Draft New Network Report

APRIL 2023

BUS CONNECTS GALWAY

SUSTAINABLE TRANSPORT FOR A BETTER CITY.

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1 Executive Summary

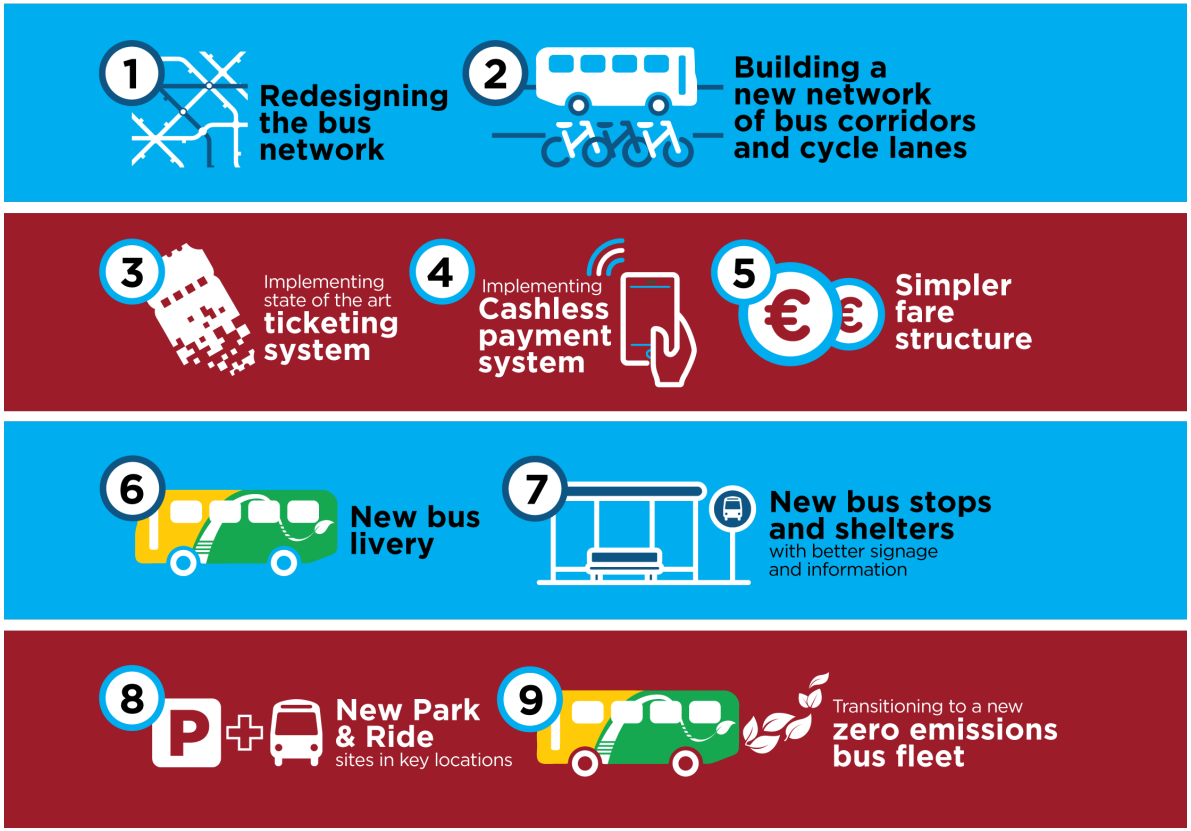
What is BusConnects Galway?

BusConnects is a programme of public transport investment in Ireland's major urban centres. It is developed and managed by the National Transport Authority (NTA), and funded by Project Ireland 2040.

BusConnects includes many elements:

- Redesigning the bus network
- Building new bus corridors and cycle lanes
- Implementing a state of the art ticketing system
- Implementing a cashless payment system
- Simpler fare structure
- New bus livery
- New bus stops and shelters
- New Park & Ride sites in key locations
- Transitioning to a new zero emissions bus fleet

Some of these elements are already underway in Galway. Bus priority corridors through the city centre and along Dublin Road are being planned. Many older buses have been replaced by newer yellow-and-green TFI buses, and new battery-electric buses will be added to the local fleet in 2023.



Completing BusConnects Galway will help realise these Government policy strategies and local plans:

- National Development Plan 2021-2030
- Climate Action Plan 2023
- Cross-City Link
- BusConnects Dublin Road
- Galway Transport Strategy
- Galway City Council Development Plan
- Galway County Transport & Planning Strategy
- Sustainable Mobility Policy

This bus network redesign and public consultation will also inform the update to the Galway Metropolitan Area Transport Strategy, which begins this year.

What is the Network Redesign?

The Galway bus network has evolved slowly with the growth of the city. In 2016 the Galway Transport Strategy identified improvements to the urban bus network which were partially implemented in the years since.

In light of the growth coming to Galway and national efforts to reduce carbon emissions from transport, there is an urgent need to re-evaluate and re-invest in bus services in Galway.

This network redesign is one step in that process. It is a collaboration among:

- National Transport Authority
- Galway City Council
- Galway County Council
- City Direct
- Bus Éireann

City Direct and Bus Éireann are the operators of urban bus services in Galway.

The bus network redesign is a review of where and how often the bus should come. This includes which roads buses run on, times and days of service, frequencies, stop locations, and how people will interchange between routes.

The network is being reinvented from a blank slate, rather than adjusted from the current network. There is no assumption that inherited patterns of bus service must be maintained for the sake of tradition or to avoid change.

With that said, many parts of the Galway bus network make good sense today, and are retained and added-upon in the Draft New Network.

Redesign Process

This report forms the basis for public consultation on the Draft New Network and the gathering of public feedback. Public consultation begins on 24th April and is expected to continue for six weeks after.

This report includes:

- An assessment of existing demand and need for public transport.
- Key principles and choices in redesigning the bus network
- The Draft New Network proposal.

Since every detail of the existing network is something somebody relies on, NTA expects a broad range of positive and negative comments. Any large change to a bus network will result in inconvenience for some people, even if it benefits most people.

Once the planning team has understood the feedback on the Draft, a Final New Network will be designed. Implementation of route changes consistent with the Final New Network are planned to begin in 2025.

Routes Under Review

This network redesign focuses on Galway City, Bearna and Oranmore. It includes these urban routes:

Route	Operator
401	Bus Éireann
402	Bus Éireann
404	Bus Éireann
405	Bus Éireann
407	Bus Éireann
409	Bus Éireann
410	City Direct
411	City Direct
412	City Direct
414	City Direct
424[1]	Bus Éireann

1 Bearna & Galway segment of Route 424 only.

Study Area

The study area for this network redesign covers the urban bus network provided by Bus Éireann and City Direct within Galway City, Bearna and Oranmore. The study area does not include towns further out such as Claregalway and Moycullen.

Bus services in these smaller towns and other areas of County Galway have been reviewed as part of Connecting Ireland Rural Mobility Plan, a national initiative to improve public transport outside major cities and towns.

However, during planning for the Draft New Network, likely paths that rural and intercity will take as they enter Galway City have been identified and marked on the map.

The network redesign may change which roads buses run on, times and days of service, frequencies, stop locations and how people interchange.

More Service Investment

Added Service

The existing bus network does not adequately address local or national goals for growth, quality of life and sustainability. The NTA is proposing a significant increase in service through BusConnects Galway.

The Draft New Network would increase the amount of bus service in the Galway urban network by nearly 50%. This increase includes some service that can be seen on a map – such as new route segments – and some service that appears in timetables:

- 3 routes operating every 15 minutes or better, Monday through Saturday.
- Improved frequencies and more routes offered on weekends.
- More evening service.
- 24-hour service between the eastern and western sides of the city.

Patronage vs. Coverage

One of public transport's main goals is high patronage. High patronage generally results when places with many people are connected by frequent, fast and linear service. High patronage is necessary to meet climate, growth and liveability goals.

But patronage is not public transport's *only* goal. Public transport is also expected to provide some service to all urbanised areas, even where few people live or work, and even where patronage is low. The purpose of such service is to prevent isolation and support people's needs for mobility no matter where they live.

These two goals are in tension. The more service is focused into frequent, all-day routes, in the areas where the most people live and work, the less it can be spread out in order to cover all areas.

Not all of the routes proposed in the Draft New Network are expected to attract high patronage. Some of them serve the purpose of covering areas where patronage will likely be low, but the service is important nonetheless.

What is the value of high patronage?

- Make service more useful for more people
- Support dense and walkable development
- Improve access to jobs, education and other opportunities for large numbers of people
- Encourage people to switch from car to public transport
- Combat traffic congestion
- Reduce carbon emissions

What is the value of coverage?

- Promote social and economic inclusion, regardless of where people live
- Prevent isolation for people who live in less-populated areas
- Include everyone in the benefits of public transport

How to Read the Network Maps

Colours Show Frequency

In the maps on the next two pages **route colours represent frequency.** Each route is colour-coded based on its frequency on weekdays at midday.

- **Dark red** lines indicate very frequent service, with a bus coming every 10 minutes.
- **Red** lines indicate frequent service, every 15 minutes or better.
- **Purple** lines indicate routes that come every 20 minutes.
- **Dark blue** lines indicate routes that come every 30 minutes.
- **Light blue** lines indicate routes that come every 60 minutes.

New Route Numbers

All of the proposed routes have been given unique numbers, to differentiate them from existing Galway routes.

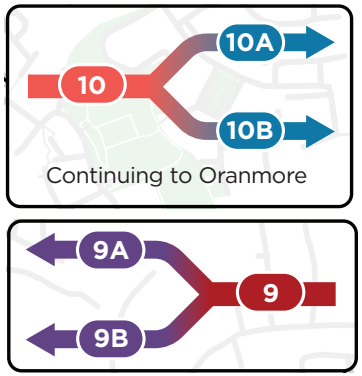
However, if a proposed route is very similar to an existing route, then it is given a related number. For example:

- Proposed Route 1 is similar to existing Route 401.
- Proposed Route 4 is similar to existing Route 404.
- Proposed Route 9 is similar to existing Route 409.

The numbers proposed are not final, and may change before the Final New Network is put in place.

Route Branching

Some routes in the Draft New Network would branch, shown on the maps with this diagram:



These are not interchanges. The buses on the less frequent "branches" run together to form the more frequent "trunk."

In the top example, Route 10 on Dublin Road is a combination of Routes 10A and 10B to and from Oranmore. Routes 10A and 10B each offer 30 minute frequency, and where they are together on Dublin Road they are scheduled such that one or the other of them comes along every 15 minutes.

The same is true of Routes 9A and 9B in the west, which combine to form Route 9 and continue to the city centre and to Parkmore.

Connecting Ireland

On the map on the next page, routes connecting Galway to Carraroe, Clifton, Tuam, Castlebar, Claremorris, Claregalway, Mountbellow, Athlone and Limerick are marked with a "CI" label. These routes will be planned in a separate process through Connecting Ireland. The towns they serve, their frequencies and their hours of service will be addressed in that process. Connections between these interurban routes and the urban Galway network are important, which is why they are shown on the Draft New Network map.

Route Descriptions

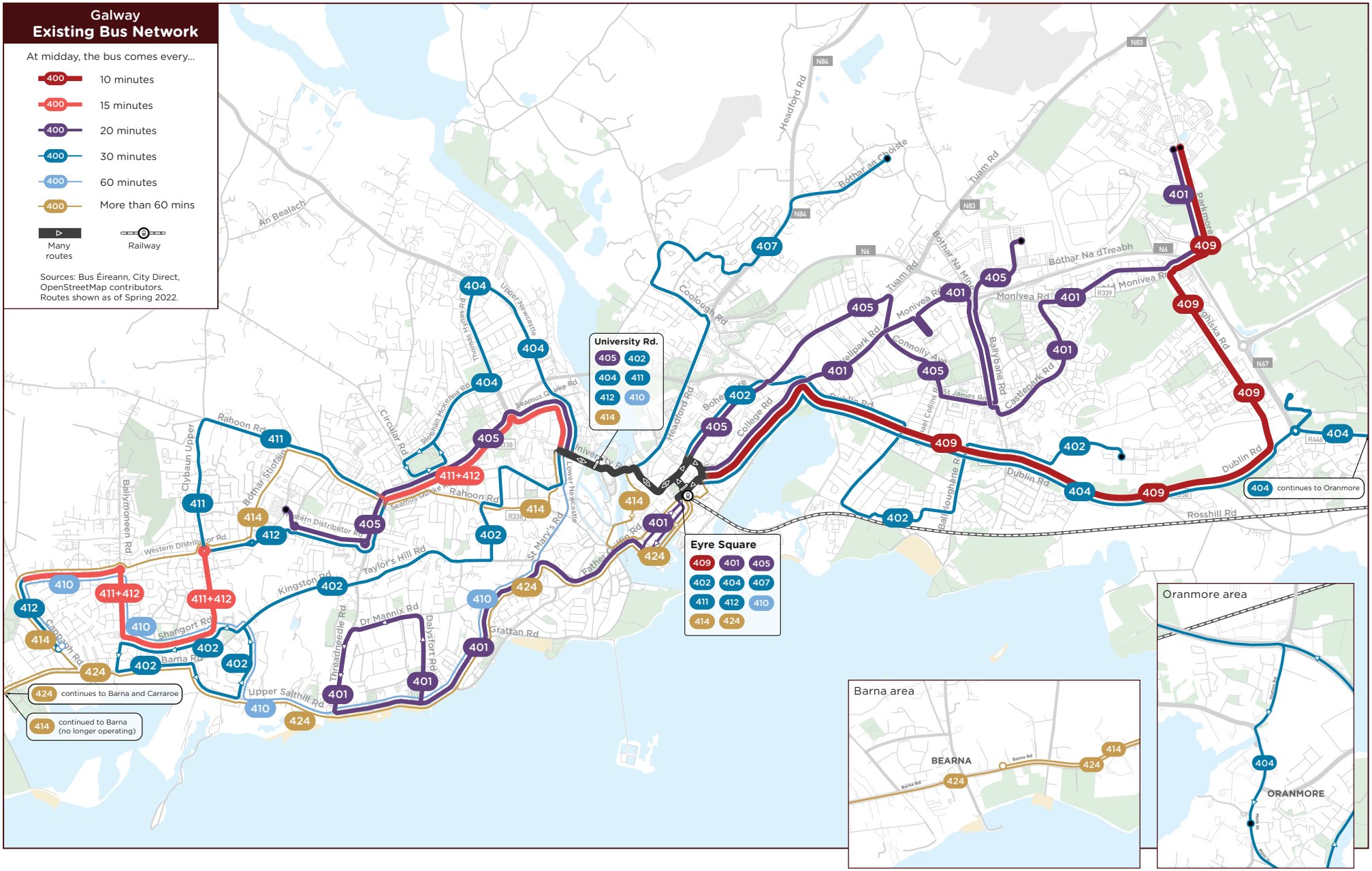
Street-by-street descriptions of each proposed route are provided on page 74.

Descriptions of proposed frequencies and spans (hours of service) are given on page 98.

Map of the Draft New Network

For a closer look at the Draft New Network, please use the resources at busconnects.ie/galway, especially the online map.

Map of the 2022 Existing Network



Service to More Areas

The Draft New Network would provide new service in certain areas which are not served today. They are marked in yellow on the map below, and include:

- Upper Ballymoneen Road
- The southerly part of Circular Road
- Roscam
- The Coast Road, between Galway City and Oranmore
- The south edge of Deerpark Industrial Estate
- Station Road in Oranmore
- Oranhill

The Draft New Network would also remove service on a few streets, which are marked in pink on the map below. In these cases, the total number of people affected would be small, and improved service would be provided within a short walk. Removing these few, small segments has a benefit to a large number of people as it allows bus routes to be more linear and direct and the network to be simpler.

Overall the share of residents within 400 metres of a bus stop (about a five minute walk) would increase from 62% to 67%, with a similar increase in the share of jobs close to a bus stop.

Higher Frequencies and a New 24-Hour Route

The Draft New Network would improve frequencies on many routes, especially on weekends.

- Instead of two routes offering high frequency today (every 15 minutes or better), **three routes would offer high frequency** and each of them would cover many kilometres on both sides of the city.
- As a result, **33% of residents would be within 400 m of a frequent route, compared to 19% on the existing network**.
- On **Saturdays** the improvement would be greater, with **33% of residents near a frequent route, compared to 10% today**.

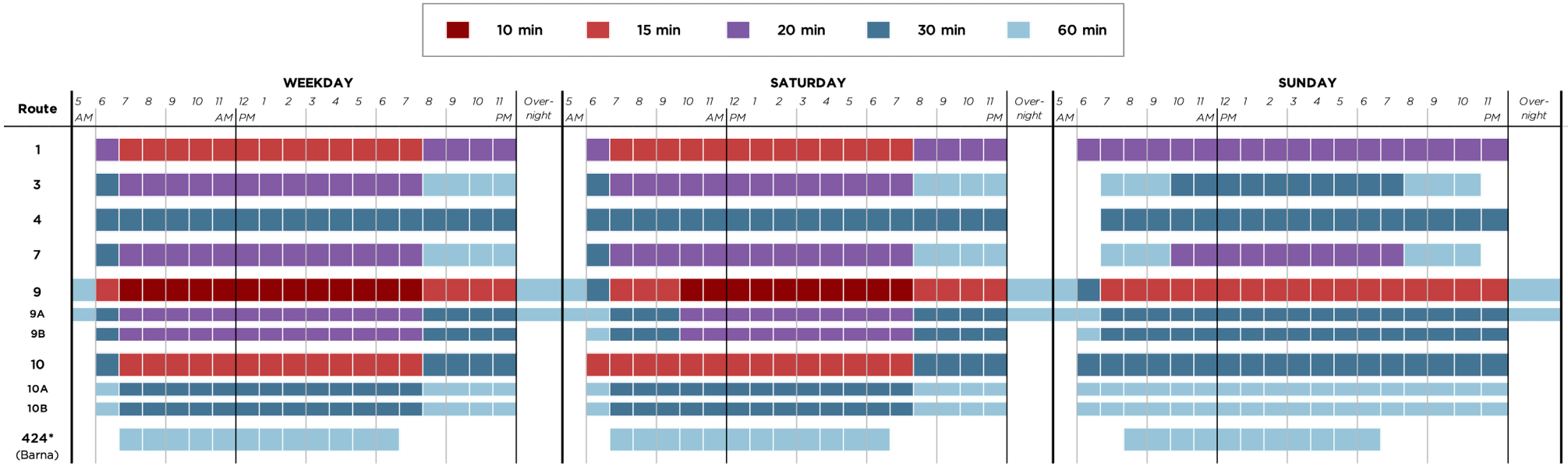
In addition to frequency improvements, some routes would run longer in the morning and at night.

The proposed Route 9 (similar to today's Route 409) would offer overnight service, once per hour, traversing the city from Knocknacarra in the west, through the centre, to Doughiska and Parkmore in the east.

24-hour service helps people working or socializing at night make their way home safely, and it helps people with very early morning work make their journeys as well.

The graphic below uses colour to describe each route's proposed frequency by time and day. Text tables with the same information are provided in Appendix A.

Galway Draft Network Bus Route Frequencies



Notes * This chart only the shows frequency of Route 424 trips between Ceannt Station and Barna. Some trips on 424 will continue to/from Carraroe, Lettermullen, Carna, etc.

More Access to Opportunity

It's impossible to predict exactly how many people might use an improved bus network. The future is inherently unpredictable, as our recent experience with the Covid-19 pandemic demonstrated. Predictive models can be used to forecast future public transport patronage, to use them we must make myriad assumptions about the future at least some of which will turn out to be wrong.

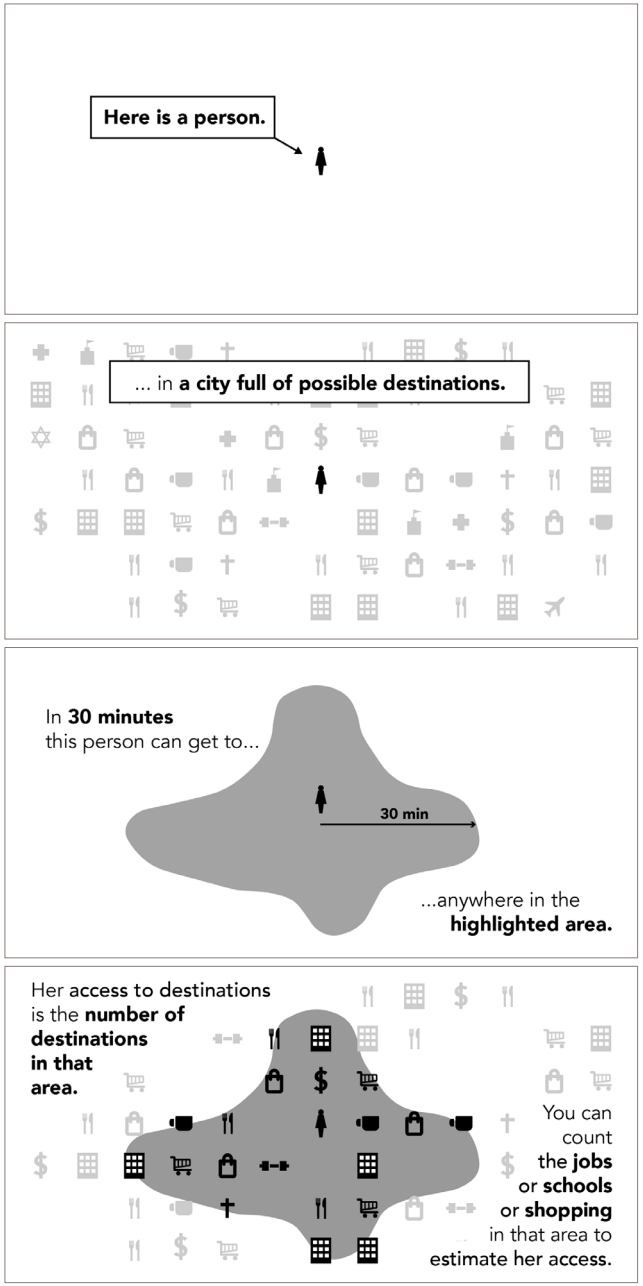
At the individual level, it is also hard to predict public transport patronage. It is difficult to know how someone will make their travel decisions in the future if there are changes in where they live, where they work, fuel prices, traffic congestion, the quality of public transport service, improvements to cycling and walking facilities, their own ability to drive a car, etc.

In the face of so much uncertainty, we can rely on simpler measures that focus on the near-term consequences of a change, and that require fewer assumptions about the future. One such measure is "access," also sometimes called "accessibility." Access measures the usefulness of a public transport network for any person who has a limited amount of time to spend traveling.

Public transport is useful to the extent that it allows people to go where they want in a reasonable amount of time. **The more destinations you can reach in a reasonable amount of time, the greater your access to opportunity.**

When we measure access, as illustrated at right, we use Census data representing where people live and work. We then use arithmetic to sum travel times between all residents and jobs. This arithmetic is described on the next page.

Designing cities and their public transport networks so that more people have access to more opportunities, within a reasonable journey time, is a reliable way to increase patronage.



What factors affect access to opportunity?

Access to opportunity via public transport is affected by:

- **How many destinations are near public transport**
- **How long a person has to walk** to and from service
- **How long they have to wait** for the service
- **How far they have to travel** in the public transport vehicle
- The **speed** of the vehicle
- **How long they have to wait to interchange** between services

Public transport operators have control over some of these factors: waiting time, interchange, route directness, where service is provided.

They have less or no control over other factors that affect access: public transport speed, travel distances, or where jobs and housing are located. These factors are generally controlled by local authorities as they manage land use, development and roadways.

Estimating Journey Times

Often when people describe public transport journey time they focus on the time spent on the bus. Public transport journeys also include time spent walking and waiting, which can exceed the time spent on the vehicle itself.

Walking to and from the stop

Most public transport journeys begin and end with a walk.

Waiting for the next bus

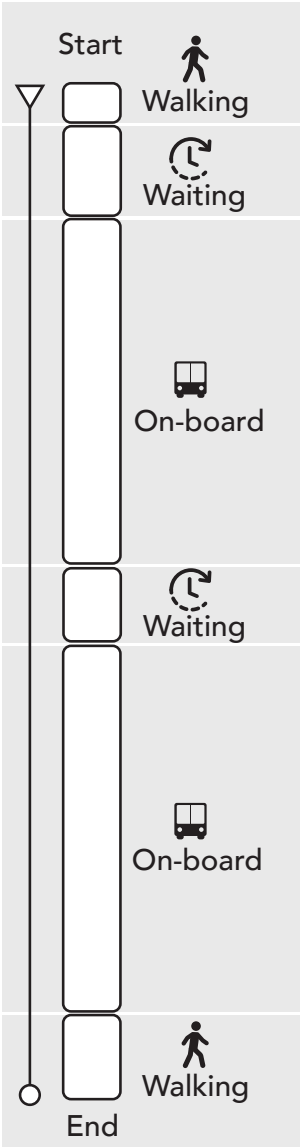
Waiting doesn't only happen at the start of your journey, it can also happen at the end. You may leave home shortly before your bus departs, but if your bus comes infrequently you often have to arrive at your destination early to avoid being late.

If you're interchanging, you'll have to wait a second time.

On average, across all passengers, the minutes spent waiting will sum to approximately one-half of the frequencies of the routes in question.

On-board the vehicle

Time spent on-board is affected by distance and speed. In summing travel times on the Draft New Network, we used conservative (slow) assumptions, and did not take into account the faster speeds that would result from Cross-City Link. Improvements in speeds will result in greater job access for more people.



Increased Access Throughout the City

Access improvements that would result from the Draft New Network have been analysed for:

- Door-to-door journeys of 30 minutes or less, and 45 minutes or less.
- Rush hours and midday.
- Weekdays, Saturdays and Sundays.
- All residents and all jobs.
- People living without a car; residents of areas with high social deprivation; and young, unemployed and senior residents.

On **weekdays**:

- The average resident could access 38% **more** jobs within 30 mins. or less, and 13% more within 45 mins.
- More than one-half of residents would be able to reach **more** jobs within 30 mins. or less, and the other half of residents would experience **no change** in job access.
- 83% of residents would have access to **more** jobs within 45 mins. or less. 16% of residents would experience **no change**, and only 1% of residents would **lose** access to as many jobs within 45 minutes.

The Draft New Network would be beneficial specifically for **residents of areas of social deprivation**, which are shown in shades of orange on the map on page 45:

- Residents in disadvantaged areas would have access to 48% **more** jobs within 30 mins. on weekdays, with similar increases on Saturdays and Sundays.
- The number of disadvantaged residents who would lose access to jobs is very small, less than 0.5% and too small to pinpoint.

Access would be improved on **Saturdays and Sundays** as well:

- The average resident would have access to 43% **more** jobs within 30 mins., and 14% more jobs within 45 mins., on Saturdays.
- On Sundays, the average resident could reach 54% **more** jobs within 30 mins. and 29% **more** within 45 mins.

The maps on the following pages show changes in access on weekdays for each local area in Galway, Barna and Oranmore.

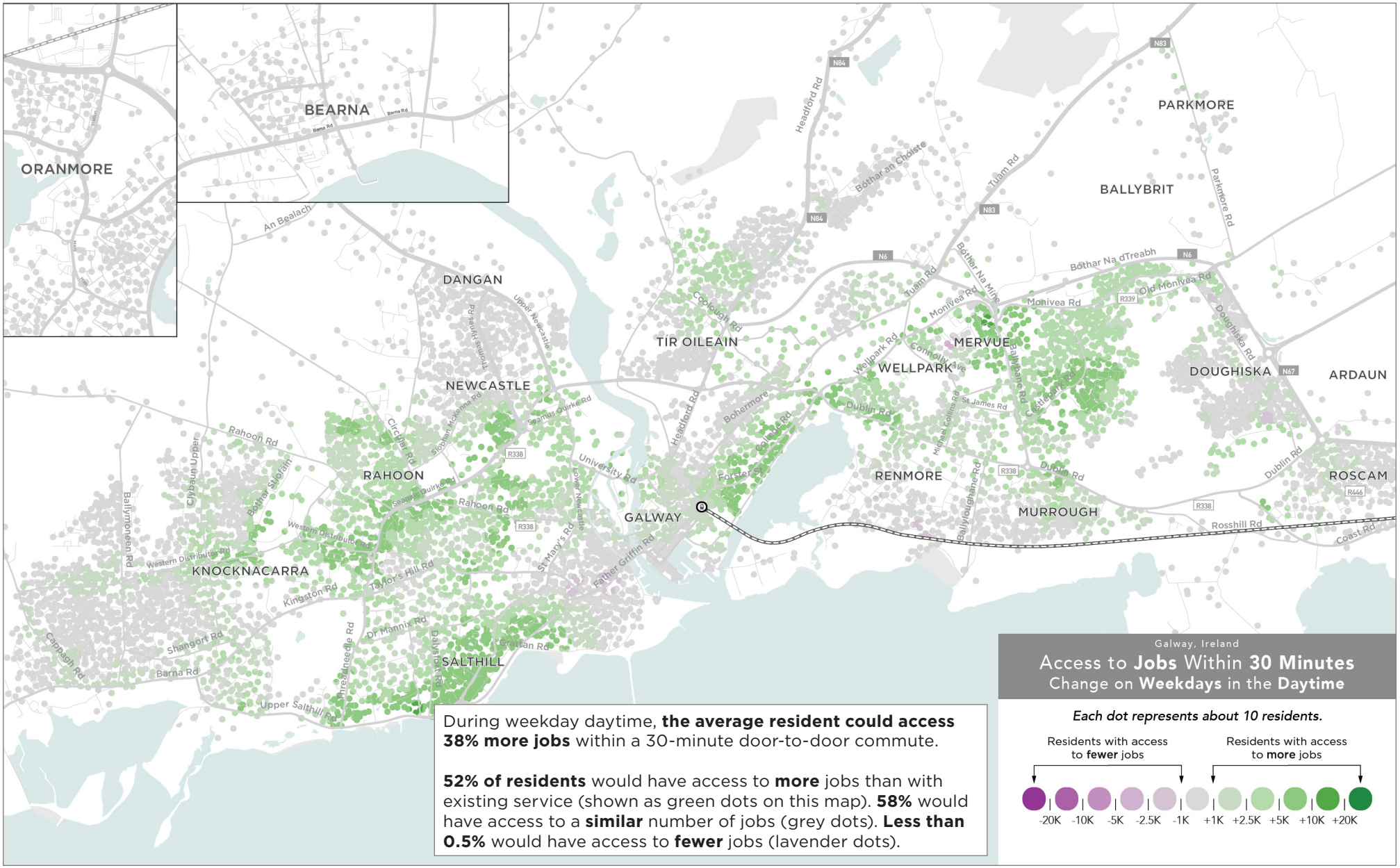
- The first map shows job access change based on where residents live.
- The second map shows the same results, but based on where jobs are located.

Maps showing changes in access on Saturdays and Sundays are in the section beginning on page 83.

Maps showing changes in access within 30 or 45 minute journeys, for any area, can be made using the interactive webmap linked from www.busconnects.ie/galway.

Many places people visit (such as shopping, schools, restaurants, medical services) are also places of work, so access to a greater number of jobs goes along with access to important destinations.

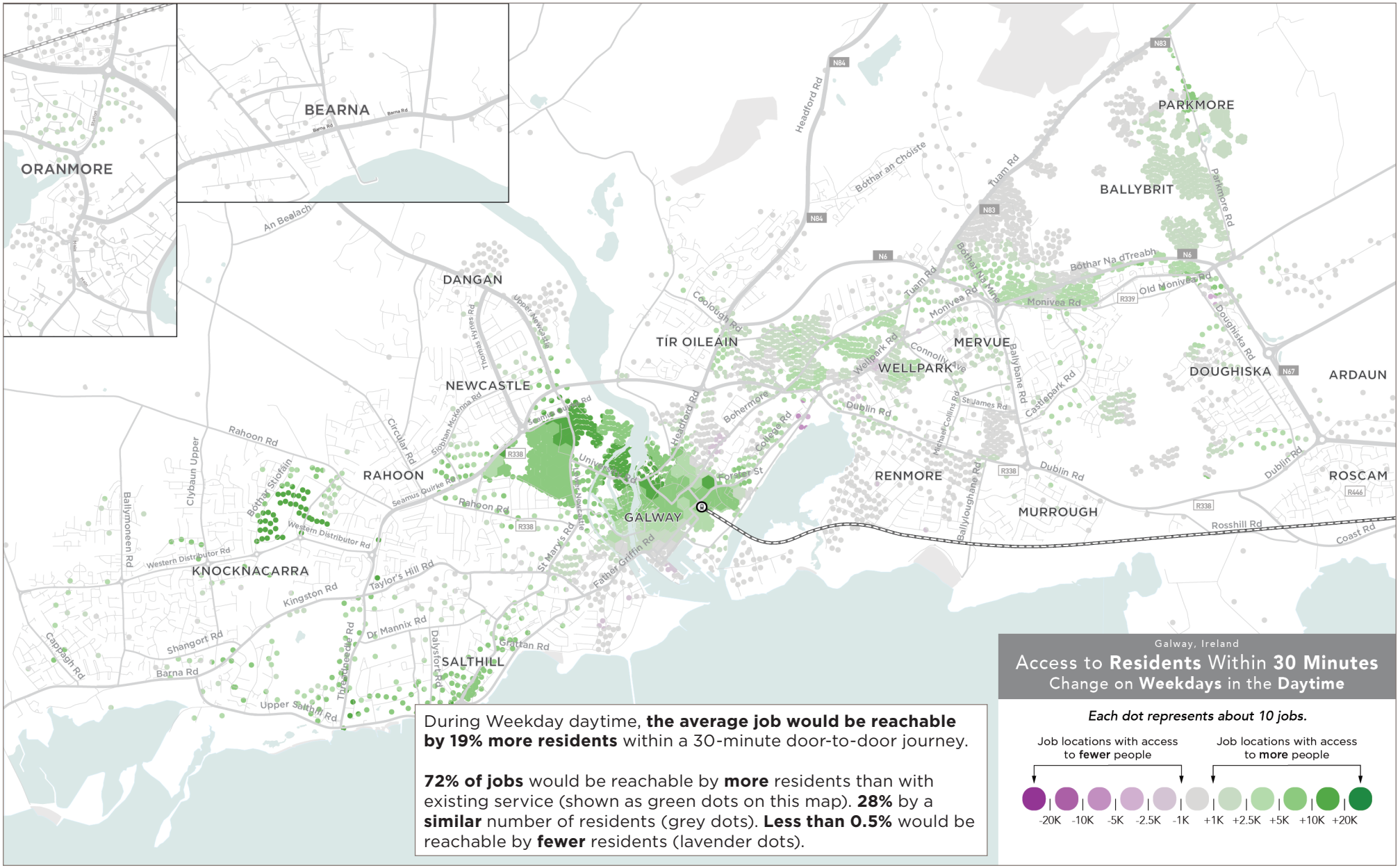
Map of Residents' Access to Jobs on Weekdays



During weekday daytime, **the average resident could access 38% more jobs** within a 30-minute door-to-door commute.

52% of residents would have access to **more** jobs than with existing service (shown as green dots on this map). **58%** would have access to a **similar** number of jobs (grey dots). **Less than 0.5%** would have access to **fewer** jobs (lavender dots).

Map of Employers' Access to Workers on Weekdays



During Weekday daytime, **the average job would be reachable by 19% more residents** within a 30-minute door-to-door journey.

72% of jobs would be reachable by **more** residents than with existing service (shown as green dots on this map). **28%** by a **similar** number of residents (grey dots). **Less than 0.5%** would be reachable by **fewer** residents (lavender dots).

Galway, Ireland

Access to Residents Within 30 Minutes
Change on Weekdays in the Daytime

Each dot represents about 10 jobs.

Job locations with access to **fewer** people — Job locations with access to **more** people

-20K -10K -5K -2.5K -1K +1K +2.5K +5K +10K +20K

Fast, Reliable Service with Cross-City Link

The Draft New Network is designed to take advantage of the planned Cross-City Link.

The Cross-City Link scheme is part of BusConnects Galway and the Galway Transport Strategy. The aim of the scheme is to deliver efficient, safe, and integrated sustainable transport movement on a key east-west corridor in Galway City, which it would do by providing improved walking, cycling and bus infrastructure. It would include bus priority lanes and other transport management measures that improve bus performance.

Today bus journeys across the City Centre can be very slow, as buses are delayed by congestion and at junctions. In the 2022 analysis of the scheme, it was estimated that the Link would save buses between 7 and 12 minutes on average when crossing the city centre per direction.

There is also frustrating variability in journey times today. Cross-City Link would reduce that variability, so that the bus journey time across the centre would be reliably fast all day long.

A planning consent application for the scheme is currently before An Bord Pleanála, with a decision expected by the end of 2023. If consent is given for the scheme, then construction could begin immediately and would be completed in 2025.

Nearly all of the proposed routes in the Draft New Network would use the scheme's "Bus Priority Link" between Newcastle Road in the west and Dublin Road in the east.

The map on the next page shows the Bus Priority Link in blue, along University Road, the Salmon Weir Bridge, Eglinton Street, Eyre Square, Forster Street and College Road.

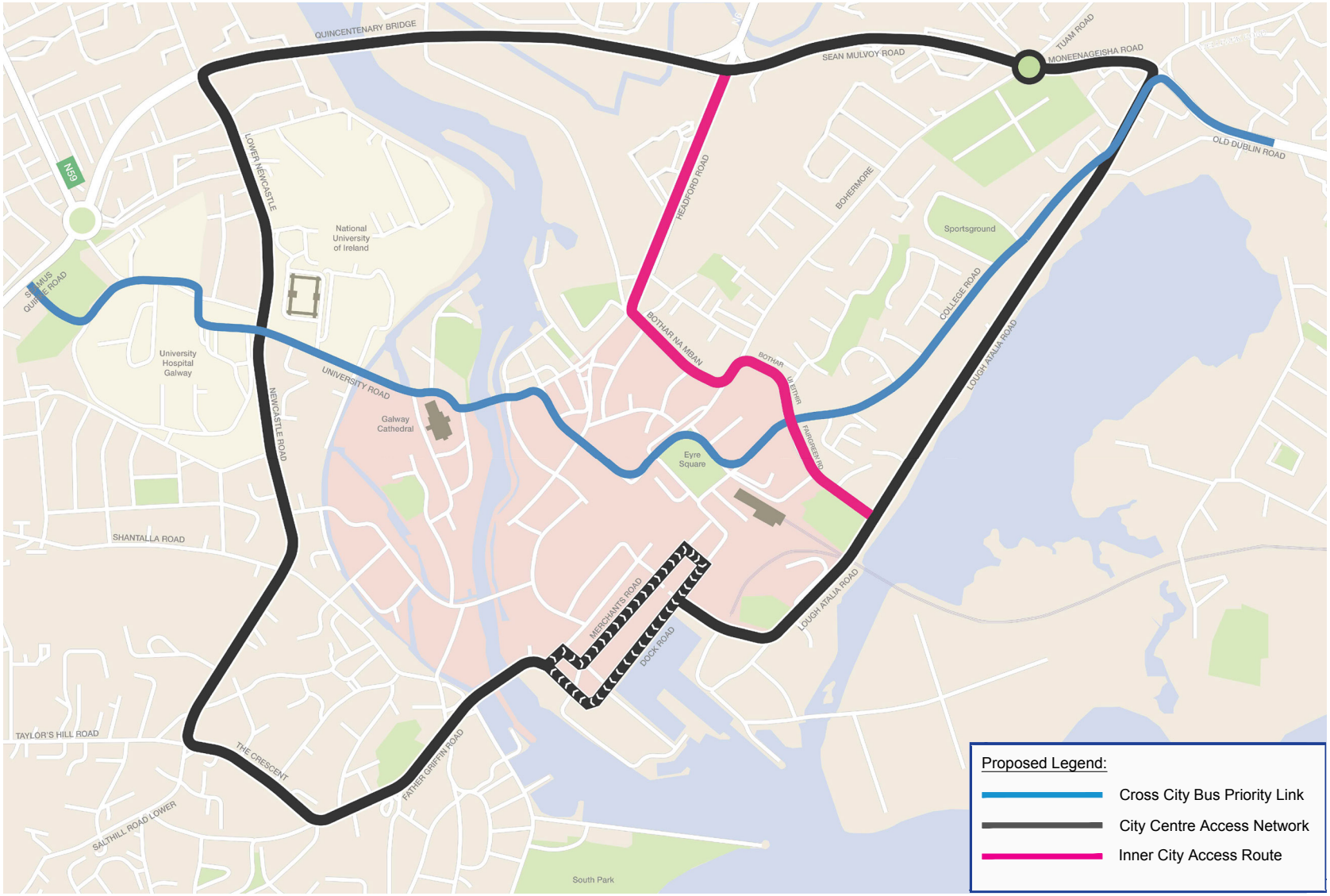
Two proposed routes would use only portions of the Bus Priority Link in the city centre. These two exceptions would ensure that all dense areas of the city centre are within a reasonable walking distance of public transport, and that public transport journeys are direct and linear

- Proposed Route 3 would use Bohermore Road (rather than College Road) to ensure that residents and workers on either side of Bohermore Road have a reasonable walk to a bus. Without Route 3, the walk from a bus stop on Bohermore Road to a stop on the Bus Priority Link on College Road, or to a stop on Headford Road, would be more than 600 m.
- Proposed Route 7 would use Father Griffin Road to enter the city centre rather than University Road and the Salmon Weir Bridge. This would ensure that the many residents of the Claddagh would have a reasonable walk to a bus, as would the workers and visitors near Spanish Parade. It would also provide residents of the Claddagh a direct route into the centre rather than a deviation to the north to reach University Road.

Neither Bohermore Road nor Father Griffin Road will offer buses priority. In fact, in the Cross-City Link scheme Father Griffin Road is proposed as a main route for car movement (shown in black on the next page).

Therefore proposed Routes 3 and 7 are likely to be slower when crossing the city centre than other routes. They may be less appealing to people making long journeys across the centre, but in many of the outlying areas they serve other routes are nearby and could be used for faster cross-city journeys.

Map of Cross-City Link Bus Priority



This map describes the Bus Priority Link, in blue, as proposed in the 2021 Cross-City Link public consultation. Other elements of the scheme shown on this map will be reviewed and may change as part of the update to the Galway Metropolitan Area Transport Strategy, which begins in 2023.

How to Learn About the Draft New Network

In this Report

This Report is one source of information about the Draft New Network. Within this Report you will find:

- The principles used in bus network design, starting on page 22.
- An overview of the existing bus network serving Galway City, Barna and Oranmore, starting on page 29.
- An overview of the demographic and built environment factors in Galway which affect public transport, starting on page 35.
- A description of the Draft New Network, starting on page 67.
- Analysis of how residents' access to jobs and to various frequencies of service, would change with the Draft New Network, starting on page 75.

Online Map

To explore what the Draft New Network would mean for your area and for your journeys, you can refer to the online webmap available at the BusConnects website.

The online map allows you to:

- Zoom in and see detailed routing.
- Look at areas that are difficult to show on these small pages.
- See how average access to jobs or residents would change from your area.
- Create your own access map comparing how far you could travel using the existing network or the Draft New Network.

All routes in the Draft New Network have new numbers!

Give us your feedback on the NTA's project website: www.busconnects.ie/galway

2 Route & Network Design Principles

What Makes a Useful Network?

Access to opportunity, described on the previous pages, is the way that public transport network design can affect **patronage**.

There are many factors that affect patronage which have nothing to do with access or bus network design, such as:

- Overall travel demand
- Public transport fares
- Road tolls
- Fuel prices
- Car ownership rates
- Car park availability

In this report, we focus on factors that the NTA and its local partners in Galway **can** influence:

- **Where** routes go
- Their **frequency** and **hours of service**
- The **connections** among public transport services, and the ease of interchange
- **Land use** and **development patterns**
- **Demographics**, and where people with particular needs are located
- **Street design** and **walkability**

The first three factors on this list have to do with the design of bus routes and of the integrated public transport network. These are the factors proposed to change in the Draft New Network in ways that would make the network more useful for more people.

The latter three factors on this list - land use, demographics and street design – have a heavy influence on the cost and usefulness of public transport. They are primarily controlled by City and County Councils. They cannot be immediately changed through BusConnects, but they can be adapted over the long-term to make public transport more useful and more efficient in Galway. That adaptation will be key to maximizing the benefits of BusConnects.

Free Interchange

In support of BusConnects and this network redesign, a new fare structure will soon be introduced in Galway which reduces barriers and penalties for interchange.

Interchange between urban bus routes will be free. Interchange between rail and bus will not come with an extra charge as fares will be based on distance travelled rather than the number of vehicles or public transport modes used.

Free interchange allows us to design a network that maximises people's access to opportunity and minimises travel times, without the preoccupation of avoiding interchanges. In some cases, in Galway, the fastest trip between two points can be provided for with two frequent and direct bus routes. Whilst there is an inconvenience and slight discomfort involved in interchange, most people have a greater need to get where they are going quickly than to avoid interchange.

A well-connected network is key to high patronage. Routes must connect with one another so that people can reach many different places across the city.

Frequency

One of the most powerful ways to increase access across a network is to shorten waiting times by improving frequency.

More frequent service:

- Reduces waiting time (and thus overall travel time).
- Lets you travel whenever you want.
- Improves reliability, because if you miss your bus or it breaks down, another one is coming soon.
- Makes interchange (between two frequent services) fast and reliable.

When frequency improves in places with large numbers of residents, jobs and other opportunities, that improves access for many people.

Better frequency increases the potential for high patronage, though it isn't enough by itself to cause high patronage.

A high-patronage network is more useful for more people. And most people are in a hurry.

How Frequent is Frequent Enough?

In smaller cities like Galway, peoples' trips tend to be short. Public transport must be very frequent for short trips, since waiting time can dwarf journey time on the bus.

To think about whether any frequency is "frequent enough," imagine waiting one-half of the frequency (since on average, you will) and ask yourself whether you could tolerate waiting that long as part of an everyday trip.

One can imagine that with real-time arrival information available on people's phones, frequency doesn't matter, because nobody needs to wait for a bus anymore. If a bus only comes once an hour, that's alright, because your phone will tell you when you should go to the stop.

Despite this new technology, frequency still matters enormously, because:

- Waiting doesn't just happen at the start of your journey, it also happens at the end. You might not spend time waiting at the stop, but if your bus is infrequent you often have to choose between arriving too early or too late.
    - For example, if you start work at 8:00 am but the bus passes your workplace only at 7:10 and 8:10 am, you have a choice between being 50 minutes early or 10 minutes late.
- You can't always plan the start time of a return journey. You may be able to time your departure from home to the bus timetable, but few people get to decide when their work shift ends, when a film finishes, or when a doctor's appointment ends.

The shorter the trip, the less people tend to tolerate a long wait.

Distance, Cost and Frequency

Within a limited public transport budget, longer routes trade-off against higher frequencies.

This doesn't mean that a high frequency network is all short routes. But it does mean that as a system expands to serve new areas, maintaining high frequency would require investing in more vehicles and paying more drivers.

Alternatively, lengthening routes to serve new areas can be accomplished without new funding, but only by cutting frequencies or hours of service to cover the increased cost of the distance.

One bus can provide 30-minute frequency over a short distance…

…but double the distance means half the frequency. Now the bus comes every 60 minutes.

As routes get longer, a public transport authority must either **cut frequencies** or **spend more** to add buses and drivers to the route.

Speed, Cost and Frequency

Slower speeds have the same effect as longer distances. If the same route takes twice as long to drive now as it did ten years ago, the transport provider needs twice as many buses and drivers to maintain the same frequency.

As public transport slows down, the cost of operating it increases. A public transport provider can either reduce frequencies or come up with additional funding – funding which could otherwise have been used to *improve* service rather than run slower service at a higher cost.

Bus Priority

The link between speeds and operating costs is why **bus priority** is so essential to public transport success in a growing city like Galway.

This is the basis for Cross-City Link and other BusConnects bus priority measures, which will not only speed passenger journeys but also ensure that public transport can operate efficiently and that Galwegians get the most out of the national investment in Galway service.

When congestion slows down public transport, it becomes more costly to operate. This consumes funding that could otherwise be spent to make the service better.

Radial vs. Orbital Services

A public transport network should be greater than the sum of its routes. One route can take people only so many places – but if that route makes connections with many other lines, vastly more places become reachable.

The Galway public transport network is highly **radial**: all lines connect in the city centre. This reflects the shape of the city: all major surface roads lead to the city centre, which comprises the highest concentration of activity, and these radial roads are also very busy and lined with dense housing, shops and offices.

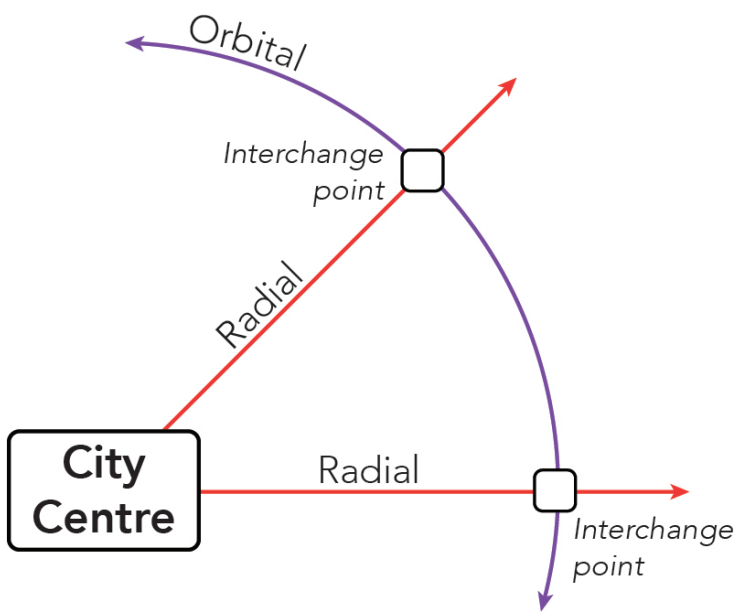
In a purely-radial network, every route connects with every other route at the centre; only one interchange is needed to reach every point in the system.

But as Galway has grown, more journeys take place between outlying locations, and travelling through the centre can feel like a hassle.

Orbital routes might solve this problem, by allowing for cross-city travel without going through the centre. However, the small size of Galway and concentration of demand both along radial roads and in the city centre mean that larger numbers of journeys are served by focusing investment on frequent radial routes. At the same level of funding, adding more orbital routes would mean less frequent service overall, which would lengthen journeys made by great numbers of people.

Cross-City Link and other BusConnects priority measures will allow for faster journeys through the city centre. This will be particularly valuable for people who are crossing the city, rather than starting or ending their trip in the centre.

In the future when Galway is a much larger city, adding an orbital route may result in a more useful network. But at the size foreseen for the next decade, a bigger effect can be made on journey times and the overall usefulness of public transport if the focus is put on higher frequencies, better connections between routes, and bus priority measures through the city centre.



Radial bus routes travel between the City Centre and suburbs. All existing bus routes in Galway are radial, mostly following the main roads in and out of the centre of the city, though with some orbital movements in routes to serve perpendicular roads like Threadneedle, Doughiska or Ballybane Roads.

Orbital bus routes travel between suburbs. This can be useful to connect suburban destinations. However, there is a trade-off between adding orbital service, and making radial routes more frequent.

Connections or Complexity?

There is a trade-off between interchange and complexity that arises from the math and geometry of transport. The more a public transport network is designed to avoid interchange, the more complex it will be, and the poorer the frequencies of many routes.

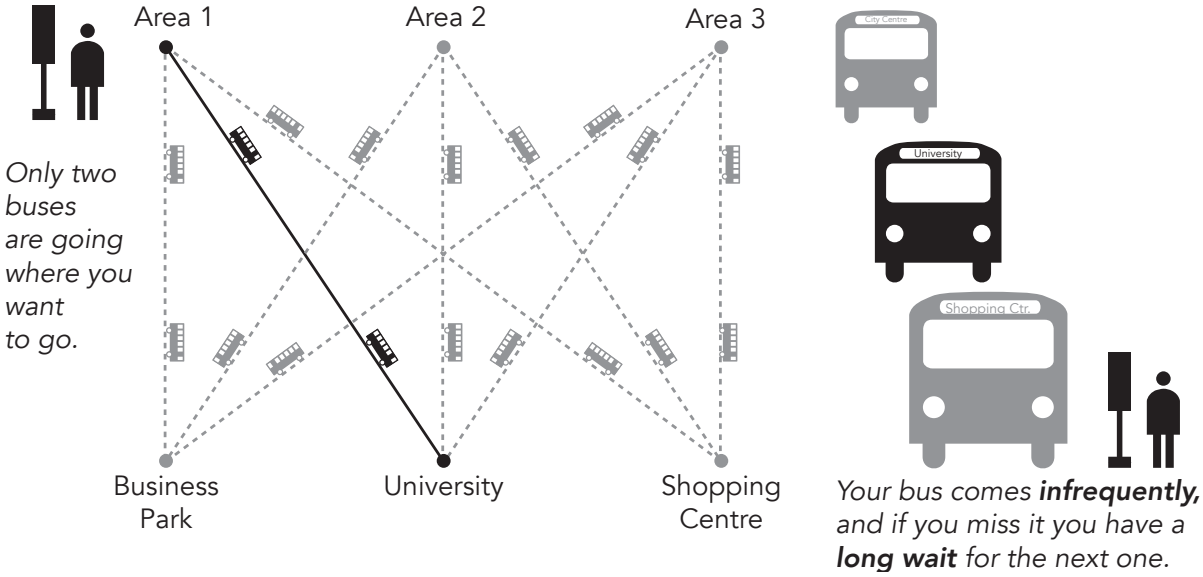
Obviously we would all prefer a one-seat-ride, rather than a second wait for a second bus. But making that wish come true for all would spread service thin, and thereby make it less useful.

The illustrations on this page and the next page show why designing a network for some interchange allows for higher frequencies, better reliability and shorter journey times overall.

The network at right is made of direct routes, one from each of three residential areas to each of three major destinations.

There are a total of nine routes, but each is only run by two buses, so the frequencies are poor. You always get a direct journey, but you can't depart when you want to, you have to time your departure to the bus schedule. If you miss their bus, it's a long wait until the next one.

Direct Routes, Higher Complexity



In contrast, the network on this page serves the same six places but uses fewer routes.

Each route offers much better frequency. In order to make this high frequency service possible, the available buses must be concentrated onto fewer routes, which means that some interchange is required. But the high frequencies make those interchanges fast and reliable.

In this more frequent network, you can depart at the right time for your work shift or class, because a bus is always coming soon. Your needn't arrive too early just because that's when the bus timetable dictates. You spend less time waiting for the bus and **your door-to-door travel time is shorter – despite the interchange**.

An important thing to note about these two networks is that *they cost the same to operate.*

Even with the increase in service envisioned by BusConnects Galway, it is not possible to improve route frequencies in Galway if the network must also be designed to avoid interchange.

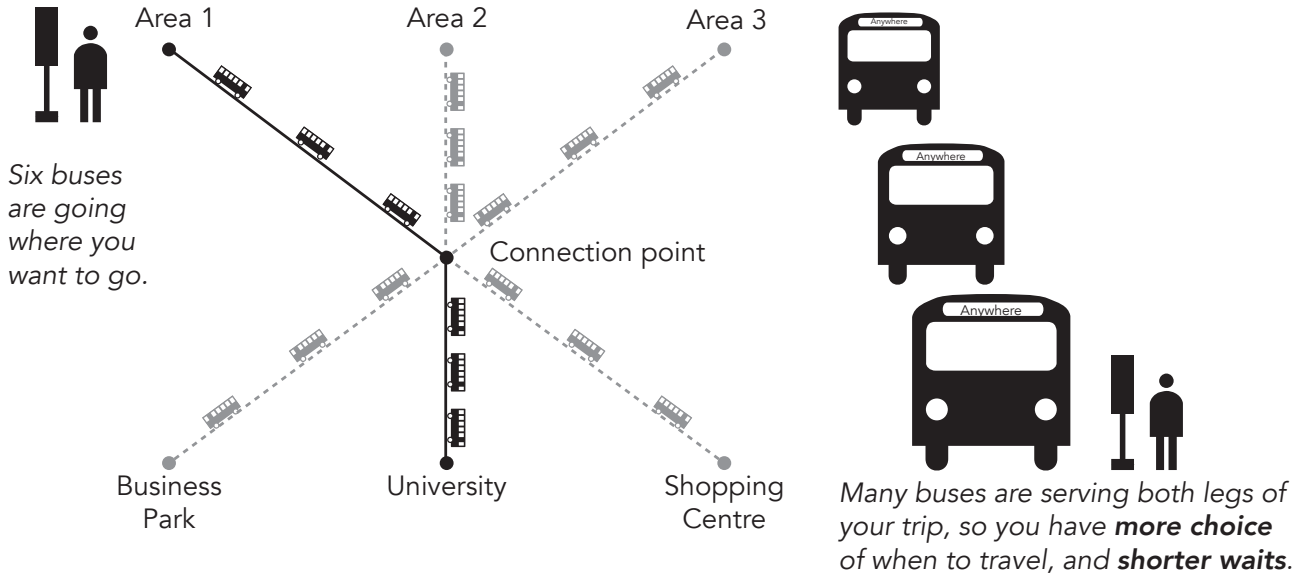
Designing the Galway bus network to avoid interchange would mean running a "spaghetti-pile" of routes, from every area to every other area. With so many unique routes, they would have a poor frequency, because the available service would be divided across all of them.

People would save a little time by avoiding interchange, but they would lose more time due to the poor frequencies of the routes. Such a network would also be complex and hard for people to learn and remember, especially people new to the city.

Whilst everyone would understandably prefer a route that goes directly from where they live to where they work; and another route that does the same to where they shop; and a third to where they socialise...satisfying those individual desires would result in an infrequent network that few people would find useful.

This is why the Draft New Network is designed with an acceptance that some journeys will involve interchange.

Connections, Lower Complexity



3 The Existing Bus Network

This chapter describes the Existing Network, route frequencies and hours of service, and how the network serves coverage and patronage goals:

- To describe coverage provided by the Existing Network, a map and analysis are provided describing how many people are within a short walk of any bus service.
- To describe the patronage potential of the Existing Network, an analysis is provided which shows how many people are within a short walk of *frequent* service, as high frequency correlates with high patronage.

Recent Improvements

The Galway urban bus network has had some improvements in frequency and design in the past 7 years. Investment in higher frequency on Route 409 is an example.

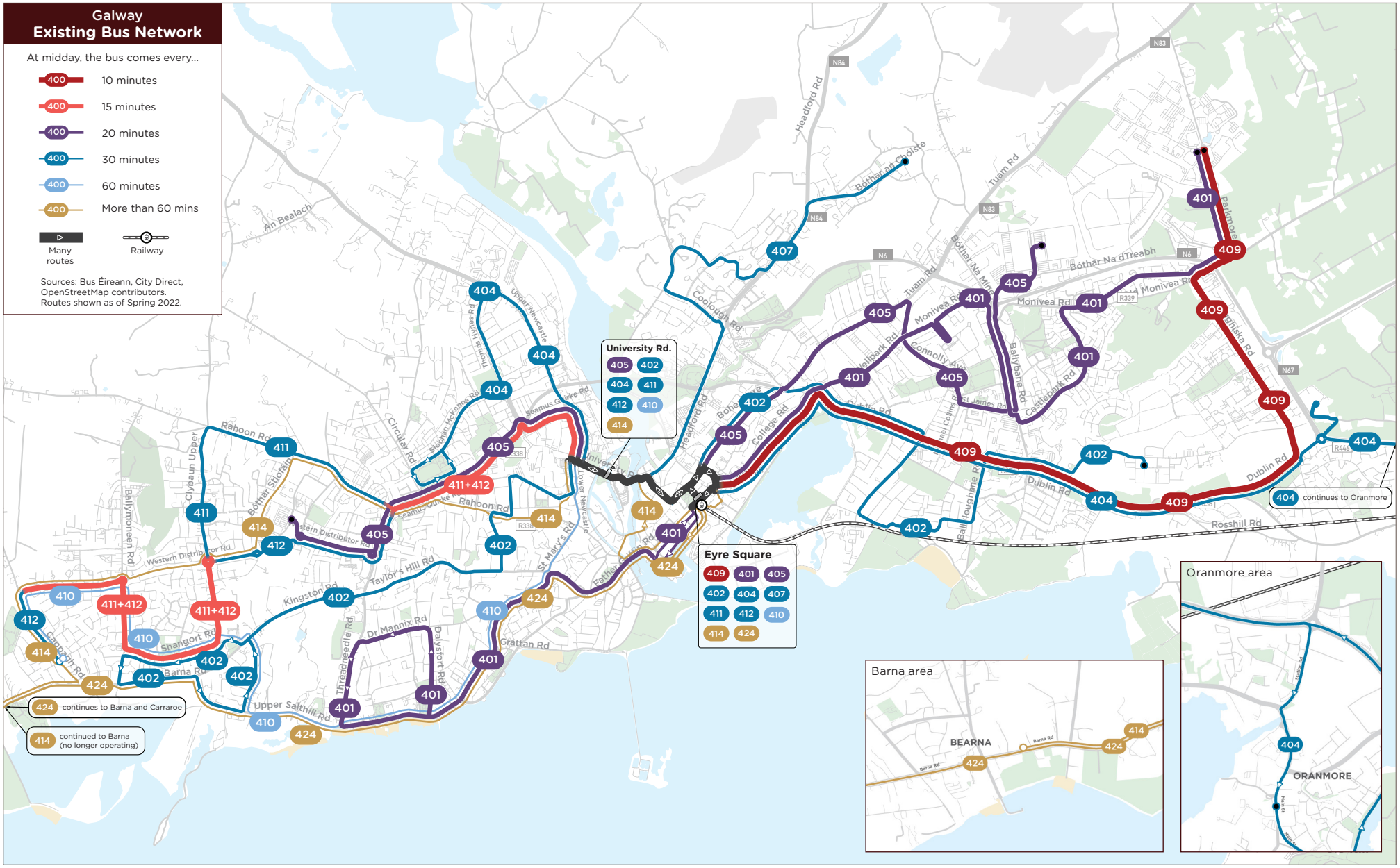
Whilst many existing routes are well-designed to meet existing demand and needs, with suitable frequencies, a blank-slate redesign and increased service budget make it possible to contemplate greater improvements.

Colour Represents Frequency

The graphics and maps on the following pages use **colour to represent frequency:**

- **Red** represents frequent service, with a bus coming every 15 minutes or better.
- **Dark red** indicates service every 10 minutes.
- **Purple** is for routes coming every 20 minutes.
- **Dark blue** routes come every 30 minutes
- **Light blue** routes come every 60 minutes.

Map of the 2022 Existing Network



Existing Frequencies and Hours of Service

The graphic below uses colour to convey the frequency of each existing urban bus route, during each hour of the day on weekdays, Saturdays and Sundays. (Text tables with the same information are provided starting on page 96).

The Existing Network consists of 10 routes, operated by Bus Éireann or City Direct.

Span of Service

Nine routes operate on Saturdays, and eight operate on Sundays.

Daily spans (hours of service) vary on each route. Most routes offer service all day on weekdays starting around 6 or 7 am, with similar start times on Saturdays. On Sundays, most routes start one hour later.

Mondays-through-Saturdays, six routes operate until about 11 pm, and four operate until about 12 am.

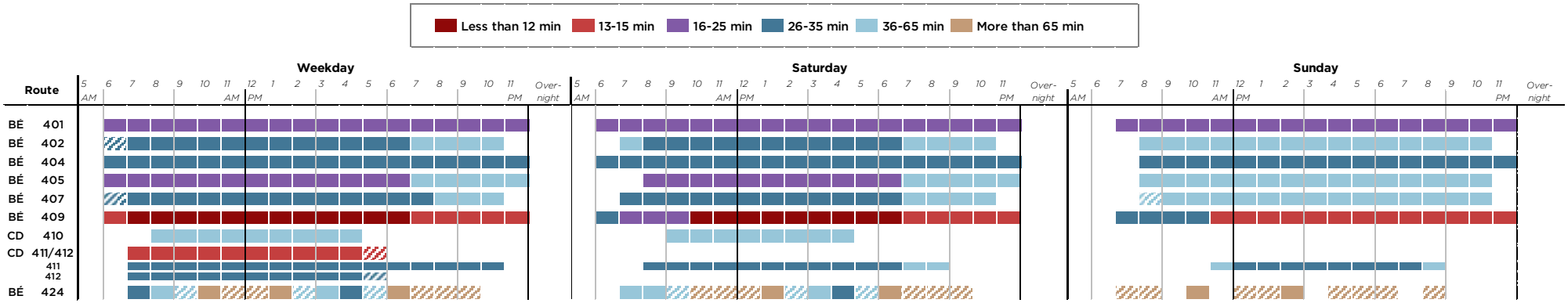
Frequent Network

The Galway frequent network today is quite minimal. In a small city, where journeys are short, a frequency worse than every 15 minutes will not compete well against driving, hiring a taxi, cycling or just walking all the way. The shorter someone's trip, the less they will tolerate a long wait for the bus before finding an alternative.

Only two routes in the existing network offers service coming every 15 minutes or better, on weekdays – Route 409 and the combined portions of Routes 411 and 412.

On weekends, Route 409 maintains its high frequency, and no other route offers waits of 15 minutes or less.

Galway Urban Bus Route Frequencies, June 2022



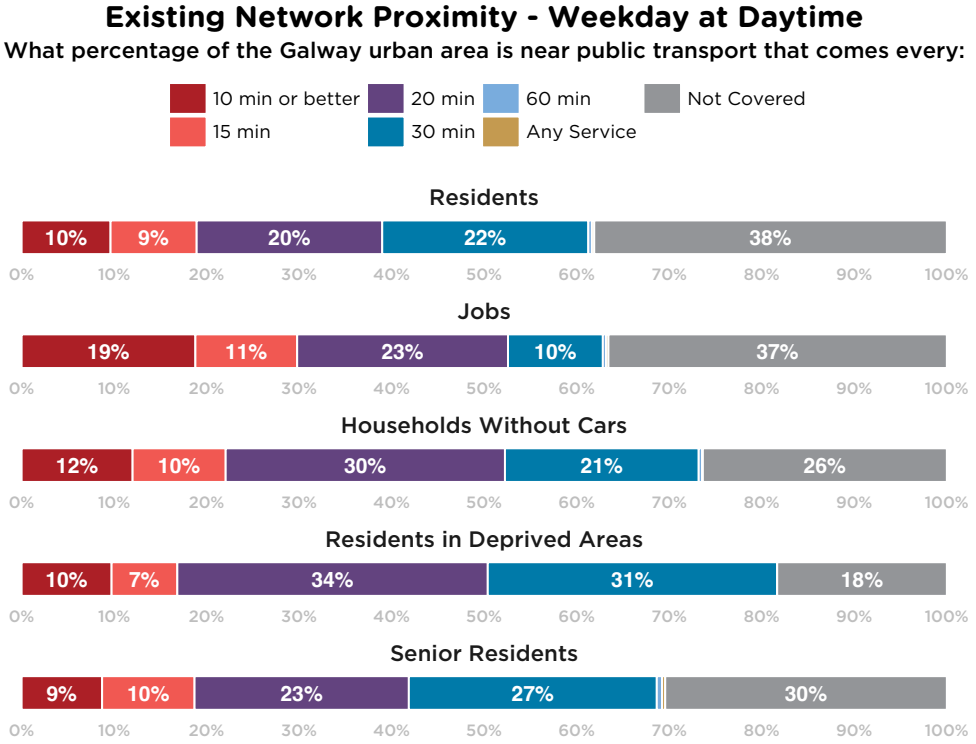
Proximity to Any Service, and Frequent Service

The graphic to the right shows how many people and jobs are close to public transport at different frequencies in the study area (including Bearna and Oranmore). As of the 2016 Census (which is still the most recent available for this purpose), there were about 90,000 residents and 50,000 jobs in the study area.

62% of the area's residents and 63% of jobs are within a 400 m walk (about five minutes) of bus routes of any frequency. These figures are higher for households without cars (74%), residents in deprived areas (82%) and seniors (70%). Increasing the percentage of residents and jobs near **any service** addresses **coverage** goals such as social inclusion.

The map on the following page shows which buildings (residences and workplaces) are today within a 400 m walk of bus service of any frequency. Buildings shown in green are within a 5 minute walk of a bus stop, and buildings in orange are not. In some areas, buildings are close to a bus stop as-the-crow-flies but, due to a lack of street and footpath connections, the walk to that bus stop is long.

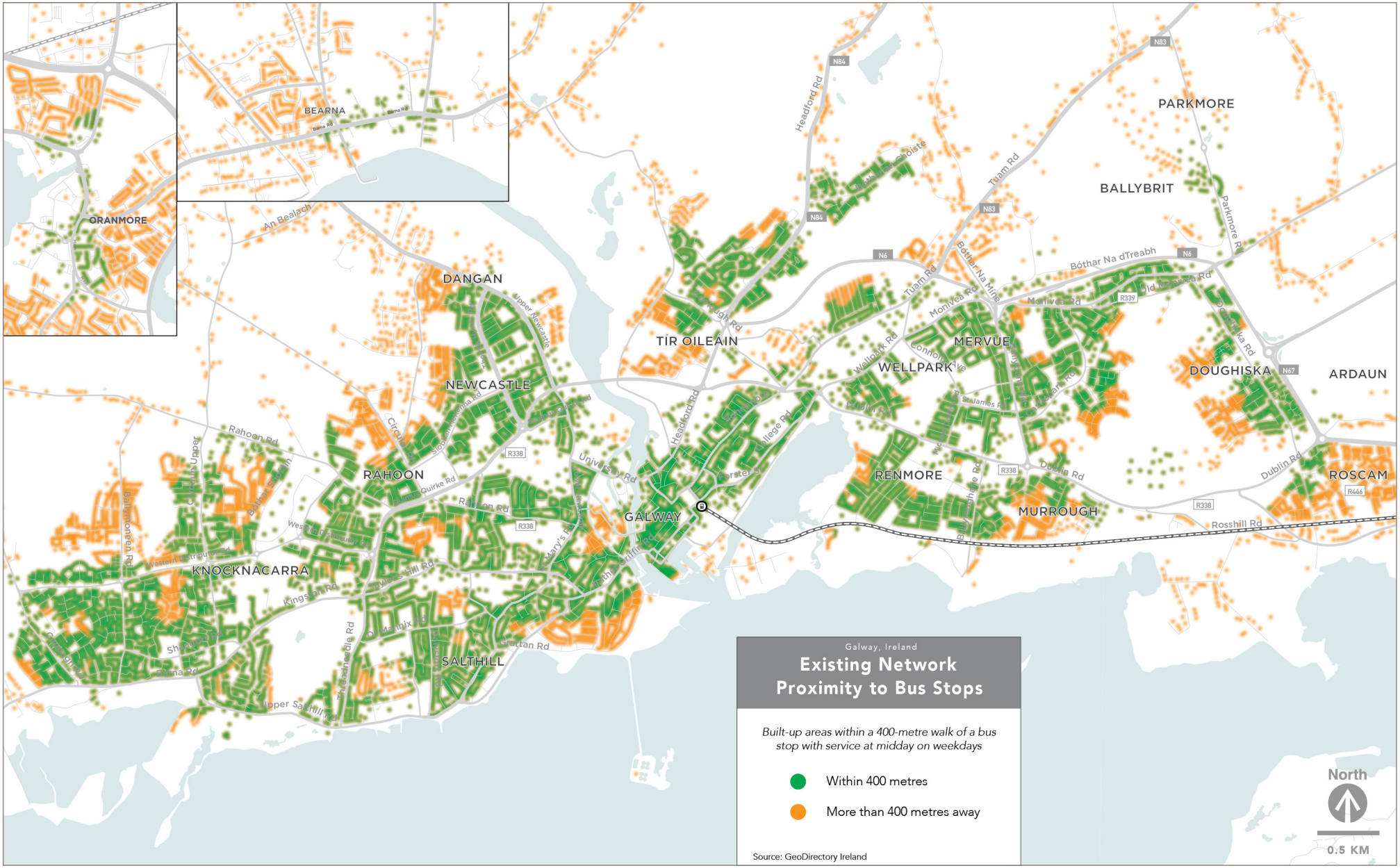
Only 19% of residents and 30% of jobs are within a 400 m walk of frequent public transport (coming every 15 mins. or better). The figures are similar for households without cars (22%), residents in deprived areas (17%) and seniors (19%). Increasing the number of people near **frequent service** addresses **patronage** goals, as higher frequency services tend to be more useful and attract more passengers. It also supports social inclusion, as people living in situations of deprivation, seniors, and people without cars value their time and benefit from more frequent service.



Note: Proximity is measured as being located within 400 m of a bus stop.

81% of Galway residents are more than 5 minutes' walk from a frequent bus.

Map of Existing Network Coverage



4 Analysis of Markets and Needs

In this chapter, we present data that informs two different considerations in transport planning:

- *Where are the strongest markets for transport, with potential for high patronage and low operating costs?*
- *Where do people have moderate or severe needs for transport, where services may be justified regardless of patronage or cost?*

Indicators of Strong Public Transport Markets, or High Needs

The maps on the following pages show:

- Residential density
- Job and education density
- Activity density, which combines residents, jobs and education into one measure
- Density of no-car households
- Areas of affluence and deprivation
- Density of unemployed residents
- Density of young residents (ages 17 and under)
- Density of senior residents (ages 65 and over)

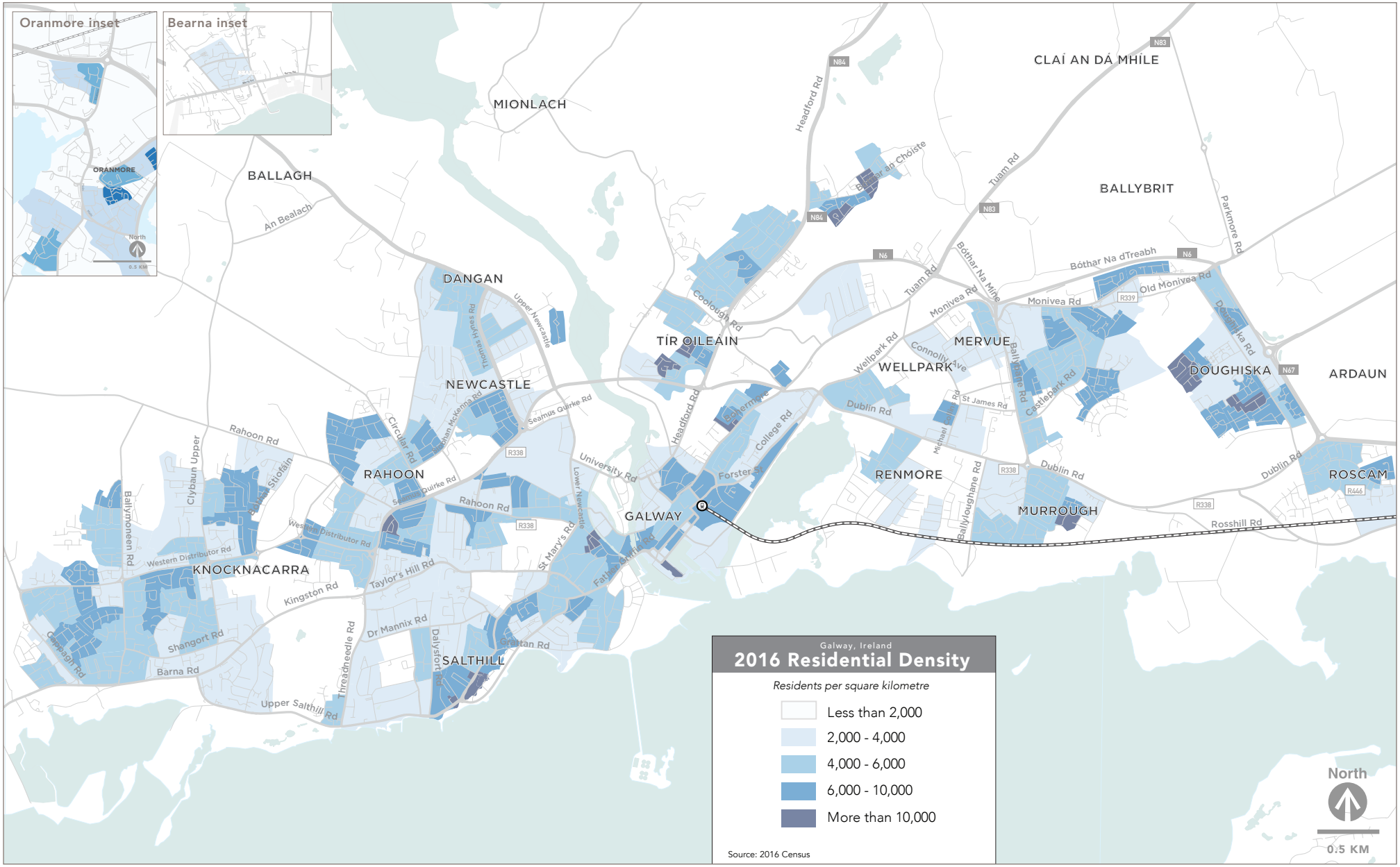
Many of the maps use 2016 Census data, which does not reflect developments since 2016 in areas like Oranmore, Roscam, Ballymoneen, and the city centre.

In designing the Draft New Network, the network redesign planning team did not rely on Census data alone. The team worked closely with staff from Galway City Council, Galway County Council, Bus Éireann and City Direct to ensure that the Draft New Network would address current conditions and imminent development which will be built by 2025, as well as changes in bus patronage and demand since the pandemic.

Most of the maps on the following pages show the density of each population group across the area. However, density on its own is not enough to support high patronage. We must examine these maps for all of the land use qualities that indicate high patronage potential, in addition to density:

- **Walkability**. Even if numerous people are near a stop, for many of them to use public transport the walk to the stop must be a reasonable distance and the walking conditions must be safe and appealing.
- **Linearity**. Only when dense developments are arranged in linear patterns, along bus-operable roads, can bus routes can be direct whilst getting close to large numbers of people and activities. This also makes them more efficient, which supports higher frequency.
- **Continuity**. Crossing rural areas and open space takes time and therefore consumes operating budget. This means that the farther apart built-up areas are, the greater the cost to connect them, or the worse frequency can be offered across that distance.
- **Mix of Uses.** When places are dense with many types of development, public transport can work efficiently in both directions at many times of the day and week.

Residential Density



Relevance

Understanding where many people live close together can help us see where there is a strong market for public transport. Many journeys start and end at home, so places where many people live have potential for high patronage.

People's homes also serve as destinations for other people's trips such as for visiting, caring for family, or receiving services someone provides from home.

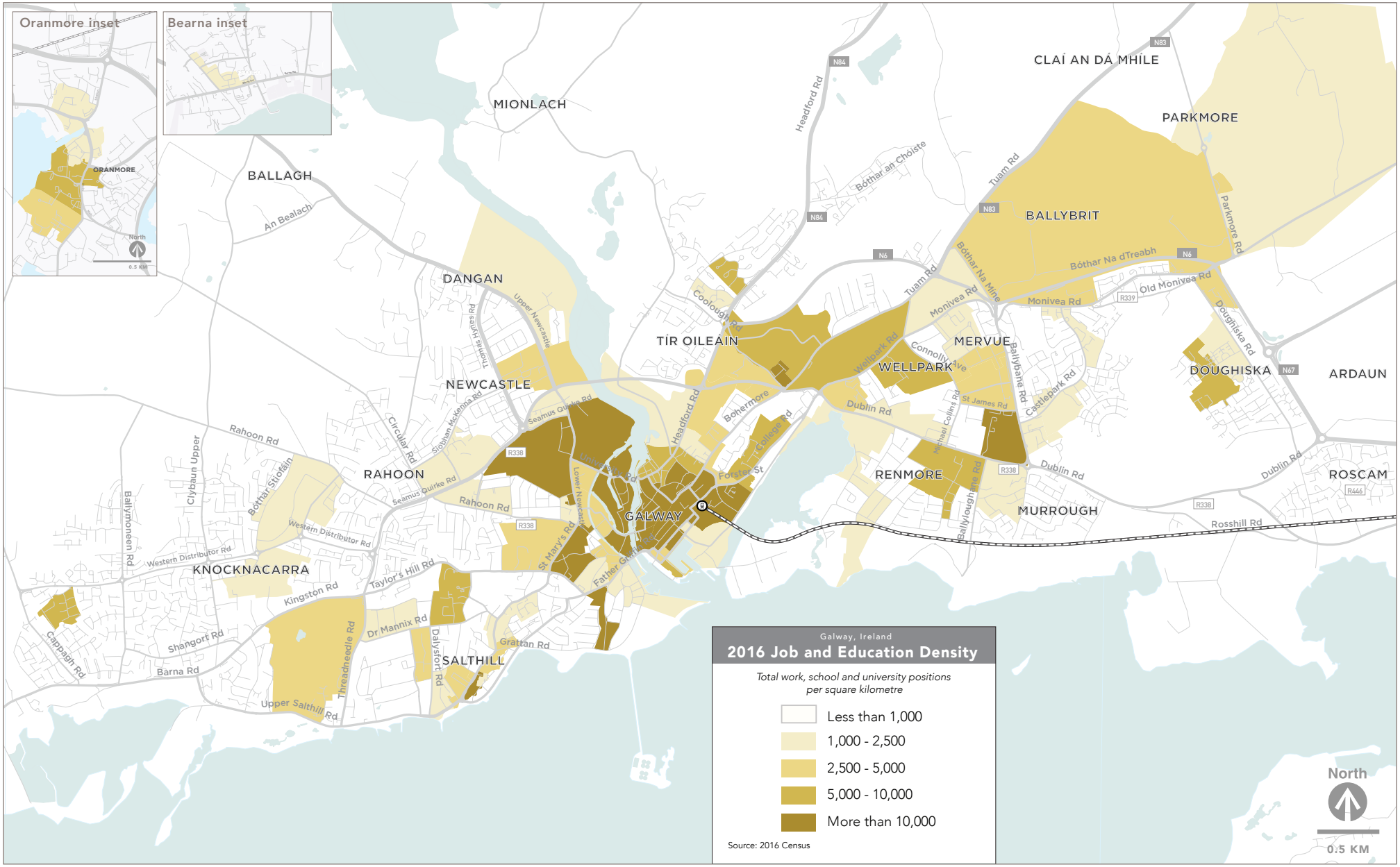
Observations

Dense residential areas are fairly **scattered** across Galway, rather than concentrated around certain roads or in certain areas.

Some of the densest residential areas are in places that are **hard to reach**, such as in **Castlegar** a fair distance from the Headford Road; in **Doughiska** set far back from Doughiska Road; and in **Murrough** set far back from Dublin Road.

There is a linear pattern of high residential density across the historic portion of the city, from **Salthill**, along both **Salthill and Father Griffin Roads**, across the **city centre**, and out **Bohermore and College Roads**.

Job & Education Density



Relevance

The density of jobs and school or university positions show the areas to which many people travel on a daily basis. The map on the previous page sums together the number of jobs in each area, plus the number of enrolment positions available in schools, colleges and universities.

However, helping people travel to these destinations is about more than just commutes. Job locations also represent shops, restaurants, hospitals, services, and all of the other places that people go as part of a full life.

University campuses, in addition to attracting students, are also important destinations for the faculty and staff that support their studies, researchers, visitors, and, in the case of medical schools and teaching hospitals, patients seeking care.

Observations

Jobs and education positions are highly concentrated near the city centre.

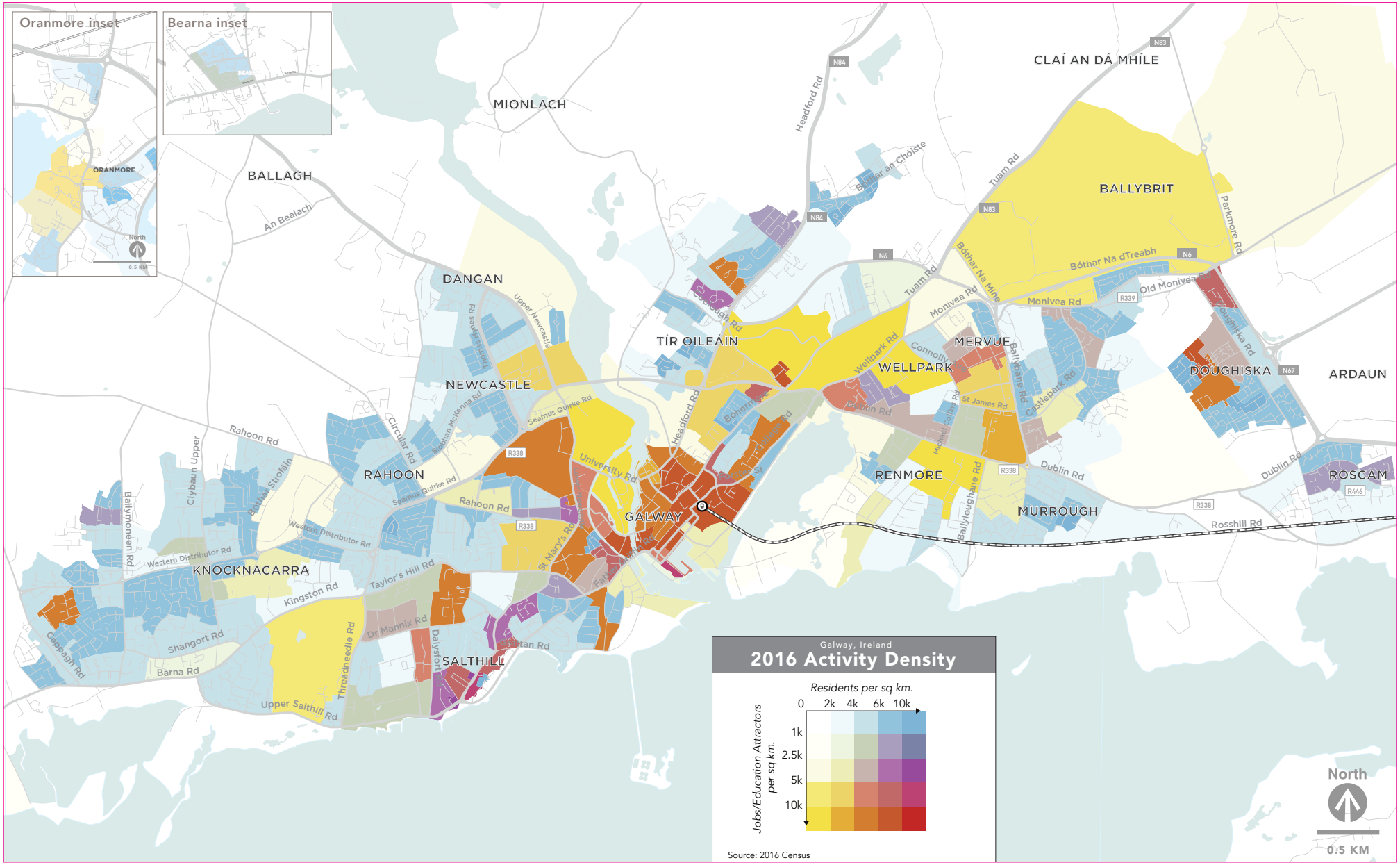
Lesser-densities are apparent along **Salthill, St. Mary's and Newcastle Roads** on the west side of the city; along **Tuam and Wellpark Roads** on the east side; and along **Dublin Road** between Headford Road and Ballybane Road.

Below the **Ballybrit** label on this map is a large area of moderate density. This is in fact a dense job area with its data spread across a very large zone (which includes the racecourse). Most of the jobs are not located along Tuam Road and the N6 motorway as suggested by this map, but rather in the **Ballybrit Industrial Estate** which is only reachable via a single entrance at its south end.

Parkmore appears on this map to have low job density, but with more recent data it would likely appear to have moderate density. It is unlikely to appear as dense as the city centre, because so much of the area in **Parkmore Business Park** is given over to car parks and roads, resulting in fewer jobs per square kilometre (and fewer jobs near any given bus stop) than in pre-car developments.

The cluster of moderate activity density in **Doughiska** is attributable to a primary school and college located next to one another, about 350 m from Doughiska Road, with dense housing nearby.

Activity Density



Relevance

The map of activity density on the previous page shows the density of residents, jobs, and education positions together.

The Activity Density map allows us to identify corridors that are:

- *Continuously* dense, so that bus service needn't cross empty gaps; and
- With a *mix of uses*, so that buses will be well-used all day and all week, in both directions.

This is an important map for use in the design of high patronage bus routes. However, some of the zones in Census data are extremely large, and can therefore be misleading about the actual location of housing, jobs or schools. For example, the area south of Kingston and west of Threadneedle Roads appears to be dense with jobs or schools. In fact it is one big zone that mostly consists of a golf course, but with two major schools located on Threadneedle Road itself. The zone labelled "Ballybrit" is similarly large and vague, because the jobs are concentrated in its western part whilst the eastern part is the race course. Notwithstanding this map's importance as a reference, in the design of the Draft New Network it has been supplemented by staff with detailed knowledge of the city.

Observations

On the west side, there is continuous high density and a mix of uses all the way **from Salthill to the city centre**, along **Salthill/St. Mary's/Newcastle Roads**, and along **Father Griffin Road**.

Upper Newcastle Road, along which university and student housing have been recently developed, is likely now denser than it appears from 2016 data. However, it would be hard to match the density and mix of uses of the **older university and hospital campuses** to the south.

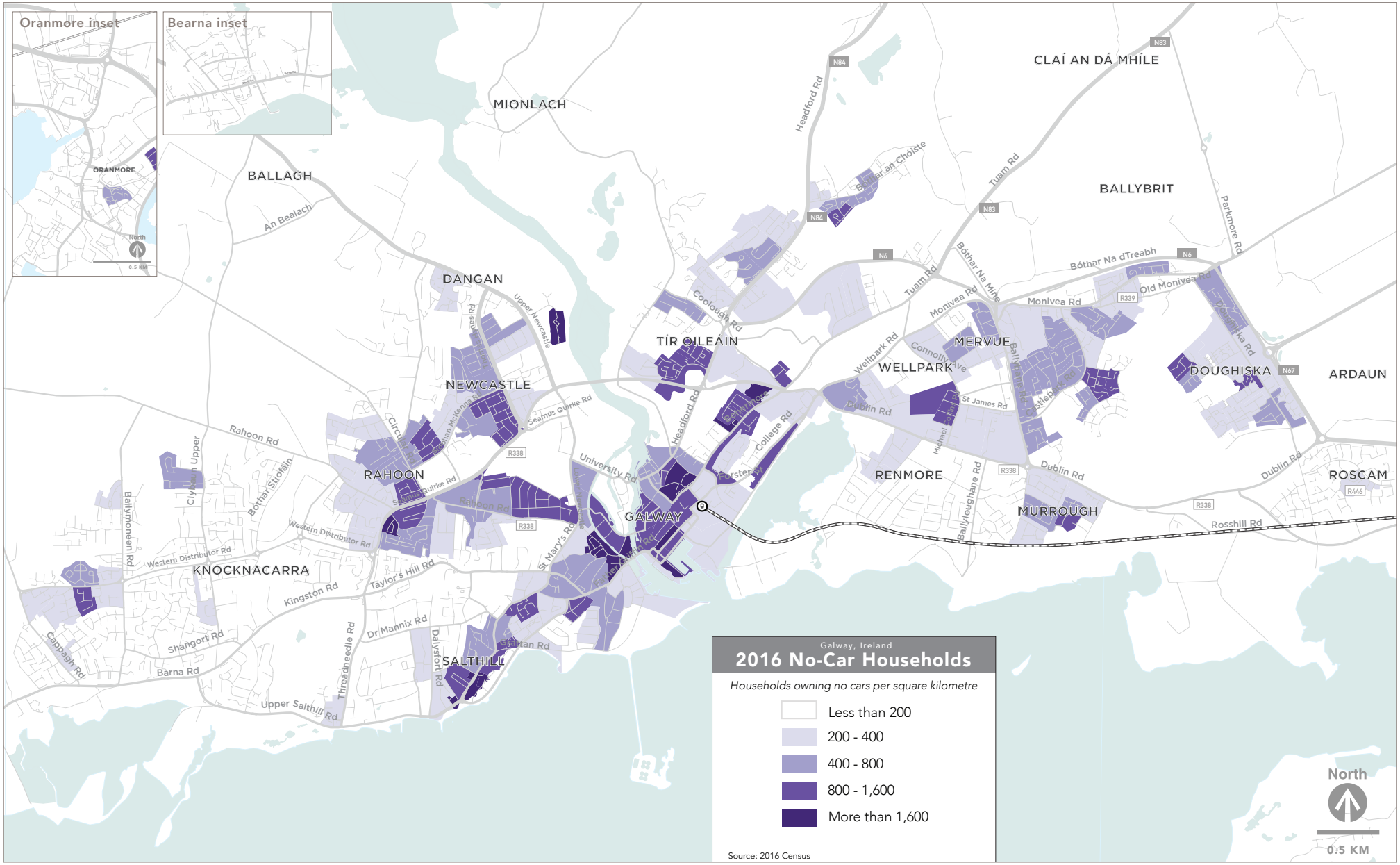
Knocknacarra has a very low mix of uses, being almost entirely residential with a few schools. This means that travel demand will likely be more directional than in mixed-use areas, with higher demand to go inbound towards the city in the morning than outbound, and vice versa in the afternoons. Combined with the fact that Knocknacarra has fairly low densities, patronage per bus, per hour, is unlikely to be as high in Knocknacarra than in mixed-use areas.

On the east side, **Headford Road, Bohermore Road, College/Wellpark Roads and the inner segment of Dublin Road** offer long, linear routes with a continuously-dense mix of uses along them. The **Coast Road and the outer segment of Dublin Road** have less density.

Doughiska and Ballybane Roads are dense with mixed uses, though because they are perpendicular/orbital in orientation (rather than radial into the centre) it is tricky to design a network that serves them well without making routes terribly circuitous.

In the **Doughiska** area, there is a dense mix of uses arising from housing, shops and schools. However, the densest areas are set back from the road, resulting in longer walks for passengers. If public transport were to deviate off of Doughiska Road to get closer to these areas, it would make the route circuitous for through-riding passengers. The same is true in **Murrough** and **Roscam**, where the denser housing has been located away from the roads that buses will run on.

Density of No-Car Households



Relevance

The map on the previous page shows where no-car households are concentrated in Galway.

The presence of households with no cars indicates both potential for high patronage and a need for public transport service.

In places that are far from the city centre, people without cars may have few options besides public transport for reaching jobs and services beyond their immediate area.

Observations

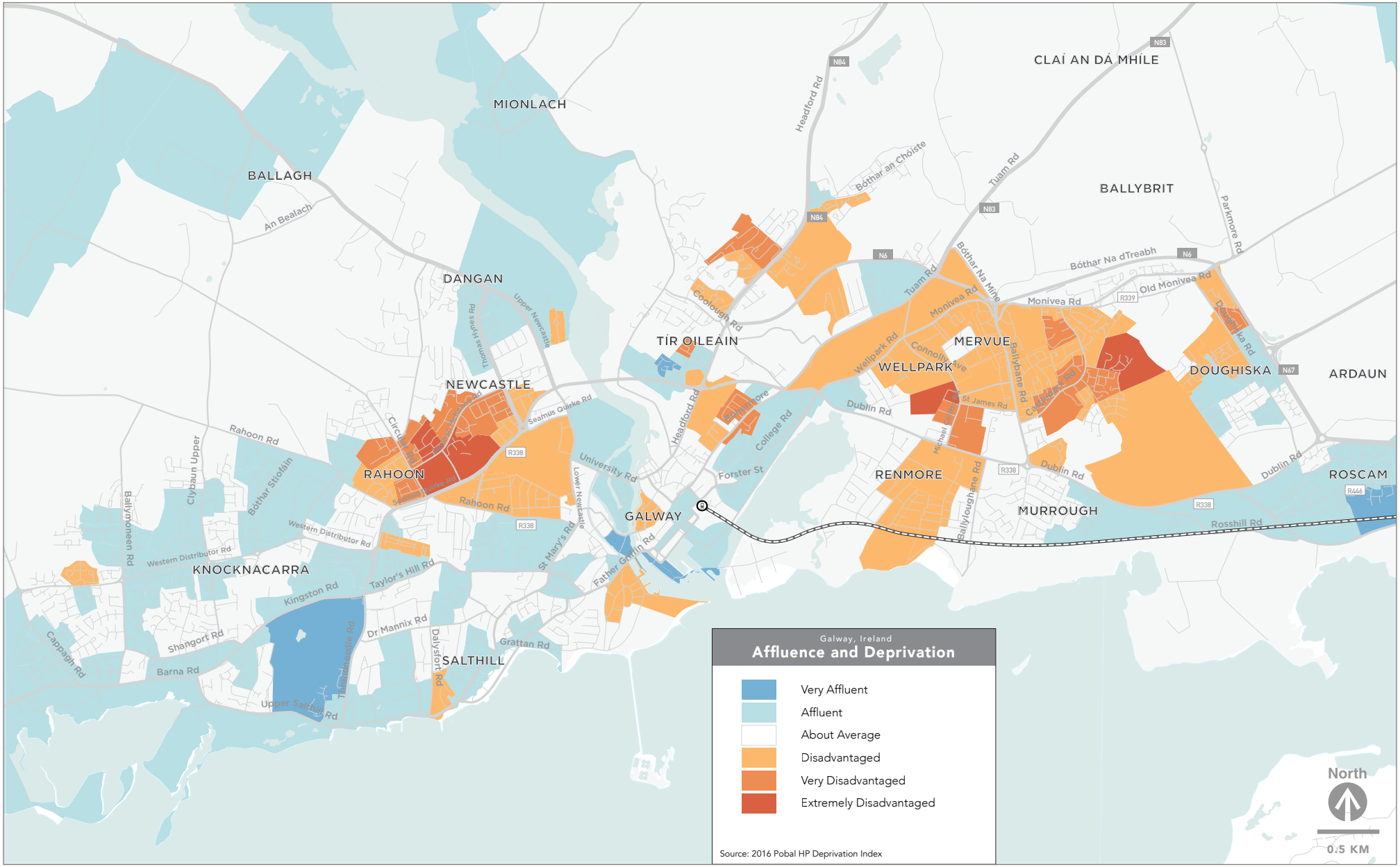
There are high densities of no-car households in and close to the **city centre**.

Many are so close to the centre and other major destinations that walking and cycling are probably the most time-competitive mode for many trips. Others are approximately two kilometres from the centre in **Salthill, Rahoon, Newcastle**, and along **Headford, Bohermore and College Roads**, far enough that the bus may be more appealing than cycling or walking for many people, especially on a cold and rainy day.

Areas dense with no-car households are scattered across the **east side** of the city. On the west side in **Knocknacarra** the density of no-car households is very low.

Note that there are some no-car households even in areas shown as white on this map, but the number of such households per square kilometre is low in those areas. This suggests lower patronage potential, and a smaller number of people who could benefit from service to the area, compared to places where more no-car households would be within walking distance of each bus stop.

Levels of Affluence or Deprivation



Relevance

The map of affluence and deprivation on the previous page shows the variation of the Pobal HP Deprivation Index in 2016 in the Galway urban area[1]. Unlike other maps in this chapter, this is not a map of density, but shows the relative levels of affluence or deprivation in each area.

The areas shown in all three shades of orange/red on this map are the areas used in analysis cited elsewhere, to define which residents are living in areas of deprivation.

Affluence and deprivation tend to affect people's travel behaviour Affluent people travel more, on average, because they have money to spend on travel itself and on activities they enjoy. But affluent people are also more likely to own their own cars or pay to hire a car. Therefore, affluent areas can generate high public transport patronage, but only if the service is convenient, because most people have a ready alternative to hand.

People with lesser means travel less on average. However, they are also less likely to own cars. They have a greater incentive to use public transport rather than buy their own car, or pay to hire a car, in order to save money. High deprivation areas can therefore be places where public transport is socially important and badly needed, even if few people live in the area. High deprivation areas that are also dense with residents are almost always areas of high patronage.

Observations

There is little similarity between the patterns on this map and the patterns on the no-car households map. One reason is that this is a categorical map, whilst the no-car households map is a density map. An area may have high deprivation and correspondingly few cars but, if only a small number of people live there, it is not *dense* with no-car households.

Another reason may be that the **city centre** and adjacent areas are difficult places to park and drive a car. Affluent and middle-income people may spend extra on housing to live in the centre for the convenience and lifestyle, but eschew a car because of the hassle involved in storing it. It is not unusual for city centres to have low car ownership but average affluence.

Wellpark, Mervue and Castlepark show up as disadvantaged on this map, as do some areas along **Headford Road**. Part of **Doughiska** appears moderately disadvantaged, whilst another part appears moderately affluent.

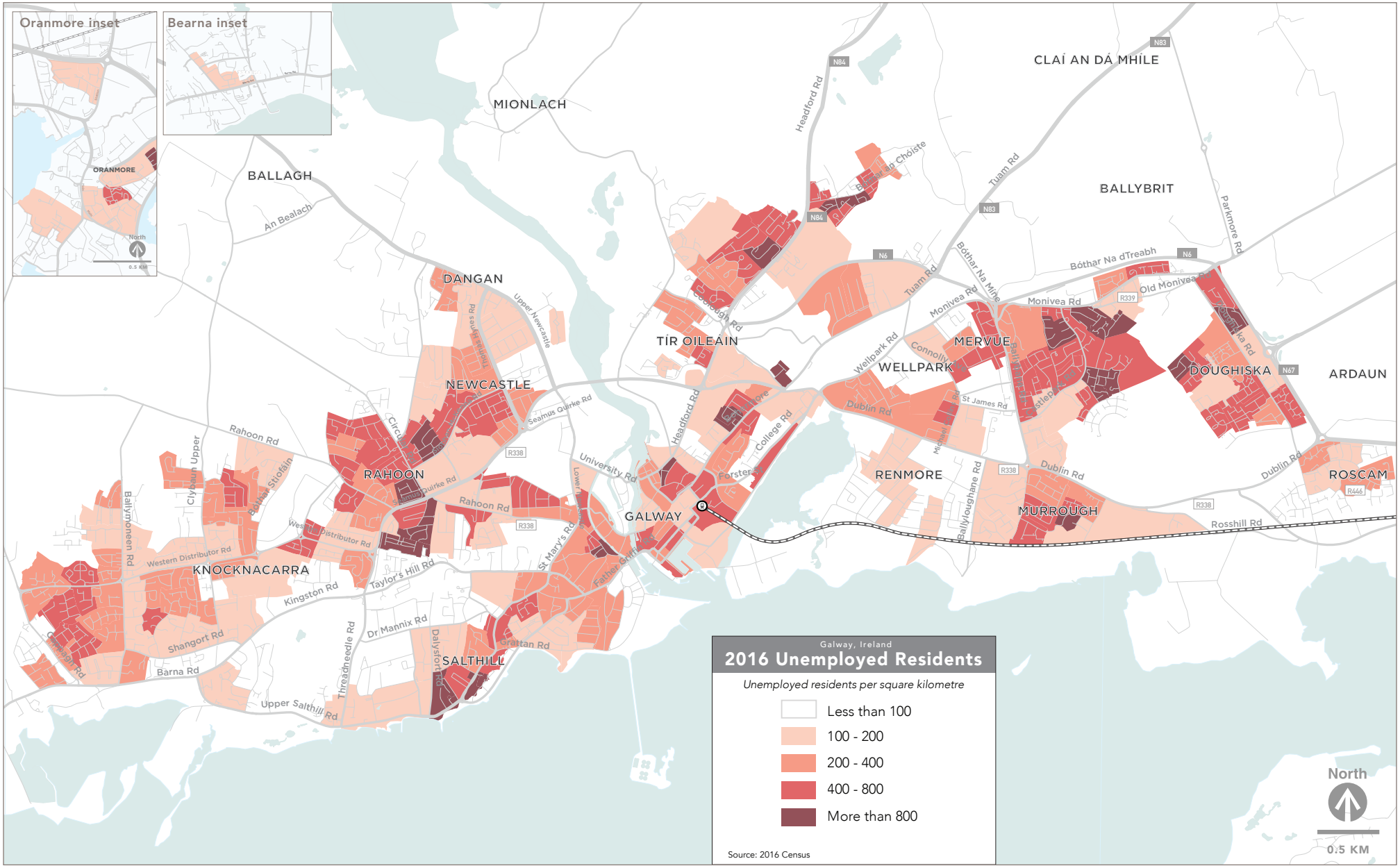
There is a very large cluster of disadvantaged areas in **Rahoon**, along **Seamus Quirke Road**. **Knocknacarra** shows moderate affluence over quite a large area, in contrast to the rest of the city. **Murrough** and **Roscam** also appear moderately affluent.

Note that this data includes university students, whose incomes are generally low or zero, but most of whom are not experiencing deprivation in the same sense as other residents.

Additional construction since 2016 has likely changed the affluence of some of the zones on this map. Knowledge of recent developments and demographic changes was contributed to this redesign process by local staff.

1 More details about the Deprivation Index can be found at the archived Trutz Haase website.

Density of Unemployed Residents



Relevance

The map on the previous page shows where people who were unemployed in 2016 were concentrated. This data does not include people who were enrolled in university, permanently disabled or retired, only those actively seeking work.

Unemployment in 2023 is known to be lower than in 2016 and so the patterns shown on this map are sure to have changed since the data were collected.

It may seem strange to focus on unemployed people as a source of transport demand or need, given that unemployment typically requires less travel than employment. However, a map of unemployment density adds important context. It helps identify areas where many people may benefit from better access to employment and educational opportunities, even if the average person may not be severely deprived.

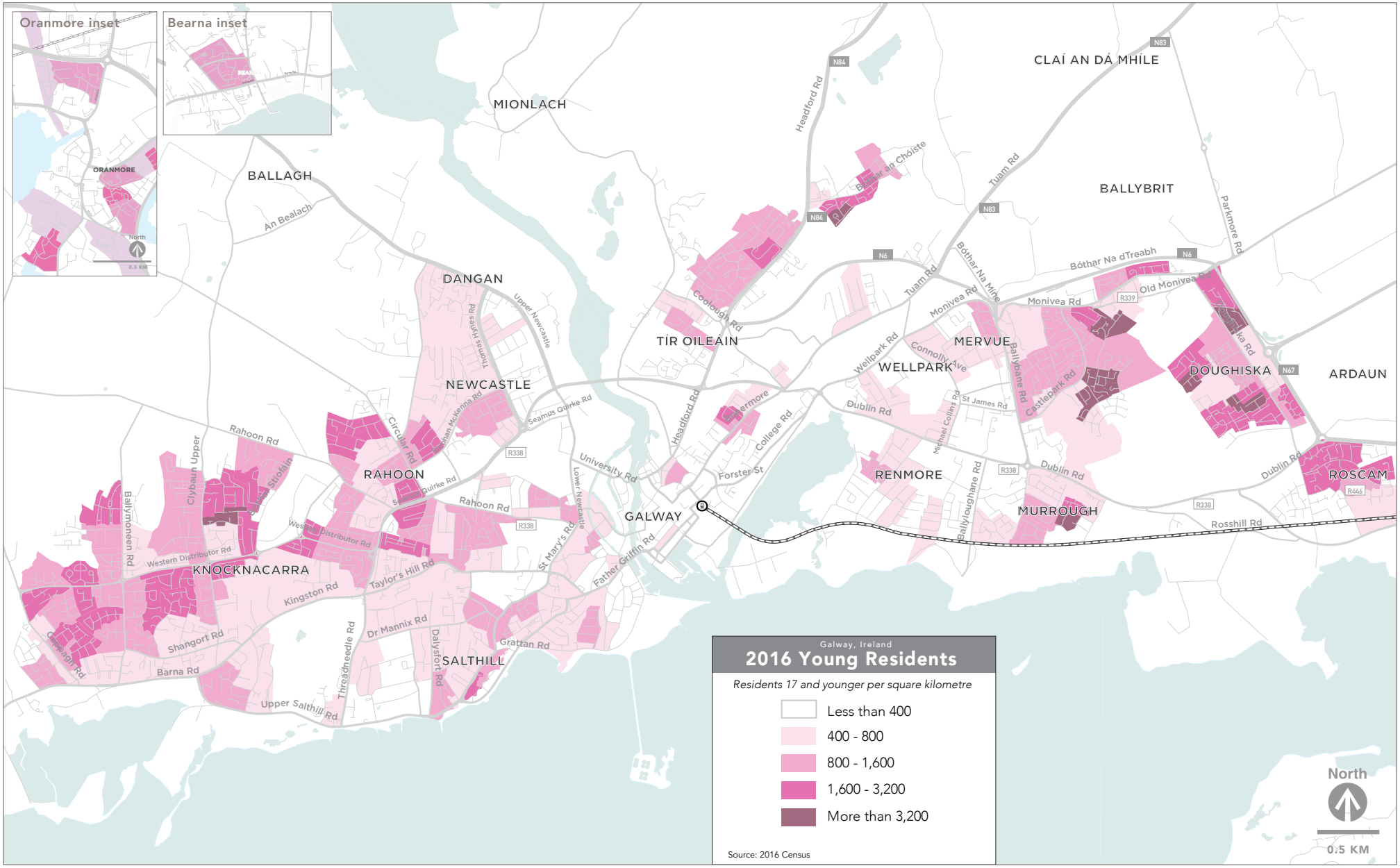
Together, maps of unemployment and deprivation help identify where public transport would be valuable for social reasons. In denser and more central areas, this need complements patronage goals. In outlying areas with low density, public transport may not attract high patronage but can fulfil coverage and inclusion goals.

Observations

Areas with high densities of unemployed residents are visible in **Rahoon**, **Salthill**, along the **Headford and Bohermore Roads**, in **Castlepark, Murrough and Doughiska**.

In the latter three areas – **Castlepark, Murrough and Doughiska** – the areas that are densest with unemployed residents are mostly set off from the main roads (Monivea, Dublin and Doughiska Roads). This makes it more difficult to reach these residents with nearby bus service whilst still operating efficient, linear routes.

Youth Density



Relevance

Children are not legally able to drive. Nonetheless, they travel to schools, to see friends and family and to attend various activities.

Driving children around is a major consumer of parents' and other caretakers' time. Public transport can be both a relief to busy adults and a source of independence and empowerment for young people. Children have access to discounted youth fares which provide an extra incentive.

A map of youth density combines both a certain level of need, and a certain amount of potential for high patronage, as many people who have travelled on a bus at 4 pm on a weekday can attest.

Observations

Areas that are dense with young people show up on this map in **Doughiska, Castlepark, Roscam and Murrough**, as well as along the **Headford Road**, and in the towns of **Oranmore and Bearna**.

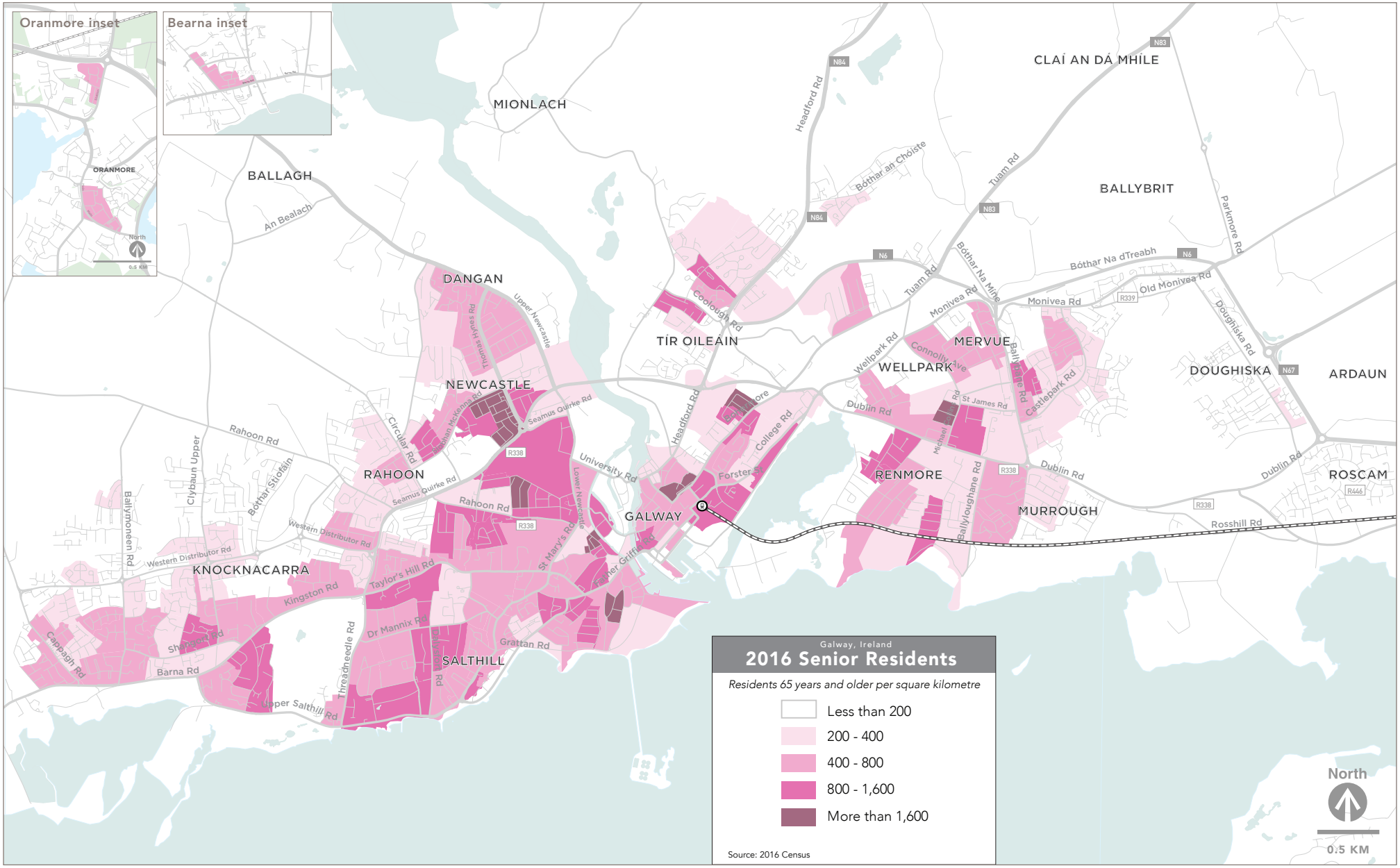
The **city centre** and surrounding areas have low densities of youth, though they have many schools and other activities that are destinations for young people's trips.

This map does not simply echo the map of residential density, as shown in Knocknacarra. **Knocknacarra** has low residential density, compared to the rest of the city, however it has moderate densities of young people over quite a large area.

The parts of **Knocknacarra** which are most dense with children are mostly cul-de-sac subdivisions, with poor street connectivity and few connecting paths (a problem the Galway City Council is working to address). As a result, many of these children may be close to the bus as-the-crow-flies but have a long and circuitous walk to the bus stop. This is also true of residential areas along the **Headford Road**.

Castlepark has an internal network of footpaths which allow for shorter walks to a bus on a main road. With better pedestrian connections to the Merlin Park Hospital lane, the bus route serving the hospital could also provide very nearby service for the dense family housing near Merlin Castle.

Density of Seniors



Relevance

Older people have a propensity for using public transport, due to fixed incomes, lower rates of driver licensing, difficulty maintaining driving skills, and the Free Travel Scheme.

However, as a group, they tend to have different preferences for transport service design than younger people and working people:

- They often have a strong preference for short walks to and from the bus stop, or are physically unable to walk very far at all.
- They often have more time to make their journey.
- They are less likely to make trips for which they do not control the timing (such as to a job or school). Therefore, they are able to schedule more of their trips around the bus timetable.

For these reasons, retirees and seniors tend to be more concerned that transport routes get close to their homes and destinations, and less concerned about whether the service is frequent or fast, compared to younger and working people.

Observations

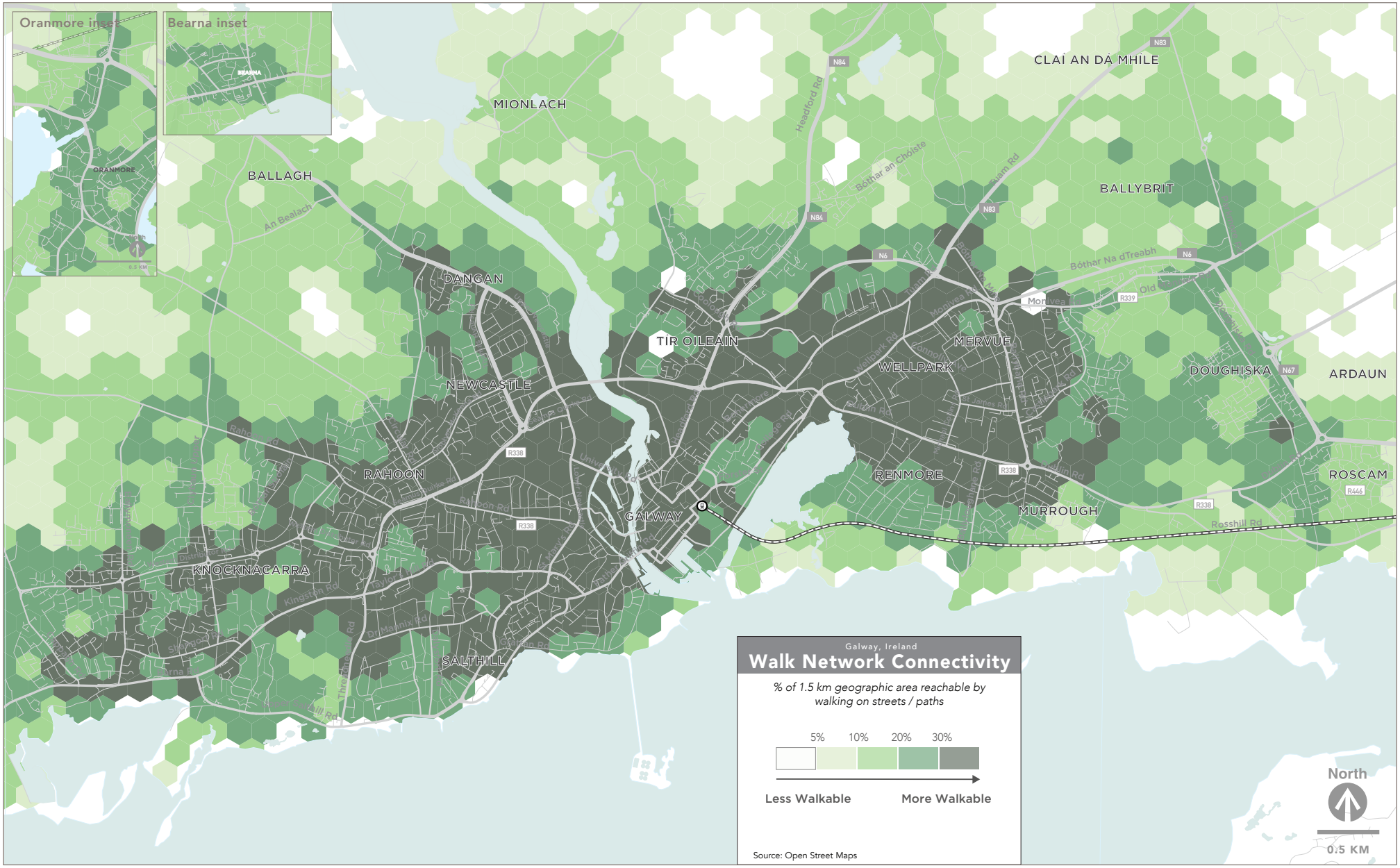
Whilst there are older people living in every area to some degree, the density of seniors is higher in older areas of the city, especially the **city centre**.

On the west side, densities are highest in **Salthill, Newcastle, Shantalla, the Claddagh,** and along **Barna and Kingston Roads** in Knocknacarra.

On the east side, senior density is a little lower than in the centre or on the west side, but moderate density is visible along the close-in segments of **Headford, Bohermore, College, and Dublin Roads**, as well as along **Monivea and Ballybane Roads**.

In new construction areas, such as **northern Knocknacarra, the outer segment of Headford Road, Castlegar, Doughiska and Roscam**, senior density is strikingly low. These same areas are quite dense with young people as shown on the map on an earlier page.

Walk Network Connectivity



Relevance

The map on the previous page shows one measure of walkability: the portion of the nearby area that can be reached by walking up to 1.5 km on streets or paths. A higher portion means that an area is more permeable for walking.[1]

This map, unlike others, is not based on 2016 data but uses the most recent data contributed to Open Street Maps.[2]

Places with few street or path connections require people to walk longer distances to reach destinations that are nearby as-the-crow-flies. Such places appear on this map in light green. Places where many connected streets or paths allow people to reach most nearby places quickly appear in dark green.

Observations

Nearly **every part of the city within 2 km of Eyre Square** is highly walkable. The exception is an area between **College and Bohermore Roads**. As described previously in this report, the lack of reasonable walks between these two roads presents a challenge for Cross-City Link and its planned concentration of bus routes on College Road.

Despite having many cul de sacs, **Wellpark, Mervue and Castlepark** are quite walkable thanks to pedestrian-only connections between residential streets and to main roads.

Roscam, Doughiska and Castlegar have poor walk network connectivity, despite the scale of housing being added in those areas and the number of young people there.

In **Knocknacarra**, the problem of disconnected cul de sacs is visible as light green blobs indicating lower walkability in the centres of the "superblocks" defined by the main roads. Walkability is particularly poor in the built-out area between **Upper Clybaun Road and Bóthar Stiofáin**, where no streets or paths go through in the east-west direction.[3]

The **Ballybrit and Parkmore** business parks have poor walkability due to many buildings being located on cul de sacs and few ways to enter and exit the business parks by any mode.

Rahoon and Shantalla have very good walk connectivity. In terms of potential bus patronage and social inclusion this is excellent, as previous maps showed that they are dense with young people, seniors, no-car households, and unemployed residents, and have a higher degree of deprivation than the city on average.

1 Places near a water body – such as the ocean, river or lough – have naturally lower walkability by this measure, because hardly anyone can walk on water.

2 Unpaved walking paths, such as the dirt paths in Merlin Woods, are included in this network analysis even though they are not accessible or comfortable for all walkers. All of the street and path connections can be viewed, and corrected if necessary, at openstreetmap.org.

3 Walkability is also poor between the Upper Ballymoneen and Clybaun Roads, however they are separated by a bog.

Patronage, Efficiency and the Built Environment

Public transport providers can attract more passengers by offering service that more people find useful.

However, land use and street design have a huge impact on how many people will find a service useful, how much patronage it will attract, and how much it costs to provide.

Five land use factors are especially suggestive of high patronage potential and service efficiency:

- Density
- Walkability
- Linearity
- Continuity
- Mix of Uses

The way these factors affect patronage and cost are described on the following pages, and illustrative examples are given from Galway.

Density

The graphic on the right shows two identical bus routes. The route on the top is travelling in an area that has twice as many homes as the route on the bottom.

All else being equal, the route on top will attract higher patronage, because there are simply more people who will want to travel to and from the area.

Density answers the basic question, *"How many kilometres must we drive a bus to reach 100 people?"* The more spread apart the people are, the farther public transport must drive to reach them, which results in higher costs (or poorer frequency).

Housing, jobs and schools are highly concentrated in Galway city centre, as well as along certain radial roads: Dublin Road, Wellpark/Monivea Roads, Bohermore Road, Father Griffin Road and Newcastle/Salthill Roads.

Additional dense areas are scattered across the city, farther from one another and farther from main roads, for example in Doughiska, Ballybrit, Mervue, Roscam, to a small degree in Knocknacarra, and along the Headford Road.

How many people, jobs and activities are near each stop?

\+ Many people and jobs are within walking distance of public transport.

\- Fewer people and jobs are within walking distance of public transport.

The images on the next page show example densities in Galway.

While household size affects density, the major determinants are the type, size and spacing of buildings.

Most residential areas in Galway have low density. The higher density residential developments in Galway are attached two- or three-story housing and a small number of apartment buildings of three stories or more.

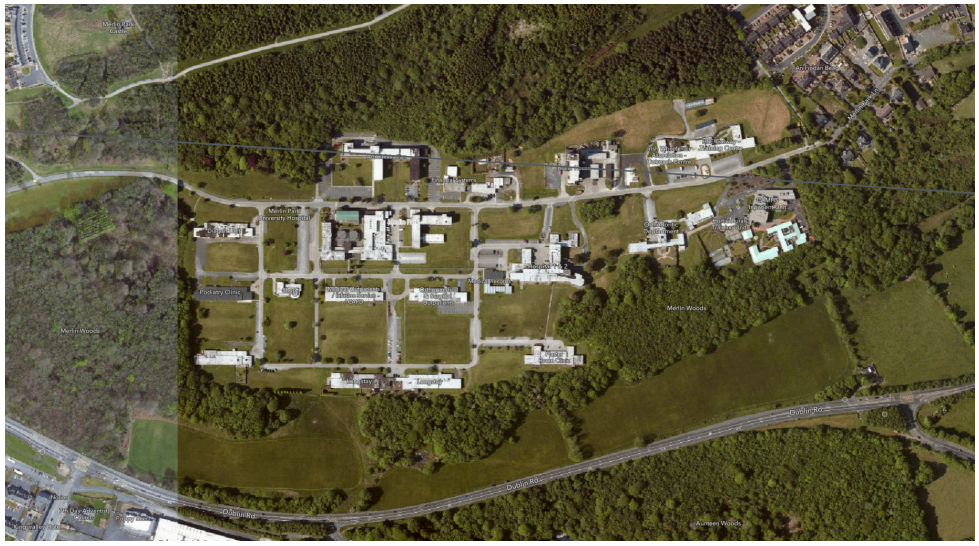
Commercial and industrial development is also quite low density, with most employment buildings spread far apart and few buildings exceeding three stories.

The denser areas of Galway would not, by global or even European standards, be considered "dense."

Density Examples in Galway

Low density: Residences in Renmore and Murrough are low-rise and separated from one another, resulting in few people near each bus stop.

Higher density: Attached housing in Doughiska (at left) and apartment buildings along Bishop O'Donnell Road (at right) put many residents close to each potential bus stop.



Low density: Commercial development can also happen at low densities, as in the case of Merlin Park Hospital which has small, low buildings with long distances between them.

Higher density: University Hospital Galway has tall buildings concentrated in a small area.

Walkability

Density alone is not enough to ensure high patronage at a bus stop. To use a bus stop, people need to be able to get to the stop. The vast majority of urban public transport start with walking.

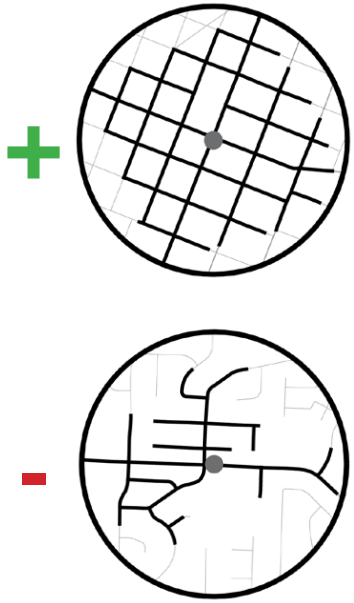
The street network, footpaths and crossings around a bus stop affect how many people are willing and able to walk to the stop. If a street network is disconnected, the bus stop on a main road may be close as-the-crow-flies but quite far away by walking. As a result, it will be useful to relatively few people.

At large junctions and roundabouts, bus stops are often located far from the junction. This adds extra distance to the walk to any point on the intersecting street.

In Galway, walkability has been undermined by the lack of pedestrian connections between estates. This is true of both residential and commercial/industrial estates. For decades, developments have been permitted to shy away from main roads, and wall themselves off from adjacent areas which undermines public transport. The walk from one main road to the next one over is often indirect, and in many cases impossible. This is a major impediment to providing service within a short walk of most people and destinations.

Two examples are shown on the following page, but many other examples could be made as poor street connectivity is a problem across Galway.

Is it easy to walk between the stop and the activities nearby?



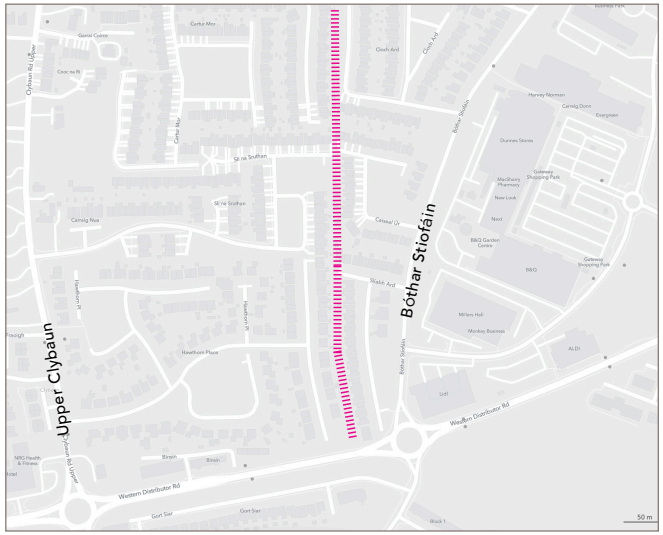
The dot at the center of these circles is a transport stop, while the circle is a 400 metres radius.

The whole area is within 400 metres, but only the black-shaded streets are within a 400 metre *walk.*

\+ It must also be safe to cross the street at a stop. You usually need the stops on both sides for two-way travel!

As noted above, walks between Headford, Bohermore and College Roads are circuitous and long. This is a matter of concern because the Cross-City Link scheme proposes to concentrate most bus routes onto College Road. A lack of street connectivity will hamper the ability of residents to the north to reach that service. This is mitigated, in the Draft New Network, by the maintenance of service on Bohermore Road.

Walkability Examples in Galway



Poor street connectivity: Many residential areas, for example in Knocknacarra, were permitted to eschew street or even footpath connections to adjacent areas. For example, between Upper Clybaun Road and Bóthar Stiofáin, no streets or footpaths go through. (The separation line between the two street networks is marked in pink.) This limits how many people can reach a bus stop on either road.

Good street connectivity: In older areas, street connectivity tends to be better. In Shantalla, most streets go through and make a connection; someone can walk out of their residential area in multiple directions. Public transport can run on main roads whilst getting within walking distance (not just flying distance) of many nearby people.

Linearity

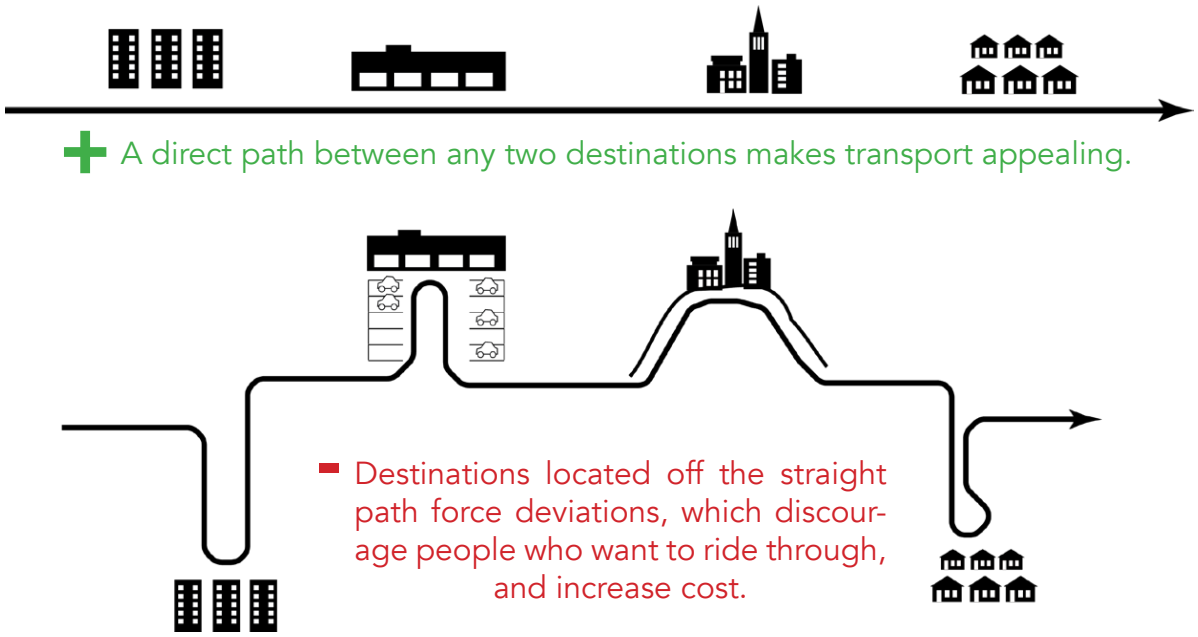
Exactly where development is allowed determines how *linear and direct* public transport routes can be.

The graphic on the right shows destinations aligned in two different ways. In the town on the top, the destinations are on the main road. Public transport can serve all destinations with a straight line. If you are travelling through this area, you're always travelling towards your destination, and never feel that you're being taken out of your way.

The town on the bottom has the same four destinations, but has permitted them to be built far from the main road. To serve these places, a bus needs to drive away from the main road, get to the front door, and then drive back to the main road. If this is your destination, this is great for you... but if you are travelling between any other places, you are taken out of your way and your trip is longer.

Notice that the line serving the town at bottom is much longer than the line in the town at top. At twice the length, it either costs twice as much to operate, or can only be offered at half the frequency. In this way, disconnected and non-linear development makes it harder to afford high frequency bus routes.

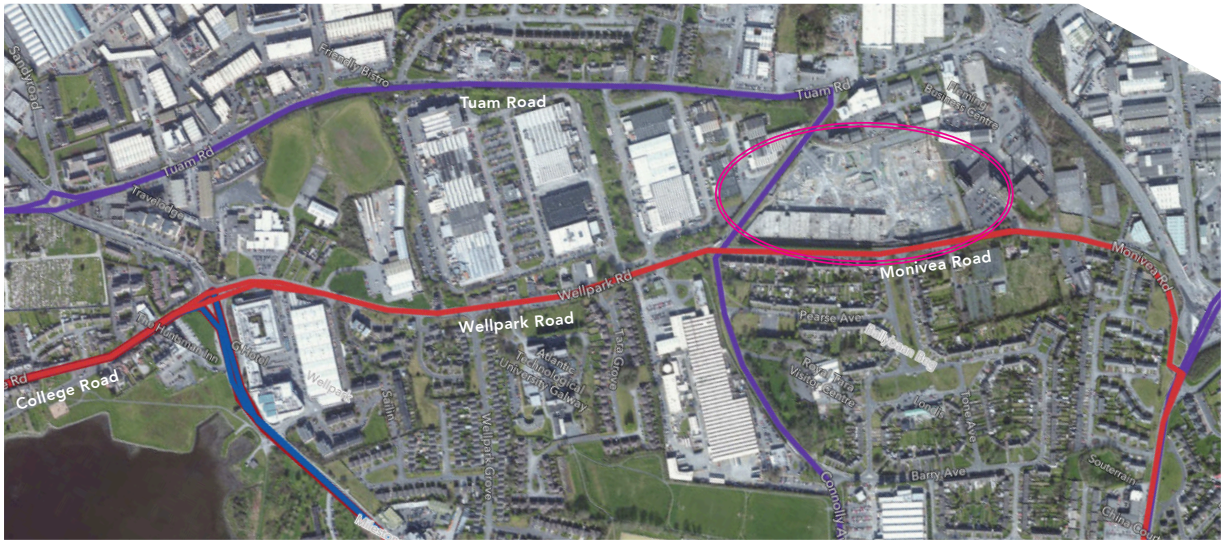
Can public transport run in reasonably straight lines?



Linearity is a challenge in Galway because dense development has in many cases been permitted to locate far from main roads, and without local street connections between adjacent developments. In addition, the lack of pedestrian connections between some adjacent areas creates pressure for bus routes to wiggle in and of estates rather than keep to the main roads.

Galway City Council are working to improve pedestrian connectivity between adjacent areas, and to main roads, which should over time reduce pressure to deviate routes into and out of isolated developments.

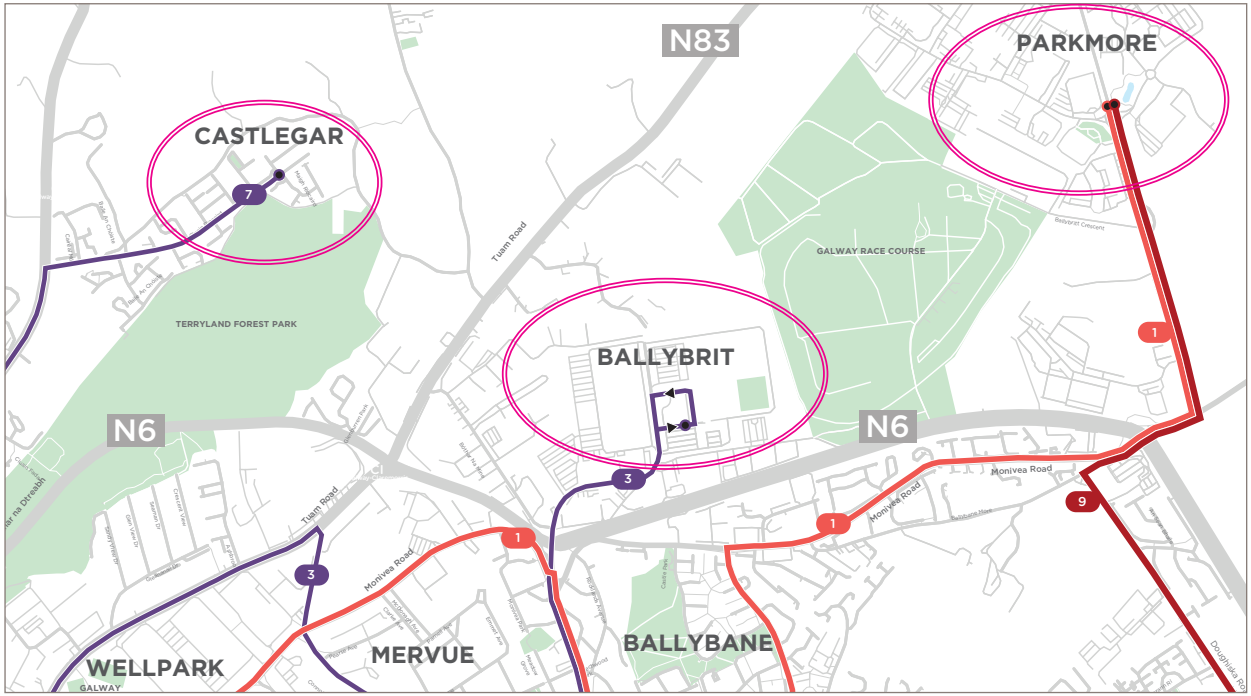
Linearity Examples in Galway

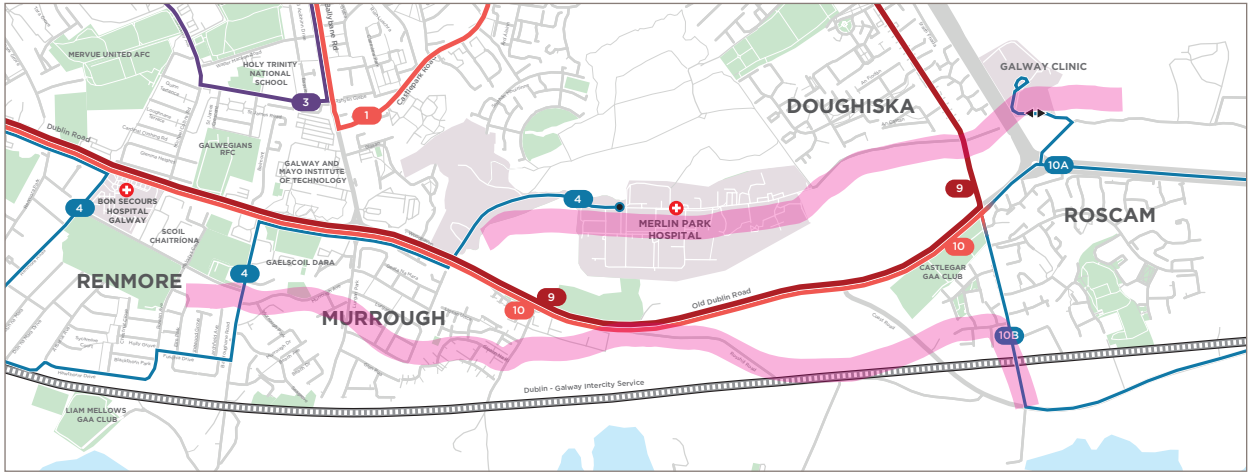


Linear development: The intensification that is being encouraged around the very linear Wellpark and Monivea Roads supports linear bus routes and an efficient network. For example, the Crown Square development which is under construction in Mervue (circled in pink at left) will put numerous jobs and services in a place that is efficient to serve with two existing, linear bus routes.

As Galway City grows along these, and other, existing bus routes, it supports investments in frequency and span on those routes. Such investments benefit not only the new developments but all of the people already using those routes for other journeys.

Linearity Examples in Galway, continued





Disconnected development: On the northeast side of Galway, three major developments can't be connected to one another for lack of streets that buses can run on: Castlegar, Ballybrit and Parkmore can each only be served by terminating routes. They are circled in pink on the map of the Draft New Network at left, on top.

No matter which direction someone is traveling, their journey out of each of these areas has to go in only one direction first, which limits the number of places they can go within a reasonable amount of time. With a better local street network, the route in Castlegar could go on to Ballybrit or Parkmore, and the route in Ballybrit could go on to Parkmore or Castlegar.

Today, service to each area can only be justified by that area alone. If they were connected, higher levels of service could be provided efficiently. The direct connections between them would also be valuable to residents and workers traveling between these areas.

Similar consequences are visible around Dublin Road, where a lack of east-west streets between adjacent areas mean that each area can only be served by either a deviation or a terminal end of a route. Deviations make routes more frustrating for through-passengers, whilst terminating routes aren't as useful or efficient as a through-route would be.

This affects Renmore, Murrough and Roscam on the south side of Dublin Road; and Merlin Park Hospital, Doughiska and Galway Clinic on the north side.

With a better local street network, these areas could be connected directly to one another (following theoretical patterns marked in pink in the map at left, on bottom). This would improve access between them, and would make the overall network more efficient, allowing for higher levels of service to each area.

Continuity

With public transport, distance is a major contributor to the cost of service.

Connecting places that are far away is more expensive than connecting places that are close by, and – as described on page 25 – making routes longer requires either an increase in spending or a decrease of frequencies.

For this reason, places that have *continuous density and activities* along a road will generate higher patronage relative to costs.

Development in Galway is fairly continuous, with most new developments located adjacent to existing built-up areas (rather than across wide gaps of agricultural land or open space). This makes it less costly to extend routes to new development as they only have to be extended a short distance, and it makes the network more efficient than it would be if development were scattered more widely.

However, a few socially important developments are being placed across rural gaps or on the far side of low-density residential areas. These developments will be difficult to provide with frequent, useful service.

To provide an existing example, the Galway Clinic was built on the far side of the N67, without new local street connections to existing built-up areas. It is a short distance away, but it is often a slow journey due to congestion on the N67, and the cost of the deviation to reach the Clinic must to be justified by only the needs and demand of that single development.

Does public transport have to cross long gaps?

\+ Short distances between many destinations are faster and cheaper to serve.

\- Long distances between destinations means a higher cost per patron.

Mix of Uses

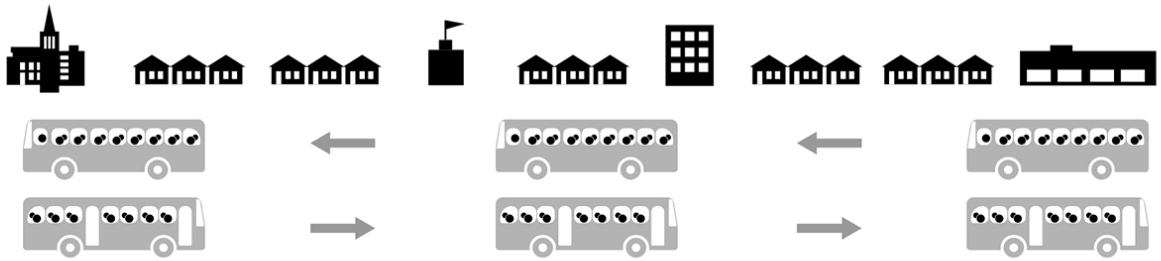
The mix of uses along a road affects how many passengers transport can attract, relative to cost. A mix of uses tends to generate patronage in both directions, at many times of day and week.

Public transport in purely residential areas is used mostly in one direction – away from the residences, towards jobs. It is often not well-used outside of rush hours.

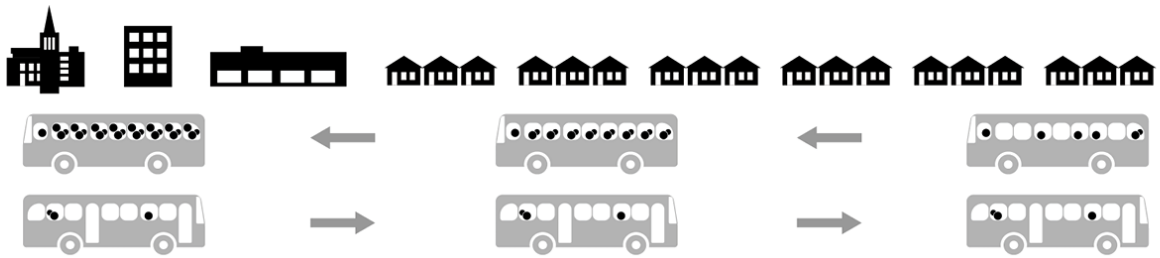
There are three ways that mixed-use development patterns can support efficient, high-patronage public transport:

- Vehicles can be full in both directions, rather than being empty half the time. This means that there can be twice as much patronage, relative to operating cost.
- Vehicles can be full all day and all week, rather than only at rush hours. The cost of buying and maintaining the vehicles is supporting more passengers.
- If people board and alight all along the route, then the route is used for many short trips. Each seat on the vehicle is useful to multiple people.

Do people travel in both directions, all day?



\+ A mix of land uses means buses are ridden in both directions, more times of the day and week.

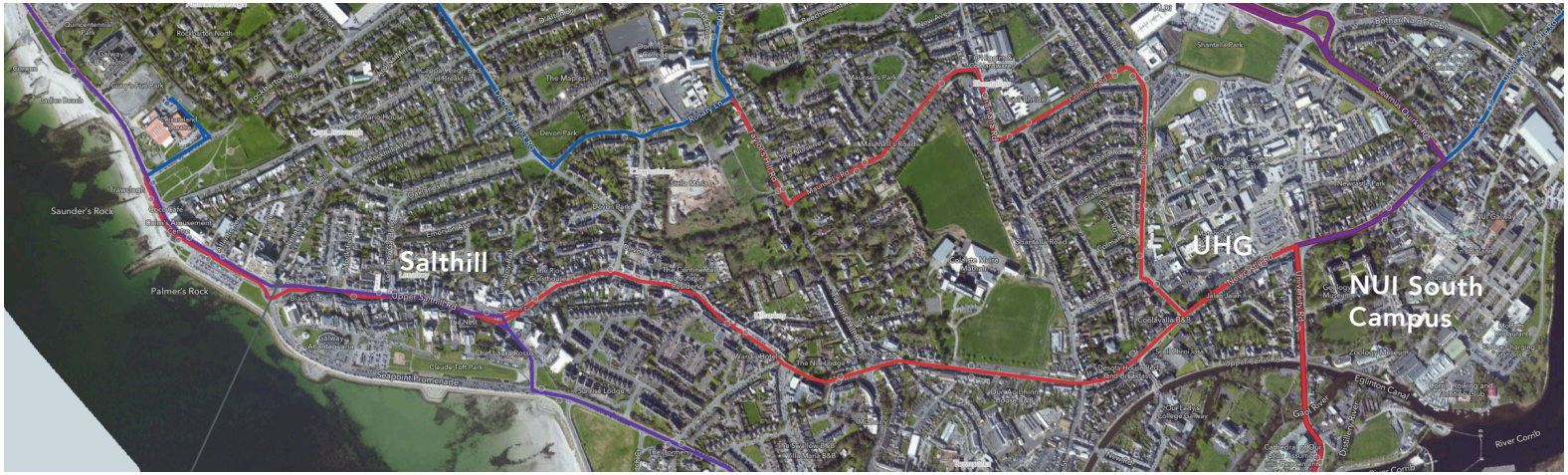


– Transport serving purely residential areas tends to fill up in one direction, but not in the other.

Galway has a high mix of uses in historic areas, but newer developments have been built for one single use. For example:

- Knocknacarra is almost entirely residential.
- The large Parkmore and Ballybrit Business Parks are purely industrial and commercial.
- Castlepark, Castlegar, Rahoon, and areas along the Headford Road have been developed as purely residential.
- Bearna and Oranmore have historic main streets with commercial and retail development, but most new development is purely residential.

Continuity & Mix of Uses Examples in Galway



Continuous, dense, linear development: Two of the strongest markets for public transport in Galway are Salthill/Newcastle Roads (shown at top, left) and inner Dublin Road (shown at bottom, left).

On Salthill/Newcastle Roads, the density of jobs and residents is high along nearly the entire length, thanks to small and attached houses; many small businesses facing the road; very few car parks; and the major activity hubs at UHG and NUI. For every kilometre a bus drives on this road it passes numerous people and myriad destinations, all within very short walks of the bus stops.

On Dublin Road, between Wellpark and the Merlin Hospital Gate, density is lower due to large car parks, fields and pitches. However, there are numerous businesses, offices and social services lined up here: ATU, the Garda offices, Bon Secours Hospital, hotels, schools, and more, plus some apartments. Trips along Dublin Road can be efficiently served with a linear and frequent route.

Continuity & Mix of Uses Examples in Galway

Rural gaps: The towns of Oranmore (shown at top) and Bearna (at bottom), are separated from Galway City by rural gaps. Bus routes between towns and cities are rarely as frequent as bus routes within cities. This is simply because there are fewer people per kilometre in rural areas, which makes patronage per bus lower, which makes it harder to justify frequent service. And with most passengers traveling into the city, buses aren't as well-used in the other direction.

Urban gaps: Gaps between areas of high patronage potential can also exist in urban areas. For example, the golf course and fields along Kingston Road, shown at right, mean there is little demand for bus service in that area (and the houses north of the road have a footpath that connects to frequent bus service on the W. Distributor Road). Low-density housing or commercial development can also present gaps between areas with higher demand, as described on the previous page with regards to new social housing being built on the edge of Knocknacarra.

5 Overview of the Draft New Network

How to Read the Network Maps

Colours Show Frequency

In the maps on the next two pages **route colours represent frequency.** Each route is colour-coded based on its frequency on weekdays at midday.

- **Dark red** lines indicate very frequent service, with a bus coming every 10 minutes.
- **Red** lines indicate frequent service, every 15 minutes or better.
- **Purple** lines indicate routes that come every 20 minutes.
- **Dark blue** lines indicate routes that come every 30 minutes.
- **Light blue** lines indicate routes that come every 60 minutes.

New Route Numbers

All of the proposed routes have been given new numbers, to differentiate them from existing Galway routes.

However, if a proposed route is very similar to an existing route, then it is given a related number. For example:

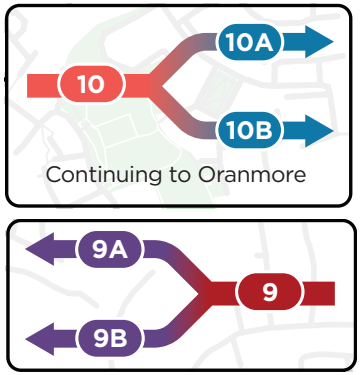
- Proposed Route 1 is similar to existing Route 401.
- Proposed Route 4 is similar to existing Route 404.
- Proposed Route 9 is similar to existing Route 409.

The numbers proposed are not final, and may change before the Final New Network is put in place.

Route Branching

Some routes in the Draft New Network would branch. This is shown on the maps with this diagram:

These are not interchanges. The buses on the less frequent "branches" run together to form the frequent "trunk."



In the top example, Route 10 on Dublin Road is a combination of Routes 10A and 10B to and from Oranmore. Routes 10A and 10B each offer 30 minute frequency, and where they are together on Dublin Road they are scheduled such that one or the other of them comes along every 15 minutes.

The same is true of Routes 9A and 9B in the west, which combine to form Route 9 and continue to the city centre and to Parkmore.

Connecting Ireland

On the map on the next page, routes connecting Galway to Carraroe, Clifton, Tuam, Castlebar, Claremorris, Claregalway, Mountbellow, Athlone and Limerick are marked with a "CI" label. These routes will be planned in a separate process through Connecting Ireland. The towns they serve, their frequencies and their hours of service will be addressed in that process. Connections between these interurban routes and the urban Galway network are important, which is why they are shown on the Draft New Network map.

Route Descriptions

Street-by-street descriptions of each proposed route are provided on page 74.

Descriptions of proposed frequencies and spans (hours of service) are given on page 98.

Map of the Draft New Network

For a closer look at the Draft New Network, please use the resources at busconnects.ie/galway, especially the online map.

Proposed Service in the City Centre

The city centre portion of the Draft New Network is shown at right. All routes in the Draft New Network would serve the city centre.

The design of routes in the city centre takes into account the Cross-City Link scheme, described starting on page 19. A planning application for the scheme is currently before An Bord Pleanála. If consent is given for the scheme, then construction to begin immediately and is planned to be completed during 2025, in time for the implementation of the new network.

Most cross-city routes would use the Bus Priority Link, whilst Routes 3 and 7 would use parallel paths to provide reasonable walking distances and linear routes for people in Bohermore, the Claddagh and Spanish Parade.

The only urban route that would terminate in the centre would be Route 424 Carraroe/Barna. All other routes would terminate on the outlying areas of Galway and in Barna and Oranmore. This is a major change from the Existing Network and requires that bus layover spaces and driver rest facilities (especially toilets) be constructed at the outer terminii of these routes.

Changes in Coverage

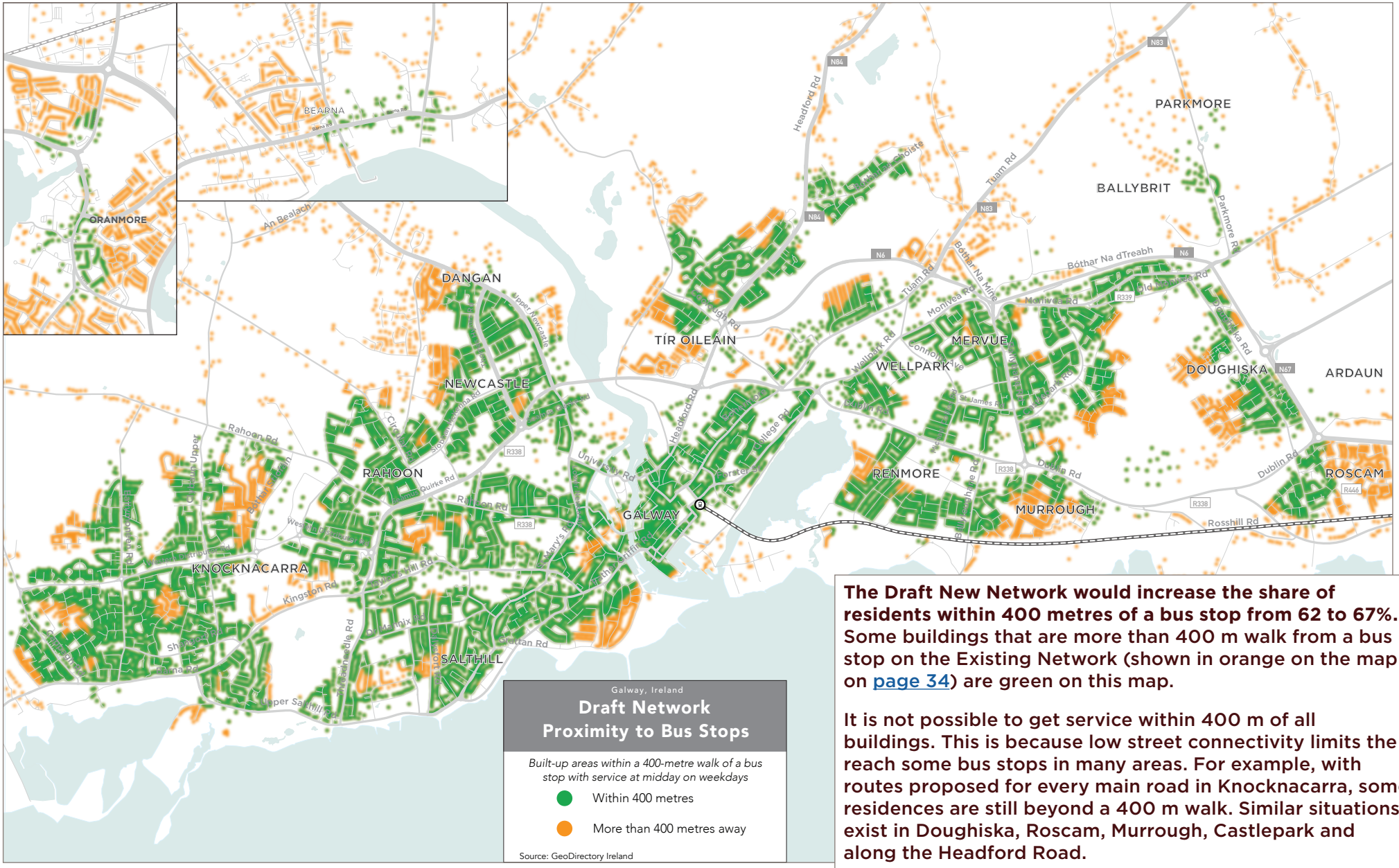
The Draft New Network would provide new service in certain areas which are not served today. They are marked in yellow on the map below, and include:

- Upper Ballymoneen Road
- The southerly part of Circular Road
- Roscam
- The Coast Road, between Galway City and Oranmore
- The south edge of Deerpark Industrial Estate
- Station Road in Oranmore
- Oranhill

The Draft New Network would also remove service on a few streets, which are marked in pink on the map below. In these cases, the total number of people affected would be small, and improved service would be provided within a short walk. Removing these few, small segments has a benefit to a large number of people as it allows bus routes to be more linear and direct and the network to be simpler.

Overall the share of residents within 400 metres of a bus stop (about a five minute walk) would increase from 62% to 67%, with a similar increase in the share of jobs close to a bus stop.

Map of Draft New Network Coverage



The Draft New Network would increase the share of residents within 400 metres of a bus stop from 62 to 67%. Some buildings that are more than 400 m walk from a bus stop on the Existing Network (shown in orange on the map on page 34) are green on this map.

It is not possible to get service within 400 m of all buildings. This is because low street connectivity limits the reach some bus stops in many areas. For example, with routes proposed for every main road in Knocknacarra, some residences are still beyond a 400 m walk. Similar situations exist in Doughiska, Roscam, Murrough, Castlepark and along the Headford Road.

Higher Frequencies and a New 24-Hour Route

The graphic below describes proposed frequencies for each route, by time of day and day of the week.

Every route would operate seven days per week. Service on all routes would operate from 6 am to midnight on weekdays and Saturdays. Route 9 (and the 9A branch) would also offer overnight service.

On Sundays, some routes would start at 7 am (rather than 6 am) and end at 11 pm (rather than midnight). The hours of routes' best frequencies would be shorter on Sundays.

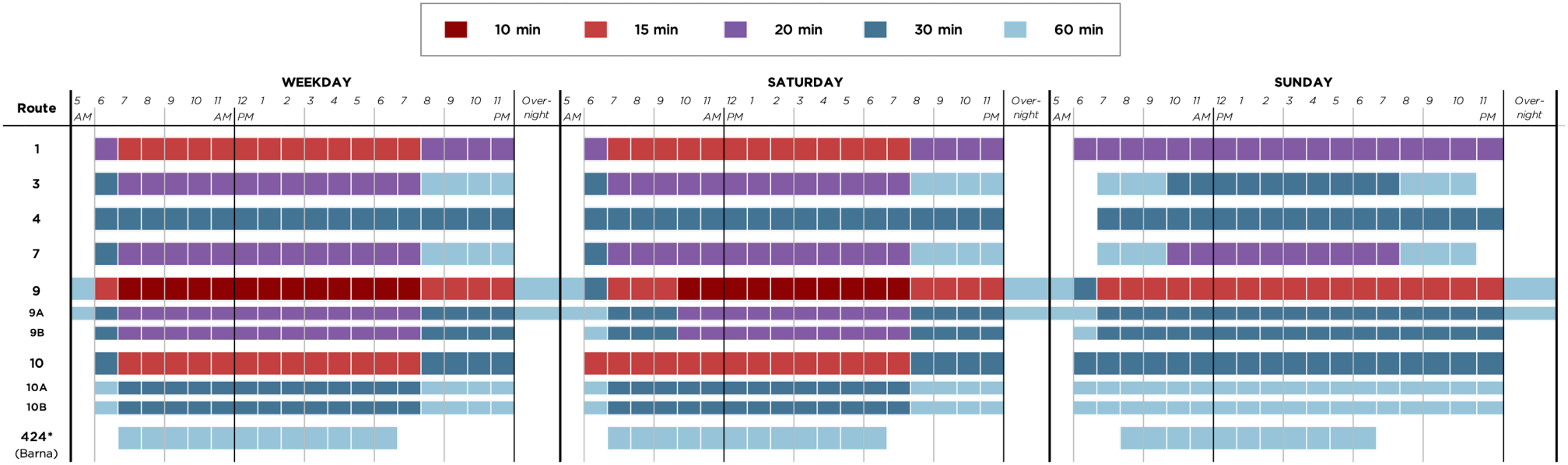
The Galway frequent network would expand. Instead of the two routes offering high frequency today (every 15 minutes or better), *three* routes would offer high frequency (Routes 1, 9 and 10) on both sides of the city.

As a result, 33% of residents would be within a 5 minute walk of a frequent route (compared to 19% on the Existing Network).

Branches of routes would operate one-half as frequently as the trunk route. During weekday daytimes this means, for example, that Routes 9A and 9B would offer 20-minute frequency during the times when the trunk Route 9 offers 10-minute frequency. The Route 10 branches (10A and 10B) would operate the same way, with 30-minute frequency when the trunk has 15-minute frequency.

Text-based tables of the route frequencies shown below are provided starting on page 98.

Galway Draft Network Bus Route Frequencies



Notes * This chart only the shows frequency of Route 424 trips between Ceannt Station and Barna. Some trips on 424 will continue to/from Carraroe, Lettermullen, Carna, etc.

Route-by-Route Description

The table on this page provides a detailed text description of every proposed route and branch in the Draft New Network.

The frequencies described in this table represent the frequency provided on weekdays, between 7 am and 8 pm. All routes also provide this frequency on Saturdays during the day.

Route 9 (and the 9A branch) would operate 24 hours per day, seven days per week, coming approximately once per hour between midnight and 5 am.

Route	From	Via	To	How Often	Replaces Route...
1	Gateway	Western Distributor Road - Threadneedle Road - Salthill Promenade - Upper Salthill Road - St Mary's Road - Newcastle Road - University Road - Galway Cathedral - City Centre (via Cross-City Link) - College Road - Monivea Road - Ballybane Road - Castlepark Road - Monivea Road - Parkmore Road	Parkmore Business Park	15 mins	401
3	Gateway	Western Distributor Road - Clybaun Road Upper - Rahoon Road - Diarmuid Road - Bun a Chnoic - Circular Road - Seamus Quirke Road - Newcastle Road - University Road - Galway Cathedral - City Centre (via Cross-City Link) - Prospect Hill - Tuam Road - Connolly Avenue - St James Road - Ballybane Road	Ballybrit Industrial Estate	20 mins	405
4	Gateway	Galway West Business Park - Rahoon Road - Seamus Quirke Road - Bóthar Le Cheile - Siobhan McKenna Road - Thomas Hynes Road - Upper Newcastle Road - Newcastle Road - University Road - Galway Cathedral - City Centre (via Cross-City Link) - College Road - Dublin Road - Renmore Road - Hawthorn Drive - Fuschia Drive - Ballyloughane Road - Dublin Road	Merlin Park Hospital	30 mins	402 + 404
7	Cappagh Road	Barna Road - Knocknacarra Road - Upper Salthill Road - Salthill Promenade - Upper Salthill Road - Grattan Road - Whitestrand Road - Father Griffin Road - Dock Road/Merchants Road - City Centre - Eglinton Street - Headford Road - Coolough Road - Tirellan Heights - Headford Road - Bóthar an Chóiste	Castlegar	20 mins	407
9	Gateway	Gateway Shopping Centre - Western Distributor Road - Rahoon Road - Seamus Quirke Road - University Road - Galway Cathedral - City Centre (via Cross-City Link) - College Road - Dublin Road - Doughiska Road - Parkmore Road	Parkmore Business Park	10 mins	409
9A	Cappagh Road	Western Distributor Road - Gateway Shopping Centre - Western Distributor Road - Rahoon Road - Seamus Quirke Road - University Road - Galway Cathedral - City Centre (via Cross-City Link) - College Road - Dublin Road - Doughiska Road - Parkmore Road	Parkmore Business Park	20 mins	411
9B	Ballymoneen Road	Upper Ballymoneen Road - Lower Ballymoneen Road - Shangort Road - Clybaun Road Lower - Western Distributor Road - Gateway Shopping Centre - Western Distributor Road - Rahoon Road - Seamus Quirke Road - University Road - Galway Cathedral - City Centre (via Cross-City Link) - College Road - Dublin Road - Doughiska Road - Parkmore Road	Parkmore Business Park	20 mins	NEW + 411
10*	Taylor's Hill Road	Maunsells Road - Shantalla Road - Colmcille Road - Costello Road - Newcastle Road - University Road - Galway Cathedral - City Centre (via Cross-City Link) - College Road - Dublin Road - (*via Galway Clinic and Eastern Approach Road OR via Roscam and Coast Road) - Main Street	Oranmore	15 mins	NEW
10A	Salthill	Leisureland - Rockbarton Road - Salthill Promenade - Threadneedle Road - Taylor's Hill Road - Maunsells Road - Shantalla Road - Colmcille Road - Costello Road - Newcastle Road - University Road - Galway Cathedral - City Centre (via Cross-City Link) - College Road - Dublin Road - Galway Clinic - N67 - Main Street	Oranmore via N67	30 mins	404
10B	Gateway	Western Distributor Road - Threadneedle Road - Doctor Mannix Road - Devon Gardens - Taylor's Hill Road - Maunsells Road - Shantalla Road - Colmcille Road - Costello Road - Newcastle Road - University Road - Galway Cathedral - City Centre (via Cross-City Link) - College Road - Dublin Road - Doughiska Road - Roscam - Coast Road - Main Street	Oranmore via Roscam	30 mins	NEW
424	Bearna	Barna Road - Shangort Road - Clybaun Road Lower - Western Distributor Road - Gateway Shopping Centre - Western Distributor Road - Rahoon Road - Seamus Quirke Road - University Road - Galway Cathedral - City Centre	Ceannt Station	60 mins	424

*Route 10 provides 15 minute frequency between Oranmore and Galway.
The Route 10 branches diverge between Oranmore and Dublin Road and where they are apart they each provide 30 minute frequency.

6 Comparing the Existing and Draft New Networks

Public Transport and Access to Opportunity

It's impossible to predict exactly how many people might use an improved bus network. The future is inherently unpredictable, as our recent experience with the Covid-19 pandemic demonstrated. Predictive transport models can be used to forecast future public transport patronage, to use them we must make myriad assumptions about the future at least some of which will turn out to be wrong.

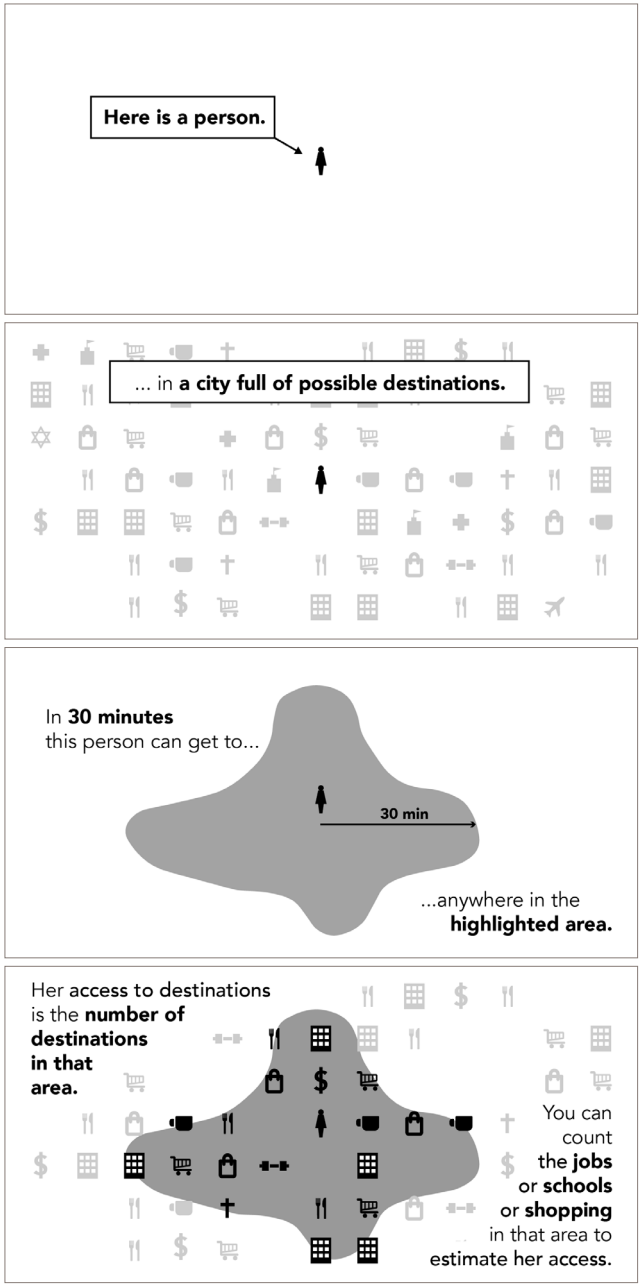
At the individual level, it is also hard to predict public transport patronage. It is difficult to know how someone will make their travel decisions in the future if there are changes in where they live, where they work, fuel prices, traffic congestion, the quality of public transport service, improvements to cycling and walking facilities, their own ability to drive a car, etc.

In the face of so much uncertainty, we can rely on simpler measures that focus on the near-term consequences of a change, and that require fewer assumptions about the future.
One such measure is "access," also sometimes called "accessibility." Access measures the usefulness of a public transport network for any person who has a limited amount of time to spend traveling.

Public transport is useful to the extent that it allows people to go where they want in a reasonable amount of time. **The more destinations you can reach in a reasonable amount of time, the greater your access to opportunity.**

When we measure access, as illustrated at right, we use Census data representing where people live and work. We then use arithmetic to sum travel times between all residents and jobs. This arithmetic is described on the next page.

Designing cities and their public transport networks so that more people have access to more opportunities, within a reasonable journey time, is a reliable way to increase patronage.



What affects public transport access?

Access to opportunity via public transport is affected by:

- **How many destinations are near public transport**
- **How long a person has to walk** to and from service
- **How long they have to wait** for the service
- **How far they have to travel** in the public transport vehicle
- The **speed** of the vehicle
- **How long they have to wait to interchange** between services

Public transport operators and planners have control over some of these factors: waiting time, interchange, route directness, where service is provided.

They have less or no control over other factors that affect access: public transport speed, travel distances, or where jobs and housing are located. These factors are generally controlled by local authorities as they manage land use, development and roadways.

Estimating Journey Times

Often when people describe public transport journey time they focus on the time spent on the bus. Public transport journeys also include time spent walking and waiting, which can exceed the time spent on the vehicle itself.

Walking to and from the stop

Most public transport journeys begin and end with a walk.

Waiting for the next bus

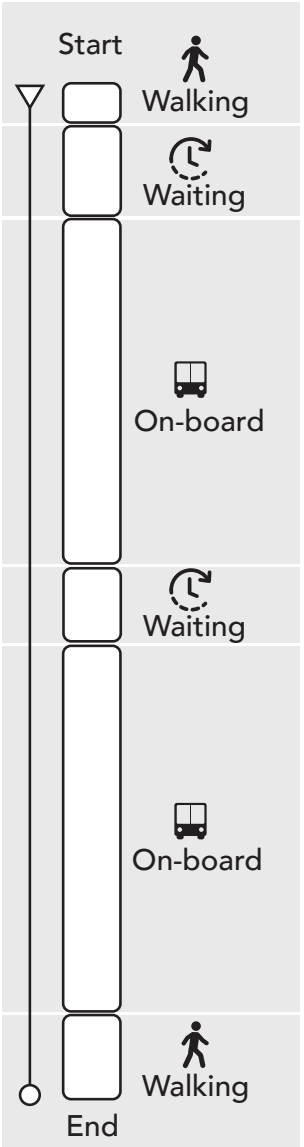
Waiting doesn't only happen at the start of your journey, it can also happen at the end. You may leave home shortly before your bus departs, but if your bus comes infrequently you often have to arrive at your destination early to avoid being late.

If you're interchanging, you'll have to wait a second time.

On average, across all passengers, the minutes spent waiting will sum to approximately one-half of the frequencies of the routes in question.

On-board the vehicle

Time spent on-board is affected by distance and speed. In summing travel times on the Draft New Network, we used conservative (slow) assumptions, and did not take into account the faster speeds that would result from Cross-City Link. Improvements in speeds will result in greater job access for more people.



Improved Access from Example Locations

Maps on the following pages show how access would change with the Draft New Network, from six example locations, on weekdays.

What do these maps mean?

These maps are meant to answer the questions:

- *How many places could I reach from each place, in a reasonable amount of time?*
- *How would this be different from where I can go today?*

The reader is encouraged to make their own map for any place in Galway, Oranmore or Bearna, using the online Draft New Network Viewer.

Assumptions

You're walking and using public transport. These maps illustrate improvement in the bus network, comparing the Draft New Network to Existing. They are not comparing the car or bicycle to public transport.

You walk at a moderate speed. The maps assume a walking speed of 1 metre per second, which is a bit slow for an able-bodied and unencumbered adult. This reflects things that can slow people down like street crossings.

You wouldn't walk for more than 30 minutes total, in any one-way journey. Walking trips are included, not only to a bus stop but even all the way to a destination if it is faster to reach that destination by foot than by bus. However, walking is assumed to be limited to 30 minutes per one-way journey, beyond which either the bus would be used (even if it takes longer) or the destination could not be reached.

Most bus stops would be located in the same places as they are now. In cases of new or different streets being served, we've made some assumptions about where stops would be located. Stop locations in the city centre and on nearby roads would also change as a result of Cross-City Link.

Aside from those cases, most stops have been kept the same between the two networks.

On average, your wait to use a bus would equal half its frequency, for the reasons explained on the previous page. For example, if the bus comes every 15 minutes, you'll wait 7.5 minutes on average. If it comes every 30 minutes, you'll wait 15 minutes on average.

Buses would travel at similar speeds as they do now. Cross-City Link would increase bus speeds, but in all of the maps and analysis in this report today's speeds were assumed. Cross-City Link would result in even larger gains in access than reported here.

You would interchange if it made your trip quicker overall. BusConnects Galway will include the elimination of interchange fares between urban buses.

If you were to interchange, you would have to wait for the second bus as well. As with the first bus, the assumed wait time would be half the frequency of the second bus route.

You're travelling on a weekday, in the daytime. Similar maps exist for Saturdays and Sundays, and they are provided in Appendix B which, to control document size, is a separate file.

Eyre Square

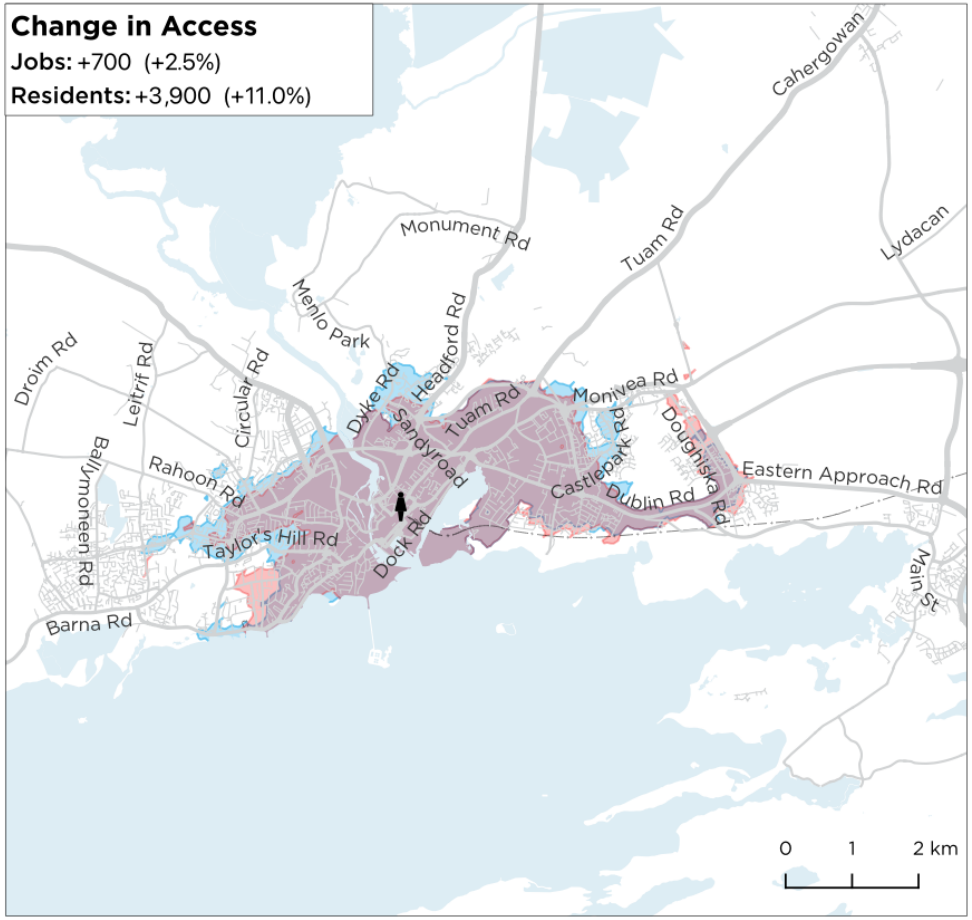
How far could I travel from

Eyre Square

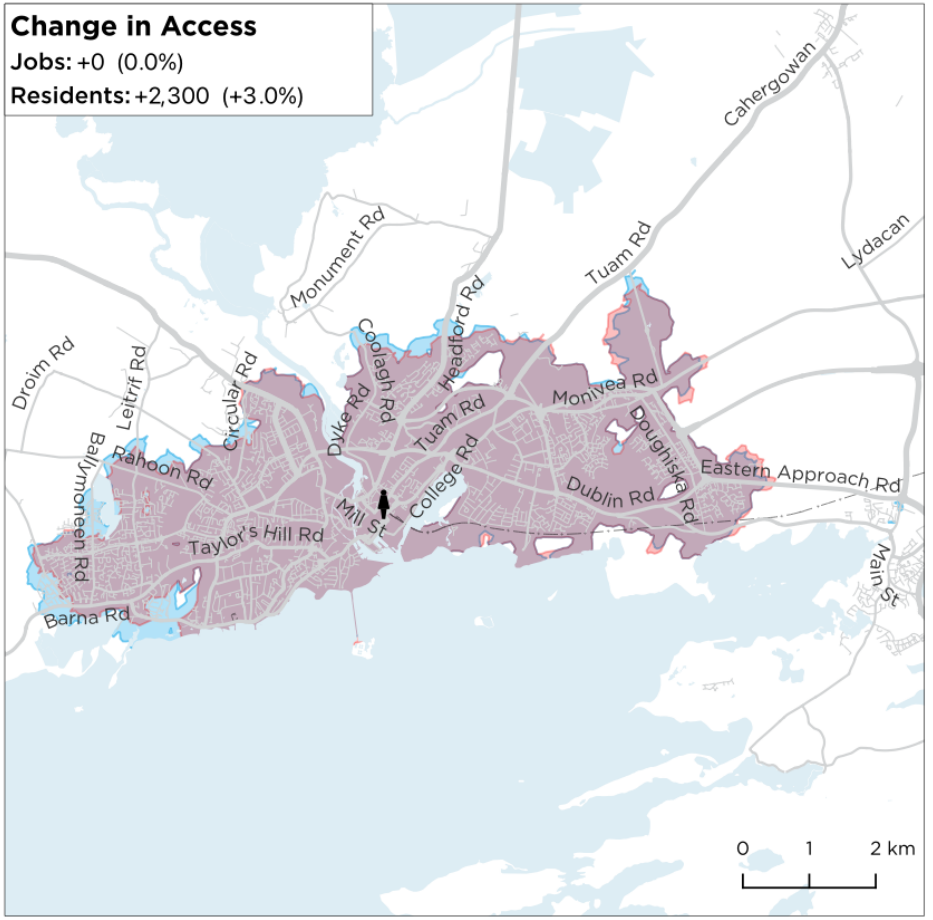
in a reasonable amount of time?

Weekdays, in the Daytime

30 minutes



45 minutes



Gateway Shopping Centre

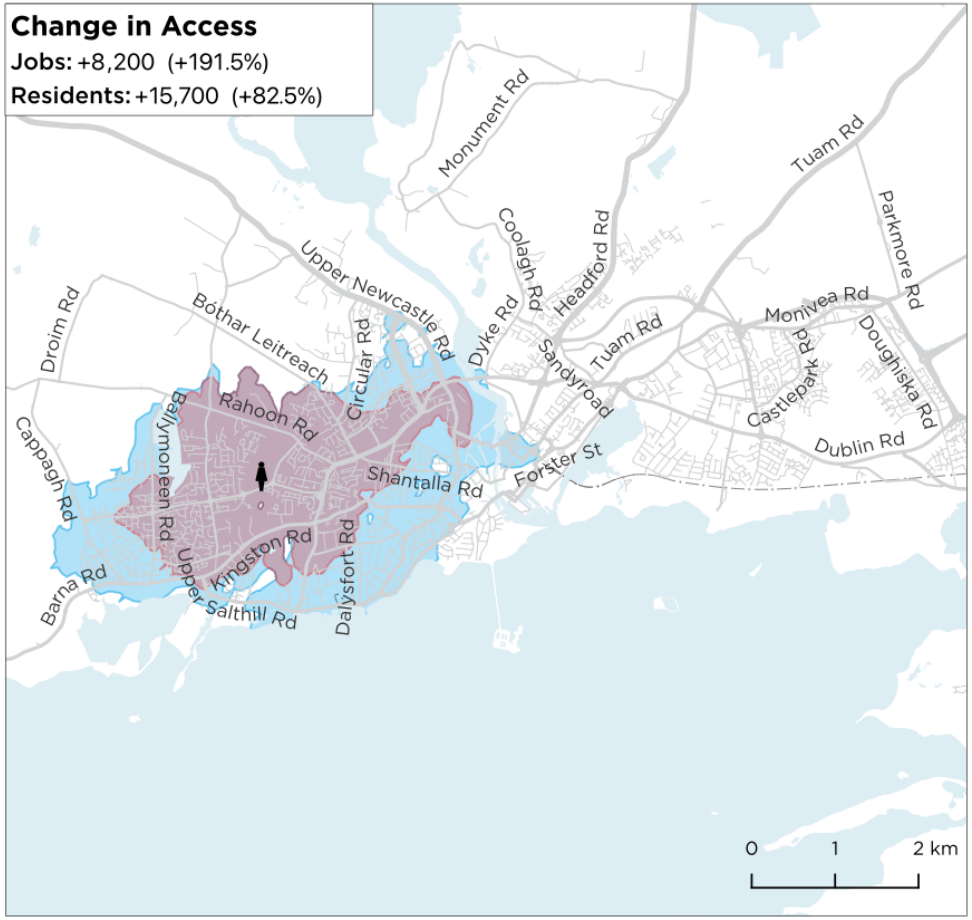
How far could I travel from

Gateway Shopping Centre

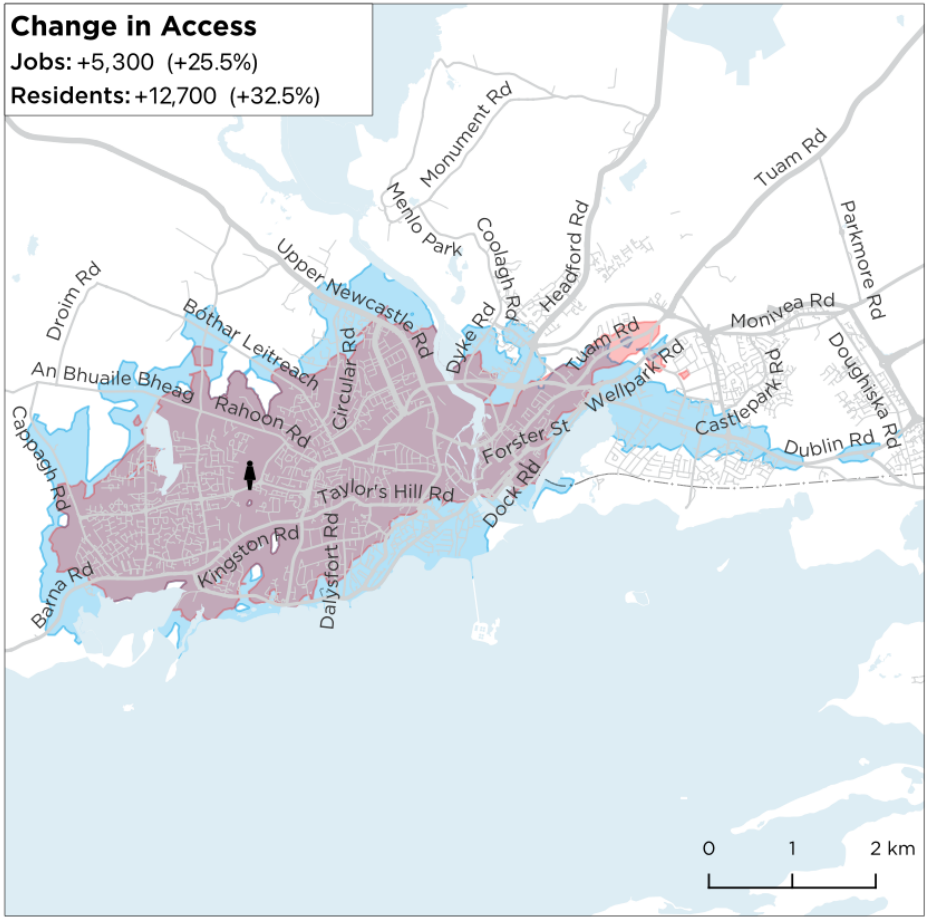
in a reasonable amount of time?

Weekdays, in the Daytime

30 minutes



45 minutes



Castlepark

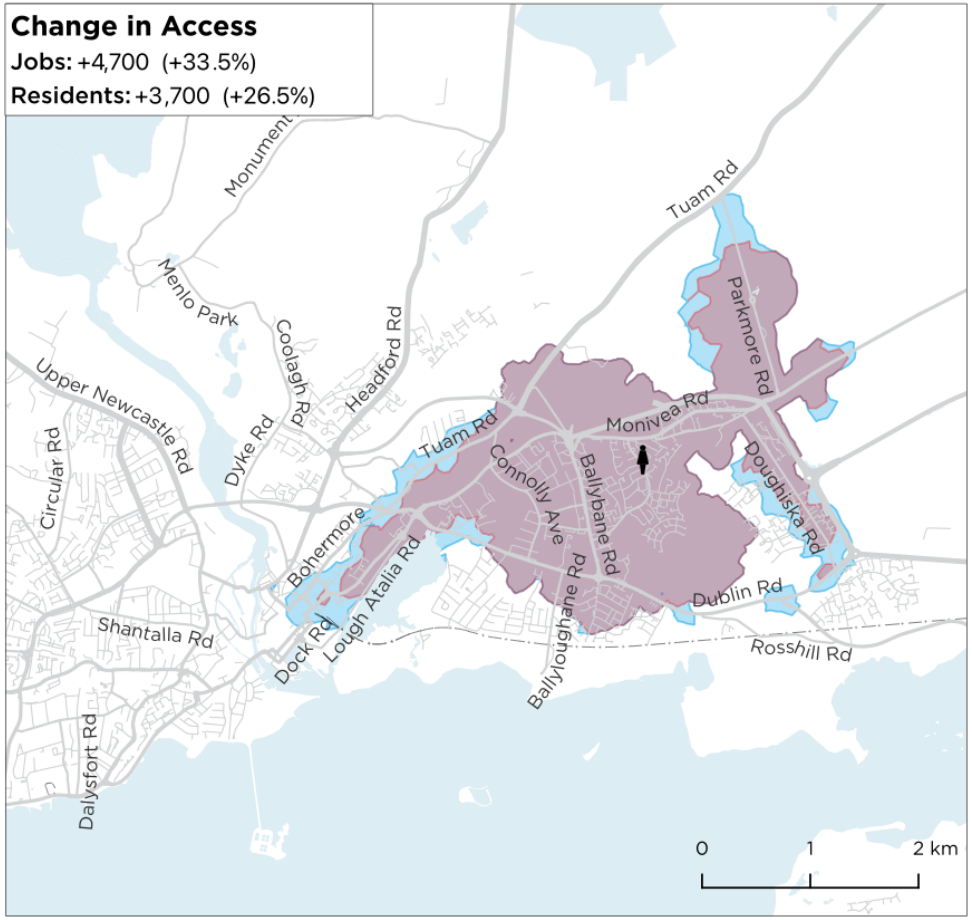
How far could I travel from

Castlepark Road

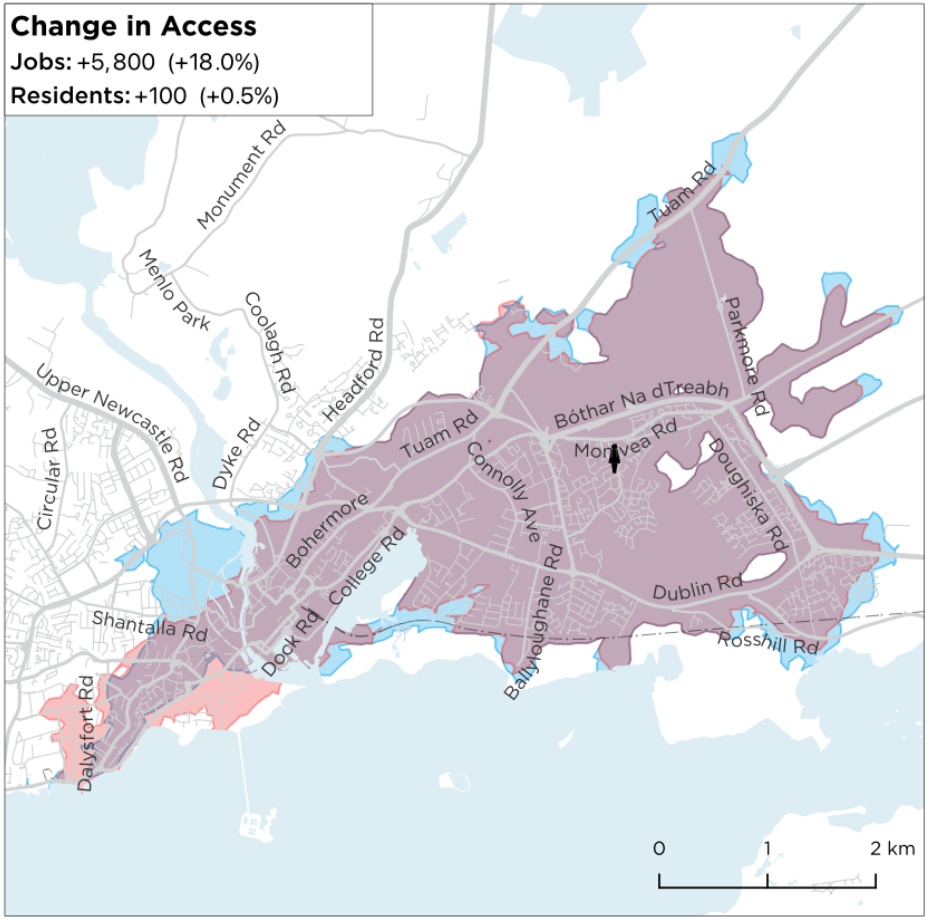
in a reasonable amount of time?

Weekdays, in the Daytime

30 minutes



45 minutes



Salthill

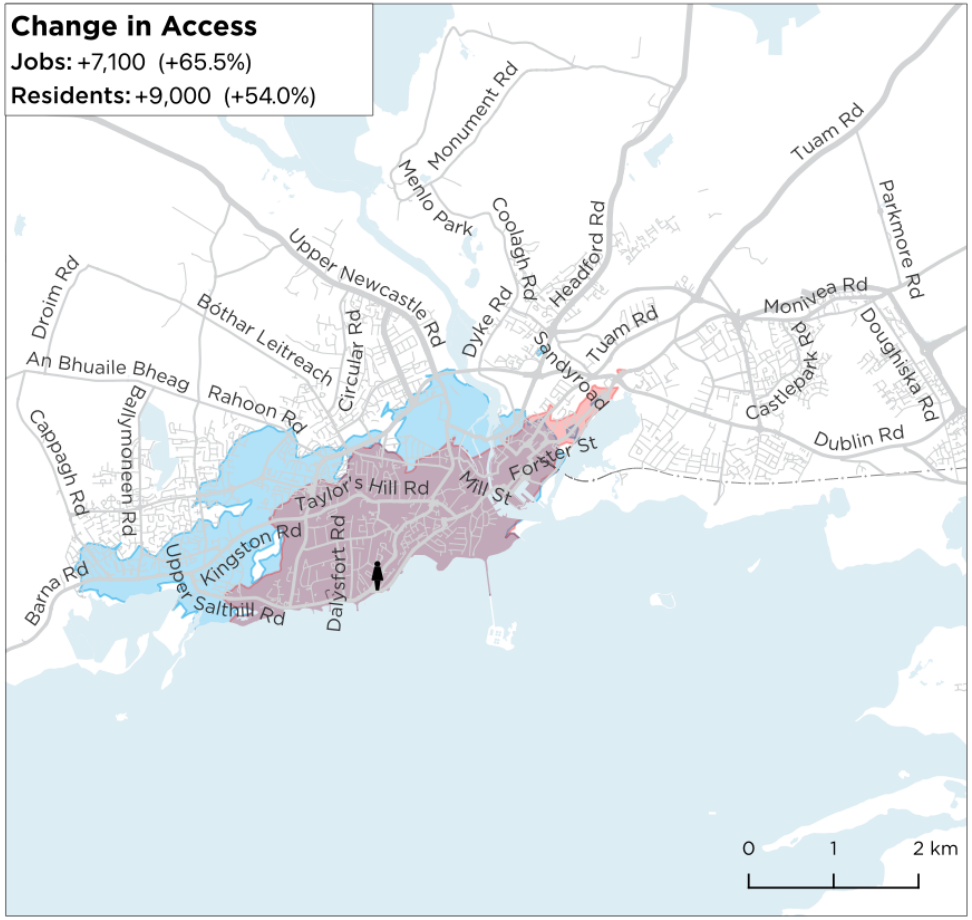
How far could I travel from

Salthill

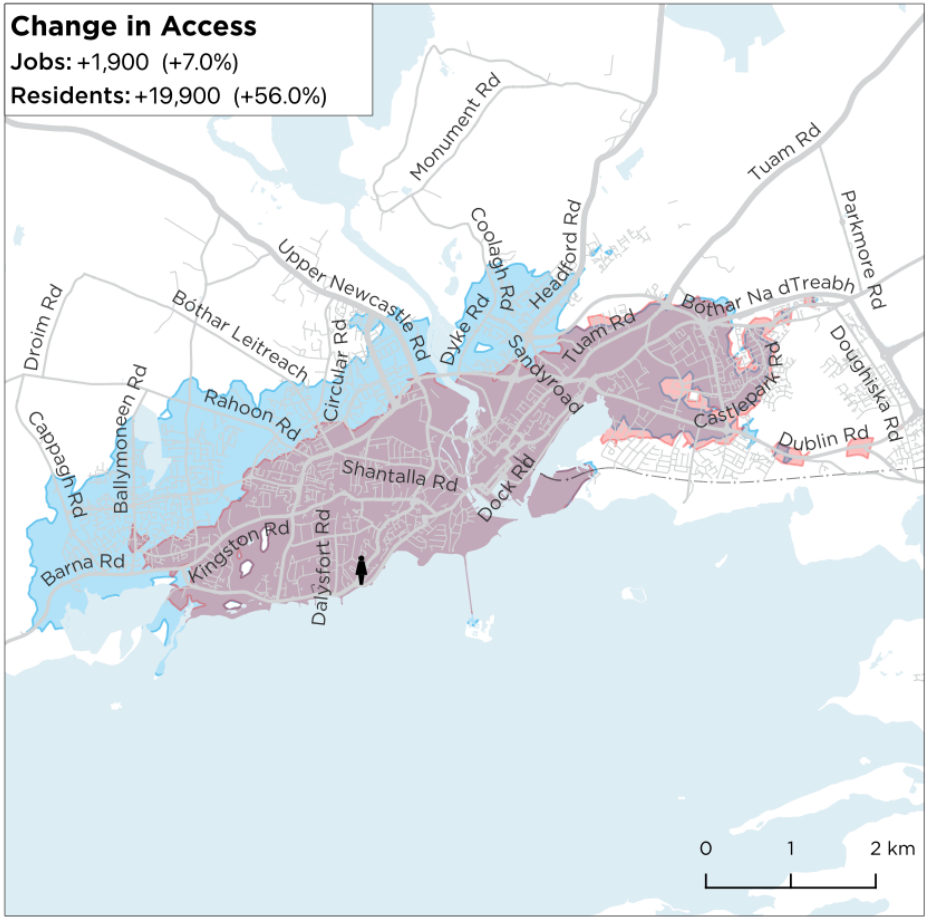
in a reasonable amount of time?

Weekdays, in the Daytime

30 minutes



45 minutes



Increases in Access Citywide

Access improvements that would result from the Draft New Network have been analysed for:

- Door-to-door journeys of 30 minutes or less, and 45 minutes or less.
- Rush hours and midday.
- Weekdays, Saturdays and Sundays.
- All residents and all jobs.
- People living without a car; residents of areas with high social deprivation; and young, unemployed and senior residents.

Analysing these variations and sub-populations are important to describe the way the network would serve the great diversity of trips Galwegians take. However, all this variation generates myriad results, and a subset of the resulting maps are presented in the body of this report.

Whilst jobs are important destinations on their own, they also correlate with the places people go to shop, socialise, access services and more. They are therefore a stand-in for access to many different kinds of opportunity.

On **weekdays**:

- The average resident could access 38% **more** jobs within 30 mins. or less door-to-door bus journey time, and 13% more within 45 mins.
- More than one-half of residents would be able to reach **more** jobs within 30 mins. or less, and the other half of residents would experience **no change** in job access.
- 83% of residents would have access to **more** jobs within 45 mins. or less. 16% of residents would experience **no change**, and only 1% of residents would **lose** access to as many jobs within 45 minutes.

The Draft New Network would be beneficial specifically for **residents of areas of social deprivation**, which are shown in shades of orange on the map on page 45:

- Residents in highly disadvantaged areas would have access to 48% **more** jobs within 30 mins. on weekdays, with similar increases on Saturdays and Sundays.
- For job access within 45 mins., disadvantaged residents would have access to 14% **more** jobs on weekdays and Saturdays and 39% on Sundays.
- The number of disadvantaged residents who would lose access to jobs within 30 mins. is certainly less than 0.5% and to small to measure.

Access would be improved on weekends:

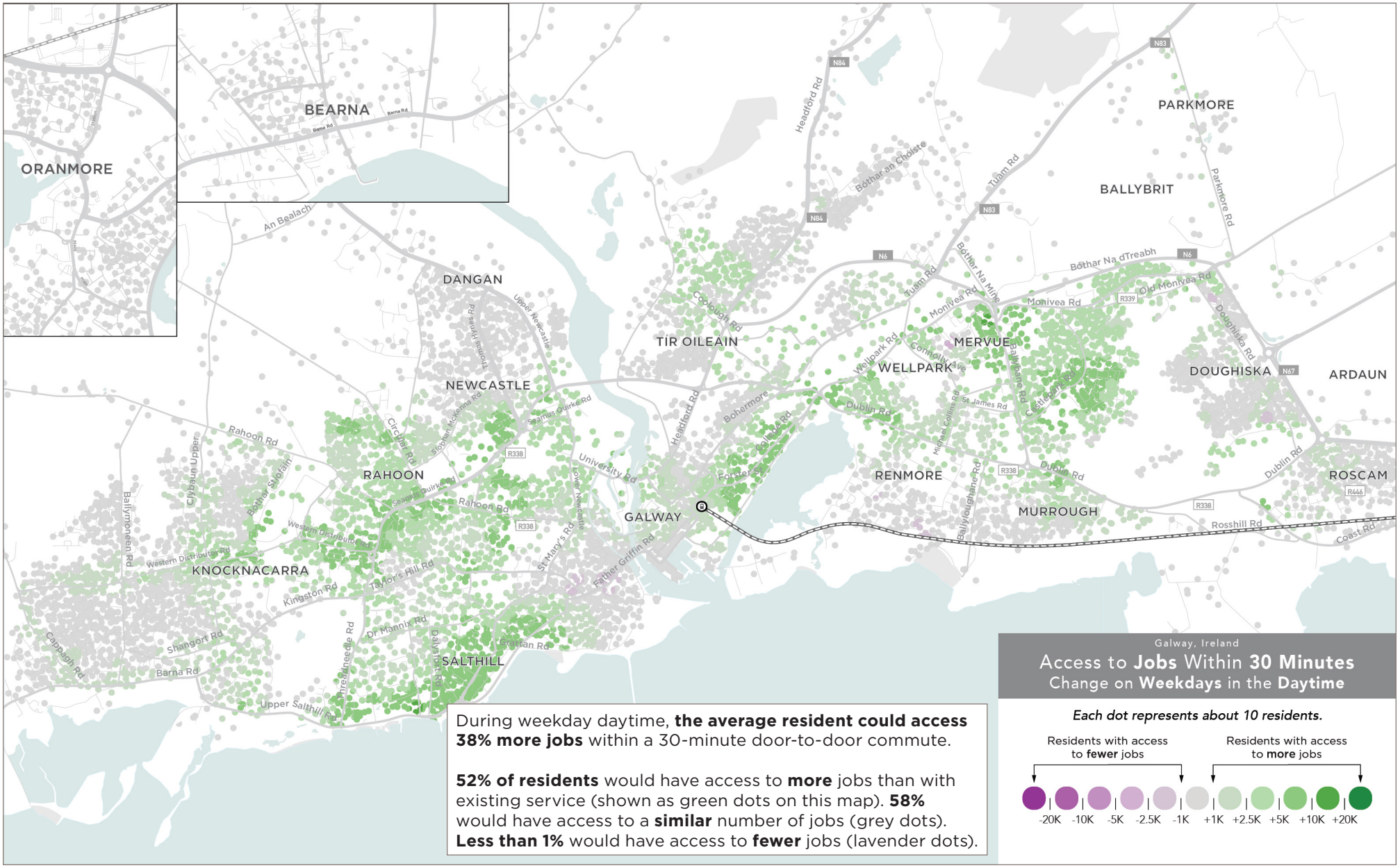
- The average resident would have access to 43% **more** jobs within 30 mins., and 14% **more** jobs within 45 mins., on Saturdays.
- On Sundays, the average resident could reach 54% **more** jobs within 30 mins. and 29% **more** within 45 mins.

The maps on the following pages show changes in access within 30 mins.; on weekdays, Saturdays and Sundays; for Galway, Barna and Oranmore areas.

- The first set of maps shows job access change based on where residents live.
- The second set of maps shows the same change in access results, but based on where jobs are located.

Maps showing changes in access within 30 or 45 minute journeys, for any area, can be made using the interactive webmap linked from www.busconnects.ie/galway.

Map of Residents' Access to Jobs on Weekdays



Galway, Ireland

Access to Jobs Within 30 Minutes
Change on **Weekdays** in the **Daytime**

Each dot represents about 10 residents.

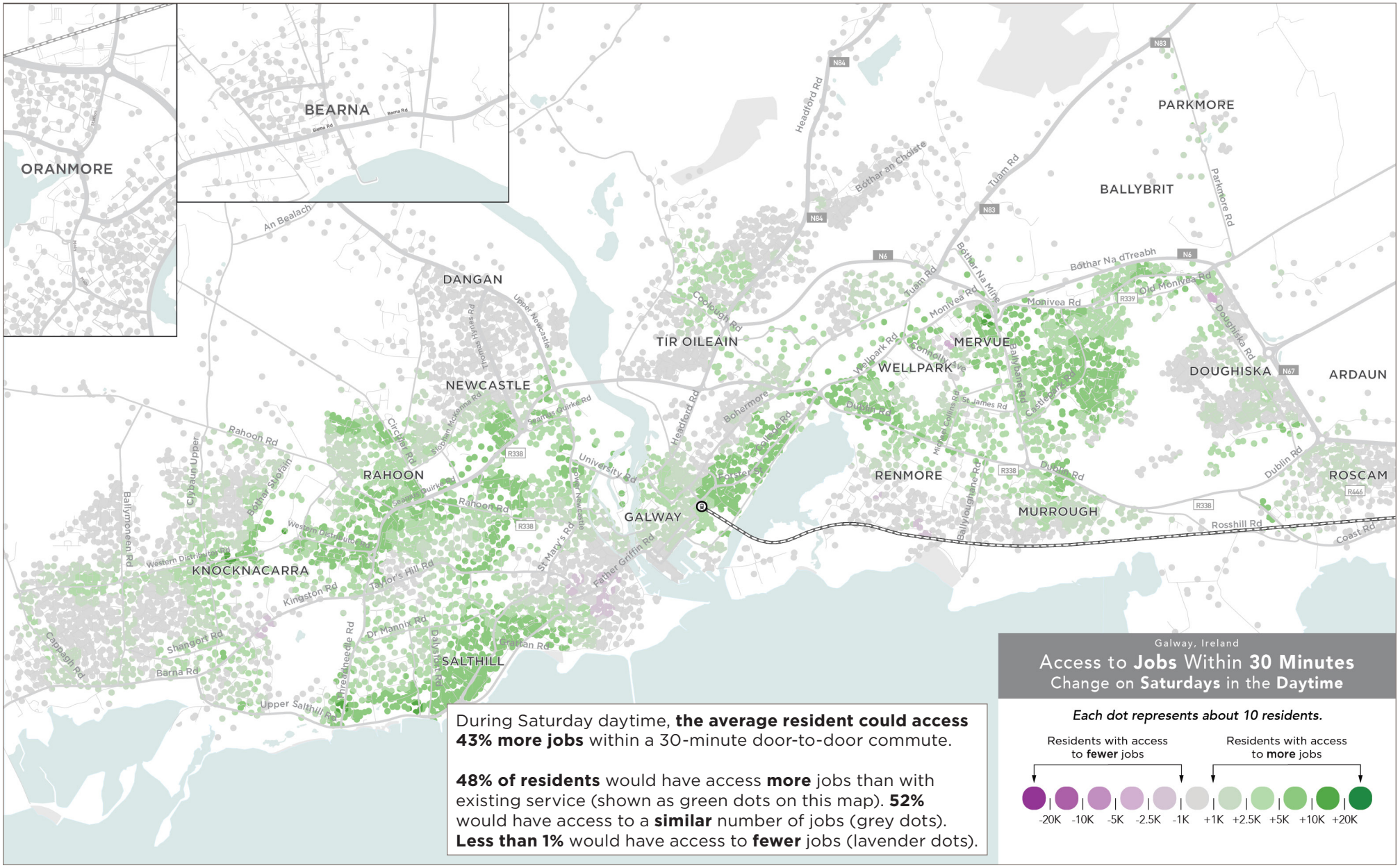
Residents with access to **fewer** jobs | Residents with access to **more** jobs

-20K -10K -5K -2.5K -1K +1K +2.5K +5K +10K +20K

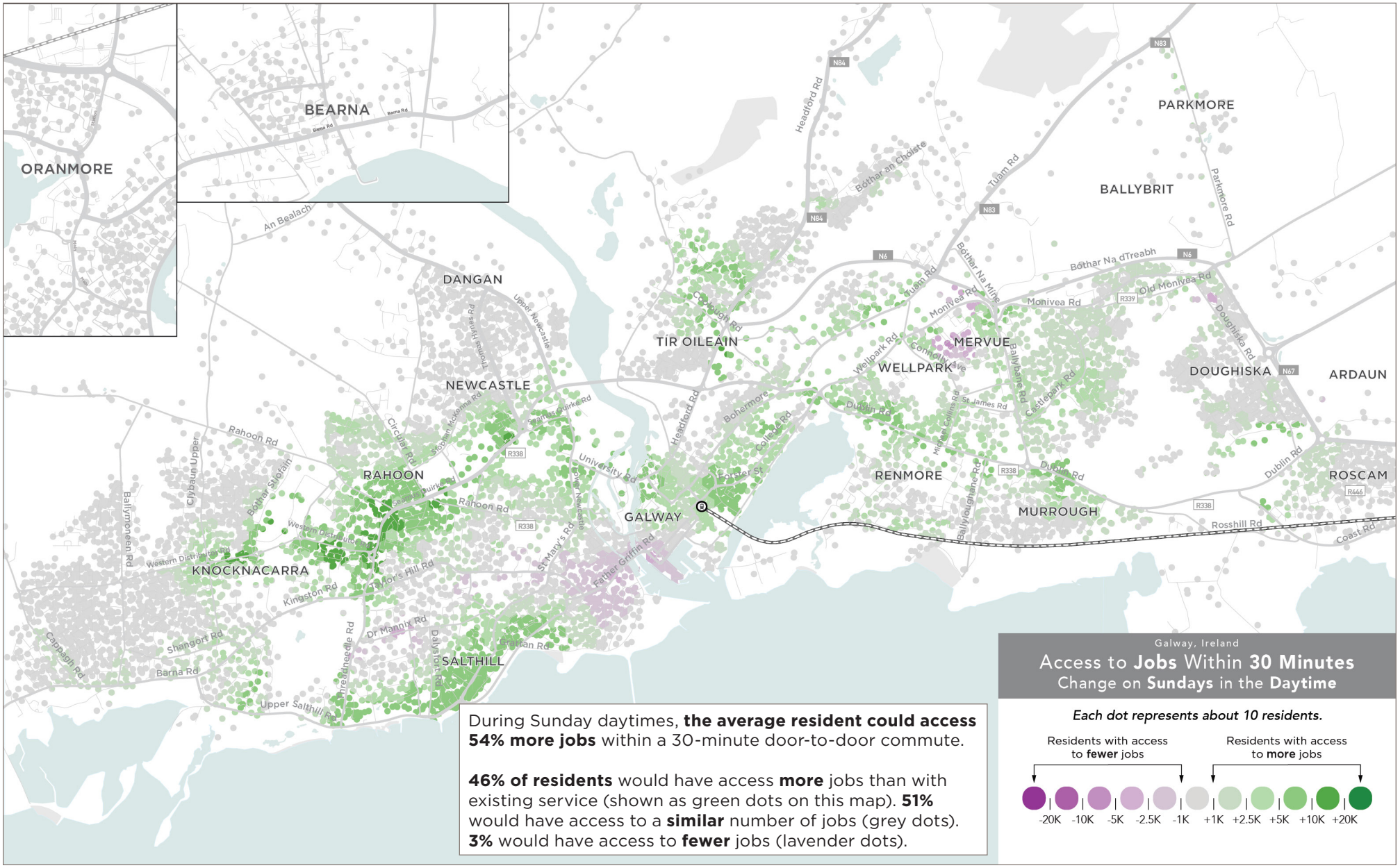
During weekday daytime, **the average resident could access 38% more jobs** within a 30-minute door-to-door commute.

52% of residents would have access to **more** jobs than with existing service (shown as green dots on this map). **58%** would have access to a **similar** number of jobs (grey dots). **Less than 1%** would have access to **fewer** jobs (lavender dots).

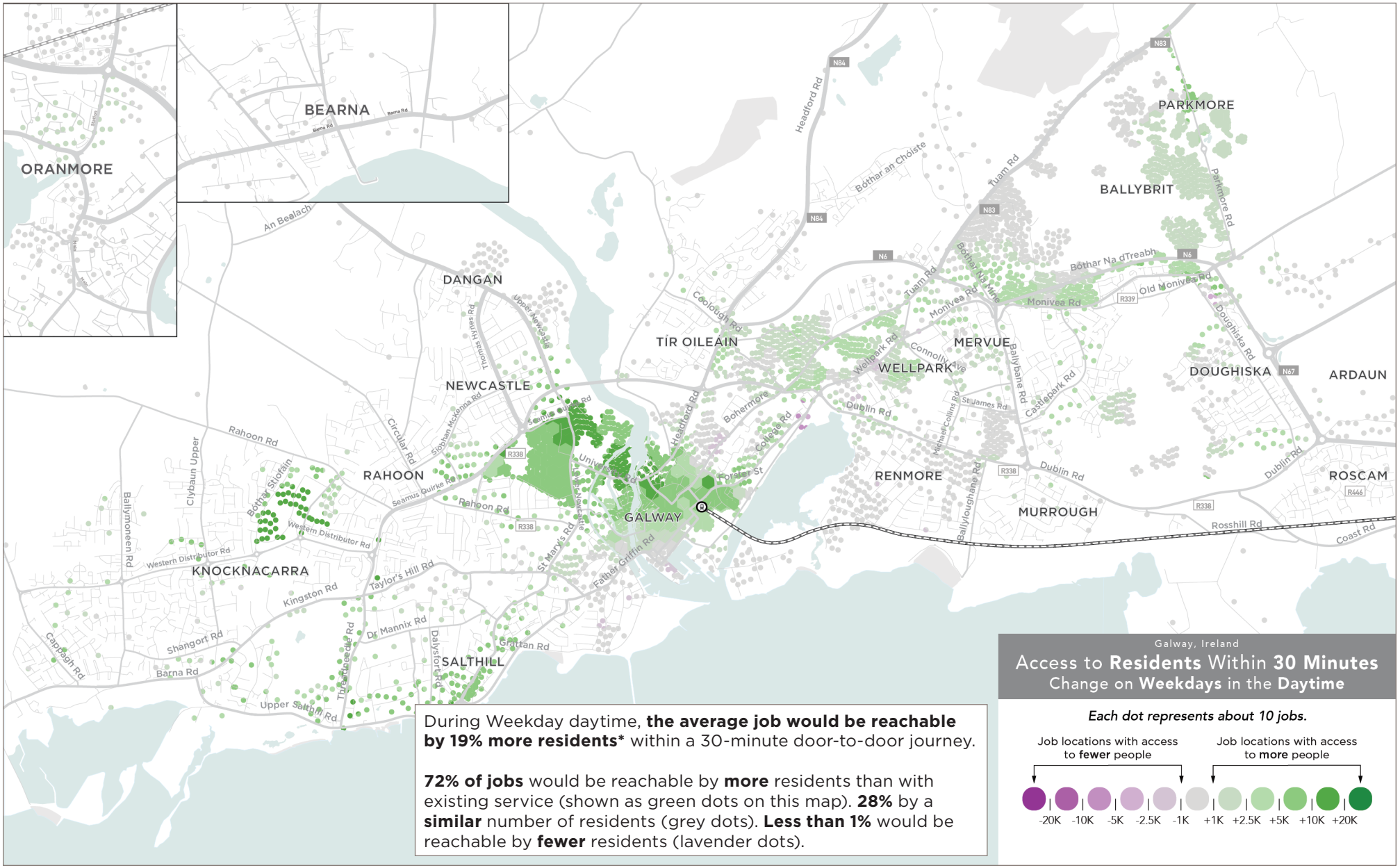
Map of Residents' Access to Jobs on Saturdays



Map of Residents' Access to Jobs on Sundays



Map of Employers' Access to Workers on Weekdays



Galway, Ireland

Access to Residents Within 30 Minutes
Change on Weekdays in the Daytime

Each dot represents about 10 jobs.

Job locations with access to **fewer** people | Job locations with access to **more** people

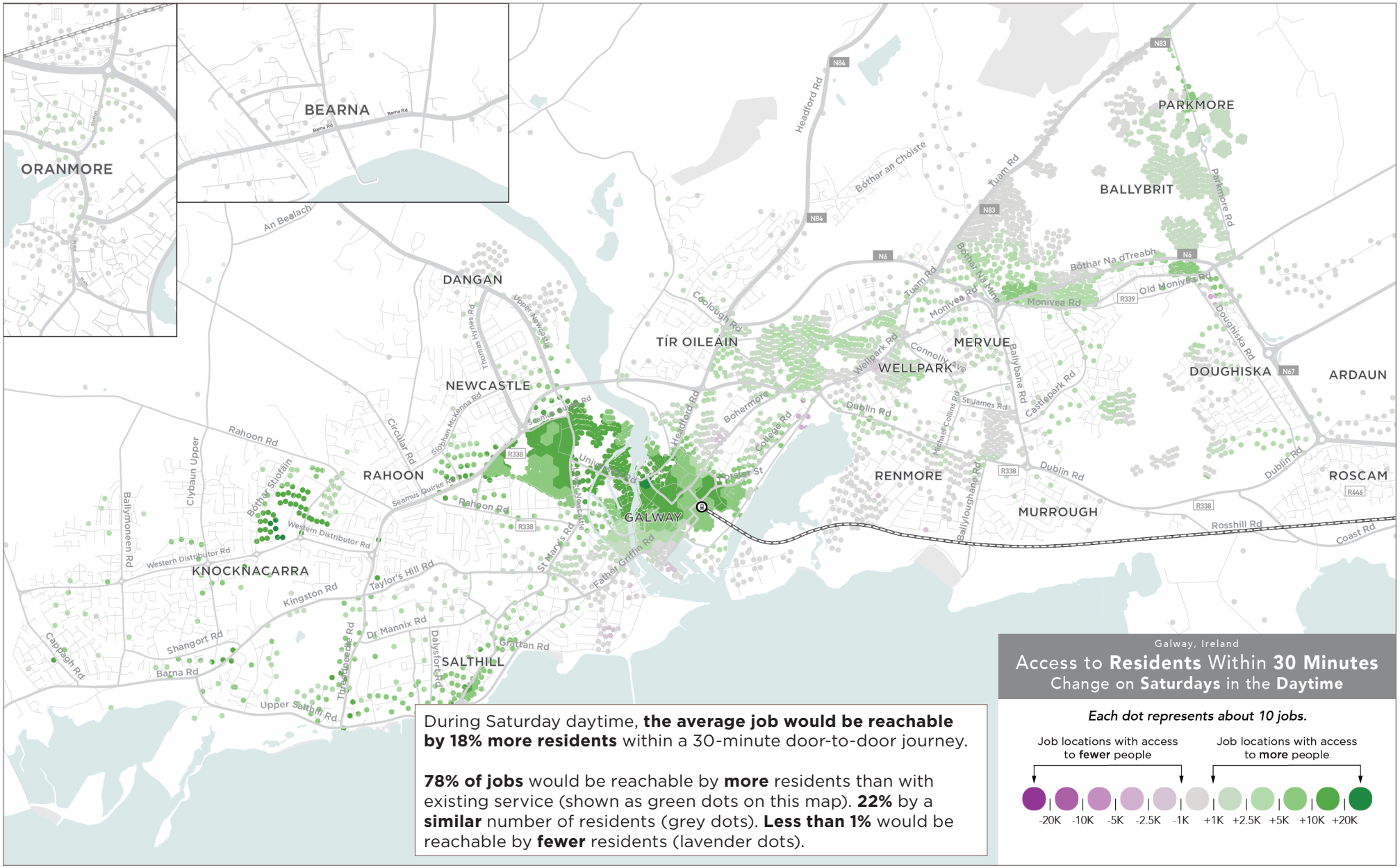
-20K -10K -5K -2.5K -1K +1K +2.5K +5K +10K +20K

During Weekday daytime, **the average job would be reachable by 19% more residents*** within a 30-minute door-to-door journey.

72% of jobs would be reachable by **more** residents than with existing service (shown as green dots on this map). **28%** by a **similar** number of residents (grey dots). **Less than 1%** would be reachable by **fewer** residents (lavender dots).

*The mathematically-inclined reader will recognise that the average increases in job access given for residents to jobs, and for jobs to residents, should be equal (comparing the number given on this map to the number given on page 84). The discrepancy reveals that we are using the word "average" to describe the *median* change within the population. Median is more reflective of people's concerns and experiences about changes to public transport, but is hard to define the term to the lay-reader without getting overly-technical. It is the author's opinion that most ordinary readers would themselves give a definition of the word "average" that is closer to the mathematical definition of "median."

Map of Employers' Access to Workers on Saturdays



Galway, Ireland

Access to Residents Within 30 Minutes
Change on Saturdays in the Daytime

Each dot represents about 10 jobs.

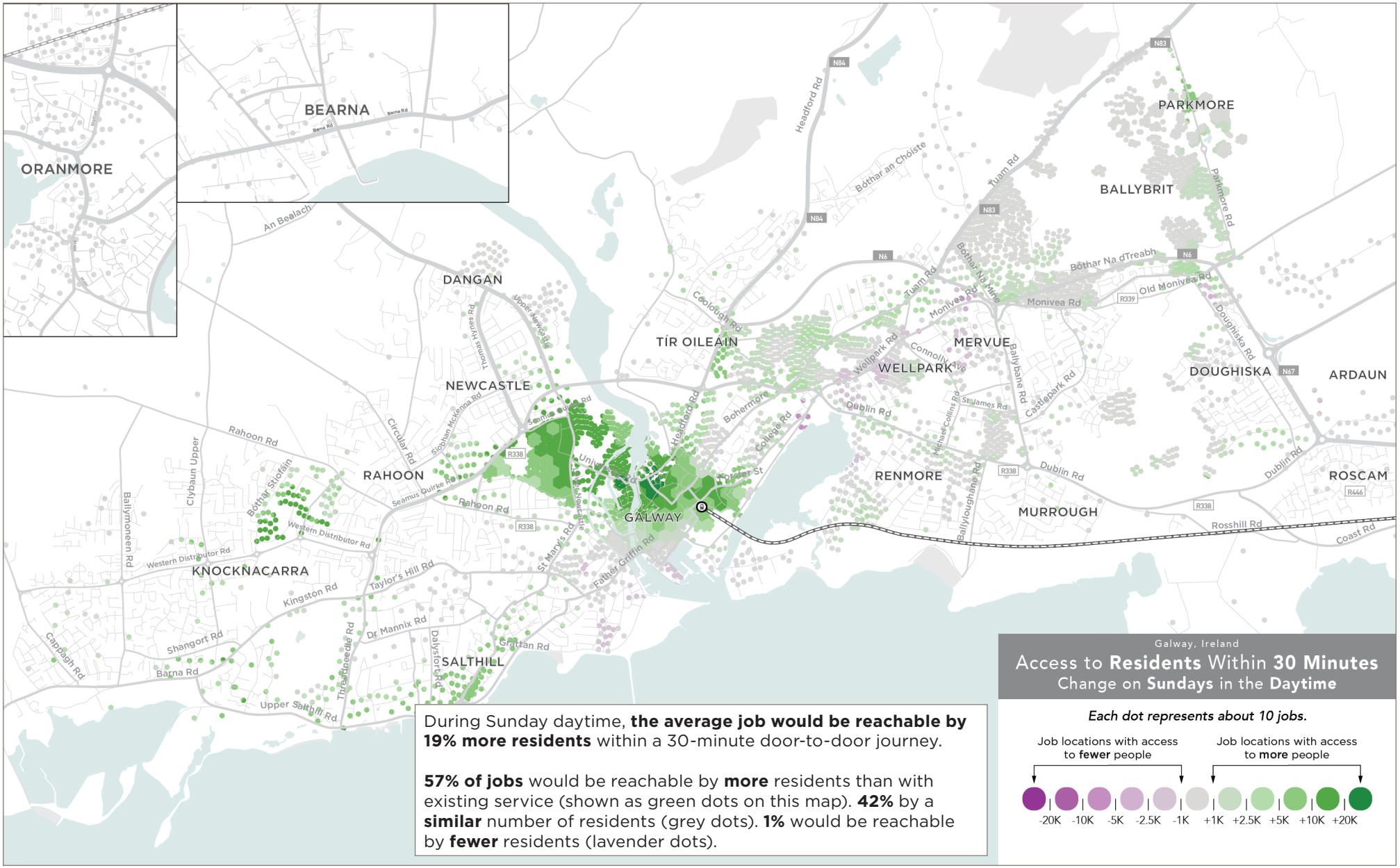
Job locations with access to **fewer** people | Job locations with access to **more** people

-20K -10K -5K -2.5K -1K +1K +2.5K +5K +10K +20K

During Saturday daytime, **the average job would be reachable by 18% more residents** within a 30-minute door-to-door journey.

78% of jobs would be reachable by **more** residents than with existing service (shown as green dots on this map). **22%** by a **similar** number of residents (grey dots). **Less than 1%** would be reachable by **fewer** residents (lavender dots).

Map of Employers' Access to Workers on Sundays



During Sunday daytime, **the average job would be reachable by 19% more residents** within a 30-minute door-to-door journey.

57% of jobs would be reachable by **more** residents than with existing service (shown as green dots on this map). **42%** by a **similar** number of residents (grey dots). **1%** would be reachable by **fewer** residents (lavender dots).

Proximity to Service of Various Frequencies

On the next four pages, graphics illustrate how people's proximity to bus service would change with the Draft New Network.

This analysis has been performed for all residents, and for residents in specific situations: those living in areas of high deprivation, seniors, and households without cars. The same analysis has also been performed for jobs.

Walking Distance

Someone is considered "proximate" if they are within a 400 m walk of a bus stop. This walk is measured along the pedestrian network, and is therefore sensitive to barriers such as motorways, cul de sacs or walls.

Most people can walk 400 m in about 5 minutes. Some people cannot walk that distance, either all the time or in certain situations (such as when carrying packages or wrangling small children). Other people regularly walk much longer than 5 mins. and would happily walk longer to reach public transport, especially if is frequent, fast and reliable.

It is not possible to set one or even multiple walking distance limits that reflect the great diversity of walking abilities and desires among Galwegians. For the purpose analysing the Draft New Network, a 5 minute walk has been assumed.

Frequencies by Time of Day and Week

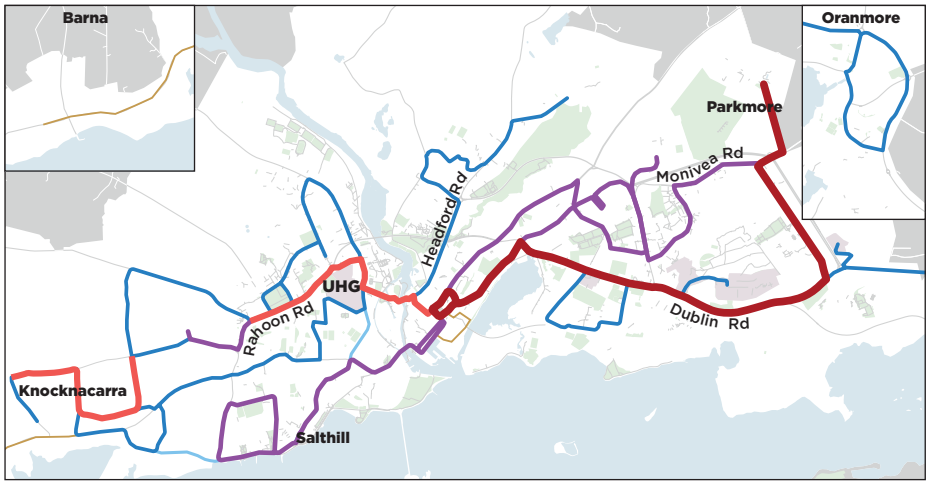
The number of residents and jobs within 400 m of service has been measured at these times:

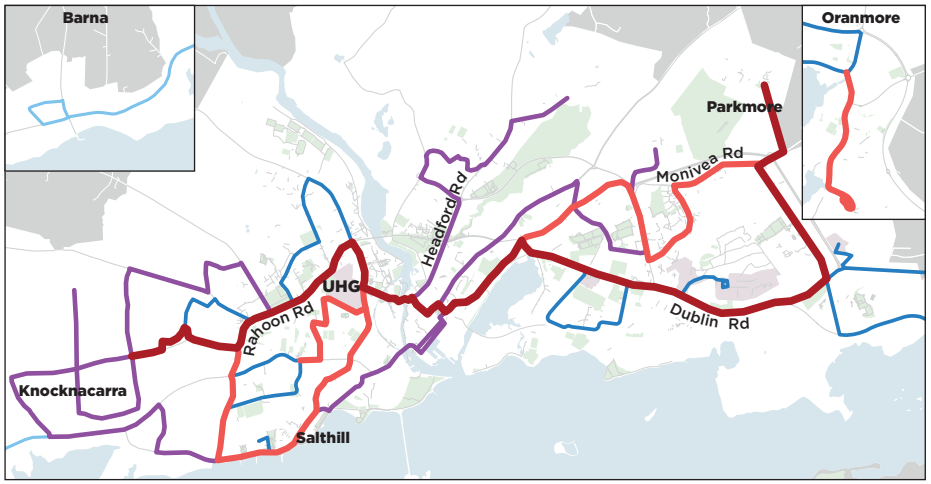
- Weekdays at midday, reflecting the service offered between the AM and PM rush hours. For many routes this is also the same level of service offered in the early morning and evening.
- Weekdays at rush hour. Most existing routes offers the same frequencies at AM and PM rush hours, however there are small differences and to be precise we have taken the PM rush hour as the compared time.
- Saturdays at midday, reflecting the service offered during most of the day.
- Sundays at midday, reflecting the service offered during most of the day.

The charts on each page are accompanied by small maps. These maps use colour-coding of routes to give a visual impression of the frequency of the networks during each of these four days and times.

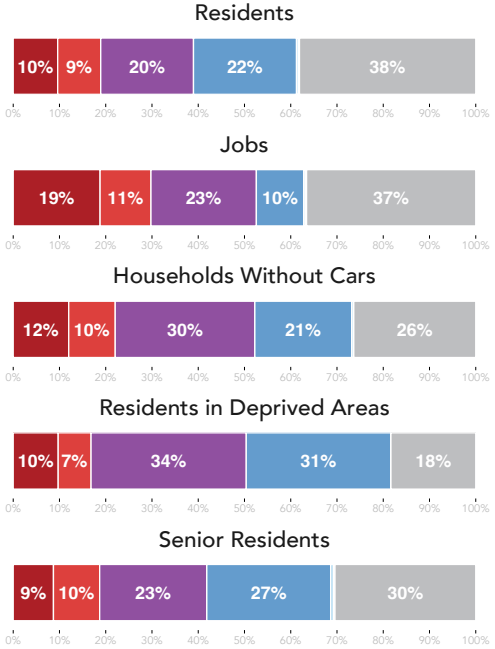
Weekdays, Daytime

Many people need to travel throughout the day, as well as during rush hours, whether to come home from an early work shift, leave work or school early, go to a meeting, or run errands.





Weekday, Daytime in the Existing Network



Map legend:

The bus comes about every...

- 10 minutes
- 15 minutes
- 20 minutes
- 30 minutes
- 60 minutes
- over 60 minutes

Graph legend:

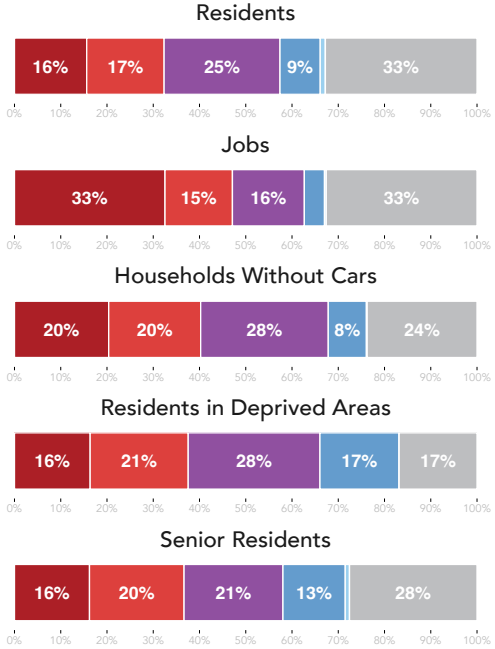
Within 400 m walk of buses coming around every

10 minutes or better	15 minutes	20 minutes	30 minutes	40-60 minutes	60+ minutes	over 400 m from service

The graph on the left shows the portion of residents and jobs in the study area that are within a 400 metre walk of public transport, and at what frequency, in the daytime on weekdays.

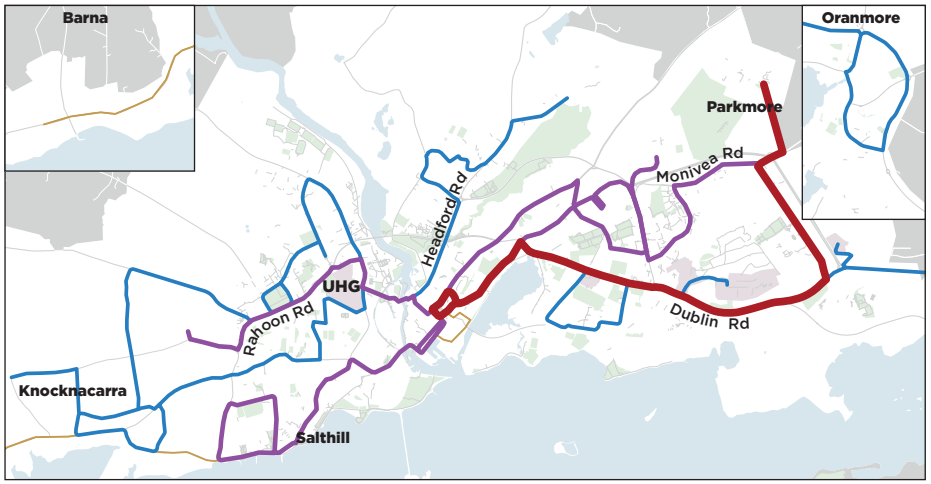
The graph on the right shows the same measure for the Draft New Network.

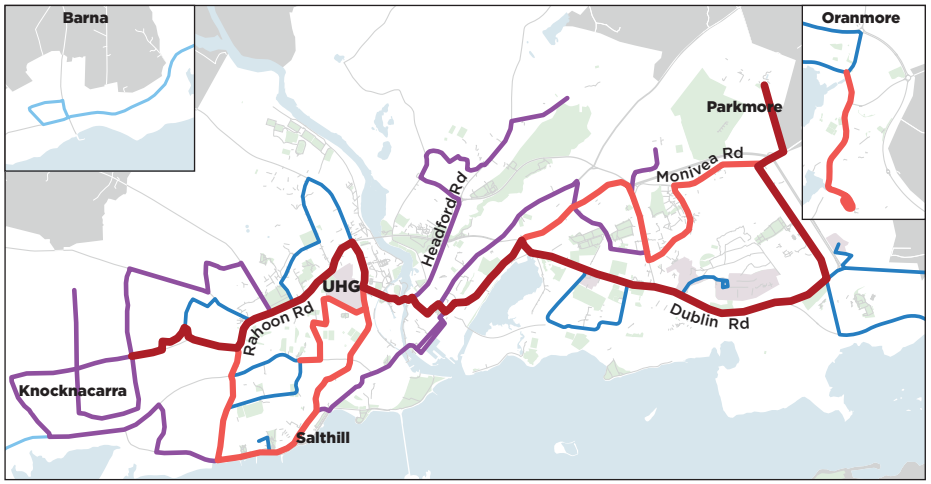
Weekday, Daytime in the Draft New Network



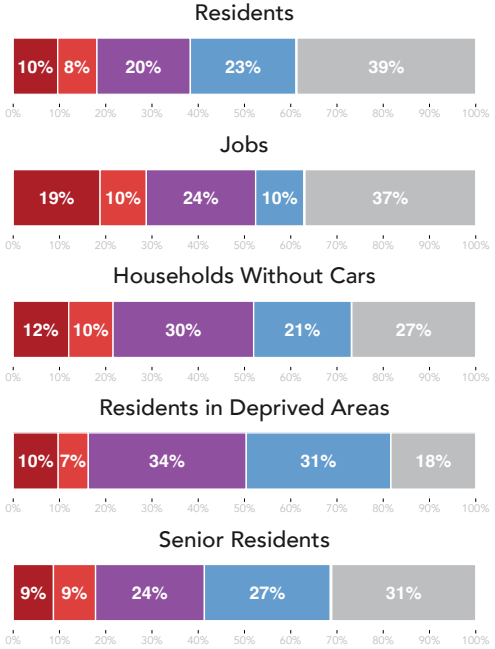
Weekdays, Rush Hour

Rush hours often correspond to peak travel, as many office workers commute to or from home. Many people also run errands on the way to or back from work or school.





Weekday, PM Rush Hour in the Existing Network



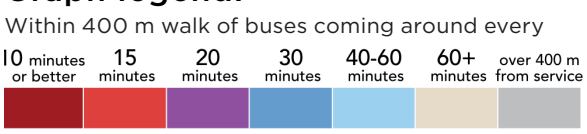
Map legend:

The bus comes about every...

- 10 minutes
- 15 minutes
- 20 minutes
- 30 minutes
- 60 minutes
- over 60 minutes

Graph legend:

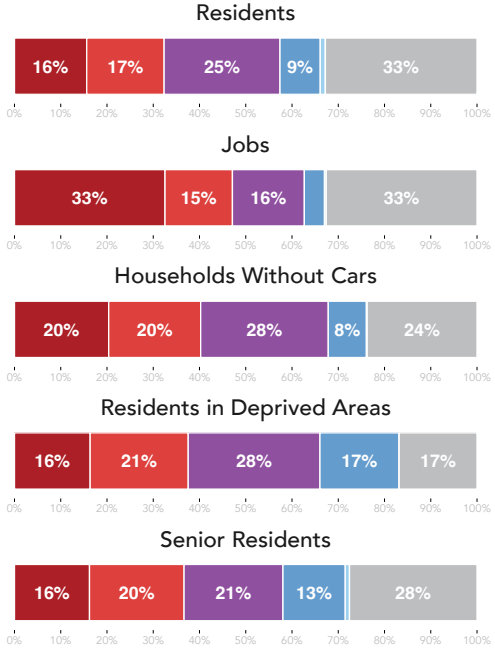
Within 400 m walk of buses coming around every



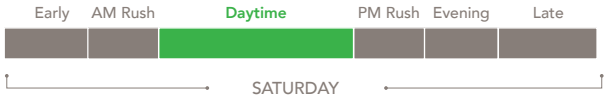
The graph on the left shows the portion of residents and jobs in the study area that are within a 400 metre walk of public transport, and at what frequency, during the PM Rush Hour on weekdays.

The graph on the right shows the same measure for the Draft New Network.

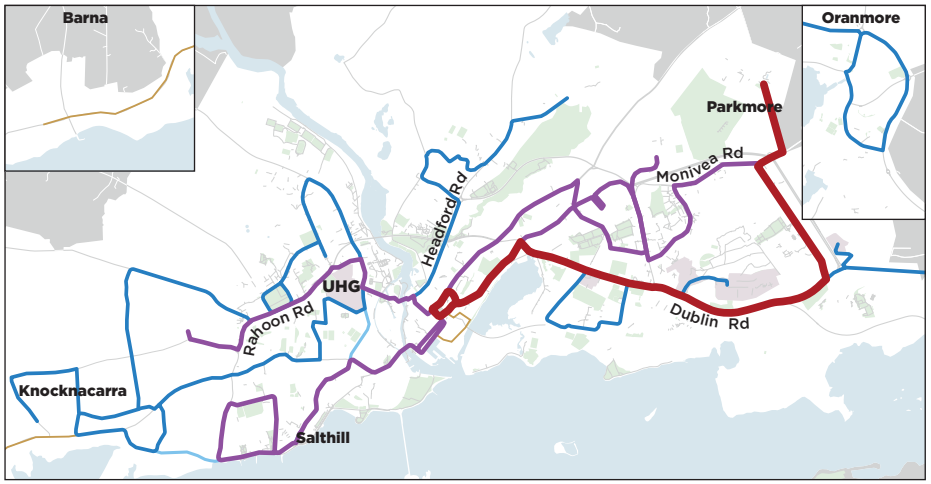
Weekday, PM Rush Hour in the Draft New Network

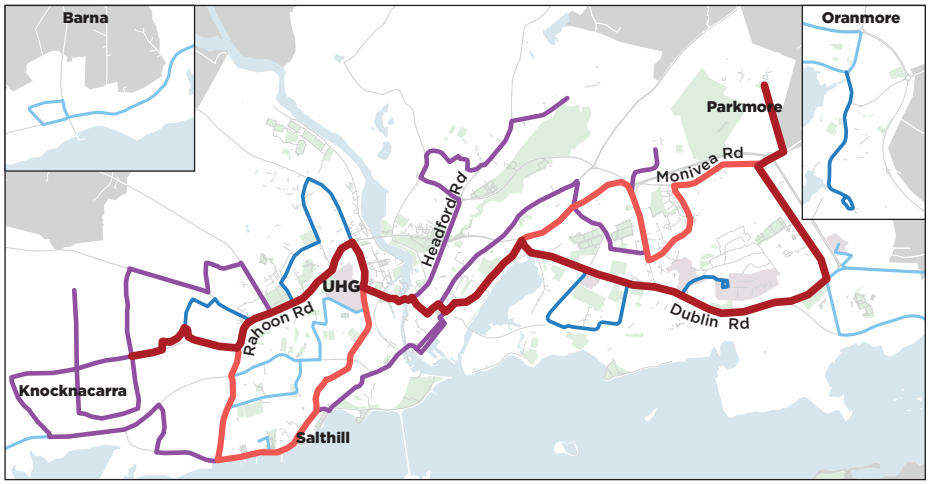


Saturdays, Daytime

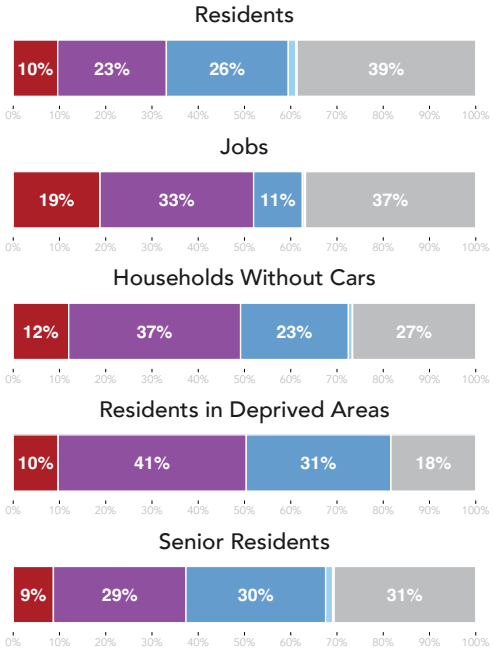


Weekend travel has grown over the last few decades. In addition to travel for errands and socialising, many retail, service, and hospitality workers commute on weekends.





Saturday, Daytime in the Existing Network



Map legend:

The bus comes about every...

- 10 minutes
- 15 minutes
- 20 minutes
- 30 minutes
- 60 minutes
- over 60 minutes

Graph legend:

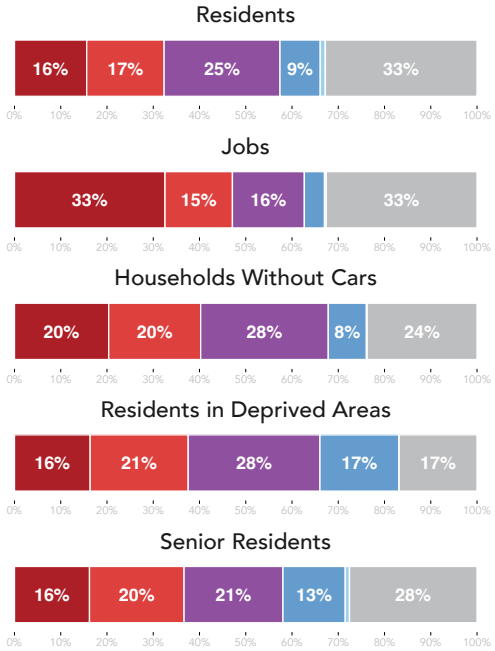
Within 400 m walk of buses coming around every

10 minutes or better	15 minutes	20 minutes	30 minutes	40-60 minutes	60+ minutes	over 400 m from service

The graph on the left shows the portion of residents and jobs in the study area that are within a 400 metre walk of public transport, and at what frequency, in the daytime on Saturdays.

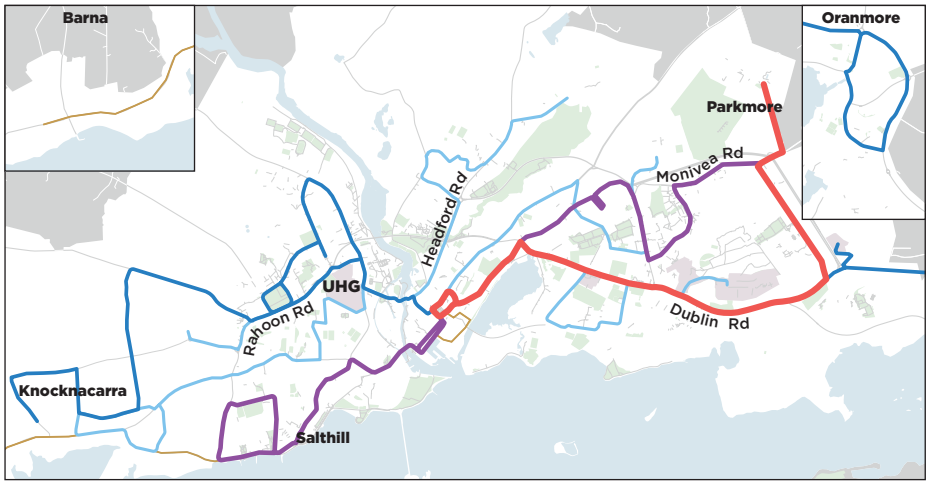
The graph on the right shows the same measure for the Draft New Network.

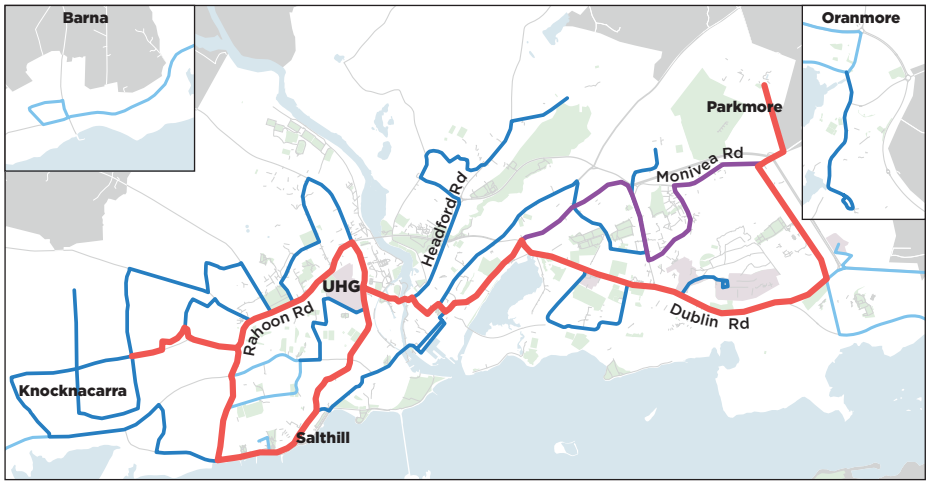
Saturday, Daytime in the Draft New Network



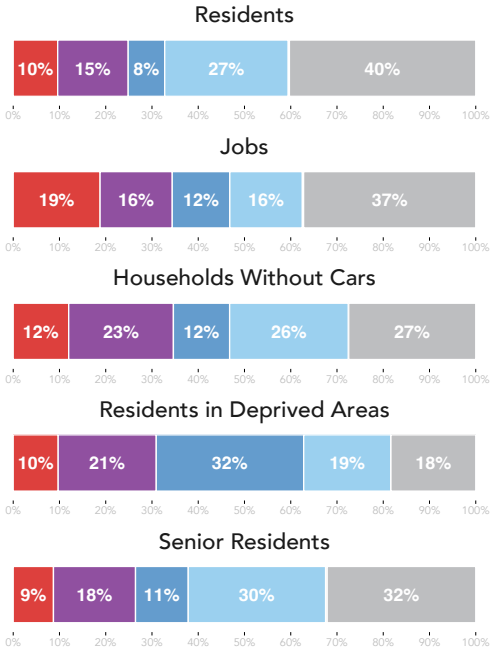
Sundays, Daytime

As traditions relating to Sundays change, more people want to travel for all purposes. Industrial jobs sometimes call for weekend shifts as well.





Sunday, Daytime in the Existing Network



Map legend:

The bus comes about every...

- 10 minutes
- 15 minutes
- 20 minutes
- 30 minutes
- 60 minutes
- over 60 minutes

Graph legend:

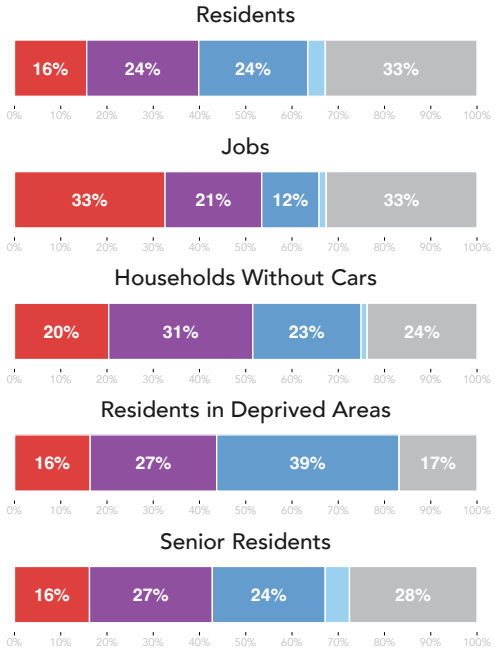
Within 400 m walk of buses coming around every

10 minutes or better	15 minutes	20 minutes	30 minutes	40-60 minutes	60+ minutes	over 400 m from service

The graph on the left shows the portion of residents and jobs in the study area that are within a 400 metre walk of public transport, and at what frequency, in the daytime on Sundays.

The graph on the right shows the same measure for the Draft New Network.

Sunday, Daytime in the Draft New Network



Appendix A

Text-based Tables of Route Frequency by Time of Day

Existing Network Frequencies and Spans (Text)

Route	Weekdays and Saturdays from 5am to 8pm	Weekdays and Saturdays from 8pm to 5am	Sundays from 5am to 8pm	Sundays from 8pm to 5am	Notes
Route 401 between Salthill and Parkmore via Eyre Square	Every 20 minutes from 6am to 7pm	Every 20 minutes from 7pm to 12 midnight	Every 20 minutes from 7am to 7pm	Every 20 minutes from 7pm to 12 midnight	
Route 402 between Seacrest and Merlin Park via Eyre Square	Limited trips from 6am to 7am, then every 30 minutes from 7am to 7pm	Every 60 minutes from 7pm to 11pm	Every 60 minutes from 8am to 7pm	Every 60 minutes from 7pm to 11pm	
Route 404 between Newcastle and Oranmore via Eyre Square	Every 30 minutes from 6am to 7pm	Every 30 minutes from 7pm to 12 midnight	Every 30 minutes from 8am to 7pm	Every 30 minutes from 7pm to 12 midnight	
Route 405 between Rahoon and Ballybane via Eyre Square	Every 20 minutes from 6am to 7pm	Every 40 minutes from 7pm to 12 midnight	Every 40 minutes from 8am to 7pm	Every 40 minutes from 7pm to 11pm	
Route 407 between Eyre Square and Bóthar an Chóiste	Limited trips from 6am to 7am, then every 30 minutes from 7am to 7pm	Every 60 minutes from 7pm to 11pm	Limited trips from 8am to 9am, then every 60 minutes from 9am to 7pm	Every 60 minutes from 7pm to 11pm	
Route 409 between Eyre Square and Parkmore via GMIT	Every 15 minutes from 6am to 7am, then every 10 minutes from 7am to 7pm	Every 15 minutes from 7pm to 12 midnight	Every 30 minutes from 7am to 11am, then every 15 minutes from 11am to 7pm	Every 15 minutes from 7pm to 12 midnight	
Route 410 between Cappagh Road and Eyre Square via Salthill	Every 60 minutes from 8am to 5pm	No service at this time	No service at this time	No service at this time	

Route	Weekdays and Saturdays from 5am to 8pm	Weekdays and Saturdays from 8pm to 5am	Sundays from 5am to 8pm	Sundays from 8pm to 5am	Notes
Route 411 between Cappagh Road and Eyre Square via Westside	Every 30 minutes from 7am to 7pm	Every 30 minutes from 7pm to 11pm	Every 60 minutes from 11am to 12 noon, then every 30 minutes from 12 noon to 8pm	Every 60 minutes from 8pm to 9pm	
Route 412 between Cappagh Road and Eyre Square via Gateway Retail Park	Every 30 minutes from 7am to 5pm, then limited trips from 5pm to 6pm	No service at this time	No service at this time	No service at this time	
Route 424 between Barna and Galway Ceannt	Approximately every 90 minutes from 7am to 7pm	Every 90 minutes from 7pm to 10pm	Limited trips from 7am to 7pm	No service at this time	Select trips in the peak direction are sometimes fewer minutes apart than 90 minutes. Route 424 continues beyond Barna to Carraroe, Lettermullen, and Carna.

Draft New Network Frequencies and Spans (Text)

Proposed Route	Weekdays and Saturdays from 5am to 8pm	Weekdays and Saturdays from 8pm to 5am	Sundays from 5am to 8pm	Sundays from 8pm to 5am	Notes
Route 1 between Gateway and Parkmore via City Centre	Every 20 minutes from 6am to 7am, then every 15 minutes from 7am to 8pm	Every 20 minutes from 8pm to 12 midnight	Every 20 minutes from 6am to 8pm	Every 20 minutes from 8pm to 12 midnight	
Route 3 between Gateway and Ballybrit Industrial Estate via City Centre	Every 30 minutes from 6am to 7am, then every 20 minutes from 7am to 8pm	Every 60 minutes from 8pm to 12 midnight	Every 60 minutes from 7am to 10am, then every 30 minutes from 10am to 8pm	Every 60 minutes from 8pm to 11pm	
Route 4 between Gateway and Merlin Park via City Centre	Every 30 minutes from 6am to 8pm	Every 30 minutes from 8pm to 12 midnight	Every 30 minutes from 7am to 8pm	Every 30 minutes from 8pm to 12 midnight	
Route 7 between Cappagh Road and Castlegar via City Centre	Every 30 minutes from 6am to 7am, then every 20 minutes from 7am to 8pm	Every 20 minutes from 8pm to 12 midnight	Every 60 minutes from 7am to 10am, then every 20 minutes from 10am to 8pm	Every 60 minutes from 8pm to 11pm	
Route 9 between Knocknacarra and Parkmore via City Centre	Every 60 minutes from 5am to 6am, then every 15 minutes from 6am to 7am, then every 10 minutes from 7am to 8pm	Every 15 minutes from 8pm to 12 midnight, then every 60 minutes from 12 midnight to 5am	Every 60 minutes from 5am to 6am, then every 60 minutes from 6am to 7am, then every 15 minutes from 7am to 8pm	Every 15 minutes from 8pm to 12 midnight, then every 60 minutes from 12 midnight to 5am	Route 9 provides 24-hour service following branch 9A

Proposed Route	Weekdays and Saturdays from 5am to 8pm	Weekdays and Saturdays from 8pm to 5am	Sundays from 5am to 8pm	Sundays from 8pm to 5am	Notes
Route 9A between Cappagh Road and Parkmore via City Centre	Every 60 minutes from 5am to 6am, then every 30 minutes from 6am to 7am, then every 20 minutes from 7am to 8pm	Every 30 minutes from 8pm to 12 midnight, then every 60 minutes from 12 midnight to 5am	Every 60 minutes from 5am to 7am, then every 30 minutes from 7am to 8pm	Every 30 minutes from 8pm to 12 midnight, then every 60 minutes from 12 midnight to 5am	Route 9A will operate 24 hours per day
Route 9B between Upper Ballymoneen Road and Parkmore via City Centre	Every 30 minutes from 6am to 7am, then every 20 minutes from 7am to 8pm	Every 30 minutes from 8pm to 12 midnight	Every 60 minutes from 6am to 7am, then every 30 minutes from 7am to 8pm	Every 30 minutes from 8pm to 12 midnight	
Route 10 between Taylor's Hill Road and Oranmore via City Centre	Every 30 minutes from 6am to 7am, then every 15 minutes from 7am to 8pm	Every 30 minutes from 8pm to 12 midnight	Every 30 minutes from 6am to 8pm	Every 30 minutes from 8pm to 12 midnight	Branches 10A and 10B combine to provide 15-minute frequencies between Galway and Oranmore
Route 10A between Leisureland and Oranmore via the Eastern Approach Road	Every 60 minutes from 6am to 7am, then every 30 minutes from 7am to 8pm	Every 60 minutes from 8pm to 12 midnight	Every 60 minutes from 6am to 8pm	Every 60 minutes from 8pm to 12 midnight	Branches 10A and 10B combine to provide 15-minute frequencies between Galway and Oranmore
Route 10B between Gateway and Oranmore via Roscam	Every 60 minutes from 6am to 7am, then every 30 minutes from 7am to 8pm	Every 60 minutes from 8pm to 12 midnight	Every 60 minutes from 6am to 8pm	Every 60 minutes from 8pm to 12 midnight	Branches 10A and 10B combine to provide 15-minute frequencies between Galway and Oranmore

Proposed Route	Weekdays and Saturdays from 5am to 8pm	Weekdays and Saturdays from 8pm to 5am	Sundays from 5am to 8pm	Sundays from 8pm to 5am	Notes
Route 424 between Barna and Galway Ceannt	Every 60 minutes from 7am to 7pm	No service at this time	Every 60 minutes from 8am to 7pm	No service at this time	Route 424 continues past Barna to Carraroe, Lettermullen, and Carna. Details of that longer service will be planned in Connecting Ireland.