

# Appendix C

## Public Transport Network Development



**Straitéis Iompair na Gaillimhe**  
**Galway Transport Strategy**

Galway Transport Strategy  
Urban Public Transport Network  
Route Selection Process

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# 1. Introduction

This report reviews the existing public transport provision in Galway, and assesses the appropriate options for improving the network to better meet the current and future travel demand for Galway City and catchment.

The report initially sets out the current travel demand patterns across the Galway City area using data from the CSO Place of Work School Census of Anonymised Records (POWSCAR) data obtained from the 2011 Census. The report assesses the existing city bus network, using GIS analysis to illustrate the network coverage, and Automated Vehicle Location (AVL) data to highlight existing delays.

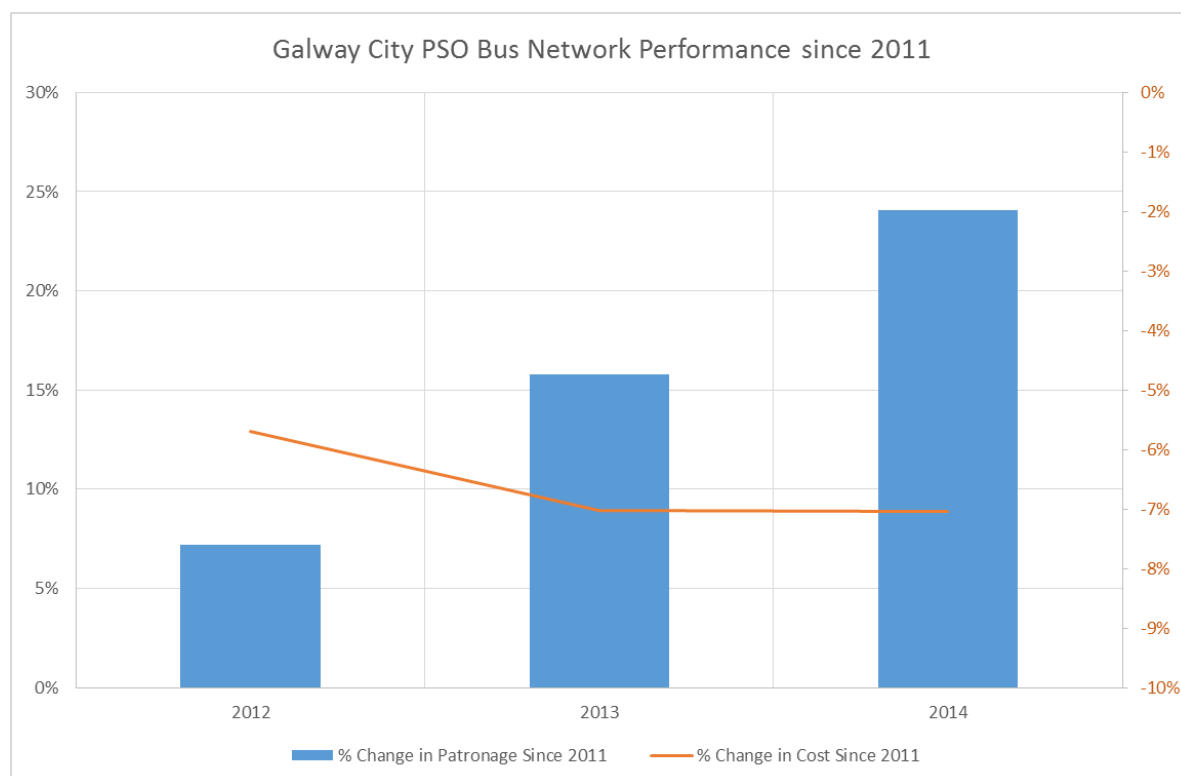
Taking into account the current travel demand patterns and the characteristics of the existing city bus network, the report identifies potential approaches for improving the public transport offer in Galway. These proposals will be assessed to determine the most appropriate longer term public transport options. The viable public transport options for Galway City will then be brought forward for analysis, and assessed using the full NTA Western Regional Model (WRM). These results are presented in **'Appendix B – GTS Appraisal and Modelling'**. The preferred scenario will form part of the finalised Galway Transport Strategy.

An environmental assessment has also been undertaken on the proposals contained in this report. For details of the environmental constraints and associated mitigation measures developed, please refer to Chapter 9 of the **GTS Technical Report**.

## 1.1 Background

A programme of bus network adjustments was implemented across Galway City in March 2012. This programme resulted in an increase of 24% in bus patronage, when comparing 2011 to 2014 (Figure 1.1), improving the operating efficiency and reliability of services. Building on this, consultants were commissioned by Galway City Council to produce a Bus and Cycle Network Plan for the Galway Metropolitan Area which was finalised in 2014. That study was restricted to examining and improving existing bus services, and is a valuable resource in relation to identifying the infrastructure required to improve bus services along existing road corridors. This report builds on the analysis previously carried out on public transport provision in Galway.

Figure 1.1: Bus Patronage and Bus Operating Costs 2011-2014



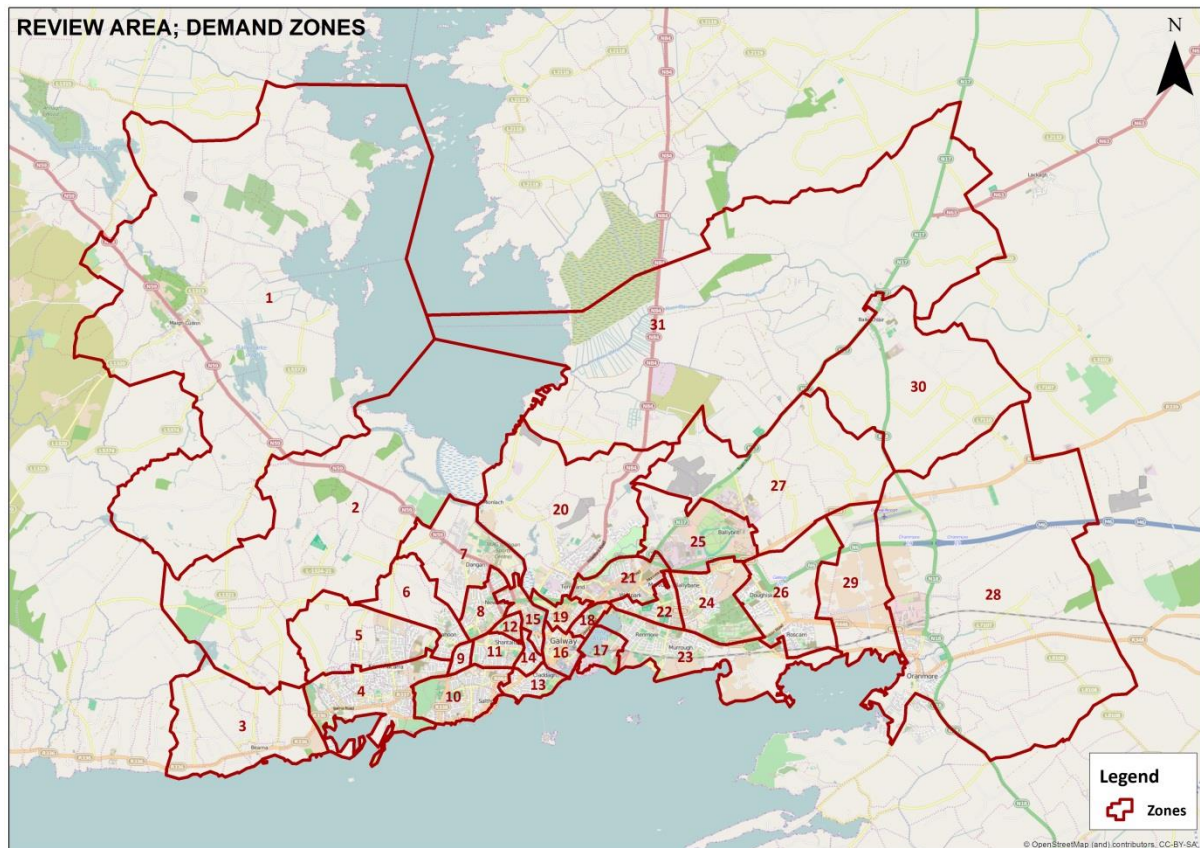
## 2. Demand Analysis

To understand the travel requirements, particularly with regard to the provision of public transport services, it is important to understand the general travel patterns in Galway. A full analysis of Travel Demand is set out in more detail in **'Appendix A – GTS Transport Demand'**. However to assess public transport options, an overview has been set out below.

The analysis in this section highlights the principle travel movements across the Galway City area, based on CSO POWSCAR data. This comprehensive dataset gives detailed information on the distribution of work and education trips, based on the 2011 Census. It should be noted that POWSCAR is not necessarily a 100% sample of employment and education trips. For example, it does not capture part-time working or trips by mobile workers who may not have continuous fixed destination for work purposes. Additionally, not everyone fills out the census properly.

To aid the analysis of the detailed POWSCAR data, the core study area was divided into 31 zones. This breakdown, based on an amalgamation of CSO Small Areas is set out in Map 2.1. Addendum 1 to this report – 'POWSCAR 2011 Demand Matrices for Study Area' sets out the matrices of work and education trips within the area comprised of the 31 zones. The table also shows a description of each zone, based on the prominent origin and destination point for work or education travel within that zone.

Map 2.1- Study Area for Analysis of Travel Demand (31 Zones)



## 2.1 Employment Travel Demand

### 2.1.1 Employment Destinations

According to the 2011 Census, there are approximately 27,000 trips with origins inside the Study Area to destinations within the Study Area, for work purposes on a daily basis. The top ten destination zones for trips to work from within the Study Area are set out in Table 2.1 below and the distribution of all trips to work from within the Study Area is illustrated in Map 2.2. These top ten zones account for approximately 20,000 trips to work, which is roughly 75% of all trips to work within the study area.

*Table 2.1: Top 10 Destinations for Trips to Work from within Study Area (Source: POWSCAR 2011)*

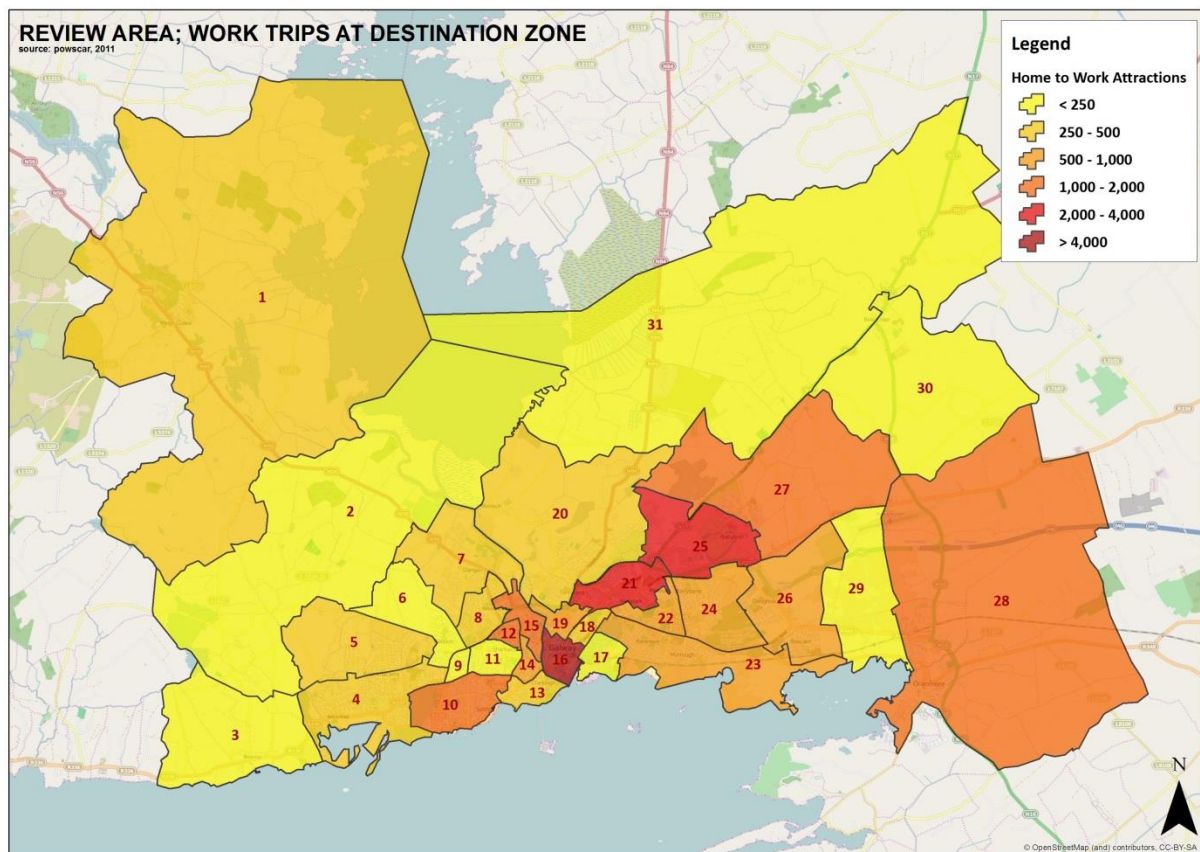
<b>Zone</b>	<b>Destination Description</b>	<b>Total</b>
<b>16</b>	City Centre	4,804
<b>25</b>	Ballybrit & Parkmore	3,954
<b>21</b>	Mervue Industrial Estate	2,575
<b>12</b>	University Hospital	1,971
<b>15</b>	NUIG	1,477
<b>27</b>	Parkmore Industrial Estate	1,166
<b>10</b>	Salthill	1,139
<b>28</b>	Deerpark Industrial Estate	1,136
<b>22</b>	GMIT	982
<b>19</b>	Galway Shopping Centre	926

It is clear that the most important destination for trips to work is the City Centre, with almost 20% of trips to work directed to this zone. It is significant however, that the combined total of trips to work to zones 25 and 27 (Parkmore and Ballybrit Industrial Estates) also equates to circa 20% of trips to work within the study area.

The analysis also reveals the critical importance of the large institutional employers in Galway – with Galway University Hospital attracting 1,971 trips to work at its campus on the Newcastle Road, and NUIG attracting a further 1,477 trips to work. These two locations combined attract 13% of the study area work trips.

Other significant employment areas which need to be considered in the development of public transport options are the Mervue Industrial Estate, with 2,575 trips to work from within the Study Area, and employment concentrated at more peripheral locations, such as the Salthill and Oranmore/Deerpark areas.

Map 2.2: Study Area Work Trips at Destination Zones.

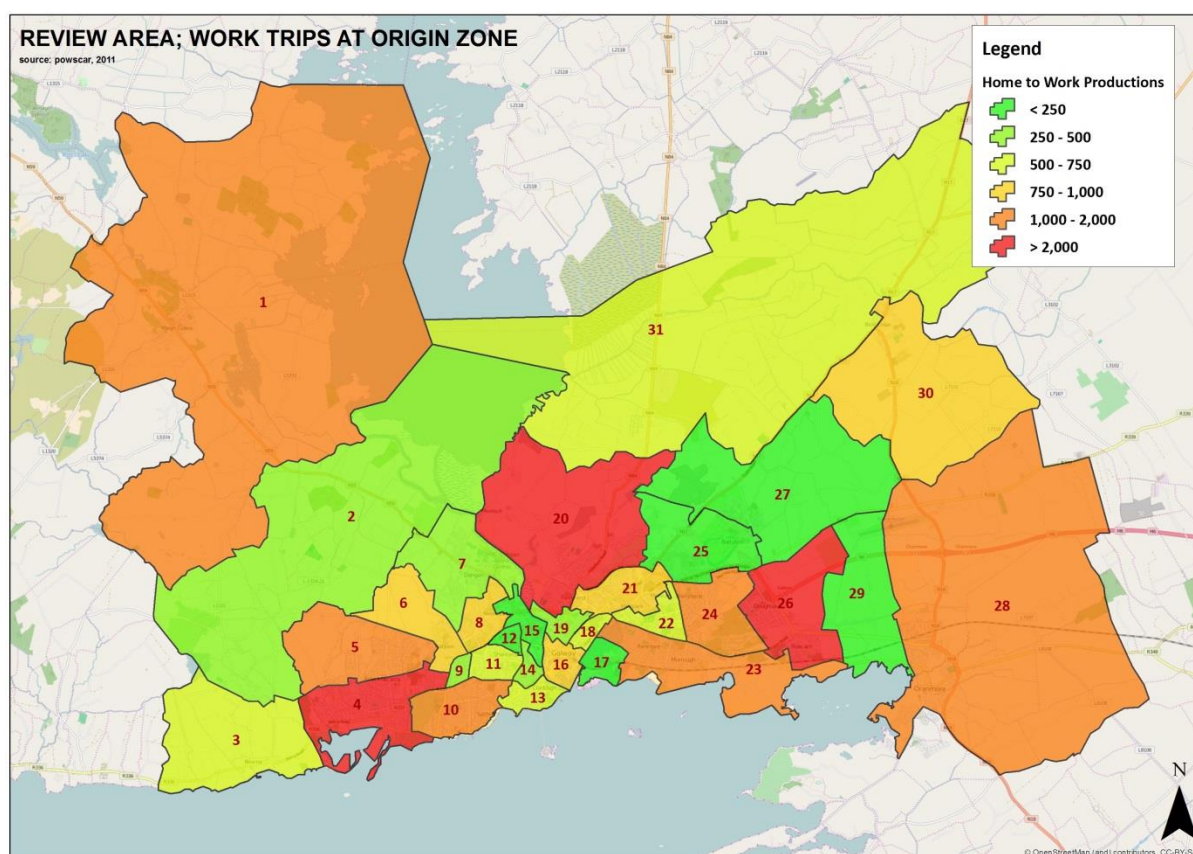


### 2.1.2 Origin of Employees

The origin of work trips within the Study Area reflects the distribution of population, with larger residential areas generating greater numbers of work trips. The distribution of work trips at the zones from which they originate is illustrated in Map 2.3.



Map 2.3: Study Area Work Trips at Origin Zones.



### 2.1.3 Pattern of Trips to work within the Study Area.

The volume of work trips between the origin and destination zones illustrates the corridors where the highest demand for travel to work exists. The location and spatial pattern of the corridors of highest demand highlights which corridors should be served by public transport that would make employment destinations more accessible to those who work in them. This is difficult to graphically illustrate due to the large dispersal of trips which hides the overriding travel patterns. Mining into the data (which is set out in of Addendum 1 'POWSCAR 2011 Demand Matrices for Study Area'), highlights some of the most notable links between zones.

In this regard, although there is a wide spread of trips across the city, it is noticeable that from every zone there was a strong link to the city centre, and in most cases, the city centre was the largest destination for work trips. There is also a strong demand for travel from most zones to University Hospital Galway and NUI Galway. Ballybrit and Parkmore also attract trips from across the city, however there is a noticeably stronger demand from the east of the city, especially the Doughiska, Oranmore and Tirellan areas.

## 2.2 Education Travel Demand

### 2.2.1 Destination of Trips to Education

In total, there were 18,280 recorded trips to education in 2011 within the study area. The top 10 destination zones for trips to education are set out in Table 2.2 below and the distribution of all trips to education from within the Study Area is illustrated in in Map 2.4. These top 10 zones account for 15,134 trips to education or roughly 83% of all trips to education within the study area.

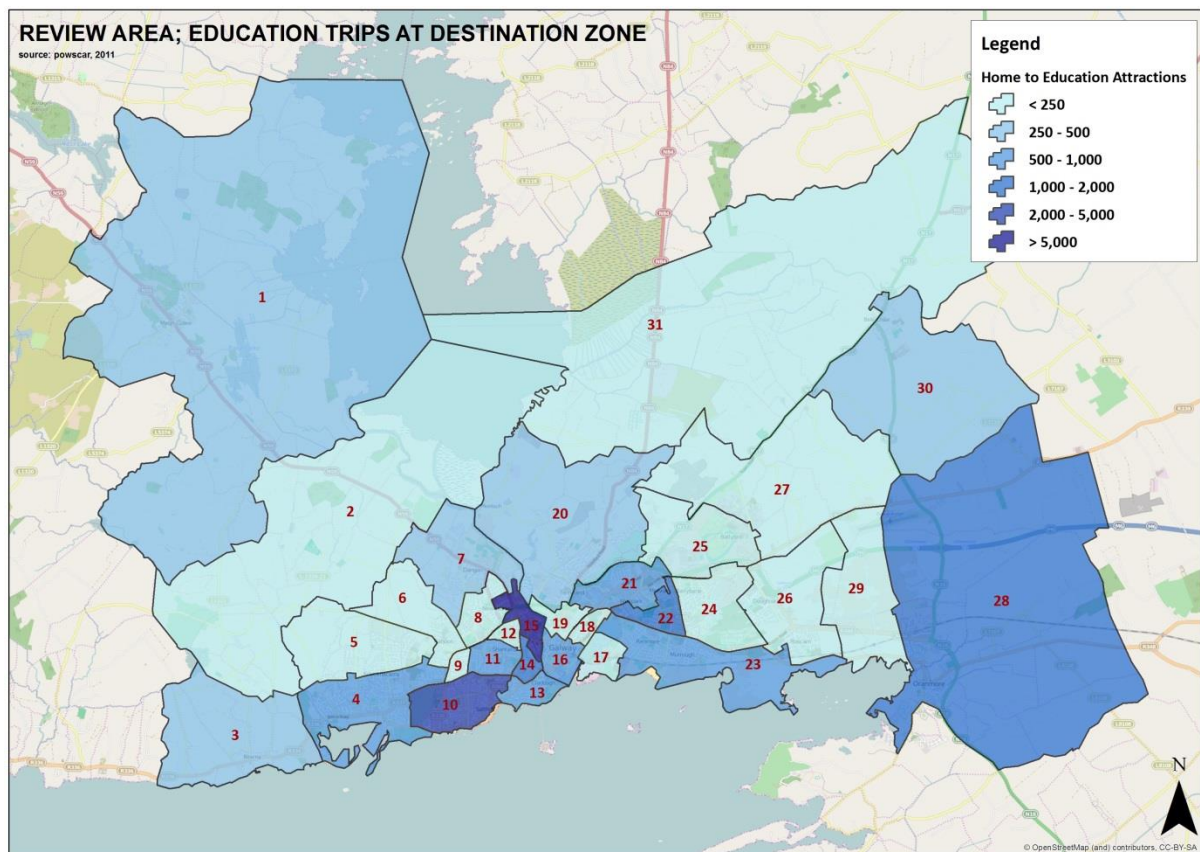
*Table 2.2: Top 10 Destination Zones for Education trips\* within the Study Area (Source: POWSCAR 2011).*

<b>Zone</b>	<b>Destinaton Descripiton</b>	<b>Total</b>
<b>15</b>	NUIG	<b>5,007</b>
<b>10</b>	St. Enda's School	<b>2,277</b>
<b>22</b>	GMIT	<b>1,606</b>
<b>14</b>	Dominick Street	<b>1,200</b>
<b>28</b>	Oranmore	<b>1,043</b>
<b>23</b>	Scoil Chaitriona	<b>977</b>
<b>11</b>	St. Mary's College	<b>806</b>
<b>21</b>	Moneenageisha Community College	<b>800</b>
<b>16</b>	City Centre	<b>793</b>
<b>4</b>	Knocknacarra	<b>625</b>

(\*Zone may include more than one school/college, but one school/college is named to help identify the location)

NUIG is the most important education destination within the study area. The zone containing GMIT is also a destination for a significant number of trips, while there are clusters of schools at Zones 10 and 14 which each attract in excess of 1,000 trips to education.

**Map 2.4: Trips to Education at Destination Zones.**



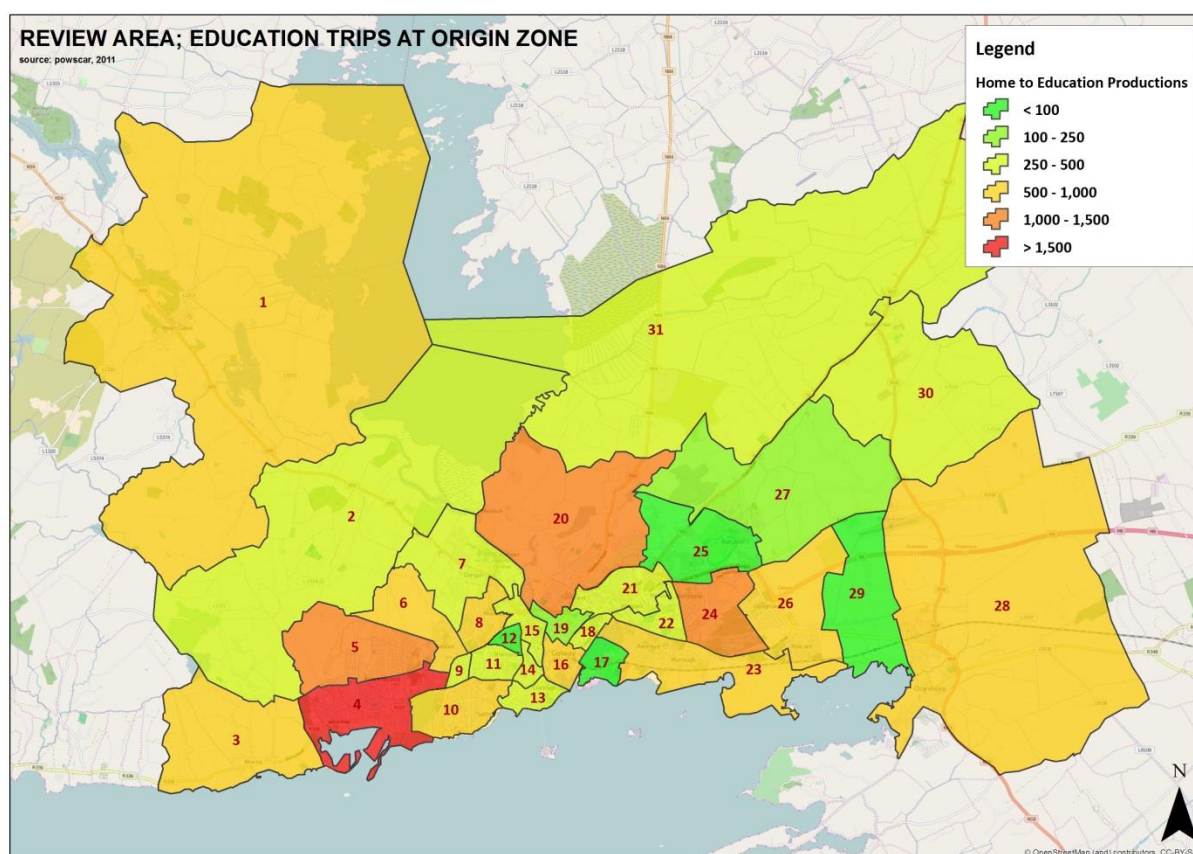
### 2.2.2 Origin of Trips to Education

The origins of education trips are different to that of employment. In general it can be observed that students tend to travel further to third level and larger second level educational institutes, while generally coming from a local catchment for smaller secondary and primary schools.

Looking at the origin – destination matrix for Education (Addendum 1), it is clear that students travel from across the study area to the third level institutes. Despite this, there is a strong local catchment, with a lot of students staying in adjacent residential area (e.g. Newcastle Road / Dangan, and Tirellan with respect to NUIG, and Renmore and Ballybane with respect to GMIT).

Larger secondary schools, such as the St. Enda's and Salerno schools on Threadneedle Road, attract a wide catchment of students. However, there is still a predominance of students coming from the local areas. Smaller schools, particularly primary schools, mainly attract pupils from a local catchment. The origin of education trips is set out in Map 2.5.

Map 2.5 Education Trips from Origin Zones



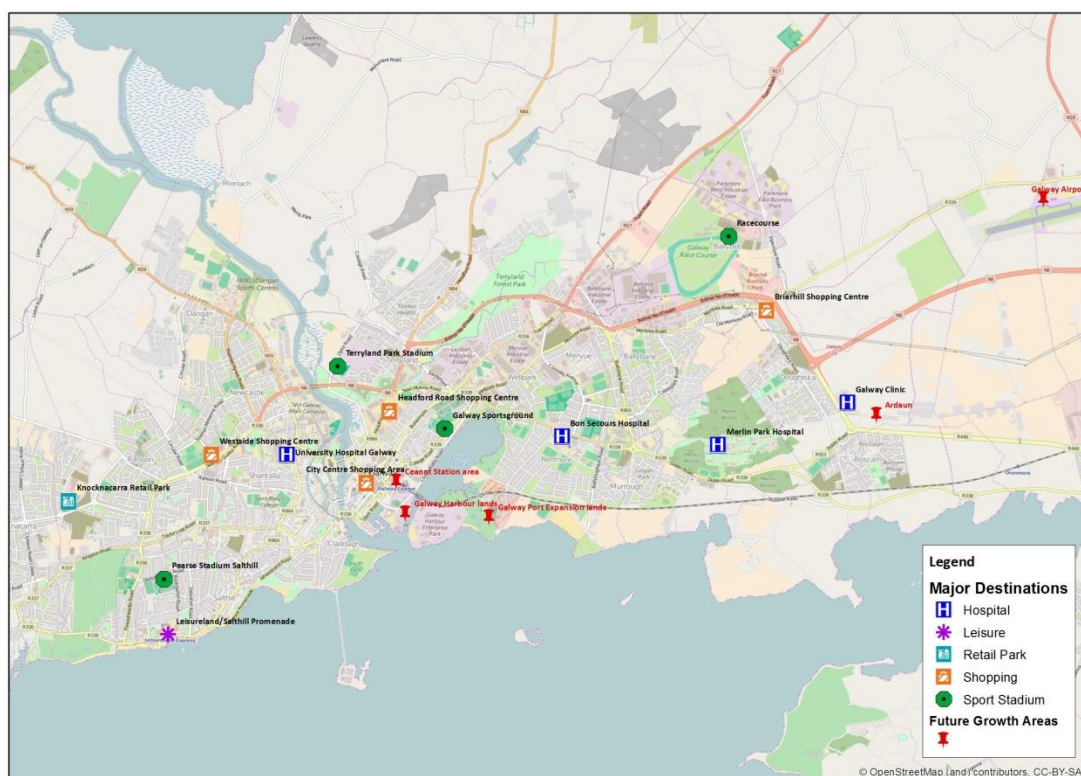
## 2.3 Other Trip Purposes

The data available from the CSO POWSCAR dataset is invaluable in providing an understanding of the location and scale of employment and education destinations, and more importantly in establishing the catchments and linkages between origins and destinations. Although employment and education are the primary trip purposes during the peak hours, it is critical that all day trip purposes are catered for also, in order to provide an efficient and functional public transport network. It is important therefore to identify the location of other major trip attractors, particularly shopping and leisure facilities, which would require public transport throughout the day and week.

The location of shopping, leisure and other destinations, such as hospitals and sports grounds, have been identified in Map 2.6. Major destinations include the city centre as a retail destination, the larger suburban retail parks, such as Briarhill, Galway Shopping Centre and Westside Shopping Centre. Other important locations are the hospitals, in particular Galway University Hospital, Merlin Park, Bon Secours and the Galway Clinic, and leisure facilities such as the Salthill Promenade area, Eamonn Deacy Park, Pearse Stadium and Ballybrit Racecourse.



Map 2.6: Location of Other Major Attractors



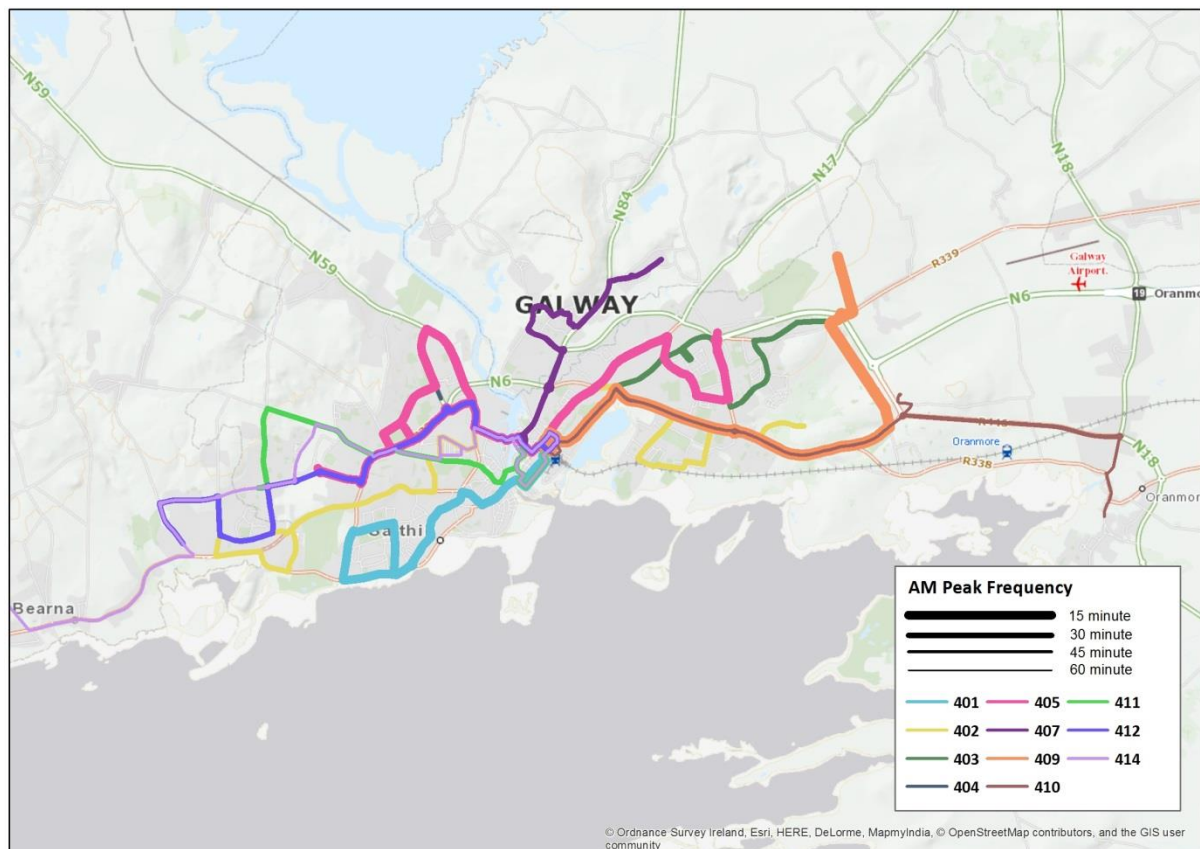
### 3. Existing City Public Transport Service

Improvements to the city bus service in recent years have included the re-organisation of routes and schedules, and the introduction of newer fleet (and more recently the roll-out of the Leap Card). These measures have contributed to an increase in patronage of 24% from 2011-2014, albeit from a previously low base.

It is important to review the existing city bus network, to understand what the current services are doing successfully, where there are weaknesses in the service, and if there are areas that do not have access to the bus network.

There are currently 11 city bus routes within Galway City, 8 of which are PSO Services operated by Bus Éireann, and 3 commercial services operated by City Direct. These routes are illustrated in Map 3.1.

Map 3.1: Existing City Bus Network in Galway



### 3.1 Service Frequency

Of the current city bus services, there is only one route (Route 409 from Eyre Square to Parkmore) which operates at a frequency of one bus in each direction every 12 minutes, between 7am and 7pm. All of the other services operate at lesser frequencies, with some routes having frequencies as little as one bus every 60 or 70 minutes. Map 3.2, above, and Table 3.1 set out the current peak time service frequency for each service.

Table 3.1: Timetable and Journey Information

Route	Origin	Destination	Weekday AM Peak Frequency	Journey Time (mins)	Bus Route Drive time (mins)	Orig-Dest Suggested fastest route Drive time (mins)	Orig-Dest Suggested fastest route Drive distance (km)	Bus journey avg speed km/h	Orig-Dest Suggested fastest route Drive time speed km/h	Fastest Route Drive Time as proportion of timetable journey time	Bus Route Distance (km) (google)
401	Eyre Sq. Sth.	Pearse Stadium	20 mins	20	11	9	3.8	13.5	25.3	45%	4.5
402	Merlin Pk. Hosp	Seacrest	30 mins	60	31	20	10.1	12.6	30.3	33%	12.6
403	Eyre Sq. Nth	Parkmore Rd.	30 mins	30	18	11	6.5	16.4	35.5	37%	8.2
404	Eyre Sq. Nth	Westside SC	45 mins	25	13	8	2.6	12.7	19.5	32%	5.3
405	Ballybane	Rahoon	20 mins	40	21	12	7.1	13.5	35.5	30%	9
407	Eyre Sq. E	Br. An Chóiste	30 mins	29	12	8	4	10.6	30.0	28%	5.1
409	Eyre Sq. E	Parkmore Rd.	12 mins	29	18	11	6.6	17.6	36.0	37%	8.8
410	Ceannt Station	Oranmore	60 mins	30	20	15	9.6	22.8	38.4	50%	11.4
411	Eyre Sq. Nth	Cappagh Rd. (Ros Ard)	30 mins	27	22	12	6.4	21.8	32.0	44%	8.9
412	Eyre Sq. Nth	Cappagh Rd. (Ros Ard)	30 mins	27	17	13	6.2	18.9	28.6	48%	8.5
414	Eyre Sq. Nth	Barna	70 mins	42	23	17	9.1	16.0	32.1	40%	11.2
Total Distance covered by all Bus Routes (km) (google)											94.4

### 3.2 Interchange Potential

Currently, to get from one side of the city to the other by public transport, a change in buses is required for most passengers, due to the majority of routes originating or terminating at Eyre Square. Before the 2012 network changes, there was slightly more interworking cross city, but this practice was changed largely to address reliability issues for buses passing through the city centre. Although bus stops at Eyre Square are conveniently located for ease of transfer between services, the current timetabling and service frequency means that there can be a significant interchange time penalty for people wishing to interchange from one service to another. In addition, due to the absence of an integrated fare (other than period / season tickets), it is required to pay for both legs as separate trips, making the cost of a cross city public transport journey costly.

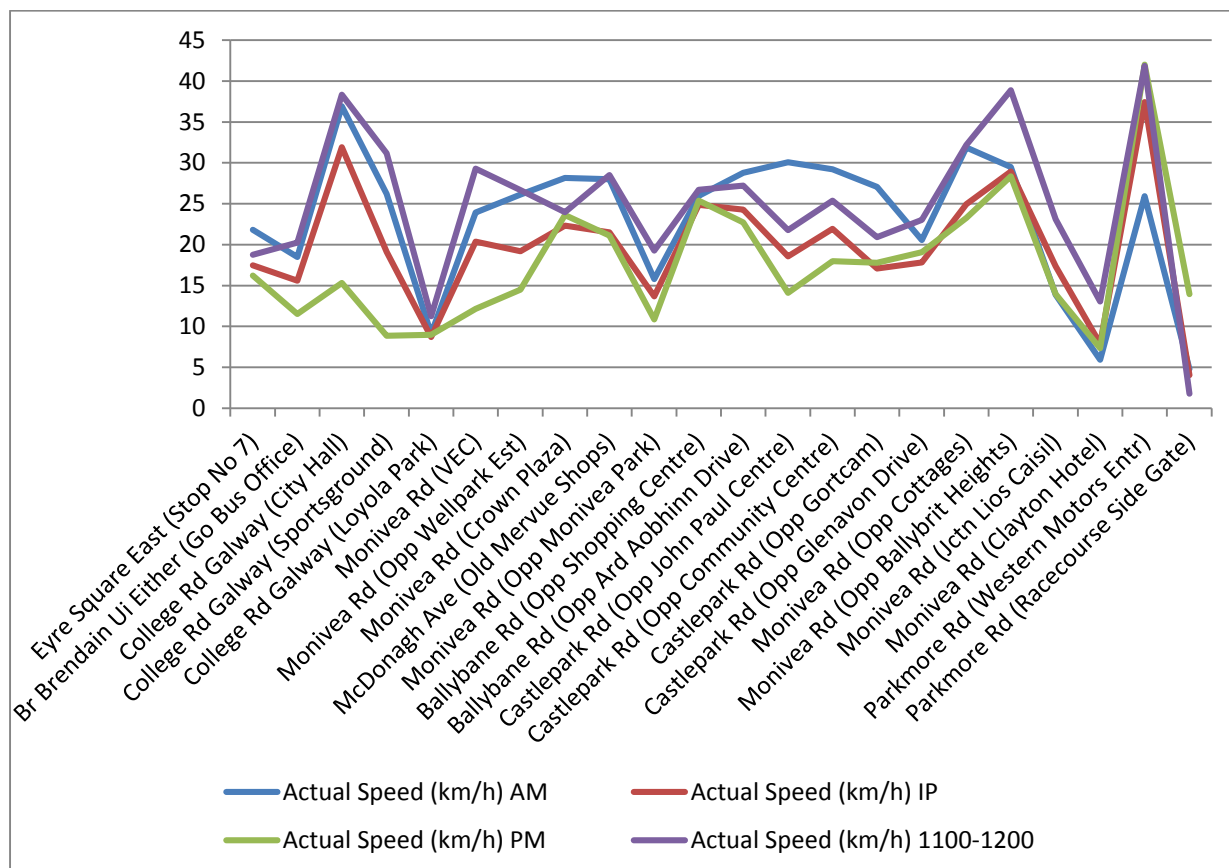
### 3.3 Journey Speed and Reliability of Existing Services

The existing public transport network operates primarily on road, with only limited bus priority infrastructure across the city. This has an impact on the journey speed of public transport routes, and more critically, on journey time reliability. Table 3.1, above, sets out the current average speed based on the scheduled timetabled journey time. From this information, all services have an average journey speed of less than 20kph, with the exception of route 410 to Oranmore, and Route 411 to Cappagh Road. Therefore, the overall journey times for most public transport users are uncompetitive against the car.

In addition to the relatively slow journey times by public transport, there is a high degree of variance in public transport journey times across the day. This is a significant problem, and results in

unreliability in schedules and journey times for public transport users. The observed variance of route 403 from Eyre Square to Parkmore is set out in Figure 3.1. This graphic illustrates the difference in journey speed in the morning, evening and during the day. From this it is observed the significant impact of traffic congestion in the evening peak on travel out of the city (particularly the stretch between Eyre Square and College Road).

Figure 3.1: Route 403 bus speeds for AM & PM peaks, Inter-Peak (IP) period and 11am-12pm period

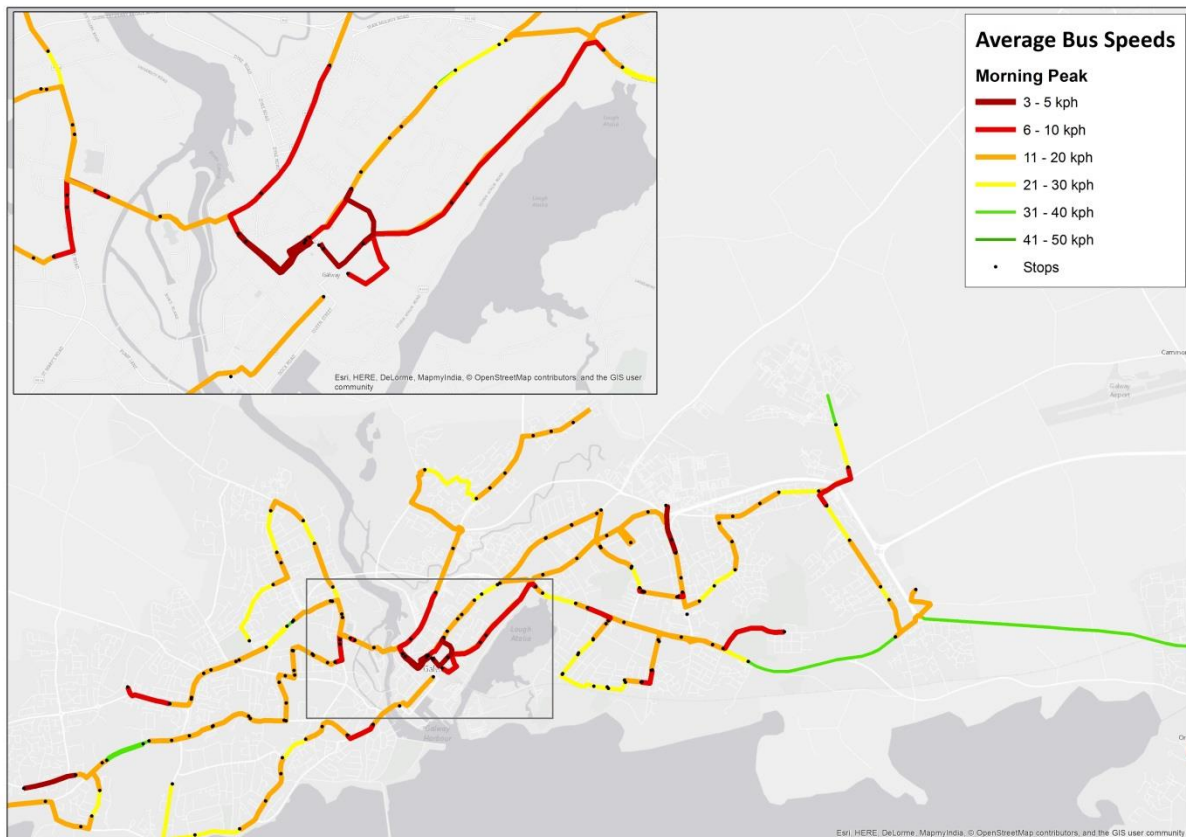


### 3.4 Network Delays

Linked to the issues raised on journey speed and reliability of existing services, an analysis has been carried out on the current location of delays on the bus network. This data has been taken from Bus Éireann Automated Vehicle Location (AVL) data, which monitors the speed and location of all Bus Éireann services operating in Galway City. A composite map of all day bus delays is set out in Map 3.2 below. This highlights the significant points of network congestion in Galway City, with areas such as the City Centre and heavily trafficked suburban areas such as Briarhill and the Western Distributor Road standing out.

Map 3.2: Composite Map of All Day Bus Delays

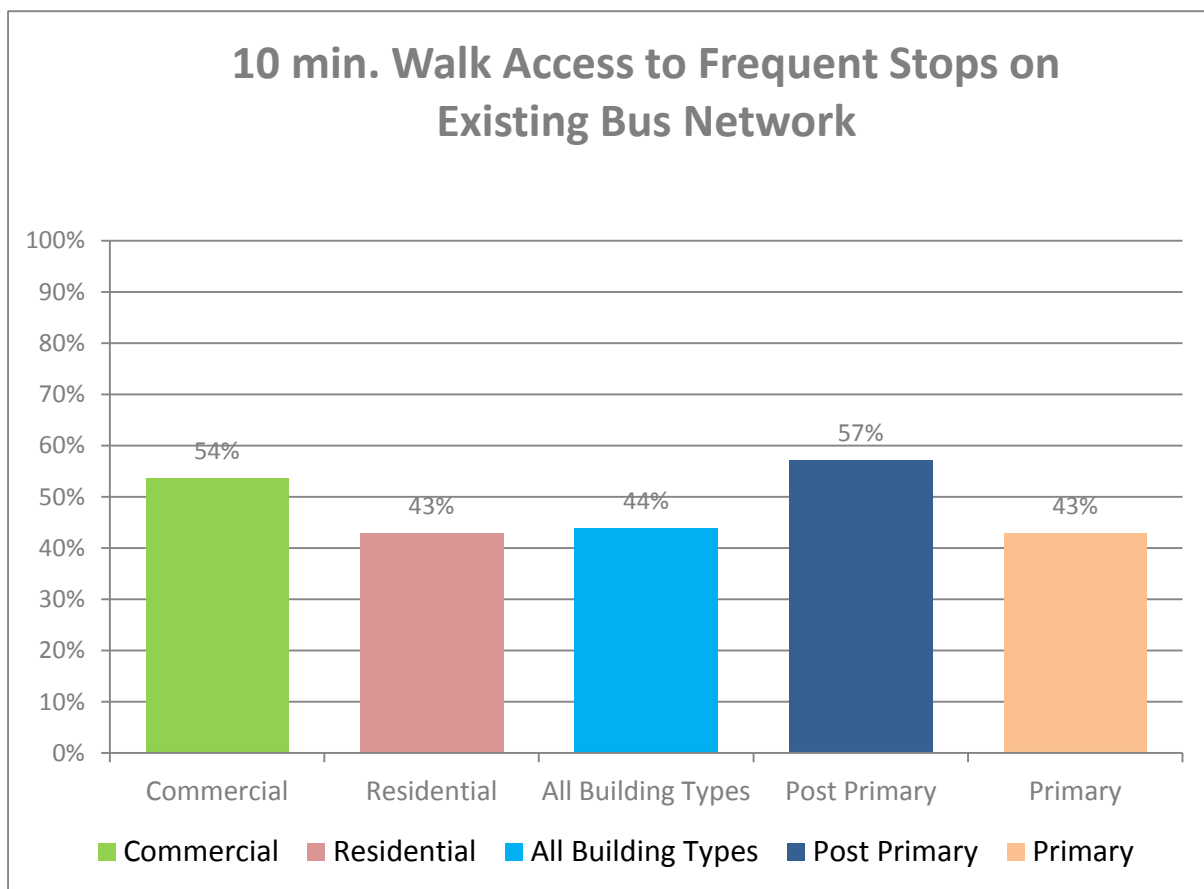




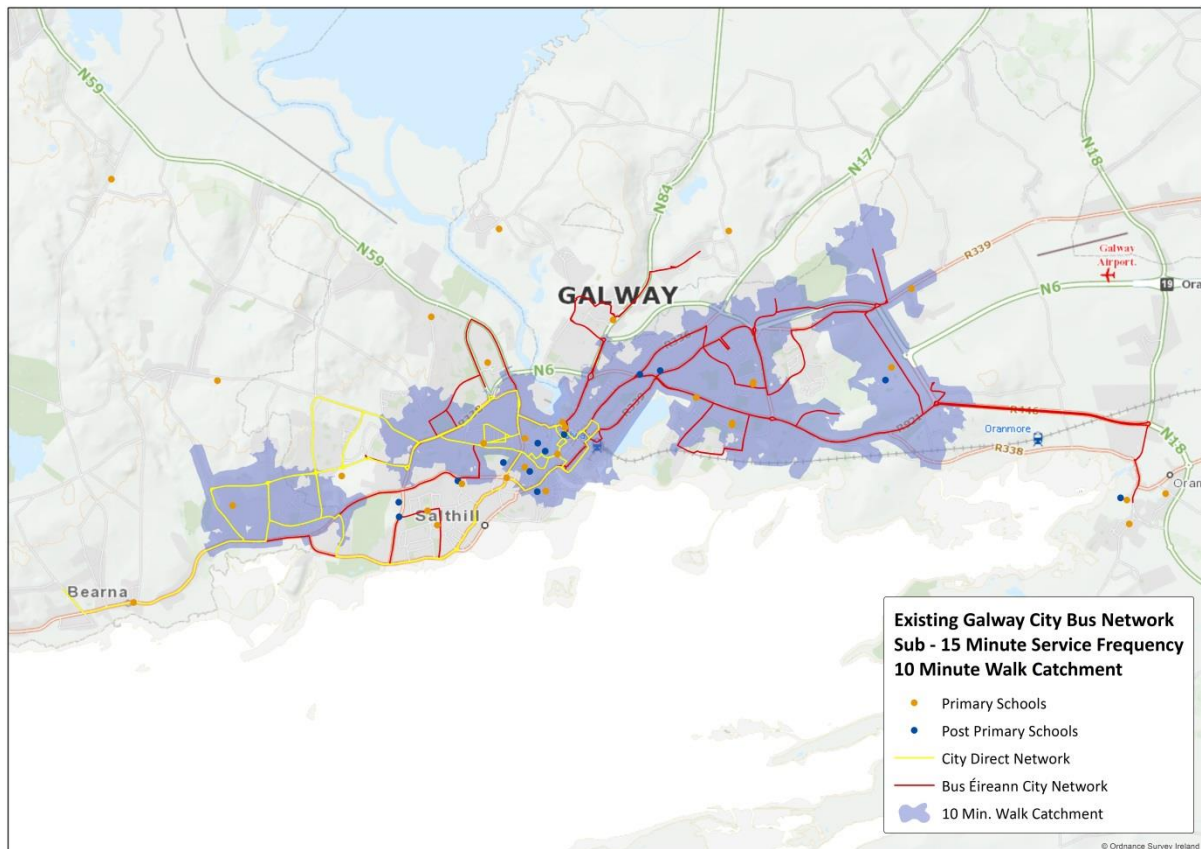
### 3.5 Coverage of Existing Services

The existing bus network has a relatively good spatial coverage of the city, with services along most arterial routes out of the city centre. A map of the existing routes was set out in Map 3.1. An accessibility analysis has been carried out on these routes, and based on the spatial coverage, but not taking into account bus frequency or intended destination, 86% of all commercial and residential buildings in the Study Area would be within a 10 minute walk of a bus stop. Bus frequency and access to the intended destination are critical in ensuring that a service is an attractive option for users. In this regard, the accessibility analysis was rerun, taking frequency into account. This time only stops where a bus will arrive at a frequency of every 15 minutes or greater were identified and only 44% of all commercial and residential buildings are within a 10 minute walk of a bus stop where that frequency applies. Using the same analysis, the accessibility of Primary and Secondary schools was also assessed (it was noted that both NUIG and GMIT are currently well served by existing bus services). This highlighted that currently there are only 15 (43%) of Primary Schools and 8 (57%) of Secondary Schools where located within a 10 minute walk of higher frequency bus stops. This is illustrated in Figure 3.2, and Map 3.2.

Figure 3.2: Coverage of buildings within 10-minute walk time of existing network where minimum 15-minute bus service frequency applies



Map 3.2: Coverage of City by Bus Network where frequency is sub-15 minute



## 4 Development of Public Transport Alternatives

Taking into account the demand analysis set out in Section 2 and the review of the existing public transport presented in Section 3, a set of alternative public transport proposals for Galway were developed and assessed.

To frame the development of the different public transport options for Galway a number of objectives were agreed. Each alternative was then assessed against these parameters to determine the most appropriate proposals for Galway's transport requirements.

Public Transport Objectives:

- Ensure user travel demands (to work, school, and other destinations) are met in the most efficient manner possible;
- Ensure value for money in terms of capital and operation costs;
- Improve the legibility and usability of the public transport network;
- Improve journey time reliability and journey speed;
- Increase frequency of services, including an appropriate level of all day service frequency;
- Utilise and promote interchange between services to maximise user catchment, including the use of Park and Ride;
- Improve operational efficiency for service providers; and,
- Embrace the use of Smart Technology.

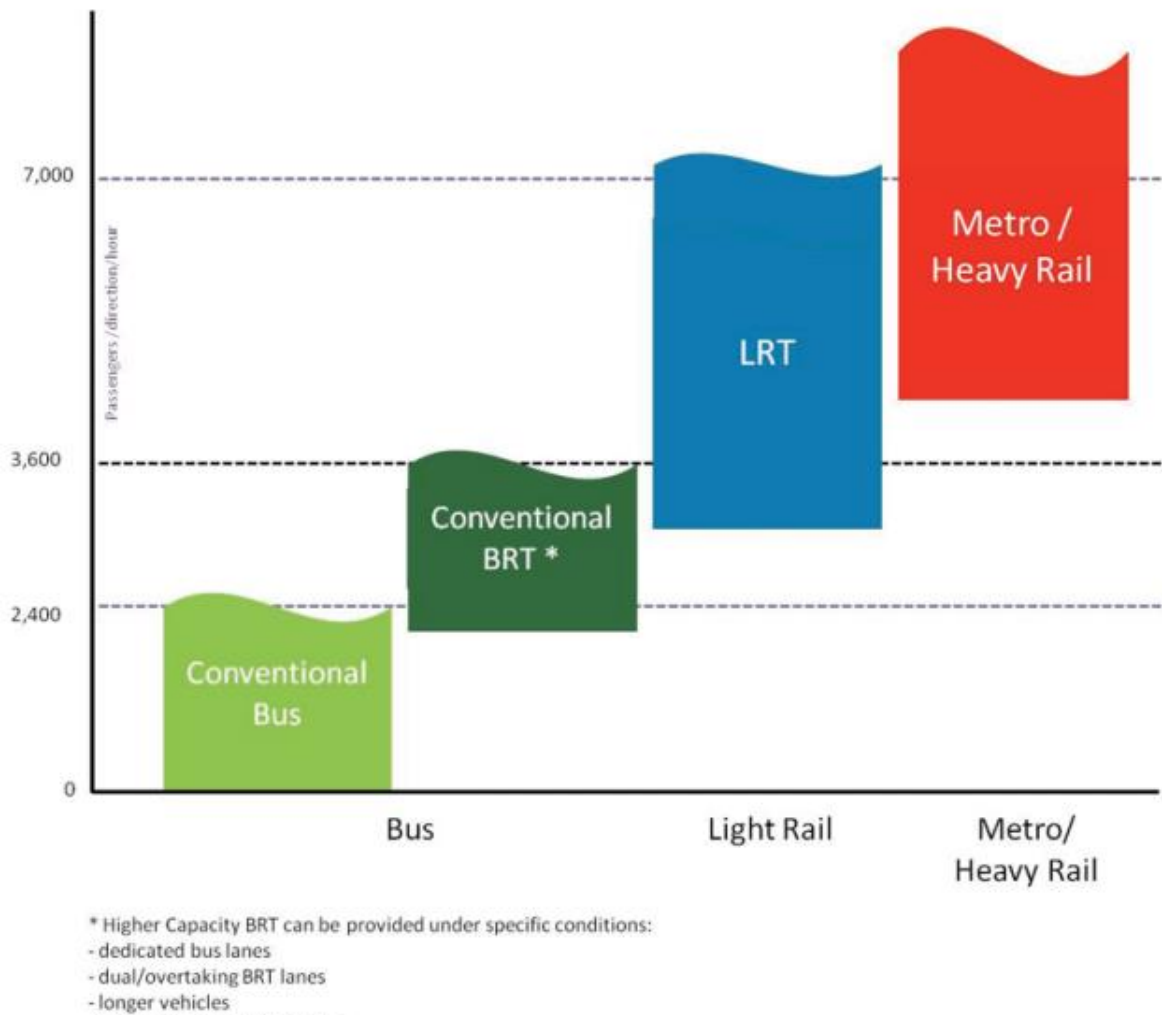
#### 4.1 Developing the public transport options

The most successful public transport networks and services are generally those that cater for a broad variety of trip purposes such as commuter trips, trips to education, and trips for retail and leisure activities. This generally results in well used services throughout the day and the opportunity to efficiently operate and maintain public transport services with regular frequency patterns that provide flexibility for the passenger to travel when they would like.

Galway is an historic city and its layout and road network reflect a city that has developed over many years with some roads being very narrow and some turns being difficult for some modern public transport vehicles to navigate.

The type of public transport system best suited to Galway not only needs to take into account the physical characteristics and constraints of the city, but also the level of demand and resultant passenger carrying capacity the system will require. Figure 4.1 illustrates the capacity that can be achieved by different types of public transport services in general. It is understood that high capacity (or 'mass transit') public transport systems are best suited to catering for high concentrations of demand rather than widely distributed trips.

*Figure 4.1 – Public Transport Mode Capacities (source: UITP Paper 'Public Transport: making the right mobility choices' (Vienna 2009)*



Due to the development pattern of land use in Galway, trip patterns do not all converge along high demand corridors, which means that no one corridor attracts a high level of demand. As such an integrated network of services is more appropriate for maximising mode-share and revenue than more limited linear ‘mass transit’ services.

Taking the objectives, land use patterns and service options into account, 4 alternative proposals were developed, namely;

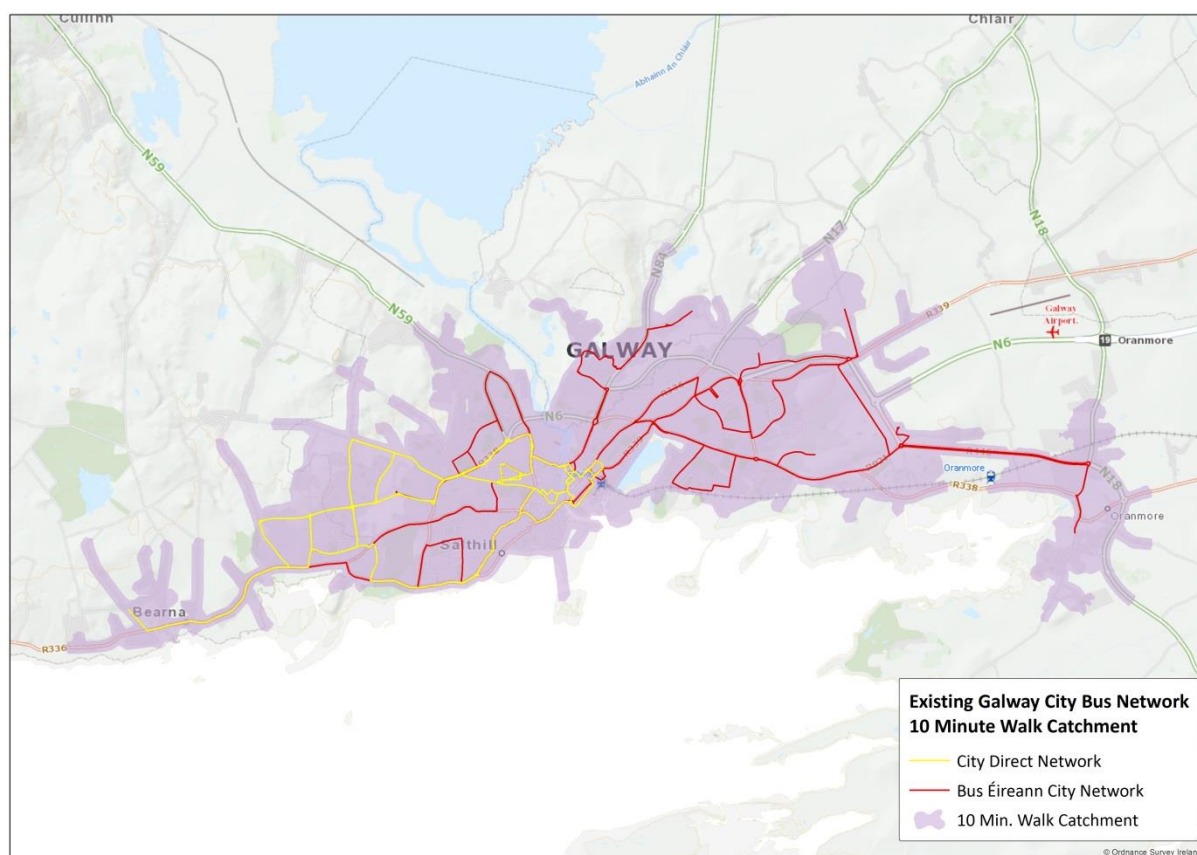
- Improve frequency on existing bus routes
- Cross City Bus Network
- Cross City Bus Network with Orbital Bus Variant
- Cross City Light Rail Line with partial Cross City Bus Network

The alternatives have been recommended to fulfil the objectives set out above. The alternatives will be assessed comparatively in order to determine which options are the most suitable to proceed to subsequent stages of assessment, in which they will be modelled using the NTA Western Regional Model to determine the potential mode share of each option. This is set out in ‘**Appendix B – GTS Appraisal and Modelling**’.

#### 4.1.1 Improved Frequency on existing routes

As previously stated, the existing bus network has seen a significant rise in patronage over recent years. One option considered as part of the Galway Transport Strategy was to simply increase the frequency of existing routes, offering more capacity and more services per day. This has the advantage that the existing network has good coverage across the Study Area – 86% of all commercial and residential buildings are within 10 minutes walking time of bus stops on the network (See Figure 4.2). These services, with increased frequency, would operate existing routes, and utilise existing infrastructure. However the current routings would require a significant number of new buses to increase the frequency, and the routings do not facilitate easy interchange or maximise the accessibility of key destinations, such as the employment zoned land to the east of the city.

*Figure 4.2 – Catchment of existing network – Buildings within 10 minute walk-time of bus stops on all routes*



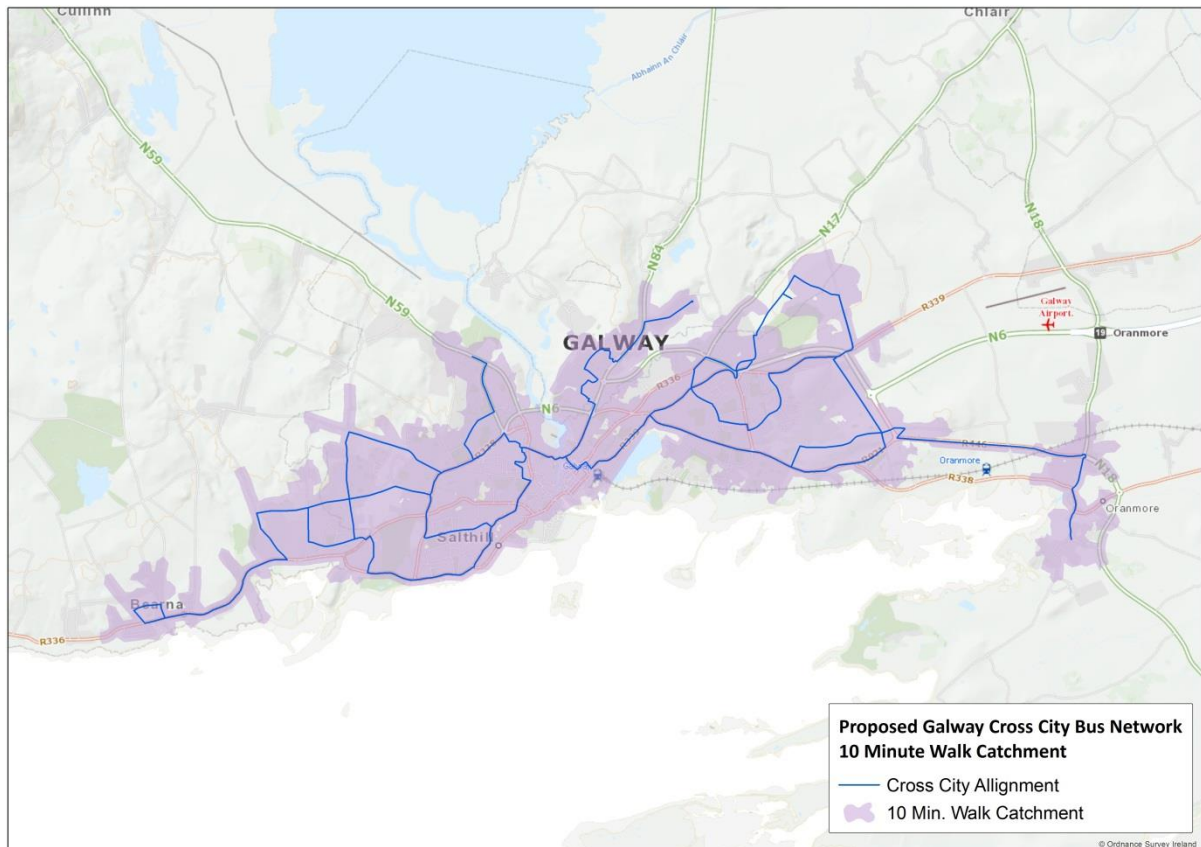
#### 4.1.2 Cross City Bus Network

Using the existing network alignments as a starting point, a cross city network proposal was developed. This proposal was based on linking the residential origins to the key destination locations. The routing of buses was modified in some cases to better reflect the current origin-destination combinations extracted from the 2011 POWSCAR data, and all routes were designed to allow for interchange at key locations – particularly at stops within the city centre. By pairing cross city routes, it was possible to reduce the number of services to 5, making the network more legible for residents



and visitors alike. By streamlining the existing routes however, there are some areas close to the city centre such as parts of Renmore and the area near Father Griffin Road, which would no longer be within a 10-minute walk time of a bus route. The catchment area of the Cross City Bus Network is set out in Figure 4.3.

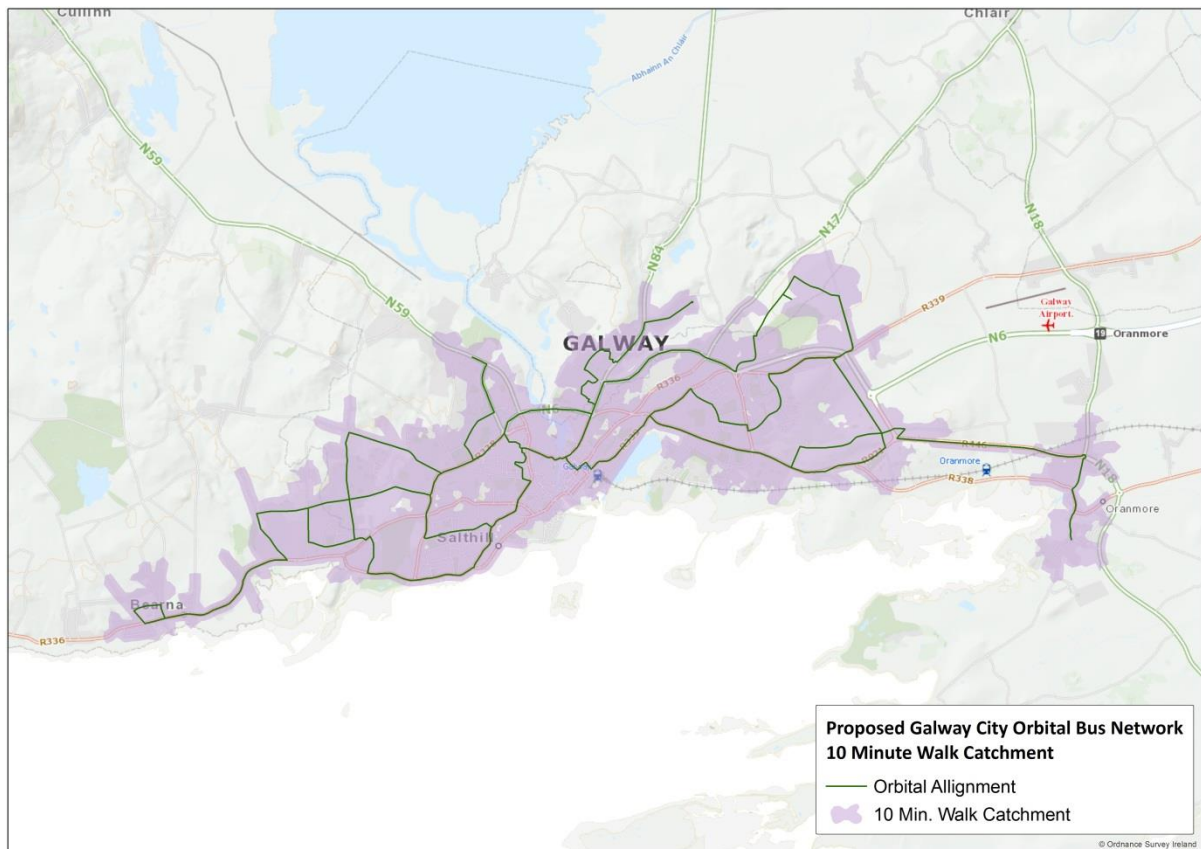
*Figure 4.3: Catchment of Cross City Bus Network – Buildings within 10 minute walk-time of bus stops on all routes*



#### 4.1.3 Cross City Bus Network with Orbital Bus Variant

A variant of the Cross City Bus Network was developed, replacing one of the routes with a route bypassing the centre via the Quincentenary Bridge. This proposal benefits from many of the advantages of the Cross City Bus Network, but the interchange potential is reduced, with one route bypassing the city centre. By providing more direct access to peripheral employment centres from the west of the city, the proposed route does not directly access the city centre. This would require a large amount of passengers to interchange outside the city centre to access the centre by public transport. The city centre is the principle trip attractor in the study area, so this is a significant disadvantage to some potential passengers. The catchment area of the Cross City Bus Network with Orbital Bus Variant is set out in Figure 4.4.

*Figure 4.4: Catchment of Cross City Bus Network with Orbital Bus Variant – Buildings within 10 minute walk-time of bus stops on all routes*

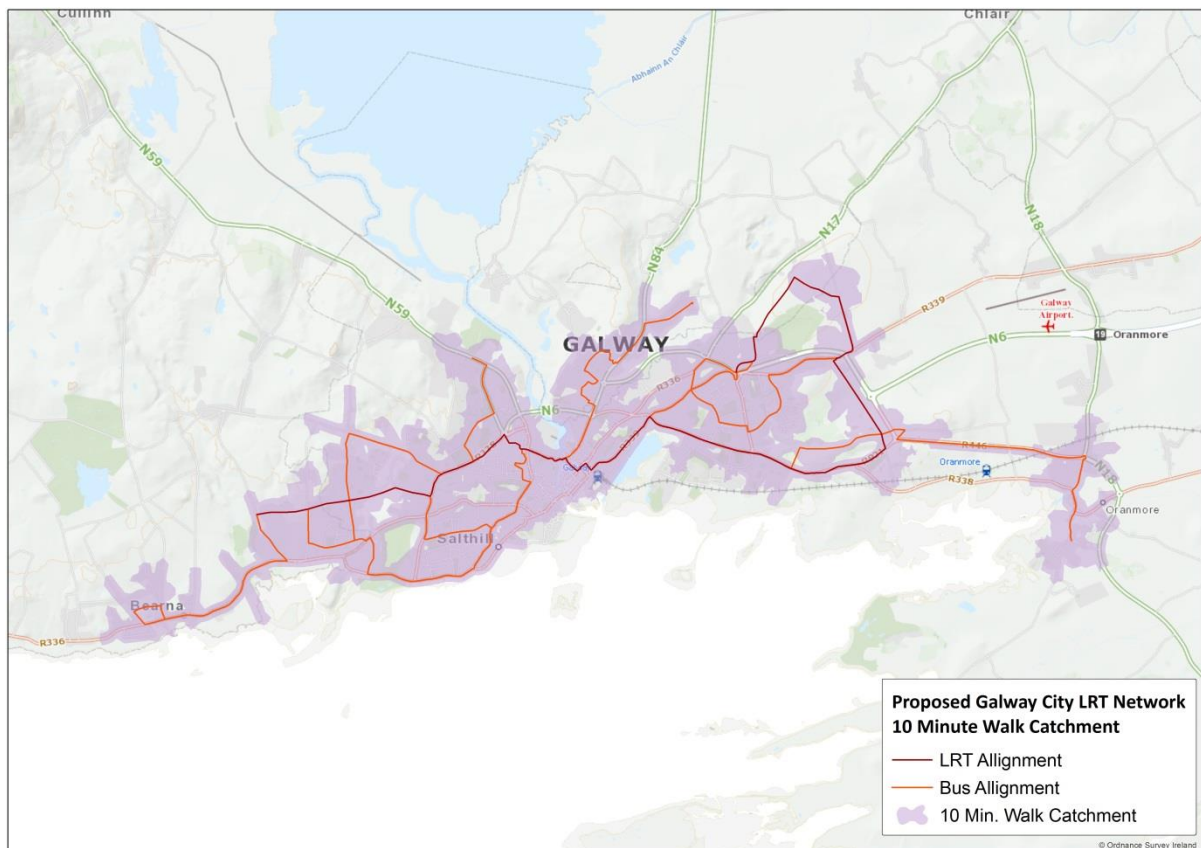


#### **4.1.3 Cross City Light Rail Line with partial Cross City Bus Network**

To assess the potential of a high capacity public transport option for Galway, a light rail proposal was assessed. This option substituted one of the bus routes with a light rail route, running from Knocknacarra to Ballybrit, via the Dublin Road and Parkmore Industrial Estate. This route was complemented by the rest of the Cross City Bus Network, which facilitated interchange onto the light rail route as required. Although the public transport catchment of this option was good (Figure 4.5), the requirement to space stops at a greater distance apart resulted in the overall catchment being less than the Cross City Bus Network option. Also, due to the high capacity of the light rail vehicles, the operational frequency of the service was less, making it less attractive for discretionary trips.

*Figure 4.5: Catchment of Cross City Light Rail Line with partial Cross City Bus Network – Buildings within 10 minute walk-time of stops on all routes*





#### 4.1.2 Improving Access to Education

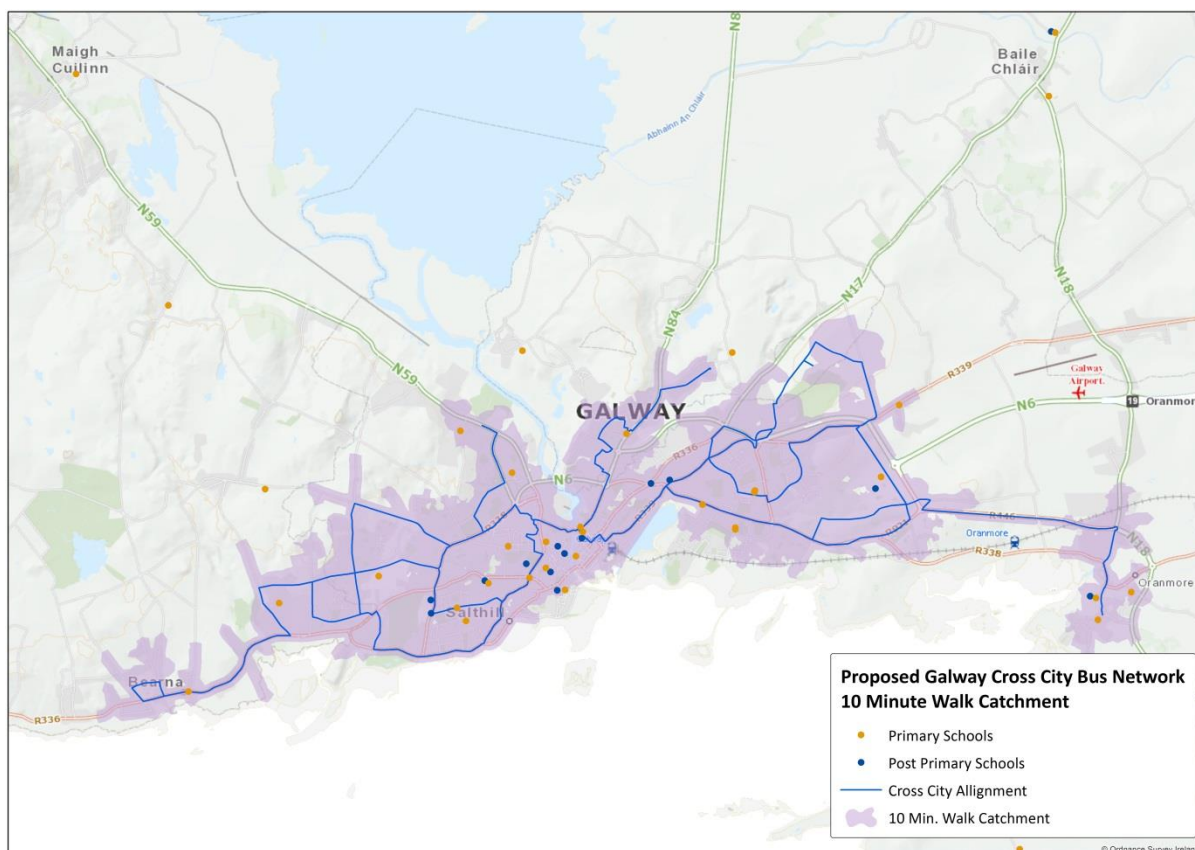
An important aspect of improving the provision of Public Transport in Galway was to improve access to schools and college across the region. As illustrated in Section 3.5, only 15 (43%) of Primary Schools and 8 (57%) of Secondary Schools were located within a 10 minute walk of higher frequency bus stops.

By revising the bus networks it will be possible to improve access to all educational establishments in Galway. Both NUIG and GMIT are both well served by existing buses, and this will continue to be the case by adopting any of the four proposed public transport options.

In relation to Primary and Secondary schools, each of the four proposed public transport options provide an identical improvement to the level of accessibility. Each option will increase the number of Primary Schools within 10 minutes of a higher frequency bus stop to 27 (77%), while the number of Secondary Schools within 10 minutes of a higher frequency bus stop increases to 13 (93%). By way of example the future catchment of the Education establishments is set out in Figure 4.6.

It is also noted that the Primary and Secondary schools that are not within the 10 minute catchment of a higher frequency bus stop are all located within the rural catchment of the study area (e.g. the one Secondary School not covered is Coláiste Bhaile Chláir in Claregalway).

*Figure 4.6: Example - Catchment of Cross City Bus Network – Education establishments within 10 minute walk-time of stops on all routes*



## 5 Assessment of Public Transport Alternatives

The four public transport options were assessed, taking into account passenger catchment and linkages to key destinations, interchange potential, operator costs and capital investment requirements. An initial screening of the four options was carried out as part of this selection process. This screening was used to determine which options were taken forward for modelling. An overview assessment of the four public transport options is set out in Table 5.1 below.

*Table 5.1: Assessment of Public Transport Alternatives*

	Public Transport Network Options											
Assessment Criteria	Improve Frequency on Existing Bus Routes	Cross City Bus Network	Cross City Bus Network with Orbital Bus Variant	Cross City Light Rail Line with partial Cross City Bus Network								
Passenger Catchment and Linkages to Key Destinations	Good coverage due to dispersed route pattern. Key destinations reasonably well served from city centre. Network lacks direct connectivity for trips such as Mervue-Ballybrit-Parkmore, Salthill to UHG & NUIG.	Bus routings reflect highest origin-destination pairings identified in POWSCAR 2011. Catchment does not include sections of inner residential areas, but lesser demand for PT trips to the major destination of the city centre exist in those areas.	Orbital routing serves a demand for work trips between western and eastern outer areas. However, that demand is not comparable in scale to the demand for radial travel to central areas. Radial demand to centre may favour car travel if potential frequency reduces in favour of accommodating orbital route. Absence of one cross-city route via centre, to accommodate orbital route, leaves certain neighbourhoods in west suburbs more remote from radial bus service. Demand for orbital service will be peak-loaded. Represents opportunity to significantly support mobility management at high-intensity employment areas, therefore reducing point congestion on strategic road network.	Network routings reflect highest origin-destination pairings identified in POWSCAR 2011. Catchment does not include sections of inner residential areas, but lesser demand for PT trips to the major destination of the city centre exist in those areas. Catchment of light rail line reduced from equivalent bus route due to necessity of wider stop spacing for operational reasons. Light rail line inflexible in terms of routing to new locations of travel demand within city footprint.								
Interchange Potential	Interchange available to/from Eyre Square on all services, but also necessary for majority of trips. Lack of common corridors elsewhere in the city makes it difficult for interchange to happen to accommodate local trips not involving city centre.	Interchange of all routes at City Centre and UHG. Also interchange of majority of routes at edge of centre areas such as UHG, Moneenageisha junction, Westside Shopping Centre.	Reduced compared to other Network options because orbital route bypasses City Centre, UHG, Moneenageisha interchange sites.	Interchange of all routes at City Centre and UHG. Also interchange of majority of routes at edge of centre areas such as UHG, Moneenageisha junction, Westside SC.								
<table><tr><td>Relative Performance</td><td>Excellent</td></tr><tr><td></td><td>Very Good</td></tr><tr><td></td><td>Fair</td></tr><tr><td></td><td>Poor</td></tr></table>					Relative Performance	Excellent		Very Good		Fair		Poor
Relative Performance	Excellent											
	Very Good											
	Fair											
	Poor											

Table 5.1: Assessment of Public Transport Alternatives (continued).

	Public Transport Network Options																							
Assessment Criteria (continued)	Improve frequency on existing bus routes	Cross City Bus Network	Cross City Bus Network with Orbital Bus Variant	Cross City Light Rail Line with partial Cross City Bus Network																				
Operator Costs	Improvement on all routes to high-frequency would involve operating many more buses. Therefore costs would increase greatly.	Higher frequency of bus service would be required to meet travel demand on proposed routes, therefore costs significant. Cost would be offset somewhat by less distances travelled by buses due to more consolidated network of routes.	Extra distance involved in orbital crossing than routing all services through centre as other networks do. Indirect costs in that car traffic will be relocated off Quincentenary Bridge and potentially add congestion to streets where remainder of bus network will operate. Extra costs involved in maintaining bus frequency in those circumstances.	Higher frequency on network would be required to meet travel demand on proposed routes, therefore costs significant. Cost would be offset somewhat by less distances travelled by buses/trams due to more consolidated network of routes.																				
Capital Investment Requirements	Bus routes disperse on many roads moving out from city centre. Therefore, achieving priority for journey time reliability would have significant costs to implement. Away from city centre approaches, buses exposed to peak time localised congestion. Also, many additional buses needed for increased frequency.	Concentrated network at approaches to city centre and within city centre means that comparatively less interventions would be required, in an environment where competition for limited road space is most intense among competing demands such as pedestrian and cyclist movements, vehicular access and parking, loading and deliveries, and regional, local and private bus transport.	Significant additional infrastructure costs to allow Quincentenary Bridge and its approaches to accommodate bus priority.	Cost of 1 tram line and 4 bus routes would be multiples of what 5 equivalent bus routes would cost.																				
<table> <tr> <td>Relative Performance</td><td>Excellent</td><td></td><td></td><td></td></tr> <tr> <td></td><td>Very Good</td><td></td><td></td><td></td></tr> <tr> <td></td><td>Fair</td><td></td><td></td><td></td></tr> <tr> <td></td><td>Poor</td><td></td><td></td><td></td></tr> </table>					Relative Performance	Excellent					Very Good					Fair					Poor			
Relative Performance	Excellent																							
	Very Good																							
	Fair																							
	Poor																							

## 6 Conclusion

This report sets out the selection process for determining the best options to bring forward for testing to determine which will provide the best long term public transport solution for Galway City. Following review of the Assessment of the Public Transport Alternatives it was decided that three options would be brought forward for testing, namely:

- Cross City Bus Network
- Cross City Bus Network with Orbital Bus Variant
- Cross City Light Rail Line with partial Cross City Bus Network

The subsequent testing and assessment and identification of the preferred public transport option is set out in **'Appendix B – GTS Appraisal and Modelling'**.

# Galway Transport Strategy

## Urban Public Transport Network

### Route Selection Process

#### **Addendum 1 – POWSCAR 2011 Demand Matrices for Study Area**



## Matrix of trips within the city area to/from the 31 Zones, for Work. Source: CSO POWSCAR 2011.

Home - Education Trips (Source: POWSCAR 2011)			Zone Name as Destination																																
Zone Name as Origin	Zone Name as Destination	31 Zone No.	Zone Name as Destination																																
Zone Name as Origin	Zone Name as Destination	31 Zone No.	Moycullen	Tonabru	Barna Village	Joyce's District Centre	B&Q Retail Park	Rahoon	IDA Dangan	Westside Shopping Centre	Gleann Dara	St. Enda's School	St. Mary's College	University Hospital	Galway Technical Institute	Dominick Street	NUIG	City Centre	Harbour Enterprise Park	City Hall	Galway Shopping Centre	Tirellan	Mervue Industrial Estate	GMIT	Bon Secours Hospital	Merlin Park Hospital	Ballybrin & Parkmore	Galway Clinic	Parkmore Industrial Estate	Deerpark Industrial Estate	Garraun Devt. Area	Claregalway	Carrowbrown	total	
31 Zone No.	31 Zone No.	31 Zone No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	total	
	Moycullen	Moycullen	1	414	0	0	0	0	15	0	0	134	38	0	19	60	196	11	0	0	0	0	15	25	10	0	0	0	0	0	0	0	0	950	
	Tonabru	Tonabru	2	13	0	52	34	22	0	49	0	0	81	0	0	51	77	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	437	
	Barna Village	Barna Village	3	0	0	155	41	0	0	0	0	81	10	0	10	58	105	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	504	
	Knocknacarra South	Joyce's District Centre	4	0	0	23	294	12	0	43	0	476	77	0	93	183	466	109	0	41	0	93	62	22	0	0	0	0	0	0	0	0	0	2,012	
	Knocknacarra North	B&Q Retail Park	5	0	0	18	206	30	0	36	0	317	83	0	51	102	199	65	0	0	0	40	30	12	0	0	0	0	0	0	0	0	1,206		
	Rahoon	Rahoon	6	0	0	0	21	0	0	39	0	148	93	0	34	65	191	45	0	0	0	15	18	10	0	0	0	0	0	0	0	0	696		
	Dangan	IDA Dangan	7	0	0	0	0	0	0	89	0	58	14	0	10	23	191	0	0	0	0	15	16	0	0	0	0	0	0	0	0	0	0	434	
	Newcastle	Westside Shopping Centre	8	0	0	0	0	0	0	86	0	86	72	11	36	60	381	38	0	0	0	29	15	0	0	0	0	0	0	0	0	0	0	836	
	Gleann Dara	Gleann Dara	9	0	0	0	0	0	0	16	0	54	66	0	22	29	156	20	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	396	
	Salthill	St. Enda's School	10	0	0	0	0	0	0	0	0	263	39	0	42	161	262	41	0	10	0	0	21	26	0	0	0	0	0	0	0	0	0	876	
	Shantalla	St. Mary's College	11	0	0	0	0	0	0	72	54	72	54	0	14	83	202	23	0	0	0	14	11	0	0	0	0	0	0	0	0	0	0	494	
	Newcastle Park	University Hospital	12	0	0	0	0	0	0	0	0	0	0	0	0	0	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63	
	Claddagh	Galway Technical Institute	13	0	0	0	0	0	0	0	0	25	16	0	30	69	128	0	0	0	0	14	14	0	0	0	0	0	0	0	0	0	0	315	
	Henry Street	Dominick Street	14	0	0	0	0	0	0	0	0	0	0	0	11	29	209	0	0	0	0	10	12	0	0	0	0	0	0	0	0	0	0	301	
	Corrib Village	NUIG	15	0	0	0	0	0	13	0	0	0	0	10	0	229	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	284	
	City Centre	City Centre	16	0	0	0	0	0	0	0	0	0	0	0	30	410	21	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	546	
	Mellows Park	Harbour Enterprise Park	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	37	
	College Road	City Hall	18	0	0	0	0	0	0	0	0	0	0	0	0	122	30	0	0	13	0	13	29	12	0	0	0	0	0	0	0	0	0	258	
	Bohermore	Galway Shopping Centre	19	0	0	0	0	0	0	0	0	0	0	0	10	0	115	35	0	0	0	10	16	0	0	0	0	0	0	0	0	0	0	207	
	Tirellan	Tirellan	20	0	0	0	0	0	22	0	0	100	59	0	32	50	536	74	0	0	0	337	77	62	52	0	39	0	0	0	0	0	0	1,455	
	Tuam Road	Mervue Industrial Estate	21	0	0	0	0	0	0	19	0	0	0	0	13	81	31	0	0	0	16	51	47	28	0	0	0	0	0	0	0	0	0	307	
	Mervue	GMIT	22	0	0	0	0	0	0	11	0	0	0	0	13	50	14	0	0	0	0	42	106	48	0	0	0	0	0	0	0	0	0	309	
	Renmore	Bon Secours Hospital	23	0	0	0	0	0	0	0	0	52	12	0	24	14	124	37	0	0	75	335	235	0	0	0	0	0	30	0	0	0	948		
	Ballybane	Merlin Park Hospital	24	0	0	0	0	0	10	0	0	67	63	0	25	53	114	79	0	0	25	106	404	255	0	12	0	44	61	0	0	0	1,337		
	Ballybrin	Ballybrin & Parkmore	25	0	0	0	0	0	0	0	0	0	0	0	22	34	93	48	0	0	25	70	192	175	0	12	18	75	71	0	0	0	917		
	Doughiska	Galway Clinic	26	0	0	0	0	0	0	0	0	52	22	0	22	34	93	48	0	0	25	70	192	175	0	12	18	75	71	0	0	0	917		
	Parkmore Industrial Estate	Parkmore Industrial Estate	27	0	0	0	0	0	0	0	0	33	0	0	0	34	0	0	0	0	0	13	14	0	0	0	53	13	0	18	0	0	209		
	Oranmore	Deerpark Industrial Estate	28	0	0	0	0	0	0	0	0	12	0	0	0	104	13	0	0	0	13	48	30	0	0	0	682	0	0	0	0	0	934		
	Garraun Devt. Area	Garraun Devt. Area	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	50		
	Claregalway	Claregalway	30	0	0	0	0	0	0	0	0	39	11	0	12	82	0	0	0	0	10	16	11	0	0	0	0	117	0	162	0	0	496		
	Carrowbrown	Carrowbrown	31	0	0	0	0	0	0	0	0	48	22	0	14	75	0	0	0	0	21	11	20	11	0	17	0	11	24	0	94	0	390		
	total	total		439	0	252	625	74	0	460	<10	<10	2,277	806	92	585	1,200	5,007	793	0	135	<10	447	800	1,606	977	<10	107	22	220	1,043	0	277	14	18,280

## Matrix of trips within the city area to/from the 31 Zones, for Education. Source: CSO POWSCAR 2011.



