of the scheme. A wide range of data sets have been analysed to inform the impacts analysis including from The Scottish Government, Transport Scotland, The Department for Transport, Dundee City Council and the Office for National Statistics. Where quantitative data was unavailable or limited, and to provide more detailed insights into specific issues, consultation with business owners, business and trade representative organisations, transport operators and community interest groups was undertaken as part of the NLEF process. The report also accessed a Scottish wide survey of businesses and people conducted by Transport Scotland to elicit their views on LEZs.

1.1.3 The report is structured as follows [update to final report]:

- Chapter 1 sets the context of this IIA.
- Chapter 2 provides detailed background on policy, Dundee's LEZ, and related projects.
- Chapter 3 presents the methodology of the IIA.
- Chapter 4 summaries the expected impact of the LEZ on IIA population groups
- Chapter 5 summarises the IIA findings against the IIA objectives.
- Chapter 6 details mitigation that may be used to reduce the potential negative impacts of the LEZ.

1.2 Health and air pollution

1.2.2 Pollutants caused by vehicle emissions are largely invisible, but these gases and particulates can be hazardous to human health. A recent review (2019) highlights a growing body of scientific evidence which links higher levels of air pollution with increased ill health. Particularly at risk are the very young, older people/pensioners and those with pre-existing health conditions and illnesses such as asthma. Dundee City Council produce annual Local Air Quality Management (LAQM) reports that track the progress of the Air Quality Action Plan (AQAP) in Dundee and interventions that effect air quality over time. Despite improvements in air quality since the introduction of the AQAP, there remain several locations in the Air Quality Management Area (AQMA) where exceedances of emissions exist and where the Air Quality Standards (AQS) are not being met.

1.2.3 A LEZ is therefore being introduced in the city to accelerate Dundee's required compliance with the AQS.

1.3 Low Emission Zones

1.3.2 LEZs are a Scottish Government policy response to aforementioned air pollution issues. They are areas where only vehicles of a certain emissions standard are allowed to enter/exit/operate within thereby reducing the use of more polluting vehicles. The potential benefit comes from the reduction in emissions associated with vehicles and resulting increase in health outcomes. LEZs may also encourage modal shift away from private cars to public transport and active travel with the potential for fewer vehicles overall to enter/exit/operate within the zone.

1.3.3 **Low Emission Zones are included in the** Transport (Scotland) Act 2019 **which** received Royal Assent in November 2019. The Act provides the legislative framework for Scottish local authorities to design, establish and operate nationally consistent LEZs. It allows the Scottish Government to set consistent national standards for a number of key aspects including emissions, penalties, exemptions and parameters for grace periods. Local authorities now have the powers to create, enforce, operate or revoke a LEZ in their areas and to design the shape, size and vehicle scope of their low emission zone.

1.3.4 The accompanying LEZ Regulations were laid in Parliament in January 2021, thereby allowing Scottish Ministers to set nationally consistent standards (Regulations) on LEZ matters specified in the Act (e.g. emission standards, penalties and exemptions, statutory consultees). There are two sets of regulations for LEZs in Scotland. The Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021 cover the topics of emission standards, exemptions, penalty charge rates, and enforcement. The Low Emission Zones (Scotland) Regulations 2021 cover the topics of consultation, publication and representations, examinations, approved devices, accounts and amending or revoking LEZs.

1.4 National Low Emission Framework

1.4.2 An assessment and appraisal process to inform the size and scope of Dundee's LEZ follows the National Low Emission Framework (NLEF) guidance. The NLEF is "*an air quality-focused, evidence-based appraisal process developed to help local authorities consider transport related actions to improve local air quality, where transport is identified as the key contributor to air quality problems"* (NLEF, 2019).

1.4.3 NLEF has allowed DCC to:

- build an evidence base to assist in the appraisal of Dundee's LEZ
- identify the objectives of the LEZ
- identify a range of LEZ options for stakeholder and public consultation
- develop a robust and detailed traffic and emissions model testing programme to assess the impacts of the LEZ options
- identify the preferred LEZ for Dundee

1.5 Integrated Impact Assessment

1.5.2 This report is an Integrated Impact Assessment (IIA) following NHS Lothian's guidance (in line with the IIAs undertaken for the LEZ proposals for Edinburgh, Aberdeen and Glasgow) to identify the potential differential effects on different groups as a result of the introduction of a LEZ in Dundee, as stipulated in the NLEF guidance.

1.5.3 The IIA method was chosen due to the overlapping nature of the assessment, where the IIA consists of a combined framework of the following assessments:

- Equality Impact Assessment (EqIA)
- Child Rights and Wellbeing Impact Assessment (CRWIA)
- The Fairer Scotland Duty (FSD)

1.5.4 Full detail on the IIA process and methodology can be found Chapter 3.

2 A LOW EMISSION ZONE FOR DUNDEE

2.1 Background

2.1.1 The Environment Act 1995 requires all local authorities in the UK the statutory duty to undertake an air quality assessment within their area and determine whether they are likely to meet the air quality objectives for a number of pollutants. The process of review and assessment of air quality undertaken by local authorities is set out under the Local Air Quality Management (LAQM) regime.

2.1.2 Where the results of the review and assessment process highlight problems in meeting the objectives for air quality, the authority is required to declare an Air Quality Management Area (AQMA). Following the declaration of an AQMA, the local authority is then required to produce an Air Quality Action Plan (AQAP) which sets out measures that the local authority will implement to work towards to achieve air quality objectives.

2.1.3 In 2006 Dundee City Council (DCC) declared the whole of DCC local authority area as an AQMA for the NO_2 annual mean objective. In 2010, DCC amended the initial AQMA to include the annual mean objective for PM_{10}. Following the declaration of the AQMA, DCC published an Air Quality Action Plan (AQAP) in January 2011.

2.1.4 The AQAP provide the mechanism by which local authorities, in collaboration with national agencies and others, will state their intentions for working towards the air quality objectives using the powers they have available. DCC's AQAP includes a series of measures that they will introduce in pursuit of the Air Quality Standards (AQS). The principal aim of the AQAP is to minimise the effects of air pollution on human health within the local authority area using all reasonable measures, within reasonable time frames, and by working towards achieving the AQS.

2.1.5 Despite improvements in air quality since the introduction of the AQAP, there remain several locations in the AQMA where exceedances of emissions exist and where the AQS are not being met. The number of exceedances of the NO_2 annual mean objective has decreased from 16 in 2018 to 10 in 2019. The 2020 Air Quality Annual Progress Report (APR) for Dundee City Council, contains the latest (2019) information on air quality in Dundee.

2.1.6 In September 2017, the Scottish Government, in their Programme for Government, committed to the introduction of Low Emission Zones (LEZs) into Scotland's four biggest cities (Glasgow, Edinburgh, Aberdeen and Dundee). At the time of writing each city is required to have declared their LEZ by February – May 2022. The LEZ is being introduced to accelerate the required compliance with the AQS.

2.1.7 A LEZ is a scheme under which individuals driving vehicles which fail to meet specified emission standards will be prohibited from driving those vehicles in contravention of the terms of the scheme as proposed by a local authority within a designated geographical area.

2.2 Legislative Framework and Operation of a LEZ

2.2.1 The Transport (Scotland) Act 2019 section 6(4)(a) provides the powers to specify LEZ emission standards for vehicles in the Regulations and allows all Scottish LEZs operate to a consistent national level. A person may not drive a vehicle on a road within a LEZ unless that vehicle meets the specified emission standard. Vehicles that fail to comply with the LEZ emission standard will be subject to LEZ enforcement measures once any LEZ grace period has ended. The LEZ emission standards are:

- Euro VI emission standards for buses, coaches and heavy good vehicles with diesel engines, with retrofitted vehicles to this standard also being acceptable (Euro VI vehicle registrations from 2013
- Minibuses, large vans, taxi's and cars are set at the Euro 6 for diesel and Euro 4 for petrol vehicles (Euro 6 diesel vehicle registrations in 2015, Euro 4 petrol vehicles in 2006).

2.2.2 Section 6(4)(a) of the Transport (Scotland) Act 2019 enables exemptions to be set consistently across Scotland. DCC will have no ability to vary or choose from the national LEZ exemptions listed in Regulation 3 of the LEZ Regulations and outlined in Table 2.1.

DCC are therefore required to operate their LEZ in compliance with the exemption list, so that there is national consistency in its application.

Table 2.1 : National LEZ Exemptions

Vehicle type of classification	Description
Emergency Vehicles	For or in connection with the exercise of any function of:
	the Scottish Ambulance Service,
	the Scottish Fire and Rescue Service,
	Her Majesty's Coastguard, and
	the National Crime Agency.
Military Vehicles	Vehicles belonging to any of Her Majesty's forces; or used for the purposes of any of those forces
Vehicles of Historic Interest	Vehicles which are 30 years old or older, are no longer in production and historically preserved or maintained
Vehicles for Disabled Persons	Vehicles registered with a 'disabled' or 'disabled passenger vehicles' tax class
	Vehicles being used for the purposes of the 'Blue Badge Scheme'.
Showman Vehicles	Highly specialised vehicles used for the purposes of travelling showmen, where the vehicle is used during the performance, used for the purpose of providing the performance or used for carrying performance equipment.

2.2.3 The Transport (Scotland) Act 2019 requires a LEZ to specify a grace period before penalty enforcement of the scheme. Section 15 details the scope and time-limits of the grace period. The grace period applicable to non-residents must expire:

- not less than 1 year after it (LEZ declaration) begins, and
- not more than 4 years after it begins.

2.2.4 The grace period applicable to residents (whose registered address is inside the zone) must expire not more than 2 years after the expiry of the grace period applicable to non-residents.

2.2.5 Section 6(4)(a) of the Transport (Scotland) Act 2019 enables penalty charges to be set, based on the vehicle class, and sets out the circumstances in which penalty charges can be subject to a discount or surcharges or to escalate the penalties over time. The LEZ Regulation 4 and Schedule 4 has set 'tiers' of penalties based on a pre-set number of Penalty Charge Notices (PCN's) being issued. The tier structure is outlined in Table 2.2

Table 2.2 : Proposed penalty charge structure for a non-compliant, non-exempt vehicles in a LEZ

Vehicle Category / Tier	Tier				
	1	2	3	4	5
Car, Taxi and Private Hire	£60	£120	£240	£480	£480
Minibus	£60	£120	£240	£480	£960
Light goods vehicles	£60	£120	£240	£480	£480
Bus or Coach	£60	£120	£240	£480	£960
Heavy goods vehicles	£60	£120	£240	£480	£960
Motorcycle or Mopeds	£60	£120	£240	£480	£480
Special purpose vehicles	£60	£120	£240	£480	£480

2.2.6 Section 8 of the Transport (Scotland) Act 2019 also enables the enforcement of LEZ schemes. The LEZ will be enforced through Automatic Number Plate Recognition (ANPR) cameras with the LEZ Regulations Schedule 6 detailing the approved devices.

2.3 Policy Context

4.1.6 A full policy review has been undertaken in the NLEF Stage 1 Report (*Dundee Low Emission Zone, National Low Emission Framework Stage 1 Report, SYSTRA 2019)*. The policy review first set the context of the legislative framework for introducing a LEZ in Dundee, providing background on where LEZ fits in the legislative landscape. This was followed with a detailed review of National, Regional and Local plans, policies and strategies to ensure cognisance is taken of those that may help shape a LEZ in Dundee or in turn, be impacted by the introduction of a LEZ.

2.3.1 Activities relating to monitoring and management of air quality in Scotland are primarily driven by European (EU) legislation (at the time of writing) and implemented to UK and Scottish air quality policy. A summary of the legal air pollutant limits and guidelines in Scottish law is detailed in Table 2.3, with local authorities responsible for achieving these objectives.

Table 2.3 : Air Pollutant Limits and Guidelines

Pollutant	Air Quality Objective	
	Concentration	Measured as
Nitrogen Dioxide (NO2)	200 µg/m³ (not to be exceeded more than 10 times a year)	1-hour mean
	40 µg/m³	Annual mean
Coarse Particulate Matter (PM10)	50 µg/m³ (not to be exceeded more than 7 times a year)	24-hour mean
	18 µg/m³	Annual mean
Fine Particulate Matter (PM2.5)	10 µg/m³	Annual mean
Sulphur Dioxide (S02)	350 µg/m³ (not to be exceeded more than 24 times a year)	1-hour mean
	125 µg/m³ (not to be exceeded more than 3 times a year)	24-hour mean
	266 µg/m³ (not to be exceeded more than 35 times a year)	15 minute mean
Benzene	3.25 µg/m³	Running annual mean
1,3 Butadiene	2.25 µg/m³	Running annual mean
Carbon Monoxide (CO)	10.0 mg m³	Running 8-hour mean
Lead	0.25 µg/m³	Annual mean

2.3.2 There are also many related national, regional and local policies and strategies that can influence and be influenced by, the delivery of Dundee's Low Emission Zone. Many of these policies and strategies are focused on transportation issues, and may help contribute to overall improvements in air quality in the Dundee City AQMA. Similarly, it is crucial that local plans and policies (e.g. Development Plans, Economic Strategies) are informed by the LEZ to ensure they continue to drive improvements in air quality.

2.3.3 The detailed legislation, policies and plans reviewed in the NLEF Stage 1 Report are listed below. Firstly, the key policy and legislative drivers for Low Emission Zones are:

- Transport (Scotland) Act 2019t;
- Cleaner Air for Scotland – The Road to a Healthier Future (CAFS)
- The Environment Act 1995: Part IV

2.3.4 The wider legislative and policy that influence or can be influenced by a LEZ in Dundee:

- EU, UK and Scottish Air Quality Legislation
    - The Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC)
    - 2013 Clean Air Programme for Europe (COM(2013)918)
    - 2016 National Emissions Ceiling Directive (2016/2284/EU)
    - The Environment Act 1995: Part IV
    - The Air Quality Strategy for England, Scotland, Wales and Northern Ireland
    - Air Quality Standards (Scotland) Regulations 2010
    - Air Quality (Scotland) Regulations 2000
    - Air Quality (Scotland) Amendment Regulations 2002
    - Air Quality (Scotland) Amendment Regulations 2016
    - Cleaner Air for Scotland – The Road to a Healthier Future (CAFS)
    - National Low Emission Framework (NLEF)

- National Plans, Policies and Strategies
    - National Planning Framework 3 (NPF3)
    - National Transport Strategy 2 (NTS2)
    - Strategic Transport Projects Review (STPR)
- Regional Plans and Polices
    - Strategic Development Plan 2012-2032 (TAYPlan)
    - TACTRAN Regional Transport Strategy (2015–2036 Refresh)
    - Tay Cities Regional Economic Strategy 2019-2039
    - Tay Cities Deal Proposal
- Local Plans and Policies and Projects
    - City Plan for Dundee 2017 – 2026
    - Dundee Local Development Plan
    - Dundee Cycle Strategy
    - Tay Cities Regional Transport Model
    - Dundee City Microsimulation Model

2.4 Objectives of Dundee's LEZ

2.4.1 The objectives for Dundee's Low Emission Zone were accepted at the Dundee City Council Community Safety & Public Protection Committee meeting on June 3 2019 and updated at the same committee on February 24 2020.

2.4.2 They are that Dundee's Low Emission Zone will:

Protect public health through improving air quality in Dundee and achieving air quality compliance for NO_2, PM_{10} and $PM_{2.5}$

Develop an environment that helps promote more active and sustainable travel choices in Dundee and contributes to meeting emission reduction targets set out in Part 1 of the Climate Change (Scotland) Act 2009.

Contribute to the ongoing transformational change in Dundee and help promote the city as an inclusive and desirable place to live, invest, visit and learn

2.5 Identification of Dundee's preferred LEZ Option

2.5.1 In line with the Transport Scotland Act and associated Regulations and Guidance, it is proposed that:

- low emission zone entry will be based on the Euro emission engine classification standards
- low emission zones operate continuously, 24 hours a day, seven days a week, all year-round enforcement will utilise Automatic Number Plate
- Recognition (ANPR) cameras, linked to a national vehicle licencing database, will monitor vehicles entering a low emission zone to detect vehicles which do not comply with the minimum Euro emission standards
- low emission zones will be based on a penalty notice approach to discourage non-compliant vehicles from entering the zone
- the design, implementation and operation of low emission zones will involve grace periods to allow commercial fleet operators and private vehicle owners time to prepare
- exemptions will be specified in regulations such as the ability for a local authority to allow time limited local exemptions for up to 12 months
- local authorities publish a report annually on the effectiveness of low emission zones.

2.5.2 SYSTRA, on behalf of Dundee City Council, has followed the National Low Emission Framework (NLEF) guidance to build an evidence base to inform the development of the LEZ and to undertake a structured LEZ option appraisal process to identify LEZ options that best satisfy the LEZ objectives.

2.5.3 The NLEF guidance, published in January 2019, states that NLEF *is an air quality-focused, evidence-based appraisal process developed to help local authorities consider transport related actions to improve local air quality, where transport is identified as the key contributor to air quality problems (*NLEF, 2019).

2.5.4 The guidance states that the aim of the NLEF is to improve local air quality in areas where Scottish Air Quality Objectives (AQOs) are exceeded, or likely to be exceeded, and transport is identified as the key contributor. Local authorities that have declared AQMAs should have regard to the NLEF when developing their air quality action plans and Low Emission Zones.

2.5.5 The NLEF appraisal process provides a consistent approach that can be applied across Scotland to inform decisions on transport-related actions to improve local air quality. It is designed to support local authorities in considering transport-related issues in the context of local air quality management and help develop evidence to support consideration of the introduction of an LEZ as an appropriate option to improve air quality.

2.5.6 The NLEF Stage 1 Report (*Dundee Low Emission Zone, National Low Emission Framework Stage 1 Report, SYSTRA 2019)* detailed the review of Dundee's Local Air Quality Management and presented an evidence base to assist in the appraisal and implementation of Dundee's LEZ through the Stage 2 Assessment process.

2.5.7 A first Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework Interim Stage 2 Report, SYSTRA 2019)* was completed in September 2019 and detailed the identification of the LEZ objectives and the preferred LEZ options to be presented for consultation and detailed testing through local traffic and air quality models. The report summarised the high level scenario testing undertaken using SEPA's National Modelling Framework (NMF) Dundee City Air Quality Model to inform the LEZ option generation and development process. The NMF results showed that:

- Ensuring all buses meet Euro VI standard bring the largest reduction in modelled NO_2 of any change to a single type of vehicle and should be included in any LEZ option for Dundee
- The inclusion of Euro 6 standard diesel cars (in addition to buses) to a city wide LEZ would allow all key locations of exceedances to fall within air quality standards although a city centre only LEZ does not ensure city wide compliance
- HGVs, LGVs (both Euro VI) and petrol cars (Euro 4) do not bring sufficient benefit on their own to be considered individually for a LEZ, but do bring some further pollution benefits to a LEZ which includes buses and diesel cars

2.5.8 The LEZ Objectives and NMF results informed a LEZ option generation and development process. An unconstrained LEZ option generation exercise identified 40 possible LEZ options of varying size and vehicle compliance. High level sifting and option appraisal against the LEZ objectives and feasibility, affordability and public acceptability criteria concluded there to be 8 emerging LEZ Options.

2.5.9 Detailed analysis of these emerging LEZ options was undertaken and concluded that two options and their identified variants should be recommended for wider public and stakeholder consultation. The LEZ Options for Consultation were:

- LEZ Option 1A - Inner Ring Road Bus Only (including bus station)
- LEZ Option 1B - Inner Ring Road Bus Only (excluding bus station)
- LEZ Option 2A - Inner Ring Road All Vehicles (including all car parks)
- LEZ Option 2B - Inner Ring Road All Vehicles (excluding Bell Street and West Marketgait NCP car parks)
- LEZ Option 2C - Inner Ring Road All Vehicles (excluding Bell Street, West Marketgait NCP and Wellgate car parks)

2.5.10 The option generation exercise identified the area inside Dundee's inner ring road as the most viable area for a LEZ and this is shown in Figure 2.1. The 5 options listed above are slight variants of this area and/or include different proposed vehicle restrictions.

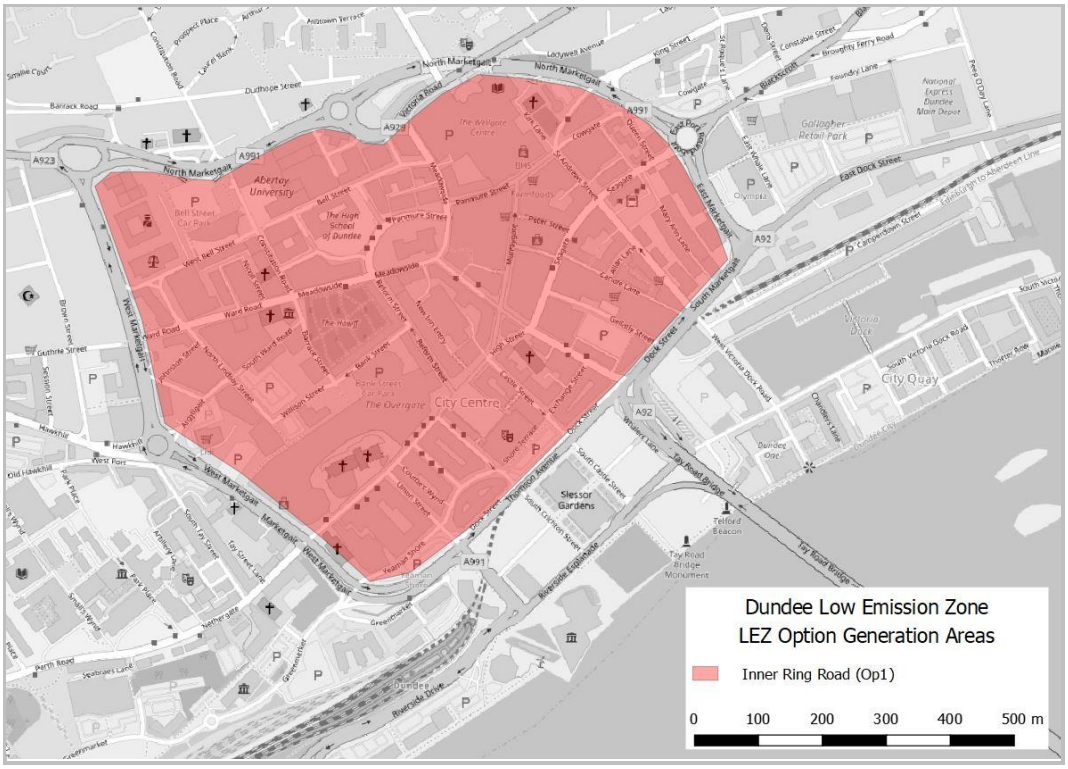

Figure 2.1 : Inner Ring Road LEZ for Dundee

2.5.11 Following publication of the first interim NLEF Stage 2 Report and on instruction from DCC's Community Safety & Public Protection Committee, SYSTRA and DCC undertook a 6 week public and stakeholder consultation exercise in Autumn 2019. The results from consultation informed the final LEZ option for Dundee along with detailed traffic microsimulation modelling and traffic emissions modelling.

2.5.12 A second interim NLEF Stage 2 Report (*Dundee Low Emission Zone, National Low Emission Framework Interim Stage 2 Report, SYSTRA 2021)* was published in May 2021 and, through analysis of consultation findings and outcomes from the traffic and emissions modelling, it identified the final proposed LEZ for the city, as outlined below.

2.6 Final LEZ for Dundee

2.6.1 The final Dundee LEZ Option incorporates the area inside the A991 inner ring road, excluding Bell Street car park, West Marketgait NCP car park and Wellgate Centre car park.

2.6.2 A detailed drawing of the final Dundee LEZ is shown in Figure 4.7 A list of all roads which form part of the zone, as required by the Transport (Scotland) Act 2019 is included in Appendix D of the NLEF Stage 2 Report.

Figure 2.2 : Dundee LEZ Option Area

2.6.3 The Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021 sets the emission standards for entry to the LEZ without penalty and allows DCC to define which vehicle types are to be restricted from entering the LEZ area.

It is proposed that the final Dundee LEZ Option applies to all vehicles types as specified in Regulation 2 of the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021, excluding the national LEZ exemptions listed in Regulation 3.

2.6.4 The LEZ emission standards for Dundee LEZ are therefore:

- Euro VI emission standards for buses, coaches and heavy good vehicles with diesel engines, with retrofitted vehicles to this standard also being acceptable (Euro VI vehicle registrations from 2013)
- Minibuses, large vans, taxis and cars are set at the Euro 6 for diesel vehicles and Euro 4 for petrol vehicles (Euro 6 diesel vehicle registrations in 2015, Euro 4 petrol vehicles in 2006).

2.6.5 The Transport (Scotland) Act 2019 requires a LEZ to specify a grace period before penalty enforcement of the scheme.

It is proposed that the grace period for Dundee's LEZ expires in May 2024 for all vehicle types and for residents and non-residents of the zone.

2.6.6 Section 8 of the Transport (Scotland) Act 2019 enables the enforcement of LEZ schemes. The LEZ will be enforced through Automatic Number Plate Recognition (ANPR) cameras with the LEZ Regulations Schedule 6 detailing the approved devices.

2.6.7 ANPR camera enforcement is currently subject to funding decisions from Transport Scotland and procurement procedures with suppliers. The exact number and location of ANPR cameras is therefore not concluded and will be confirmed in the final NLEF Stage 2 Report and submission to Scottish Ministers.

2.6.8 In line with Section 18 of the Transport (Scotland) Act 2019, it is anticipated that the LEZ will be enforced at all times. Section 17 of the Act does allow for DCC to apply time-limited exemptions to enforcement should it be required, for example for road closures and diversion routes.

2.7 Consultation and Engagement on Dundee's LEZ

2.7.1 The development of Dundee's LEZ has been informed and shaped by public and stakeholder engagement from the outset. The consultation outcomes are used to inform the IIA, in particular the likely behavioural response from each IIA group identified in Chapter 3.

Statutory Consultation

2.7.2 Section 11 of the Transport (Scotland) Act 2019 states that before a local authority submits its final Low Emission Zone (LEZ) proposals to Scottish Ministers for approval, it must consult with:

- the Scottish Environment Protection Agency,
- NatureScot
- Historic Environment Scotland,
- such persons as the authority considers represent the interests of—
    - i. the road haulage industry,
    - ii. the bus and coach industry,
    - iii. the taxi and private hire car industry,

iv. local businesses, and
v. drivers, likely to be affected by the proposal,

- such persons as are specified by the Scottish Ministers in regulations
  i. neighbouring local authorities
  ii. the Regional Transport Partnership (Tactran)
  iii. the local Health Board
- such other persons as the authority considers appropriate

2.7.3 In line with The Act 2019, Dundee City Council (DCC) launched an eight-week statutory consultation from 14th June 2021 to 9th August 2021 on its proposed LEZ scheme for the city, as agreed at the Community Safety and Public Protection Committee on 7th June 2021.

2.7.4 The statutory consultation period consisted of the following elements:

- Letter correspondence to statutory consultees advising of LEZ proposals
- Stakeholder workshops
- Online survey seeking views on the proposed LEZ option
- Information flyer delivered to residents and businesses in proposed LEZ area

2.7.5 Table 3.1 lists the stakeholders contacted directly by DCC and shows those that have provided a written submission in response.

Table 2.4 : List of Stakeholder contacted by DCC and record of response

Stakeholder Type	Organisation	Response Received
Bus and coach industry	Moffatt & Williamson	
Bus and coach industry	Stagecoach East Scotland	Yes
Bus and coach industry	Xplore Dundee	Yes
Bus and coach industry	Stagecoach Citylink Coaches	Yes
National Body	Historic Environment Scotland	Yes
National Body	SEPA	
National Body	NatureScot	Yes
Neighbouring Local Authority	Angus Council	
Neighbouring Local Authority	Fife Council	Yes
Neighbouring Local Authority	Perth & Kinross Council	
Local Health Board	NHS Tayside	Yes
Regional Transport Partnership	SESTran	Yes
Regional Transport Partnership	TACTRAN	Yes
Freight Representative	Road Haulage Association	Yes
Freight Representative	Logistics UK	Yes
Local Business	Royal Mail	Yes
Local Business	UPS	Yes
Business Representative	Dundee & Angus Chamber of Commerce	N/A
Business Representative	Eco Stars	N/A
Taxi Operators	DCC Taxi Liaison Group	N/A

2.7.6 Note that Eco Stars, a free national environmental fleet management recognition scheme which operates a local scheme in Dundee, was utilised to send letters to its members from the local business and freight community. The DCC taxi liaison group sent letters to its members to allow all taxi representatives the opportunity to respond.

2.7.7 In addition to the responses noted above, DCC received written submissions from the following individuals and organisations:

- Asthma UK & British Lung Foundation Scotland
- Dundee and Angus Green Party
- Enterprise Holdings
- Friends of the Earth Tayside
- Maggie Chapman, MSP for Scottish Green Party

- Paths for All
- RAC Motoring
- The National Union of Rail, Maritime and Transport Workers (RMT) Dundee Taxi Branch
- Tayside & Fife Greener Practice
- Unite Union Taxi Branch

2.7.8 SYSTRA and DCC organised seven virtual stakeholder workshops held in June, July and August 2021 during DCC's 8-week statutory consultation period on its LEZ proposals. A summary of the workshop groups and number of attendees is provided in Table 3.2.

Table 2.5 : Dundee LEZ Stakeholder Workshops 2021

Workshop Group	Date	Number of Attendees
Neighbouring authorities & regional transport partners	24/06/2021	20
Bus Operators	01/07/2021	6
Freight Operators	06/07/2021	4
Taxi Trade Representatives	07/07/2021	2
Stobswell Forum	08/07/2021	3
City centre & harbour community council	21/07/2021	4
Green Groups Forum	02/08/2021	4
Business Community	05/08/2021	15
Total No. of Stakeholders Consulted:		**58**

2.7.9 Each workshop was scheduled for 1 hour 30 minutes. At all stakeholder workshops, a presentation on the proposals for the LEZ in Dundee, including details on planned operation and enforcement timeline for its introduction, was given by the Dundee LEZ Delivery Group (LEZDG). This was followed by a question and answer session. It should be noted that the sessions were held with representatives of each group or community, with the reach of each session extending beyond the number of attendees listed in Table 3.2.

2.7.10 Full written responses and analysis of the submissions and workshop outcomes can be found in the *Dundee Low Emission Zone Engagement Report (SYSTRA, September 2021)* where the statutory consultation has confirmed there is no need for DCC to reconsider any aspect of the LEZ as defined in the *Statement of Scheme Proposal.*

Previous Consultation Period

2.7.11 Prior to the statutory consultation in 2021, a six-week consultation period ran in 2019 seeking to discover the views of stakeholders and members of the public on LEZs in general and specifically the potential options for Dundee that emerged from the Interim NLEF Stage 2 Report, as noted above. The consultation took the form of an online public survey and face to face workshops with key (and statutory) stakeholders. The outcomes from the consultation period were reported to the Community Safety and Public Protection Committee in February 2020 and summarised here.

2.7.12 The online public survey ran for six weeks from 4th October to 19th November 2019 and was administered by DCC. The survey was viewed 1902 times and was completed a total of 1336 times. Most completions (96%) were by individuals and the greatest number of respondents (42%) live and work in Dundee. The survey included questions seeking to discover respondents' views on LEZs in general and specifically the potential options for Dundee that emerged from the Interim NLEF Stage 2 Report with:

- 65% of respondents supported the general principle of LEZs and
- 60% supported the principle of a LEZ for Dundee
- 64% considered that it should apply to all vehicle types

- 35% (the greatest percentage of respondents) favoured the LEZ option that has now been identified as the preferred LEZ Option for Dundee.

2.7.13 A range of workshops with key stakeholders were held concurrently with the live public survey dates during October and November 2019. Key stakeholders were also invited to submit a formal written response on their views on the LEZ proposals. The stakeholders represented at the workshops were as follows:

- Bus industry representatives:
  - Stagecoach East Scotland, Xplore Dundee, Moffat & Williamson and the Confederation of Passenger Transport (CPT)
- Freight industry representatives:
  - Logistics UK (Freight Transport Association), Road Haulage Association, United Parcel Service (UPS), local freight operators
- The Tayside and Central Regional Transport Partnership (Tactran)
- Business community:
  - DDOne, Federation of Small Businesses (FSB) and Dundee & Angus Chamber of Commerce, local businesses
- Community Councils:
  - Stobswell Forum, City Centre & Harbour, West End
- Environmental/interest groups
  - British Lung Foundation, Friends of the Earth Tayside (FoET), Friends of Riverside Nature Park, Scottish Wildlife Trust and Extension Rebellion, Dundee Civic Trust, Dundee Resource & Re-Use Centre
- Taxi representatives
- Car park operators (no response)

2.7.14 Further analysis of the results can be found in the second interim NLEF Stage 2 Report. The consultation results show there to be support for the introduction of a LEZ in Dundee and specifically the final proposed LEZ area, including restrictions on all vehicles types as specified in the LEZ Regulations.

Focussed Covid-19 Consultation

2.7.15 In response to the Covid-19 pandemic, the national LEZ Leadership Group announced in May 2020 a temporary pause in plans to implement LEZs across Scotland. Plans were formally resumed in August 2020 and a new indicative timescale for the introduction of LEZs was published, that aims to see their introduction between February and May 2022.

2.7.16 In light of the difficulties faced by many throughout 2020 and 2021, particularly, in the context of a Dundee city centre LEZ, city businesses and bus operators, DCC were keen to understand the level of support for the introduction of a LEZ in the city post pandemic and gauge the impact the pandemic may have had on businesses and bus operators in preparing for its introduction.

2.7.17 Bus operators in the city have been consulted regularly and kept up to date with ongoing proposals for the city's LEZ. Given the importance of bus compliance to the success of any LEZ, the operators were approached in March 2021 and all operators completed a questionnaire on the impact of Covid-19 on investment plans and likely future fleet compliance.

2.7.18 A questionnaire was also circulated to approximately 300 city centre businesses and members of the Dundee LEZ Delivery Group attended the Dundee Business Recovery meeting in February 2021 to present the current LEZ proposals and to seek views from the broad range of city businesses in attendance.

2.7.19 A key outcome from the focused consultation was to inform the length of the grace period. It was recognised that the Covid-19 pandemic has had an unprecedented impact on society, including on the wider environment and the economy. Cognisance of the difficulties faced by many throughout 2020 and 2021, particularly in the context of a Dundee city centre LEZ and its implications for city businesses and bus operators, suggested that a grace period greater than the required minimum was needed and a two year grace period was proposed.

Additional Consultation Resources

2.7.20 The IIA also utilises outcomes from two Transport Scotland facilitated public consultation exercises, *Building Scotland's Low Emission Zones* and Scotland Low Emission Zone Consultation on Regulations and Guidance 2019-2020.

3 METHODOLOGY AND APPROACH TO IIA

3.1 Introduction

3.1.1 This section sets out the approach (datasets, frameworks, guidance, and methods of analysis) used to identify and assess the impacts of a potential LEZ in Dundee.

3.2 Overall approach

3.2.1 The objective of this report is to present potential impacts arising from the LEZ and use this analysis to support wider assessment of key LEZ decisions. The report uses the NHS Lothian Integrated Impact Assessment (IIA) approach because it is an effective mechanism of meeting requirements of NLEF and the Equality Act 2010 (Specific Duties) (Scotland) 2014 (see sections 3.3 and 3.4 for more detail). This IIA approach is consistent with Transport Scotland's approach to the IIA for the LEZ Regulations. The approach has also been tailored to reflect relevant supporting guidance for Dundee's LEZ. The assessment was undertaken using datasets, including outputs from transport and air quality modelling, and employed a range of methodologies to conduct analysis to better understand the impacts from a LEZ and recommend mitigations.

3.2.2 The information presented in this methodology section of the IIA can be summarised as follows:

- Frameworks and guidance
  - National Low Emission Framework; NHS Lothian's integrated impact assessment (IIA) guidance and supporting guidance; HMRC Greenbook approved DEFRA approach to damage cost calculation; and UK Government's Joint Air Quality Unit (JAQU) guidance.
- Modelling
  - SEPA's National Modelling Framework (NMF) Dundee City Air Quality Model
  - Dundee Greater City Centre Base Paramics Traffic Microsimulation Model – 2019 Base, 2023 Reference Case and 2023 LEZ Options
  - Estimation of economic impacts requires structured assessment. Costs of replacing vehicles, welfare loss, asset value loss and damage cost to health are impacts modelled within this IIA.
- Analysis and the estimation of impacts
  - How the guidance, methodology, and datasets were brought together to produce an estimation of the impacts
- Survey and public and stakeholder consultation
  - Incorporating outputs from Dundee City Council public and stakeholder engagement exercises on the LEZ proposals, including statutory consultees listed in Section 11 of the Transport (Scotland) Act 2019
  - Incorporation of outputs from Scotland-wise consultations which sought to ascertain views on a number of aspects including awareness, transport, emissions, potential LEZ designs, and potential impacts from the LEZ (Transport Scotland 2017, Transport Scotland 2020)

3.2.3

3.3 Main guidance – NHS Lothian IIA

3.3.1 The NHS Lothian IIA guidance is used to structure the assessment of effects resulting from the implementation of a LEZ in Dundee, as required through the NLEF. The Equality Act 2010 (Specific Duties) (Scotland) 2014, requires public bodies, to assess the impact of applying a proposed new or revised policy or practice where necessary to fulfil the requirements of the Public Sector Equality Duty (PSED) as set out in Section 149 of the

Act. In addition, The Fairer Scotland Duty (FSD) places a legal responsibility on public bodies in Scotland to actively consider ('pay due regard' to) how they can reduce inequalities of outcome caused by socio-economic disadvantage, when making strategic decisions. As such, an IIA is an effective mechanism of meeting these legal requirements by considering the needs of different groups and to assess proposals for potential equality impacts to prevent unlawful discrimination.

3.3.2 The NHS Lothian IIA guidance informs that when undertaking an IIA, the likely impacts of the policy or proposal on the following groups are assessed:

- People with protected characteristics (e.g. age, gender, disability, ethnicity, religion);
- Those vulnerable to falling into poverty (e.g. unemployed, single parents, homeless people, carers and vulnerable families)
- Geographical communities (e.g. urban, rural, and business communities)
- Staff (where applicable)

3.3.3 In Chapter 4, the LEZ proposal is therefore assessed by identifying how it differentially impacts on these different population groups.

3.3.4 These impacts are organised by the following themes:

- Equalities and Human Rights;
- Environmental
- Economic

3.3.5 Chapter 5 presents impacts under defined IIA objectives associated with the aforementioned themes, as shown in Table 3.1. Note, not all IIA objectives listed in the NHS Lothian IIA guidance are relevant to the LEZ and are not included in Table 3.1, as agreed with DCC.

3.3.6 In line with the NHS Lothian IIA guidance, the likely impacts arising from the introduction of the LEZ on different population groups has been discussed at the DCC LEZ Delivery Group (a monthly meeting), which consists of the following representatives:

- Dundee City Council (officers from different departments)
- Transport Scotland
- SEPA
- Neighbouring authorities
- Regional transport partner
- NHS Tayside
- SYSTRA

3.3.7 In addition, the development of the LEZ proposals have been informed by these and other interest groups and stakeholders through ongoing consultation, as noted in Chapter 2.

Table 3.1 : IIA Objectives

IIA Topic Theme	IIA Objective
Equality and Human Rights	Eliminate discrimination and harassment
	Advance equality of opportunity e.g. improve access / quality of services
	Foster good relations within and between people with protected characteristics
	Enable people to have more control of their social/work environment
	Reduce differences in status between different groups of people
	Promote participation, inclusion, dignity and control over decisions
	Protect vulnerable children and Adults
Environment	Environmental Reduce greenhouse gas (GHG) emissions
	Plan for future climate change
	Pollution: air/water/soil/noise
	Protect coastal and inland waters
	Enhance biodiversity
	Encourage resource efficiency (energy, water, materials and minerals)
	Public Safety (e.g. minimise waste generation, infection control, accidental injury, fire risk)
	Reduce need to travel and promote sustainable forms of transport
	Improve the physical environment (e.g. housing quality, public space, access to and quality of green space)
Economy	Maximise income and/or reduce income inequality
	Help young people into positive destinations
	Support local business
	Help people to access jobs (both paid and unpaid)
	Improve literacy and numeracy
	Improve working conditions, including equal pay
	Improve local employment opportunities
	Improve quality of and access to services

4 IMPACT BY POPULATION GROUPS

4.1 Introduction

4.1.1 This chapter describes the different analysis undertaken in the IIA, for each of the identified IIA groups:

- People with protected characteristics (e.g. age, gender, disability, ethnicity, religion);
- Those vulnerable to falling into poverty (e.g. unemployed, single parents, homeless people, carers and vulnerable families)
- Geographical communities (e.g. urban, rural, and business communities)
- Staff (where applicable)

4.1.2 Several sources of information were utilised to provide a robust view of the likely impacts on different groups following the introduction of the LEZ. The following publicly available information sources were utilised in the IIA for Dundee LEZ:

- Scotland's Census 2011
- National Records of Scotland Mid-2020 Small Area Population Estimates for 2011 Data Zones
- Scottish Index of Multiple Deprivation (SIMD) 2020
- Dundee City SIMD2020 Briefing Note
- National Atmospheric Emissions Inventory (NAEI) 2018
- Dundee Citizen Survey 2019
- Dundee Poverty Profile 2020
- Dundee Economic Profile 2019
- Equality Evidence Finder
- Nomis Official Labour Market Statistics
- Sexual Orientation in Scotland 2017
- Transport Scotland Scottish Transport Statistics 2020
- Office for National Statistics (Economy)

4.1.3 In addition to the publicly available sources above, the IIA utilised information provided by DCC, SEPA and the National Modelling Framework and traffic data and model outputs from the Paramics traffic modelling (undertaken by SYSTRA).

4.1.4 It should be noted that many of the available sources of information refer to the pre-Covid-19 and Brexit period (up to 2019).

4.1.5 Before specifically focussing on the impacts by each groups (Section ¢o), the above data sources have first been used to undertake the following analysis:

- An overview of Dundee's population
- The likely number of vehicles impacted by the LEZ
- An overview of the city centre economy
- The predicted improvements to air quality and impact on health and inequalities

4.2 Overview of Dundee's Population Characteristics

4.2.2 Dundee is Scotland's fourth largest city with the most recent estimate of Dundee's population is 149,320 (National Records of Scotland (NRS) 2019 Mid-year population estimate), including approximately 4,500 residents in the LEZ area. Approximately 26,000 residents in Dundee City are aged 65 years and older (ca. 17% of total population), while in the LEZ area only approximately 500 people (11%) are aged 65 years and older, Dundee City was the only council area in Scotland that experienced a decrease in average median age of its data zones between mid-2009 and mid-20120 (NRS Mid-2020 Small Area Population Estimates).

4.2.3 It is estimated that there are approximately 74,000 people in employment in Dundee City (Nomis 2019). While there is no data is available specifically for the number of jobs in the LEZ area itself, the 2011 Census shows that 61% or 1,400 people approximately of those aged over 16 living in a census zone inside or partially inside the LEZ area are economically active (including students).

4.2.4 60.3% of commuters in Dundee travel by car (including passenger car pools and taxis). Of the 1,400 economically active population in and around the LEZ area, 56% commute by foot, 13% by bus and 13% drive a car or van (Census 2011). This suggests that the majority of the working population in and around the LEZ area will not be adversely affected by LEZ enforcement when commuting, particularly under the assumption that all bus services will be compliant.

4.2.5 That said it is residents of the LEZ area and regular commuters that will be most impacted by the introduction of the LEZ, both positively and negatively. People visiting the city centre for shopping and other activities will also be impacted by the LEZ. In 2018, almost 500,000 overnight visits were recorded in Dundee City, most of them including activities in the city centre (DCC 2019).

4.2.6 Whenever possible, the IIA utilised local data specific for the LEZ area or the wider Dundee City area and different geographies have been considered, depending on the source available, as detailed below.

Scotland's Census 2011

4.2.7 The most recent Census data from 2011 was used to understand demographic characteristics of the resident population within the LEZ. Data were retrieved for the boundary shown in Figure 4.7, that include different zones identified by postcode. The data extracted from the selected area can be considered to coincide with of the future LEZ area.

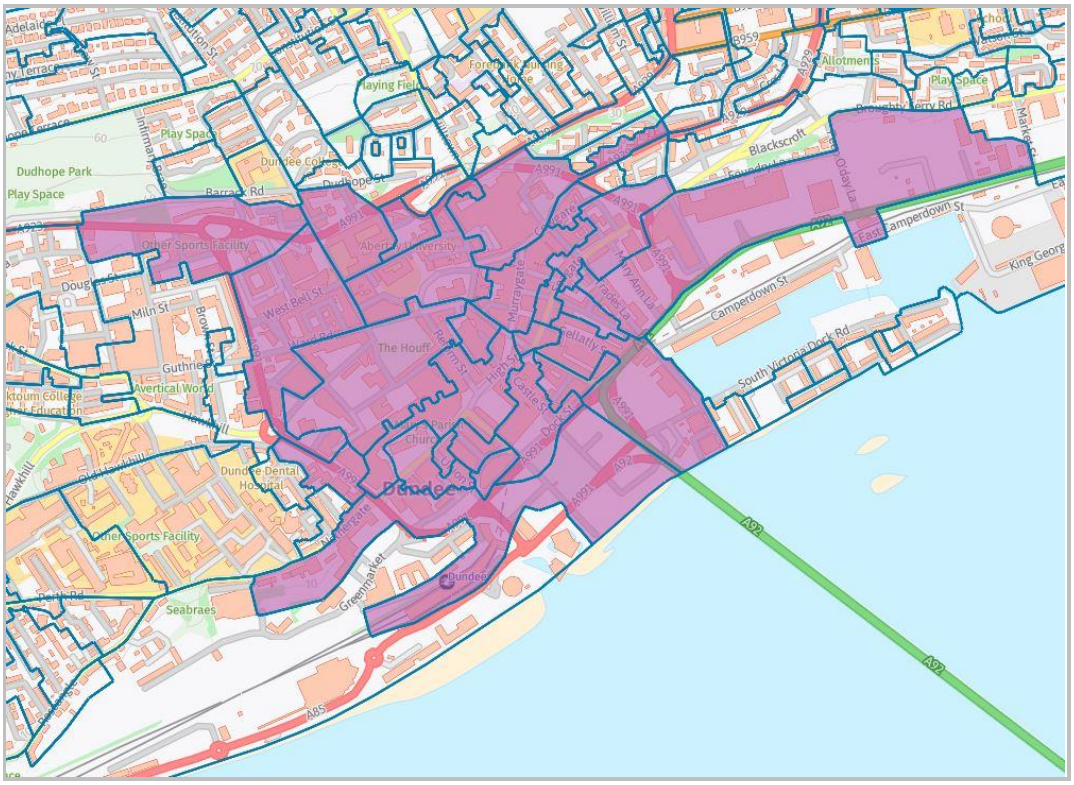

Figure 4.1 : Output Areas Census 2011 (Source: Census 2011)

SIMD 2020

4.2.8 The Scottish Index of Multiple Deprivation is a relative measure of deprivation across 6,976 small areas (called data zones). If an area is identified as 'deprived', this can relate to people having a low income but it can also mean fewer resources or opportunities. SIMD looks at the extent to which an area is deprived across seven domains: income, employment, education, health, access to services, crime and housing

4.2.9 SIMD 2020 was used to identify potential impacts in relation to the level of deprivation of different areas in the LEZ and Dundee city. Dundee has 188 data zones in total and specific analysis of data zones either fully or partially inside the LEZ area was undertaken to obtain an understanding of the levels of deprivation of the population living in an area

representative of the LEZ. The SIMD 2020 data zones used in the IIA are shown by the green markers in Figure 4.7

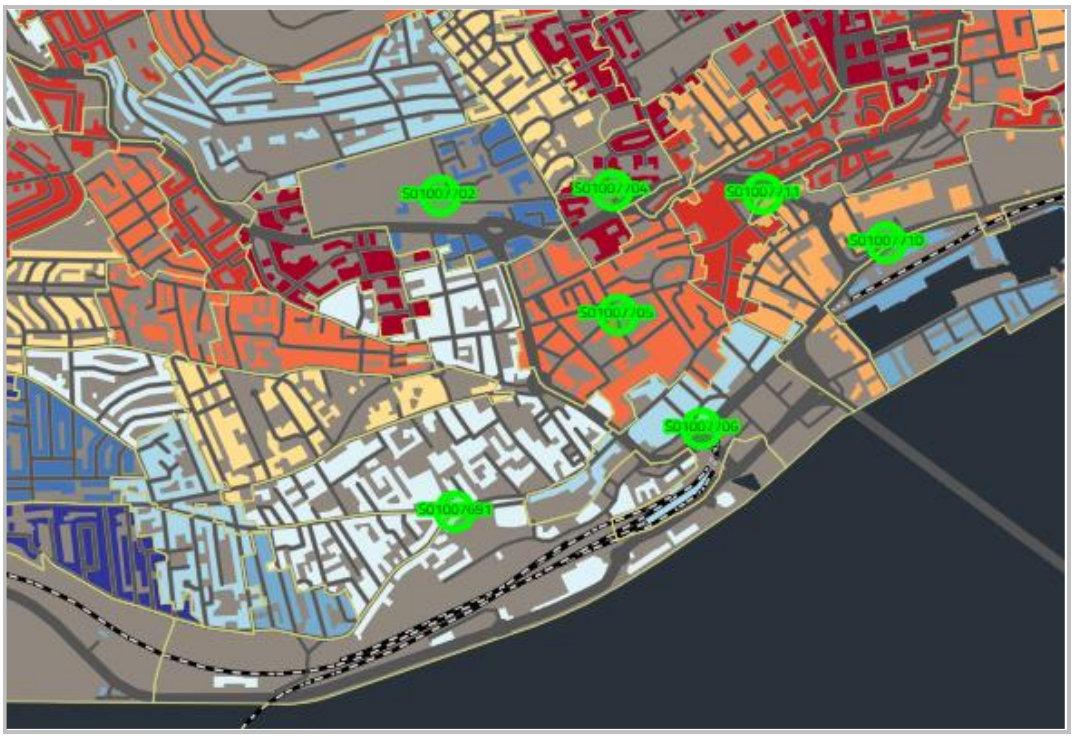

Figure 4.2 : SIMD 2020 Data Zones fully or partially inside Dundee's LEZ area

4.2.10 The Scottish Government uses 20% as a marker for the "Most Deprived" however they also state that those living in areas up to 40% most deprived may also experience difficulties.

4.2.11 The SIMD 2020 shows that 54,497 (36.6%) people in Dundee City live in a data zone within the 20% most deprived, with these data zones shown in Figure 4.7. This compares to 53,435 (36%) in SIMD 2016.

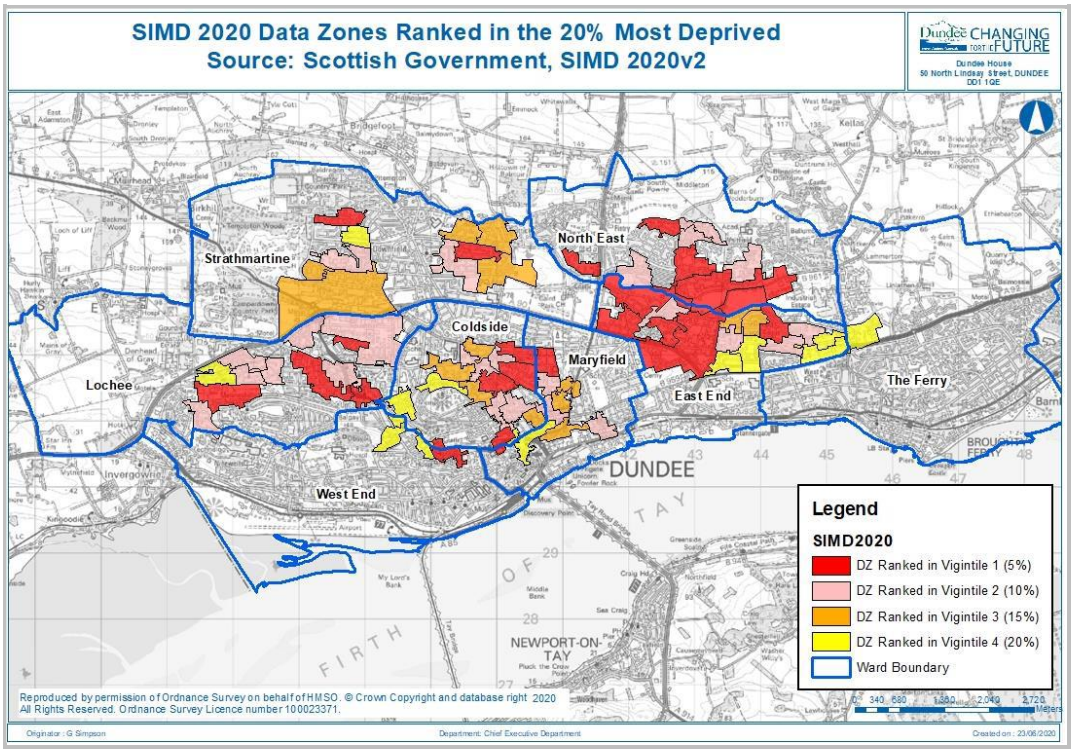

Figure 4.3 : SIMD 2020 20% Most Deprived Areas in Dundee (Source: DCC)

4.2.12 The Electoral Ward of Maryfield encompasses the city centre and the proposed LEZ area and contains 8 data zones within the 20% most deprived, an increase of one datazone since 2016.

4.2.13 The SIMD 2020 reported that 10,506 children (aged 0-15 years) live within the 20% most deprived data zones, this accounts for 43.8% of children in that age group in Dundee City overall. In Maryfield 802 (36.6%) of children live within the 20% most deprived data zones. The young are a particular group at risk from poor air quality and any improvements in air quality will directly impact on them.

4.2.14 The employment domain in the Scottish Index of Multiple Deprivation examines unemployment claimant counts averaged over 12 months, working age incapacity benefit or employment support allowance recipients and working age severe disablement allowance recipients. The SIMD 2020 reported that 35,975 people (36.4%) of the working age population in Dundee City live in a data zone that is ranked in the 20% most deprived in the employment domain, with 4,416 (31.5%) in the Maryfield Ward.

4.2.15 The SIMD 2020 reported that 24,291 people or 16.4% of the population in Dundee City are classed as income deprived, with 3,064 (16.5%) located in Maryfield.

4.3 Number of Vehicles Affected by the LEZ

4.3.2 A LEZ will restrict vehicle access for non-compliant vehicles to the city centre of Dundee To understand the impact of this restriction on the population, it is important to understand the total number of vehicles likely to be impacted. To ascertain a realistic estimate of the total non-compliant vehicles, data from traffic surveys and the Paramics traffic model was utilised.

4.3.3 An Automatic Number Plate Recognition (ANPR) traffic survey was undertaken over a 24-hour period in May 2018 by Transport Scotland on key routes in Dundee city. Data recorded in the survey included information on vehicle type, fuel and Euro standard passing through the survey locations and is considered representative of the local vehicle fleet composition in Dundee and therefore the types of vehicles likely to visit the LEZ in one day. The total number of non-compliant vehicles registered by ANPR cameras in Dundee, is shown by fuel type and Euro standard in Table 4.1. Table 4.2 shows the percentage of each vehicle type and Euro standard captured by the survey. Note, in both tables that compliant vehicles types are represented by grey cells.

Table 4.1 : Number of vehicles by fuel and Euro standard registered by ANPR cameras (2018)

Euro Standard	Car (Petrol)	Car (diesel)	LGV (Petrol)	LGV (diesel)	HGV	Bus
Euro 1	49	21	2	10	6	1
Euro 2	403	71	2	22	6	10
Euro 3	2477	1556	19	875	121	48
Euro 4	9901	6833	18	2504	463	65
Euro 5	13477	15359	12	6793	1361	124
Euro 6	11080	12051	2	1533	725	33
Total non-compliant	2929	23840	23	10204	1957	248
Total compliant	34458	12051	32	1533	725	33

Table 4.2 : Percentage of vehicles by fuel and Euro standard registered by ANPR cameras (2018)

Euro Standard	Car (Petrol)	Car (diesel)	LGV (Petrol)	LGV (diesel)	HGV	Bus
Euro 1	0.1%	0.1%	3.6%	0.1%	0.2%	0.4%
Euro 2	1.1%	0.2%	3.6%	0.2%	0.2%	3.6%
Euro 3	6.6%	4.3%	34.5%	7.5%	4.5%	17.1%
Euro 4	26.5%	19.0%	32.7%	21.3%	17.3%	23.1%
Euro 5	36.0%	42.8%	21.8%	57.9%	50.7%	44.1%
Euro 6	29.6%	33.6%	3.6%	13.1%	27.0%	11.7%
Total non-compliant	**7.8%**	**66.4%**	**41.8%**	**86.9%**	**72.9%**	**88.3%**
Total compliant	**92.2%**	**33.6%**	**58.2%**	**13.1%**	**27.0%**	**11.7%**

4.3.4 The percentages of each vehicle type and Euro standard shown in Table 4.2 were utilised by SEPA for the air quality modelling and in the Paramics traffic modelling undertaken by SYSTRA. Under the assumption that the ANPR survey results are representative of all traffic in Dundee, the ANPR proportions and the outputs from the Paramics traffic models can be used to infer the total number of non-compliant vehicles that enter the LEZ area each day. Using the Dundee City traffic model, the total number of vehicles entering and exiting the LEZ area (Figure 4.7) was calculated and factored to 24 hours (using SEPA's EMIT factor). This was then multiplied by the non-compliant proportions in Table 4.2 to give the total number of non-compliant vehicles to be impacted by the LEZ over a 24 hour period (based on 2018 data), as shown in Table 4.3.

4.3.5 It should be note that the figures presented in Table 4.3 represent only one day and on another day a number of these vehicles will be the same while others will be different (i.e. a driver/vehicle that enters daily and a driver/vehicle that enters once a year). Using the data available, an estimate of the total daily number is presented only, with no data available to allow a more statistically robust estimation of the number of vehicles impacted in total during the lifetime of the LEZ

Table 4.3 : Number of non-compliant vehicles entering the LEZ area in 2018

Euro Standard	Car (Petrol)	Car (Diesel)	LGV (Petrol)	LGV (Diesel)	HGV	Bus
Euro 1	10	0	0	0	0	10
Euro 2	80	10	0	0	0	60
Euro 3	500	300	0	90	10	300
Euro 4	-	1300	-	250	30	400
Euro 5	-	3000	-	700	90	800
Total non-compliant	**590**	**4610**	**0**	**1040**	**130**	**1570**

4.3.6 The number of non-compliant vehicles entering the LEZ area, as derived from 2018 traffic survey data and subsequent traffic modelling, is shown in Table 4.3. The LEZ in Dundee will be enforced in 2024 and to estimate the total number of non-compliant vehicles in 2024 from the 2018 survey data, vehicle fleet composition projections from the National Atmospheric Emissions Inventory (2018) (NAEI) were utilised. These forecasts could be

seen as too optimistic in terms of natural turnover of vehicles and therefore are potentially underestimating the impact of a LEZ. The forecast are UK-wide and perhaps not strictly representative of Dundee's vehicle fleet projections. They also do not take into account factors such as Brexit or the Covid-19 pandemic which potentially negatively impact incomes and therefore reduce the natural turnover of vehicles. However, the expected impact on non-compliant vehicles and drivers outlined below is considered the same in 2018 and 2024 and therefore the analysis is considered to hold true no matter the actual number of non-compliant vehicles in 2024 (i.e. somewhere between 2018 and 2024 figures).

4.3.7 The forecast number of vehicles impacted by the LEZ in 2024, based on NAEI forecasts, is shown in Table 4.4.

Table 4.4 : Projected number of non-compliant vehicles entering the LEZ area in 2024

Euro Standard	Car (Petrol)	Car (diesel)	LGV (Petrol)	LGV (diesel)	HGV	Bus
Euro 1	0	0	0	0	0	0
Euro 2	0	0	0	0	0	0
Euro 3	0	0	0	10	0	50
Euro 4	-	200	-	50	0	80
Euro 5	-	1300	-	250	10	220
Total non-compliant	**0**	**1500**	**0**	**310**	**10**	**350**

4.3.8 While a number of cities in England have introduced Clean Air Zones (CAZ), LEZs in Scotland have yet to be introduced for general traffic to date (Glasgow introduced a phased bus only LEZ in 2018). As such there is little evidence available to inform the likely behavioural response to the introduction of a LEZ in Dundee with its associated penalty charge enforcement. However, the extensive consultation exercises, as detailed in Chapter 2, alongside the existing Dundee road network and proposed LEZ area, do allow for a number of informed assumptions to be made as to the likely response to the introduction of the LEZ and the resultant impacts on drivers of non-compliant vehicles.

4.3.9 The NAEI forecasts there to be approximately 1500 non-compliant cars (approximately 12% of all trips) that would still be entering/exiting the inner ring road area on a daily basis in 2024. With the LEZ in place, these vehicles can no longer enter without penalty. The city centre and LEZ area is considered a destination or origin for vehicles and is not a through route for vehicles (i.e. journeys that have a start and end outside the city centre will not route through the LEZ and instead use the inner ring road on the periphery of the LEZ boundary). This is considered true with and without a LEZ in place. The non-compliant cars that will be impacted by the LEZ are assumed to be entering the city centre for a purpose (e.g. shopping, business, leisure or housing) and without a LEZ these trips would park at a location in the city centre. With the exception of residents, it is assumed that all other trip purposes by non-compliant vehicles would continue but instead of parking inside the LEZ, the drivers would choose to park on the edge of the zone. It is considered unlikely that the introduction of the LEZ will result in owners of non-compliant vehicles upgrading their vehicle (at significant cost) rather than switching to park at one of the car parks on the periphery (at the same cost as current parking). Car park analysis in the NLEF Stage 2 Report showed there to be sufficient parking availability at the multi-story car parks of Bell Street, West Marketgait NCP and Wellgate centre excluded from the final LEZ area alongside the provision of further car parking at Greenmarket and Olympia car parks, with all car parks shown to be within a 10 minute walk to the centre of city.

4.3.10 The above assumption of non-compliant driver behaviour does not hold true for existing "pass-by" trips to city centre businesses. Of the 1500 non-compliant cars there is no data on the number of trips that enter the LEZ area for a short period to access a service (e.g. a shop or café). Such trips, by a non-compliant vehicle, would be expected to be lost if this was their only purpose in visiting the LEZ area, having a negative effect on the incomes of small business. However, it again must be noted that non-compliant cars are expected to make up approximately 12% of all daily trips in the city. A smaller proportion of these would be purely "pass-by" trips and therefore the overall impact is anticipated to be small, relative to the income of each business.

4.3.11 As noted in Chapter 2, vehicles for disabled drivers and passengers are exempt from enforcement in Dundee LEZ and therefore any non-compliant vehicles used by this group will be unaffected and can drive and park as they do now. This includes continued access to West Marketgait NCP car park and the shop mobility service located here.

4.3.12 Residents of an address registered in the LEZ area are assumed to require the same level of vehicles access to their properties as they do now. Resident parking permits are in operation inside the proposed LEZ area and DCC issued 356 city centre parking permits in year to 31 March 2021. Utilising the NAEI forecasts, in 2024 it is expected that approximately 40 permits issued will be to non-compliant cars. What is not known is the behavioural change from owners of non-compliant vehicles. Those that can afford to do so may choose to upgrade to a compliant vehicle. Those that cannot afford to do so can utilise their existing City Centre permit to park at locations outside the LEZ area (but inside the permit boundary) at no extra cost but with the inconvenience of not being able to access their vehicle directly from their property. As with all owners of non-compliant vehicles, there is the opportunity to utilise funding to assist with obtaining a compliant mode of transport, and this is discussed in Chapter 0.

4.3.13 The NAEI forecasts only approximately 10 non-compliant HGVs would enter the city centre area daily in 2024, compared to approximately 130 non-compliant HGVs in 2018. While the forecast may be considered low, almost negligible, this is consistent with information obtained from the stakeholder engagement with freight operators. It was noted that with the proposed enforcement date of 30th May 2024, Euro VI (compliant) vehicles will naturally make up most of the HGV fleet through current replacement cycles and have become "standard" fleet for many operators in and around Dundee. The economic "life" for a HGV is approximately 7 or 8 years, after which they become too expensive to maintain and operate. In 2024, a Euro VI will have been the emission standard for 11 years meaning the majority of HGVs will be of this standard or above and therefore the impact on HGV operators is considered minimal.

4.3.14 The NAEI forecasts there to be approximately 350 non-compliant buses operating in the city in 2024. However, the forecasts do of course not account for the introduction of the LEZ and the two main operators in Dundee, Xplore Dundee (McGill's) and Stagecoach are aware of the requirement to meet the LEZ emission standards by the end of the grace period. Both operators have made significant investment in recent years to upgrade their fleets and the introduction of the LEZ will require further significant investment to ensure their fleets are fully compliant. Both operators have indicated that they expect to meet the required standards for their respective fleets by 2024 but clearly the ongoing investment has been influenced by the LEZ proposals (that have been discussed in detail with them for a number of years). The financial outlay from the operators is offset somewhat by the Bus Emissions Abatement Retrofit (BEAR) programme, discussed in detail in Chapter 0.

4.3.15 The NAEI forecasts there to be approximately 310 non-compliant light goods vehicles (LGVs) entering the LEZ each day by 2024. LGVs generally provide a service (e.g. goods delivery to small businesses, delivery service to business and residents) and there will remain demand for this service provision. Larger logistics and courier providers (e.g. UPS who provided response to the consultation) are likely to have the ability to adjust services such that their compliant fleet operates in the LEZ with non-compliant vehicles deployed in areas with no LEZ. LEZ enforcement is more likely to impact smaller businesses who operate a small number of LGVs and don't have the option or ability to switch to a non-compliant vehicle. The LEZ Retrofit Fund provides micro-businesses with funding to replace their LGVs with a LEZ compliant mode of transport and will help lessen the financial burden on LGV drivers.

4.3.16 The taxi fleet operating in Dundee is predominately made up of cars, with no black cab or London Hackney type vehicles in operation, which can be eligible for retrofitting to the minimum LEZ emission standards. Taxis (cars) are likely to enter the LEZ area regularly, multiple times a day and like all vehicles will have to be compliant to avoid penalty. There were 714 registered taxi vehicles in Dundee in 2020 (Transport Scotland). As advised by DCC there is no vehicle age limit required to obtain a taxi licence so it is possible that some taxis may be non-compliant in 2024. However, engagement with taxi operators suggest that the majority of taxi operators and drivers lease or purchase their vehicles and are likely to be on a maximum finance/lease contract of 5 to 7 years, therefore projected taxi fleet

improvements will ensure most taxis will be compliant by 2024. Those operators and drivers of non-compliant vehicles can possibly make use of the micro-business funding, as detailed in Chapter 0.

4.3.17 Utilising NAEI projections, the total number of non-compliant vehicles that would be entering the city centre area can be estimated. With the LEZ in place, drivers of these vehicles will have to adjust their trips, stop making their journey or upgrade their vehicles. As explained above, it is anticipated that cars will generally adjust their journey end point and the cost to comply with the LEZ will be relatively similar to a city without a LEZ. HGVs and taxis are expected to naturally upgrade by 2024 such that the impact is minimal. Bus operators are currently upgrading their fleets in anticipation of the LEZ being introduced in 2024. This significant investment would occur naturally in time but is progressing at a quicker pace with the LEZ time-limited requirements for compliance. The investment by bus operators is offset to some degree with retrofit funding available. LGV users, particularly those driven by individuals or small businesses (rather than larger logistics companies) face the prospect of having to upgrade their vehicles to continue their business needs inside the LEZ. On the whole therefore, the total number of vehicles required to upgrade is anticipated to be small in comparisons to the total number of trips entering the LEZ on a daily basis.

4.4 Dundee city centre businesses and economy

4.4.2 To understand the potential impact on the economy and businesses in Dundee from the introduction of the LEZ, it is important to establish the existing economic picture in the city.

4.4.3 The most recent statistics available from Dundee City Council on local economy refer to the pre-Covid-19 period (up to 2019). Both Brexit and Covid-19 will have had impacts on Dundee's economy, but at this stage it is not possible to measure the impacts of these events. It should be noted the statistics on jobs and employee numbers are not granular enough to provide detailed information on the LEZ area alone and are for the full Dundee City area.

4.4.4 The total Gross Value Added (GVA) produced in the Tay Cities Region (numbers not available for LEZ area) in 2018 was £17,116m, an increase of 14.6% in 10 years (ONS).

4.4.5 Employee numbers in Dundee increased by 2.7% between 2015 and 2018 with 76,000 employee jobs in the city. In 2019, Dundee's employment rate was 65% and while this was the second lowest employment rate of UK cities, it represented an increase of 0.9% on 2018. Unemployment fell to 5.5% in 2020, reducing from 9.1% in 2016 (DCC).

4.4.6 The Dundee City region has approximately 3,300 enterprises located within its boundary, with 83% of them having fewer than 10 employees (Nomis), with the number of enterprises by size in Dundee shown in Table 4.5.

Table 4.5 : Number of enterprises by size in Dundee

Size	Micro (0 to 9)	Small (10 to 49)	Medium (50 to 249)	Large (250+)	Total
Number of Companies	2,810	475	75	20	3,380

4.4.7 The sectors with the highest employee jobs are:

- Human health and social work (17,000 employees)
- Wholesale and retail (11,000 employees)
- Education (9,000 employees)
- Accommodation and food services activities (8,000 employees)

4.4.8 The introduction of an LEZ will create an additional cost to businesses that do not use compliant vehicles. Sectors that are most dependent on LGVs such as the construction, wholesale and retail trade, accommodation and food service activities, and transportation and storage may be impacted by the requirement to comply with LEZ regulations. There

are around 1,380 business in Dundee that fall within these sectors. Figure 4.7 shows the employment size band of such industries in 2020. It is apparent that most of the enterprises have 0 to 49 employees and it is typically this size of company that will have the most difficulty in upgrading their vehicles to become LEZ compliant.

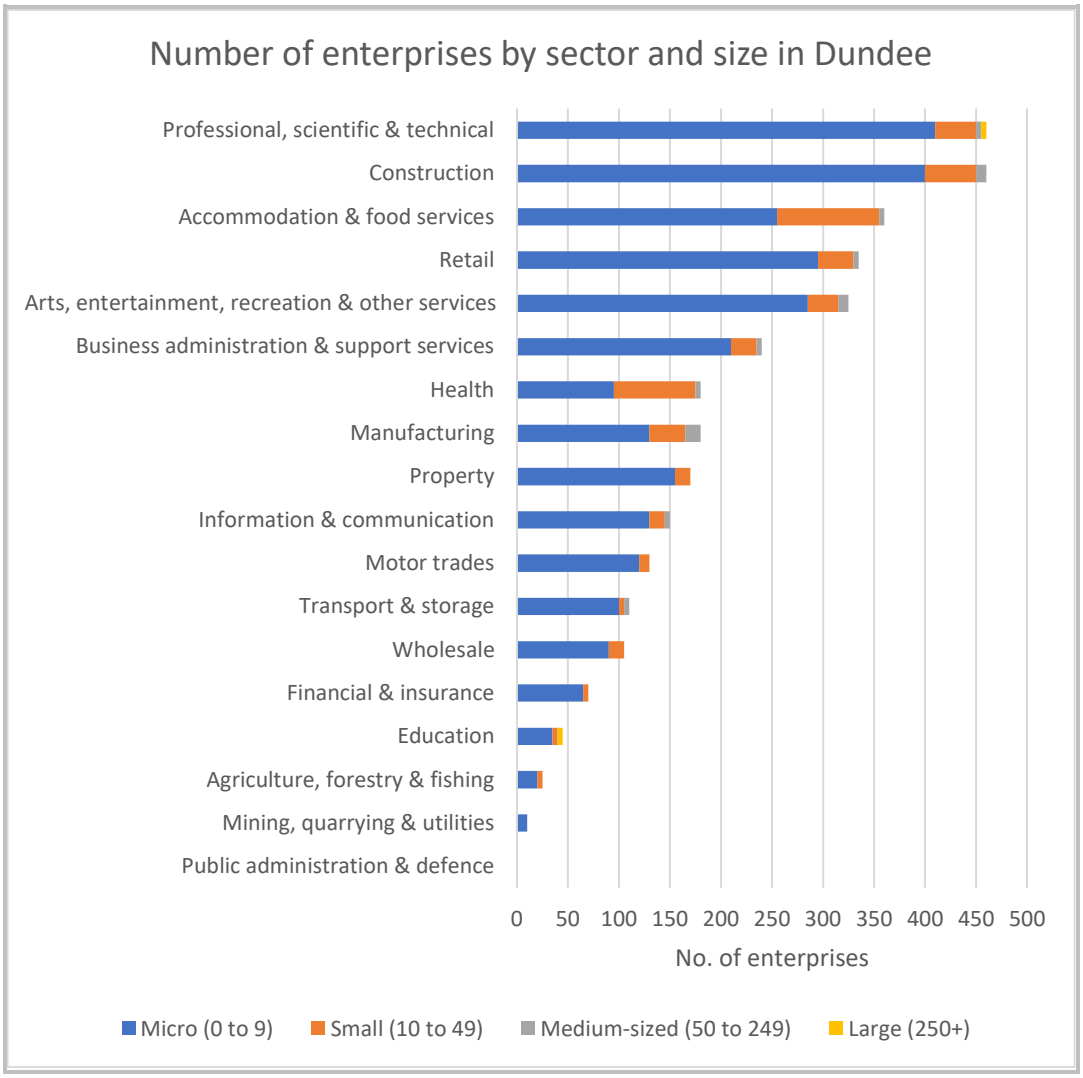

Figure 4.4 : Number of Enterprises by sector and size in Dundee (2020 Nomis)

Business and Regulatory Impact Assessment

4.4.9 In line with the LEZ Guidance, the proposed LEZ scheme can be subject to a Business and Regulatory Impact Assessment (BRIA), if required. A BRIA is used to assess the cost and benefits to businesses and the third sector of any proposed legislation or regulation, with the goal of using evidence to identify the proposal that best achieves policy objectives while minimising costs and burdens as much as possible.

4.4.10 The content and detail in a BRIA is predominately encompassed by this IIA and therefore a BRIA is not undertaken, in line with the approach taken by the other cities introducing a LEZ.

4.5 Anticipated Improvements to Air Quality and the Environment

4.5.2 According to Public Health England, poor air quality is the largest environmental risk to public health in the UK, as long-term exposure to air pollution can cause chronic conditions such as cardiovascular and respiratory diseases as well as lung cancer, leading to reduced life expectancy.

4.5.3 Although long term exposure to air pollution can affect all members of society, some groups are more vulnerable to the effects of air pollution because of their age (children and older people are at increased risk), existing medical conditions and/or health determining behaviours. Areas of high deprivation are also associated with poorer air quality and the health impacts of poor air quality compound pre-existing health inequalities.

4.5.4 A primary objective of the LEZ is to improve air quality. To understand the benefits of the LEZ to the local population, existing air quality levels and predicted air quality improvements have been assessed throughout the NLEF process, utilising SEPA's National Modelling Framework (NMF) Dundee City Air Quality Model.

Existing Air Quality in Dundee

4.5.5 In 2006 DCC declared the whole of the local authority area as an Air Quality Management Area (AQMA) for the NO_2 annual mean objective and published an Air Quality Action Plan (AQAP) in January 2011. Air quality in Dundee is generally good but despite improvements in air quality since the introduction of the AQAP, there remain several locations in the AQMA where exceedances of emissions exist and where the AQS are not being met. The number of exceedances of the NO_2 annual mean objective has decreased from 16 in 2018 to 10 in 2019. The introduction of the LEZ will aim to accelerate the continued improvements to air quality in the city.

4.5.6 DCC are required to report on observed air quality in the city on an annual basis and the 2020 Air Quality Annual Progress Report provides the full ratified and adjusted 2019 air quality dataset. Detailed analysis of air quality in Dundee is reported in the NLEF Stage 1 Report (*Dundee Low Emission Zone, National Low Emission Framework Stage 1 Report, SYSTRA 2019*). In total, there were 11 locations where annual mean concentrations of NO_2 exceed the AQO of 40 µg/m^3 (maximum legal limit) and a further 12 sites where annual mean concentrations of NO_2 exceed 36 µg/m^3 (within 10% of maximum legal limit) The primary exceedance locations of NO_2 are shown to be on or inside the inner ring road area of the city centre and on the Lochee Road corridor and these are shown in Figure 4.5.

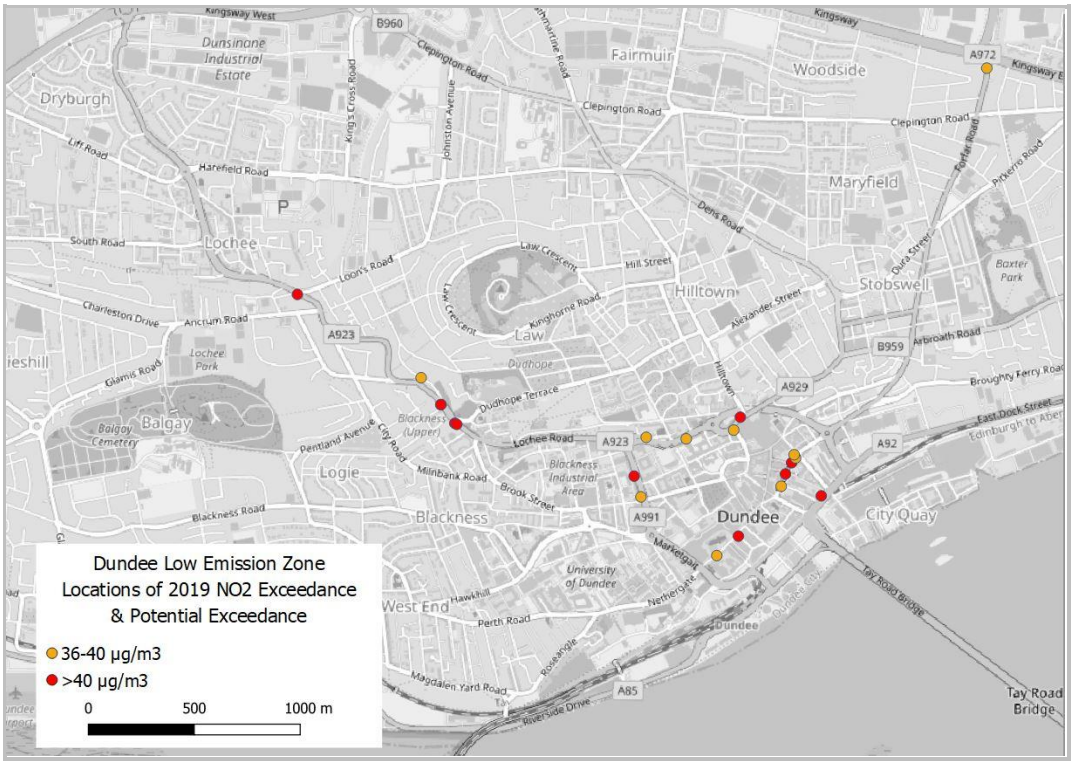

Figure 4.5 : 2019 Annual Mean Concentrations of NO_2 greater than 36 µg/m3

4.5.7 The 2021 Air Quality Annual Progress Report provides the full ratified and adjusted 2020 air quality dataset. This dataset contains observed data captured during the Coivd-19 pandemic and is not considered representative of the yearly trend in pollution levels up to

and including 2019. The 2019 dataset has therefore been used in the NLEF appraisal and option development process.

Air Quality Modelling

4.5.8 Air quality modelling has been undertaken by SEPA through the National Modelling Framework (NMF) in support of the Scottish Government's Cleaner Air for Scotland Strategy (CAFS). CAFS set a commitment to develop a NMF to provide a standardised approach to modelling air quality to support the consideration of LEZs in Scotland. The NMF ensures that the analysis and generation of evidence to support decision-making in the LEZ development process is consistent across all local authorities. Output from the NMF Dundee City Air Quality Model (SEPA) has informed the LEZ option development and appraisal process and ensured the LEZ delivers the expected improvements to air quality.

4.5.9 Chapter 5 of the second interim NLEF Stage 2 Report details how the NMF was utilised in the option development process, informing the size and vehicle scope of the LEZ. The conclusions from the initial NMF assessment helped identify the LEZ options for the first round of public and stakeholder consultation and detailed traffic model testing, as outlined in Chapter 2 above.

4.5.10 Upon identification of the final preferred LEZ scheme for Dundee, the NMF assessed the preferred scheme to identify the impact of the LEZ on air quality, with full outcomes provided in SEPA's *Cleaner Air for Scotland – National Modelling Framework – Low Emission Zone Dundee Evidence Report (SEPA, September 2021).* The key outcomes from the air quality modelling of Dundee's proposed LEZ are:

- Modelling identified that the highest concentrations of annual-average NO2 occurred in the City Centre where vehicle emissions were dominated by buses, whilst diesel car emissions dominated other key routes around the city.
- Traffic model outputs indicated relatively low levels of displacement due to the LEZ in operation, with the inner ring road experiencing a small increase in car flow, whilst there are general reductions within the LEZ area.
- Emissions analysis identified that key bus routes inside the LEZ boundary will experience the largest reductions in NOx emissions by an average of 70%, whilst emissions on Lochee Road will reduce by an average of 20%.
- Air quality model results indicate that existing exceedances inside the LEZ (for the base year of 2017) would all be removed following LEZ implementation.
- Localised exceedances may remain on Dock Street, despite a small decrease in NO2 concentrations due to the LEZ.
- There is a small decrease in NO2 concentrations along Lochee Road and Logie Street, including at locations where NO2 exceedances were observed in 2019.
- The LEZ is expected to lead to substantial reductions in tailpipe emissions of PM10, most notably on bus routes inside the LEZ.

4.5.11 The NMF confirms there is a large reduction in emissions and roadside concentration of NO2 inside the LEZ area, where all modelled levels drop below the legal requirement of 40 µg/m^3. The predicted changes to NO2 concentrations in Dundee city centre are shown in Figure 4.6 and Figure 4.7.

Figure 4.6 : NO2 Concentrations in Dundee city centre without LEZ

Figure 4.7 : NO2 Concentrations in Dundee city centre with proposed LEZ

4.5.12 The Committee on the Medical Effects of Air Pollutants (COMEAP) has established that short-term exposure to NO2 , particularly at high concentrations, is a respiratory irritant that can cause inflammation of the airways leading to, for example, cough, production of mucus and shortness of breath. Public Health England detail epidemiological studies that have also shown associations of outdoor NO2 with adverse effects on health, including reduced life expectancy.

4.5.13 The LEZ stops the most polluting vehicles from operating within the city centre of Dundee with the NMF concluding that this will reduce emissions and improve air quality. These improvements to air quality will in turn have a positive effect on health of those who visit the city and in particular those most at risk of respiratory illness including older people/pensioners and children (including unborn children). This improvement to air quality is the most significant positive impact of the LEZ and will have health and wellbeing benefits for residents, workers, and visitors to the city.

4.5.14 The NMF also concludes that the LEZ provides improvements to emissions and air quality city-wide as cleaner vehicles travel to/from the LEZ area. This is particularly noticeable on those routes served by buses, where compliance of the bus fleet to enter the LEZ area results in cleaner buses serving the entire city. This impact shows the LEZ to have wider benefits to all of Dundee's population.

4.5.15 Lochee Road is a key traffic corridor with existing exceedances in NO2 concentrations (in 2019, pre-Covid-19 traffic levels). NMF emissions analysis has shown that NOx emissions reduce by approximately 20% on the Lochee Road corridor, resulting in a fall in NO2 of approximately 1.5 to 2 $\mu g/m^3$. While this reduction is not enough in itself for NO2 concentrations to fall below to 40 $\mu g/m^3$ (of 2019 levels), it does represent an improvement to air quality. The potential for future NO2 exceedances along Lochee Road will depend partly on the extent to which traffic levels return to pre-COVID levels and the planned improvement works to the corridor.

4.5.16 The NMF also examined the predicted changes to PM10 emissions resulting from the introduction of the LEZ. Particulate matter (PM) is a generic term used to describe a complex mixture of solid and liquid particles of varying size, shape, and composition. According to Public Health England, there is an extensive body of evidence that long-term exposure to PM increases mortality and morbidity from cardiovascular and respiratory diseases. Outdoor air pollution, particularly PM, has also been classified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans (a Group 1 carcinogen) and a cause of lung cancer. The NMF concludes there are large reductions in PM10 tailpipe emissions as a result of implementing the LEZ with the largest reductions occurring inside the LEZ. While the NMF has not predicted the resulting reductions in concentrations of PM10, it is clear that any reduction in PM10 will bring health improvements to those regularly exposed and again in particular those vulnerable to the effects of poor air quality.

4.6 Differential Impacts by Population Groups

4.6.2 Using the sources of information and the analysis of the available data identified above, the impact of the proposed LEZ on the different IIA affected groups outlined in the IIA Guidance is undertaken below in Table 4.6.

Table 4.6 : Impacts by Population Group

Type	Evidence Used
People with protected characteristics	
Older people and people in their middle years	Dundee's population is generally comparable to the rest of Scotland. In Dundee City, 17% of people is aged 65 years or older, compared to the 19% of the whole country. However, median age of the city population is getting younger and the Maryfield Ward (containing the LEZ) has a lower share of over 65s, with 13% aged 65 or over Older people (residents and visitors) and people in their middle years will benefit from the reduction in emissions and the improved air quality in the city centre following the introduction of the LEZ, particularly those suffering with respiratory illnesses.
Young people and children	9% of residents in Maryfield Ward are aged below 16 years old. Young people and children are one of the categories that will benefit differentially from the air quality improvement that the LEZ will bring, particularly those with respiratory illnesses. This benefit will be perceived not only by residents, but also by young people and children visiting the city centre, e.g. students, pupils attending the High School of Dundee within the LEZ, and nursery children
Men (including trans men), Women (including trans women) and Non-binary people (Include issues relating to pregnancy and maternity including same sex parents)	Health benefits related to improved air quality are applicable to all people living, working, or visiting the LEZ particularly those who suffer from respiratory illnesses.
Minority ethnic people (includes Gypsy/Travellers, migrant workers, non-English speakers)	According to Census 2011 data, within the LEZ, 15% of people identify as non-white, with the largest communities identifying as Asian, Asian Scottish, or Asian British. Some minority ethnic people, particularly non-English speakers, may struggle to be aware of the introduction of the LEZ. If they travel within the city centre with a non-compliant vehicle, they may incur fines and subsequently face financial issues. Awareness campaigns with ethic groups should form part of the mitigation, discussed in later chapters.

	The equality evidence finder provides data at national level and suggests the minority ethnic groups are more likely to be in poverty compared to white-British. For example, 31% of 'Asian or Asian British' ethnic groups were in relative poverty before housing costs compared to 16% of 'White - British' people. This may limit their ability to comply with the LEZ requirements.
Disabled people (includes physical disability, learning disability, sensory impairment, long-term medical conditions, mental health problems)	26% of respondents to the Dundee Citizen Survey 2019 said that they (or someone in their household) had a long-term illness, health problem or disability which limits their daily activities or the work they can do, increased from 18% in 2016 to 2018. According to Census 2011 data, 9% of respondents living in the LEZ residents (either with partial or full census area inside the LEZ) had a disability limiting their day-to-day activities. DCC has issued blue badges to 6,035 people in Dundee (about 4% of the population). No detailed information is available on their home locations. In line with the LEZ Regulations, there is expected to be a limited direct impact from the introduction of the LEZ on blue badge holders or owners of vehicles for disable people, as these user categories will be exempt from the LEZ requirements. Disabled people are also entitled to free bus travel in Scotland. Impacts experienced by those providing care support for vulnerable people may adversely affect those receiving care, for example, if the cost of care is increased. Carers who own a non-compliant vehicle and cannot afford to upgrade it may have to increase the cost or reduce the quantity of the care they provide, to offset the charge, where this is not paid by their employer.
Refugees and asylum seekers	The Scottish Refugee Council Dundee Office is located within the LEZ boundary. Refugees and asylum seekers are likely to have very low income levels and will be negatively impacted if any vehicles that they have access to are non-compliant. Private vehicle ownership of this specific population group is likely to be significantly lower than for the population as a whole and this will reduce the impact on this group.
People with different religions or beliefs (includes people with no religion or belief)	There are several locations for religious congregation and places of worship in the city centre. These include: St. Andrews Parish Church, Central Baptist Church, Dundee Congregational Church, Mosaic Church, Meadowside St Paul's Church, Christ Apostolic Church House of Dundee. Dundee Central Mosque, Dundee Islamic Society, Dundee Synagogue and Guru Nanak Gurdwara and other places of worship are located outside the LEZ area. People relying on non-compliant cars and that are not able to change their vehicle may find it more difficult to access these locations, with the potential for negative impacts on their wellbeing. It is noted however that, these vehicles would pay for parking before the LEZ and will still have the opportunity to park on the periphery of the LEZ area.

Lesbian, gay, bisexual, and heterosexual people	Local data on sexual orientation are not available, but at national level, 2% of adults identified as Lesbian, Gay, and Bi-sexual and Other, 3% do not know or refused to answer It is unknown if people of non-heterosexual orientation are potentially more likely to use their own cars to go to the city centre due to concerns over their personal security using public transport. Of these, some may be using a non-compliant vehicle. This issue may be relevant particularly for trips done at night-time.
People who are unmarried, married or in a civil partnership	No readily identified impacts.
Those vulnerable to falling into poverty	
Unemployed	Due to lower income, these groups are less able to upgrade a non-compliant vehicle. They may experience a potentially negative impact on their ability to take up a job within the LEZ if they do not have easy access to affordable public transport or active travel alternatives. Unemployed and people on benefits are less likely to have access to a car, due to low income. The Dundee Citizen Survey 2019 reports 94% of residents had a bus stop within a 5-minute walk from their home. Nearly one quarter (23%) of respondents who walk as their main mode of transport said affordability was a barrier and more than one fifth of respondents who receive full welfare benefits (22%) said affordability was a barrier to using public transport. It is noted in the mitigation chapter the availability of funding for those on low income and benefits
People on benefits	
Single parents	Due to a potential lower income, single parents who own a non-compliant vehicle may have difficulties in upgrading it and as a result potentially have reduced access to formal and informal childcare within the LEZ.
Vulnerable families e.g. young mothers, people experiencing domestic abuse, children at risk	Potentially lower access to nurseries and support groups within the LEZ (e.g. Dundee Women's Aid office is located in the city centre) if they do not have access to a compliant vehicle, public transport, or active travel alternative.
Pensioners	The share of older people within the LEZ is lower compared to Dundee City and the Scottish average. Pensioners who own a non-compliant vehicle, may face financial constraints upgrading it. Nevertheless, people over 60 are eligible to receive free bus passes and may have a higher propensity to modal shift. Older people are also less likely to drive every day and less likely to hold a driving license than average (Equality Evidence Finder) and the Dundee Citizen Survey showed younger respondents aged 16-34 were significantly more likely to visit Dundee City Centre more than once a week (35%) or at least once a week (29%) than respondents aged 65 and over (8% and 16% respectively).

Looked after children and young people	The Dundee City Council Fostering and Adoption Office is located outside the LEZ area however there are a number of non-profit support services inside the LEZ area, such as Home-Start Dundee and Who Cares? Scotland. There is a potential risk of lower access to such services for visitors and staff if they do not have access to a compliant vehicle, public transport, or active travel alternatives. Care leavers have a higher risk of lower incomes which could hinder them from travelling within the LEZ if they do not have access to public transport or active travel alternatives and are currently using a non-compliant vehicle to access the city centre.
Those leaving care settings (including children and young people and those with illness)	
Homeless People	DCCs Homeless Services Unit is based at the East District Housing Office outside the LEZ area. Several non-profit organisations providing support to homeless people, such a Shelter, are located in the LEZ area and homeless people may be indirectly impacted if volunteers do not have access to a compliant vehicle, public transport, or active travel alternatives
Carers (including young carers and carers with protected characteristics)	Carers who own a non-compliant vehicle and cannot afford to upgrade it may have to reduce the quantity or increase the cost of the care they provide to those inside the LEZ
Those involved in the criminal justice system	Dundee Sheriff Court and Justice of the Peace Court is located within the LEZ boundary. There is a potential risk of lower access for visitors and staff if they do not have access to a compliant vehicle, public transport or active travel alternatives. It is noted however that there are several parking options outside the LEZ located close to the court. In addition, there may be a possible issue in relation to the transport of prisoners but no data is available for this.
Those living in the most deprived communities	People living in more deprived communities may be more affected by the introduction of the LEZ as they are likely to have a larger financial challenge in upgrading any non-compliant vehicles that they use. 6 SIMD zones have been identified within the LEZ border (either fully or partially). According to the latest available data (SIMD 2020), one area is in the most deprived decile and two are in the most deprived quintile of the whole country. Dundee City is split into 188 SIMD data zones. The SIMD 2020 reported that 54,497 (36.6%) people in Dundee City live in a data zone ranked within the 20% most deprived and that 70 of Dundee City's 188 data zones were ranked in the 20% most deprived in Scotland. People living in the most deprived areas are more likely to have a non-compliant vehicle and to have difficulties in upgrading it. However as noted, those that do currently use a non-compliant vehicle to enter the city centre will be able to park on the periphery of the LEZ area.

People with low literacy/ numeracy	Non-English speakers or people with low literacy/numeracy, may not be aware of the introduction of the LEZ. If they travel within the city centre with a non-compliant vehicle, they may incur in fines and financial issues.
People misusing substances	Potentially lower access to support groups within the LEZ if they do not have access to a compliant vehicle, public transport, or active travel alternative.
Others e.g. veterans and students	Abertay University is located inside the LEZ area and the University of Dundee is located immediately outside the LEZ area. Students may see a reduction in access if they rely on a non-compliant vehicle and are unable to transfer to active or public transport modes however students are less likely to own a car compared to other population groups. The number of total students at Abertay University and The University of Dundee in the academic year 2017/218 was approximately 4,000 and 15,000 respectively. This number includes 600 and 2,000 non-UK domiciled students, that are even less likely to own a car. Veteran support services (e.g. The Scottish Veterans Housing Association and Veterans First Point) are located outside the LEZ and access to such services is maintained.
Geographical Communities	
• Rural/ semi-rural communities • Urban communities • Coastal communities • Business community	Dundee is a local economic hub for neighbouring populations from Perth and Kinross Council, Angus Council and Fife Council, as well as the with Dundee City boundary. Those from surrounding rural/semi-rural communities may regularly visit the city for leisure, work or study. These communities may be adversely affected by the LEZ due to being forced to upgrade due to lack of viable alternative modes of transport caused by their location. As noted however, it is anticipated that the availability of parking will be sufficient for non-compliant cars to allow continued access to Dundee and current provision of bus services is not expected to change as a result of the LEZ introduction.
Employees	
• Full-time • Part-time • Shift workers	Shift workers with a non-compliant vehicle will have less public transport alternatives, particularly at night, to commute to/from the LEZ. This will result in potential issues in keeping or finding a job in the city centre for specific employee categories (e.g. people working in nightclubs and bars, receptionists, people working in emergency services, cleaners etc). The provision of parking on the periphery of the LEZ area may not be perceived as suitable or as safe as parking closer to their place of work

5 IMPACT BY IIA OBJECTIVES

5.1 Introduction

5.1.1 This section presents impacts arising from the introduction and operation of the preferred LEZ in Dundee. Table 5.1 details the positive and negative impacts resulting from the introduction of the LEZ on the three IIA objectives of Economy, Environment and Equality and Human Rights. These impacts represent disproportionate effects on various population groups which were identified through direct engagement, examination of survey results, research and analysis of existing datasets (see Chapter 4 for more detail).

Table 5.1 : Summary of IIA Impacts

#	Impact	Description	Differentially affected populations*	Boundary Impact differentiators / Geographical implications
IIA Objective - Equality and human rights				
1	Positive health impact	The LEZ will discourage the most polluting vehicles from operating within the city centre of Dundee. This will reduce emissions and improve air quality and in turn have a positive effect on health of those most at risk of respiratory illness including older people/pensioners and children (including unborn children). Modelling has shown that some benefits will be felt city-wide as cleaner vehicles travel to/from the LEZ area. This is the most significant positive impact of the LEZ and will have health and wellbeing benefits for residents, workers, and visitors to the city	Children, pregnant women, disabled people and older people/pensioners.	The city centre has some of the highest air pollution concentrations and is the focussed area of the LEZ therefore most benefit will be observed in this area. City wide air pollution concentrations also will improve due to the required compliance of the city bus fleets. Positive health impacts will be felt by residents, workers and visitors. SEPA's NMF modelling concludes that all air quality exceedances will fall within legal limits inside the LEZ area. Levels outside the LEZ area will also fall (due to improved bus fleets) and it is possible planned complimentary traffic management proposals will further reduce the emissions levels.
*affected populations: population groups mentioned in methodology section				
2	Positive health impact	The LEZ (and complimentary traffic management measures on key corridors in Dundee) may encourage some modal shift from cars to public transport and active travel which will have a positive impact on health. Any reduction in private car trips will result in further improvements to air quality	Children, pregnant women, disabled people and older people/pensioners.	It is anticipated that any shift to sustainable modes of transport is likely to be city wide, particularly on key corridors with improved bus fleets and/or improved active travel links. Active travel uptake may also increase with, both city wide and inside the LEZ as a result of improved air quality

3	Reduction in access	Bus operators may increase the price of fares as a result of the increased costs to their operations arising from the need to replace or upgrade buses, to ensure compliance with the LEZ regulation. For some bus passengers the increase in price may make the journey unaffordable and result in them foregoing their journey. This may affect people's ability to engage in activities or will struggle to reallocate their required services which in turn will affect their wellbeing/social activity. ***Mitigation:*** *This effect will not be applicable to holders of free travel passes including older people/pensioners, disabled and subsidised travel; therefore, the effect on most of the affected population will be mitigated.*	Unemployed, people on benefits, single parents, homeless people, carers, part-time workers, students, staff vulnerable to falling into poverty	The effect of bus fare increase would be felt city-wide. NLEF appraisal notes that all bus services that operate in the city, enter the LEZ area for part of their routes, therefore all city bus services must be compliant to continue operating in the city. It is the nature of the operators in the city that fare increase would be across all services, not targets on services that enter the LEZ (as noted, this is all services)
4	Reduction in access	Bus operators may remove non-profitable routes in response to LEZ related costs to upgrade fleet. Communication with bus operators suggest this to be an unlikely consequence of the LEZ introduction and more likely is a time-limited reduction in services when there is an incident or breakdown (with lack of compliant replacement vehicles)	Unemployed, older people/pensioners, disabled people, carers, pregnant women, rural/semi-rural communities	Any service reduction has the potential to impact all areas of the city, depending on the particular routes or areas targets.
5	Negative financial impact	Impacts on non-English speaking residents or visitors of the city, potentially due to low awareness of LEZ being in place. Possibly non-English speaking populations from low income households with a non-compliant vehicle may enter LEZ by mistake and enter into financial difficulty due to the fine incurred and an inability to pay. ***Mitigation:*** *Impact could be mitigated by providing clear communications around the LEZ implementation across different media and in a range of languages used by communities in Dundee*	Low income householders, minority ethnic people (including non-English speakers).	This impact may be felt city-wide as people travel to the city centre

6	Reduction in access and quality of care reduction	The LEZ Regulations indicate that disabled tax class and Blue Badge holders are exempt from penalty enforcements of the LEZ and this will lessen the impact on non-compliant vehicles used by this population group. People with a disability who do not use public transport who own a non-compliant vehicle and cannot afford to upgrade, may choose to forego their journey into the city centre if they do not meet the exemption requirements, adversely affect their opportunity to access services and having a negative impact on their social activity. The LEZ will also impact non-compliant minibuses providing community transport services (care providers, youth groups, school groups, elderly care providers) which may not meet exemption criteria. Any impacts experienced by those providing care support for vulnerable people may also adversely affect those receiving care, for example, if the cost of care is increased. Carers who own a non-compliant vehicle and cannot afford to upgrade may have to reduce the quality and /or quantity of the care they provide. There is a particularly disproportionate impact on unpaid carers of family members, who not only experience a reduction in the care they can offer to others but may also suffer reductions in access for themselves and family members ***Mitigation:*** *Impact can be mitigated through the hardship fund, retrofitting, exemption for disabled tax class, Blue Badge holders and funding to support transfer of adaptive features onto LEZ compliant cars for those most affected.*	Disabled people and carers.	This will primarily impact those services and/or care provided in the city centre (LEZ) area. Services and care provided outside the LEZ will operate as they do now.

7	Reduction in access	People who use their own cars that are fitted with adaptive features (such as swivel chairs) to access community and leisure facilities within the City Centre may not be able to afford the cost of transferring the adaptive features onto LEZ compliant cars. This in turn potentially can adversely affect their social activity/ day to day activity. ***Mitigation** : disabled tax class and blue badge holders exempt from enforcement and this should minimise such an impact*	Disabled people and carers.	This will only impact those services and care provided/accessed in the city centre (LEZ) area. Services and care provided outside the LEZ will operate as they do now.
8	Reduction in provision of services	Community Transport Providers, usually LGV (minibuses), with non-compliant vehicles may shift services to areas outside LEZ. This has the potential to effect older people/pensioners, disabled people and children who are dependent on their service to undertake social activities related travel. However, the funding options available to upgrade their non-compliant fleet and grace period grace periods will mean vehicles 9 years old or newer are likely to be compliant and not face restriction from entering the LEZ. ***Mitigation** : Any identified source of funding for vehicle upgrades or retrofitting should be clearly communicated to Community Transport Providers: such as the Energy Savings Trust's Scottish Bus Abatement Retrofit Programme and Electric Vehicle Loans. DCC should also engage with Community Transport Providers to effectively communicate LEZ proposals and on potential impact to help them prepare better for the change.*	Older people/pensioners, children and disabled people.	This will only impact those services and care provided/accessed in the city centre (LEZ) area. Services and care provided outside the LEZ will operate as they do now.

9	Reduction in access	Community groups that engage with children, may use LGVs (such as minibuses) to transport children for various activities in city centre and or to access facilities in the City Centre. Given the city centre area covered by the LEZ, it is anticipated that such facilities are small in number. However, there is a potential that activities provided to these groups are restricted or increase in cost until vehicle is changed. However, as noted above, minimum grace periods will mean vehicles 9 years old or newer are likely to be compliant and not face restriction from entering the LEZ	Young people and children	This will only impact those services and care provided/accessed in the city centre (LEZ) area. Services and care provided outside the LEZ will operate as they do now.
10	Reduction in access to services and employment opportunities	There is a potential for people who currently use their own vehicles to access the city centre for employment or recreation to be negatively affected if they can no longer use their private vehicle for access. While switching to public transport may be viable for some it will not be for everyone. Some groups may perceive there to be personal security concerns with public transport. As a result, passengers may forego their journey into the City Centre, particularly at night time. ***Mitigation** : The LEZ makes available a number of parking locations on the periphery of the zone and make a viable alternative for many, though not all.*	Minority ethnic people, disabled people, Non-binary, Transgender, women, those involved in the criminal justice system, older people.	City-wide impact on those accessing the city centre
11	Reduction in access to services	There are several locations for religious congregation and places of worship that are located within the LEZ area. If most of the users live outside of the City Centre and are reliant on cars, their activity may be adversely affected if they have to forego their journey. As noted above however, the availability of parking on the periphery of the zone mitigates this impact somewhat	People of different religious belief/ faith	Only those services located in the LEZ area will be affected

12	Lack of access to affordable finance leading to disproportionate negative quality of life impact and reduction in access	Cost of replacing a vehicle with a compliant mode of transport will impose a greater burden on older people/pensioner, low income individuals and families for whom a vehicle is necessary due to the disproportionately large amount of income for an unexpected replacement. For example, a single parent may have a decreased earning potential compared to a two parent family. As noted in the IIA analysis, the number of private vehicle owners that will be required to upgrade is considered minimal. ***Mitigation*** *: Impact may be mitigated through the Funding opportunities for those on means tested benefits.*	Single parents, people on benefits, vulnerable families, older people/pensioners, carers, and students	Mainly impacts those who reside in the city centre LEZ area and cannot afford to replace their vehicle. Those who reside outside the LEZ will have restricted access but unlikely to change vehicle on accessibility grounds only with access to several car parks maintained.
IIA Objective - Environment and sustainability				
13	Positive effect on air quality	Implementing a LEZ is shown to bring air quality improvements and health & wellbeing improvements particularly those population groups which are most sensitive to poor air quality, notably those suffering from chronic respiratory illness, and young children.	Children, disabled people and pregnant women	Greatest impact inside the LEZ boundary but impacts also felt city-wide as improved bus fleet service full city area.
14	Positive effect on air quality and climatic factors	Air quality modelling has shown the LEZ will reduce pollution (NO2 and PM2.5/PM10) in Dundee and is also therefore likely generate a positive effect on reducing factors contributing to climate change through reduced greenhouse gas emissions	Individuals	As above

15	Positive effect on population and human health	The LEZ may promote sustainable forms of transport via modal shift from cars to buses, shared cars, bicycles or walking, which in turn will have positive impact on air quality. Dependent on what modes people shift to there may be positive effects on the health and well-being of people due to physical activity (cycling/ walking) and exposure to outdoor spaces.	Individuals	It is anticipated that any shift to sustainable modes of transport is likely to be city wide, particularly on key corridors with improved bus fleets and/or improved active travel links. Active travel uptake is also likely to increase with, both city wide and inside the LEZ as a result of improved air quality
16	Environment	Improvements to air quality could directly lead to improvements to physical environment and to places. This is outlined in the accompanying Strategic Environmental Assessment for Dundee	Children, disabled people and pregnant women	Greatest impact inside the LEZ boundary but impacts also felt city-wide as improved bus fleet service full city area, improving air quality along key bus routes
17	Water pollution	The introduction of a LEZ is not likely to significantly affect water.	-	-
18	Soil pollution	The introduction of a LEZ is not likely to significantly affect soil.	-	-
19	Noise Pollution	Reduced traffic flows directly from LEZ restrictions and possibly also caused by modal shift towards public transport and active travel, are likely to lead to a reduction in city centre background noise. Lower noise pollution is anticipated to have health and productivity benefits.	Urban communities, veterans, children and young people (including students)	Impact likely to be felt both inside the LEZ and throughout the city bus networks
20	Protection of Landscape/ Townscape	The introduction of the LEZ is not likely to significantly affect landscape. However, there may be minor improvement to townscape due to reduction in vehicles on the street. Where signage is required this needs to be sensitively located to avoid negative impact on key views and listed building setting.	Urban communities, children and students	Predominately inside the LEZ area

21	Protection of Cultural Heritage	Vehicle emissions contain various pollutants that can damage buildings including carbon dioxide (CO2) and sulphur and nitrogen oxides. The reduction of vehicle traffic in the city centre may help alleviate this problem.	Urban communities	Predominately inside the LEZ area
22	Nature Conservation	The introduction of the LEZ is not likely to significantly affect biodiversity, however there are potential benefits from a reduction in air pollution deposition on habitats through reduced traffic.	Urban communities	Predominately inside the LEZ area
23	Waste creation	A shift towards compliant vehicles may lead to redundant non-compliant vehicles being removed from the fleet. The scrappage of these surplus vehicles may cause environmental harm if not disposed of correctly (e.g. battery disposal).	Children, older people/pensioners and pregnant women	City-wide
24	Transmission of infectious disease	The potential modal shift from private vehicles to public transport could potentially increase disease transmission, particularly with uncertainty around the longevity of the COVID-19 impact. Increased public transport usage could increase the likelihood of transmission, potentially leading to an increase in contagion and a negative effect on city-wide health.	Older people and people in their middle years, those living in the most deprived communities, carers, disabled people, urban communities, minority ethnic people.	City-wide

IIA Objective - Economy				
25	Consumer welfare loss and asset value loss	A proportion of non-compliant vehicle owners may upgrade their vehicle although this is expected to be a small number in Dundee. Similarly, there may be some non-compliant vehicles that may be scrapped that otherwise would not have. These activities represent a form of consumer welfare loss or asset value loss. In Dundee, as noted in the IIA analysis the total number of non-compliant vehicles affected is anticipated to be small, relative to those vehicles whose owners change trip journey/destination.	Individuals and local economy	Any welfare or asset loss is likely to be city-wide.
26	Increased capital and operational expenditure, impacting upon services provided and scale of operation.	Some vehicle (especially bus, LGV and HGV) have relatively long turnover periods. The LEZ may require users to change their vehicles earlier than anticipated. The need to purchase compliant vehicles and sell/scrap their non-compliant vehicle means that the users will incur additional financial cost. Given the potential number of vehicles required to upgrade or alter behaviours, it is conceivable that some businesses may be forced to alter operations in order to comply. This could entail reducing services, cutting staff, or reducing training. As noted in the IIA analysis this impact differs depending on the size of business with smaller businesses less likely to be able to replace/redeploy non-compliant vehicles. ***Mitigation:*** *Micro-businesses can apply for funding through the LEZ Support Fund to assist with the costs of replacing non-compliant vehicles, lessening the financial burden on smaller businesses.*	Lower income community Groups Business communities Business communities' staff Urban communities Low income groups, Part-time workers	City-wide, though as noted in IIA analysis the total number of vehicles being replaced is anticipated to be relatively low

27	Potential economic activity increase	Increased economic activity for a number of sectors may occur but again in Dundee this impact may be minimal. Examples include Second hand car traders, vehicle scrappage, vehicle leasing operators, active-travel distributors/repairers, and public transport operators through increased patronage.	Business community	City-wide
28	Potential economic activity increase	Decreased traffic and cleaner atmosphere may lead to higher quality of public spaces in the city centre. This could lead to more opportunities for business and tourism to Dundee city centre as more people are attracted to a cleaner, more attractive city space.	Business community. People that work and visit areas within the LEZ boundaries, urban communities	Predominately inside the LEZ area
29	Re-distribution of business footfall	The cost incurred from entering or operating within the LEZ may cause changes in consumer travel patterns. Penalties implemented as part of the LEZ may deter those outside of the LEZ from entering the city centre, particularly for "pass-by" trips, potentially changing previously established shopping patterns. Consumers may choose to visit a store outside of the LEZ, rather than the store they previously visited inside the LEZ. This will have a negative impact on the footfall of businesses located within the LEZ, potentially causing the relocation of 'footloose' businesses to outside of the LEZ. ***Mitigation:*** *The final LEZ proposals allow for access to three city centre car parks on the periphery of the LEZ area, within short walking distance to core city centre businesses thereby limiting the impact of changes to*	Business community staff, staff vulnerable to falling into poverty, urban communities, rural/semi-rural communities	Both city centre and city-wide

30	Decreased labour market pool	Decreased access to the city centre due to the LEZ restricting entry to non-compliant cars may cause certain members of society (lower income households) to be dissuaded from applying for a job in the city. This may have a negative effect on the size and diversity of the potential workforce in Dundee. ***Mitigation:*** *As noted, the final LEZ proposals allow for access to three city centre car parks on the periphery of the LEZ area, within short walking distance to core city centre businesses thereby limiting the impact of access to employment. Without a LEZ, the same parking changes would apply* .	Business community and local economy	Both city centre and city-wide
31	Increased income inequality	People from low income households who use cars to visit the city centre for work on a regular basis may face financial difficulty to upgrade their vehicle, if they choose to do so. Income inequality may increase as those on low incomes may take on credit to pay for vehicle changes that they would not otherwise have purchased. Again, it is noted in the analysis it is likely individuals will adjust their trip patterns rather than purchase new vehicles and in Dundee this impact will likely be low. ***Mitigation*** *: Any impacts may be mitigated through LEZ Support Fund to help households with low income to afford an upgrade to a compliant vehicle or travel pass. Again, the availability of car parking on the periphery will mitigate against the need for many to upgrade their*	Lower income households, staff vulnerable of falling into poverty, business community staff	Both city centre and city-wide

32	Increased employment opportunities	The development of the retrofitting and Low Emission Vehicle (LEV) industries as a result of the LEZ may create employment opportunities throughout the supply chain. Jobs involving the manufacture, maintenance, and sales/operation of lease or rental vehicles could be created.	Unemployed, young people, students, shift workers, staff vulnerable to falling into poverty, business community staff	Both city centre and city-wide
33	Travel efficiency	A reduction in general traffic inside the LEZ, as shown in the traffic modelling, could impact the efficiency of the public transport network, lessen delays, lower the time taken for buses to complete their routes, and improving the efficiency of travel for both commuters and leisure seekers. Complimentary traffic management measures seek to improve journey time reliability on key routes in the city. This impact is related to other impacts where users experience an changes in travel times due to different modes of travel or origin/destination of their journey.	Business community staff, urban communities	Both city centre and city-wide

6. MITIGATION

6.1 Introduction

6.1.1 Mitigation forms a key part of the overall impact assessment. Properly targeted mitigation measures, such as funding and exemptions can reduce many negative impacts associated with the LEZ introduction and in turn maximise positive impacts. There are many forms of mitigation through both the LEZ implementation and support offered by local councils and Transport Scotland and this is constantly evolving. It therefore should be noted that the mitigation within this section is not exhaustive and may change in the future.

6.2 Exemptions

6.2.1 Exemptions for some vehicle categories from the LEZ emission standards are stated in Chapter 2 and set out in the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021. These exemptions are a form of mitigation as they decrease the negative impacts of Dundee's LEZ on emergency services and disabled individuals.

6.2.2 DCC have issue 6,035 blue badges for disabled persons up to the end of March 2021 and holders of blue badges will be able to travel into the LEZ area without penalty, no matter their vehicle type standard. The exemption of blue badge holders and those with disabled tax classed vehicles significantly mitigates any potential negative impact the LEZ could have had on this group of the population.

6.3 Funding

6.3.1 Through its 2018 Programme for Government, the Scottish Government committed to help those who will have most difficulty preparing for the introduction of Low Emission Zones in Scotland, including Dundee. Funding is available for qualifying individuals and organisations who may struggle with the introduction of Dundee's LEZ for the financial year 2021/2022. Although it is not certain to what extent funding will continue to be provided and therefore negative effects minimised and positive effects maximised, it is anticipated that some level of funding will be made available until the introduction of the LEZ enforcement in 2024. Funding specifically mitigates the negative impacts caused by issues with upgrade costs and mode shift.

LEZ Support Fund: Households and Businesses

6.3.2 £3 million new funding has been made available in 2020/21 through the Low Emission Zone Support Fund to help more individuals and organisations prepare for the introduction of Low Emission Zones in Scotland.

6.3.3 From previous rounds of funding, Dundee has been awarded grants worth £25,000 towards households and grants worth £3,000 towards businesses.

6.3.4 The Low Emission Zone Support Fund, funded by Transport Scotland and administered by Energy Saving Trust, offers an incentive for low-income households to take older, more polluting vehicles off the road.

6.3.5 Grants of up to £3,000 are available to incentivise the disposal of non-compliant vehicles:

- £2,000 is available to eligible households who dispose of their non-compliant vehicle with a Scottish authorised treatment facility. The applicant must live close to a proposed Scottish low emission zone and be in receipt of specific means-tested benefits.

- Travel Better incentives of up to £500 will also be made available for each adult in the household. A maximum of £1,000 per household applies.

6.3.6 The Travel Better fund, of which £14,000 has been awarded in Dundee, give funding towards purchasing a new or second hand bike, cargo bike or e-bike, cycle equipment, membership and driving credits for car clubs and cycle hire schemes or multi-trip public transport tickets. Together with the Disposal Grant of £2,500 the funding for households tries to incentivise switching to a more sustainable and active travel mode, where possible. There is no obligation to use the Disposal Grant for a specific purpose and it can be used to fund the purchase of a compliant vehicle.

6.3.7 For businesses, the Low Emission Support Fund offers micro businesses and sole traders, with an operating site within 20km of the low emission zones, a £2,500 grant towards the safe disposal of non-compliant vehicles.

6.3.8 The LEZ Support Fund, and the grants issued as part of it, incentivises both households and businesses to take older vehicles off the road which do not comply with the LEZ emission standards. Due to its qualifying criteria, it specifically targets those identified in this IIA, households on low incomes and small/medium enterprises, as being disproportionately affected by the LEZ due to decreased ability to meet the LEZ standards.

The Low Emission Zone Retrofit Fund

6.3.9 The LEZ Retrofit Fund will provide micro-businesses in Dundee with support to retrofit their existing non-compliant vehicle with Clean Vehicle Retrofit Accreditation Scheme approved solutions, making sure the vehicles meet the minimum proposed emission standards. Grants are available to cover up to 80% of the cost of a retrofit solution, subject to the following terms and conditions:

- Up to £5,000 per light commercial vehicle and wheelchair accessible taxi installing retrofit exhaust after-treatment systems.
- Up to £10,000 per wheelchair accessible taxi installing re-powering technology.
- Up to £16,000 per heavy goods vehicle or refuse collection vehicle.

6.3.10 It is anticipated that the update of the Retrofit Fund will be limited in Dundee due to the existing taxi fleet (non-hackney type) and the feedback from HGV drivers that the services is not suitable for their needs. This is confirmed with the previous uptake where no grants have been awarded in Dundee.

Bus Emissions Abatement Retrofit (BEAR) programme

6.3.11 This fund aims to fit buses and coaches with Clean Vehicle Retrofit Accreditation Scheme (CVRAS) accredited retrofit technology solutions to support the delivery of LEZ by increasing the number of compliant buses.

6.3.12 The Bus Emissions Abatement Retrofit Programme (BEAR) Phases 1, 2 & 3 provided £12.2M funding to support the costs of retrofitting of 762 buses and coaches to Euro VI standard in Scottish Air Quality Management Areas from 2018 to 2021 (Transport Scotland).
BEAR Phase 4 funding of up to £5.7 million is available in the 2021/22 financial year to licensed bus and coach operators, local authorities and community transport operators located in, or operating eligible vehicles based on routes within one of the LEZs in Scotland (and/or one of Scotland's AQMAs).

6.3.13 In Phase 3, covering the year 2020/2021, both Xplore Dundee and Stagecoach received funding from the BEAR scheme. Through consultation with the bus operators it is

anticipated that further applications for support will be submitted to allow each operator to meet its requirements for the LEZ in Dundee.

Scottish Ultra-Low Emission Bus Scheme (SULEBS)

6.3.14 The Scottish Ultra-Low Emission Bus Scheme (SULEBS) was an evolution of the Scottish Green Bus Fund held each year between 2011 and 2018. SULEBS supported the Scottish Government's net zero targets, its commitment to delivering Low Emission Zones and Scotland's ambitions for transport decarbonisation.

6.3.15 It provided support for the purchase of new ultra-low emission buses up to a maximum 75% of the differential costs against diesel buses, depending on their zero emission running capability. Support was also available for the infrastructure for this technology of up to a maximum 75% of the capital cost.

6.3.16 The first round of SULEBS ran in August 2020. Over £10.1 million of funding supported four completed bids, for the introduction of 57 ultra-low emission buses, and supporting infrastructure. The second round of SULEBS ran in January/February 2021. Over £40.5 million of funding will support six completed bids, introducing a further 215 ultra-low emission buses, and supporting infrastructure across Scotland.

6.3.17 In Dundee, Xplore Dundee were awarded £1,946,727 towards 12 double deck hydrogen buses.

6.3.18 Further support for transition to zero emission buses has been offered under the Scottish Zero Emission Bus Challenge Fund (ScotZEB) which opened for bids on 4 August 2021.

7. SUMMARY AND CONCLUSIONS

7.1 Summary of Impacts

7.1.1 This report presents a range of impacts resulting from the proposed implementation of a LEZ and includes direct and indirect impacts affecting individuals and businesses. The magnitude of impact varies according to likelihood of occurrence and the considered mitigations. The following impacts are considered to be of high priority:

- Health benefits
    - A direct impact of the LEZ will be to reduce emissions concentrations through restricting access to the city centre from the most polluting vehicles. A secondary impact may be felt through improved vehicle turnover as a behavioural change to the LEZ, though this is anticipated to be limited in Dundee. Indirect impacts of the LEZ may be the resulting health benefits from a mode shift from private vehicle travel to active travel or public transport modes.
- Potential economic costs replacing vehicles
    - LGV and bus will be most significantly affected due the requirements of their trips inside the LEZ area
    - Private car owners will likely be affected to a lesser degree, primarily due to the area covered by the LEZ. It is anticipated that few private car owners that currently access the city centre would consider replacing a non-compliant vehicle over adjusting their parking/trip habits to utilise a car park on the periphery of the zone. This however may result in changes to access, as noted below.
- Reduction in the access and provision of goods/services/care
    - Businesses are likely to be impacted as they will face restrictions in how they can operate in a the city centre should they currently utilise a non-compliant vehicle
    - Individuals are given fewer options as they face restrictions to access the good/service/care or the good/service/care is no longer being offered. This will especially affect who are reliant on private vehicle transport but do not have access to finance to achieve compliance or those that use community transport not considered exempt from LEZ enforcement.
- Potential economic activity changes
    - Through the changing atmosphere of the city centre, some people and businesses may be more attracted to the area, generating more economic activity.
    - The push to compliant vehicles provides new opportunities for retrofitting, vehicle sales/maintenance, vehicle lease operations and car clubs potentially generating economic and employment growth.
    - Some sectors and industries that are reliant on vehicles and have a fleet of non-compliant vehicles may be adversely affected by the LEZ and may be forced to reduce or amend operations at a cost impact.

7.2 Conclusions

7.2.1 The LEZ has the potential to cause a range of positive and negative impacts, from improving health of society to potentially reducing access to the city centre for those who rely on private vehicle transport. The most significant impact of the LEZ will be the improvement in air quality and the resulting health benefits, benefitting residents, visitors and workers. The LEZ also has a potential positive health impact through encouraging the use of active travel and public transport for certain trips and changing existing travel behaviours.

7.2.2 Given the focus of the IIA to look at how certain protected groups are potentially differentially affected, there are instances where the LEZ could disproportionately affect some groups in society. For example, those who have a diminished ability to upgrade to a compliant vehicle due to low income (including people on benefits, single parents, or disabled people). Those on lower incomes may experience reduced access to locations and in turn the goods, services, or employment opportunities available to them. Community transport providers rely on cars and minibuses that may be subject to a LEZ, therefore the services they provide to a range of protected groups (such as youth groups and those receiving care) may be affected.

7.2.3 Mitigation can reduce these potential impacts. For example, the recently announced LEZ Mobility Fund, retrofitting schemes, and exemptions outlined in the LEZ regulations all look to reduce any negative impacts of the proposed LEZ scheme. The IIA shows that protected members of society can be impacted by the LEZ in subtle ways that, although small in magnitude relative to the overall health benefits of the LEZ, can be removed or mitigated through considerate decision making at a national and local level.

Appendix D

Dundee City Council – Notice of Dundee Low Emission Zone scheme proposal

Under the powers granted by the Transport (Scotland) Act 2019, and in accordance with The Low Emission Zones (Scotland) Regulations 2021 Dundee City Council (DCC) proposes to introduce a Low Emission Zone (LEZ) in Dundee.

This Notice of Dundee Low Emission Zone scheme proposal is in line with Regulation 3 of Part 2 of the Low Emission Zones (Scotland) Regulations 2021 which requires that a notice publicised by a local authority in relation to proposals for making, amendment or revocation of a LEZ scheme should include:

- The name of the local authority making, amending or revoking the LEZ
- A description of the proposed LEZ scheme
- A statement outlining the purpose and effect the LEZ will have in relation to the roads it covers,
- The roads in which the LEZ scheme covers.
- Further information where the details of the proposed LEZ scheme can be accessed
- Information regarding how objections can be made, and the period in which objections can be made

Name of Local Authority making, amending or revoking the Low Emission Zone

Dundee City Council.

Description of the proposed Low Emission Zone

Dundee City Council has identified that an area within the A991 inner-ring road network (as identified on the map below and at the end of this Notice) will form a Low Emission Zone within which only vehicles that meet or exceed the vehicle emission standards set out in the Low Emission Zone (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021 can be driven on roads within the LEZ area.

The Dundee LEZ will apply to all vehicle types, apart from motorcycles and mopeds (which have been scoped out of the proposed LEZ scheme) and those subject to a national exemption outlined in the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021.

The types of vehicles to be included will be the following categories as set out in Annex II of the Directive 2007/46/EC as listed in Table 1 below.

Table 1: Types of vehicles to be included in the proposed Dundee LEZ scheme

Vehicle	Vehicle Category	Description
Light passenger vehicles	M1	Vehicles designed and constructed for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat.
Minibus	M2	Vehicles designed and constructed for the carriage of passengers, comprising more than eight seats in addition to

		the driver's seat, and having a maximum mass not exceeding 5 tonnes.
Bus and coach	M3	Vehicles designed and constructed for the carriage of passengers, comprising more than eight seats in addition to the driver's seat, and having a maximum mass exceeding 5 tonnes.
Light Goods Vehicles (LGVs)	N1	Vehicles designed and constructed for the carriage of goods and having a maximum mass not exceeding 3.5 tonnes.
Heavy Goods Vehicles (HGVs)	N2	Vehicles designed and constructed for the carriage of goods and having a maximum mass exceeding 3.5 tonnes but not exceeding 12 tonnes.
	N3	Vehicles designed and constructed for the carriage of goods and having a maximum mass exceeding 12 tonnes.

Vehicles will be permitted access to LEZs on the basis of their exhaust emissions standard. Mandatory nationally consistent emission standards for Scottish LEZs have been set for virtually all petrol and diesel vehicle classifications (e.g. buses, taxis, vans, HGVs, cars, motorcycles) within The Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021). These are shown in Tables 2 and 3.

Table 2: LEZ emission standard for compression ignition (diesel) engines

Vehicle category	Emission standards	Euro Categories
Heavy-duty vehicles (e.g. HGVs and buses/coaches)	Euro VI	M2, M3, N2, N3
Light passenger and light goods vehicles	Euro 6	M1, M2, M3, N1, N2
Special category vehicles: • an ambulance (which is not exempt under the Regulations); • a hearse; • a motor caravan.	Euro 6	M1, M2, M3

Table 3: LEZ emission standard for positive ignition (petrol and gas) engines

Vehicle category	Emission standards	Euro Categories
Heavy-duty vehicles (e.g. HGVs and buses/coaches)	Euro IV	M2, M3, N2, N3
Light passenger and light goods vehicles	Euro 4	M1, M2, N1, N2
Special category vehicles: • an ambulance (which is not exempt under the Regulations); • a hearse; • a motor caravan.	Euro 4	M1, M2, M3

Vehicles can be retrofitted with emission abatement technology to improve emissions. Suitably certified retrofitted or repowered vehicles - where the emission standards are confirmed to a Euro 6/VI standard equivalent - will also be LEZ compliant.

Dundee's proposed LEZ will not apply to motorcycles and mopeds given the limited contribution these make to NO_2 emissions.

As identified in The Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021, a number of vehicle types will be exempt from LEZs in Scotland, meaning that any restrictions will not apply to them. The list of national exemptions can be found in Table 4 below.

Table 4: National exemptions

Vehicle type or classification	Description
Emergency vehicles	The vehicle is being driven by any person who is: • undertaking their duty as a constable; • providing a response to an emergency at the request of the Scottish Ambulance Service Board; • exercising the functions of the Scottish Ambulance Service Board, the Scottish Fire and Rescue Service, Her Majesty's Coastguard or the National Crime Agency.
Naval, military or air force vehicles	• Vehicles being used for naval, military or air force purposes.
Historic vehicles	• The vehicle was manufactured or registered under the Vehicle Excise and Registration Act 1994 for the first time at least 30 years ago; • The vehicle is no longer in production; and • The vehicle has been historically preserved or maintained in its original state and has not undergone substantial changes in the technical characteristics of its main components.
Vehicles for disabled persons	• The vehicle is being driven by any person who is in receipt of a badge (a blue badge) that has been issued under Section 21(2) of the Chronically Sick and Disabled Persons Act 1970, • a passenger in the vehicle has been issued with a badge under that Section of that Act; or • a badge for the vehicle has been issued under Section 21(4) of that Act; or • a reduction in annual rate of vehicle excise duty applies because the vehicle is being used by a disabled person in receipt of personal independence payment at the standard rate; or • Vehicles registered with a 'disabled' or 'disabled passenger vehicles' tax class e.g. the vehicle is exempt from payment of vehicle excise duty under paragraph 19(1) or 20(1) of

	schedule 2 of the Vehicle Excise and Registration Act 1994 (exemptions from excise duty for vehicles used by disabled persons).
Showman vehicles	• Vehicles described as either “showman’s goods vehicle” or “showman’s vehicle” according to Section 62(1) of the Vehicle Excise and Registration Act 1994. Note: these are highly specialised vehicles used for the purposes of travelling showmen, where the vehicle is used during the performance, used for the purpose of providing the performance or used for carrying performance equipment.

* Note: blue badges are assigned to a person, not a vehicle, so a blue badge holder could travel in any vehicle and the rules of the blue badge would be applied to that vehicle on that day of travel.

The Transport (Scotland) Act 2019 allows for local authorities to grant a ‘time-limited exemption’ of no more than 1 year (although this can be renewed following reassessment) to certain vehicles or vehicle types which would allow any non-compliant vehicles within such a group to continue to drive within the LEZ area without penalty on a temporary basis. The Council may grant time limited exemptions but only in exceptional circumstances where it can be clearly demonstrated that vehicle operators or groups are doing all they can to comply with the LEZ but may require longer time than the agreed grace period. Currently, no specific time-limited exemptions are proposed.

The LEZ will operate 24 hours a day, 7 days a week, all year.

The legislation allows for the LEZ to be suspended for the duration of events of local or national significance. The LEZ can also be suspended in emergency situations, such as an accident on the wider road network that requires all vehicles to be temporarily diverted through the LEZ area (but only where vehicles follow prescribed diversionary routes).

The default penalty charges for LEZs have been set in Schedule 4 of the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021 and therefore are consistent across all of Scotland.

The initial penalty charge for all non-compliant vehicles is set at £60, reduced by 50% if it is paid within 14 days. The penalty amount doubles with each subsequent breach of the rules detected in the same LEZ. The penalty charges are capped at £480 for cars and light goods vehicles and £960 for buses and HGVs. Where there are no further breaches of the rules detected within the 90 days following a previous violation, the penalty is reset to the base tier of charge i.e. £60.

Enforcement will commence following the end of the 2-year grace period and will be undertaken through the use of Automatic Number Plate Recognition (ANPR) cameras.

The LEZ is to be introduced to: protect public health through improving air quality in Dundee and achieving air quality compliance for nitrogen dioxide (NO2), Particulate Matter (PM)10 and PM2.5 objectives prescribed under Section 87(1) of the Environment Act 1995; develop an environment that helps promote more active and sustainable travel choices in Dundee and contributes to meeting emission reduction targets set out in Part 1 of the Climate Change (Scotland) Act 2009; and, contribute to the ongoing transformational change in Dundee and help promote the city as an inclusive and desirable place to live, invest, visit and learn.

Statement outlining the purpose and effect the LEZ will have in relation to the roads it covers

We want people in Dundee to enjoy

- cleaner air

- better health
- a more pleasant and attractive city.

Air pollution is harmful to health, especially for

- the young
- the elderly
- those with heart and lung conditions.

Dundee has made progress in reducing levels of air pollution, however there are still streets where nitrogen dioxide (NO2) is at levels that exceed set objective levels so we need to take more action.

In Dundee (and most UK cities), road traffic is the main source of NO_2.

Low Emission Zones can help reduce pollution from vehicle emissions, tackling both poor air quality and climate change. LEZs reduce pollution levels and improve air quality by stopping the most polluting vehicles entering a specific area.

Despite improvements in air quality since the introduction of the DCC Air Quality Action Plan in 2011, there remain locations in the city where the Air Quality Objective (AQO) for annual mean NO_2 are not being met. While the number of exceedances of the NO_2 annual mean objective has decreased, the proposed LEZ is to be introduced in the city to accelerate Dundee's required compliance with the objective levels.

The primary focus of the LEZ is to protect public health by improving air quality and reducing exposure to high concentrations of air pollutants. The SEPA Low Emission Zone Dundee Evidence Report has identified that the air quality model results indicate that local concentrations of Nitrogen Dioxide (NO_2) are reduced by the LEZ, with exceedances modelled inside the LEZ would all be removed following LEZ implementation. The LEZ is also expected to lead to substantial reductions in tailpipe emissions of PM10, most notably on bus routes inside the LEZ. It is also expected that as vehicle fleets change to comply with the LEZ requirements, benefits to air quality will extend beyond the LEZ area, such as Lochee Road where the SEPA report identifies small reductions in NO_2 concentrations.

By restricting access of particular vehicles, the LEZ may also have a broader impact on transport choices, encouraging the use of active travel modes with positive effects on human health and for climate change targets, in line with the LEZ objectives.

The roads (or parts of a road) which are to form part of the LEZ

Road name	Part of road which form part of LEZ
Allan Lane	Full length
Albert Square	Full length
Argyllgait	Full length
Bank Street	Full length
Barrack Street	Full length
Bell Street	Between Victoria Road and Constitution Road
Cameron's Close	Full length
Candle Lane	Full length
Castle Street	Full length
Chapel Street	Full length

Commercial Court	Full length
Commercial Street	Full length
Constitution Road	Full length
Courthouse Square	Full length
Couttie's Wynd	Full length
Cowgate	Full length
Crichton Street	Full length
Dock Street	Between Whitehall Crescent and Commercial Street/A991 junction
Euclid Crescent	Full length
Euclid Street	Full length
Exchange Court	Full length
Exchange Street	Full length
Forester Street	Full length
Gellatly Street	Full length
High Street	Full length
Irvine's Square	Full length
Johnston Street	Full length
King Street	Between St. Andrew's Street and North Marketgait
Malthouse Close	Full length
Mary Ann Lane	Full length
Meadow Entry	Full length
Meadowside	Between Meadow Lane and Constitution Road
Murraygate	Full length
Nethergate	Between West Marketgait and Crichton Street
Nicholl Street	Full length
North Lindsay Street	Full length
Panmure Street	Full length
Peter Street	Full length
Pullar's Close	Full length
Queen Street	Full length
Rattray Street	Full length
Reform Street	Full length
Royal Exchange Lane	Full length
Seagate	Between Commercial Street and East Marketgait

Shore Terrace	Full length
Soapwork Lane	Full length
South Ward Road	Full length
St Andrew's Lane	Full length
St Andrew's Street	Full length
Sugarhouse Wynd	Full length
Trades Lane	Full length
Union Street	Full length
Ward Road	Full length
West Bell Street	Full length
Whitehall Crescent	Full length
Whitehall Street	Full length
Willison Street	Full length
Yeaman Shore	Full length

Further information where the details of the proposed LEZ scheme can be accessed

Full details of the proposed Low Emission Zone scheme for Dundee including the report on the outcomes of the consultation and stakeholder engagement can be found:

- on the Dundee City Council website at: www.dundeecity.gov.uk/lez
- by request via email to: dundee.lez@dundeecity.gov.uk

Information how objections can be made, and the period in which objections can be made

In line with Regulation 4 of Part 2 of the Low Emission Zones (Scotland) Regulations 2021, any persons may object to the making, amendment or revocation of a LEZ scheme. The period of time in which objections can be made is 28-days beginning with the date on which the Notice of LEZ proposals is published.

Any objection should be made in writing and contain a statement of the grounds of the objection and can be submitted to:

Head of Sustainable Transport and Roads,
Dundee City Council
Floor 5
Dundee House
50 North Lindsay Street,
Dundee DD1 1LS
Or via email to: dundee.lez@dundeecity.gov.uk