Limerick Shannon Metropolitan Area Transport Strategy

Transport Options and Network Development Report

June 2020

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Document Identification Table	
Client / Project Owner	National Transport Authority
Document Title	Transport Options and Network Development Report
Task Order	
Task	Limerick and Shannon Metropolitan Area Transport Strategy
Deliverable Code	
Version	V2.0
Document Status	Draft

Document Status Tables

Version 1

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Version 2

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Version 3

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1 Introduction

1.1 Background

The National Transport Authority (NTA) is a public body set up under statute and established in December 2009. The role and functions of the NTA are set out in three Acts of the Oireachtas; the Dublin Transport Authority Act 2008, the Public Transport Regulation Act 2009 and the Taxi Regulation Act 2013. In August 2015, the Department of Transport, Tourism and Sport (DTTaS) published its policy document *"Investing in our Transport Future - Strategic Investment Framework for Land Transport"*. Action 4 of that framework states that: *"Regional transport strategies will be prepared by the NTA and provide an input to regional spatial and economic strategies".*

Having regard to its role in relation to transport, and the action placed upon it in the DTTaS policy document, the NTA, in collaboration with Limerick City and County Council and Clare Council, is developing a Transport Strategy for the Limerick and Shannon Metropolitan Area (LSMA) covering the period to 2040. The strategy will align with the over-arching vision and objectives of the National Planning Framework (NPF) and Regional Spatial and Economic Strategy (RSES) and will provide a framework for the planning and delivery of transport infrastructure and services in the LSMA over the next two decades. It will also provide a planning policy for which other agencies can align their future policies and infrastructure investment.

1.2 Purpose of Report

The methodology for the development of the LSMA Transport Strategy 2040 is undertaken on a step by step basis, from: reviewing the existing policy and transport baseline, undertaking a detailed future demand analysis, developing transport options, developing the draft Strategy for public consultation and subsequently finalising the Strategy, as shown in Figure 1-1.

Figure 1-1: Limerick and Shannon Metropolitan Area Transport Strategy Methodology

Having developed the 2040 Baseline Demand in the "Demand Analysis Report", this report describes the process of developing the transport options for all modes (public transport, walking, cycling, car and freight). The principles and methodology for the development of the transport options is described, as is the modelling and refinement of these options.

A separate modelling report will outline the appraisal of the final Strategy option, utilising the Mid-West Regional Model (MWRM) appraisal toolkit providing a quantitative appraisal that aligns the Department of Transport, Tourism and Sport (DTTAS) Common Appraisal Framework (CAF).

1.3 Report Structure

The following provides a description of the contents of each section of the report;

- **Section 2:** outlines the methodology applied in developing the Transport Network Options for all modes.
- **Section 3:** Outlines the development of the Public Transport network options on a corridor basis for different public transport modes.
- **Section 4:** Outlines the Road Network developed.
- **Section 5:** Describes the development of the Cycling Network.
- **Section 6:** Describes the objectives and proposals for the Walking Network; and
- **Section 7:** Concludes the report.

2 Transport Network Option Development Methodology

2.1 Option Development and Assessment Methodology

This report describes the process of options development for all transport modes. Figure 2-1 below outlines the methodology for the development and assessment of the strategy options. The upper-limit public transport demand was determined from the "idealised" public transport network model run as discussed in the "Demand Analysis Report". The "idealised" public transport network included very high frequency services on all main corridors into the city and an assumed minimum speed for public transport, intended to be representative of high priority.

The public transport options have been developed based on this "idealised" demand and subsequently updated and re-run in the MWRM. Iterative model runs were undertaken to further refine and assess the options with the outputs partially informing the Multi-Criteria Assessment outlined in this report. The cycling, walking and road network were also modelled, refined and assessed iteratively in combination with the public transport proposals. The resulting outcome of this process is the identification of an Emerging Preferred Strategy Network.

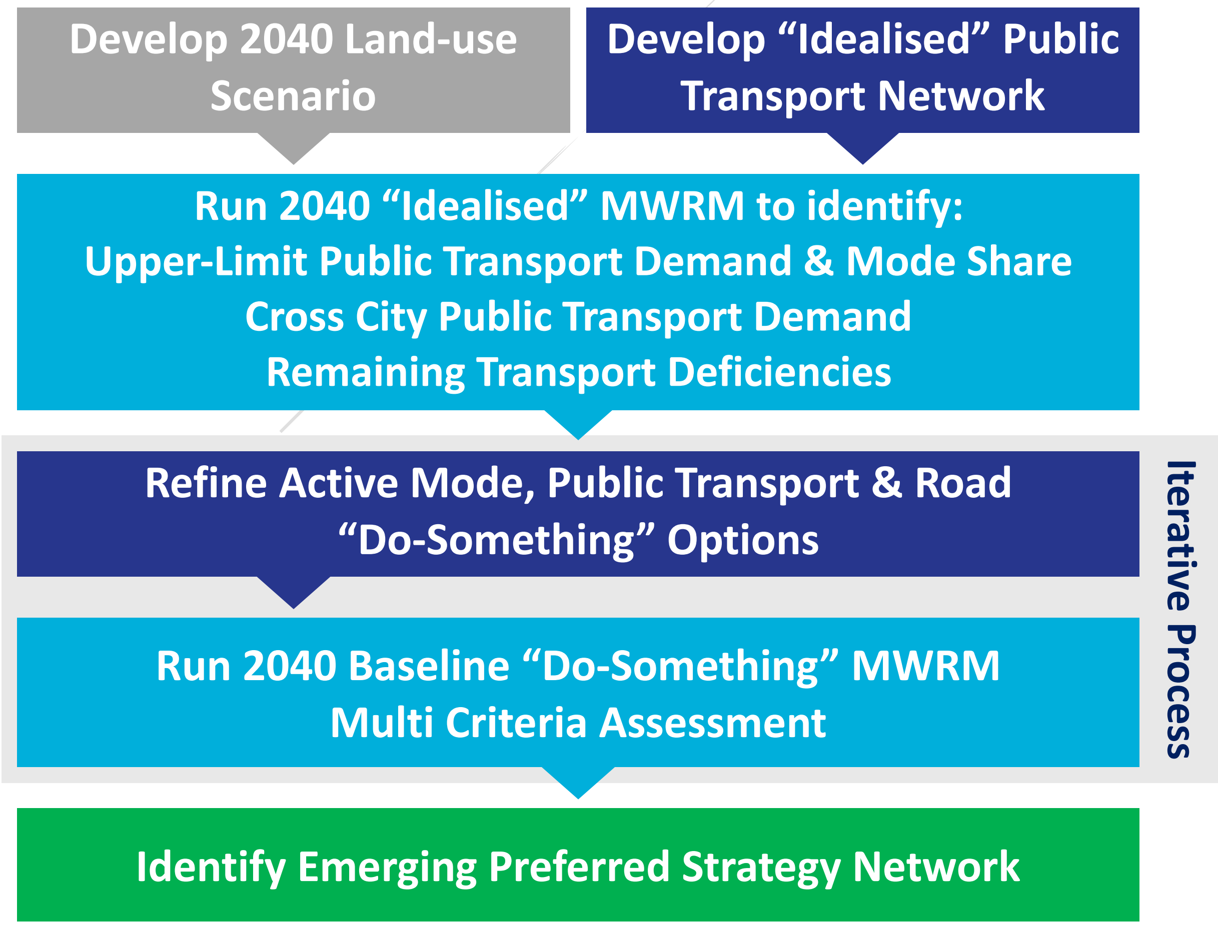


Figure 2-1: Option Development and Assessment Methodology

2.2 Network Options Development Hierarchy

The following lists the order in which the transport network has been developed. Initial stages focus on the development of the public transport network as the demand analysis has shown that the public transport mode share has the greatest potential for improvement. The cycling, walking and road networks have been subsequently developed.

- Public Transport Network;
- Road Network;
- Cycling Network; and
- Walking Network.

2.2.1 Development and Assessment of Transport Networks

The methodology under which the transport options have been developed and assessed is guided by the ***'Common Appraisal Framework (CAF) for Transport Projects and Programmes, March 2016'*** published by the Department of Transport, Tourism and Sport (DTTAS), which requires schemes to be appraised under the general criteria of Economy, Safety, Environment, Accessibility & Social Inclusion and Integration.

All transport proposals will subsequently be required to be assessed in line with TII Project Appraisal Guidelines (PAG) and DTTaS guidance for scheme appraisal before implementation. This process may include a Route Options Assessment and detailed Business Case. This process has not been undertaken as part of the strategy which is intended to be provide a framework for the delivery of transport infrastructure and services.

2.3 Public Transport Network

Public Transport Network Options have been developed by corridor based on the public transport demand associated with the corridors developed in the "Demand Analysis Report". Section 3.2 also outlines a description of each corridor. Based on the radial demand and the orbital demand the proposed route, service type, service frequency and level of priority have been developed and refined through further modelling.

There is some overlap between the public transport proposals and the road network where new links are required to facilitate the routing of public transport services. Public transport priority measures have also been included which in some instances impacts upon the road network. This is discussed further in Section 3 on a corridor by corridor basis.

2.4 Road Network

A review of the road network demand, which includes road network travel demand from beyond the LSMA, has been undertaken to determine the requirement for road network improvements. National road network, regional road network and city road network will be considered. A review of currently proposed road network infrastructure will be undertaken and aligned to policy and demand needs within the LSMA. The road network will also be reviewed with the aim of aligning road network provision with public transport, walking and cycling provision.

2.5 Cycle Network

The cycle network has been developed using the Limerick Metropolitan Cycle Network Study 2025 as a reference. The 2025 cycle plan will be reviewed to ensure integration and alignment with the emerging proposals for the public transport, walking and road modes proposed in the strategy. The network will also be extended as required to meet future demand.

2.6 Walking Network

The walking network will be reviewed to ensure integration and alignment with the proposals for the public transport, cycling and road modes proposed in the strategy.

3 Public Transport Option Development

3.1 Typical Urban Public Transport Capacity Ranges

Figure 3-1 illustrates the range of public transport capacities, in passengers per hour per direction, that can be achieved by different public transport models of Bus, Bus Rapid Transit (BRT), Light Rail Transit (LRT) and Metro / Heavy Rail. It shows that bus based public transport can cater for capacities of up to 2,000pax/hr/dir, BRT can cater for capacities between 1,000 and 4,000pax/hr/dir, LRT can cater for capacities between 3,000 and 7,000pax/hr/dir, with Metro or Heavy Rail catering for capacities above 5,000pax/hr/dir. While the values outlined in Figure 3-1 are not set in stone they do provide a good indication as to the likely public transport requirements for the corridors being reviewed.

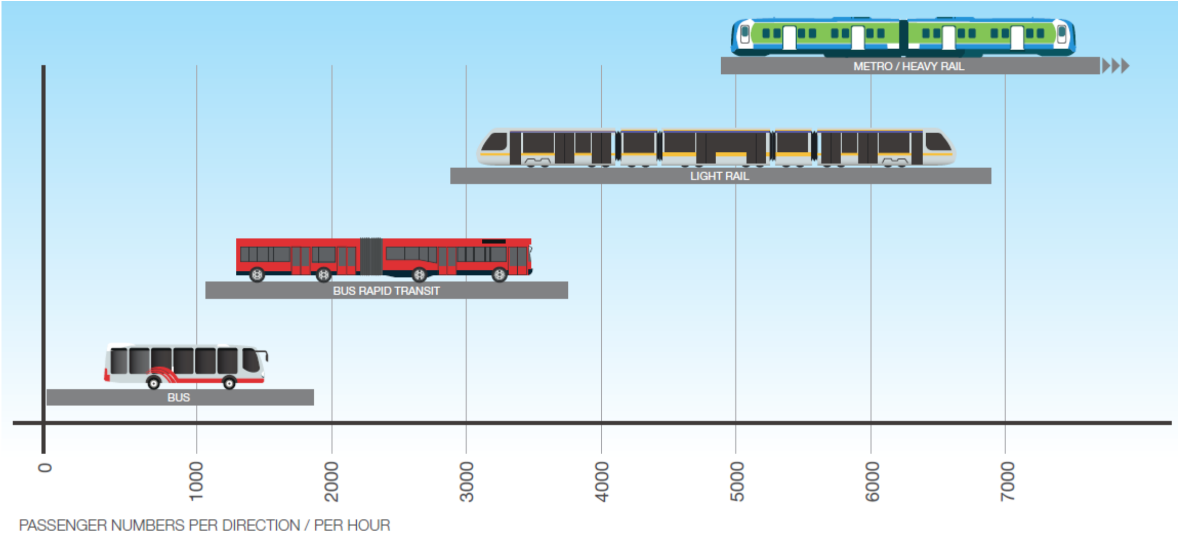


Figure 3-1: Public Transport Capacity Ranges[1]

3.2 Demand Corridors

To facilitate analysis of travel demand within the LSMA, the area was divided into several corridors based on the national and regional transport networks around a central city centre core. These corridors are primarily used to describe radially-based trips, which represents the most dominant trip pattern within the LSMA. The corridors and the settlements within each corridor are follows:

- Corridor A: King’s Island, Westbury and Parteen
- Corridor B: The University, South Clare SDZ, Annacotty, Castletroy, Garryowen and Castleconnell
- Corridor C: Roxboro
- Corridor D: Dooradoyle, Raheen and Ballinacurra
- Corridor E: Mungret and Ballinacurra
- Corridor F: Moyross, Clareview, Caherdavin, Shannon, Bunratty, Sixmilebridge and Cratloe

The corridors have been subdivided into smaller segments based on inner and outer sectors which allow for the greater understanding of movements along the corridor and orbital trips between corridors. The city core, sectors, corridors and segments are shown in Figure 3-2. The segments are

[1] UITP Conference 2009 – Public Transport: Making the Right Mobility Choices

named based on their corridor letter and sector number (i.e. Segment B1 lies with corridor B and sector 1).

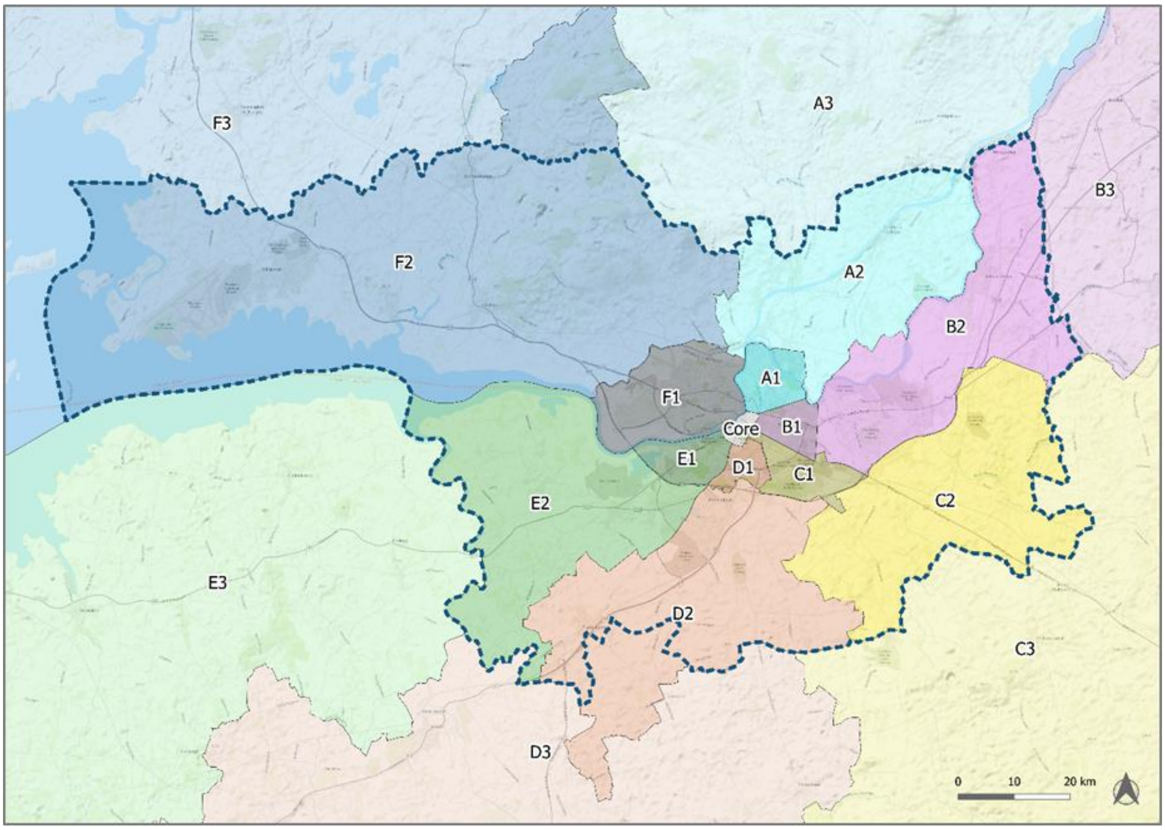


Figure 3-2 LSMA Corridors & Segments

Figure 3-3 shows the AM peak hour public transport idealised demand associated with these corridors. The demand is based on simplified "spider's web" network. More details on this demand and spider's web mapping can be found in the "Demand Analysis Report". As shown, the highest radial public transport demand is along corridors B and F followed by D and E. In comparison, the orbital demand is lower with the highest demand modelled between corridors D & E. It is important to note that the demand shown along one arm of the spider's web may in reality be across more than 1 routes or road link in the corridor.

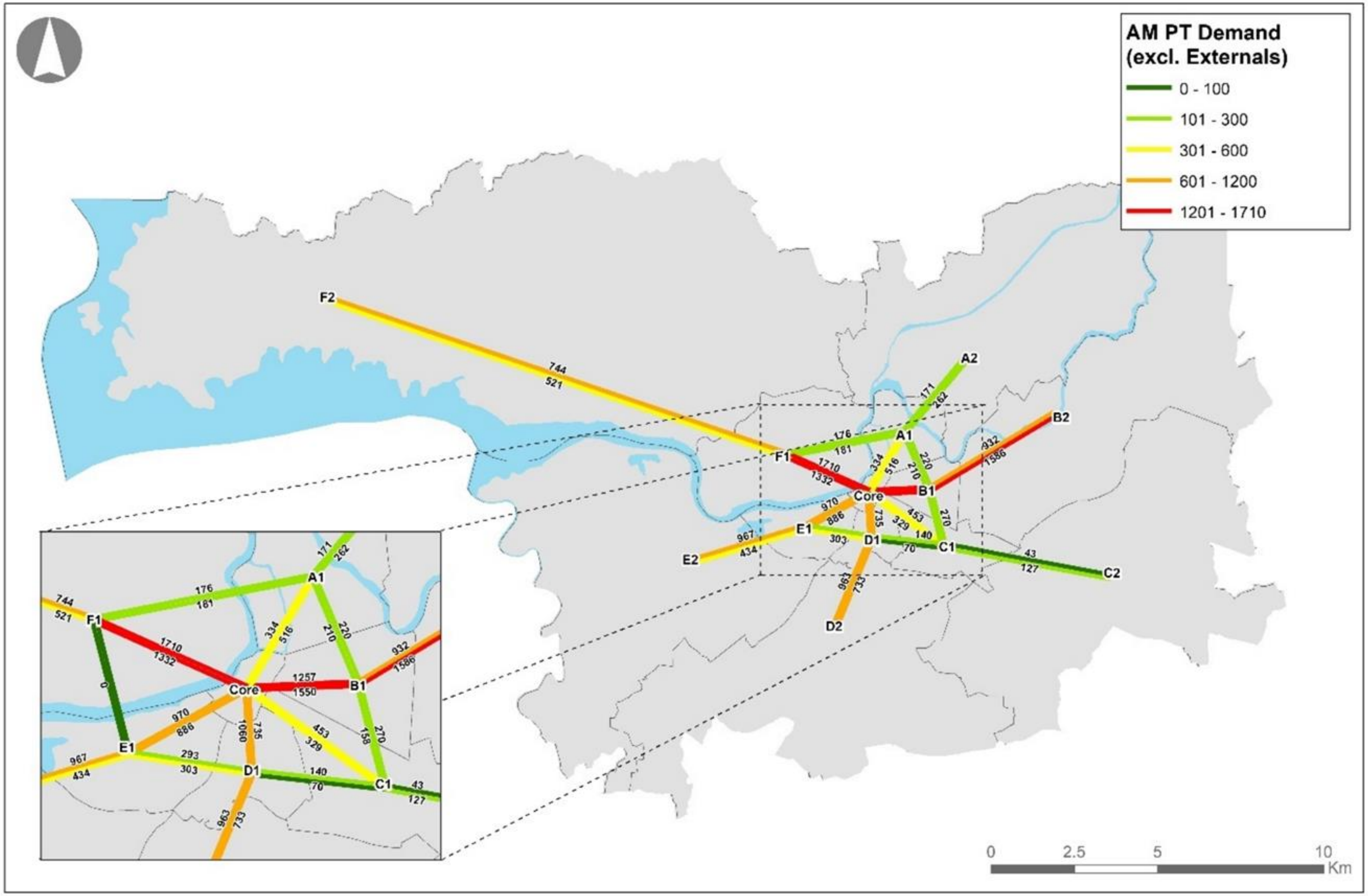


Figure 3-3: AM Peak PT Demand – all Corridors

3.3 Principles of the Idealised Public Transport Network

The “idealised” public transport network was developed based on six principles that created a network that maximises the public transport mode share. Figure 3-4 outlines the principles that underpin the performance of the “idealised” public transport network. In order to develop the LSMA public transport network in more detail and to maximise the public transport mode share the principles that underpin the performance of the “idealised” network should be applied to the network options.

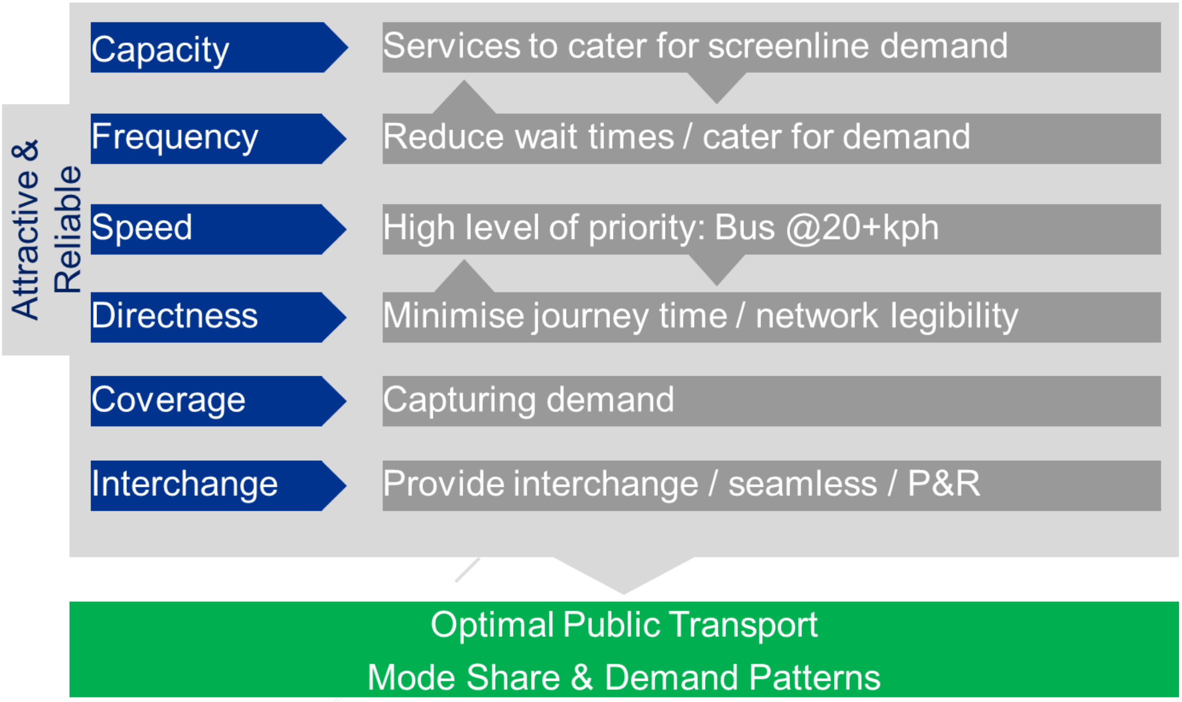


Figure 3-4: Principles of the Idealised Public Transport Network

3.4 Common Appraisal Framework (CAF) and Route Alignment Considerations

3.4.1 Consideration of Alternatives

The procedure for the assessment of the options is guided by the ‘Common Appraisal Framework (CAF) for Transport Projects and Programmes, March 2016’ published by the Department of Transport, Tourism and Sport (DTTAS), which requires schemes to be appraised under the general criteria of **Economy, Safety, Environment, Accessibility & Social Inclusion and Integration**. Alternative public transport provisions for the Public Transport Corridors have been considered to ensure that the preferred public transport meets the requirements of the CAF. It should be noted that a more detailed feasibility assessment and appraisal of the public transport schemes identified within the preferred option will be required at a later stage in the planning process.

The alternatives considered to meet the public transport demand within each corridor include the following:

- **Option 1:** Bus services;
- **Option 2:** Bus Rapid Transit;
- **Option 3:** Light Rail Transit; and
- **Option 4:** Suburban Rail.

The options identified have been assessed relative to each other under the above five criteria using the following rating system outlined in Table 3.1. The assessment has been made for each of the six corridors identified in Section 3.2 and the options might vary depending on the existing and proposed infrastructure on each of them.

Table 3.1: Assessment Rating Table

Colour	Relative Performance
(Dark green)	Very Good
(Light green)	Good
(Yellow)	Neutral
(Orange)	Poor
(Red)	Very Poor

3.4.2 Route Alignment Considerations

The route option alignments for the bus routes in each of the corridors have been developed considering the six principles that underpin the performance of the "idealised" public transport network. The six principles were defined in section 3.3 and relate to capacity; frequency; speed; directness; coverage; and interchange possibilities. These were considered to provide a comprehensive network that maximises the public transport mode share.

In order to ensure that the route option alignment and the proposed priority measures can be accommodated, a review was undertaken in the context of determining potential route alignments that meet these six principles. This review included:

- Existing Transport Network;
- Population Distribution & Density;
- Employment and Education distribution;
- Network Constraints; and
- Public Transport Service Catchment.

The capacity of each proposed route was then combined and compared against the idealised demand to ensure that a surplus of capacity was available. The capacity associated with different public transport options and frequency is outlined in Table 3.2.

Table 3.2: Public Transport Design Capacity and Frequency

Capacity Assumptions	Seating Capacity	Crush Capacity	Design Capacity
Commuter Rail	285	412	350
Light Rail	70	305	259
Bus Rapid Transit	60	120	102
Double Decker Bus	74	88	75
City Coach Bus	58	82	70
Intercity Bus	50	53	50
Shuttle Bus	30	30	30
Assumed Design Capacity reduction factor of	**85%**	**or 100% of seated capacity, whichever is larger**	

Approximate 1 Hour Peak Design Capacity	Commuter Rail	LRT	BRT	DDB	CB	ICB	SB
Design Capacity per Service Vehicle/Train	350	259	102	75	70	50	30
Frequency	**Capacity**						
60 min	350	259	102	75	70	50	30
30 min	700	519	204	150	139	100	60
20 min	1,051	778	306	224	209	150	90
15 min	1,401	1,037	408	299	279	200	120
12 min	1,751	1,296	510	374	349	250	150
10 min	2,101	1,556	612	449	418	300	180
9 min	2,335	1,728	680	499	465	333	200
8 min	2,627	1,944	765	561	523	375	225
7 min	3,152	2,333	918	673	627	450	270
6 min	3,502	2,593	1,020	748	697	500	300
5 min	4,202	3,111	1,224	898	836	600	360
4 min	5,253	3,889	1,530	1,122	1,046	750	450
3 min	7,004	5,185	2,040	1,496	1,394	1,000	600
2 min	10,506	7,778	3,060	2,244	2,091	1,500	900

3.5 Supporting Modelling Undertaken

The following section provides a high-level overview of the supporting modelling undertaken using the NTA's Mid-West Regional Model (MWRM) to aid the options development and assessment. Public Transport options were developed prior to modelling based on the idealised demand outlined and the principles outlined in section 3.3. A number of options were also developed to make best use of the existing available infrastructure, such as existing rail lines. The modelling was then undertaken iteratively with each run used to refine the inputs and assumptions for the next run. The outputs of these runs were used to inform the options assessment for each corridor and refine the options outlined in Section 3.6-3.11.

Improvements to public transport modes were modelled separately and prior to any road improvements to understand the likely maximum demand for public transport, the remaining road congestion issues with an improved PT network in place and the subsequent impact of the road infrastructure on car and public transport demand. The modelling runs undertaken as part of the options development are outlined in Table 3-3 along with the main additional inputs included in each run.

Table 3.3: Optioneering MWRM Runs

Scenario	LNDR Phase 1	Bus Network & Priority	Cycle Network	Improved Rail Network	City Centre PT Measures	Full LNDR	Foynes to Limerick
Do Min	✓						
It 1: Bus	✓	✓	✓				
It 2: Bus & Rail	✓	✓	✓	✓			
It 3: Bus & City Centre	✓	✓	✓		✓		
It 4: Bus, City Centre & Roads	✓	✓	✓		✓	✓	✓

3.5.1 Traffic Modelling Report

Further details on these runs and their results can be found in Section 5.2 of the Traffic Modelling Report. The modelling report also contains detailed on subsequent runs and appraisal of the final strategy option.

Each of the runs outlined is described below.

3.5.2 Do-Minimum

This run included the existing road, public transport, walking and cycling networks with Phase 1 of the LNDR from Coonagh to Knockalisheen, due to open in 2020. The opening year AM peak mode shares for the metropolitan area are shown below for the Do-Minimum Scenario and for the 2016 model as a reference.

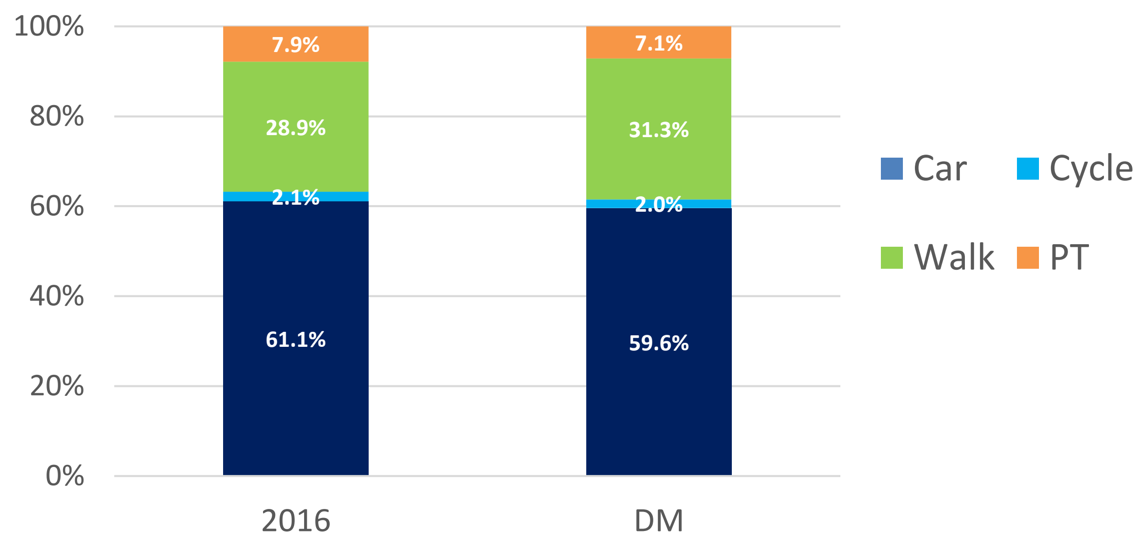


Figure 3-5: Do-Minimum Mode Shares- AM Peak

As shown, the car mode share has dropped slightly as has the public transport mode share. This is partly due to the increase in congestion for general traffic and buses which increases the attractiveness of walking and partly to the distribution of future population.

3.5.3 Iteration 1 (AAE)

This included a comprehensive network of radial and orbital bus routes developed to meet idealised demand outlined in Figure 3-3 and in accordance with the principles outlined in section 3.3. A high level of bus priority along the network was assumed in addition to the existing road capacity. In reality, this level of priority may not be feasible along the entire network or require some decrease in road capacity and/or traffic management. However, to understand the latent demand for public transport and ensure the options proposed catered for this demand priority was assumed. This run also included an improved cycle network based on the Limerick Metropolitan Cycle network. The mode shares for this scenario and the Do-Minimum are outlined below.

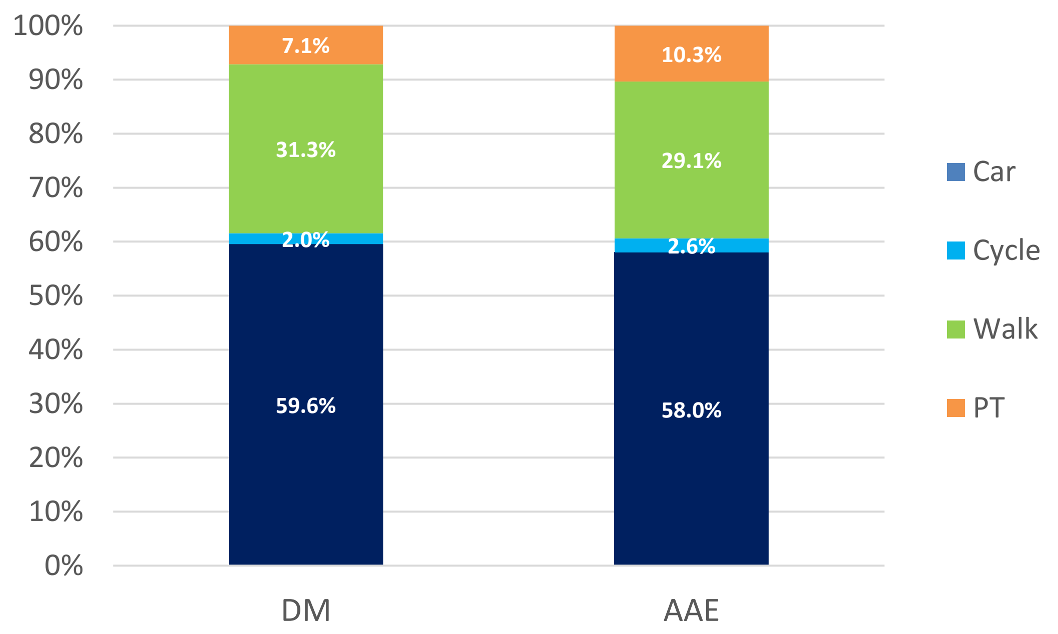


Figure 3-6: Iteration 1 Mode Shares-AM Peak

As shown the improved bus network increases the public transport patronage by approximately 45% in absolute terms and increases the overall mode share by over 3%. This results in a drop in both walking and driving. The number of cyclists increases by 30% though this represent a small change in its overall mode share.

3.5.4 Iteration 2 (AAF)

This run included all measures from the previous iteration along with an improved suburban rail network. This included the following:

- Rail Spur to Shannon Airport;
- 20-minute headways from Colbert Station to Limerick Junction, Nenagh, Shannon & Ennis;
- Dual Tracking on each of these lines to enable the more frequent services;
- New stations at existing urban settlements along each line including Garryowen, Corbally, Moyross, Cratloe, Bunratty, Castleconnell, Ballysimon, Pallas & Oola.

The mode share for this and the previous runs is outlined in Figure 3-6.

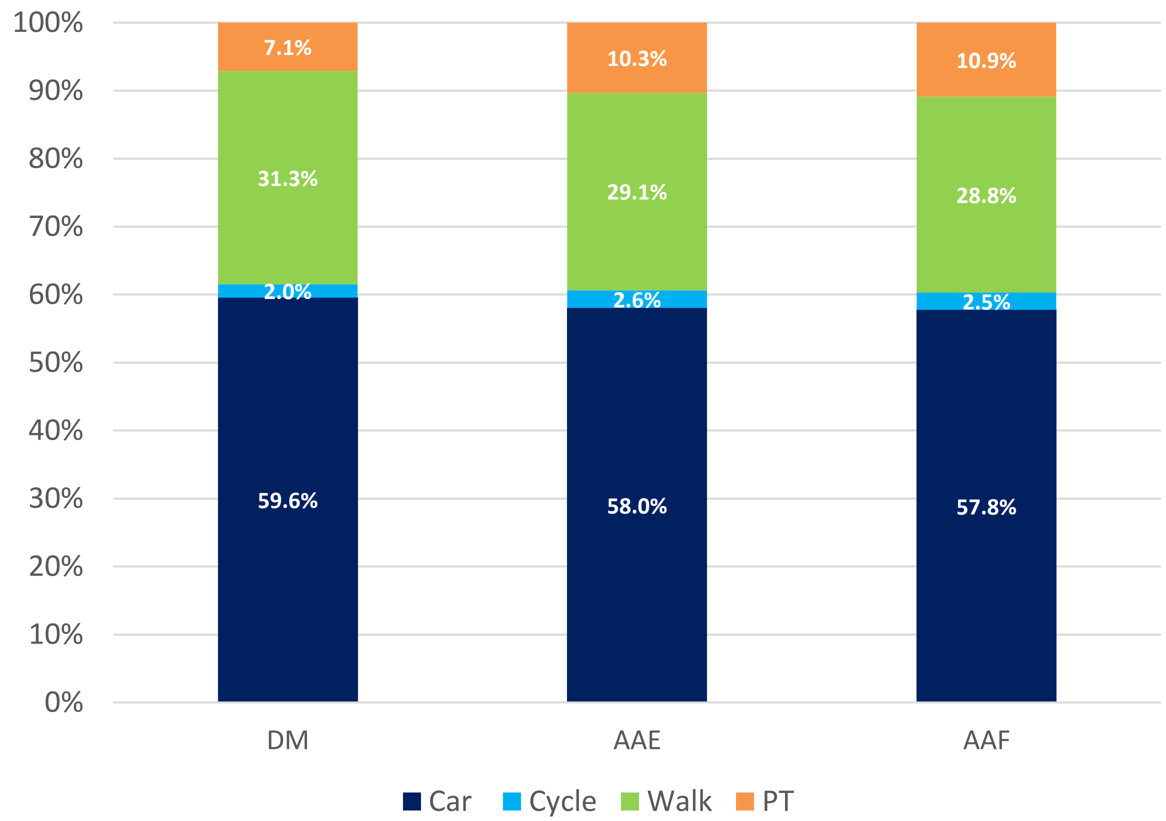


Figure 3-7: Iteration 2 Mode Shares – AM Peak

As shown, the significant improvement in rail infrastructure has a relatively limited impact on mode shares with an increase of 0.6% in the public transport mode share. The majority of these trips switch from walking and cycling.

The patronage of each individual rail service shows that the majority of services are well below their design capacity. Table 3-4 illustrates the passenger volume as a percentage of design capacity for each modelled peak. There is some possibility of an improved service to Ennis, and potentially Limerick Junction, along existing lines based in the below but likely not to the extent assumed for modelling purposes. The Shannon Line in particular is unlikely to be feasible given the level of new infrastructure required to achieve this.

Table 3.4: Iteration 2 – Rail Passenger Volume/Design Capacity by Modelled Service & Peak hour

Service	Time Period			
	AM	LT	SR	PM
Nenagh to Limerick	26%	6%	7%	9%
Limerick to Nenagh	9%	6%	13%	10%
Ennis to Limerick	53%	11%	15%	14%
Limerick to Ennis	18%	14%	38%	26%
Limerick to Limerick Junction	12%	16%	25%	21%
Limerick Junction to Limerick	34%	14%	14%	13%
Limerick Train Station to Shannon	19%	10%	13%	13%
Shannon to Limerick Train Station	28%	12%	15%	13%

To assess the performance of individual new stations within the metropolitan area, the boardings and alightings from the AM peak have extracted for each proposed station and compared against the equivalent patronage for buses service local to the station. This is outlined in Figure 3-9.

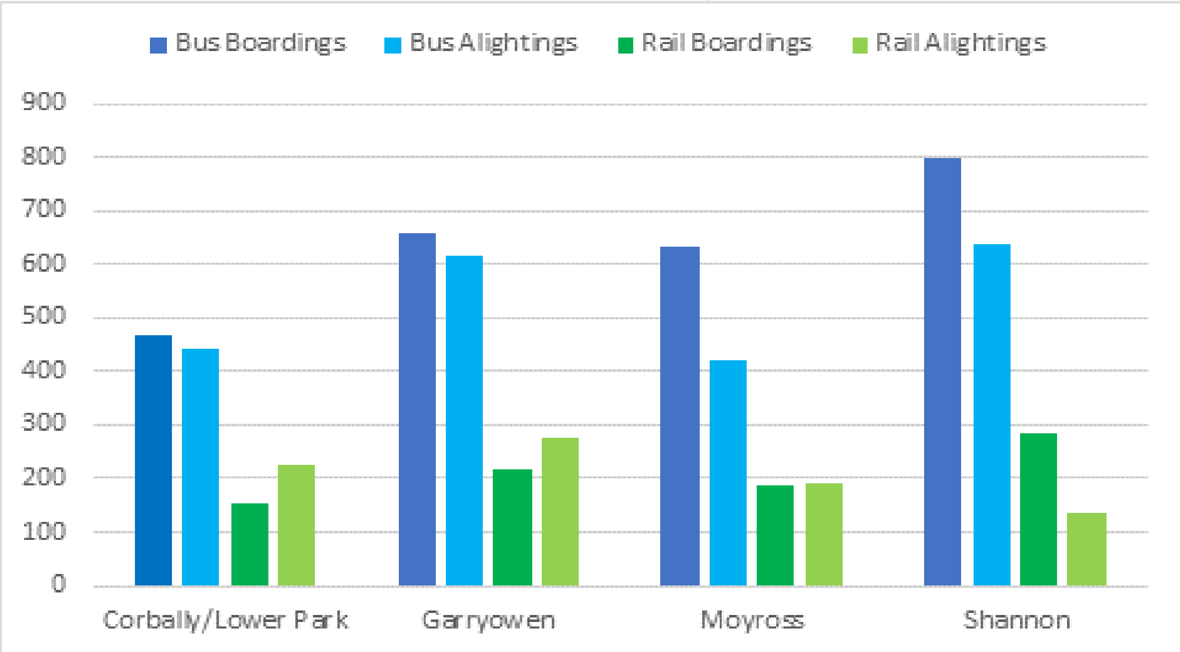


Figure 3-8: AM Peak Boardings and Alightings for proposed Stations

As shown, the demand for bus still outweighs the demand for rail at these locations despite the increase in the rail frequency and capacity.

The lack of land use consolidation around potential rail station locations, in combination with a lack of competitive journey time against the proposed bus service, results in low levels of rail patronage within Limerick City and the LSMA. For rail to become a viable option in the context of the LSMA, a concerted land use plan to consolidate the growth around potential rail stations would be required.

3.5.5 Iteration 3 (AAG)

This run includes all measures included in Iteration 1 along with traffic management measures and additional bus priority within Limerick City Centre. This includes public transport only measures along O'Connell Street and Sarsfield Bridge with Henry Street becoming two-way to general traffic. The rail improvements were not included based on the performance of rail in Iteration 2 which indicated low demand along the higher frequency services and low demand at each of the new rail stations. The mode shares for this iteration and previous iterations are shown below.

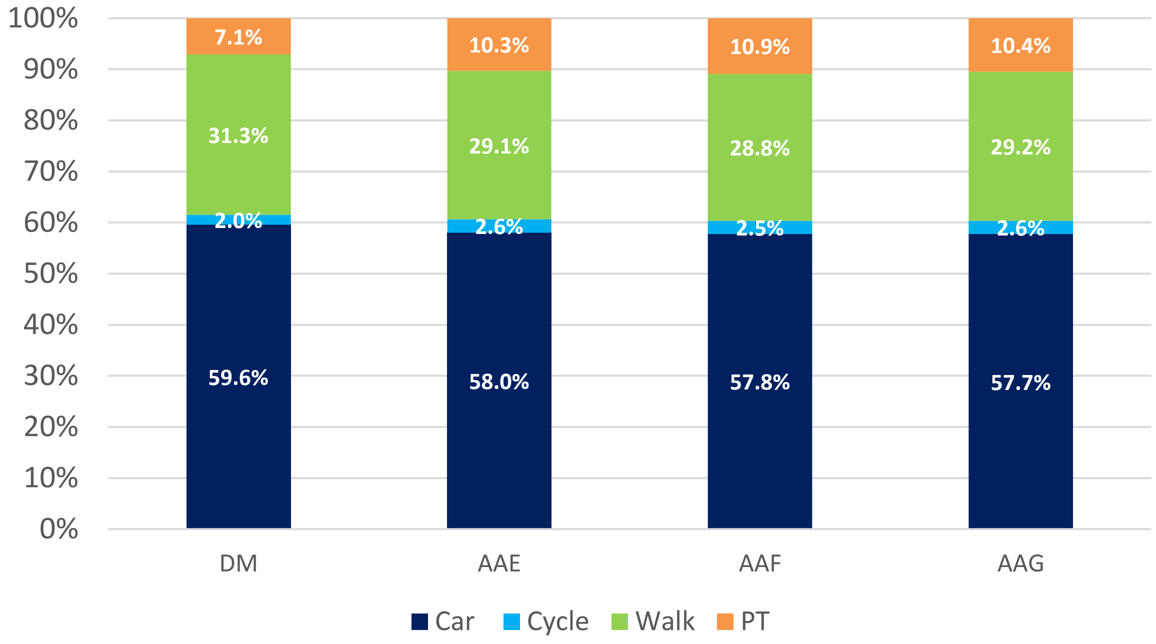


Figure 3-9: Iteration 3 Mode Share -AM Peak

As shown, the traffic management measures and increased priority through the city has a greater impact on car mode shares than the provision of additional Rail. There is also an uplift in walking as more people opt to walk for shorter distance trips to the city centre.

3.5.6 Iteration 4 (AAH)

This included the bus and city centre measures along with the N69 Foynes to Limerick incorporating Adare Bypass and full Limerick Northern Distributor Road. The resultant mode shares for this iteration are shown in Figure 3-10.

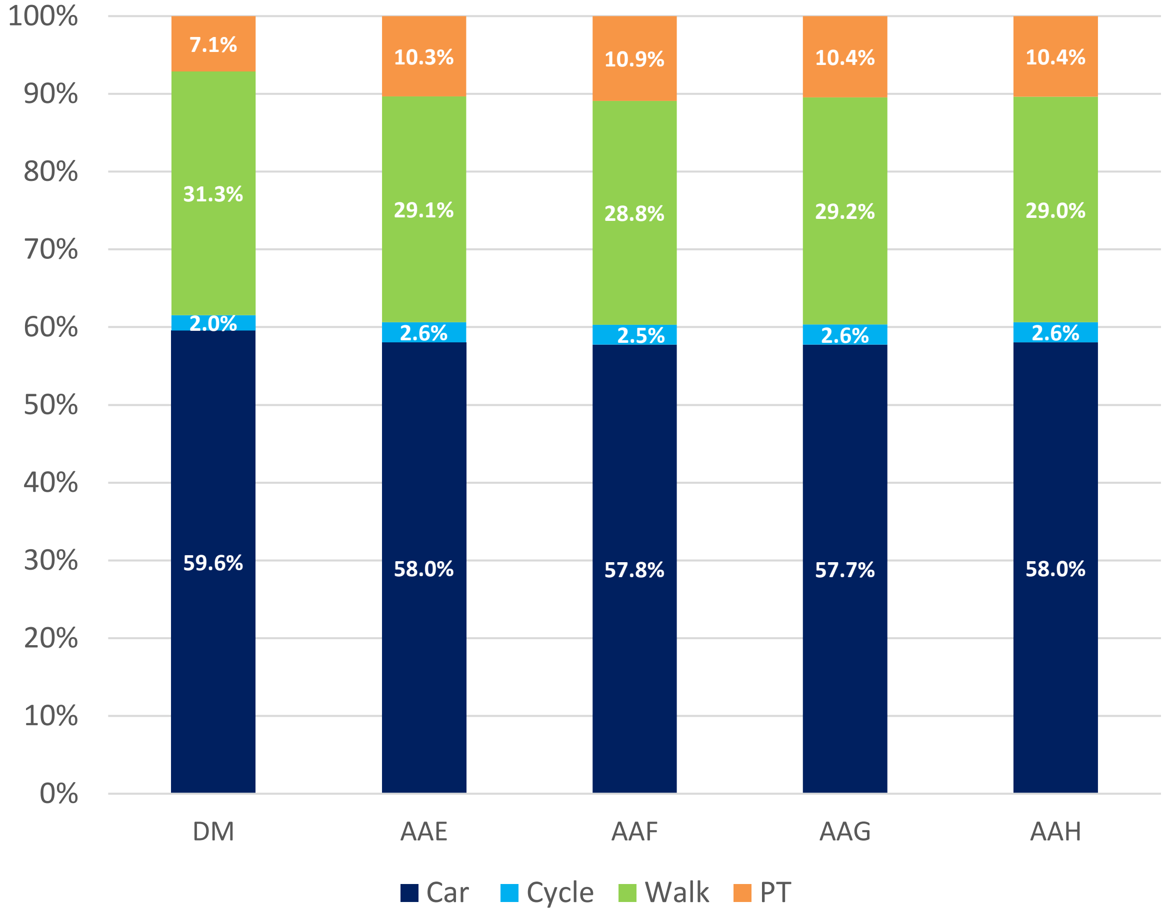


Figure 3-10: Iteration 4 Mode Share -AM Peak

As shown, the introduction of the LNDR results in a slight increase in car mode share as a result of a decrease in walking; public transport and cycling mode shares are unchanged. The would suggest a very slight increase in shorter distance car trips resulting from the scheme. Though the changes are relatively minor it's important the implementation of the LNDR and subsequent development of the corridor are carefully managed. In addition, the modelling results did show a decrease in traffic using the Shannon Tunnel with the LNDR in place, as discussed in Section 5.2.5 of the Traffic Modelling Report.

3.6 Corridor A

3.6.1 Target Demand

Based on the public transport demand identified for Corridor A from the Spider's Web diagram which is based on the "Idealised" public transport network, the "Target Demand" can be identified. Table 3.5 shows the two-way AM Peak Corridor A screenline demand on the radial movements, highlighting the largest demand as the "Target Demand" for each movement. For Corridor A the highest one-way demand is 516 passengers.

Table 3.5: Identifying Maximum Demand to Develop Public Transport Options

Service Type	Outer Radial (A2 – A1)	Inner Radial (A1 – Core)
Inbound	334	**516**
Outbound	262	171

3.6.2 Common Appraisal Framework (CAF)

Table 3.6 outlines the results of the multi-criteria assessment in line the CAF requirements for Corridor A. The table describes how each of the options compares against each criterion and the cells are colour coded to indicate relative performance.

Table 3.6: Assessment of Alternative Transport Measures for Corridor A

	Economy	Environment	Safety	Integration	Accessibility and Social Inclusion
Option 1: Bus services;	Demand levels suggest buses can provide the appropriate level of capacity-based on the capacities of different modes outlined in Figure 3.1. This will make the best use of investment by improving current network and could provide greater returns on investment in terms of benefit to cost ratio.	Produces less GHG than private Car alternative. Options available for different fuel sources.	Bus travel would reduce the number of cars in use and would reduce the potential accident rate.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately.	An integrated bus network can improve the accessibility and social inclusion to users and the flexible network can access most areas even with network constraints.
Option 2: Bus Rapid Transit;	Demand levels do not indicate that a BRT would provide value for money, based on significant cost associated with introduction of BRT.	Produce less GHG than private transport. Options available for different fuel sources. May have some impact on surrounding environment in order to accommodate.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 3: Light Rail Transit;	Travel demand is well below capacity of Light Rail, particular given it is combined demand across the corridor. Unlikely that Light Rail would provide value for money given construction costs. Significant costs also associated with operation.	Environmental impacts in terms of construction. Particularly within the city where significant land take may be required. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Can connect with rail stations and bus interchanges, but journey times can be hindered by private car traffic, if not prioritised appropriately.	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 4: Suburban Rail	Travel demand is well below capacity of heavy rail. A new stop could be provided at the intersection of Corbally Road on the existing Limerick-Ennis rail line, however double tracking would be required to provide a frequent service. This would not be warranted based on travel demand. Modelling shows that even with a frequent rail service, more passengers choose to travel by bus from Corbally. City Centre Journey times would be comparable to the bus equivalent, but construction and operation costs would be higher.	Environmental impacts in terms of widening to dual track. Particularly within existing urban footprint. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Integration with other services and land-use is limited to the existing corridor. Within the city in particular Colbert is removed from the major destinations.	Enhances accessibility for those living along existing rail routes but has limited flexibility in serving other areas of the corridor.

From Table 3.6 “Option 1 Bus Services” are considered to be the preferred option for the corridor based on the multi-criteria assessment, providing the most benefits overall whilst maximising value for money. Improvements to the existing rail line with a stop provided at Corbally were tested as part of the Iteration 2 modelling run, as outlined in Section 3.5, and the modelling showed limited passenger demand at the new stop compared to bus. In addition, due to the routing of the existing rail track and removed location of Colbert relative to the city, journey times are comparable by rail and bus from Corbally to the City Centre. Travel demand, population and employment densities are below that required for any other alternative public transport measures along the corridor such as Light Rail and Bus Rapid Transit.

3.6.3 Services and Routes

The number of bus routes and frequency of these services were reviewed to meet the target demand in addition to providing sufficient coverage. Table 3.7 below shows an example of the methodology applied in determining potential public transport options to cater for the maximum target demand (between A1 and Limerick City Core). It shows that to cater for the target demand four bus routes are required, with one running at a 10-minute headway, one at a 15-minute headway and two running at a 30-minute headway. This would result in a Bus service passing from Corridor A into the City Core approximately every 4 minutes approximately.

The table shows the breakdown of the number of routes by type and frequency of service with the associated carrying capacity by design and carrying capacity utilising standing room (Crush Capacity). This is presented alongside the maximum demand for the service to indicate whether or not the Option caters for the target demand. For Corridor A, it is clear that the Design Capacity caters for the target demand. If for any reason there is substantial additional demand, there is additional residual Standing Capacity if required. It is apparent that in general the maximum screenline target demand in Corridor A is of a scale that would require high frequency bus services across multiple routes.

Table 3.7: Option Development to Cater for Maximum Screenline Demand

Max Demand: 516 Service Type	Design Capacity	Indicative Public Transport Option
City Coach Bus	70	1 routes X 10 min freq 1 routes X 15 min freq 2 routes X 30 min freq
Design Capacity		**976**
Crush Capacity		**1,148**

Lower Frequencies could be provided in Corridor A and still meet the required level of capacity. However, this must be balanced against the attractiveness of frequency and the need to form a coherent cross-city network, as detailed in Section 3.12.

3.6.4 Route Option Alignments

The route option alignments have been developed taking into account the six principles that underpin the performance of the ‘idealised’ public transport network presented in Section 3.4.2.

Four main routes were identified in order to cater for the proposed public transport options. Figure 3-11 illustrates the proposed Public Transport Options for Corridor A, outlining how the options have been developed to align with the six principles as much as feasibly possible.

They broadly serve each of the population settlement of the corridor connecting them to the city centre.

Bus Route 1: Green

Bus Route 1 has been identified to run from Ardnacrusha along the R463 diverting via Parteen Village and School Road before returning to the R463 and onwards to the City Centre via the Corbally Road and King's Island.

Bus Route 2: Yellow Branch

Bus Route 2 has been identified to run from St. Mary's Park on King's Island across the Matthew Bridge to the City Centre

Bus Route 3: Yellow Branch

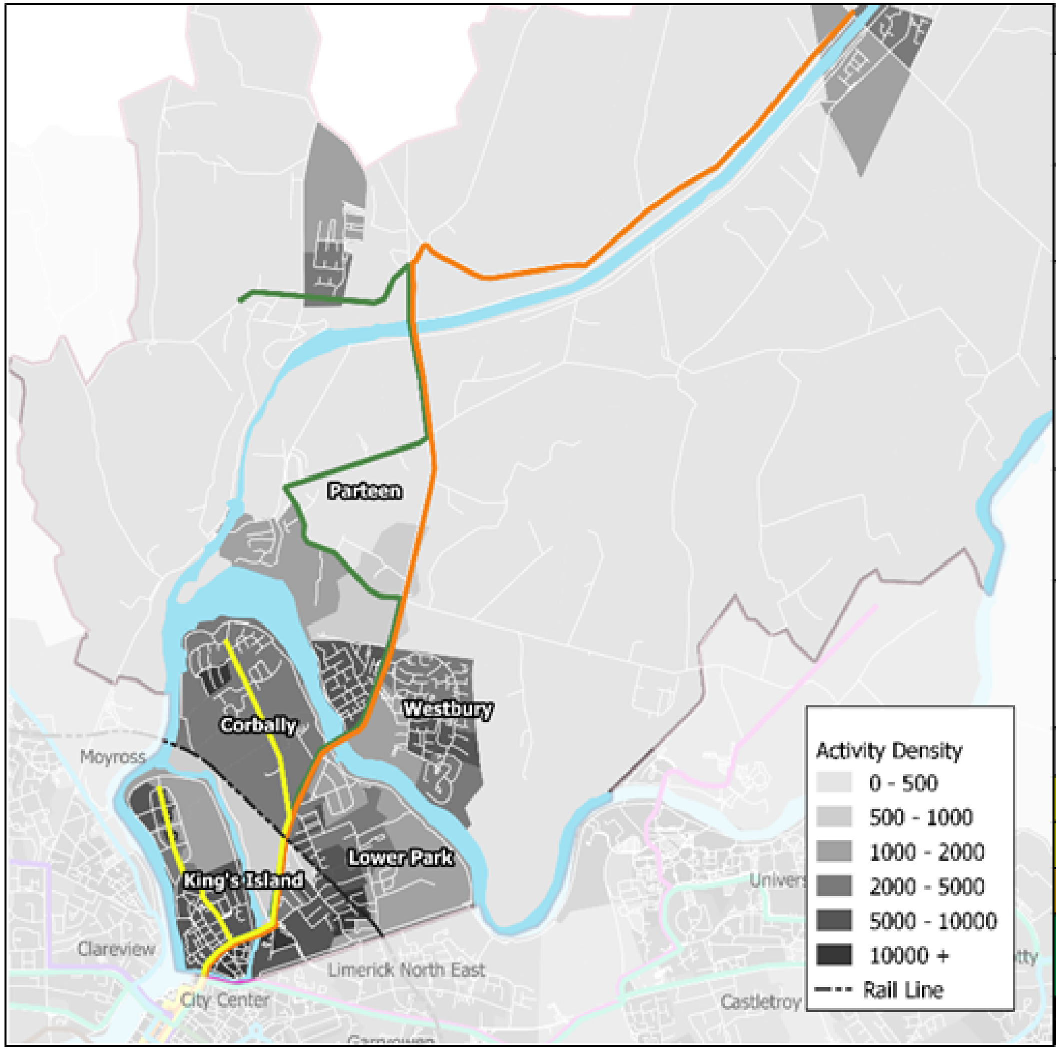
Bus Route 3 has been identified to run from Corbally along the length of the Mill Road before going onwards to the City Centre via the Corbally Road and King's Island.

Bus Route 4: Orange

Route 4 has been identified to run from the village Clonlara along the R463 to Ardnacrusha and onwards to the City Centre via the Corbally Road and King's Island.

3.6.5 Route Option Priority Measures

In order to achieve high speed, high frequency, reliable public transport services within Corridor A increased public transport priority and provision is required. The focus of the improvements to public transport speeds and priority will be along the Corbally Road from Larkin's Pub to the City Centre. This priority may be in the form of bus lanes, priority signal or bus gates. Further, more detailed assessments will be required to determine the feasibility of different priority measures and the optimal combination of measures. The introduction of the Limerick Northern Distributor Road (LNDR) could remove traffic from the radial network and provide more space for additional priority. The supporting priority measures are illustrated in Figure 3-12.



Guiding Principles Table	
Capacity	The maximum 'idealised demand' (A1-Core) is 516 and represents 58% of the service capacity.
Frequency	Bus service passing from Corridor A into City Core every 4 minutes approximately.
Speed	Radial bus lanes and priority proposed along Corbally Road into the City Centre.
Coverage	73% of the population and 86% of employment within Corridor A are within the walking catchment of a high frequency bus service.
Interchange	Interchange opportunities with Northern Orbital. The Yellow and Green routes will also provide interchange at Colbert Rail Station.
Directness	The orange and yellow routes provide direct radial routes into the city. The green route provides additional coverage for Parteen and then connect directly to the city.

Route/Service	Headway	Capacity
Raheen-Corbally	30 min	418
Raheen-King's Island	30 min	139
Clonlara-Raheen	15 min	139
Crossagalla/Ballysimon-Ardnacrusha	10 min	279
Total	**4.3min**	**976**

Figure 3-11: Corridor A – Route Alignment Options

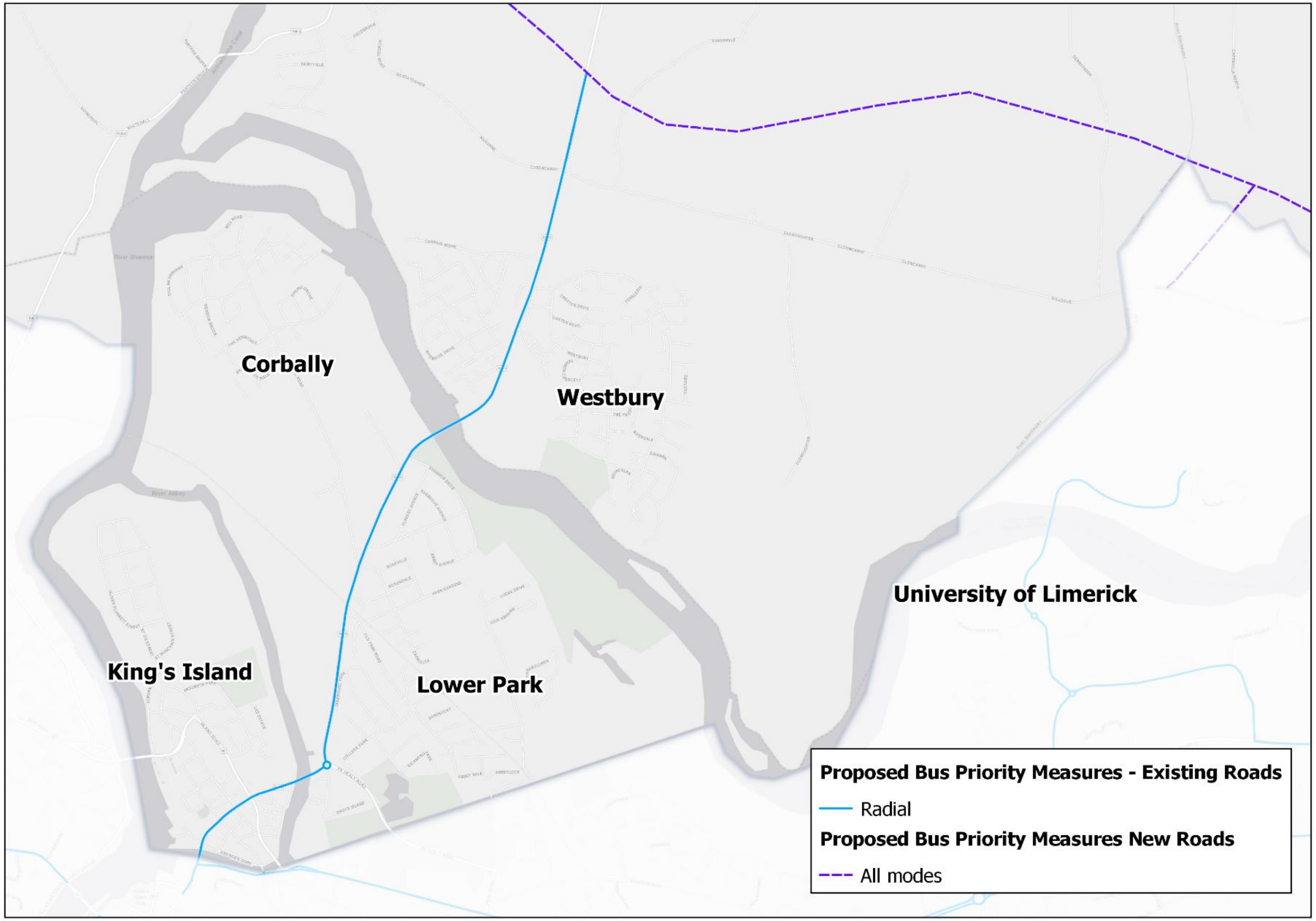


Figure 3-12: Corridor A – Supporting Priority Measures

3.7 Corridor B

3.7.1 Target Demand

Based on the public transport demand identified in the Spider's Web based on the "Idealised" public transport network, the "Target Demand" for Corridor B can be identified. Table 3.8 shows the two-way Corridor B screenline demand on the radial movements, highlighting the largest demand as the "Target Demand" for each movement. The highest demand along Corridor B is 1586.

Table 3.8: Identifying Maximum Demand to Develop Public Transport Options

Service Type	Outer Radial (B2 – B1)	Inner Radial (B1 – Core)
Inbound	1586	1550
Outbound	932	1257

3.7.2 Common Appraisal Framework (CAF)

Table 3.9 outlines the results of the multi-criteria assessment in line the CAF requirements for Corridor B. The table describes how each of the options compares against each criterion and the cell is colour coded to indicate relative performance.

Table 3.9: Assessment of Alternative Transport Measures for Corridor B

	Economy	Environment	Safety	Integration	Accessibility and Social Inclusion
Option 1: Bus services;	Demand is within capacity of bus-based network. This makes best use of investment in current network and could provide greater returns on investment in terms of benefit to cost ratio.	Produces less GHG than private Car alternative. Options available for different fuel sources.	Bus travel would reduce the number of cars in use and would reduce the potential accident rate.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately.	An integrated bus network can improve the accessibility and social inclusion to users and provide access to areas not easily served by more infrastructure intensive modes.
Option 2: Bus Rapid Transit;	Given the idealised demand is across a number of roads/routes it is unlikely that a BRT would provide value for money, based on significant cost associated with introduction of BRT. However, this could be a potential longer-term option for upgrade of more frequency bus services.	Produce less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 3: Light Rail Transit;	Travel demand is well below capacity of Light Rail, particular given it is combined demand across the corridor. Unlikely that Light Rail would provide value for money given construction costs. Significant costs also associated with operation.	Environmental impacts in terms of construction. Particularly within the city where significant land take may be required. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Can connect with rail stations and bus interchanges, but journey times can be hindered by private car traffic, if not prioritised appropriately.	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 4: Suburban Rail	Travel demand is well below heavy rail capacity. Stops could be provided along existing rail line at Garryowen and/or Castleconnell. However, based on the modelled demand for these stations the ridership would not justify the double tracking of these lines which is needed to provide an increase in frequency of services. Significant costs associated with construction and operation of these services also.	Environmental impacts in terms of widening to dual track. Particularly within existing urban footprint. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Integration with other services and land-use is limited to the existing corridor. Within the city in particular Colbert is removed from the major destinations.	Enhances accessibility for those living along existing rail routes but has limited flexibility in serving the majority of the population and employment centres along the corridor.

From Table 3.9 "Option 1 Bus Services" are considered to be the preferred option for the corridor based on the multi-criteria assessment, providing the most benefits overall while maximising the economic benefits and cost efficiency. Bus Rapid Transit is not preferred given the capacity of a bus-based options can cater for the travel demand and provide more flexibility. However, the bus network could be upgraded to a BRT type service in the future should demand exceed capacity. Neither new Light nor Heavy Rail is warranted based on the demand. Modelling in Iteration 2 also showed that the level of demand for Rail at both Garryowen & Castleconnell was low compared to bus and unlikely to warrant construction of new stations and the double tracking of the existing line required to cater for more frequent services. The existing rail line also terminates in Colbert which is geographically removed from the City Centre resulting in comparable journey times to the city by bus and rail.

3.7.3 Services and Routes

The number of bus routes and frequency of these services were reviewed to meet the target demand. Table 3.10 below shows an example of the methodology applied in determining potential public transport options to cater for the maximum target demand. It shows that to cater for the target demand five bus routes are required, with three running at a 20-minute headway, one at a 10-minute headway and one running at a 7.5-minute headway.

The table shows the breakdown of the number of routes by type and frequency of service with the associated carrying capacity by design and carrying capacity utilising standing room (Crush Capacity). This is presented alongside the maximum demand for the service to indicate whether or not the Option caters for the target demand. For Corridor B, the Design Capacity caters for the target demand with significant available crush capacity if required.

Table 3.10: Option Development to Cater for Maximum Screenline Demand

Max Demand: 1586 Service Type	Design Capacity	Indicative Public Transport Option
Double Deck Bus	75	1 routes X 7 min freq 2 routes X 20 min freq 1 route X 10 min freq
Shuttle Bus	30	1 route X 20 min freq
Design Capacity		**1747**
Crush Capacity		**2056**

3.7.4 Route Option Alignments

The route option alignments have been developed in line with the six principles that underpin the performance of the 'idealised' public transport network presented in Section 3.4.2.

Five main routes were identified in order to cater for the proposed public transport options. Figure 3-13 illustrates the proposed Public Transport Options, outlining how the options have been developed to align with the six principles as much as feasibly possible. A Park and Ride is proposed to be located near junction 28 on the M7 where the Dublin Road meets the M7 and Newport Road.

Bus Route 1: Pink

Bus Route 1 has been identified to run from UL through the campus passing Plassey Student Village before exiting onto the R445 Dublin Road from Plassey Park Road. It then follows the road all the way to City Centre.

Bus Route 2a: Turquoise

Bus Route 2a travels along the R445 route all the way from Annacotty to the City Centre serving Castletroy Town Centre and the Castletroy Shopping Centre on the way.

Bus Route 2b: Turquoise Variation

Bus Route 2b is a variation of Route 2a. It diverts from the R445 via Plassey Park Road serving IDA Ireland's National Technology Park and then routes through the UL campus before re-joining the R445 Dublin Road and continuing into the City.

Bus Route 3: Blue

Bus Route 3 has been identified to run from Annacotty, initially routing along the R445 before diverting along Castletroy College Road to Monaleen. It will then cross the Golf Links Road via a new link road which will lead to the Bloodmill Road via Ballysheedy. The route will then go to the City Centre through Garryowen passing the Markets Field stadium.

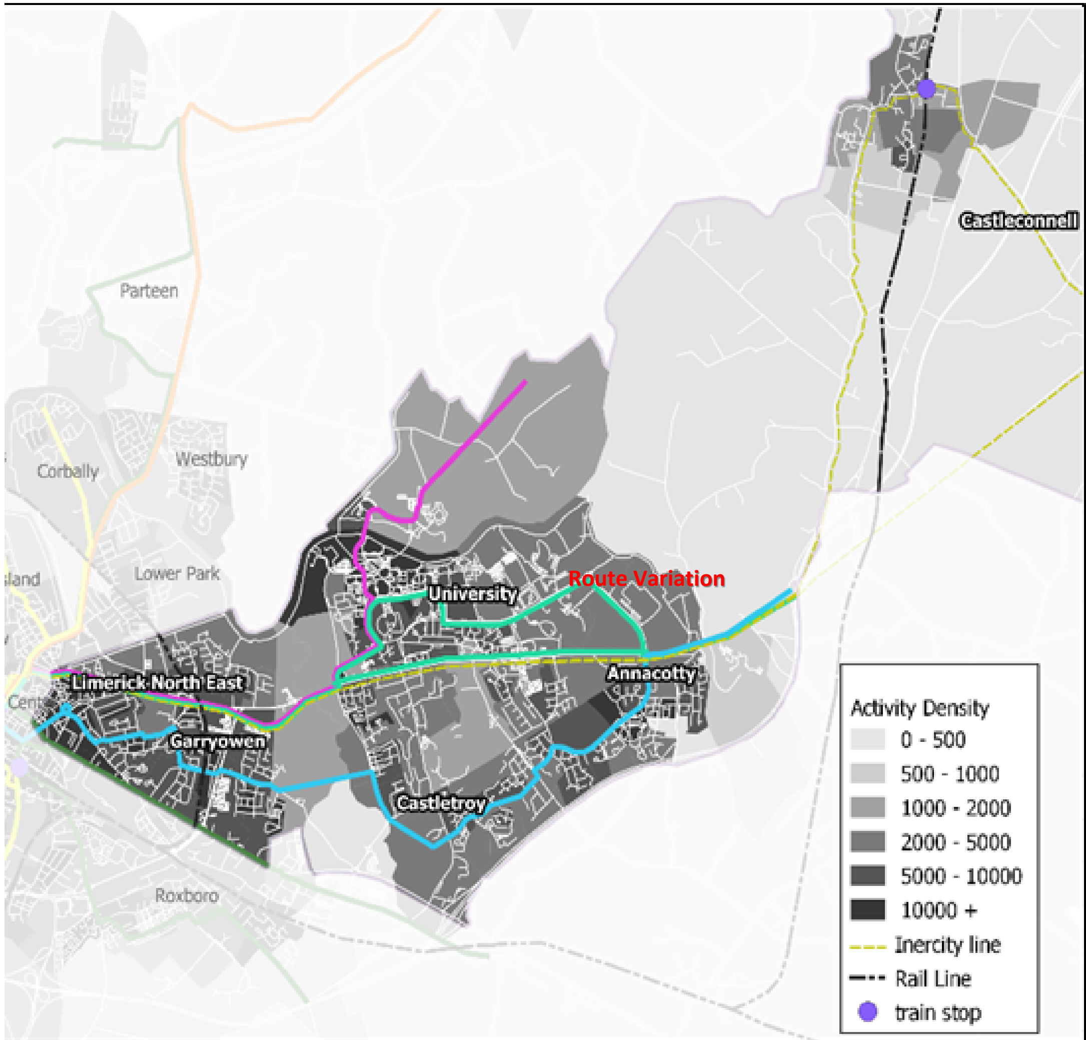
Bus Route 4: Green

Bus Route 4 has been identified to run from just outside the M7 along the Old Ballysimon Road, joining with the Ballysimon Road and onwards to the City Centre. The route transverses both corridor B and C with catchment in both corridors. It will be of particular use to those in South Garryowen who wish to access the city.

3.7.5 Route Option Priority Measures

In order to achieve high speed, high frequency, reliable public transport services within Corridor B increased public transport priority and provision is required, above and beyond the existing bus lane provision. The main focus of the improvements to public transport speeds and priority will be along the Dublin Road and Ballysimon Road corridors. There will also be bus priority within the grounds of University of Limerick and the National Technology Campus. There are also a number of new links proposed between the Golf links Rd., Groody Rd. and Bloodmill Road to improve directness of services and alleviate pressure on the Dublin and Ballysimon Roads. There is also an additional PT only link from the Childers Road through to Granville Park. This priority may be in the form of bus lanes, priority signal or bus gates.

All priority measures are indicative and require further detailed modelling and assessment to assess their feasibility and identify the optimal package of measures. The indicative supporting priority measures are illustrated in Figure 3-14.



Guiding Principles Table	
Capacity	The maximum 'idealised demand' (B2-B1) is 1586 which is 91% of service capacity and 77% of crush capacity.
Frequency	Service passing from Corridor B into City Core approximately every 2-3 minutes
Speed	Bus priority proposed along Dublin Rd, Ballysimon Rd and through UL. New roads are also proposed along the blue route linking Groody Road with Bloodmill Road and Golf Links Road.
Coverage	82% of the corridor population and 89% of employment are within walking distance of a high frequency bus service, additional coverage is provided by intercity and regional buses.
Interchange	Opportunity to interchange between all radial routes and the North/South Orbital Routes.
Directness	The Pink and Turquoise routes provide direct links into the City. The blue and turquoise variation through UL provide additional coverage. The proposed new links along the Blue route will increase its directness.

Route/Service	Headway	Capacity
UL-Mungret/Raheen	7.5 min	641
Annacotty-UL-Caherdavin	20 min	224
Annacotty-Caherdavin	20 min	224
Annacotty-Moyross	10 min	449
Ballysimon-Ardnacrusha	20 min	209
Total	2.6 min	1747

Figure 3-13: Corridor B – Route Alignment Options

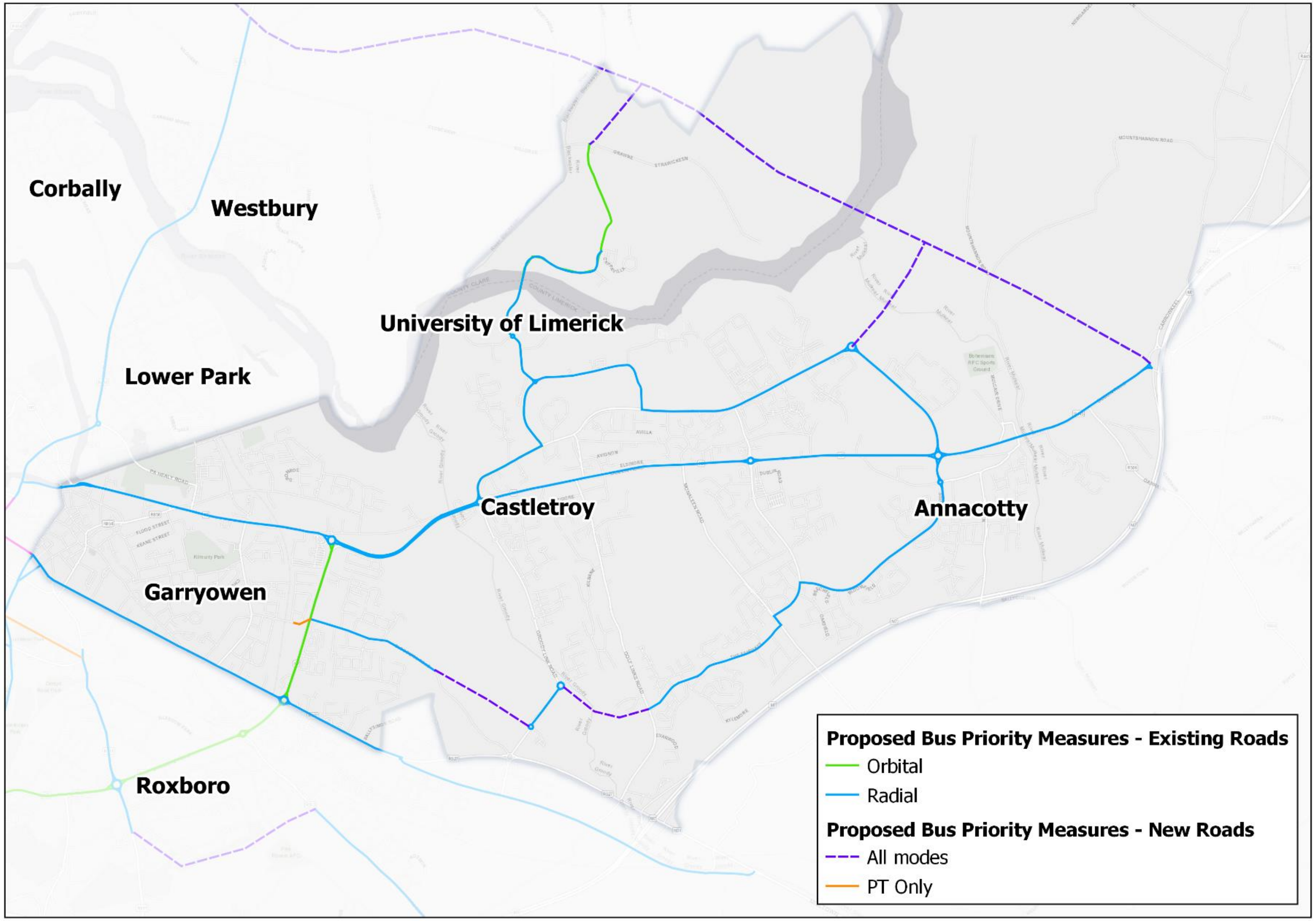


Figure 3-14: Corridor B – Supporting Priority Measures

3.8 Corridor C

3.8.1 Target Demand

Based on the public transport demand identified in the Spider's web based on the "Idealised" public transport network, the "Target Demand" for Corridor C can be identified. Table 3.11 shows the two-way Corridor C screenline demand on the radial movements, highlighting the largest demand as the "Target Demand" for each movement. The highest radial demand in Corridor C is 329 passengers.

Table 3.11: Identifying Maximum Demand to Develop Public Transport Options

Service Type	Outer Radial (C2 – C1)	Inner Radial (C1 – Core)
Inbound	127	329
Outbound	43	453

3.8.2 Common Appraisal Framework (CAF)

Table 3.12 outlines the results of the multi-criteria assessment in line the CAF requirements for Corridor C. The table describes how each of the options compares against each criterion and the cell are colour coded to indicate relative performance.

Table 3.12: Assessment of Alternative Transport Measures for Corridor C

	Economy	Environment	Safety	Integration	Accessibility and Social Inclusion
Option 1: Bus services;	Demand is well within capacity of bus-based network. This makes best use of investment in current network and could provide greater returns on investment in terms of benefit to cost ratio.	Produces less GHG than private Car alternative. Options available for different fuel sources.	Bus travel would reduce the number of cars in use and would reduce the potential accident rate.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately.	An integrated bus network can improve the accessibility and social inclusion to users and provide access to areas not easily served by more infrastructure intensive modes.
Option 2: Bus Rapid Transit;	The idealised demand is significantly below a capacity of a BRT which would be very unlikely to provide value for money, based on significant cost associated with introduction of BRT.	Produce less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 3: Light Rail Transit;	Travel demand is significantly below capacity of Light Rail, particular given it is combined demand across the corridor. Unlikely that Light Rail would provide value for money given construction costs. Significant costs also associated with operation.	Environmental impacts in terms of construction. Particularly within the city where significant land take may be required. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Can connect with rail stations and bus interchanges, but journey times can be hindered by private car traffic, if not prioritised appropriately.	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 4: Suburban Rail	Travel demand is significantly below heavy rail capacity. However, stops could be provided along existing rail line at Ballysimon as a potential P&R. Improvements along this line could also potential improve intercity services. However, they may be significant costs associated with construction and operation of these services also.	Environmental impacts in terms of widening to dual track. Particularly within existing urban footprint. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Integration with other services and land-use is limited to the existing corridor. Within the city in particular Colbert is removed from the major destinations.	Enhances accessibility for those living along existing rail routes but has limited flexibility in serving some pockets of the population and employment along the corridor.

From Table 3.12 “Option 1 Bus Services” are considered to be the preferential option for Corridor C based on the multi-criteria assessment, providing the most benefits overall while maximising value for money.

While the corridor runs parallel to the existing Limerick-Limerick Junction/ Limerick-Ballybrophy Line there are no existing stations on-route. While the cost of providing a new station and/or dual tracking the line to Limerick Junction may be significant it could have benefits for Intercity passengers and potential Park & Ride demand from the M7. The feasibility of this should be assessed in greater detail.

3.8.3 Services and Routes

The transport network for the LSMA identifies a high frequency bus service to cater for this area of the network. As such the number of bus routes and frequency of these services were reviewed to meet the target demand. Table 3.13 below shows an example of the methodology applied in determining potential public transport options to cater for the maximum target demand. It shows that to cater for the target demand two bus routes are required, with both running at a 20minute headway.

The table shows the breakdown of the number of routes by type and frequency of service with the associated carrying capacity by design and carrying capacity utilising standing room (Crush Capacity). This is presented alongside the maximum demand for the service to indicate whether or not the Option caters for the target demand. For Corridor C, it can be seen that the Design Capacity caters for the target demand. If there is any unforeseen additional demand, there is lots of additional Standing Capacity if required. It is apparent that in general the maximum screenline target demand in Corridor C is of a relatively small scale, and a high frequency bus services across multiple routes would be most suited.

Table 3.13: Option Development to Cater for Maximum Screenline Demand

Max Demand: 453 Service Type	Design Capacity	Indicative Public Transport Option
City Coach Bus	70	2 routes X 20 min freq
Inter-City Bus	50	1 route X 60 min freq
Design Capacity		**468**
Crush Capacity		**545**

Note the additional capacity of a potential rail station and park and ride at Ballysimon has not been included as this is more likely to serve demand coming from outside Corridor C.

3.8.4 Route Option Alignments

The route option alignments have been developed in line with the six principles that underpin the performance of the ‘idealised’ public transport network presented in Section 3.4.2. Two main routes were identified in order to cater for the proposed public transport options. Figure 3-15 illustrates the proposed Public Transport Options, outlining how the options have been developed to align with the six principles as much as feasibly possible. A Park and Ride location is proposed to be located near M7 exit 29 where the Old Ballysimon Road meets the Tipperary Road (N24).

Bus Route 1: Green

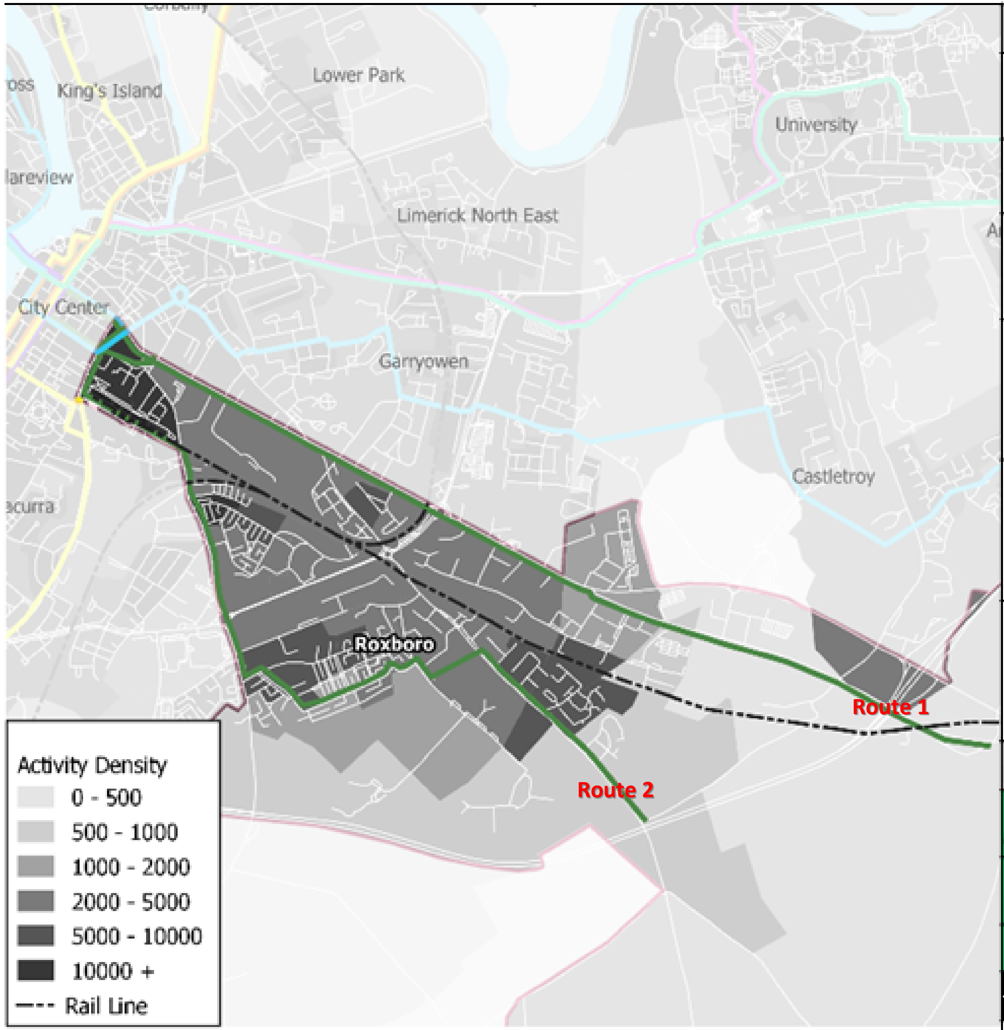
Bus Route 1 is shared with Bus route 4 on corridor B as the route has catchment in both corridors. It has been identified to run from just outside the M7 along the Old Ballysimon Road, joining with the Ballysimon Road and onwards to the City Centre. It will link the City Centre to important shopping and employment areas at City East Retail Park, City East Plaza, Eastway Business Park, and Delta Retail Park. This route would also link to any proposed Park & Ride site at Ballysimon.

Bus Route 2: Green Branch

Bus Route 2 has been identified to run from just inside the M7 along the R512 Kilmallock Road before diverting through O'Malley Park, Southill, via a new link road adjacent to Mount Saint Oliver Cemetery. It will then route towards the City Centre along Roxboro Road, but divert alongside Colbert Station along the way. This will provide a link between the station and the City Centre.

3.8.5 Route Option Priority Measures

In order to achieve high speed, high frequency, reliable public transport services within Corridor C increased public transport priority and provision is required, above and beyond the limited, existing bus lane provision. Measures to improve public transport speeds and priority will be put in place on the majority of the proposed routes. This priority may be in the form of bus lanes, priority signal or bus gates. For Bus Route 1 this will be along the Old Ballysimon Road and the Ballysimon Road to the City Centre. For Bus Route 2 this will be along Killmallock Road and Roxboro Road and include a new link through Southhill and bus only route by Colbert Station. The supporting priority measures are illustrated in Figure 3-16.



Guiding Principles Table	
Capacity	The maximum 'idealised demand' (C1-Core) is 453 which is 97% of the design capacity and 83% of crush.
Frequency	Service passing from Corridor C into City Core every 10 minutes.
Speed	Existing and proposed bus lanes along Ballysimon Road and Roxboro Road with new link provided between Kilmallock Road and Southhill.
Coverage	59% of the population and 70% of jobs are within the walking catchment of a core bus services. Additional intercity and regional buses will provide additional coverage to the more rural areas of C2.
Interchange	Southern route will connect directly to Colbert Rail Station with a new entrance/road provided through the rail station for buses. Interchange opportunities between both routes and southern orbital.
Directness	Ballysimon routes provides direct radial connection to the city centre. Crossagalla provides additional coverage, directness of this of this route will be improved by new proposed link road.

Route/Service	Headway	Capacity
Crossagalla-Ardnacrusha	20 min	209
Ballysimon-Ardnacrusha	20 min	209
ICB	60 min	50
Total	10 min	468

Figure 3-15: Corridor C – Route Alignment Options

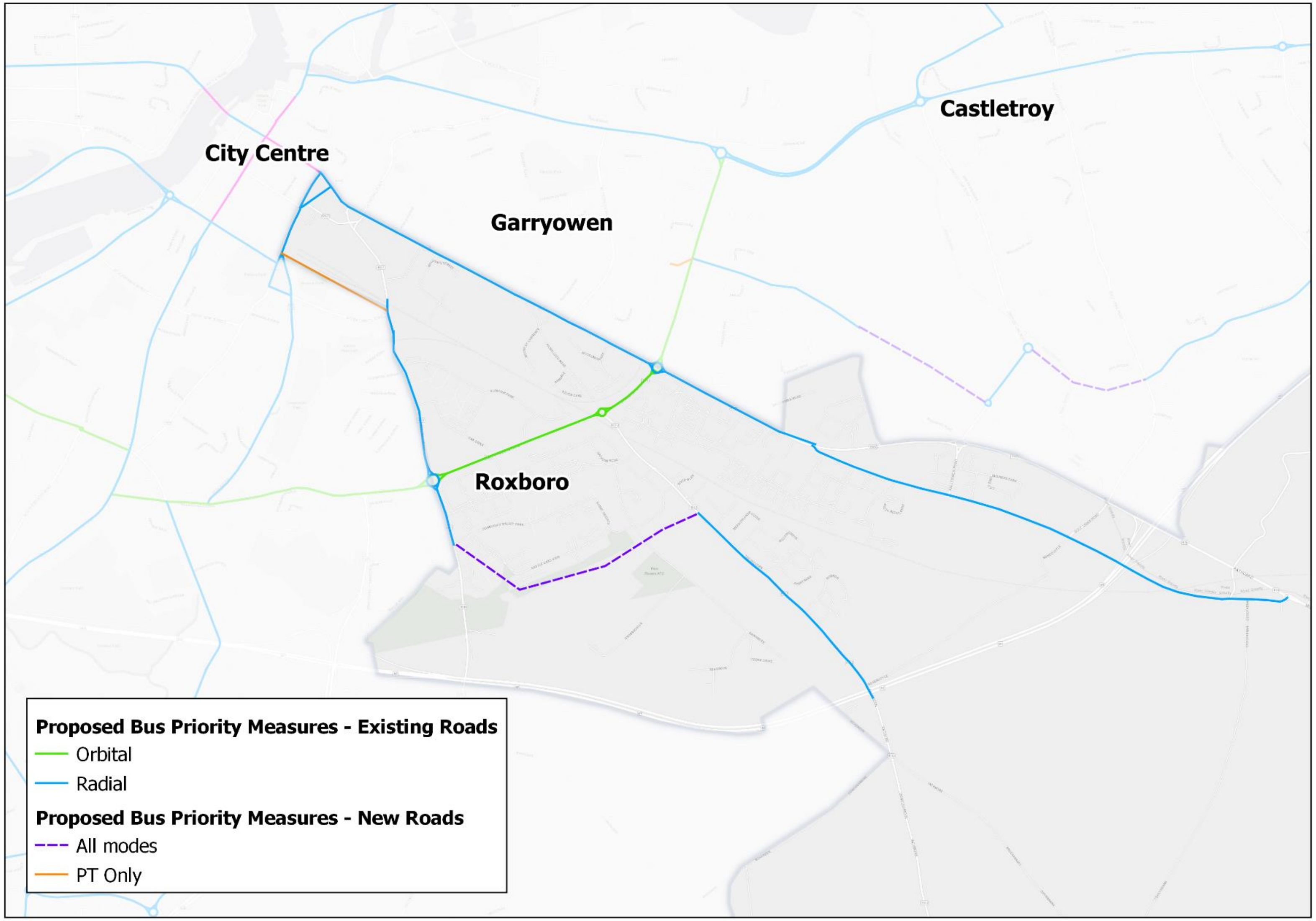


Figure 3-16: Corridor C – Supporting Priority Measures

3.9 Corridors D & E

3.9.1 Target Demand

The demand for corridors D & E has been combined as one corridor for the purposes of this assessment as the main road link connecting both corridors to the city is R526 Ballinacurra Road. Any proposed high frequency service would likely to run along this corridor and would serve both corridors.

Based on the public transport demand identified in the Demand Report based on the "Idealised" public transport network, the "Target Demand" can be identified. Table 3.14 shows the two-way Corridor D & E screenline demand on the radial movements, highlighting the largest demand as the "Target Demand" for each movement.

Table 3.14: Identifying Maximum Demand to Develop Public Transport Options

Service Type	Outer Radial (D2 – D1)	Inner Radial (D1 –Core)	Outer Radial (E2 – E1)	Inner Radial (E1 –Core)	Combined Outer Radial (D/E2 – D/E1)	Combined Inner Radial (D/E1 –Core)
Inbound	963	1060	967	970	1930	2030
Outbound	733	735	434	886	1167	1621

3.9.2 Common Appraisal Framework (CAF)

Table 3.15 outlines the results of the multi-criteria assessment in line the CAF requirements for Corridor D & E. The table describes how each of the options compares against each criterion and the cell is colour coded to indicate relative performance.

Table 3.15: Assessment of Alternative Transport Measures for Corridor D & E

	Economy	Environment	Safety	Integration	Accessibility and Social Inclusion
Option 1: Bus services;	Demand is within capacity of bus-based network. This makes best use of investment in current network and could provide greater returns on investment in terms of benefit to cost ratio.	Produces less GHG than private Car alternative. Options available for different fuel sources.	Bus travel would reduce the number of cars in use and would reduce the potential accident rate.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately.	An integrated bus network can improve the accessibility and social inclusion to users and provide access to areas not easily served by more infrastructure intensive modes.
Option 2: Bus Rapid Transit;	Given the idealised demand is across a number of roads/routes it is unlikely that a BRT would provide value for money, based on significant cost associated with introduction of BRT. However, this could be a potential longer-term option for upgrade of more frequency bus services.	Produce less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 3: Light Rail Transit;	Travel demand is well below capacity of Light Rail, particular given it is combined demand across the corridor. It is therefore unlikely that Light Rail would provide value for money given construction costs. Significant costs also associated with operation.	Environmental impacts in terms of construction. Particularly within the city where significant land take may be required. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Can connect with rail stations and bus interchanges, but journey times can be hindered by private car traffic, if not prioritised appropriately.	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 4: Suburban Rail	Travel demand is well below heavy rail capacity. Stops could be provided along disused rail lines from Mungret and/or Patrickswell. However, based on the likely significant costs associated with reopening these lines and their limited catchment within the corridor it is unlikely that the costs of reopening and constructing new stations would be justified.	Environmental impacts in terms of construction of stations and reopening works to allow frequent services. Particularly within existing urban footprint. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Integration with other services and land-use is limited to the existing corridor. Within the city in particular Colbert, the terminus, is removed from the major destinations.	Enhances accessibility for those living along existing rail routes. However, the majority of the corridor is not close of existing rail which run along the corridor boundaries.

From Table 3.15 “Option 1 Bus Services” are considered to be the preferred options for Corridors E & D based on the multi-criteria assessment, providing the most benefits overall while maximising value for money. Bus services allow a wider network of routes which will serve the majority of the population that would not be possible with BRT. The level of demand particularly given it is combined across two corridors is unlikely to justify the reopening of the existing rail lines and construction of new stations. This is further compounded by the fact the rail lines are not well integrated into the surrounding land-use and are on the outskirts of the existing urban footprint.

3.9.3 Services and Routes

The transport network for the LSMA identifies a high frequency bus service to cater for these areas of the network. As such the number of bus routes and frequency of these services were reviewed to meet the target demand. Table 3.16 below shows an example of the methodology applied in determining potential public transport options to cater for the maximum target demand. It shows that to cater for the target demand five bus routes are required, with four running at a 15minute headway and one running at a 5-minute headway.

The table shows the breakdown of the number of routes by type and frequency of service with the associated carrying capacity by design and carrying capacity utilising standing room (Crush Capacity). This is presented alongside the maximum demand for the service to indicate whether or not the Option caters for the target demand. For Corridors D and E, the Design Capacity easily caters for the target demand. Should there be any additional demand, there is also residual additional Standing Capacity. It is apparent that in general the maximum screenline target demand is of a scale that would require high frequency bus services across multiple routes.

Table 3.16: Option Development to Cater for Maximum Screenline Demand

Max Demand: 1060 Service Type	Design Capacity	Indicative Public Transport Option
Double Deck Bus	75	2 routes X 15 min freq 1 route X 5 min freq
City Coach Bus	70	2 routes X 15 min freq
Inter-City Bus	50	2 routes X 60 min freq
Design Capacity		**2154**
Crush Capacity		**2521**

3.9.4 Route Option Alignments

The route option alignments have been developed in line with the six principles that underpin the performance of the ‘idealised’ public transport network presented in Section 3.4.2.

Five main routes were identified in order to cater for the proposed public transport options. Figure 3-17 illustrates the proposed Public Transport Options, outlining how the options have been developed to align with the six principles as much as feasibly possible.

Bus Route 1: Purple

Bus Route 1 has been identified to run from Raheen through the Raheen Industrial Estate to Mulcair Road, here it turns to route along the Dooradoyle Road serving the Crescent Shopping Centre. It then turns up Ballinacurra Road and travels into the City Centre via O'Connell Avenue.

Bus Route 2: Orange

Bus Route 2 has been identified to run from Raheen to the City Centre via a new link road across close to Mungret Woods that bypasses the R510. It re-joins the R510 at the Mungret Road before travelling along the Dock Road to the Shannon Bridge.

Bus Route 3a: Pink Branch

Bus Route 3a has been identified to run around the back of Raheen Business Park and along the R526 St. Nessan's Road passing University Hospital Limerick. It continues along this road before reaching Ballinacurra Road, passing the Crescent Shopping Centre, and then routing to the City Centre via O'Connell Avenue.

Bus Route 3b: Pink Branch

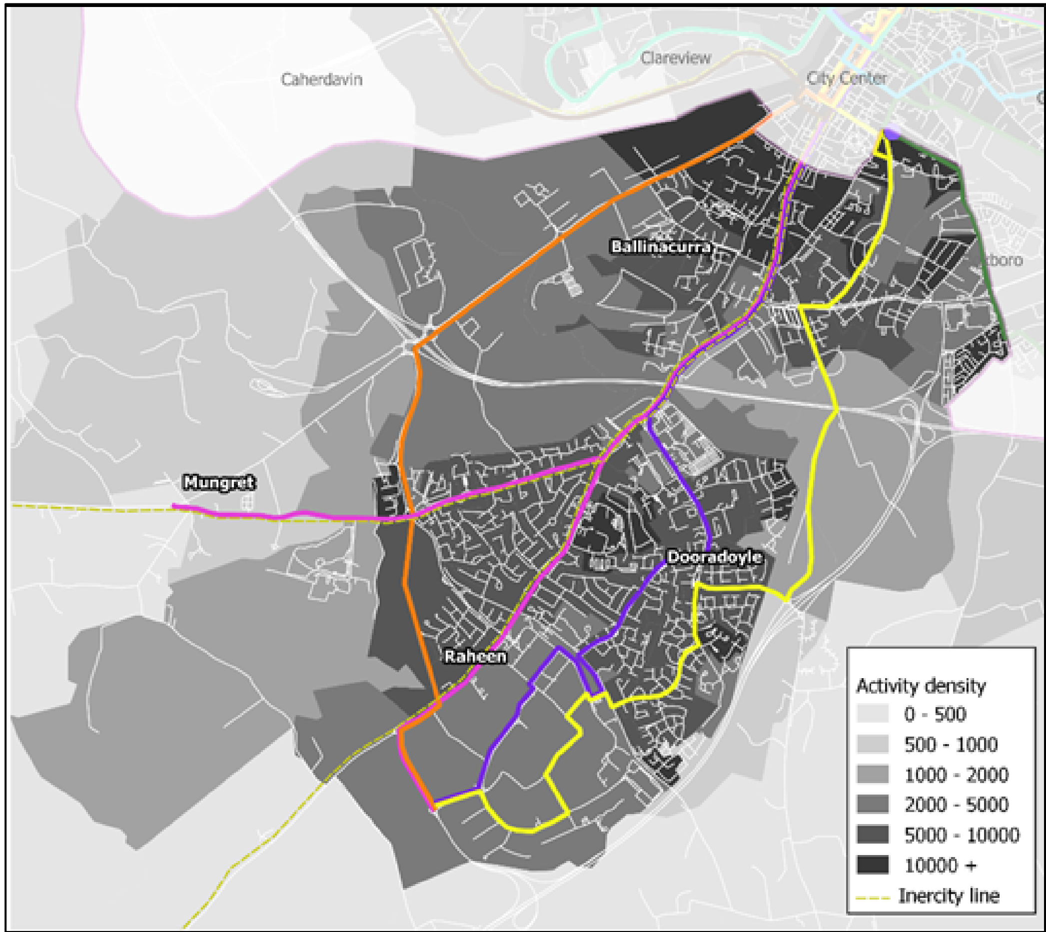
Bus Route 3b runs instead from Mungret along Father Russell Road where it joins St. Nessan's Road before continuing along Ballinacurra Road passing the Crescent Shopping Centre before routing to the City Centre via O'Connell Avenue.

Bus Route 4: Yellow

Bus Route 4 is proposed to run from Raheen Industrial Estate through Raheen Business Park and the Church Hill Meadows housing estate. It then runs briefly along the Dooradoyle Road before turning up Rosbrien Road as far as Childers Road. It then routes along Childers Road before turning up the Hyde Road towards the City Centre serving Colbert Station on-route.

3.9.5 Route Option Priority Measures

In order to achieve high speed, high frequency, reliable public transport services within Corridors D and E increased public transport priority and provision is required, above and beyond the existing limited bus lane provision. The main focus of the improvements to public transport speeds and priority will be on the Dock Road, O'Connell Avenue, Mungret Road, St. Nessan's Road, Dooradoyle Road, Rosbrien Road, the Hyde Road, and to the rear of the Raheen Industrial Estate. In addition, a new link road at Mungret Woods will enable room for bus priority. This priority may be in the form of bus lanes, priority signal or bus gates. These supporting priority measures are illustrated in Figure 3-18.



Guiding Principles Table	
Capacity	The maximum 'idealised demand' (D1&E1-Core) is 2030, which is 94% of design capacity and 81% of crush capacity.
Frequency	Service passing from Corridor D/E into City Core approximately every 2 minutes.
Speed	There is an existing bus lane inbound along the Ballinacurra Road with additional bus lanes proposed outbound and along O'Connell Ave. Proposed bus lanes along the Dock Road & R510 will increase speeds of the orange route.
Coverage	76% of the population and 79% of employment are within walking distance of a core bus service.
Interchange	All routes can interchange with the southern orbital. The yellow route will also provide a connection to Colbert Station.
Directness	The pink and orange route provide direct radial routes into the city. A new link is also proposed to connect Raheen Business Park and Ballycummin Road to provide more direct routing for the purple and yellow route.

Route/Service	Headway	Capacity
Raheen-Ballygrennan	5 min	898
Clonlara-Raheen	15 min	279
UL-Raheen	15 min	299
UL-Mungret	15 min	299
Raheen-Corbally/King's Island	15 min	279
ICB	30 min	100
Total	2 min	2154

Figure 3-17: Corridor D & E – Route Alignment Options

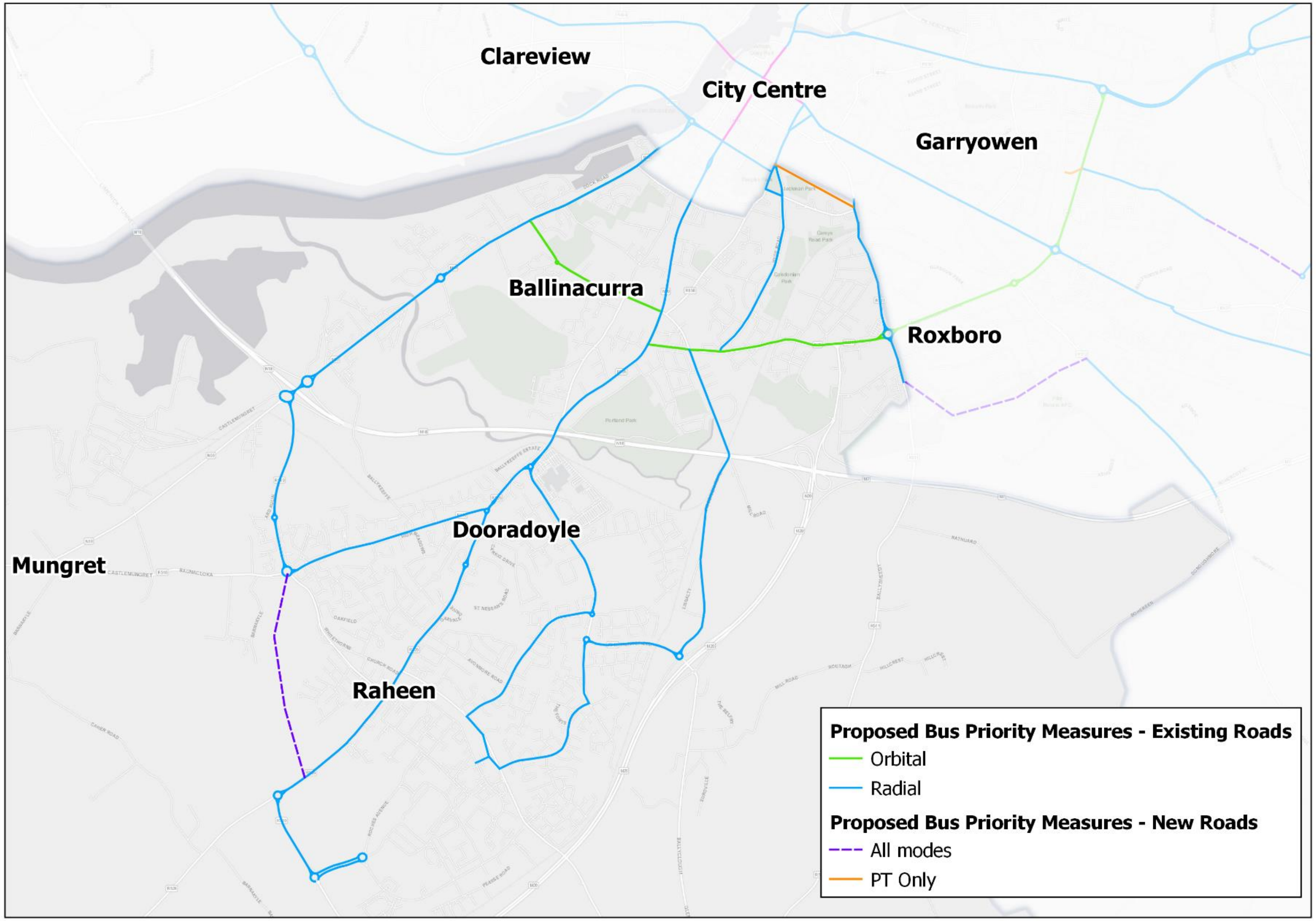


Figure 3-18: Corridor D & E – Supporting Priority Measures

3.10 Corridor F

3.10.1 Target Demand

Based on the public transport demand identified in the Spider's Web based on the "Idealised" public transport network, the "Target Demand" for Corridor F can be identified. Table 3.17 shows the two-way Corridor F screenline demand on the radial movements, highlighting the largest demand as the "Target Demand" for each movement. The highest radial demand is 1710 passengers passing from F1 to the City Centre Core.

Table 3.17: Identifying Maximum Demand to Develop Public Transport Options

Service Type	Outer Radial (F2 – F1)	Inner Radial (F1 – Core)
Inbound	744	1710
Outbound	521	1332

3.10.2 Common Appraisal Framework (CAF)

Table 3.18 outlines the results of the multi-criteria assessment in line the CAF requirements for Corridor F. The table describes how each of the options compares against each criterion and the cell is colour coded to indicate relative performance.

Table 3.18: Assessment of Alternative Transport Measures for Corridor F

	Economy	Environment	Safety	Integration	Accessibility and Social Inclusion
Option 1: Bus services;	Demand is within capacity of bus-based network. This makes best use of investment in current network and could provide greater returns on investment in terms of benefit to cost ratio.	Produces less GHG than private Car alternative. Options available for different fuel sources.	Bus travel would reduce the number of cars in use and would reduce the potential accident rate.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately.	An integrated bus network can improve the accessibility and social inclusion to users and provide access to areas not easily served by more infrastructure intensive modes.
Option 2: Bus Rapid Transit;	Given the idealised demand is across a number of roads/routes and includes demand from further out from Shannon it is unlikely that a BRT would provide value for money, based on significant cost associated with introduction of BRT. However, this could be a potential longer-term option for upgrade of more frequency bus services along the Ennis Road.	Produce less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 3: Light Rail Transit;	Travel demand is well below capacity of Light Rail, particular given it is combined demand across the corridor. Unlikely that Light Rail would provide value for money given construction costs. Significant costs also associated with operation.	Environmental impacts in terms of construction. Particularly within the city where significant land take may be required. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Can connect with rail stations and bus interchanges, but journey times can be hindered by private car traffic, if not prioritised appropriately.	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 4: Suburban Rail	Travel demand is well below heavy rail capacity. Stops could be provided along existing rail line at Moyross, and further into the LSMA at settlements such as Cratloe, as well as a potential rail spur to Shannon. However, based on the modelled demand in Iteration 2 the ridership would not justify the double tracking of these lines which is needed to provide an increase in frequency of services. Significant costs associated with construction and operation of these services also which would be operating below capacity.	Environmental impacts in terms of widening to dual track. Particularly within existing urban footprint. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Integration with other services and land-use is limited to the existing corridor. Within the city in particular Colbert is removed from the major destinations.	Enhances accessibility for those living along existing rail routes but has limited flexibility in serving the majority of the population and employment centres along the corridor.

From Table 3.18 "Option 1 Bus Services" are considered to be the preferred option based on the multi-criteria assessment, providing the most benefits overall while maximising the economic benefits. The corridor does not have the population or employment density to support a BRT or LRT line, while the existing rail corridor with a spur to Shannon would require substantial investment but would still not improve accessibility as much as bus services which provides greater coverage and flexibility in accessing the predominantly low-density residential neighbourhoods in the corridor.

3.10.3 Services and Routes

The transport network for the LSMA identifies a high frequency bus service to cater for this area of the network. As such the number of bus routes and frequency of these services were reviewed to meet the target demand. Table 3.19 below shows an example of the methodology applied in determining potential public transport options to cater for the maximum target demand. It shows that to cater for the target demand five bus routes are required, with two running at a 10-minute headway, two running at a 20-minute headway, and one running at a 5-minute headway.

The table shows the breakdown of the number of routes by type and frequency of service with the associated carrying capacity by design and carrying capacity utilising standing room (Crush Capacity). This is presented alongside the maximum demand for the service to indicate whether or not the Option caters for the target demand. For Corridor F, the Design Capacity more than adequately caters for the target demand. For any additional demand, there is residual additional Standing Capacity to accommodate additional passengers. It is apparent that in general the maximum screenline target demand in Corridor F is of a scale that would require high frequency bus services across multiple routes.

Table 3.19: Option Development to Cater for Maximum Screenline Demand

Max Demand: 1710 Service Type	Design Capacity	Indicative Public Transport Option
Double Deck Bus	75	2 routes X 20 min freq 2 routes X 10 min freq
City Coach	70	2 routes X 10 min freq
Design Capacity		**2183**
Crush Capacity		**2568**

3.10.4 Route Option Alignments

The route option alignments have been developed in line with the six principles that underpin the performance of the 'idealised' public transport network presented in Section 3.4.2.

Five main routes were identified in order to cater for the proposed public transport options. Figure 3-19 illustrates the proposed Public Transport Options, outlining how the options have been developed to align with the six principles as much as feasibly possible.

Bus Route 1a: Turquoise

Bus Route 1a has been identified to run from the City Centre across Sarsfield Bridge and along the Ennis Road through Caherdavin to the Coonagh Roundabout. It will serve the Jetland Shopping Centre, the Ennis Road Retail Centre, and the Gaelic Grounds Stadium on route.

Bus Route 1b: Turquoise Variation

Route 1b will divert via O'Callaghan Strand after crossing Sarsfield Bridge serving the North Circular Road and Fortmary Park terminating at Greystones Park adjacent to the Ennis Road and Gaelic Grounds.

Bus Route 2: Purple

Bus Route 2 has been identified to run from the City Centre across Sarsfield Bridge and along the Ennis Road before turning up Shelbourne Road as far as the Cratloe Road. It passes Thomond Park Stadium before continuing up the Old Cratloe Road next to Limerick Institute of Technology as far as the Crompaun River and the Clare border.

Bus Route 3: Brown (Shannon Local Service)

Bus Route 3 has been identified to run from the City Centre across Sarsfield Bridge and along the Ennis Road through Caherdavin. It passes Coonagh Cross Shopping Centre and continues out the R445 Ennis Road to the N18. It serves two loops from the N18 to serve the villages of Cratloe and Bunratty before reaching Shannon via Bóthar An Droichead and An Bóthar Mór. It routes through the Shannon Town Centre via Bealach Brí passing Skycourt Shopping Centre. It then passes down Gort Road and terminates at the Airport.

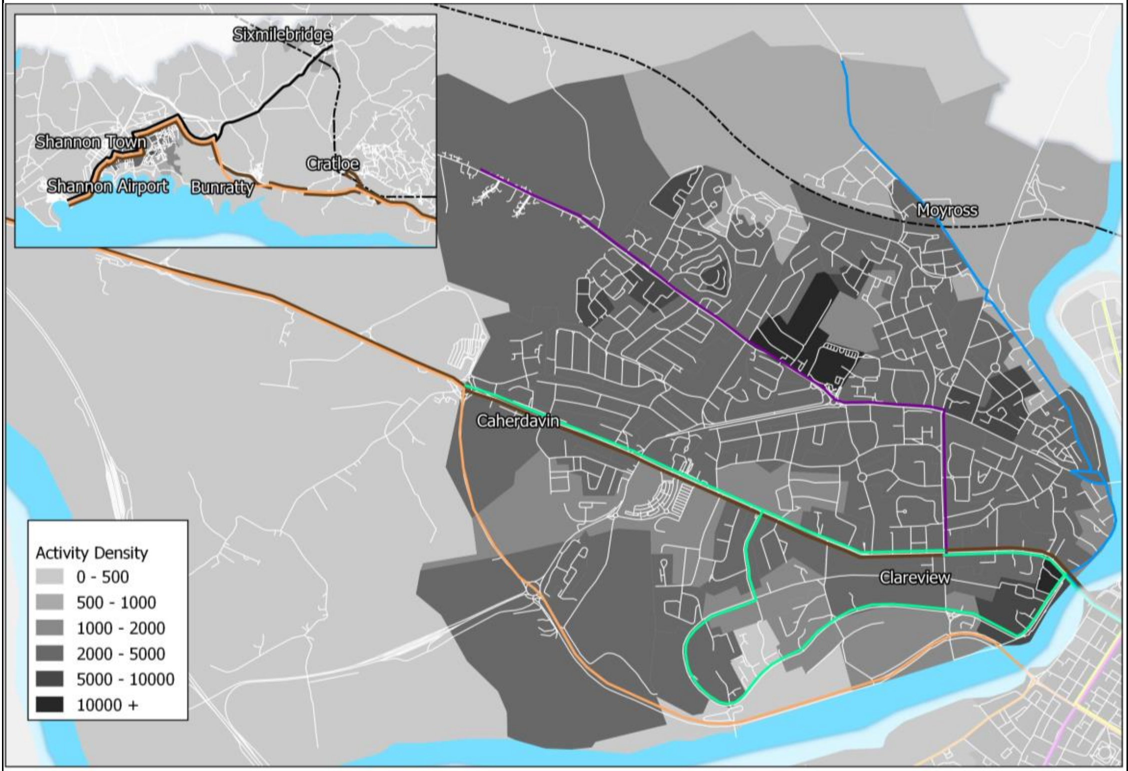
Bus Route 4: Pink (Shannon Express)

Bus Route 4 has been identified to run from the City Centre across the Shannon Bridge along the full length of the Condell Road to the Coonagh Roundabout and Coonagh Cross Shopping Centre. Here it joins the route of Bus Route 3 along the R445 Ennis Road to the N18. Unlike bus route 3, it bypasses the villages of Cratloe and Bunratty, instead continues directly to exit 7 of the N18 and routes along Bóthar An Droichead and An Bóthar Mór towards Shannon. Like Bus Route 3, it routes through the Shannon Town Centre via Bealach Brí passing the Skycourt Shopping Centre and Gort Road before terminating at the Airport.

3.10.5 Route Option Priority Measures

In order to achieve high speed, high frequency, reliable public transport services proposed within Corridor F, increased public transport priority and provision is required, above and beyond the existing bus lane provision. The main focus of the improvements to public transport speeds and priority will be along the Ennis Road between Sarsfield Bridge and the N18, and on the Condell Road between the Shannon Bridge and the Ennis Road. This priority may be in the form of bus lanes, priority signal or bus gates. The supporting priority measures are illustrated in Figure 3-20.

Corridor F



Guiding Principles Table

Capacity	The 'maximum demand' (F1-Core) is 1710 which is 65% of the design capacity.
Frequency	Service passing from Corridor A into City Core every 2 minutes approximately during the morning peak hours.
Speed	Existing and proposed bus lanes and priority along the Ennis Road and Condell Road. Potential PT only bridge at Sarsfield bridge which improve speed for Corridor F Buses.
Coverage	For F1 only, 96% of the population and 83% of jobs are within walking distance of the proposed bus services.
Interchange	Opportunity for interchange with the northern orbital and between rail and bus at Sixmilebridge station.
Directness	Nearly all service are direct radial into the city centre with one variation North Circular Road to increase coverage and accessibility.

Route/Service	Headway	Capacity
Annacotty-Caherdavin	10 min	224
Annacotty-Greystones Park		224
Raheen-Ballygrennan	5 min	898
Annacotty-Moyross	10 min	449
Limerick-Shannon	10 min	418
Limerick-Shannon Express	10 min	418
Total	1.7	2632

Figure 3-19: Corridor F – Route Alignment Options

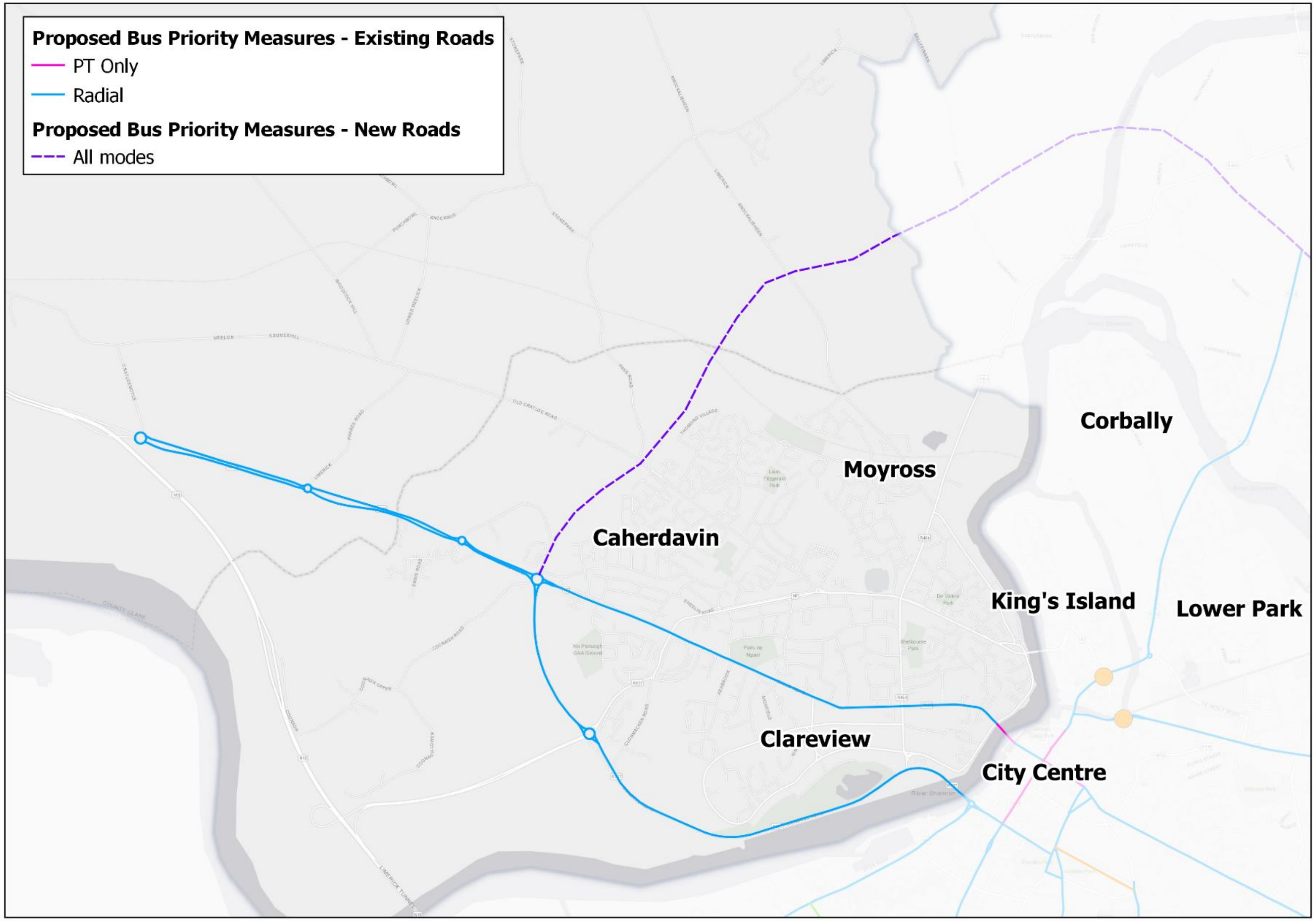


Figure 3-20: Corridor F – Supporting Priority Measures

3.11 Orbital Services

3.11.1 Target Demand

Based on the public transport demand identified in the Spider's Web based on the "Idealised" public transport network, the "Target Demand" for orbital movements can be identified. Table 3.20 shows the two-way Orbitals screenline demand on the radial movements, highlighting the largest demand as the "Target Demand" for each movement. The highest orbital demand is 220 on the north of the city between A1 and B1 and 303 on the south of the city between D1 & E1.

Table 3.20: Identifying Maximum Demand to Develop Public Transport Options

Service Type	Orbital North (F1-A1)	Orbital North (A1-B1)	Orbital South (B1-C1)	Orbital South (C1-D1)	Orbital South (D1-E1)
Inbound	181	220	270	140	303
Outbound	176	210	158	70	293

3.11.2 Common Appraisal Framework (CAF)

Table 3.21 outlines the results of the multi-criteria assessment in line the CAF requirements for Orbitals. The table describes how each of the options compares against each criterion and the cell is colour coded to indicate relative performance.

Table 3.21: Assessment of Alternative Transport Measures for Orbitals

	Economy	Environment	Safety	Integration	Accessibility and Social Inclusion
Option 1: Bus services;	Demand levels suggest buses can provide the appropriate level of capacity based in Figure 3.1. This will make the best use of investment by improving current network and could provide greater returns on investment in terms of benefit to cost ratio.	Produces less GHG than private Car alternative. Options available for different fuel sources.	Bus travel would reduce the number of cars in use and would reduce the potential accident rate.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately.	An integrated bus network can improve the accessibility and social inclusion to users and the flexible network can access most areas even with network constraints.
Option 2: Bus Rapid Transit;	Demand levels do not indicate that a BRT would provide value for money, based on significant cost associated with introduction of BRT.	Produce less GHG than private transport. Options available for different fuel sources. May have some impact on surrounding environment in order to accommodate.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Better integrated bus network can connect with rail stations, but journey times can be hindered by private car traffic, if not prioritised appropriately	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 3: Light Rail Transit;	Travel demand is significantly below capacity of Light Rail, particular given it is combined demand across the corridor. Unlikely that Light Rail would provide value for money given construction costs. Significant costs also associated with operation.	Environmental impacts in terms of construction. Particularly within the city where significant land take may be required and bridge widening. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Can connect with rail stations and bus interchanges, but journey times can be hindered by private car traffic, if not prioritised appropriately.	Potentially enhances accessibility however, access may be limited in areas where infrastructure constrained resulting in longer walk time to access services.
Option 4: Suburban Rail	Travel demand is significantly below capacity of heavy rail. Even incorporating existing rail, it is highly unlikely that the construction of orbital rail would feasible and would have significant construction and operating costs not warranted by demand.	Environmental impacts in terms of widening to dual track. Particularly within existing urban footprint. Potentially produces less GHG than private transport. Options available for different fuel sources.	Higher safety rate than car mode due to dedicated infrastructure segregating from other road users.	Integration with other services and land-use is limited to the existing corridor. Within the city in particular Colbert is removed from the major destinations.	Enhances accessibility for those living along existing rail routes but has limited flexibility in serving other areas of the corridor.

From Table 3.21 "Option 1 Bus Services" are considered to be the preferred option based on the multi-criteria assessment, providing the most benefits overall while maximising the economic benefits. Bus services allow for two clear orbital routes that serve the main employment, education, retail, and residential areas on the edge of the City. Running these routes as BRT or LRT would not be possible due to forecast loadings and cost considerations. Suburban Rail would only serve the north of the city and does not adequately serve the same destinations or integrate with other public transport services as well as bus services can.

3.11.3 Services and routes

The transport network for the LSMA identifies a high frequency bus service to cater for the orbital movements around the City. As such the number of bus routes and frequency of these services were reviewed to meet the target demand. Table 3.22 below shows an example of the methodology applied in determining potential public transport options to cater for the maximum target demand. It shows that to cater for the target just two bus routes, one north of the city, and one south of the city are required. Orbital south will run at a 10-minute frequency, while orbital north will run at a 20-minute frequency.

The table shows the breakdown of the number of routes by type and frequency of service with the associated carrying capacity by design and carrying capacity utilising standing room (Crush Capacity). This is presented alongside the maximum demand for the service to indicate whether or not the Option caters for the target demand. For the orbital routes, the Design Capacity is sufficient for the maximum demand outlined and will provide an attractive frequent service.

Table 3.22: Option Development to Cater for Maximum Screenline Demand

Max Demand: 303 Service Type	Design Capacity	Indicative Public Transport Option
City Coach	70	1 route X 10 min freq 1 route X 20 min freq
Individual Design Capacity		**420/210**
Individual Crush Capacity		**492/246**

3.11.4 Route Option Alignments

The route option alignments have been developed in line with the six principles that underpin the performance of the 'idealised' public transport network presented in Section 3.4.2.

Two main routes were identified in order to cater for the proposed public transport options. Figure 3-21 illustrates the proposed Public Transport Options, outlining how the options have been developed to align with the six principles as much as feasibly possible.

Bus Route 1: Southern Orbital

The Orbital South Route has been identified to run from the Coonagh Roundabout at Coonagh Cross Shopping Centre along the Condell Road and across the Shannon Bridge. Here it turns down the Dock Road turning along Ashbourne Avenue as far as Ballinacurra Road. It briefly routes along Ballinacurra Road before turning again at Childers Road. It continues along Childers Road serving several important shopping and employment destinations including Roxboro Shopping Centre, Galvone Industrial Estate, Crossagalla Industrial Estate, Childers Retail Park, and Parkway Shopping Centre. It then turns along the Dublin Road passing Parkway Retail Park and the Park Point Complex and terminates in the nearby UL campus.

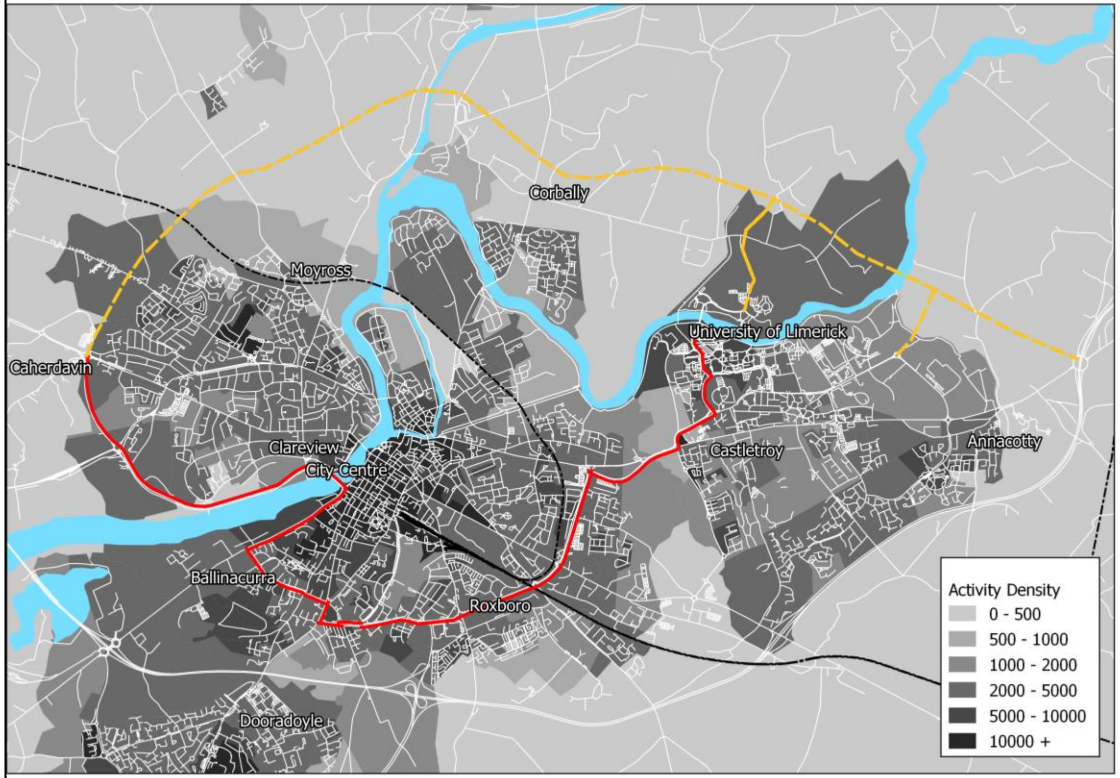
Bus Route 2: Northern Orbital

The routing of an orbital through the convoluted road network to the north of the city is extremely challenging and it is likely that such a service, if developed, would experience significant delays in general traffic and as a result of significant road network constraints. As such, it is not proposed to bring a north inner orbital forward for consideration. The LNDR has been identified as the preferred option for orbital bus movement to the north of the city connecting the west and east of the city with significant priority provided along the new road. This will link areas from the west of the city to UL and the National Technology Park. The service will be supported by Park & Ride sites as discussed in Section 3.13.

3.11.5 Route Option Priority Measures

In order to achieve high speed, high frequency, reliable public transport services proposed within Orbitals increased public transport priority and provision is required, above and beyond the existing bus lane provision. The main focus of the improvements to public transport speeds and priority on the Orbital South Route will be on the Condell Road, the Dock Road, Ashbourne Avenue, Childers Road, the Dublin Road, and in the UL campus. This priority may be in the form of bus lanes, priority signal or bus gates. The northern orbital will connect University of Limerick & the National Technology Park with proposed Park & Ride sites. The supporting priority measures are illustrated in Figure 3-22.

Orbitals



Guiding Principles Table

Capacity	On the northern side of the city the maximum 'idealised demand' 220 in any given direction which is 105% of proposed design capacity but 89% of crush capacity. In the south side of the city the maximum demand is 303 which is 72% of design capacity.
Frequency	There is 3 and 6 buses during the peak hour proposed for northern and southern orbital routes respectively.
Speed	Bus lanes and priority will provided along the length of each route.
Coverage	A total of 95,540 people and 40,099 jobs are within the walking catchment of both orbitals.
Interchange	The orbitals provide interchange opportunities with core bus services, particularly the southern orbital and will be serve proposed P&R sites (see section 3.13).
Directness	The Northern Route is very direct along the proposed LNDR alignment. The southern route runs along the childers road connecting numerous corridors.

Route/Service	Headway	Capacity
Orbital North	20 min	210
Orbital South	10 min	420

Figure 3-21: Orbitals – Route Alignment Options

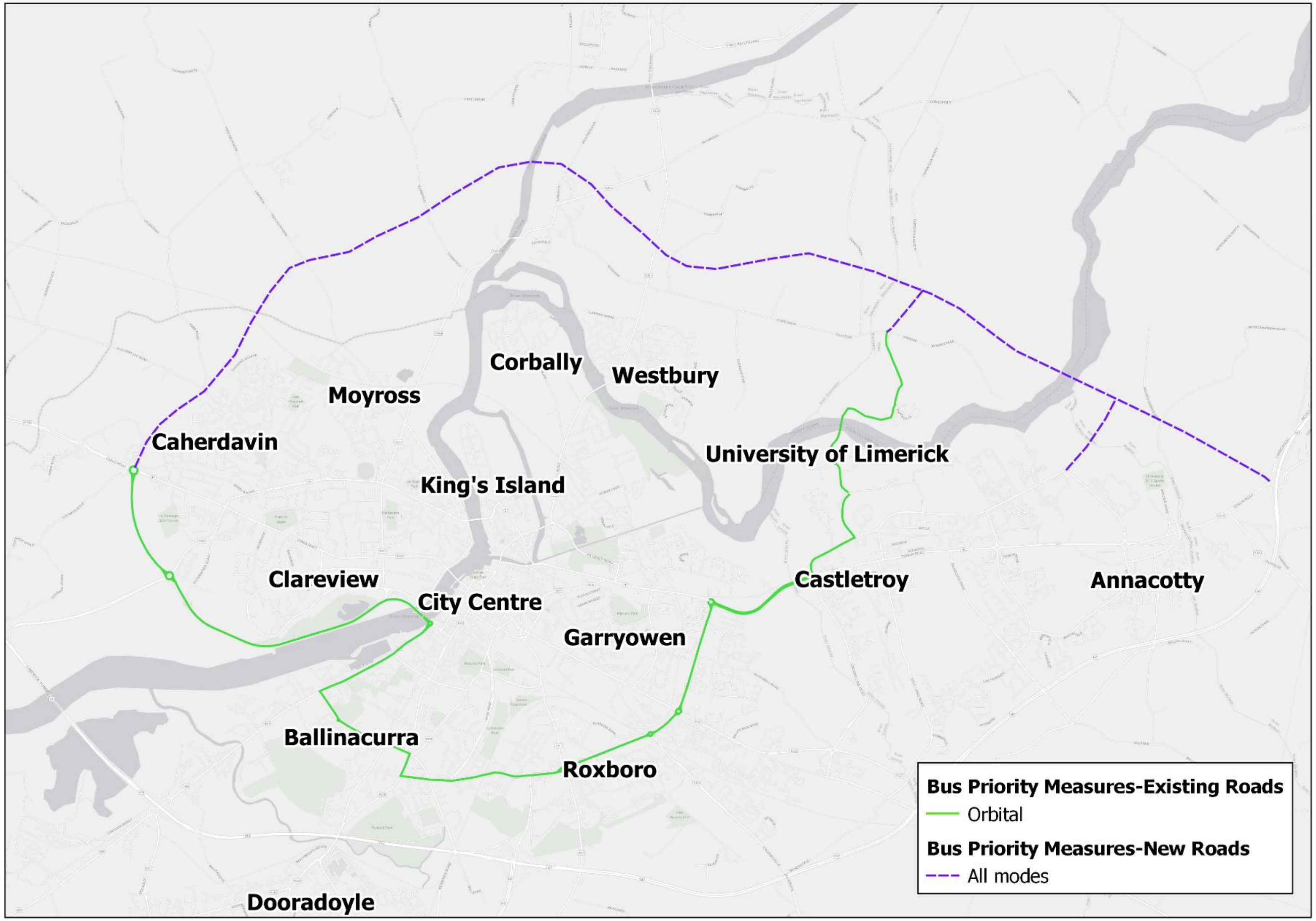


Figure 3-22: Orbitals – Supporting Priority Measures

3.12 Cross City Public Transport Services

3.12.1 Methodology

The Public Transport corridor assessment has developed radial public transport services and applied service frequencies and headways to each radial route. Cross City linkage between these radial routes can help to further increase the efficiency and effectiveness of the public transport routes by widening the catchment of the radial routes and providing connectivity between areas external to the City Centre.

The following outlines the methodology applied in determining the Cross-city services, and also the route alignment that is taken through the City Centre:

- Determine cross city public transport demand;
- Identify radial services frequencies;
- Match radial services with high cross city demand and similar service frequencies;
- Identify public transport route entry points to City Centre;
- Target key interchange locations within the City Centre.

3.12.2 Determine Cross City Demand

As outlined in the Demand Analysis Report, and earlier in this report, the two-way cross city demand between the Corridors was determined. This two-way cross city demand is shown in Table 3.23.

Table 3.23 Cross-City 2040 AM Peak Two-way Idealised Demand

Corridor	B	C	D	E	F
A	Orbital	116	212	206	Orbital
B		Orbital	558	537	941
C			Orbital	159	295
D				Orbital	506
E					510

As shown the highest cross city demand is between Corridors B & F. This includes demand to/from F2 however F2 is approximately 23km from the city centre with no population centres in between and may be suited to a frequent express or shuttle service to the city from Shannon Airport and Shannon Town than a higher capacity cross city service. Table 3.24 shows the cross-city demand with demand to/from F2 excluded.

Table 3.24 Cross City 2040 AM Peak Two-way Idealised Demand (excl. F2)

Corridor	B	C	D	E	F
A	Orbital	116	212	206	Orbital
B		Orbital	558	537	681
C			Orbital	159	207
D				Orbital	367
E					364

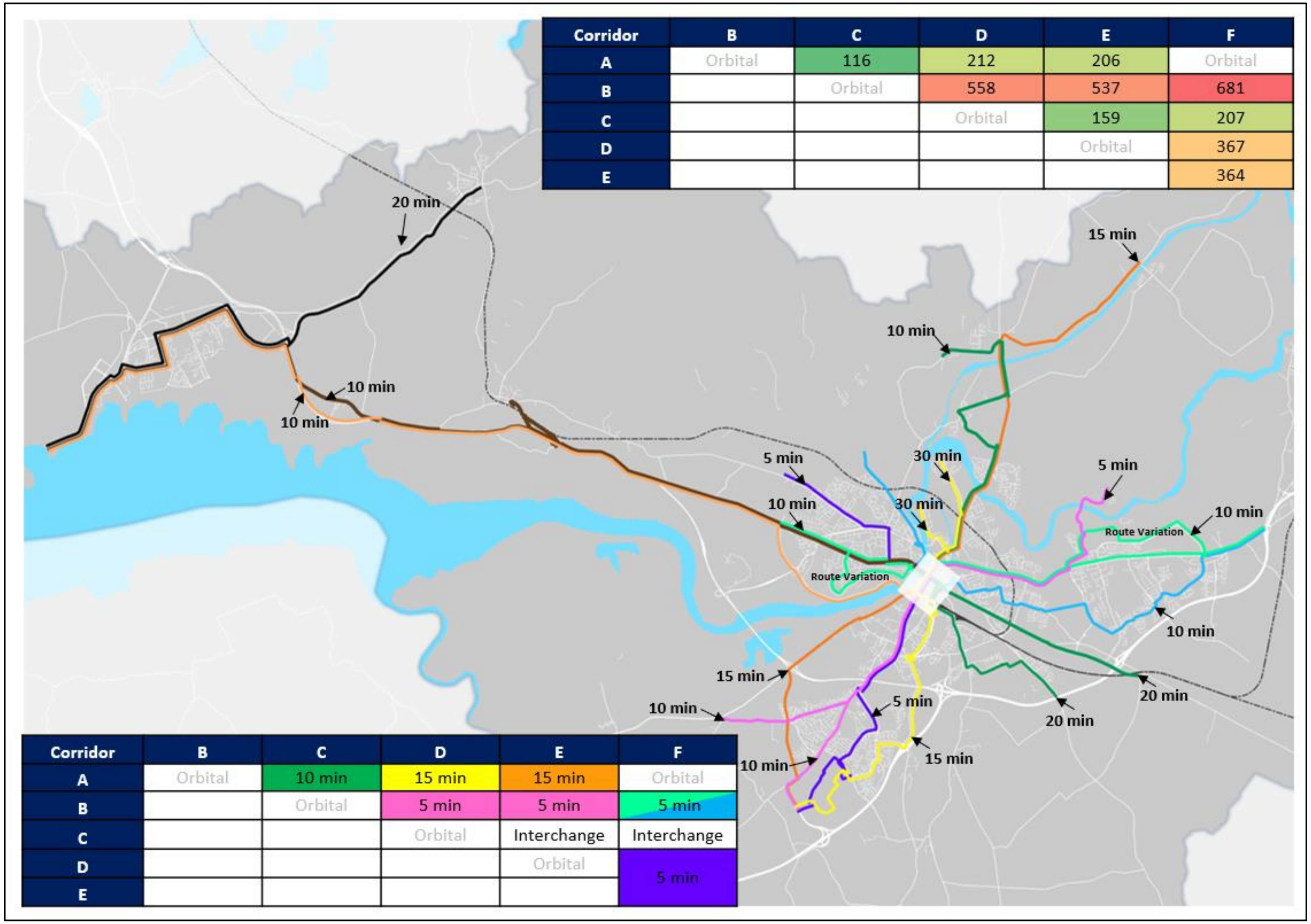
Based on the above table, there are 3 emerging cross city routes from Corridor B to D, E & F1 that could be served by a higher frequency and/or capacity service and additional priority. Corridors D & E could potentially be served by one service utilising the R526/O'Connell Avenue which would serve areas of higher densities along both corridors. The remaining demand to/from Corridors A & C could be served by reasonable frequency bus services with orbital services running north and south of the city catering for remaining orbital demand.

3.12.3 Matching Cross City Services

To determine the cross city services a route matching exercise was undertaken. This route matching exercise involves identifying proposed public transport services that have a high cross city demand and also have similar service frequencies. Figure 3-23 illustrates the results of cross city public transport service matching, with the proposed matched services colour coded on the route map and also identified in the matrix to align with the cross-city demand matrix. As shown, the highest cross city demand is served by the higher frequency with lower frequencies between corridors with lower demand. The majority of cross city movements will be facilitated by the radial routes shown, or the orbital corridor presented in Figure 3-21, however there are some movements which will require interchange between services in the city centre.

3.12.4 Review of Metropolitan Bus Network

The Metropolitan bus network will be subject to review within the lifetime of this strategy. While this report outlines the bus network assumed for the purposes of strategy preparation and assessment, it should be noted that it has been informed by forecast travel demand only. In reviewing the existing bus network, proposed changes will require to be informed by several other factors, most notably established travel patterns and operational requirements.



Corridor	B	C	D	E	F
A	Orbital	116	212	206	Orbital
B		Orbital	558	537	681
C			Orbital	159	207
D				Orbital	367
E					364

Corridor	B	C	D	E	F
A	Orbital	10 min	15 min	15 min	Orbital
B		Orbital	5 min	5 min	5 min
C			Orbital	Interchange	Interchange
D				Orbital	5 min
E					

Figure 3-23: Matching Cross City Demand with Proposed Radial Services

3.12.5 City Centre Bus Routing

There are currently many one-way streets within Limerick City Centre which are dominated by private car. Based on the existing network, proposed buses would be required to divert through this one-way network creating loops and impacting the efficiency and legibility of the proposed bus network. There is also no existing bus priority along these routes which results in considerable delays to public transport journey times and reliability of buses. This in turn impacts the attractiveness of the proposed bus network.

Figure 3-24 outlines the routing of the proposed network based on the current configuration of the road network along with the number of proposed bus services per hour on key links in the morning peak.

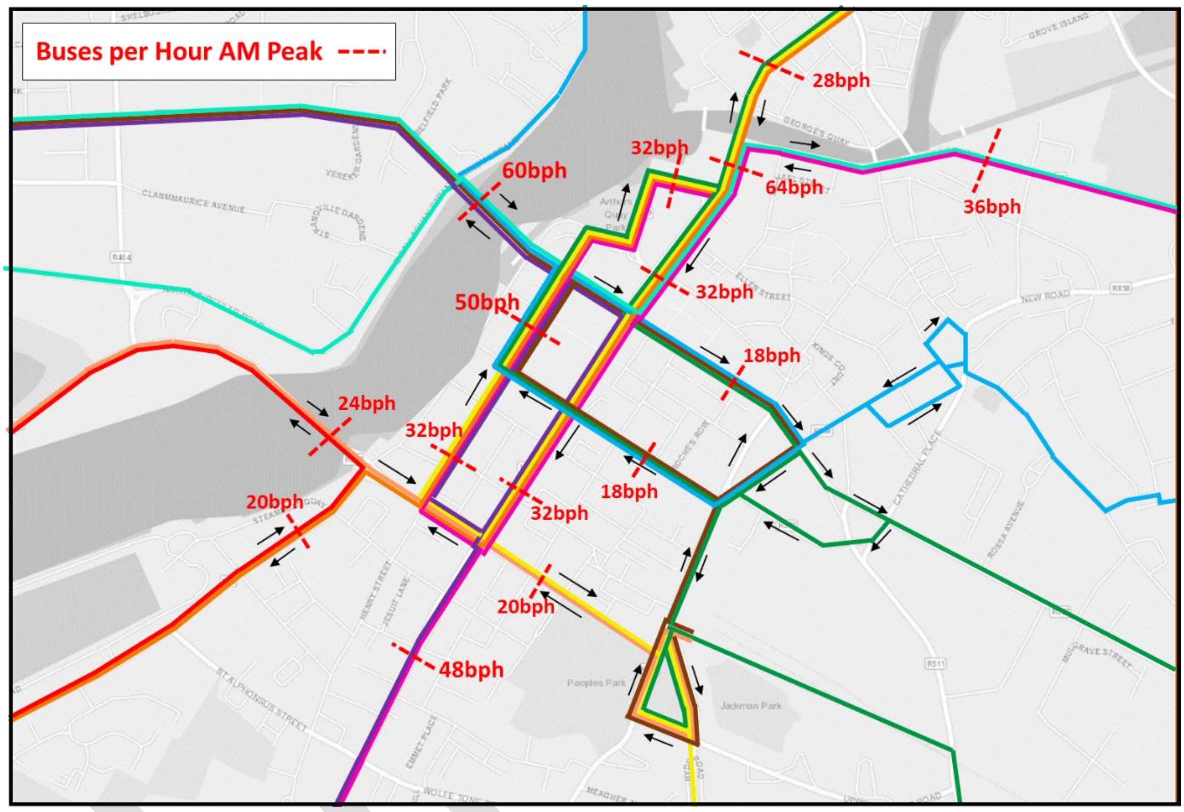


Figure 3-24: Limerick City Centre Bus Routing Existing Network

3.12.6 Alignment with Previous Proposals

Previous work undertaken as part of the Limerick Metropolitan District Movement Framework outlined several proposals to improve bus priority along with the pedestrianisation along O'Connell Street, between Roches Street & William Street, improvements at key junctions and amendments to traffic circulation to enable these measures. Figure 3-25 outlines the high-level city centre proposals included in the study.

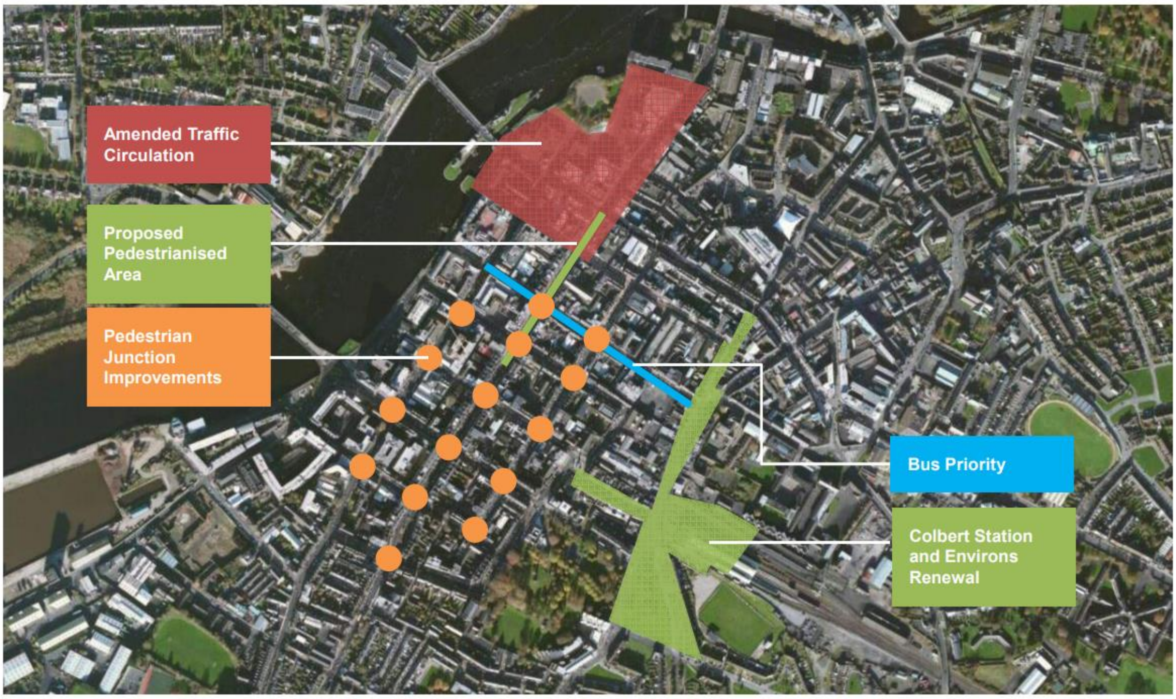


Figure 3-25: Limerick Metropolitan District Movement Framework Study-City Centre Schemes

However, the level of bus priority proposed as part of the study was limited with just Roches Street/Shannon Street flagged for additional priority. The location of this priority is at odds with the forecast public transport demand travelling North-South through the city and doesn't cater for the most frequent corridors; Sarsfield Bridge, O'Connell Street and Patrick's Street.

Further work undertaken as part of the Limerick Urban Centre Revitalisation of O'Connell Street (LUCROC) proposed a reduction in the number of lanes and increased footpaths and public realm for pedestrians along the entire length of the Street including Patrick's Street. However, this provided no additional bus priority.

3.12.7 Proposed City Centre Priority Measures

As the public transport routes converge on Limerick Centre they combine and group into roads and streets approaching the City Centre. The following lists the main Gateway entry point streets that are proposed to cater for multiple public transport routes:

- Rutland Street (64 buses per hour (AM Peak));
- Sarsfield Bridge (60 buses per hour (AM Peak));
- O'Connell Street/The Crescent (48 buses per hour (AM Peak));
- William Street/Roches Street (36 buses per hour (AM Peak)).

The objective when considering priority measures within the city centre was to connect these main gateway points ensuring the principles of the idealised public transport network outlined in Figure 3.4 are adhered to (Capacity, Frequency, Directness, Coverage, Speed and Interchange).

Based on these principles and the proposed bus network a number of measures are proposed to rationalise the bus network. These measures include removal of one-way bus loops where possible and providing a significant level of bus priority. This priority will be required to ensure the competitiveness of public transport as an attractive alternative to car. The proposed measures are shown in Figure 3-26. As illustrated the main change is along O'Connell Street, and part of Patrick's Street, which will become Public Transport only (in addition to walking and cycling) and two-way. As a result, Henry Street becomes two-way for general traffic to accommodate traffic displaced from

O'Connell Street. There are a number of changes to the traffic circulation North & South to accommodate these measures. In addition, Sarsfield Bridge is also proposed as a PT only link.

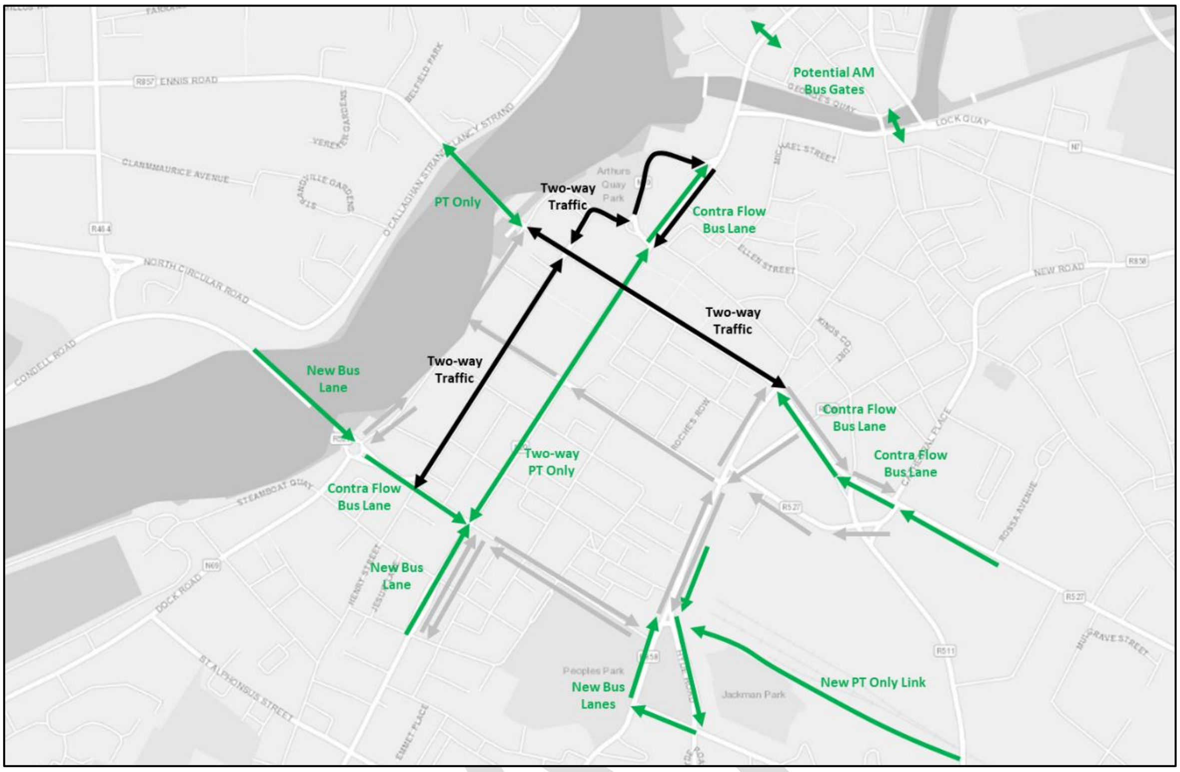


Figure 3-26: Limerick City Centre Measures

With the measures in place the bus network will become more direct and speeds will improve. The routing of the proposed network with the measures in place is shown in Figure 3-22.

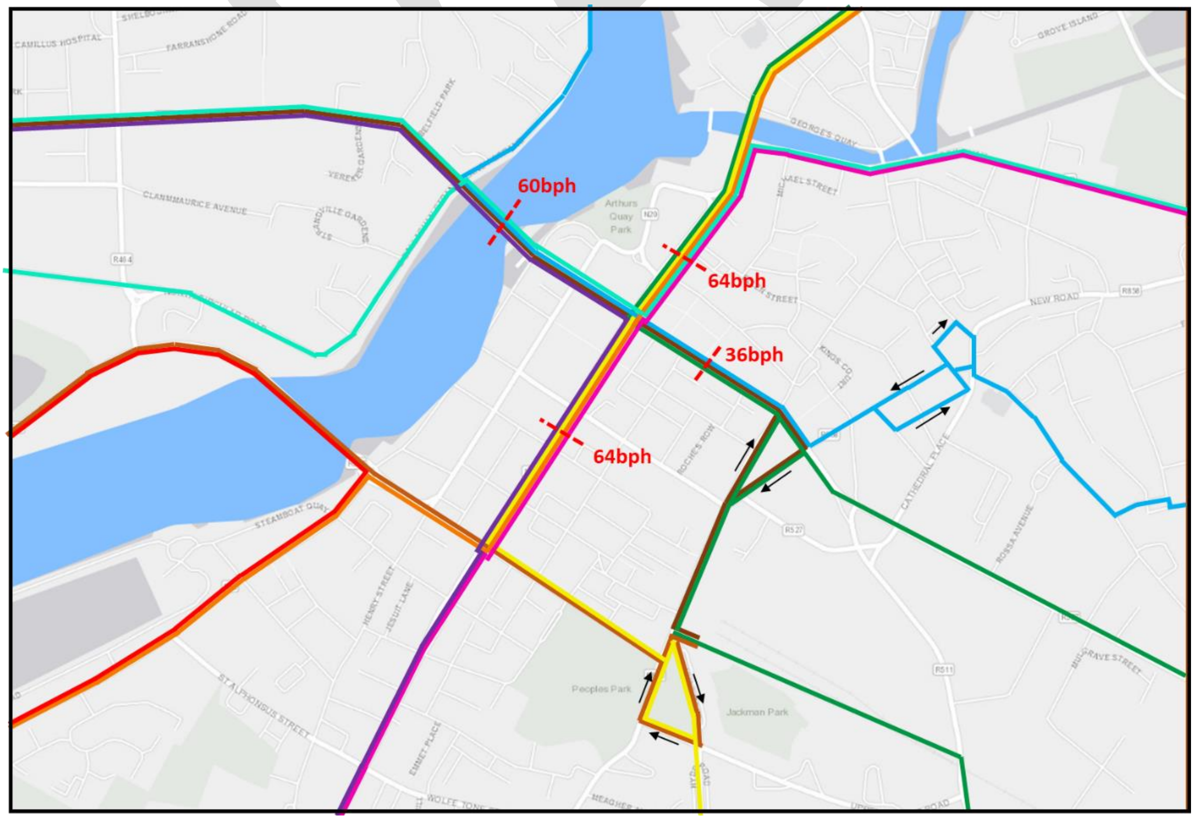


Figure 3-27: Proposed Bus Network Revised City Centre Routing

The proposals outlined are preliminary only and will require significantly more detailed modelling to understand the full impact along with a detailed assessment of traffic management implications. However, it should be recognised that considerable levels of priority will be needed to ensure the proposed public transport is attractive relative to car in order to promote a significant change in car mode share. As part of the implementation of LSMATS, it is intended to carry out a comprehensive Limerick City Centre Traffic Management Study which is intended to determine in detail these matters.

3.13 Park and Ride

3.13.1 Function of Park and Ride

Park and Ride involves providing car parking spaces at public transport interchanges to provide access to the City Centre and key destinations via public transport with managed secure parking. Park and Ride as a component of the LSMATS is a means of increasing the accessibility of the transport network to a population that might not otherwise access the network through modes such as walking, cycling or public transport transfer from car.

3.13.2 Location of Park and Ride

The location of Park and Ride sites is key to achieving the desired benefits of private car reductions. Park and Ride sites need to be situated where they can provide a competitive advantage versus car-based travel in terms of journey time to destination, security of parking, and cost of parking. Park and Ride sites are proposed at key locations around the periphery of Limerick City within the LSMA in order to widen the catchment and maximise the use of the proposed public transport network. They are located at the edge of congestion along key strategic routes where public transport provision has the capacity to serve the increased demand at these points.

3.13.3 Proposed Park and Ride Sites

The following lists the proposed Park and Ride sites and the network catchment it is intended to capture:

- Dublin Road: M7 Corridor served by two radial bus routes and potential future orbital route along the LNDR. Radial bus service every 5min.
- Old Ballysimon Road: N24/M7 Corridor served by Bus and potential new rail service. Bus every 20 minutes.
- Ballycummin Avenue: M20/N21 corridor served by 3 frequency radial routes with a bus every 2-3minutes.
- Ennis Road: N18 Corridor served by 3 radials and both orbitals. Bus every 2-3minutes.

Figure 3-28 illustrates the proposed Park and Ride locations on the proposed public transport network.

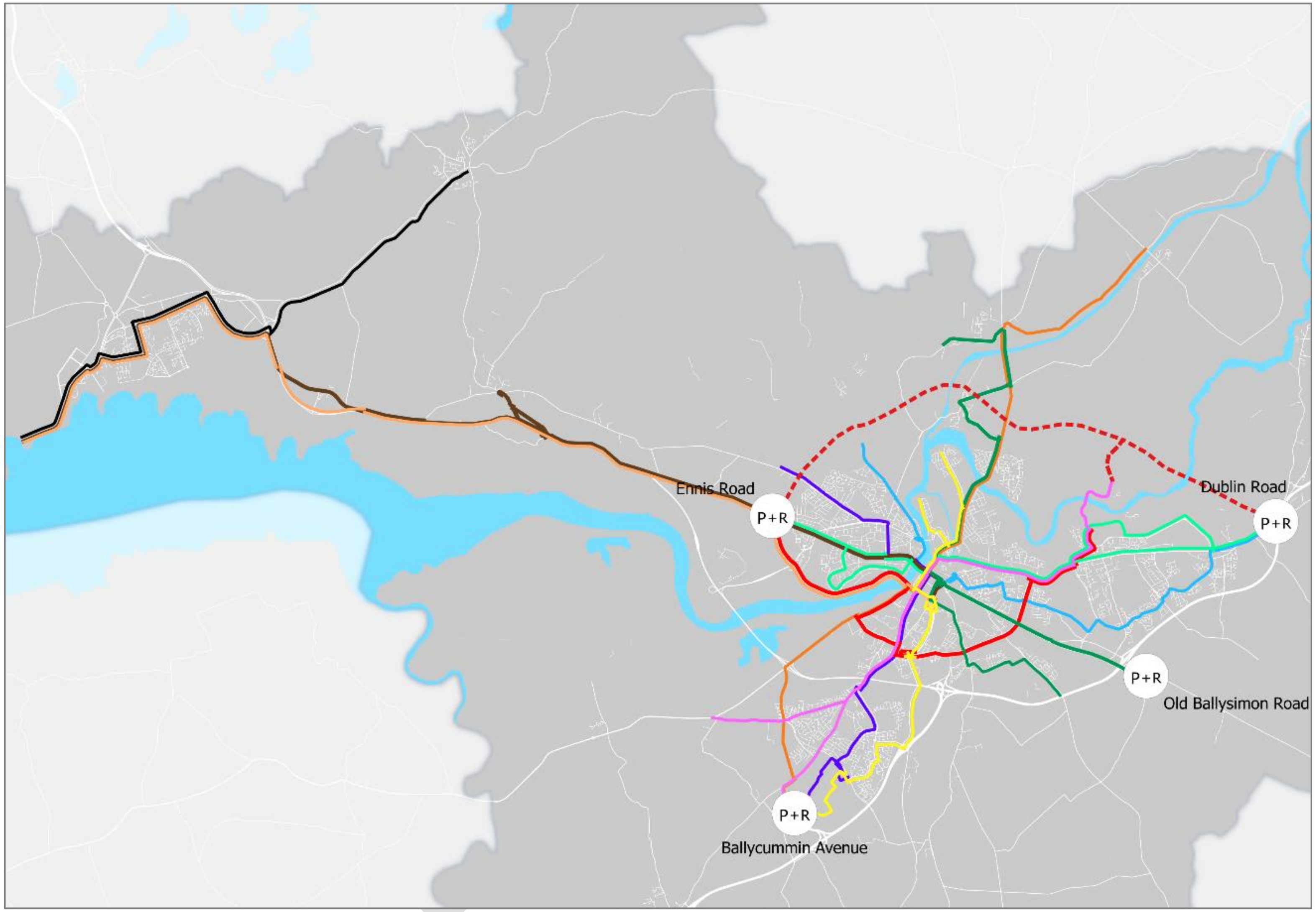


Figure 3-28: Proposed Park & Ride Facilities

4 Road Network Options

4.1 National Road Network

This section outlines the National Road network infrastructure proposed as part of the LSMATS. It takes into consideration European and National policy in the context of Spatial Planning and National Roads[2], the National Development Plan (NPD), and TII's National Roads Programme 2018 – 2027.

4.1.1 Review of Spatial Planning and National Roads

The Spatial Planning and National Roads guidelines set out planning policy considerations relating to development affecting National Primary and National Secondary Roads, including motorways and associated junctions. The following key extracts from the guidelines are important considerations for determining the function of the National Roads in the context of the LSMATS Strategy:

Function of National Roads

"National roads play a key role within Ireland's overall transport system and in the country's economic, social and physical development. The primary purpose of the national road network is to provide strategic transport links between the main centres of population and employment, including key international gateways such as the main ports and airports, and to provide access between all regions. Better national roads improve access to the regions, enhancing their attractiveness for inward investment and new employment opportunities and contribute to enhanced competitiveness by reducing transport costs. However, in recent years, increasing population and car ownership rates, changes in lifestyle and employment, and improvements in the quality of the road network have also contributed to the unsustainable outward expansion of urban areas."

Strategic Traffic

"Strategic traffic, in the context of national roads, primarily comprises major interurban and inter-regional traffic, whether HGV, car, public transport bus services or other public service vehicles, which contributes to socio-economic development, the transportation of goods and products, especially traffic to/from the main ports and airports, both freight and passenger related. In particular, any local transport function of national road bypasses and relief roads in respect of the urban areas they pass through is, and must continue to be, secondary to the role of these roads in catering for strategic traffic."

Based on the above any proposed measures should not serve to encourage the inappropriate use of the National road network by local car traffic and should increase the attractiveness of public transport alternatives and to render investment in such public transport improvements more economically viable. Without these interventions, the LSMA will continue to experience increasing congestion and private car use which put at risk any substantial investment already made on the national roads of strategic importance.

4.1.2 Proposed National Road Network

The following sections identify proposed infrastructure improvements for the national road network within the LSMA, that form part of the LSMATS.

[2] Spatial Planning and National Roads, Guidelines for Planning Authorities, January 2012, Department of Environment, Community and Local Government.

4.1.3 N/M20 Cork to Limerick

The provision of a dedicated National Road / Motorway to improve connectivity between Ireland's second and third largest cities, is consistent with the NPF's National Strategic Outcome 2, to provide Enhanced Regional Accessibility. The NDP identifies the M20 Cork to Limerick Road to be delivered by 2027, subject to appraisal, planning and procurement. The N20 Cork to Limerick Road is part of the Ten-T Comprehensive Network. The solution for the N/M20 corridor will be identified through the N/M20 Cork to Limerick Road Improvement Scheme appraisal process and the development of a business case for the Scheme.

4.1.4 N21/N69 Foynes to Limerick Road (including Adare Bypass)

The proposed Foynes to Limerick Road is 35km in length and connect the Port of Foynes to the Motorway Network to the south-west of Limerick City at Attyflin at Junction 5 on the M20/N21 near Patrickswell. The scheme incorporates a bypass of Adare Town which is a significant bottleneck on the Limerick National Road Network. The proposed route alignment is shown in Figure 4-1 below.

Enhancing the road connectivity to Shannon-Foynes Port is identified as a key growth enabler in the NPF and the NDP. The upgrade of the road is considered a key element to support the expansion of the Port of Foynes as outlined in the Government's *National Ports Policy* and the NPF. Foynes is designated as a Core Port under EU regulations (Trans European Network TEN-T). The TEN-T regulations require high-quality road connectivity thus improving journey time reliability and safety for all road users.

The road will assist in removing through traffic (particularly HGV and other freight vehicles) from villages and towns including Mungret and those outside the LSMA at Adare. A planning application was lodged with An Bord Pleanála in December 2019 and is supported by LSMATS. The proposed realignment of the N69 to connect with the M20 and the declassification of the existing N69 to Regional road status will result in the reassignment of traffic onto the M20 between Patrickswell and the M7. The proposed P&R site at Ballycummin Avenue will offer an opportunity for traffic along the M20/N21/N69 to travel by into the city centre potentially reducing traffic through the M20/M7 interchange.

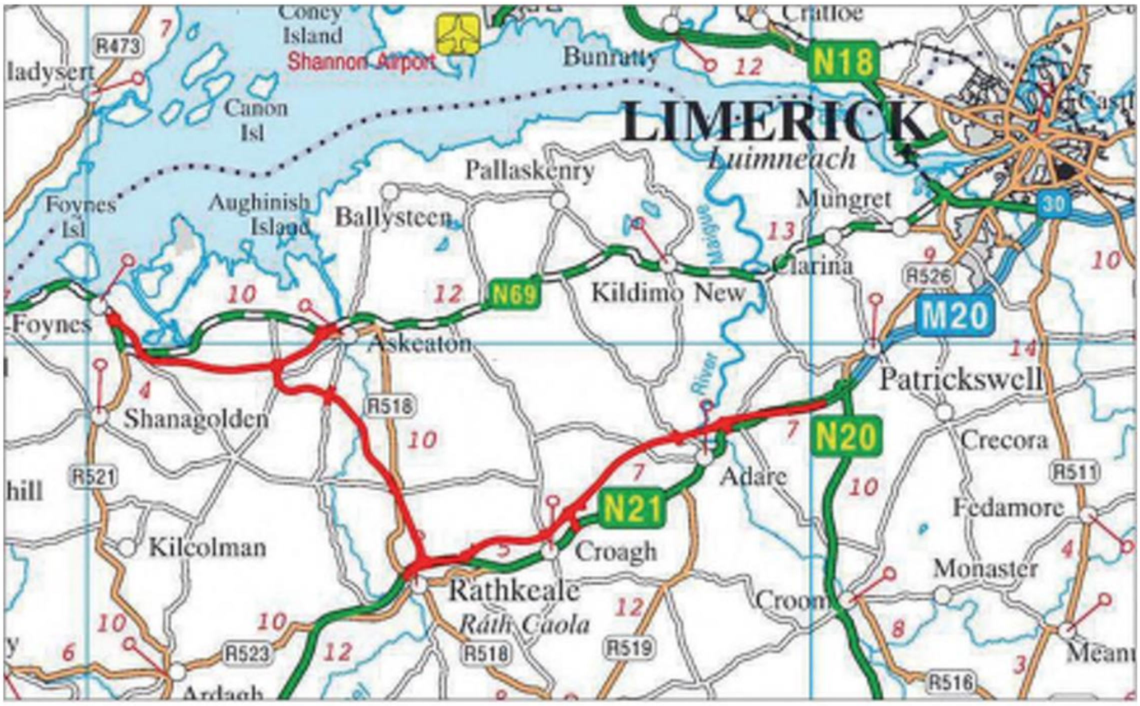


Figure 4-1: Foynes to Limerick Proposed Route Alignment

4.1.5 N18/N19 Shannon

The N18 provides connectivity between Limerick and Galway, with the N19 providing connectivity between the N18 and Shannon Airport. The N18 and N19 carriageways operated within capacity, however, there is recognition of peak-time traffic congestion at the N18/N19 grade separated junction. LSMATS contains a number of proposals that would assist in reducing this demand including promoting compact growth in the Shannon Town Centre area (reducing the need to travel by car to work), a significantly enhanced public transport network from Limerick City and Metropolitan Towns, and Smarter Travel initiatives that would look to spread traffic over a longer period thereby reducing peak time congestion.

The upgrade of the relevant N18/ N19 junctions to include measures to reduce stacking on the ramps is recommended. These may include ITS and smart traffic signalling, however, all options will need to be assessed.

There are four road access points from the N19 northbound to the Shannon area within the space of 3.5km. This could present the opportunity to provide a dedicated public transport only access from the N18 northbound to Shannon, promoting public transport usage and improving journey times.

4.1.6 M7/N18 Junction Improvements

The M7/N18 Limerick City Bypass is of key strategic important to the Strategy as it provides strategic linkage between the M7 Dublin, N24 Waterford, N/M20 Cork, N21 Tralee, N69 Port of Foynes, N18 Galway and N19 Shannon. Use of the Shannon tunnel involves the payment of a toll which provides a level of demand management on the M7/N18.

The mainline carriageway of the M7/N18 operates within capacity throughout the day, however, there is recognition of localised congestion on the grade separated junctions with this road, in particular: Mackey (Newport) Roundabout, Ballysimon Interchange and Dock Road Interchange. Ensuring that this localised junction congestion does not impact on the strategic function of the M7/N18 road is of importance to the Strategy, and improvements to junctions on this route are provided for in the LSMATS.

4.2 Regional Road Network

Additional regional road network provision needs to undertake a multi-modal function, catering for public transport, walking and cycling in addition to car traffic. The regional road network provision is required to cater for the following:

- Provide access to development lands;
- Cater for walking and cycling linkage;
- Provide access to public transport routes;
- Cater for orbital public transport provision;
- Removal of strategic traffic from Limerick City Centre; and
- Removal of local traffic from strategic road routes.

To achieve this the cross section of these roads should cater equally for active modes, public transport and car traffic as follows:

- Footpath and Cycle lane provision – 33% of cross section;
- Bus lane and priority provision – 33% of cross section; and
- Road traffic lane – 33% of cross section.

The following outlines the additional regional road network provisions for LSMATS.

4.2.1 The Limerick Northern Distributor Route

The Limerick Northern Distributor Road (LNDR) is a long-term policy objective of both Local Authorities, supported most recently by its inclusion as a National Enabler in the adopted RSES. Historically, the need for the Scheme was identified in the *Limerick Planning, Land Use and Transport Study*.

Phase 1 of the LNDR from Coonagh to Knockalisheen is currently under construction. It is understood that remaining phases of the LNDR Project will be subject to discrete appraisal processes. The LNDR is assumed to have the following functions:

- To support bus, cycling and pedestrian priority measures in the Metropolitan Area by accommodating private vehicle trips accessing residential areas and employment destinations in urban Limerick, UL and other services;
- Provide direct connectivity for the private car and public transport from Shannon and UL, the NTP and the SDZ;
- Provide for potential bespoke bus services from Galway and Shannon Town and International Airport to UL, SDZ and the NTP;
- Provide an additional access point for traffic and potential public transport from the M7 to UL and the NTP without the use of the Dublin Road and Plassey Park Road; and
- Provide multi-modal connectivity to cater for demand from Clare and Galway to UL and the NTP.

The modelling analysis undertaken as part of the strategy highlights the challenges of delivering the LNDR as it has the potential to undermine the sustainable transport mode share for Limerick City if delivered in advance of the sustainable transport interventions, as discussed in Section 3.5 and in Section 5.2 of the Traffic Modelling Report. On this basis, it is recommended that the LNDR not be delivered in advance of the substantive public transport elements of the Strategy, and that its provision is also linked to the delivery of substantive elements of Clare South East SDZ.

It is also recommended that any future appraisal of the scheme includes a detailed, multi-modal assessment of the road including its potential impact on public transport usage, car mode shares and the Shannon Tunnel traffic volumes. The appraisal should also assess any likely induced demand arising from the delivery of the scheme. Subject to the future appraisal outcomes, it is assumed the road will be designed to encourage sustainable trip making and is therefore presumed to have the following characteristics:

- 60kph speed limit;
- Single carriageway with provision for car in both directions;
- Provision for bus priority in both directions;
- Provision for pedestrians and cyclists in both directions;
- Full provision for cyclists and pedestrians at all junctions;
- At grade junctions; and
- Accesses onto M7 at J28; into Plassey, UL, SDZ, Corbally, Parteen and Moyross.

In terms of land use planning policy, although the LNDR will be a Regional route, it will be treated in a similar way to National roads and the *Spatial Planning and National Roads Guidelines* will be applied to potential changes to land use policy on this corridor. With the exception of the proposed

SDZ in South Clare and the growth of a small number of settlements in line with the County Core Strategies and RSES, according to the principles of proper planning and sustainable development, the implementation of the LSMATS would not support any significant development along the LNDR, and its strategic functions (as set out above) will be protected.

The current proposed alignment for the LNDR is shown in Figure 4-2.

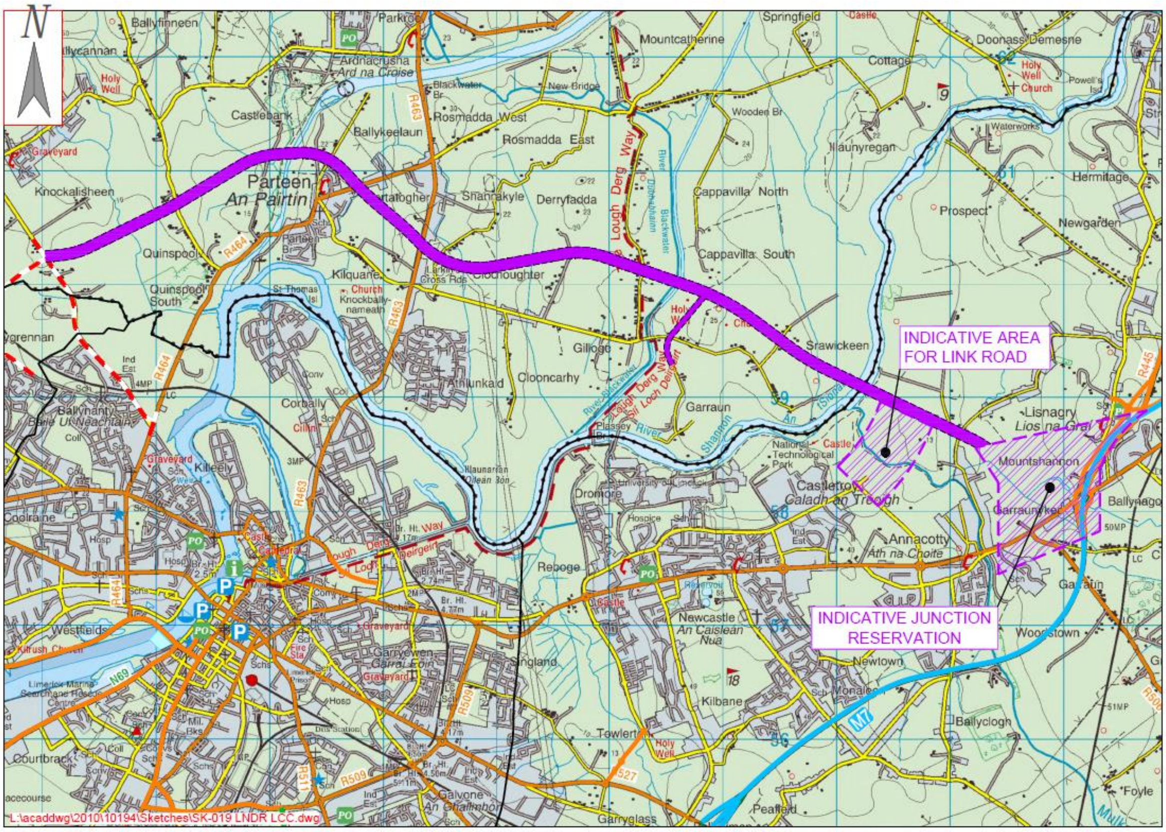


Figure 4-2: LNDR Proposed Alignment

4.2.2 Childers Road – Golf Links Road

A requirement for a link road from the Childers Road to Golf Links Road via Bloodmill Road and Groody Road has been identified in order to serve new development areas in this location and in order to provide for an additional public transport route from the city centre towards Monaleen and onwards towards Annacotty. This public transport route would require a new bus-only link from Garryowen onto Childers Road. Parts of this link will be delivered in the short term, subject to further planning and appraisal, with the remaining sections (including the bus-only link) to be progressed in later phases of the strategy.

4.2.3 Junction Improvements

Junction improvements are proposed to improve traffic flow, provide for public transport and, in some instances, the pedestrian environment. These may include the upgrade of junctions to include Intelligent Traffic Systems (ITS) or smart traffic signalling.

4.3 City Road Network

4.3.1 City Centre Traffic Management

As discussed in Section 3.12.6, there is a need to improve the level of public transport priority through the city along a number of key corridors. In addition, the street network needs to be reviewed with the aim of prioritising space for public transport, walking and cycling provision with the intention of creating a more attractive and vibrant experience for residents and visitors and improving air and noise quality. Local access should be facilitated with designated driving routes into the City and off-street carparks. Public transport will be given priority on a number of routes in the form of bus lanes, time-restricted bus gates or Advance Bus Signalling at junctions.

The introduction of a congestion charge to enter the City Centre, as part of a wider demand management study, will be considered during the lifetime of the Strategy in line with public transport improvements to support this prioritisation. In addition, the quantum and provision of on-street car parking in the city needs to be reviewed.

4.3.2 Heavy Goods Vehicles Restrictions

The HGV restrictions are proposed similar to those already implemented in both Dublin and Waterford. HGVs play an integral role in moving goods throughout the LSMA and nationwide. HGV movement can have significant impacts on traffic operations, noise, air pollution and the safety of other road users, particularly within urban environments.

The central area of Limerick City is unsuitable for heavy goods traffic and should be restricted to only those vehicles of a suitable size with an origin or destination in the centre. LSMATS proposes further consideration of restriction of the movement of HGV within the area bounded by the N18, M7 South Ring Road and proposed LNDR.

According to the Limerick HGV Study 2015, banning HGVs from the City Centre from 07:00 to 19:00 would contribute to the creation of a safe and friendly environment for cyclists and pedestrians through the recovery of street space and the reduction of conflicts between modes. The implementation of designated ‘lorry routes’ on National roads at designated times of the day will also help reduce through traffic and mitigate delays and conflict with other modes.

In addition, regulating delivery times by limiting them to off-peak periods would contribute to off-setting local traffic congestion. This could also bring additional benefits to freight operators in terms of reductions on travel times and operating costs.

5 Cycling Network

The proposed cycle network for the LSMATS is based on the Limerick Metropolitan Cycle Network Study 2025 and the Shannon Town and Environs LAP 2012 – 2018. Additional cycle links have been proposed to align with the LSMATS proposed transport networks.

5.1 Limerick Metropolitan Cycle Network Study 2025

The Limerick Metropolitan Cycle Network Study set out the envisaged cycling network for the Limerick Metropolitan Area (LMA) for 2025 and forms the basis of funding and delivery of the cycle network. The study is an important component in Limerick City and County Council's vision of developing a cycling culture within the LMA.

The proposed network has been developed on the basis of all of the following:

- National Cycle Manual requirements and guidelines for cycle network;
- Regional and local policies as well as proposed and committed schemes;
- Agreed targets of modal share;
- Comprehensive cycling trip demand analysis using data from the Central Statistics Office, POWSCAR and available traffic count surveys;
- Journey times comparison analysis; and
- Evaluation of the existing cycling facilities and quality of the service.

Key priorities for development of the Cycle Network Plan include:

- Identify a cycle network that provides continuous and coherent routes between the main trip generators and attractors;
- Achieve a quality of service level B or greater in each primary corridor;
- Achieve a quality of service level B and no less than a level C of service in secondary routes;
- Provide a quality of service B in feeder routes.

The proposed network for Limerick city and suburbs is illustrated in Figure 5-1. This includes the routes included in the Metropolitan Cycle Network Study along with some refinements and additional links, particularly in the city centre to align with the proposed city centre public transport proposals.

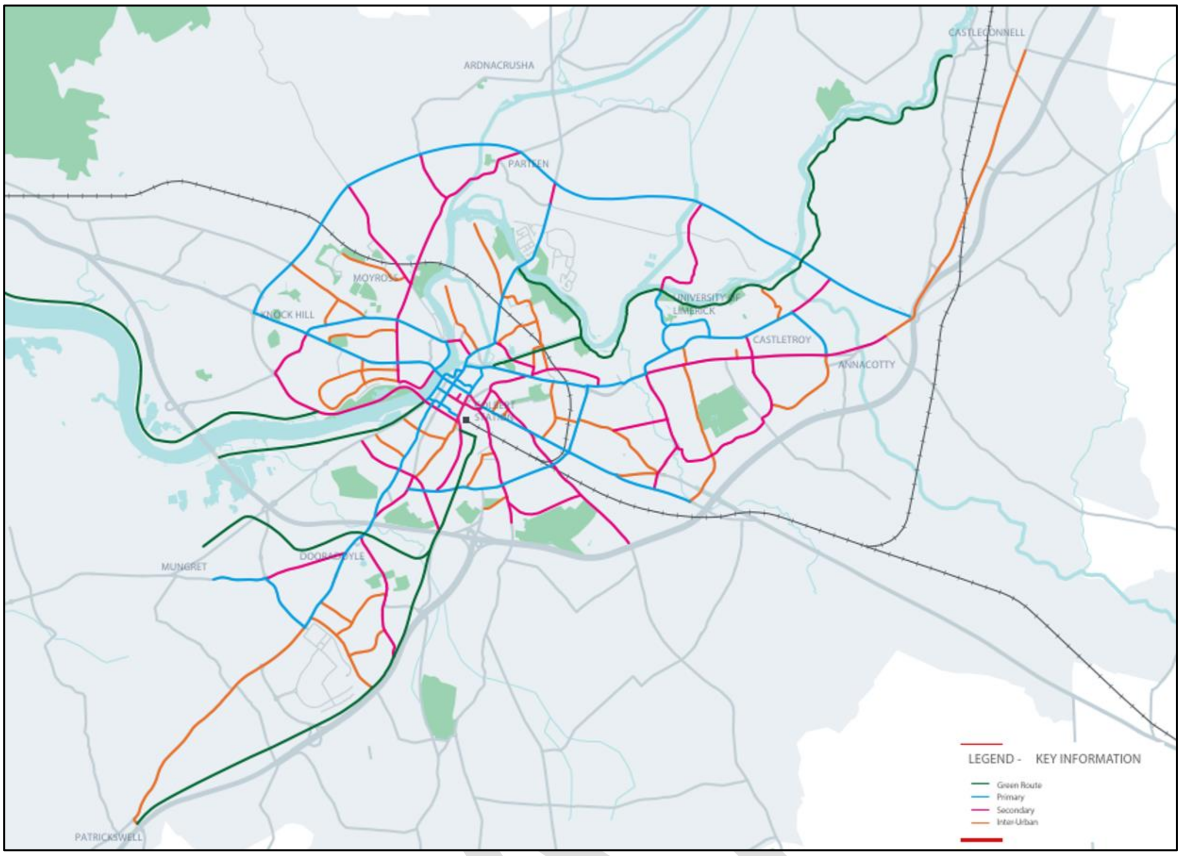


Figure 5-1: Limerick City & Suburbs Cycle Network Plan

5.1.1 Primary Network

Primary routes have been designated as such because they experience the highest level of demand. These routes are supplemented by secondary routes which may provide access to residential catchments.

5.1.2 Interurban Network

The Inter Urban Cycle Network has been developed to indicate possible connections from the Metropolitan Towns to Limerick City. In this instance, it was sought to designate the route with least possible traffic conflicts while maintaining the importance of direct and convenient access.

5.1.3 Secondary Network

Secondary routes will have the function of linking between principal cycling routes on the Primary network and zones, such as residential and zones with schools and amenities.

5.1.4 Greenways

A greenway network for completely (or almost) traffic free cycling has been proposed. This has been developed on the basis of a considerable existing network of greenway routes, the upgrade of existing paths to provide a comprehensive greenway route network and the use of disused existing railway lines.

5.2 Shannon Town and Environs LAP 2012 - 2018

The Shannon Town and Environs LAP 2012 – 2018 and the Green Infrastructure Plan contain objectives to improve pedestrian and cycle connectivity between the town centre, Industrial Park and Airport, its outlying suburban areas as well as a longer-distance routes to Ennis. The objectives also include improvements to ancillary infrastructure such as cycle parking and smarter travel initiatives.

Although there are 4km of cycle routes in Shannon Town, these are not adequately linked to each other. However, since Shannon Town is a relatively compact town, with wide road infrastructure, there is the opportunity to provide a high-quality cycle network that can encourage a higher use of cycles.

The Shannon Town and Environs LAP identified a number of walking and cycling routes linking the town centre, Airport, employment centres and schools, nature corridors residential areas. The Cycling Strategy highlights the importance of connecting the following areas with a comprehensive cycle network:

- Shannon Town;
- Shannon Airport;
- Shannon Free Zone Industrial Estate;
- Smithstown Industrial Estate;
- Shannon Aerospace;
- Ennis to Shannon cycle route;
- Primary and Secondary Schools;
- Rural hinterland around Shannon and proposed looped cycles; and
- Scenic points of interest within and around Shannon.

The key elements of the Cycling Strategy were defined as:

- Install on and off-road cycle routes around the town emanating from an orbital route around the town centre;
- Carry out improvement works at junctions so as to provide better for cyclists including installing advanced stop lines at traffic signals for cyclists;
- Install cycle parking at strategic locations throughout the town;
- Create better signing and wayfinding along routes to areas of strategic importance in the town;
- Create links to surrounding interurban and leisure routes;
- Install traffic calming where necessary to create a safer environment for cycling;
- Promote the use of Workplace Travel Plans for schools and workplaces;
- Encourage and promote the uptake of cycle training and bicycle maintenance classes;
- Promote road safety education and awareness; and
- Ensure proper maintenance of cycle facilities.

The Cycling Strategy defined for Shannon and Environs comprises cycle routes starting around the Shannon town centre and extending outwards and gives priority to linkage with the existing cycling network. In addition, it considers the location of strategic cycling infrastructure such as parking facilities across the town centre, industrial areas, schools, sport grounds, hotels and Shannon Airport.

The proposed network is shown in Figure 5-2.

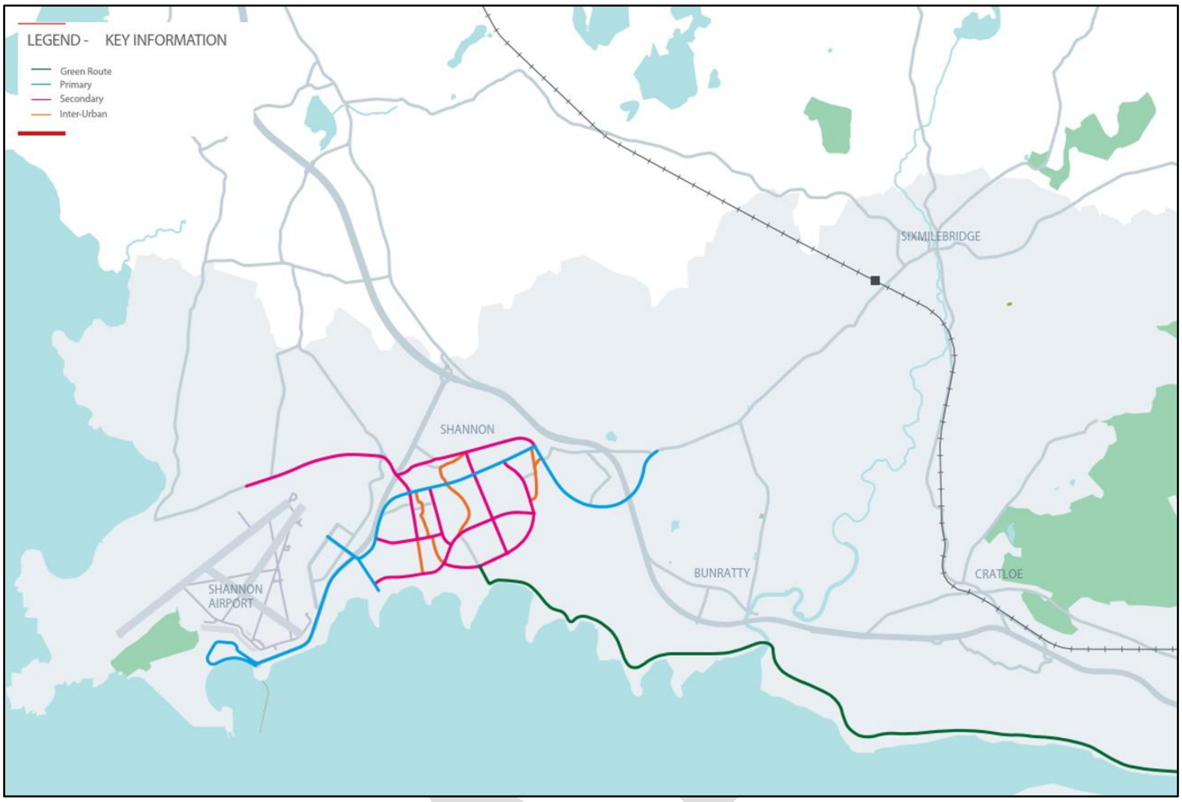


Figure 5-2: Shannon Town & Airport Cycle Network Plan

6 Walking Network

6.1 General Objectives

The following outlines the general walking network outcomes for LSMA;

- An increase in walking levels for work, education and leisure across the LSMA, particularly for short journeys (less than 2km);
- Addressing the safety issues and barriers that prevent citizens and visitors from walking more in Limerick;
- Supporting a high quality and fully accessible environment for all abilities and ages by continuing to develop a safe, legible and attractive public realm;
- Facilitate walking's role as part of linked trips, particularly with rail and bus journeys; and
- Promote a far higher standard of urban design in new developments, and in highway design, in a fashion that consistently prioritises pedestrian movement and safety over that of the private car.

In order to achieve the above outcomes, the following key actions need to be addressed.

- Radial routes to City Centre need improvement.
- Pedestrian priority areas to be expanded, enhanced and de-cluttered.
- Widening and upgrading of footpaths; greater enforcement of parked cars encroaching on footpaths.
- Upgrade walking provision in tandem with bus corridor priority improvements and Cycle Network implementation.
- Future Land Use:
    - Ensuring that the design and layout for new development provides connectivity to the existing street network and is fully permeable for walking and cycling;
    - Quality of walking routes to public transport stations and stops needs careful consideration and priority;
    - New carriageway layouts and junctions to be consistent with Design Manual for Urban Roads and Streets (DMURS) standards and principles and pedestrian priority across local junctions;
    - No "cul-de sac" design;
    - Walking accessibility to schools from local catchments, a prime consideration.

6.2 Strategic Routes

The following routes connect residential areas to key areas of employment and third-level education in Limerick City Centre and suburbs. It is envisaged that these will be upgraded in tandem with the provision of the bus priority and enhance the pedestrian (and cycle) network to enable greater levels of walking commuter trips or as part of linked-trips with public transport. The strategic routes include:

- St. Nessan's Road – UHL, Dooradoyle and Ballinacurra Crescent Shopping Centre;
- Ennis Road – connecting the predominantly pedestrian areas of west Limerick to the city centre;
- LIT / Old Cratloe Road Area – Thomond Park / Moyross;
- University of Limerick Area – R445 Dublin Road and Plassey Park Road / Castletroy / Annacotty;

- Ballycummin Road – Raheen Business Park;
- Corbally Road / Athlunkard Street – Kings Island through to the City Centre;
- Canal Route – connecting Shannon Fields to University of Limerick and the City Centre;
- Rhebogue Neighbourhood Greenway;
- Shannon town centre to Shannon Free Zone;
- Childers Road; and
- R527 Ballysimon Road.

The proposed strategic walking routes, along with proposed greenways, is shown below in Figure 6-1.

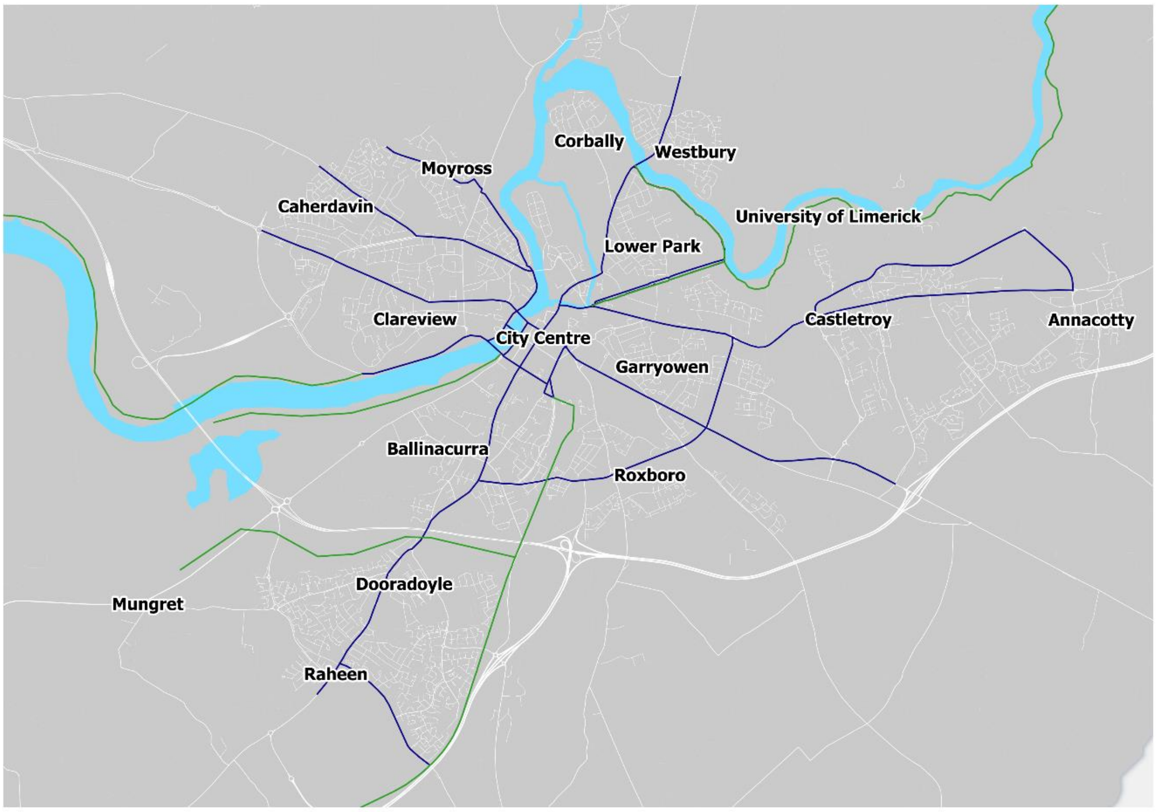


Figure 6-1: Strategic Walking Routes

6.3 City Centre Network

As detailed in Section 4.3.1 a review of the city centre street network is required. This should consider in detail the movement of pedestrians through the city, the widening of footpaths and provision of additional crossing points and shared space where appropriate. There should also be significant improvements made to the public realm within the city centre.

Whilst Limerick City Centre's historic core is compact, pedestrian access is inhibited in some areas by a limited number of pedestrian bridges over the River Shannon, substandard crossing facilities, wide multi-lane one-way streets and high volumes of vehicular traffic and speeds on approach roads. Limerick City Centre has significant potential to enhance its walkability due to its favourable flat topography and recent public realm improvements including pedestrian priority areas and improved crossing facilities.

Considerable growth within Limerick City Centre is envisaged up to 2040. It is understood that a number of projects such as the Digital District, Opera Site, Cleeve's Site, redevelopment of Arthur's

Quay and Living Georgian City Project will be progressed over the lifetime of the Strategy. These developments will attract increased pedestrian activity across the City meaning that an uplift in the quality of the pedestrian environment is required.

Walkability improvements envisaged for the City Centre over the lifetime of the Strategy include:

- O'Connell St. Improvements;
- Re-allocation of road space to prioritise pedestrian movement;
- Key junction improvements to prioritise pedestrian connectivity and permeability;
- Matching crossing facilities with pedestrian desire lines;
- Removal of street clutter;
- Improvements to the city-wide wayfinding network;
- Enforcement of illegal parking on footpaths;
- Undertake regular Walkability Audits with a variety of stakeholder groups;
- World Class Waterfront Project including a new pedestrian/cycle bridge over the River Shannon;
- Enhanced connectivity between the City Centre and Colbert Station; and
- Adequate provision of publicly-accessible toilets, lighting and seating.

In 2019, the redesign of O'Connell St. was approved by Limerick City and County Council, which will provide for a much-enhanced pedestrian environment on the street. This will need to be reviewed to potentially incorporate the proposed public transport proposals. The latest design for the street is shown below in Figure 6-2.

Figure 6-2: O'Connell Street Proposals

In 2015, Limerick City and County Council published the Design and Public Realm Code for the Limerick Regeneration Areas to complement the Regeneration Framework Implementation Plan. It provides guidance on design of streetscape and street permeability with a focus on Southill, Ballinacurra Weston, St. Mary's Park and King's Island, and Moyross.

6.3.1 New Pedestrian Bridge/World Class Waterfront Project

Limerick City and County Council have secured funding for a World Class Waterfront Project which proposes to transform the quayside of Limerick City. A new pedestrian/cycle bridge over the River Shannon is proposed as an element of this Project, as well as bridges over the Abbey River.

6.4 Metropolitan Towns

Given the high level of out-commuting experienced in the Metropolitan towns, walking should be promoted as part of linked trips with public transport. The pedestrian environment around bus stops and train stations should be improved in Cratloe, Shannon, Sixmilebridge and other metropolitan town and village centres. These will be undertaken in tandem with land use proposals that consolidate village centres, strengthen their place function and reduce the ribbon-development patterns evident in villages like Clarina and Patrickswell. LAP objectives for the pedestrian environment for Castleconnell, Askeaton, Castletroy and Patrickswell are supported by LSMATS.

Shannon

Until relatively recently, the pedestrian network in Shannon and its environs has been shaped by development layouts that have favoured movement by private vehicles over the pedestrian, which has resulted in an unattractive environment. Wayfinding in Shannon can be confusing due to an unclear hierarchy of streets, a lack of active frontage and visual cues such as landmarks and gateways.

The challenges for Shannon into the future include the need to reform and recreate pedestrian linkages between existing and new development, such as the Shannon Free Zone and residential areas, by improving:

- Legibility;
- Permeability; and
- Connectivity.

Shannon Town and Environs Local Area Plan proposes a Placemaking Framework which seeks to address these issues through the creation of a central square and a series of key nodes and routes. Clare County Council recently transformed the existing Shannon park woodlands and the adjacent Rineanna Park into a flagship Town Park. Further improvements in line with the LAP are envisaged over the lifetime of the Strategy.

Sixmilebridge

Sixmilebridge has a compact town centre, however, the pedestrian environment is of mixed quality and car dominated. The focus will be on improving the connection between the train station and the town centre. Streetscape improvements, and infill development with active frontage and improved connectivity for pedestrians across the river should be undertaken to improve overall north-south connectivity.

Bunratty

Bunratty village centre is located off the N18, along the Local Old Bunratty Road. The village is a major tourist destination within the LSMA due to the Bunratty Castle and Folk Park. Roadstone Wood Quarry is also located along this road, resulting in HGV traffic routing through the town.

To accommodate the projected visitor numbers, the public realm along the Old Bunratty Road needs improvement including the upgrade of footpaths and crossing facilities.

Cratloe

The pedestrian environment in Cratloe is challenging due to the dispersed, sprawling nature of services and residential areas along the R462, and as a result lacks sense of place. The focus should be on strengthening the village centre between Wood Road and Cratloe Cross and improving the streetscape in this area would improve pedestrian safety and comfort, create a sense of place and enhance connectivity to public transport.

Ardnacrusha

The focus for pedestrian improvements should be on creating a village centre and strengthening walking connections and permeability between residential areas, retail and community facilities.

Clonlara

The village of Clonlara has developed over time along a crossroads, resulting in linear development. The focus should be to consolidate development around the village centre, strengthen the gateways on the approach into the village and improve the junction geometry at the intersection of Springfield and Church Fields to calm traffic and improve the pedestrian environment.

Parteen

The focus for improving the pedestrian environment in Parteen should be to consolidate land use around a village centre. Improvement to walking conditions and permeability between the national school, Scoil an Phairtin, and surrounding residential estates should be strengthened.

South Clare Economic/ University of Limerick Strategic Development Zone (SDZ)

The RSES contains an objective to support the designation and subsequent development of the lands north of University of Limerick, subject to the provisions of the Planning Act and other considerations as the South Clare Economic SDZ. LSMATS proposes that an Area Based Transport Assessment should be carried out for the SDZ to ensure the creation of permeable and walkable neighbourhoods from the outset that minimise car use.

Patrickswell

Patrickswell Village Renewal Scheme was developed in 2016 and consisted of proposals to upgrade the public realm, remodel the layout of the Main St. to improve traffic management and provide a safe walking environment for pedestrians.

Patrickswell LAP has an objective to retrofit and safeguard the permeability of residential and amenity areas to each other and the town centre. LSMATS supports this objective to achieve increased permeability. It also contains an objective to implement an off-road footpath and cycleway along the River Barnakyle.

Annacotty

As part of improvements to the wider UL area, the pedestrian environment in Annacotty will be enhanced.

Clarina

The focus for Clarina will be to discourage further dispersed linear development, as a means of ensuring future residents live within walking distance of services.

Castleconnell

In accordance with the Castleconnell LAP (extended to 2023), the focus for Castleconnell is to enhance its natural and built environment, consolidate development around the village core and improve pedestrian linkages between the village and train station.

6.5 Age Friendly Towns

Changes to age-profiles of the LSMA will require that the public realm and transport network will need to adapt to consider the needs of older people, those with mobility, visual or hearing impairments and those with buggies.

Improvements include further re-allocation of road space in favour of pedestrians in the city and town centres, quayside areas, matching crossing facilities with pedestrian desire lines and re-timing of signals to reduce pedestrian wait times.

6.6 Amenity Routes

Amenity routes provide a linkage between and improve access to areas of public open space and recreational amenities.

Local amenity routes normally cater for both pedestrians and cyclists. Minimising conflict between pedestrians and cyclists will become a more pressing concern as the popularity of these areas increase. Where full segregation between pedestrian and cyclist movement is not possible, site-specific interventions including traffic calming of adjacent residential streets, low level bicycle rumble strips and considerate walking and cycling campaigns to reduce conflict may be appropriate. Shared pavements for pedestrians and cyclists are often not an appropriate response and cause conflict between a range of users, particularly in a constrained environment.

Limerick's waterfront location combined with its greenways and many green spaces offers considerable opportunities to create green-blue corridors throughout the city and suburbs connecting these areas. The benefits of green-blue corridors are multi-faceted including:

- Promote positive health and wellbeing;
- Improve air quality;
- Protect and increase urban biodiversity;
- Enhance access to nature; and
- Contribute to flood management.

Amenity walks within and through Castletroy offer significant potential for tourism development, particularly along the River Shannon, Groody and Mulcair. An objective of the *Castletroy Local Area Plan* states that the Council will seek to ensure that every new residential unit in new housing estates is located within 100m walking distance of a pocket park/ play lot, small park, or local park. *Shannon and Environs Local Area Plan* identifies four looped walks which connect the town centre to the leisure centre, various parks and woodlands, Shannon Free Zone and so on:

- Estuary Trail West;
- Slí Na Mara Trail;
- Estuary Trail East; and
- Free Zone Estuary Trail.

6.7 Wayfinding

Lack of awareness of routes and distances to destinations can be a barrier to walking, not only for tourists or visitors, but also for those with autism or dementia. A Walkable Neighbourhood Map of Limerick City was launched by Limerick City and County Council in 2019. It presents key locations and points of interests within the City Centre, designed to resemble a traditional public transport map. The map displays walking times between each stop as shown in Figure 6-3.

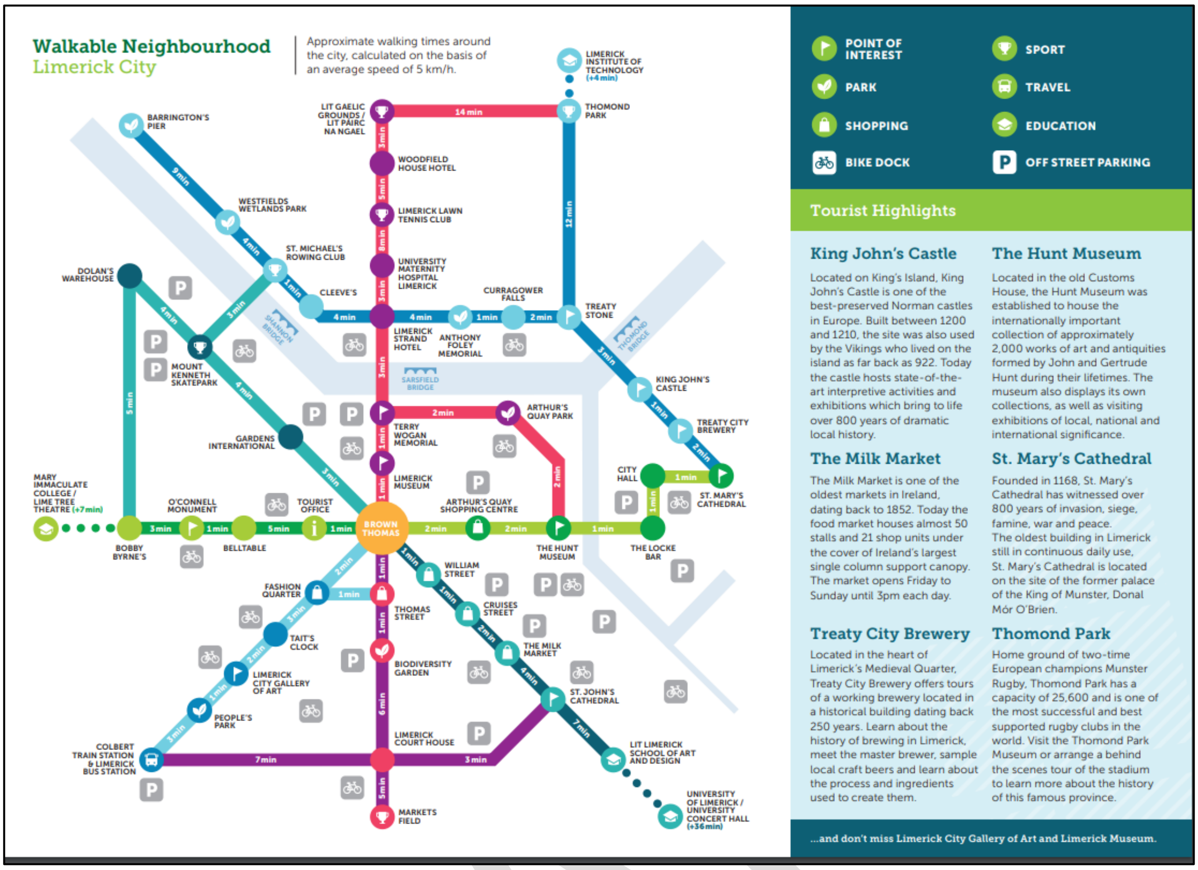


Figure 6-3: Walkable Neighbourhood Map -Limerick City

6.8 Improved Permeability

A permeable street network is a key component of supporting more walkable environments. Much of the residential development layout across the LSMA in recent decades has favoured impermeable, cul-de-sac layouts leading to circuitous routes to local services, schools and public transport stops.

Measures to improve permeability for pedestrians include:

- Opening walled boundaries/cul-de-sacs;
- Traffic filters to restrict rat-running by vehicles whilst facilitating street play;
- DIY Streets;
- Requiring quality design and pedestrian accessibility audits in planning applications for new residential areas;
- Provision of pedestrian and cycle crossings to link areas that are separated by roads or other physical barriers; and
- Planning and design that ensures accessibility for persons with mobility challenges.

The NTA's *Permeability Best Practice Guide* is available to assist local authorities and other organisations in tackling the issues that impact on permeability providing a basis for addressing the legacy of severance.

7 Conclusions

Building on the detailed Baseline Review and the Demand Analysis of forecast development growth a multi-modal transport options and network development exercise has been undertaken. This transport options and network development assessment has resulted in a transport network that:

- Will cater for future demand to 2040;
- Enables Limerick and Shannon's development in line with National Planning Framework to 2040 and beyond;
- Meets strategic and local transport needs;
- Provides strategic public transport corridors along which future development can be focussed;
- Prioritises public transport, walking and cycling;
- Is scalable and flexible to changes in demand levels; and
- Can adapt public transport level of service to meeting demand requirements.