ITEM No …5……..

REPORT TO: **COMMUNITY SAFETY AND PUBLIC PROTECTION COMMITTEE – 7 JUNE 2021**

REPORT ON: **DUNDEE LOW EMISSION ZONE – PROPOSED OPTION FOR STATUTORY CONSULTATION**

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

REPORT NO: **164-2021**

1 PURPOSE OF REPORT

1.1 The purpose of this report is to advise Committee of the preferred option for a Dundee Low Emission Zone (LEZ) Scheme, and to seek approval to carry out consultation, 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.

2 RECOMMENDATION

2.1 It is recommended that Committee approves the report and remits the Executive Directors of Neighbourhood Services and City Development to carry out the statutory consultation, in line with the requirements of with the Transport (Scotland) Act 2019, Low Emission Zones (Scotland) Regulations 2021, and the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021.

3 FINANCIAL IMPLICATIONS

3.1 Transport Scotland have confirmed that grant funding is available in this financial year for capital expenditure on infrastructure associated with the enforcement of the LEZ scheme Costs are currently being developed to support our bid for these works. Further details will be brought to members in due course.

Revenue grant funding of £40,000 for ongoing consultancy support further consultation, to complete the National Low Emission Framework process and the final LEZ Scheme has been confirmed by Transport Scotland.

Ongoing revenue costs associated with the administration of the LEZ Scheme will be the subject of future discussions with Transport Scotland and the Scottish Government.

4 MAIN REPORT

4.1 Reference is made to Article II of the Community Safety and Public Protection Committee of 23 September 2020, when Committee was advised of the revised indicative timetable for the introduction of LEZs in Scotland's main cities by February to May 2022. Reference is also made to Article V of the Community Safety and Public Protection Committee of 24 February 2020, that reported on the results of a public consultation exercise on options for Dundee's LEZ. Five options were included in the consultation, based on an interim report produced by Transport Consultants, Systra following the process set out in the National Low Emission Framework. The options, all based on the area inside the Inner Ring Road, were:

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

4.2 Of the options presented, an all vehicle LEZ based on the area inside the Inner Ring Road, excluding the Bell Street, West Marketgait and Wellgate car parks was the most favoured (Option 2C - 35% of respondents). 65% of respondents favoured an all vehicle LEZ (30% favoured a bus only LEZ). The public consultation did not generally support the Bus Only options and could be perceived as solely targeting bus operators.

4.3 The next step in the process was to undertake traffic modelling on these options and to consider other relevant factors in arriving at a final preferred option. In addition, two variants based on sections of the Lochee Road corridor were included in the traffic modelling work.

4.4 Section 14(3)(a) of the Transport (Scotland) Act 2019, states that a low emission zone scheme may not specify a 'private road'. This effectively means that options 2A and 2B are not feasible, as access to the Bell Street, West Marketgait and Wellgate car parks are directly from the inner ring road. Road safety considerations also mitigate against these options.

4.5 Two variants that included sections of Lochee Road were considered in the traffic modelling exercise:

- The Inner Ring Road plus Lochee Road to Tullideph Road
- The Inner Ring Road plus Lochee Road to Loon's Road

4.6 Traffic modelling results show that extending the LEZ to include Lochee Road significantly increases congestion in the city as non-compliant vehicles look for alternative routes. This leads to a network wide increase in journey times and queue lengths at key junctions and significant variations in traffic volumes on trunk and local road network. For example, over a 12-hour period the number of vehicles on City Road is shown to increase by 2500 vehicles, many of which would be non-compliant vehicles.

4.7 For these reasons, it is not recommended to take forward options to include the Lochee corridor as part of the designated LEZ scheme. However, City Development will continue to develop options for improving air quality and improving public transport links on this route corridor, and have recently undertaken a preliminary option assessment of measures to reduce vehicle emissions associated with traffic congestion between the Dudhope Terrace and Polepark Road junctions. A report on these preliminary proposals will be provided at a future City Development Committee.

4.8 Based on the traffic modelling results and the 2019 public consultation, it is recommended that an All Vehicle option, with the exception of motorcycles and mopeds, within the Inner Ring Road, excluding Bell Street, West Marketgait NCP and Wellgate car parks forms the basis of the Dundee Low Emission Zone Scheme. A map showing the extent of the proposed LEZ is included at Appendix 1. The LEZ guidance recommends that motorcycles and mopeds are scoped out of LEZ schemes unless local authorities can provide robust justification for their inclusion. No such justification has been established for the proposed Dundee LEZ scheme.

4.9 Traffic modelling of the recommended LEZ option shows the network operates relatively similarly to existing conditions. There is some redistribution of traffic flow on inner ring road. There is a decrease in traffic on West Marketgait, north of Westport roundabout (a location where the air quality objective for NO_2 has been exceeded in recent years) and an increase in traffic on West Marketgait, south of Westport roundabout. Traffic levels are reduced inside the inner ring road as parking trips are redistributed to the periphery car parks. A summary of the traffic modelling report is included within Chapter 7 of the "National Low Emission Framework – Stage 2 Assessment – Summary Note" report contained in Appendix 2.

4.10 The Scottish Environmental Protection Agency (SEPA) has carried out a traffic emissions assessment of the recommended LEZ scenario to assist with the identification of the preferred LEZ scheme, with their report being attached as Appendix 3. The report indicates that implementation of the proposed LEZ will reduce NOx emissions on key bus routes inside the LEZ boundary by an average of 70%. Emissions on Lochee Road outside of the LEZ boundary experience a reduction in NOx emissions by an average of 20%. SEPA have been unable to utilise the Air Quality City Model for Dundee due to a complex cyber-attack in December 2020

which has significantly impacted access to their internal systems and processes. This matter is subject to an ongoing criminal investigation by Police Scotland. SEPA have advised that the Air Quality modelling work will be undertaken over the summer, which will provide details of predicted changes to roadside concentrations including detailed work on Lochee Road and the LEZ area. This will be included in a further report to the Committee in autumn 2021.

4.11 The LEZ will include the following vehicle categories as set out in Annex II of Directive 2007/46/EC:

- Light passenger vehicles (vehicle category M1)
- Minibus (vehicle category M2)
- Bus and coach (vehicle category M3)
- Light Goods Vehicles (LCVs) (vehicle category N1)
- Heavy Goods Vehicles (HGVs) (vehicle categories N2 and N3)

4.12 In line with the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021, compliant vehicles in Dundee's LEZ will be those that meet the emission standard of:

- Euro VI for buses, coaches & HGVs (generally vehicles registered from 2013)
- Euro 6 for diesel cars and vans (generally vehicles registered from 2015)
- Euro 4 for petrol vehicles (generally vehicles registered from 2006)

4.13 The scope of the proposed LEZ scheme is consistent with LEZ plans in for elsewhere in Scotland. National exemptions are set out in the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021 and can be summarised as including:

- emergency service vehicles;
- naval, military and air force vehicles;
- historic vehicles;
- vehicles for disabled persons; and
- showman vehicles.

The LEZ will operate 24hours a day, 7 days a week. The scheme will be enforced through a network of automatic number plate recognition (ANPR) cameras. Transport Scotland will provide grant funding in this financial year for the required infrastructure.

4.14 Assuming the revised timetable set out by Scottish Government for the introduction of LEZs in Scotland's four main cities is adhered to, Dundee will introduce a LEZ in the spring of 2022.

4.15 The minimum grace period set in the Transport (Scotland) Act 2019 is 1 year, i.e. enforcement would begin 1 year after the scheme is introduced. This effectively means enforcement of the LEZ would begin no earlier than spring 2023. The maximum grace period is 4 years (2026). The grace period for residents of the LEZ area can be extended by a maximum of 2 years, but this does not have to be applied. Local Authorities have the discretion to set the grace period.

4.16 To inform the consideration of an appropriate grace period, additional consultation has taken place with key stakeholders. The main bus operators in the city have indicated that, despite significant investment in recent years, including utilising Government grants to retrofit older buses to make them Euro VI compliant, their fleets will not be fully complaint with the requirements of the LEZ by spring of 2023.

4.17 Clearly, the Covid 19 pandemic has impacted on the income of both bus operators and businesses in the city, as well as many individuals. In order to support economic recovery in the city, it is recommended that a 2-year grace period is included in the LEZ scheme, with enforcement beginning for all vehicles in spring of 2024, with no additional grace period for residents living within the LEZ boundary. The proposed LEZ design will be subject to detailed impact and environmental assessments as a part of the National Low Emission Framework

process. Initial work has been carried out for the Integrated Impact Assessment (IIA) with analysis undertaken so far showing that protected members of society can be impacted by the Dundee 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 policy making at a local or national level.

4.18 The Scottish Government provided support funding in 2020/21 for individuals and businesses that may have most difficulty achieving compliance with required emission standards for vehicles. These schemes were promoted in Dundee and Tayside, including on the Council's website. It is anticipated that further funding will be made available during this financial year.

4.19 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. This report seeks approval to undertake consultation in line with the legislative requirements on the proposed scheme. Section 11 of the Act in tandem with the Low Emission Zones (Scotland) Regulations 2021 provides a list of the organisations that local authorities must consult when making, amending or revoking a scheme. These organisations are:

- the Scottish Environment Protection Agency;
- Scottish Natural Heritage;
- Historic Environment Scotland;
- such persons as the authority considers represent the interests of—
  - the road haulage industry,
  - the bus and coach industry,
  - the taxi and private hire car industry
  - local businesses, and drivers, likely to be affected by the proposal,
  - such other persons as the authority considers appropriate
  - Local authorities neighbouring the authority that is delivering the scheme
  - Regional Transport Partnerships
  - NHS (including Health Boards)

4.20 Thereafter, in autumn this year, a further report will be brought to Committee with the detailed LEZ scheme for Dundee. This will include the results and analysis from the statutory consultation process, plus the detailed environmental and impact assessments. Should committee approve the detailed scheme the LEZ Regulations require that the local authority then publicise a notice for the making of the scheme, to which any person can make an objection within the period specified within the notice. Following this, a report detailing the number, nature and local authority's response to any objections received will be produced. This and the consultation report would then be submitted with the proposed scheme to Scottish Ministers for approval, in line with the legislative requirements and LEZ Guidance documents.

5 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 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

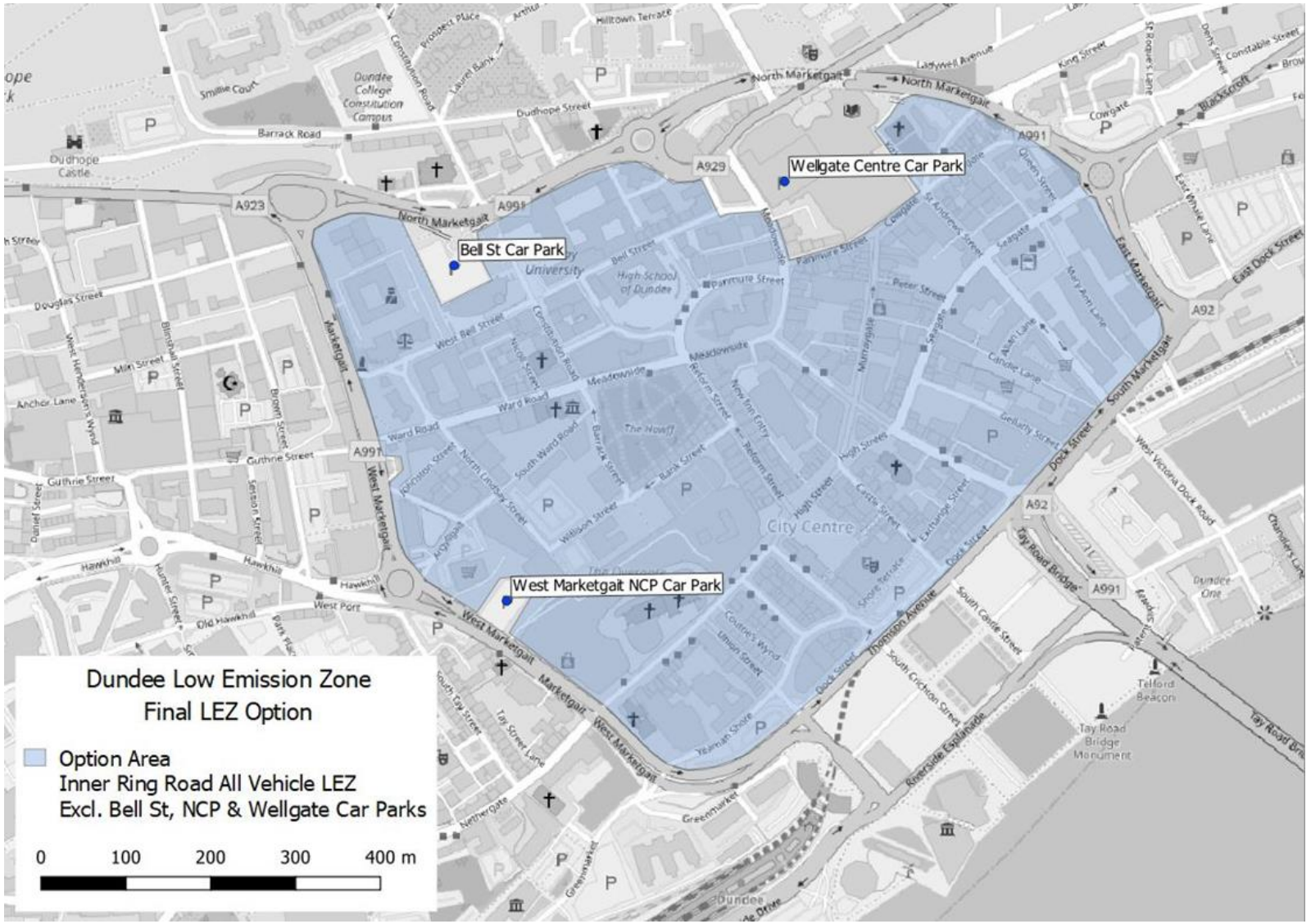
Tom Stirling
Head of Community Safety & Protection

27 May 2021

Appendices:

1) Map of proposed Low Emission Zone area
2) National Low Emission Framework – Stage 2 Assessment – Summary Note
3) SEPA Dundee Emissions Analysis Report

Appendix 1 – Map of proposed Dundee Low Emission Zone



Appendix 2 – National Low Emission Framework – Stage 2 Assessment – Summary Note

Dundee Low Emission Zone **14/05/2021**

Reference number GB01T19A08/120521

NATIONAL LOW EMISSION FRAMEWORK – STAGE 2 ASSESSMENT – SUMMARY NOTE

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SYSTRA

DUNDEE LOW EMISSION ZONE

NATIONAL LOW EMISSION FRAMEWORK – STAGE 2 ASSESSMENT – SUMMARY NOTE

IDENTIFICATION TABLE	
Client/Project owner	Dundee City Council
Project	Dundee Low Emission Zone
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2	Author				
	Checked by				
	Approved by				

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FIG. 1 INTRODUCTION

a. Background

i. 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) by 2020.

ii. Despite improvements in air quality since the introduction of the DCC Air Quality Action Plan, there remain several locations in the city where exceedances of emissions exist and where the Air Quality Standards (AQS) are not being met. While the number of exceedances of the NO_2 annual mean objective has decreased from 16 in 2018 to 10 in 2019, a LEZ is being introduced in the city to accelerate Dundee's required compliance with the AQS.

iii. 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).

iv. NLEF is a two stage process consisting of Stage 1 Screening and Stage 2 Assessment.

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

v. NLEF Guidance describes the following key steps that should be undertaken as part of the Stage 2 Assessment:

1. Define the objectives for the potential LEZ

Assess the impact of potential LEZ options with regard to air quality using the National Modelling Framework Dundee City Model

Identify the preferred option, including consideration of geographical extent and scope of vehicles to be included

Stakeholder input and consultation

Consider the wider impacts of the preferred option (e.g. traffic and air quality modelling, Strategic Environmental Assessment, Equality Impact Assessment

vi. An Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework Interim Stage 2 Report, SYSTRA 2019)* was published in September 2019 and detailed the identification of the LEZ objectives and a set of LEZ options (steps 1-3) for stakeholder and public consultation, detailed testing through local traffic and air quality models and wider impact assessments of the preferred option (steps 4-6). The first Interim Stage 2 Report did not include results from the consultation period or the detailed testing.

vii. At Stage 2, the National Modelling Framework (NMF) supports the identification of the scope and key contributors to air quality issues and provides the evidence to help assess potential benefits of transport-related actions to address those issues, with a focus on the introduction of an LEZ. The NMF Dundee City Air Quality Model has been utilised to provide high level impacts from the inclusion of particular vehicles types in a LEZ and to inform the appraisal process of the emerging LEZ options.

viii. The second Interim NLEF Stage 2 Assessment Report builds on the first interim report and incorporates findings from public and stakeholder engagement and detailed traffic modelling to identify a final LEZ option for Dundee.

ix. The final LEZ option identified in the second Interim NLEF Stage 2 Report will then be subject to further stakeholder and public consultation, as set out in the LEZ Regulations. It will also be subject to detailed impact and environmental assessments (SEA, IIA, BRIA) and be assessed in the NMF Dundee City Air Quality Model before the NLEF process is finalised and a final NLEF Stage 2 Report is prepared. It is expected that these tasks will be complete by autumn 2021.

x. This report summarises the second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021).*

b. Legislative Framework

i. 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.

ii. 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.

iii. The application of the legislative framework in the context of Dundee's LEZ is detailed in Chapter Fig. 9.

c. Covid-19 pandemic

i. Due to the impact of the COVID-19 pandemic in 2020 and 2021, plans to implement LEZs were temporarily paused with an indicative timeline for the introduction moved to between February 2022 and May 2022. The LEZ Leadership Group, which includes Scottish Ministers and representatives from Glasgow City Council, The City of Edinburgh Council, Dundee City Council, Aberdeen City Council, Public Health Scotland and SEPA, agreed the indicative timeframe to introduce LEZs across Scotland's four largest cities.

ii. It is recognised that the Covid-19 pandemic has had an unprecedented impact on society, including on the wider environment and the economy. Transport Scotland and DCC recognise that the Covid-19 pandemic may significantly influence future travel demand and in turn emissions attributed to road transport. Transport Scotland commissioned a study to consider the uncertainty over what travel will look like after the Covid-19 pandemic has ended. Outcomes from this study are summarised in Chapter Fig. 7 and used to inform the final LEZ Option.

iii. 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. As a result, additional consultation on this issue was undertaken in March 2021, with the outcomes summarised in Chapter Fig. 6 and used to inform the final LEZ Option detail.

FIG. 2 OBJECTIVES OF DUNDEE LOW EMISSION ZONE

i. Objectives for Dundee's Low Emission Zone were first accepted at the Community Safety & Public Protection Committee meeting on June 3 2019.

ii. After publication of the Transport (Scotland) Act in November 2019, an amendment was made to the original LEZ objectives to address Section 14 of the Act that included a requirement for LEZ schemes to contribute towards the emission reduction targets set out in the Climate Change (Scotland) Act 2009. The final objectives for Dundee's Low Emission Zone were accepted at the Community Safety & Public Protection Committee meeting on February 24 2020.

iii. 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

iv. Full details of the development and appraisal of objectives against SMART principals and key DCC strategies is found in the second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021)*.

v. An appraisal of the final proposed Dundee LEZ was undertaken against the LEZ objectives and showed the final Dundee LEZ option satisfies these objectives, with the full appraisal provided in the second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021).*

FIG. 3 AIR QUALITY IN DUNDEE

a. Introduction

i. DCC has a legal obligation to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. As of 2016, there is a requirement on DCC to deliver Annual Progress Reports (APR) to summarise the work being undertaken by the local authority to improve air quality and report any progress that has been made.

ii. The APRs provide extensive detail on existing air quality issues in Dundee City, the level of success from the LAQM measures and provide a key source of information for the NLEF process. DCC have produced APRs for 2016 to 2020. The results and findings of the 2018 APR, 2019 APR and 2020 APR have been used to inform the option development and appraisal process for Dundee's LEZ.

iii. A summary of the 2019 air quality data (reported in the 2020 APR) is provided in Section b below. 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*).

b. 2019 Air Quality Monitoring Data

Nitrogen Dioxide (NO_2)

i. The 2020 APR provided the full ratified and adjusted 2019 dataset for monthly means for automatic monitoring sites and diffusion tubes. The locations where annual mean concentrations of NO_2 (biased adjusted) are recorded as greater than 36 µg/m^3 is detailed in **Table 6.1** alongside the annual mean concentrations recorded from 2015 to 2018. The cells highlighted in grey are the locations where the annual mean Air Quality Objective (AQO) of 40 µg/m^3 was exceeded.

ii. In total, there are 11 locations where annual mean concentrations of NO_2 exceed the AQO of 40 µg/m^3 and a further 12 sites where annual mean concentrations of NO_2 exceed 36 µg/m^3. 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 detail in **Figure 6.1**

Particulate Matter (PM_{10} and $PM_{2.5}$)

iii. The 2020 APR reports that no exceedances of the PM_{10} annual mean objective (18 µg/m^3) were predicted at any of the monitoring locations within the AQMA during 2019. This is comparable to 2017 where there were also no recorded exceedances.

iv. The PM_{10} daily mean objective (*50µg/m^3, not to be exceeded more than 7 times per year*) was met at all monitoring locations in 2019, in line with 2017.

v. The 2020 APR reports that all estimated concentrations of $PM_{2.5}$ are below the annual mean objective of 10µg/m^3.

vi. With no exceedances of the PM_{10}, $PM_{2.5}$ AQOs (in both 2017 and 2019) NO_2 remains the key pollutant of interest for Dundee. However, although there are no recorded monitored exceedances of PM_{10} or $PM_{2.5}$ in the 2019 air quality data for Dundee, any reduction in NO_2 as a result of the LEZ will also result in a reduction in PM_{10} or $PM_{2.5}$ and continued compliance with the AQOs.

Table 6.1 : Annual Mean Concentrations of NO_2 greater than 36 µg/m³

Site ID	Site Name/Location	Annual mean NO2 concentration (µg/m3)				
		2015	2016	2017	2018	2019
DT70	Victoria Rd/Hilltown	54.1	50.8	51.5	49.2	48.3
DT37	Logie St (114)	51.0	53.8	47.9	48.2	47.1
DT205	West Marketgait/Old Mill (23)	54.0	51.6	45.1	47.0	47.1
DT31	Lochee Rd (140) Traffic Lts	50.3	53.0	48.1	48.8	46.2
DT30	Lochee Rd (138)	49.6	48.9	47.3	48.4	45.8
CM5	Seagate	49.9	47.0	44.3	45.9	44.5
DT156	Dock St (57)	51.4	49.3	49.4	46.4	44.2
CM4	Lochee Road	47.8	44.6	43.6	43.4	43.0
DT158	Lochee Rd (Romon) Average	44.8	43.8	42.6	43.1	41.5
DT190	Seagate (97)	44.6	41.8	38.7	41.7	41.0
DT76	Whitehall St (1)	44.1	43.0	40.9	42.5	40.3
DT159	Seagate(Romon) Average	42.3	41.3	38.4	40.0	39.1
DT44	Nethergate (88)	42.7	41.9	39.1	41.3	39.0
DT227	Dudhope Crescent Road (40)	0.0	0.0	0.0	39.3	38.8
DT183	West Marketgait / Guthrie St	46.8	46.1	44.1	41.4	38.3
DT83	Forfar Rd (104)	45.1	46.3	40.6	41.0	38.1
DT217	Seagate (99)	0.0	0.0	42.5	41.3	37.9
DT149	Meadowside (Romon) Average	41.2	41.0	39.3	40.4	37.7
DT224	Seagate (112)	0.0	0.0	34.1	37.6	37.1
DT204	Broughty Ferry Rd (129)	38.3	36.0	38.2	40.1	37.0
DT49	Rankine St (2)	40.2	36.5	39.3	38.5	36.7
DT92	Abertay 2	36.3	38.5	35.9	37.9	36.5
DT11	Broughty Ferry Rd (141)	35.4	40.4	40.0	36.4	36.3
Total No. Sites > 40 µg/m3		**17**	**17**	**14**	**17**	**11**

source: 2020 Air Quality Annual Progress Report (APR) for Dundee City Council

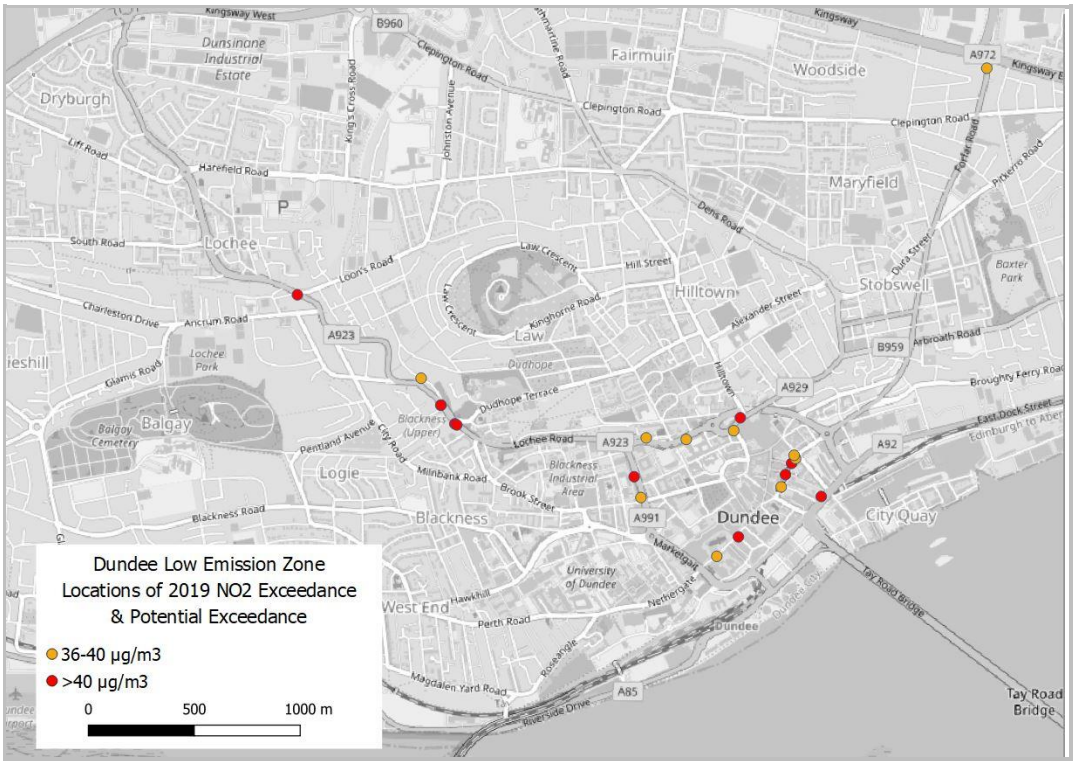

Figure 6.1 : 2019 Annual Mean Concentrations of NO_2 greater than 36 µg/m3 (City Centre & Lochee Rd)

FIG. 4 THE NATIONAL MODELLING FRAMEWORK

a. Introduction

i. The Cleaner Air for Scotland Strategy (CAFS) provided a commitment to develop a National Modelling Framework (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 those local authorities undertaking a NLEF Stage 2 assessment.

ii. The NMF air quality modelling is undertaken by SEPA who support local authorities throughout a Stage 2 assessment and the LEZ decision-making process. Modelling results from the NMF are detailed in Chapter 5 of the second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021).* The analysis presented in the full report and summarised here informs the LEZ option development and sifting process detailed in Chapters Fig. 5 and does not include full model analysis of a final LEZ scheme.

b. Summary of High Level NMF Analysis

i. Dundee City Council and SYSTRA worked with SEPA to produce a set of high level NMF scenarios to inform the LEZ option generation process. 18 high level scenarios were devised to inform the LEZ option development and the impact on modelled NO_2 from individual vehicle type restrictions enforced as part of a LEZ in Dundee was calculated.

ii. The high level NMF results show that should all buses in Dundee be of Euro VI standard there would be approximately a 19% reduction in NO_2 network-wide and that this reduction is significantly more than any other vehicle type would provide. This suggests that a LEZ for Dundee is likely to have to include buses in order for a LEZ to achieve its air quality objective.

iii. When applying modelled NO_2 reductions from the bus only scenarios to 2017 observed exceedance locations, however, the NMF predicts there to be six locations still exceeding 40 µg/m^3 and a further five sites between 36 µg/m^3 and 40 µg/m^3. This result suggest that while a Euro VI bus fleet would bring the largest reduction in NO_2, this alone is not sufficient in addressing all exceedances in Dundee.

iv. The introduction of diesel cars to a network wide scenario results in a 4% decrease in modelled NO_2. The introduction of HGVs results in a 3.5% reduction in modelled NO_2.

v. The bus only scenario results also highlighted that a city-wide LEZ and a significantly smaller LEZ contained within the inner ring road both bring similar significant reductions in NO_2 of approximately 19%, suggesting a smaller bus only LEZ to be just as effective as a city wide LEZ. Including diesel cars in an inner ring road scenario brings significant reductions to NO_2 in the inner ring road area but the impact on exceedance locations outside an inner ring road options area is minimal. However, it should be noted that the high level NMF modelling does not currently account for any reduction in trips associated with changes in driver behaviour after the introduction of a LEZ therefore the impact outside any LEZ area could be greater should such trip reductions materialise in reality.

vi. Detailed air quality modelling will be undertaken on the final proposed Dundee LEZ option to fully quantify the impacts of the LEZ on air quality.

FIG. 5 LEZ OPTION GENERATION

a. Introduction

i. NLEF is objective-led and consistent with the principles of Scottish Transport Appraisal Guidance (STAG). The starting point for the Stage 2 assessment is to define the objectives for the potential LEZ to inform the LEZ option generation, sifting and development.

ii. The NLEF Stage 1 Screening Report identified the existing air quality problems and issues in Dundee, and the LEZ objectives have been derived such that any options that satisfy these objectives will address the current air quality issues in the city.

iii. Following STAG principles, an unconstrained option generation exercise was undertaken to allow all possible options to be considered and open to appraisal. This led to a large number of potential options that required sifting, refinement and high level appraisal to filtered down to the relevant options to be carried forward to detailed appraisal and testing. The full option development, sifting, refinement and appraisal process is documented in second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021)* and the final outcomes summarised below.

b. LEZ Options for consultation and detailed model testing

i. The LEZ option development process recommended that five LEZ options be taken to wider consultation as follows:

LEZ Option 1A - Inner Ring Road Bus Only, including bus station (**Figure 6.2**)
LEZ Option 1B - Inner Ring Road Bus Only, excluding bus station (**Figure 6.3**)
LEZ Option 2A - Inner Ring Road All Vehicles, including all car parks (**Figure 6.4**)
LEZ Option 2B - Inner Ring Road All Vehicles, excluding Bell Street and West Marketgait NCP car parks (**Figure 6.5**)
LEZ Option 2C - Inner Ring Road All Vehicles, excluding Bell Street, West Marketgait NCP and Wellgate car parks (**Figure 6.6**)

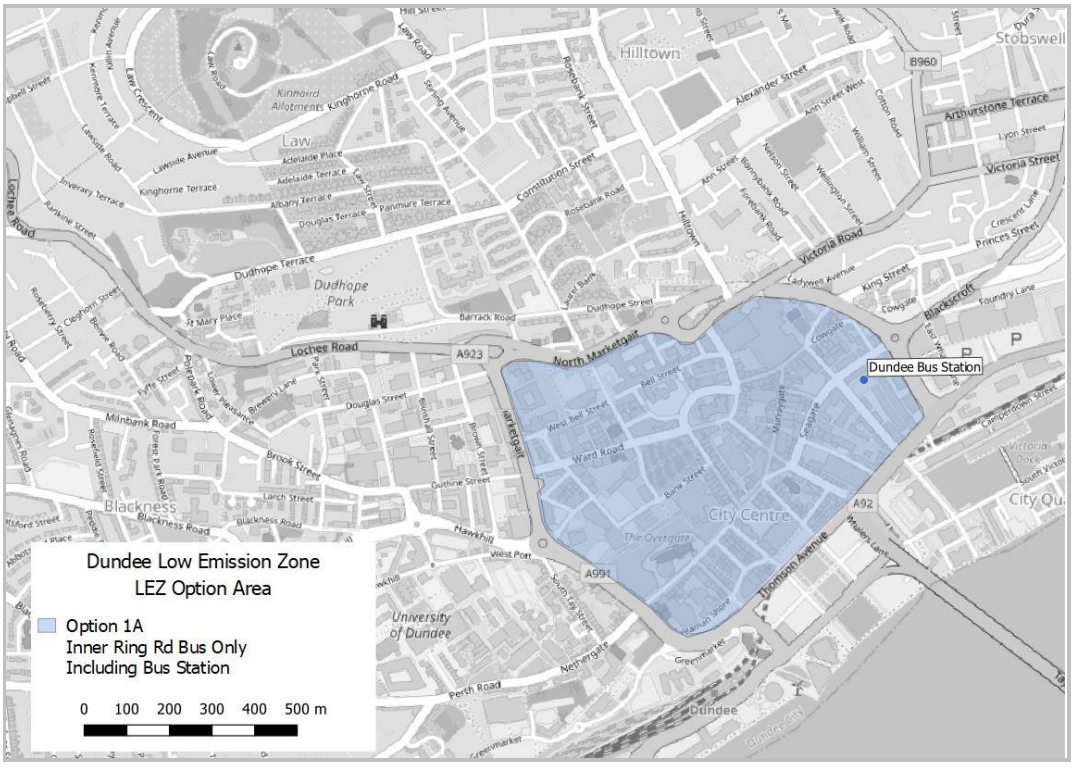

Figure 6.2 : LEZ Option 1A

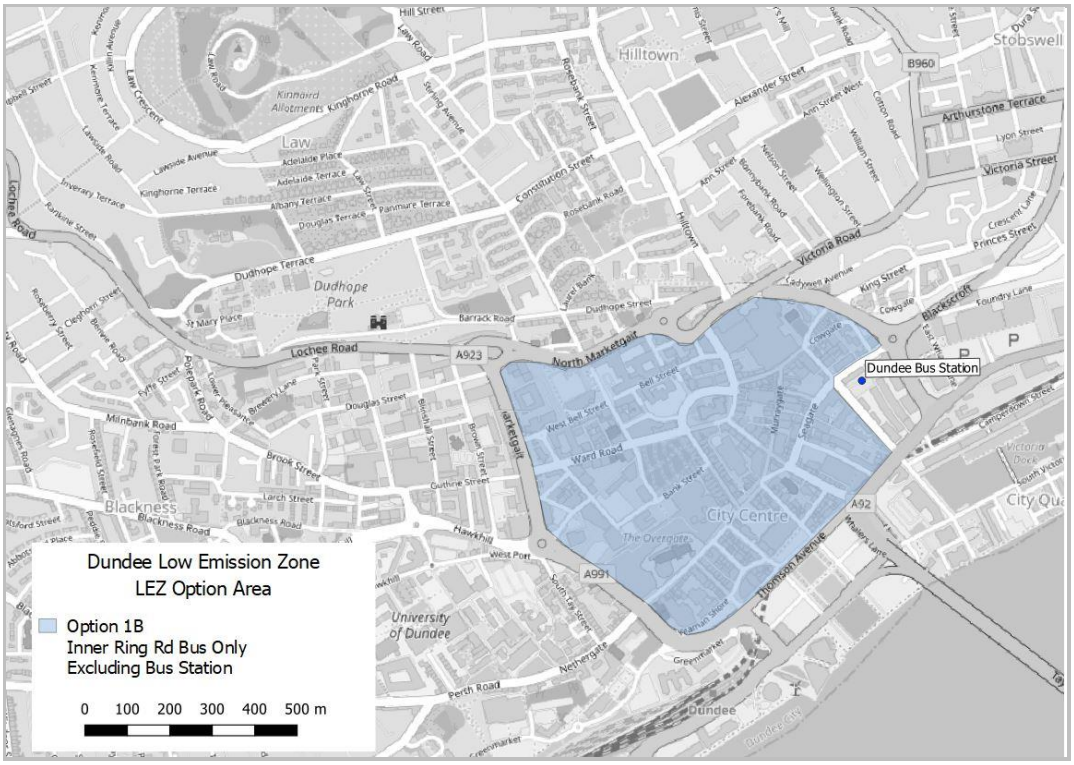

Figure 6.3 : LEZ Option 1B

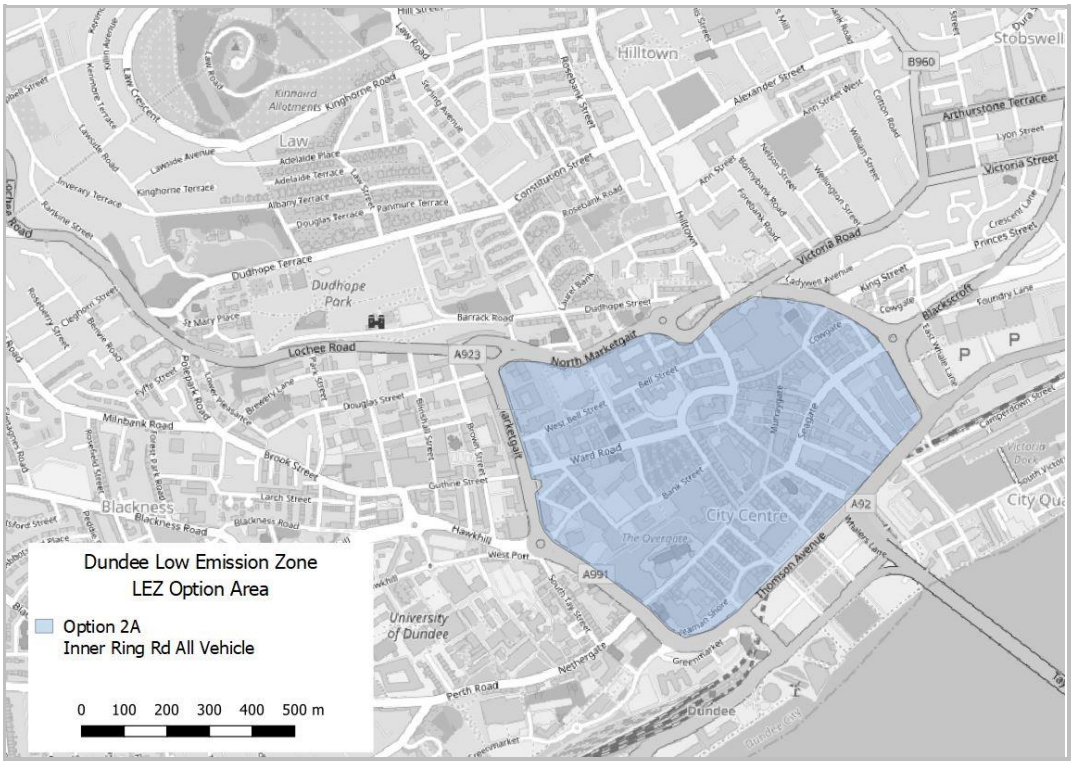

Figure 6.4 : LEZ Option 2A

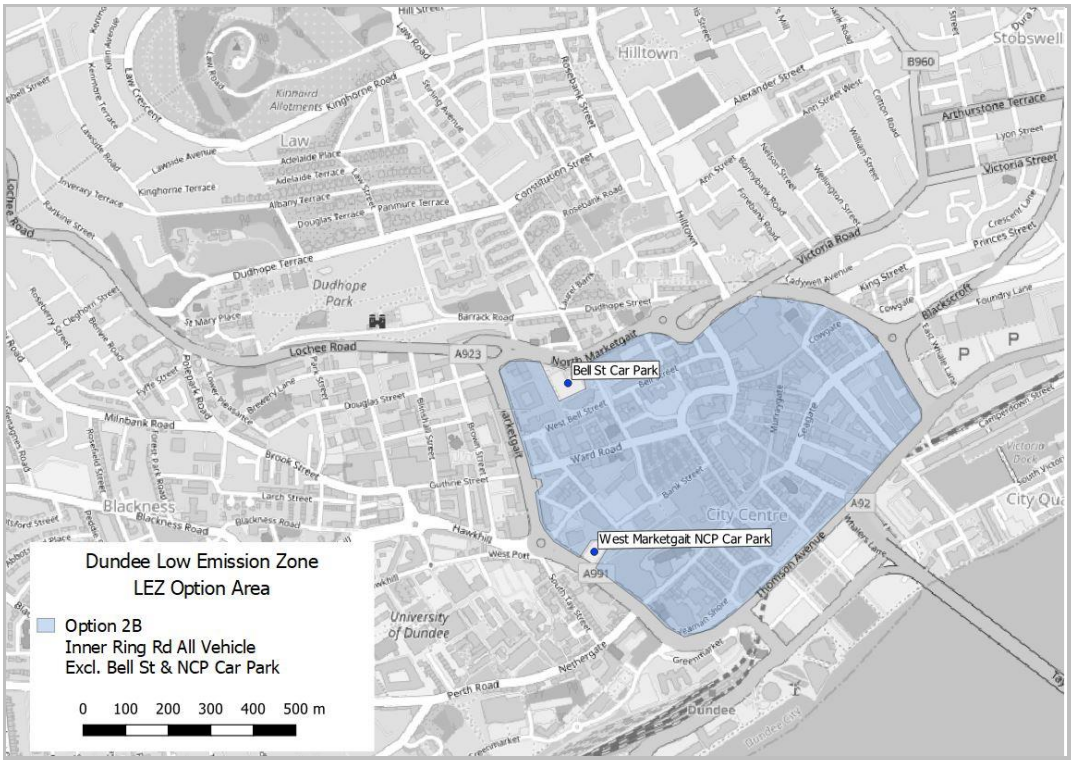

Figure 6.5 : LEZ Option 2B

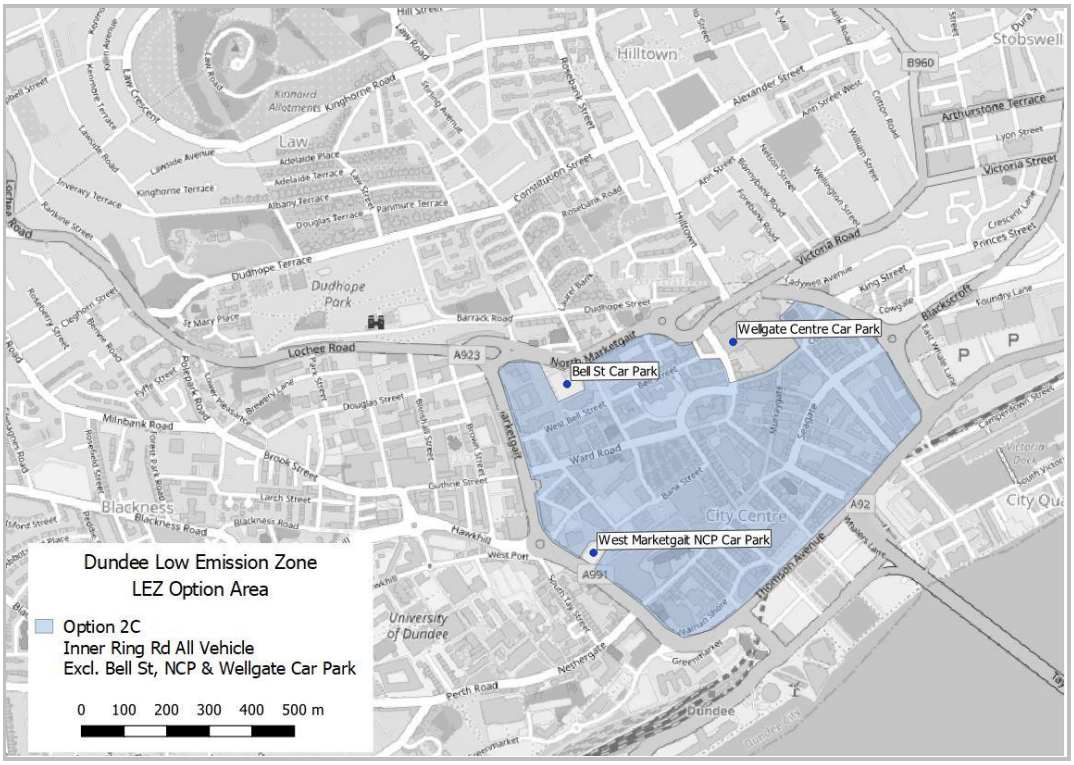

Figure 6.6 : LEZ Option 2C

ii. Note, LEZ Options 2A, 2B and 2C are defined as all vehicle LEZs for the purposes of consultation and model testing. The final vehicle types included are informed from the consultation and modelling exercises and detailed in Chapter Fig. 9.

c. LEZ Options and Impact on Air Quality

i. It can be inferred from the NMF scenario testing that all five LEZ Options for consultation will not tackle all air quality exceedance locations, with exceedances in annual mean concentrations of NO_2 predicted to remain on Lochee Road, West Marketgait and Dock Street. The analysis demonstrated that LEZ options which targeted these locations were not viable due to the expected rerouting of non-compliant vehicles and this has been

confirmed through detailed traffic modelling summarised in Chapter Fig. 7. It should be remembered however that at these locations, the introduction of any of the five remaining LEZ options does still improve concentrations of NO_2, bringing levels closer to the legal standards.

ii. NLEF Guidance states that "*it may be more appropriate to address the issue (air quality exceedance) by identifying additional location specific measures to be implemented through the AQAP, potentially through consideration of local transport measures. In this situation, the additional measures should be identified…along with a description of the likely contribution to removing exceedances" (NLEF, 2019).*

iii. It is therefore important to note that the introduction of a LEZ is not the only tool which local authorities have to address air quality exceedance and it is recommended that the LEZ Options are delivered with targeted transport interventions at remaining exceedance locations. The Paramics microsimulation traffic model of Dundee City Centre should be used to test the impact of any transport measures and outputs from the traffic model testing should be input to the NMF Dundee City Model to assess their impacts on removing the remaining exceedance locations. DCC have identified traffic management measures to improve Lochee Road, with details provided in second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021)*.

FIG. 6 LEZ PUBLIC AND STAKEHOLDER CONSULTATION

a. Introduction

i. 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 30 September 2019 to undertake a consultation exercise on the five identified LEZ Options for consultation, as detailed in Chapter Fig. 5 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 are summarised in second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021)* with key outcomes detailed below.

ii. An online public survey ran for six weeks from 4 October to 19 November 2019 and was administered by DCC. The survey was viewed 1902 times and was completed a total of 1336 times.

iii. 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)

b. Key Outcomes from consultation of LEZ Options

i. The consultation showed that the introduction of a LEZ in Dundee is generally favoured, with 65% of public responses supporting its introduction. Similarly, 64% support the introduction of a LEZ applying to all vehicle types. Support for an all vehicle LEZ is strongly favoured by bus operators who feel not including all vehicles would unfairly penalise the bus industry, a key sustainable mode of transport for the city.

ii. Bus operators have been significantly impacted by the Covid-19 pandemic and are not likely to be able to suitably invest in their fleets to meet a 2023 enforcement date. A 2024 enforcement date or later would provide a more realistic timeline to meet LEZ compliance.

iii. Although the consultation did not conclude that any of the five LEZ options can be ruled out at this stage, feedback from one bus operator (of three) highlighted that the bus station is not utilised by their services but is the hub for other operators in the city. The

operator therefore considers the exclusion of the bus station would result in unequal impacts of the LEZ on all bus companies. The resultant impact of including or excluding the bus station from a LEZ is explored further in the accompanying Integrated Impact Assessment and Business & Regulatory Impact Assessment.

iv. The stakeholder feedback suggested that further evidence is required to conclude whether Lochee Road is excluded from a LEZ. This was reflected in the public responses that favoured the view that Lochee Road should be included in a LEZ. It is well known that the corridor is subject to some of the highest levels of pollutants in the city.

v. As such, it was stated at the Community Safety and Public Protection Committee in February 2020 that detailed traffic modelling of a LEZ option including Lochee Road would be undertaken. This will provide further evidence over and above the desktop exercise conducted in the option appraisal exercise, to assess the impact of including Lochee Road in a LEZ for the city. Details of the outcome from this traffic modelling are provided in the next chapter.

c. Focussed Covid-19 Consultation

i. It is recognised that the Covid-19 pandemic has had an unprecedented impact on society, including on the wider environment and the economy. Transport Scotland and DCC recognise that the Covid-19 pandemic may significantly influence future travel demand and in turn emissions attributed to road transport. Transport Scotland commissioned a study to consider the uncertainty over what travel will look like after the Covid-19 pandemic has ended, and this is summarised in Chapter Fig. 7.

ii. 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.

iii. As noted above, 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 asked to complete a short questionnaire. Key findings from the bus operator questionnaire were:

All operators confirmed it difficult to ensure or commit to their full bus fleet Euro VI being compliant by the end of the 2023 grace period

The impacts from the pandemic on passenger numbers is significantly hampering the ability to invest in new vehicles (and therefore meet compliance levels by 2023)

The early enforcement of a LEZ may result in a reduction in services or a rerouting of services away from the LEZ area

Any additional grace period (from the minimum of 2023) would allow time to plan fleet investment to meet LEZ requirements

Private cars must be included to ensure the bus is not unfairly penalised

Any grace period should be the same for all vehicles

iv. The business community has been significantly impacted by the Covid-19 pandemic, with many shops and services required to close or provide reduced service due to Government restrictions. 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. To further understand the impact on the Dundee business community from the pandemic and the introduction of a LEZ, a short online survey was then circulated to approximately 300 city centre businesses and Dundee Chamber of Commerce members in March 2021.

FIG. 7 LEZ TRAFFIC MODELLING

a. Introduction

i. Dundee City Council commissioned the development of a traffic microsimulation model of the Dundee Greater City Centre area for the purpose of assessing the LEZ options identified through the NLEF appraisal process.

ii. An initial 2019 Base Model was developed (as detailed in the report *Dundee Greater City Centre Base Paramics Model Development Report (SYSTRA, November 2019))* and from this a future year 2023 Reference Case Model was created (as detailed in the technical note *Dundee Greater City Centre Reference Case Note (SYSTRA, February 2020))*. The 2023 Reference Case, as defined by DCC, reflects infrastructure changes and committed Local Development Plan forecasts to 2023.

iii. The 2023 Reference Case Model was used as a basis to develop three LEZ option tests, namely the three all vehicle LEZ options identified through the NLEF high level appraisal (Chapter):

LEZ Option 2A - Inner Ring Road All Vehicles, including all car parks (Figure 6.4)

LEZ Option 2B - Inner Ring Road All Vehicles, excluding Bell Street and West Marketgait NCP car parks (Figure 6.5)

LEZ Option 2C - Inner Ring Road All Vehicles, excluding Bell Street, West Marketgait NCP and Wellgate car parks (Figure 6.8)

iv. 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 public and stakeholder consultation. The Lochee Road options tests were:

LEZ Option 2A/B/C plus West Marketgait between West Port Roundabout and Dudhope Roundabout and Lochee Road to Tullideph Road

LEZ Option 2A/B/C plus West Marketgait between West Port Roundabout and Dudhope Roundabout and Lochee Road to Loon's Road

v. A technical modelling note (*Dundee Greater City Centre Paramics Model LEZ Option Testing Note (SYSTRA, April 2020)*) outlines the development of each of the LEZ option models and assesses the impact the introduction of each LEZ has on the Dundee road network, where modelled trips by non-compliant vehicle are displaced to a location outside the LEZ.

b. Summary of modelling results – Inner Ring Road LEZ

i. The Technical Note concludes the inner ring road option models operate without noticeable difference from the operation of the Reference Case model, suggesting the introduction of the LEZ options does not significantly impact on network conditions. The exception to this is the East Dock Street/East Marketgait junction which sees some increases in congestion in Option 2A, particularly in the AM, as a result of non-compliant vehicles being reassigned to car parks on the periphery of the LEZ inner ring road area. In Option 2B and 2C, where fewer vehicles are displaced due to greater car park availability in these options, this congestion is not noted in the option models.

ii. Modelled journey times were analysed for each option, representing key routes that may be impacted by the LEZ proposals, and compared to the 2023 Reference Case. The modelling shows that journey times on key routes in the city are not significantly impacted as a result of the introduction of the three LEZ options. The most notable increases to journey times occurs in Option 2A with a maximum average journey time increase of approximately 1 minute recorded on East Dock Street (westbound between Greendykes Road and East Marketgait). In Options 2B and 2C this impact is not recorded with little change in journey times compared to the 2023 Reference Case.

iii. Modelled link flow were compared for selected locations on the inner ring road for each LEZ option. This was undertaken to understand the localised impact of each option in restricting non-compliant vehicles from accessing the area inside the inner ring road and redistributing trips to car parks on the periphery of the proposed option area.

iv. Analysis of 12 hour two-way modelled flows show there to be some redistribution of traffic on the inner ring road as a result of each LEZ option. At all locations assessed, the changes in traffic flows are not considered significant for the class of road (dual carriageway) for the two-way 12 hour time period represented and the operation of the option models suggest these changes do not result in noticeable increases in network congestion.

c. Summary of modelling results – Inner Ring Road plus Lochee Road LEZ

i. The Technical Note details that the Lochee Road option models result in increased congestion at key city centre locations compared to the Reference Case model, suggesting the introduction of a LEZ incorporating the Lochee Road corridor significantly impacts on network conditions. The increase in network congestion is evident in all inner ring road option variants (Option 2A, 2B & 2C) tested with both Lochee Road variants (i.e. all 6 options models).

ii. The LEZ option incorporating Lochee Road to Tullideph Road generally has a more localised impact on the road network, due to the shorter extent of the Lochee Road corridor influenced by the LEZ. Extending the LEZ option to incorporate Lochee Road to Loon's Road results in a more significant strategic shift of non-compliant traffic away from the Lochee Road corridor to other key routes in and out of the city such as Riverside Drive, Perth Road/Hawkhill and Strathmartine Road/Hilltown. Both options result in increased network congestion and this is particularly evident in the Loon's Road variants.

iii. In both variants the congestion around the East Dock Street/East Marketgait junction is increased and in the PM period the queueing can extend past the East Dock Street/Tay Bridge junction and on to the bridge itself and through the waterfront development areas, with the reasons for this congestion discussed in the flow comparisons below. There is also an increase in queueing at the High Street/Loon's Road junction in the Tullideph Road options, where queueing can extend back on to Ancrum Road and on Gardner Street northbound on approach to Loon's Road.

iv. The modelling shows that journey times on key routes in the city are significantly impacted as a result of any LEZ option that incorporates the Lochee Road corridor. The most notable increases in journey times are seen southbound on Forfar Road and westbound on East Dock Street and this is noted in both the Tullideph Road and Loon's Road option models. In the Tullideph Road options, journey time increases of approximately 4 minutes are seen on both these routes. In the Loon's Road options, journey times increase by over 5 minutes on East Dock Street and almost 10 minutes southbound on Forfar Road. It is noticeable that these increases are on routes separate from the Lochee Road corridor and show that the inclusion of Lochee Road in any LEZ has wide ranging implications on the Dundee road network. The journey times on Lochee Road itself are shown to be comparable between all options as non-compliant vehicles are removed from this route.

v. Modelled link flow comparisons show there to be significant changes in traffic flows on the inner ring road as a result of incorporating Lochee Road in any LEZ option. The largest increases in vehicle flows are on East Marketgait, Dock Street, West Marketgait (south of West Port roundabout) and the waterfront area, ranging between approximately 3000 vehicles and 5300 vehicles over 12 hours. Conversely there is a significant reduction in traffic on West Marketgait (north of West Port roundabout) and North Marketgait as a result of a significant drop in vehicles on the adjacent Lochee Road. While such a reduction here may be welcome, the opposing increase on the southern and eastern inner ring road

results in significant congestion, as noted above, with queues extending along the waterfront area, East Dock Street and the Tay Road Bridge and journey times significantly increasing on the routes approaching these locations (Forfar Road and East Dock Street).

vi. Flow comparisons show there to be significant reductions in vehicle flow on Lochee Road, as expected, with non-compliant vehicles restricted from utilising the corridor. The results show however, that non-compliant vehicles shift from Lochee Road to a number of other adjacent routes. When the LEZ is extended along Lochee Road to Tullideph Road, the largest increases in vehicles are seen on City Road and Loon's Road, of over 2000 vehicles over 12 hours. When the LEZ is extended to Loon's Road, the impact on local routes is dampened somewhat as the larger LEZ results in a more strategic shift of trips to routes such as Perth Road/Hawkhill, where flows increase by over 1000 vehicles over 12 hours. Analysis of the vehicles switching routes from Lochee Road confirm these to be non-compliant vehicles meaning the local adjacent routes are seeing a significant increase in the most polluting vehicles.

vii. In addition to the increase in congestion and journey times and changes to vehicle flow in the city, the modelling results show that average trip distance increases as a result of introducing a LEZ with Lochee Road. This reflects the more strategic shift in non-compliant trips seeking alternative, often longer, routes in the city. From an increase in trip distance, it can be inferred that carbon emitted by road transport will also increase as a result of any LEZ that includes the Lochee Road corridor.

d. LEZ Post Covid-19 Uncertainty

i. The Covid-19 pandemic has had a dramatic impact on travel across all modes and specifically travel in Scotland's city centres. To assist in the development of the LEZs across Scotland, Transport Scotland commissioned a study to apply the principals of modelling in considering the uncertainty over what travel will look like after the pandemic has ended.

ii. The outcomes from the study are detailed in the *LEZ Post-Covid Uncertainty Summary Note (SYSTRA Ref. GB01T20E86/11024112/005, January 2021*). The core traffic modelling results summarised were undertaken based on one plausible future scenario, as defined as the 2023 Reference Case. The Covid-19 study recommended that a sensitivity test was undertaken on one other further plausible future, to ensure a robust set of modelling results to inform Dundee's LEZ.

iii. The sensitivity scenario was defined as "Coping as Best We Can" where, following an economic downturn, the projected rate of change towards a cleaner fleet is lower than pre-Covid-19 forecasts (as provided by SEPA) and traffic shrinkage is experienced, similar to the 2010 economic downturn.

iv. It was agreed with DCC that Covid-19 sensitivity tests were undertaken on the following models:

Reference Case

LEZ Option 3 - Inner Ring Road area, excluding Bell Street, West Marketgait NCP and Wellgate car parks

LEZ Option 3 Lochee Road Variant 1 – Op3 plus West Marketgait between West Port Roundabout and Dudhope Roundabout and Lochee Road to Tullideph Road

LEZ Option 3 Lochee Road Variant 2 – Op3 plus West Marketgait between West Port Roundabout and Dudhope Roundabout and Lochee Road to Loon's Road

v. To inform the required reduction in traffic, DCC's Road Traffic Reduction Act monitoring data was utilised and it was agreed with DCC that a 10% reduction would be applied to the traffic model demands for the 2023 Reference Case and appropriate LEZ Option models.

vi. The results showed general network conditions between the Covid-19 sensitivity Reference Case and option models were relatively similar with no significant increase to network congestion or journey times on key routes. However flow comparisons highlighted that there remains significant changes to localised traffic flows as a result of the Lochee Road corridor being included in any LEZ. In a similar manner to the "full" forecast scenarios summarised above, significant increases in traffic flow is recorded on routes such as City Road (up to approximately 60% increase), Loon's Road (up to approximately 50% increase) and Brook Street (up to approximately 80% increase). The sensitivity testing therefore concludes that even under a future where traffic demand is at the lower end of forecast predictions, the inclusion of Lochee Road in any LEZ will still result in localised rerouting of non-compliant vehicles.

e. Conclusions from Traffic Modelling

i. 15 LEZ options in total were tested in the Dundee City Paramics traffic model and the model results clearly show there to be considerable impacts on the Dundee Road network if Lochee Road is included in any LEZ option. For this this reason, all Lochee Road options are at this stage removed from the appraisal process and not are considered viable LEZ options.

ii. The three core inner ring road options are shown to operate with less impact on the road network however it is noted that Option 2A shows increased congestion on the inner ring road, particularly the eastern side around East Marketgait and Dock Street. This is a result of non-compliant vehicles being reassigned to car parks on the periphery of the LEZ inner ring road area. In Option 2B and 2C, where fewer vehicles are displaced due to greater car park availability in these options, this congestion is not recorded through the modelling results.

iii. At this stage in the appraisal process, Option 2A, 2B and 2C are progressed to further option refinement in the next chapter.

iv. With the removal of the Lochee Road options it is important that additional traffic and demand management measures are explored on the Lochee Road corridor to address the remaining exceedance locations on the corridor.

f. Emissions Analysis and the National Modelling Framework

i. SEPA, who develop and run the National Modelling Framework (NMF) Dundee City Air Quality Model, were subject to a cyber-attack in late 2020 resulting in the NMF being currently unavailable. The Dundee LEZ option will however be assessed in the NMF prior to submission to Scottish Minsters, subject to the availability of the NMF Dundee City Model.

ii. As an interim step to inform the likely impact on emissions resulting from the introduction of the LEZ, analysis of emissions based on traffic model outputs has been undertaken by SEPA using EMIT software and summarised in the second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021).*

FIG. 8 LEZ OPTION REFINEMENT

a. Introduction

i. The Interim Stage 2 Report identified five possible LEZ options for Dundee and these were progressed to public and stakeholder consultation and detailed testing with the results from these presented above. This chapter takes the opportunity to interpret the consultation and modelling results in Chapters Fig. 6 and Fig. 7, alongside wider appraisal considerations (such as implementation, economy and safety), to refine the five LEZ options and allow for final detailed appraisal of the remaining LEZ option(s).

ii. The five options for consultation and modelling were:
LEZ Option 1A - Inner Ring Road Bus Only, including bus station (**Figure 6.2**)
LEZ Option 1B - Inner Ring Road Bus Only, excluding bus station (**Figure 6.3**)
LEZ Option 2A - Inner Ring Road All Vehicles, including all car parks (**Figure 6.4**)
LEZ Option 2B - Inner Ring Road All Vehicles, excluding Bell Street and West Marketgait NCP car parks (**Figure 6.5**)
LEZ Option 2C - Inner Ring Road All Vehicles, excluding Bell Street, West Marketgait NCP and Wellgate car parks (**Figure 6.8**)

iii. In addition, the traffic modelling examined possible LEZ options including the Lochee Road corridor with the model results concluding that these were not suitable LEZ options.

iv. The full reasoning behind LEZ option refinement is provided in the second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021)* and the final outcomes summarised below.

Option 1A and 1B – Bus Only Options

v. The consultation and modelling results alongside wider local and national government objectives support an all vehicle LEZ and therefore the bus only LEZ options are removed at this stage as stand-alone options. It should be noted however that the remaining all vehicle LEZ options (2A, 2B and 2C) can be operated as bus only if required either initially through a phased introduction of vehicle type enforcement or at a later date, through the adjustment of LEZ restrictions.

vi. Note, "all vehicle" describes a LEZ where all vehicles are restricted that fail to meet the LEZ emission standards as set in Regulation 2 of the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021, namely:
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).
Euro 3 for motorcycles and mopeds

Option 2A, 2B and 2C – All Vehicle Options

vii. From a legislative viewpoint there are likely to be difficulties in implementing Option 2A and 2B. The Transport (Scotland) Act 2019 received Royal Assent in November 2019 and this was after the identification of these LEZ options in the Interim NLEF Stage 2 Report and the subsequent consultation period. Section 6 of the Transport (Scotland) Act 2019 details the restrictions on driving within a LEZ, and states: *A person may not drive a vehicle on a road within a low emission zone in contravention of the terms of a low emission zone scheme unless (a) the vehicle meets the specified emission standard, or (b) the vehicle is exempt (Act 2019 Section 6)*. The stating of road rather than area has implications on the proposed LEZ boundaries identified in the initial option generation exercise. Furthermore,

Section 14 of the Act 2019 states that a LEZ may not specify a private or special road as part of the scheme area.

viii. Option 2A includes two car parks with access directly to/from the A991 inner ring road, Bell Street and West Marketgait NCP car parks. A vehicle travelling on the inner ring road is not inside the proposed LEZ area and upon entering either car park cannot then be considered to be on a road inside the LEZ, as the car parks are not classified as adopted DCC roads.

ix. Option 2B includes Wellgate Centre car park and again access to this car park is directly from the A991 inner ring road at Kirk Lane, just north of King Street. The exit for Wellgate car park is on Meadowside, inside the inner ring road area. While Meadowside is an adopted DCC road, Kirk Lane is non-adopted, and therefore to include Wellgate car park as part of the LEZ would include a private road and require enforcement of the LEZ from a third party (Wellgate Centre) and not DCC.

x. Both Option 2A and 2B therefore contradict the Transport (Scotland) Act 2019 and alongside modelling and consultation considerations are removed as viable LEZ options

xi. Option 2C, which excluded Bell Street, West Marketgait NCP and Wellgate car parks does meet legislative framework and traffic modelling demonstrates the option operates without significant impacts on the current road network. In addition, Option 2C was the favoured option in the public consultation.

b. Final proposed LEZ Option for Dundee

i. As a result of the above option refinement that considered the consultation, modelling and legislative outcomes, Option 2C is the final remaining LEZ option from the identified options for consultation and testing. It recommended that this option, as shown in **Figure 6.8**, is presented as the final preferred LEZ option for Dundee, subject to final definition and appraisal against the LEZ objectives.

ii. The option is now renamed as the Dundee LEZ Option.

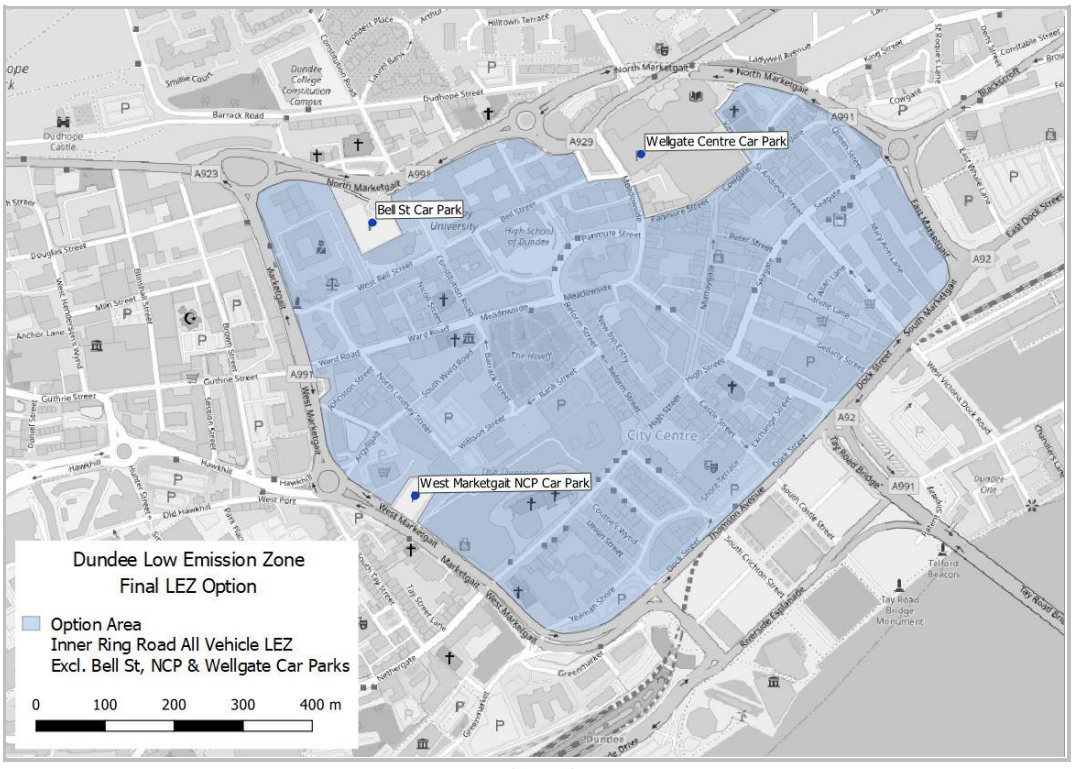

Figure 6.7 : Final Dundee LEZ Option

FIG. 9 DUNDEE LEZ OPTION DETAIL

a. Introduction

i. The analysis undertaken and summarised in Chapters Fig. 6, Fig. 7 and Fig. 8 has identified a final Dundee LEZ Option. The next stage of the NLEF process is to define the LEZ Option detail prior to a final appraisal against the LEZ objectives

ii. Section 14 of the Transport (Scotland) Act 2019 states the required content of a LEZ, namely:
The zone to which it relates, which must be specified by
- i. reference to an area on a map, and
- ii. specifying the roads (or parts of a road) which form part of the zone

the types of vehicles to which it applies
the date on which the scheme comes into effect
the grace periods applicable
the LEZ objectives

iii. This chapter will provide information on the required content of Dundee's LEZ.

b. Dundee LEZ Area

i. 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.

ii. A site visit was undertaken in March 2021 by a member of the Dundee LEZ Delivery Group to ensure the boundary of the final LEZ area took cognisance of any local access or land uses that could not be considered inside the LEZ, in line with Section 14 of the Transport (Scotland) Act 2019. An initial detailed drawing of the final Dundee LEZ is shown in **Figure 6.8** and identifies the following accesses/land uses as outside the LEZ area:
Bell Street car park (labelled A in **Figure 6.8**)
West Marketgait NCP car park (B)
Wellgate Centre and car park (C)
Shell garage on West Marketgait at Ward Road (D)
Vehicle access to Dundee House on West Marketgait, south of Argyllgait (E)
Auto Windscreens business at West Marketgait NCP car park (F)
Goods delivery access to Overgate Centre (G)
Arnold Clark storage area on East Marketgait between Seagate and Dock Street (H)

iii. The detail presented in **Figure 6.8** is considered appropriate for this stage of the Interim Stage 2 Reporting and subsequent submission to Dundee City Council Committee and for the consultation period thereafter. However, detailed design work will be undertaken prior to final submission of the Dundee LEZ Option to Scottish Ministers that will include aspects such as signage and camera placement and will present a further opportunity to finalise the LEZ boundary. It is anticipated that through the final consultation additional locations, accesses or land uses may be identified and require consideration of whether they fall inside or outside the LEZ area.

iv. 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 second Interim NLEF Stage 2 Assessment Report (*Dundee Low Emission Zone, National Low Emission Framework 2nd Interim Stage 2 Report, SYSTRA 2021)*.

Figure 6.8 : Dundee LEZ Option Area

c. Vehicles types restricted from entering Dundee LEZ

i. 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.

ii. NLEF Guidance states *"all vehicle types should be considered for inclusion in a LEZ and be assessed as part of the NLEF appraisal process…a single vehicle type or a combination of vehicle types could be subject to the LEZ requirements"* (NLEF, 2019).

iii. The final decision of the vehicles types restricted from entering Dundee's LEZ is informed therefore by NMF Dundee air quality modelling, traffic modelling and consultation outcomes as well as enforcement considerations.

iv. Analysis of modelled emission by vehicle type in the NMF Dundee Air Quality Model (Chapter Fig. 4) concluded that the inclusion of buses in Dundee's LEZ is required to bring the greatest reduction in emissions. Modelling predicts that if all buses were compliant with LEZ emission standards then all NO_2 annual mean exceedance locations inside the inner ring road (i.e. the final LEZ area) would fall below the legal limit of below 40 µg/m^3, though a number of locations would be close to exceeding this legal limit.

v. If diesel cars and HGVs were compliant with LEZ emission standards, in addition to buses, the modelling predicts that NO_2 levels at all exceedance locations would reduce by approximately an additional 3%, further protecting the city centre from exceeding the legal limits for NO_2. The modelling predicts that if vans and petrol cars were compliant with emission standards, the impact on NO_2 levels would be comparatively small but would ultimately further reduce NO_2 levels in the city centre.

vi. The traffic modelling assessed LEZ options that restricted all vehicles (buses, diesel cars, HGVs, LGVs and petrol cars) from access to the city centre unless they were compliant with LEZ emission standards. All non-compliant vehicles were assumed to remain on the road network and accessed the city centre by utilising car parks on the periphery of the LEZ area. The results show the road network operates without a noticeable impact resulting from introducing the final all vehicle Dundee LEZ Option.

vii. The public and stakeholder consultation showed that 64% of public responses support the introduction of a LEZ applying to all vehicle types. Support for an all vehicle LEZ is strongly favoured by bus operators who feel not including all vehicles would unfairly penalise the bus as a sustainable mode of transport.

viii. In addition to evidence from modelling and consultation, the wider messaging and publicising of the LEZ is simplified if vehicle restrictions apply to all vehicle types that do not meet LEZ emission standards. It is also noted that the three other cities in Scotland (Glasgow, Aberdeen and Edinburgh) plan to introduce a LEZ for all vehicles and introducing an all vehicle LEZ for Dundee would ensure consistency across the country.

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.

ix. 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).

Euro 3 for motorcycles and mopeds

x. Although the model analysis did not consider motorcycles or mopeds (as they are not generally represented in the traffic or air quality models) these are listed in Regulation 2 and are therefore considered applicable to the emissions standards for Dundee's LEZ.

xi. Section 6(4)(a) of the Transport (Scotland) Act 2019 set enforcement exemptions consistently across Scotland, with the national LEZ exemptions listed in Regulation 3 of the LEZ Regulations and outlined in **Table 6.2.** Dundee LEZ will operate in accordance with the exemption list.

Table 6.2 : 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.

d. Enforcement of Dundee LEZ

i. DCC will submit its final proposals for the LEZ to Scottish Ministers in late 2021 and, subject to any objection, is required to declare its LEZ by May 2022. While a decision on the final exact date is made, the working assumption for this Interim Stage 2 Report is that DCC will declare the LEZ in May 2022, and that the LEZ will apply to all vehicle types (not meeting LEZ standards) from this date.

ii. 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.

iii. 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.

iv. With declaration of Dundee's LEZ in May 2022, the grace period for the LEZ must therefore:
Not expire before May 2023
Expire by May 2026 for non-residents
Expire by May 2028 for residents but can expire from May 2023

v. To inform the grace period dates, consultation with two key stakeholders, namely bus operators and the business community, was undertaken in March 2021. All bus operators confirmed their full fleet would not be compliant with LEZ emission standards by 2023, the minimum grace period. While a key purpose of any LEZ is to speed up improvements to air quality (through compliance with emission standards) and DCC could enforce the LEZ in 2023, it is considered counter-productive to set a date that bus operators will be unable to meet.

vi. In addition, it is 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, suggests that a grace period greater than the required minimum is desirable.

vii. A key theme from consultation with public and key stakeholders was the need for consistency not only of the vehicle types included in the LEZ but also the grace periods applied to the LEZ enforcement. It is therefore considered important that the grace period should be applicable to all vehicle types from the same date to ensure consistency and ease of enforcement and wider communications.

viii. The theme of consistency is also extended to considerations for the grace period applied to residents of the LEZ. As of 2021, approximately 350 resident parking permits have been issued to properties inside the Dundee LEZ area. Based on 2017 vehicle compliance figures this would equate to approximately 100 vehicles being non-compliant, although this is likely to be significantly less by 2024 (7 years after compliance figures). There is considered little benefit in defining a separate grace period, that would require a more complicated enforcement process, for less than 100 vehicles. It is proposed therefore not to provide any additional grace period for residents of the zone with enforcement of the LEZ for residents and non-residents of the zone (and all vehicle types) from the same date.

With the above considerations in mind, 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.

ix. This represents an additional grace period of two years from the declaration of the LEZ in May 2022.

x. As context, in May 2024, the approximate age of non-compliant vehicles will be as follows:
Bus – 11 years or older (including those retrofitted to Euro VI standard)
HGV – 11 years or older
Diesel car/van – 9 years or older
Petrol vehicle – 18 years or older

xi. 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.

xii. 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.

xiii. 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.

FIG. 10 SUMMARY OF NEXT STEPS

a. Timetable of Dundee LEZ

i. Table 6.3 below presents the proposed timetable from committee submission of the final Dundee LEZ presented in this Interim NLEF Stage 2 Report through to full enforcement of the LEZ after the proposed grace period ends.

Table 6.3 : Timetable towards Dundee LEZ enforcement

Activity	Indicative Date
Community Safety & Public Protection Committee Report recommending final Dundee LEZ as defined in this report	June 2021
Statutory Consultation	Summer 2021
Completion of additional impact assessments (IIA, BRIA, SEA)	Autumn 2021
Community Safety & Public Protection Committee Report on statutory consultation and final LEZ option	Autumn 2021
Submission of final LEZ scheme to Scottish Ministers	End 2021
Scottish Minister approval and DCC declaration of Dundee LEZ	Spring 2022
Enforcement of Dundee LEZ	Spring 2024

b. Emissions Analysis and the National Modelling Framework

i. SEPA, who develop and run the National Modelling Framework (NMF) Dundee City Air Quality Model, were subject to a cyber-attack in late 2020 resulting in the NMF being currently unavailable. The Dundee LEZ option will be assessed in the NMF prior to submission to Scottish Minsters, subject to the availability of the NMF Dundee City Model.

ii. As an interim step to inform the likely impact on emissions resulting from the introduction of the LEZ, analysis of emissions based on traffic model outputs has been undertaken by SEPA using EMIT software. The report *Dundee Emissions Analysis Report (SEPA, May 2021)* provides full details of this analysis with outcomes to be presented in the DCC Community Safety & Public Protection Committee Report in June 2021.

iii. Outcomes from the interim EMIT analysis and from the full NMF modelling will be included as part of the final NLEF Stage 2 Report. Key initial results from the EMIT analysis are:

Implementation of the proposed LEZ will reduce NOx emissions on key bus routes inside the LEZ boundary by an average of 70%.

Emissions on Lochee Road outside of the LEZ boundary experience a reduction in NOx emissions by an average of 20%.

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 NOx emissions on small sections of road around the edge of the LEZ boundary. These occur on roads that currently have low traffic levels.

c. Impact Assessments

i. NLEF guidance advises that as part of the NLEF Stage 2 Assessment, the final Dundee LEZ should be subject to detailed impact, equality and environmental assessments to ensure any impacts, beyond improvements to air quality, are fully considered.

ii. In line with Transport Scotland's approach to the national introduction of LEZs, Dundee's LEZ will be subject to the following impact assessments:
Strategic Environmental Assessment (SEA)
Integrated Impact Assessment (IIA)
Business and Regulatory Impact Assessment (BRIA)

iii. These assessments are ongoing and it is anticipated that these tasks will be complete prior to the final submission of the Dundee LEZ to Scottish Ministers in Autumn 2021.

d. Statutory Consultation

i. Section 11 of the Transport (Scotland) Act 2019 states that before a local authority submits its final LEZ proposals to Scottish Ministers for approval, it must consult with:
the Scottish Environment Protection Agency,
Scottish Natural Heritage (now 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

ii. All statutory consultees have been involved in previous consultation and/or are part of the Dundee LEZ Delivery Group. However, in line with The Act 2019, consultation on the final Dundee LEZ will take place from June 2021. Thereafter, DCC will publish a Report on the consultation findings and, if required, take account of any representations received in the course of the consultation.

iii. Once the consultation findings have been taken into consideration, DCC will publish the final proposed Dundee LEZ scheme and, at this time, objections can be made. When the period in which objections can be made has ceased, DCC will publish a report outlining any objections received and its response.

Dundee Emissions Analysis Report

Main Points to Note

- Following the cyber-attack that significantly impacted SEPA's internal IT systems, an alternative approach for carrying out the modelling of proposed LEZs was agreed. This focuses on identifying changes to traffic emissions inside and outside the boundary of the proposed LEZ.

- The highest concentrations of annual-average NO_2 occur in the City Centre where vehicle emissions are dominated by buses. Diesel car emissions dominate other key routes around the city.

- Implementation of the proposed LEZ will reduce NOx emissions on key bus routes inside the LEZ boundary by an average of 70%. Emissions on Lochee Road outside of the LEZ boundary experience a reduction in NO_x emissions by an average of 20%.

- 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 NOx emissions on small sections of road around the edge of the LEZ boundary. These occur on roads that currently have low traffic levels.

- The next steps will focus on areas of the city that see an increase in vehicle emissions by developing the air-quality model to predict changes in roadside concentrations. This will include detailed work on Lochee Road and the LEZ area.

Scope of Report

Air Quality (AQ) modelling in Dundee is ongoing as part of the National Modelling Framework (NMF) in support of the Scottish Government's Cleaner Air for Scotland Strategy (CAFS). This report summarises work carried out to calculate tail-pipe emissions of Nitrogen Oxides (NO_x) using outputs from the Dundee traffic model which has been used to inform the planning of a Low Emission Zone (LEZ) for Dundee City Council (DCC). This work has been carried out in line with the NMF, which has the aim to deliver a detailed and consistent approach to assessing AQ in Scotland's major cities. This report provides an early indication of where traffic-related emissions are likely to increase or decrease following the implementation of the LEZ.

This report follows on from previous reports by SYSTRA to which SEPA contributed detailed AQ modelling information. SEPA's model helped to inform the testing of early LEZ scenarios.

It is important to note that this is an interim report due to technical issues described below. Further detailed AQ modelling will resume during the summer of 2021 to inform the final LEZ design and will focus on the changes in Nitrogen Dioxide (NO_2) concentrations associated with the changes in traffic patterns summarised below. Particulate Matter (PM) modelling will be included in further work.

SEPA Cyber Attack – and the Alternative Approach Taken

On Christmas Eve, the Scottish Environment Protection Agency (SEPA) was subject to a serious and complex criminal cyber-attack that significantly impacted our internal systems and our AQ modelling capabilities.

As part of SEPAs recovery plan a phased rollout to restore critical services to re-establish communication in order to continue providing priority regulatory, monitoring, flood forecasting and warning services. This 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 AQ 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 a small number of 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. This will assess the impact of the LEZ by comparing traffic and emissions between the reference/base case and LEZ scenarios.

- 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.

Introduction and Background

Air quality management activities (including AQ monitoring) in Scotland have been primarily driven by the 2008 European Union Directive on ambient air quality and cleaner air for Europe (Directive 2008/50/EC), which was incorporated into Scottish law through the Air Quality Standards (Scotland) Regulations 2010 and 2016. At a domestic level, the Environment Act 1995 and Regulatory Reform (Scotland) Act 2014 set out the Local Air Quality Management (LAQM) regime to assist local authorities in achieving compliance with legal AQ standards and objectives set to protect human health.

The CAFS Strategy, published in 2015, sets out how Scottish Government and its partner organisations propose to further reduce air pollution and improve AQ to protect human health and fulfil Scotland's legal responsibilities as soon as possible. CAFS provides a clear commitment to the NMF to ensure that a consistent approach to modelling AQ in areas associated with the highest levels of poor AQ in all four major cities is taken. The NMF will provide tools and evidence to support the NLEF. The NLEF is an evidence-based appraisal process developed to help local authorities consider transport related actions to improve local AQ.

In September 2017, the Scottish Government's Programme for Government committed to the introduction of LEZs in Scotland's four biggest cities (Glasgow, Edinburgh, Aberdeen and Dundee) by 2020, with the first introduced in Glasgow in 2018. With the advent of COVID-19 and the subsequent lock-down restrictions and recovery measures the decision was made to temporarily pause the implementation of LEZs and the Scottish Government have since set a revised timetable for LEZs to be introduced across all four cities between February and May 2022.

CAFS has been subject to a formal review, with an updated strategy (CAFS2) expected to be published shortly in 2021 (to run to 2026). The initial findings of the review identified that Scotland was performing well on AQ, with the major pollutants continuing to fall as a result of actions taken to date. However, the review also recommended that there is more work to be carried out and Scotland must take a precautionary public health approach to further AQ reductions.

Emissions Analysis

A traffic model has been developed by SYSTRA to assess how traffic patterns could change in response to the implementation of a LEZ in Dundee. The model predicts how non-compliant vehicles could be displaced by the LEZ and may re-route around the LEZ.

A comparison has been made between a 'Reference' case and a LEZ case.

- Reference case traffic flows are based on those observed in 2019, but data about the age of the fleet, e.g. the proportions of vehicles that are compliant, are based on fleet observations in 2017. The proportion of bus journeys being made by the lowest-emitting EURO VI buses in the LEZ was 30%.

- Traffic flows in the LEZ case are based on the Reference case with the added intervention of the LEZ. The vehicle fleet is also based on a fleet observed in Dundee in 2017, but the proportion of bus journeys being made by EURO VI buses was increased to 100%.

A comparison for a 2017 fleet composition gives a worst-case scenario regarding the amount of traffic that will be displaced by the LEZ. This is a more precautionary approach than projecting how quickly the fleet could upgrade in the years leading up to the full introduction of the LEZ.

Traffic model outputs were firstly processed to make them compatible with the CERC emissions database tool (EMIT) using conversion factors derived from observed traffic data. Emission rates (g/km/s) could then be calculated for every road in the traffic model for the Reference and LEZ scenarios. Comparing emissions between these 2 scenarios enables any changes due to the LEZ to be identified.

The EMIT software used contains the emission factors from the Emission Factor Toolkit (EFT) version 8.

Traffic Pollutants described in this Report

The focus of the LEZ is on reducing local concentrations of Nitrogen Dioxide (NO_2) which is emitted directly from the tailpipe of road traffic. However, NO_2 is also chemically produced in the atmosphere from road traffic emissions of Nitrogen Oxide (NO). These two pollutants are referred to collectively as Nitrogen Oxides (NO_x).

The AQ modelling focused on predicting concentrations of NO_2, which is how compliance against AQ Standards is assessed. However, the AQ model has also been used to estimate the proportions of vehicle pollution that comes from different types of vehicle, e.g. diesel cars vs buses. This type of analysis is usually performed for NO_x, rather than NO_2. It is difficult to calculate the breakdown of NO_2 for different vehicles accurately because of the additional component of NO_2 that is created in the atmosphere. For this reason, the analysis of traffic model output currently focuses on emissions of NO_x only.

LEZ Extent

The extent of the LEZ is shown in Figure 1 inside the inner ring road, which is covered by the AQ and traffic models.

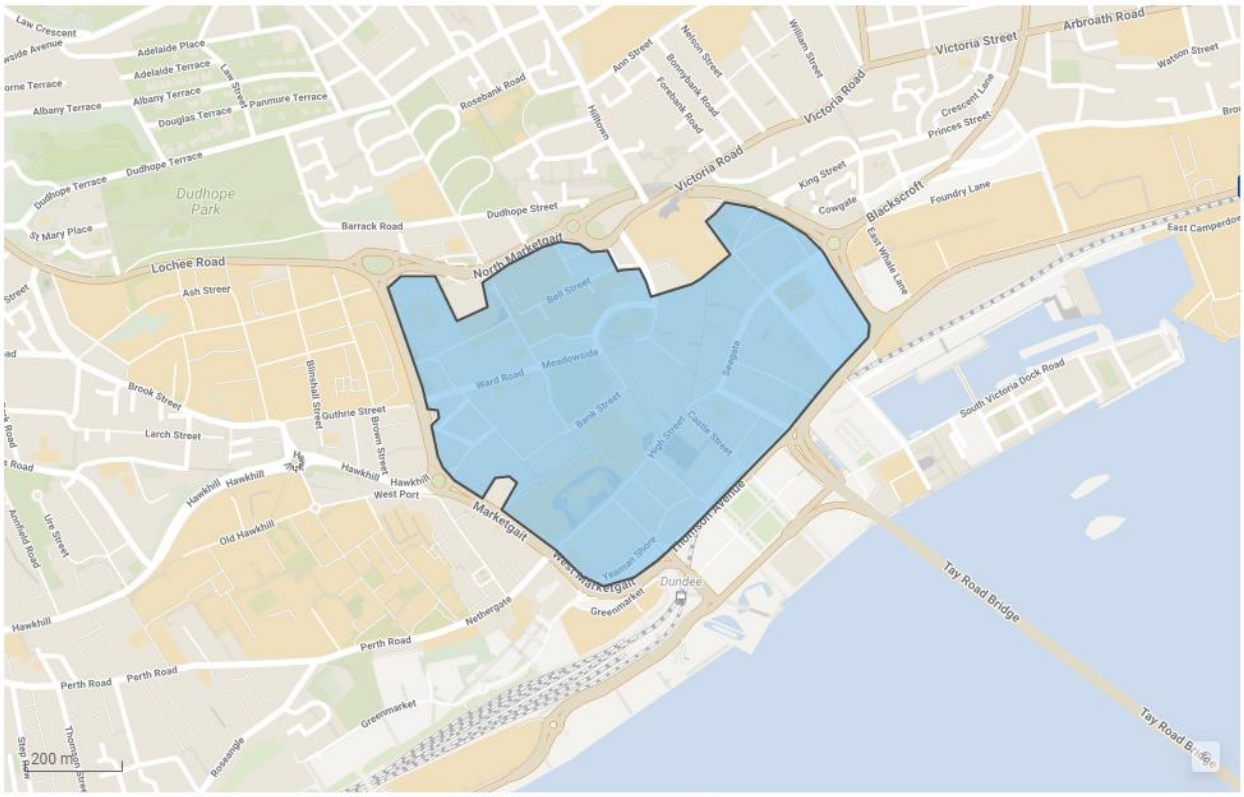

Figure 1 – LEZ extent covering the area of Dundee City Centre within the inner ring road.

Air Quality Model: Pollutant Concentrations

Air quality modelling carried out previously was used to predict concentrations of NO_2 at a network of regular kerbside points across the city. The red markers in Figure 2 show predicted exceedances of the annual average NO_2 limit value of 40µgm^{-3}. Areas of exceedance are focused in the City Centre and in particular along major bus routes. The model results shown here were based on conditions in 2017.

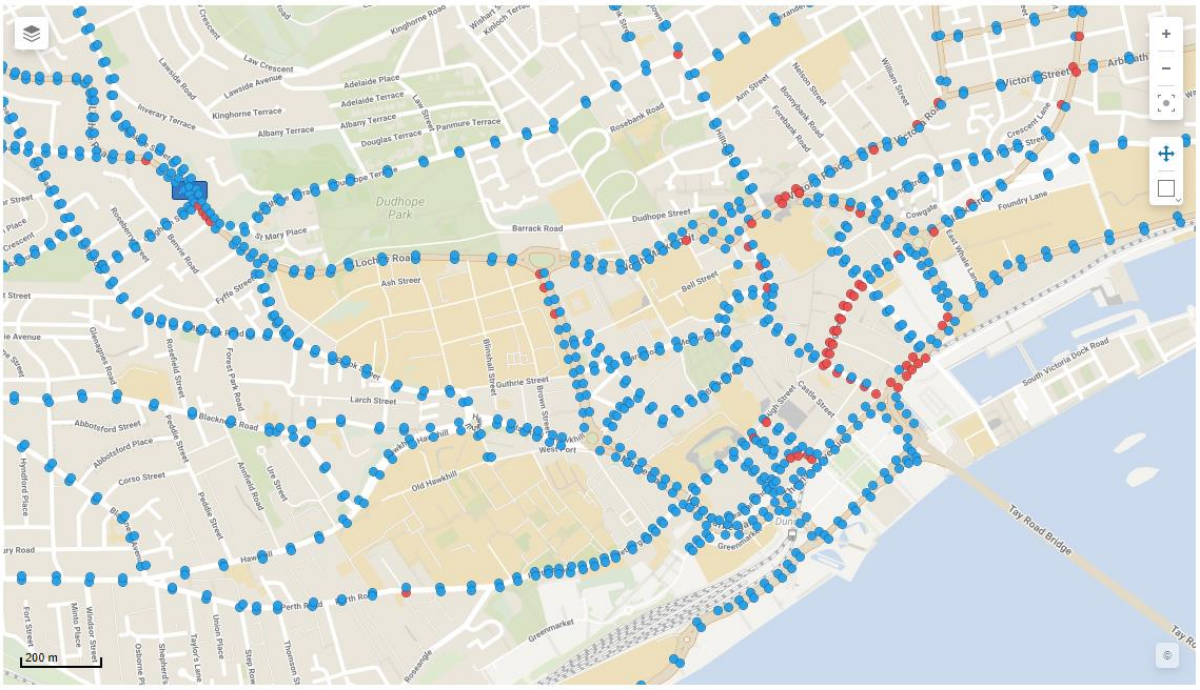

Figure 2 – Modelled concentrations of annual-average NO_2 above (red) and below (blue) the limit value of 40µgm^{-3}.

Air Quality Model: Emissions by Vehicle Type

The AQ model was also used to estimate the relative contribution to total levels of NO_x from different types of vehicles. This analysis showed that the greatest contributors to NO_x across the city are buses and diesel cars. Bus emissions are most dominant on roads inside the City Centre and on key routes in and out of the city. This is where the highest pollutant concentrations are measured and predicted (Figure 3). Diesel car emissions are dominant on other key routes around the city (Figure 4).

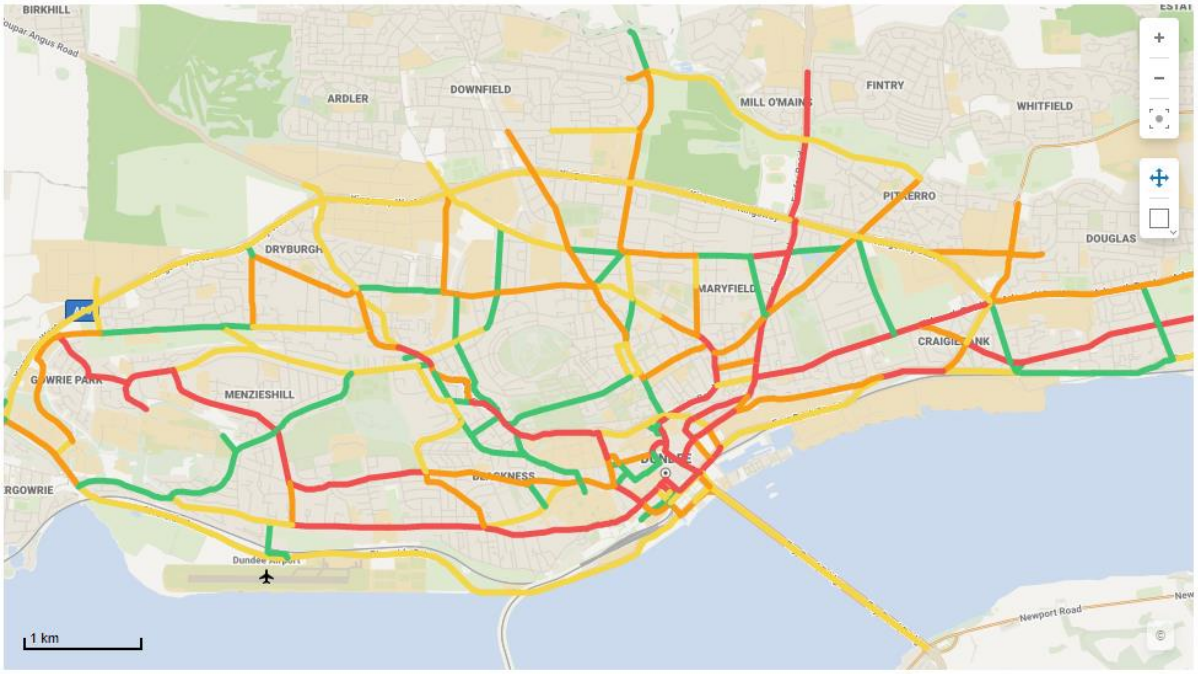

Figure 3 – The roads coloured in red are those dominated by bus emissions (highest 25%).

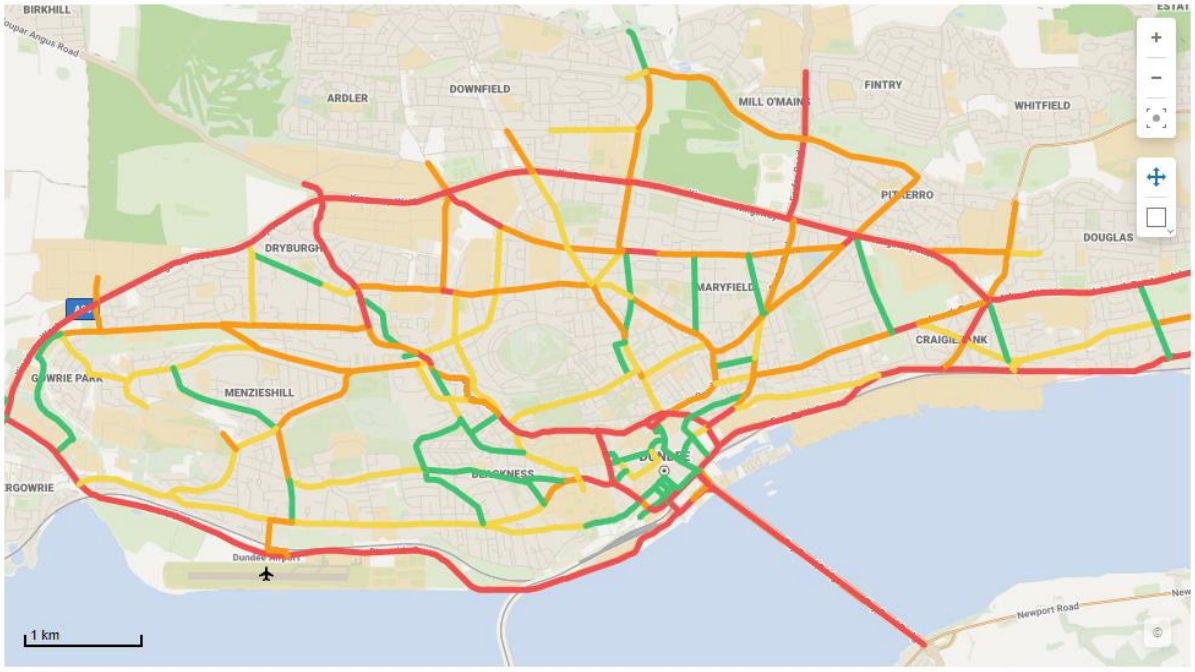

Figure 4 – The roads coloured in red are those dominated by diesel car emissions (highest 25%).

Traffic Model Analysis

The effects of the LEZ have been investigated both inside and outside of the LEZ boundary. The most significant emission reduction occurs inside the boundary where vehicles are required to meet strict emission standards. Some vehicles that do not meet the emission

standards of the LEZ re-route around the edges of the LEZ boundary. This displacement of non-compliant vehicles has the potential to increase vehicle emissions.

On key bus routes inside the LEZ there is a significant reduction in NO_x emissions. On the roads highlighted in black in Figure 5 there is an average reduction in total NO_x emissions of over 70%. Those roads highlighted that are outside of the LEZ are mostly associated with lower absolute levels of emission.

Many of the roads inside the LEZ that see the greatest reduction in emissions coincide with those highlighted in Figure 2 where the highest pollutant concentrations are experienced.

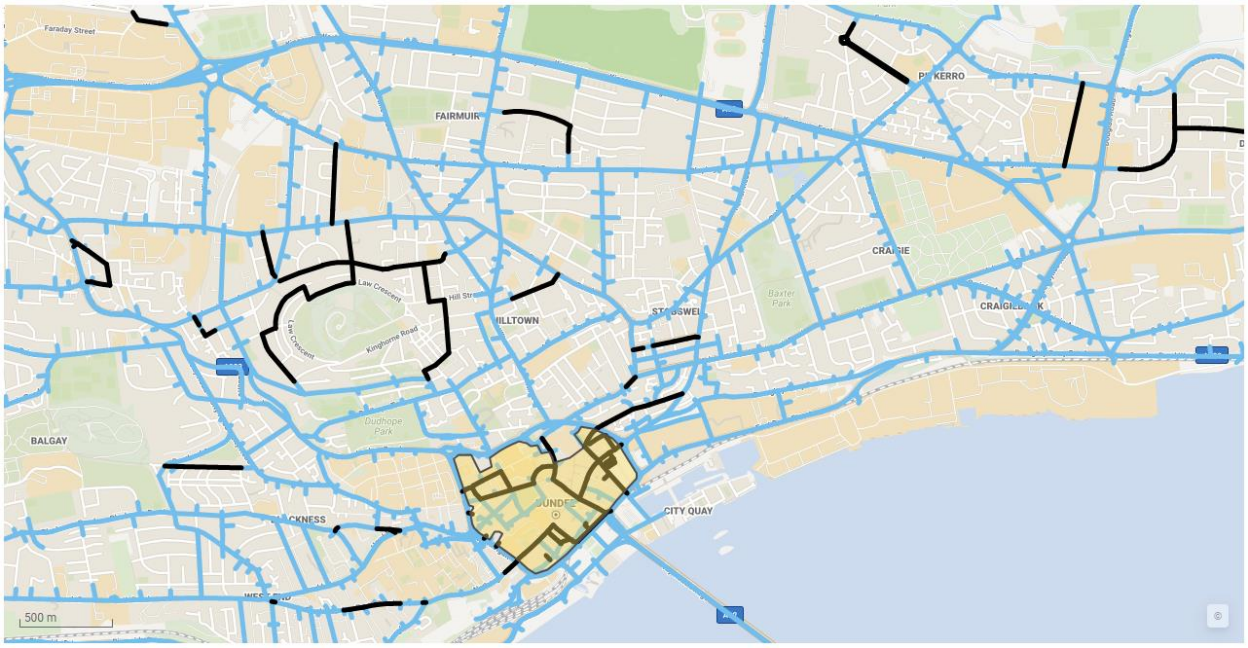

Figure 5 – Areas highlighted in black are predicted to see on average a 70% reduction in NO_x emissions. These are mostly key bus routes within the city City Centre which coincide with high pollutant concentrations and exceedances of the NO_2 annual limit value. The extent of the LEZ is shown in yellow.

There is an average reduction in NO_x emissions along Lochee Road of 20%, along the section of road highlighted in Figure 6. The air-quality model has shown that emissions in this area are linked to a wider mix of vehicle categories than those within the LEZ that tend to be dominated by buses.

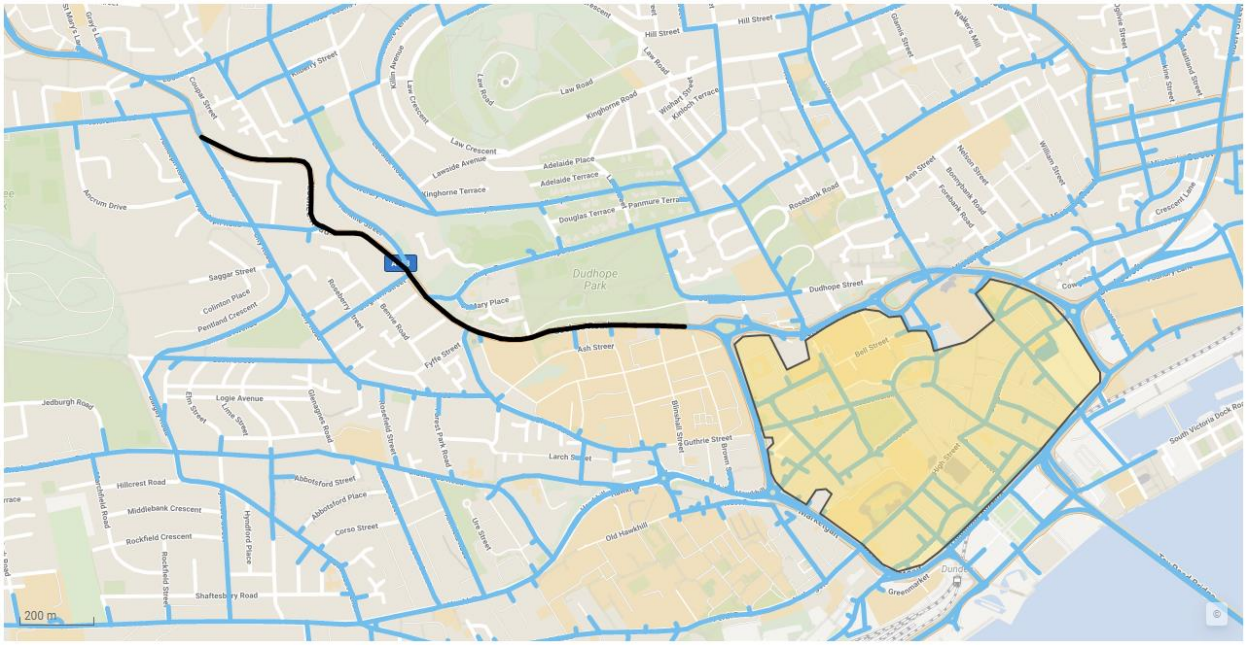

Figure 6 – Section of Lochee Road highlighted in black where NO_x emissions are reduced by 20% following implementation of the LEZ.

There is an increase in car flow around the edge of the LEZ when compared against the Reference case. On the roads highlighted in black in Figure 7 there is an increase of over 100 cars per day. The largest increases in car flow are associated with parts of Marketgait and nearby car parks, as highlighted in red. On these roads there is an increase of between 1000 and 2000 cars per day. A small link leading to the NCP Marketgait car park on the edge of the LEZ boundary sees an increase of around 4000 cars per day.

Figure 7 – Areas highlighted in black and red are predicted to see an increase in car traffic flow due to displacement of journeys around the edge of the LEZ. The extent of the LEZ is shown in yellow.

There are only small increases in other vehicle types due to the implementation of the LEZ. Roads highlighted in black in Figure 8 are those where the daily number of LGV's increases by over 25, to a max of 60. The roads highlighted black in Figure 9 show where the daily number of Rigid Heavy Goods Vehicles (HGVs) increase by over 25, to a max of 85.

Figure 8 – Roads highlighted in black experience an increase of over 25 LGVs per day.

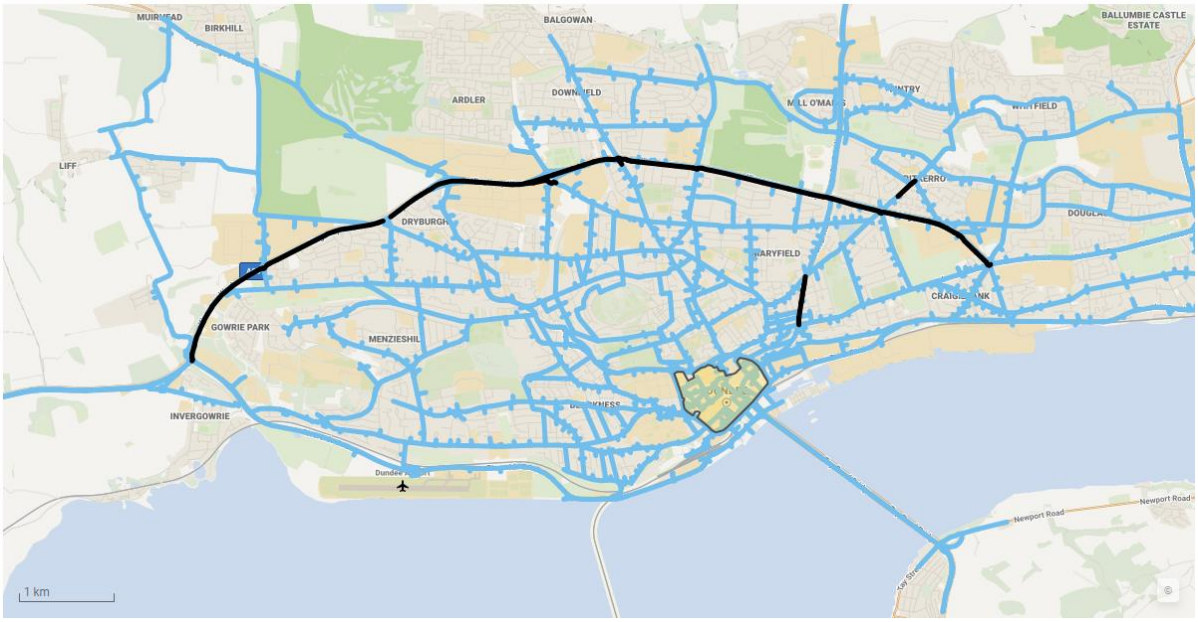

Figure 9 – Roads highlighted in black experience an increase of over 25 Rigid HGVs per day.

Areas of the model that see an increase in traffic flow correspond with a small number of roads that are predicted to see an overall increase in emissions of NO_x, due to the implementation of the LEZ. These are highlighted in black in Figure 10, although these often correspond to small increases or very low absolute rates. The increase in NO_x emissions on the Kingsway is less than 10%.

Figure 10 – Areas highlighted in black are predicted to see an overall increase in NO_x emissions due to displacement of journeys around the edge of the LEZ. The extent of the LEZ is shown in yellow.

Areas of the city that experience an increase in NO_x emissions of over 40% are very localised and are highlighted in black in Figure 11. These have an average increase of 125% and relate to the high number of cars accessing car parks on the edge of the LEZ boundary.

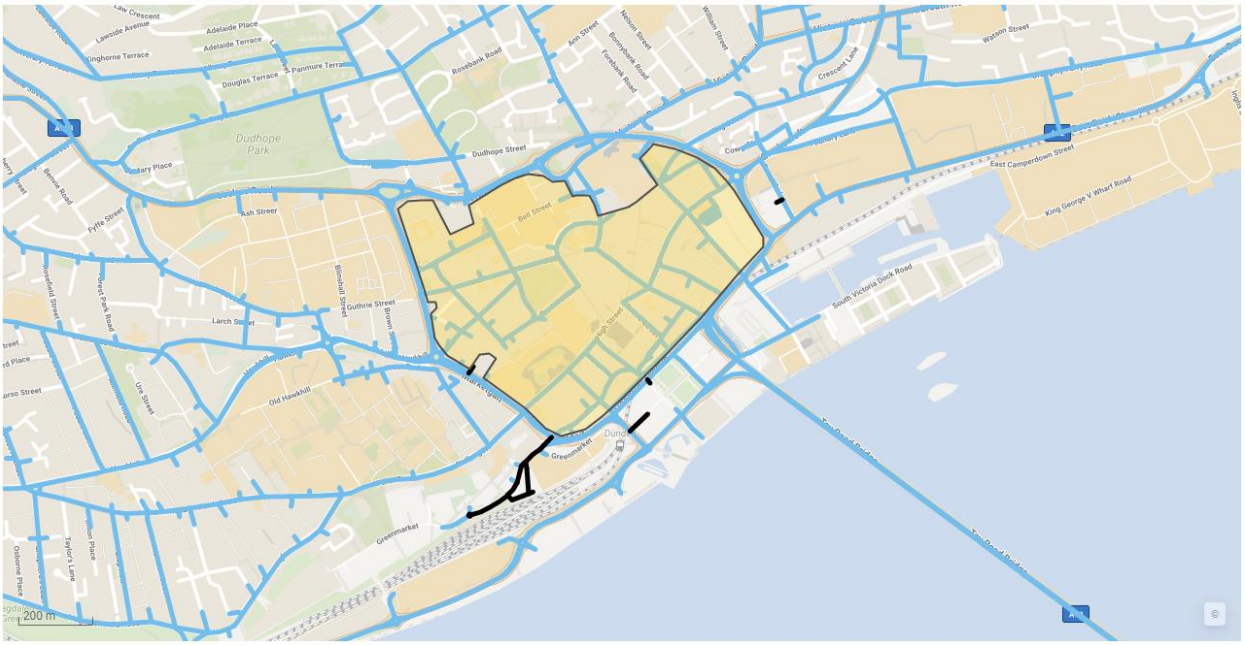

Figure 11 – Roads highlighted in black are predicted to see an increase in NO_x emissions of over 40%, with an average of 125%.

The NO_x emission rates of all roads in the model are ranked in Figure 12, for the Reference and LEZ cases. This emphasises that the overall change in emissions between the two scenarios is relatively small. The roads highlighted in black are those also highlighted in Figure 11 that see an increase in NO_x emissions of over 40%. These roads have low rates of emission and often represent very short sections of road.

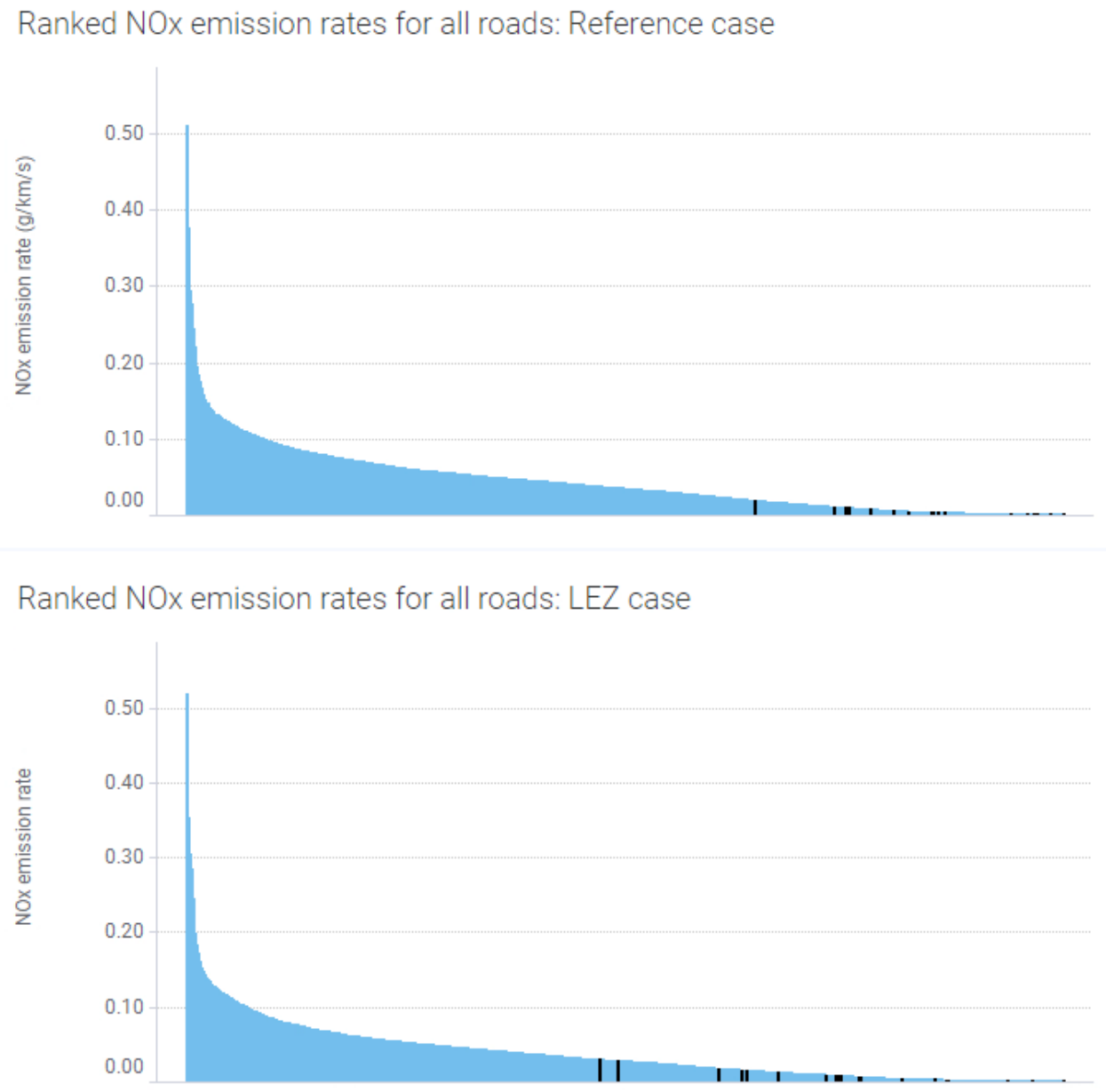

Figure 12 – Ranked NO_x emission rates on all roads in the traffic model for the Reference and LEZ scenarios.

Next Steps

The next stage of the analysis will be to use the predicted emission rates from the traffic model as input to the AQ model. The emission analysis will also inform further development of the AQ model. For example, any roads that see an increase in traffic flow but that were not identified for inclusion in the original model will be added to a more detailed version of the model.

The focus of AQ modelling will be on the area around the edge of the LEZ that sees an increase in car flow. Further detailed work will be focused on Lochee Road, which although is outside of the LEZ boundary continues to experience AQ exceedances.

For this next stage of modelling the emission rates on each of the traffic model links will be mapped onto the larger AQ model links. The results of this modelling will be visualised in a series of interactive maps and charts and made available to the local authority.

There is an additional 'demand reduction' scenario from the traffic modeling that simulates a 10% reduction in traffic flow across all vehicle categories. This scenario which could affect the amount of traffic displacement will also be investigated.