Cork County Council

Carrigaline Transportation and Public Realm Enhancement Plan

Strategy Option Evaluation Report

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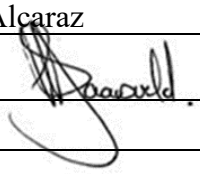
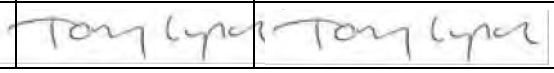
		Signature			
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1 Introduction

As part of the preparation of the Carrigaline Transportation and Public Realm Enhancement Plan (TPREP), it was important that a number of alternative transportation strategies were considered to ensure that the most appropriate plan was adopted for Carrigaline. The strategy development phase identified different transportation strategies, each potentially having different outcomes in terms of improved accessibility for the town.

The different transportation strategies were developed based on the examination of existing travel demands within the study area and reflecting on both the baseline information and the feedback obtained from the public consultation process. They were then evaluated based on the criteria set out in the Common Appraisal Framework for Transport Projects and Programmes published by the Department of Transport, Tourism and Sport.

In total, eight transportation strategies were developed and evaluated for the study area. Each of the strategies developed included alternative road improvement options to allow for the delivery of the key objectives of the Plan which are to rejuvenate the town centre, ease congestion and the dominance of the car in the town through the provision of sustainable transport infrastructure and create new public realm opportunities with increased accessibility for all.

The transportation strategies considered as part of this Plan are presented in this section and each strategy include enhancements for pedestrians, cyclists and public transport users in Carrigaline. They were then assessed individually based on established key criteria to allow a comparison between the options and the identification of the emerging preferred transportation strategy. This strategy was then developed further to include additional detail with respect to active and sustainable modes.

2 Key Performance Indicators

The key criteria established with the Common Appraisal Framework for Transport Projects and Programmes by the Department of Transport and Tourism and Sport include the following:

- Economy;
- Safety;
- Integration;
- Environment; and
- Accessibility and Social Inclusion.

This section outlines the elements under each of the key criteria:

2.1 Economy

The key elements considered under this criterion will include the operational performance of the proposed option in terms of improving traffic conditions within the study area. This criterion will also consider the potential that the proposed options will have in accommodating development growth in the area.

The evaluation criteria considered under this heading include the following:

1. Operational Performance; and
2. Capital Cost.

2.2 Safety

The key elements considered under this criterion include the safety improvements resulting from the proposed options. The review will include a safety review based on all road users, including pedestrians and cyclists.

The evaluation criteria considered under this heading include the following:

1. Road User Safety.

2.3 Integration

The key elements considered under this criterion include the alignment of the proposals with respect to the committed policy documents for the study area and embracing the smarter travel policy objectives for the study area.

The evaluation criteria considered under this heading include the following:

1. Policy Integration.

2.4 Environment

The key elements considered under this option include the impact that the proposed option has to the natural and build environment. The environmental issues considered will be the projected change in air quality, noise, landscape environment and biodiversity and impacts on existing land use, cultural heritage and water resources.

The evaluation criteria considered under this heading includes the following:

1. Environmental Impacts; and
2. Land Use Impact.

2.5 Accessibility and Social Inclusion

The key elements considered under this option include improved access to areas that are designated deprived geographic areas or to vulnerable groups. The evaluation criteria considered under this heading includes the following:

1. Accessibility and Social Inclusion.

3 Strategy Options Development

3.1 Introduction

This section outlines the strategic transportation options for Carrigaline to address the existing transportation issues and future transport demand of the town. The proposed options also provide a framework that accommodates town centre enhancement and to provide an environment where sustainable transport is prioritised.

The transport strategies developed should therefore aim to reduce the traffic volumes within the town centre and to create a more attractive area for people travelling by active modes of transport.

The north-south route on R611 (including Main Street and Cork Road through the town centre) is the current dominant traffic flow movement in Carrigaline and is under significant pressure. This route is primarily used by commuters attempting to access car parks within the town centre or to travel to other locations such as Crosshaven. In addition, high traffic volumes and vehicle queueing are also present on the east-west movement on R612 Crosshaven Road and the R613 Church Road.

Therefore, the car-dominated environment makes it difficult for sustainable transport modes to flourish, particularly for pedestrians and cyclists. Public space within the town centre is limited and is exposed to traffic fumes, noise and idling vehicles crawling through the town. In terms of public transport, the current traffic conditions impact on the bus services operating on these roads as buses are caught up in traffic, resulting in service delays.

The range of options proposed include consideration of strengthening the existing infrastructure, exploring previous proposals and amending these, where deemed necessary, and developing new options to create a better balance of travel demand over the available network.

This section also includes an evaluation of the strategic transportation options to determine a preferred option.

3.2 Transportation Strategy 1: Central Line Upgrade

One of the most direct means of resolving the current transportation challenges in Carrigaline would be to provide additional capacity along the existing road infrastructure in the town as schematically shown in **Figure 1**. To achieve this, the capacity of Cork Road and Bóthar Guidel would be increased by providing additional northbound and southbound lanes, thus widening it to a dual carriageway between the Shannonpark Roundabout and Crosshaven Road. This strategy also provides the opportunity for reduced traffic flows on Main Street to make space for enhanced public realm and sustainable transport infrastructure.

Figure 1: Transportation Strategy 1: Central Line Upgrade

Proposals associated with this strategy include the following:

- Provision of a dual carriageway, two lanes in each direction, along the R611 Cork Road and the R612 Bothar Guidel Road from the Shannonpark Roundabout to the R613 Crosshaven Road;
- Significant upgrading of the R611 Cork Road / R613 Church Road and R611 Cork Road / R612 Crosshaven Road junctions by providing turning lanes and signalisation to reduce current traffic queues and delays;
- Take advantage of the Western Inner Relief Road to be delivered in the short term, by using this as a distributor to connect to the southern part of Carrigaline and to become the primary access to town centre parking; and
- Limit access for vehicles on Main Street and allocate space to other modes of transport.

This option is a direct response to the increase in demand on the dominant travel desire lines in Carrigaline. Providing the additional capacity on Cork Road creates an opportunity to divert traffic away from the town centre creating space for town centre enhancement and to allocate road space to other modes of transport.

Currently, buses are delayed in the town centre due to congestion. The additional capacity provided on the bypass route and the reduction of traffic within the town centre can relieve the congestion and reduce the impact on bus operation.

Providing additional capacity to the existing road network is expected to address the growing traffic demand within Carrigaline; however, one of the major drawbacks of this option is that it can create a physical barrier which divides the eastern and western halves of the town from one another.

3.3 Transportation Strategy 2: Central Line Upgrade & One-Way System

Figure 2 shows a variant of the above strategy to offset the potential barrier effect that Transportation Strategy 2 represents. The barrier effect can be reduced by splitting the northbound and southbound lanes onto two routes i.e. southbound on Cork Road / Bothar Guidel and northbound on Main Street and effectively to create a one-way system within the town centre. Crossing less traffic lanes on a road at one time makes east-west movement to and from the town centre easier.

The one-way system also has the advantage of involving less-complicated junctions due to the reduction of traffic movements. Therefore, the capacity of the road system can potentially improve as more green time is available for movements.

However, this option still has a barrier effect within the northern part of Carrigaline where the road remains a dual carriageway. Although pedestrians and cyclists may find the road easier to cross due to limited number of lanes due to the one-way system, the roads might be more dangerous to cross due to an increase in vehicular speeds afforded by less friction (interfering movements and less complex and better synchronised junctions). The one system also increased journey lengths by bicycle making access by this mode less attractive.

Figure 2: Transportation Strategy 2: Central Line Upgrade with One-Way System

3.4 Transportation Strategy 3: Carrigaline LAP Outer Relief Road

Figure 3 below shows the Carrigaline LAP and the proposed alignment of the Western Outer Relief Road. **Figure 4** shows the same route, but on aerial photography for comparison purposes with other options considered.

The route follows the existing alignment of the L2473-0 in the north and the R613-85 Ballea Road to the northwest of the town. Where Ballea Road turns eastward into Carrigaline the proposed Outer Relief Road continues southbound, running in a straight line, adjacent and parallel to a country lane L6488-0 up to Mountain Road. The route then follows Mountain Road towards Carrigaline, turning sharply to the south along Lower Kilmoney Road and turning again to the east to follow Forest Hill Road and the Kilnagleary Link Road to connect to the R612 Crosshaven Road.

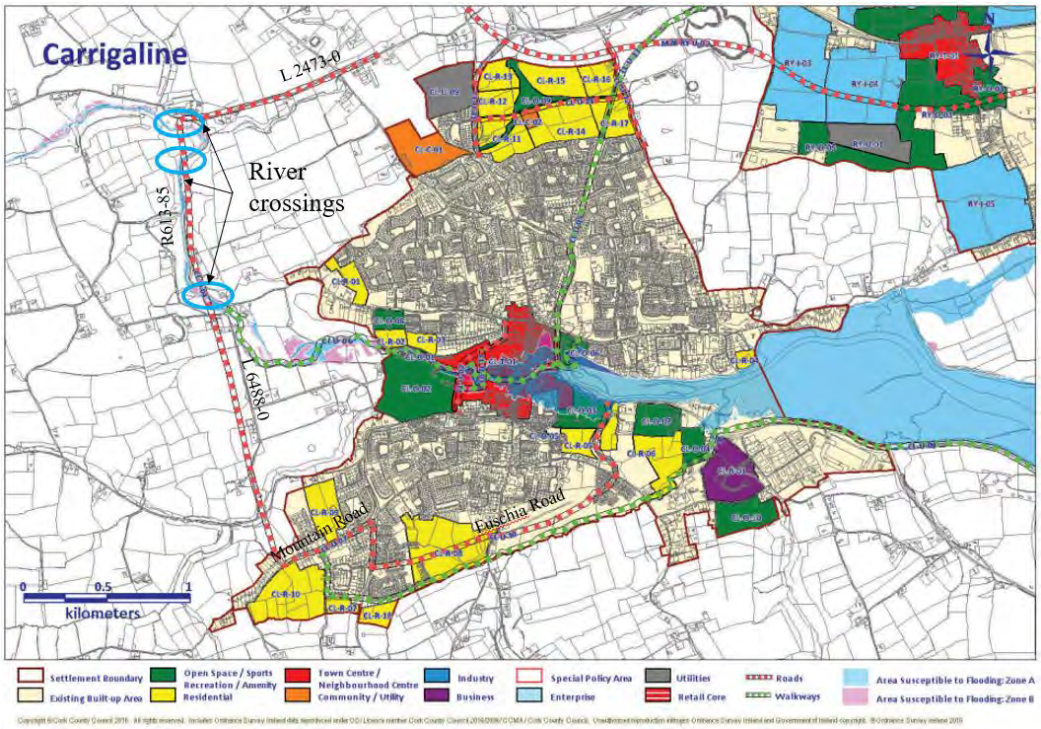


Figure 3: Transportation Strategy 3 Proposed Outer Relief Road on Carrigaline Map

Figure 4: Transportation Strategy 3 Proposed Outer Relief Road on Aerial Photography

Where Transportation Strategy 1 and 2 offer a single route through the town centre, this route provides both a town centre link and an alternative link to the national road network. The route would therefore act as a bypass for vehicles from Crosshaven and South Carrigaline to gain access to the national road network.

This option can therefore reduce the potential volume of traffic in the town centre by splitting the demand in two streams and result in travel time savings. The provision of the Outer Relief Road as idented in the Carrigaline LAP 2017 does provide a functional response to address the traffic issues in Carrigaline however its alignment does provide for some limitations as noted below:

- The total length of the proposed route is almost 8.0km, which is much longer than the current route through the town (3.0km via the R611 Cork Road / Bothar Guidel Road). In terms of time savings, there would potentially be only minimal benefits for drivers from Crosshaven and parts of South Carrigaline unless this roadway was designed to a very high speed;
- The route is indirect and involves many directional choices to be made which may be confusing to drivers. The route also consists of a variety of road types (combination of rural, urban and residential roads) may make it difficult to follow;
- The route (as noted in the LAP) crosses the Owenabue River three times in close succession which is a significant environmental concern;
- The route encloses a large portion of agricultural land to the north and east of Carrigaline. Although access to land off the distributor road would be limited, these lands could potentially become under development pressure resulting in unsustainable low-density urban sprawl;
- Cork County Council have received a submission of local residents opposed against aligning the route through Mountain Road. Residents consider Mountain Road to be a quiet country lane used as a local community amenity which would be lost if the Outer Relief Road is constructed; and
- The functionality and benefit of the southern side of the proposed Western Outer Relief Road will provide a similar function to that of the Western Inner Relief Road which is due for completion in 2022. Both roads provide connectivity between Lower Kilmoney Road and Ballea Road without the need to travel along Main Street.

3.5 Transportation Strategy 4: Northwestern Outer Relief Road Option 1

3.5.1 Route considerations

Reflecting on the key issues noted with respect to the current alignment of the Western Outer Relief Road alternative Outer Relief Route options were developed. The following aspects were reviewed in the development of the alternative options:

- Reviewing the future demand on the route and rationalising the extent of the route;
- Exploring the possibilities of providing a more direct route, closer to the edge of the existing town to limit potential urban sprawl and to improve potential time savings on the route; and
- Limiting / avoiding environmentally sensitive areas as far as possible including features such as river crossings and tree lines.

3.5.2 Resulting Alternative Routes

Figure 5 shows an alternative Outer Relief Road option based on the following rationale:

- Upgrade the existing roadways to the northwest of Carrigaline to provide an opportunity to enhance the active and sustainable transport interventions along Cork Road;
- Maximise the traffic relief associated with the Western Inner Relief road by encouraging Corkbound traffic to use the northwestern route around Carrigaline based on upgrading the existing roads; and
- Minimise any potential environmental impacts along the Ballea Road by retaining the existing alignment as much as possible and not introducing any additional river crossing on this route.

Figure 5: Transportation Strategy 4: Rationalised Outer Relief Road Option 1

3.6 Transportation Strategy 5: Northwestern Outer Relief Road Option 2

As an alternative alignment for the northwestern outer relief road, a route closer to the built-up area of Carrigaline has been considered under Transportation Strategy 5. A route closer to the town is likely to attract greater traffic flows with a corresponding greater relief to the existing road and street network in Carrigaline. However, it is noted that the topography through which this route needs to traverse has a high gradient due to the presence of rolling hills in the north-west of Carrigaline. The delivery of this new road would require extensive excavation and embankment support particularly at the tie in to the Ballea Road. This option is shown in **Figure 6**.

Figure 6: Transportation Strategy 5: Rationalised Outer Relief Road Option 2

3.7 Transportation Strategy 6: Southwestern Outer Relief Road

As a further variation to the Outer Western Relief Road presented in the Local Area Plan, the southern section of the route has been considered under Transportation Strategy 6 as shown in **Figure 7**. This section of the route is proposed to provide enhanced access between the southern part of Carrigaline (Kilmoney Road) to Ballea Road with an additional crossing of the Owenabue River.

The construction of the Western Inner Relief Road would provide additional capacity for traffic that needs to cross over the Owenabue River. It is likely that the delivery of further additional crossings of the river is a longer-term aspiration.

Figure 7: Possible extension of the Western Relief Road within the Long Term

3.8 Transportation Strategy 7: Balancing Traffic Demand on the Network (Northeastern Outer Relief Road)

While Transport Strategies 1 and 2 aim to strengthen the central route through Carrigaline to accommodate traffic demand, Transport Strategy 3 to 6 formalises an additional route along the western side of Carrigaline to reduce traffic within the town centre.

However, these strategies do not facilitate future growth and expansion of the town. The Carrigaline LAP earmarks the area to the north and east of the town for future development. This includes the Shannonpark / Janeville development, the Fernhill expansion area and commercial land uses further east towards Ringaskiddy.

The following strategic transportation option aims to provide solutions to reduce traffic within the town centre, provide alternative routes to redirect traffic and to accommodate the envisaged development to the east of Carrigaline and can be seen in **Figure 8**.

Traffic on the central corridor through Carrigaline can potentially be reduced by providing alternative routes both to the east and western sides of Carrigaline.

To the east, it is proposed to upgrade L6472, which will enclose the Fernhill expansion area and link to the N28 to the north. The N28 will be downgraded to a regional route and its current function fulfilled by the proposed new M28. Therefore, traffic volumes on the N28 is expected to reduce very significantly, providing an opportunity to reduce traffic flows along Cork Road and investing in more measures to support improved active and sustainable travel access.

This option builds on the blocks of Transportation Strategy 4 by incorporating the upgrade of the L2473-0, Ballea Road and the Inner Relief Road.

The benefit of this strategy is expected to be the following:

- The eastern and western alternative routes would provide two additional routes to the M28 Motorway and provide relief along the primary corridor running through the centre of Carrigaline;
- The existing Carrigaline road network is used to its full extent without having to provide any substantial new road investment;
- Lower traffic volumes within the town centre provides the opportunity to prioritise public transport, active travel modes and public realm enhancements; and
- Advantage is taken of the benefits presented by planned infrastructure such as the M28, including the reduction in traffic on the N28 and utilising both the northern and southern roundabouts of the Shannonpark Interchange to access the M28.

Figure 8: Transport Strategy 7: Balancing Traffic Demand on the Network

3.9 Transportation Strategy 8: Eastern Estuary Bridge

A significant proportion of through traffic within Carrigaline is generated from the Crosshaven direction. Therefore, Transport Strategy 8 includes a new road and bridge across the Owenabue Estuary, connecting Crosshaven Road with the M28. This transport proposal provides an eastern outer bypass for traffic travelling from Crosshaven and other areas within the vicinity, as well as an alternative route between Ringaskiddy and the southern parts of Carrigaline. This would potentially lead to commuters avoiding the need to travel through Carrigaline and thereby providing congestion relief and opportunities for active travel investment. The delivery of such large-scale infrastructure within environmentally designated areas would be challenging and costly particularly considering the likely traffic demand for such infrastructure.

Figure 9: Transportation Strategy 8: Owenabue Estuary Bridge Crossing

4 Options Evaluation Criteria

4.1 Evaluation Grading

The assessment of the alternative design options against each of the evaluation criteria was been based on a 10-point scale compared to the existing situation. The 10-point scale evaluation system has been proposed to assist evaluate the difference in performance between each of the proposed options. Grades **0-3** are considered negative, grades **4-6** considered neutral, and finally, grades **7 -10** are considered positive.

The following table presents an example of the Evaluation Assessment.

Table 1: Evaluation Assessment Example

	Criteria	Rating
1	Operational Performance	5
2	Capital Cost	2
3	Road User Safety	8
4	Policy Integration	8
5	Environmental Impacts	1
6	Land Use Impact	2
7	Accessibility and Social Inclusion	6
	Total	**47**

4.2 Evaluation Assessment of Transportation Strategy 1 and 2

4.2.1 Introduction

Transportation Strategy 1 is the strengthening of the central line (R611 Cork Road) into town by upgrading the road to a dual carriageway and to add additional lanes to key junctions along the route.

Transportation Strategy 2, which proposes a dual carriageway combined with a one-way system is a variant to Transportation Strategy 1 and therefore the two options are evaluated together below, as many of the issues pertaining to these options are similar.

4.2.2 Operational Performance

Appendix A includes a traffic modelling results report which is referenced in the evaluation of the options below.

Network Performance

Journey times

Compared to the 2040 Do Minimum Scenario, the journey time for Transportation Strategy 1 can be summarised as follows:

Ballinrea Road to Church Hill	quite similar
Shannonpark to Crosshaven	slight reduction
Kilmoney to Coolmore Cross	slight reduction

Compared to the 2040 Do Minimum Scenario, the journey time for Transportation Strategy 2 can be summarised as follows:

Ballinrea Road to Church Hill	significant increase
Shannonpark to Crosshaven	significant increase
Kilmoney to Coolmore Cross	significant increase

The impact of Transport Strategy 1 therefore is more or less neutral while the impact of TS2 is negative from an operational point of view.

Traffic Flows

One of the key objectives of the Carrigaline TPREP is to reduce the vehicle volumes on Main Street to create more space for public transport, walking and cycling and also to create opportunities for public realm enhancement. The change in traffic flows are therefore evaluated on meeting this objective.

TS1 shows that the strategy does result in a reduction of traffic on Main Street and that the dispersed traffic is allocated mainly to the Bothar Guidel / Cork Road corridor.

TS2 shows that the strategy results in a significant increase in traffic volume on both the central and northern section of Main Street and on the Bothar Guidel / Cork Road corridor. This additional traffic in the town centre also appears to have the effect of displacing traffic onto Bothar Glas and Ballea Road leaving Church Hill and Rose Hill with less traffic. This option appears to induce traffic on the network rather than reducing it.

Based on the above a score of 7 is given for Transportation Strategy 1, while a score of 2 is given to Transportation Strategy 2, since the latter imposes longer journey time with no gain and does not achieve the transport objective of reducing traffic in the town centre.

Capital Cost

The proposed works for Transportation Strategy 1 is considered to be high and would include costs for adding both northbound and southbound lanes on the R611 between the M28 Shannonpark Interchange to the north and the R613 Crosshaven Road junction to the south.

Additional left and right turning lanes are also proposed at the junctions with Ballinrea Road, R613 Church Road and R612 Crosshaven Road.

The proposed works for Transportation Strategy 2 would be less than Transportation Strategy 1 as the road works would be less extensive and the southern section of the upgrade would fall within the existing road footprint. The works are proposed to include a dual carriageway between the M28 Shannonpark Interchange and Ballinrea Road, converging the loop formed by the remainder of the R611 Cork Road up to the R612 Crosshaven Road, a short section of the R612 and Main Street to a one-way street. This would also involve the reconfiguration of junctions to allow for banning movements.

A score of **3** is given for Transportation Strategy 1 while a score of **4** is given to Transport Strategy 2.

4.2.3 Road User Safety

It is envisaged that pedestrian and cycle lanes would be provided adjacent to the dual carriageway which would assist in improving the safety of pedestrians and cyclists travelling north to south in Carrigaline. Widening the central route to a dual carriageway would potentially have the following road user safety impacts:

- Increase in the volume of northbound and southbound traffic traversing through the town during peak hour periods;
- Vehicles travelling at high speeds during off peak periods due to prevailing uncongested conditions;
- Crossing distances for pedestrians over the dual carriageway and at wide junctions due to additional lanes provided would increase significantly.

These impacts are expected to create a more hazardous environment for pedestrians and cyclists crossing this road infrastructure.

Transportation Strategy 2 introduces a one-way system which could potentially be less hazardous as roads within the town centre would remain narrower. However, the one-way system could potentially also facilitate higher traffic volumes during peak periods and speeding during off peak periods.

Therefore, in terms of road user safety, a score of **1** is given for Transportation Strategy 1 while a score of **3** is given to Transportation Strategy 2.

4.2.4 Policy Integration

Both national and regional planning policies aim to decrease car travel and promote sustainable transport modes by:

- Improving the local conditions for pedestrians and cyclists;
- Creating more attractive environment for active modes of transport;
- Improvement of the public realm; and
- Providing more priority to public transport networks.

Transportation Strategies 1 and 2 may conflict with the current national and regional planning policies by acting as a barrier for pedestrians and cyclists to cross and discouraging active modes of transport. The proposed infrastructure could potentially divide the town and impact on east to west movements and permeability.

More vehicles and higher speeds on the central corridor may result in car transport becoming more dominant and potentially reduce the air and noise quality within Carrigaline. This would potentially create a less attractive environment for pedestrians and cyclists and limit the potential for public realm enhancement.

A dual carriageway on Cork Road could create an opportunity to convert the one of the traffic lanes to bus lanes and therefore provide more priority to public transport. However, it would not provide additional traffic capacity and therefore not address the existing and future traffic capacity issues.

Based on the above, a score of **2** is given to Transport Strategy 1 and **3** to Transport Strategy 2 for policy integration. The latter scores slightly better as the one-way system would be easier for pedestrians and cyclists to cross the carriageway.

4.2.5 Environmental Impacts

The proposed upgrade of this route is along an existing route within a built-up area consisting mostly of hard surfacing such as roads and footpaths.

The majority of the road works is expected to occur within the existing road reserve, which is adjacent to a park on the southern section of the proposed route between R613 Ballea Road and R612 Crosshaven Road. Therefore, this imposes a risk of affecting the biodiversity within the area.

To the south of the park, the road crosses Owenbue River via a bridge, which would require widening to accommodate the proposed dual carriageway and additional lanes at the junction with R613 Crosshaven Road. This would impact on the Cork Harbour SPA Natura 2000 site, which is designated for protection of a number of bird species. Due consideration would need to be given to the protection of the river (water quality, flows and habitats) during the operation and construction phases. Additionally, there is a proposed Natural Heritage Area (pNHA) located within the site study area in Owenabue and is largely made up of Owenbue River.

The dual carriageway and widening of the junctions would have an impact on the landscape, character and visual amenity of the area. Furthermore, The junction with R613 Crosshaven road is part of the S58 scenic route which may also be affected by the widening of the road infrastructure. Therefore, consideration would be required to the design of the upgrade in relation to landscape and visual elements, particularly in the area of the Lidl roundabout and Scenic Route S58.

Sensitive receptors are located in the area, which include the surrounding residential estates adjacent to the route. Residential estates are located for most of the route, which include Janeville, Heron’s Wood, Carrigmore, Ashgrove, Ferndale, Waterpark, Seaview and Riverside.

Therefore, measures would need to be identified to reduce the potential noise, air pollution, road safety and visual impacts this option would have in the study area.

There are also a number of specific sensitive receptors which include bus stops and schools, such as Gaelscoil Charriag Ui Leighin, Saint Mary's National School and Carrigaline Community School.

In terms of environmental impact, a score of **2** is given for Transport Strategy 1 while a score of **4** is given to Transport Strategy 2.

The width of the public road space along R612 Cork Road is generally wide, which measures for more than 20.0m that allows for the envisaged road upgrade. However, there are areas where public road space is narrower and may require land acquisition and initial high-level assessment indicates that the proposed road widening may not have an impact on any building structures.

Therefore, in terms of Land Use impact, a score of **5** is given for Transportation Strategy 1 while a score of **7** is given to Transportation Strategy 2.

4.2.6 Accessibility and Social Inclusion

The proposed route provides the opportunity to increase the accessibility for Carrigaline and Crosshaven residents to Cork City and other major employment hubs which is considered a positive impact. The 2016 CSO Census shows that most of the residents within Carrigaline have access to private cars and therefore would benefit from this proposal. Bus services can potentially be improved as the proposal is expected to reduce the congestion in the town and therefore the bus operating speed may increase.

Residents that are heavily reliant on walking and cycling may be negatively impacted despite new and improved pedestrian routes and cycle ways provided as part of the scheme. This impact is essentially expected in east-west movements across town, where pedestrian and cyclists must cross the dual carriageway.

Therefore, in terms of Accessibility and Social Inclusion, a score of **4** is given for Transportation Strategy 1 while a score of **5** is given to Transportation Strategy 2.

4.2.7 Summary of Transport Strategy 1 and 2 Evaluation

Table 2 shows the summary of the evaluation of transportation strategy 1 and 2. The evaluation shows that Transportation Strategy 2 has an overall score of 27, which is slightly higher than Transportation Strategy 1.

Table 2: Transportation Strategy 1 and 2 Evaluation

No.	Criteria	Rating	
		Transportation Strategy 1	Transportation Strategy 2
1	Operational Performance	7	2
2	Capital Cost	3	4
3	Road User Safety	1	3
4	Policy Integration	3	2

No.	Criteria	Rating	
		Transportation Strategy 1	Transportation Strategy 2
5	Environmental Impacts	2	4
6	Land Use Impact	5	7
7	Accessibility and Social Inclusion	4	5
Total		**25**	**27**

4.3 Evaluation Assessment of Transportation Strategy 3 to 6

4.3.1 Introduction

Transportation Strategies 3 to 6 consider the provision of an Outer Relief Road to the west of Carrigaline.

Transportation Strategy 3 considers the proposed western outer relief road as proposed in the Carrigaline LAP 2017, while Transportation Strategy 4 and 5 focus on delivering enhanced on the northern side of the town only, while Transport Strategy 6 is a variation on Transportation Strategy 3 and 5.

4.3.2 Operational Performance

Network Performance

Journey times

Compared to the 2040 Do Minimum Scenario, the journey time for Transportation Strategy 3 can be summarised as follows:

Ballinrea Road to Church Hill — quite similar

Shannonpark to Crosshaven — slight reduction

Kilmoney to Coolmore Cross — slight reduction

Compared to the 2040 Do Minimum Scenario, the journey time for Transportation Strategy 4 can be summarised as follows:

Ballinrea Road to Church Hill — quite similar

Shannonpark to Crosshaven — slight reduction

Kilmoney to Coolmore Cross — slight reduction

Compared to the 2040 Do Minimum Scenario, the journey time for Transportation Strategy 5 can be summarised as follows:

Ballinrea Road to Church Hill — quite similar

Shannonpark to Crosshaven — slight reduction

Kilmoney to Coolmore Cross	slight reduction

Compared to the 2040 Do Minimum Scenario, the journey time for Transportation Strategy 6 can be summarised as follows:

Ballinrea Road to Church Hill	quite similar
Shannonpark to Crosshaven	slight reduction
Kilmoney to Coolmore Cross	slight reduction

All of the above strategies therefore seem to have a slight positive impact on journey time.

Traffic Flows

One of the key objectives of the Carrigaline TPREP is to reduce the vehicle volumes on Main Street to create more space for public transport, walking and cycling and also to create opportunities for public realm enhancement. The change in traffic flows are therefore evaluated on meeting this objective.

Transportation Strategy 3 does not appear to result in a reduction of traffic on Main Street; however traffic does appear to redistribute to the western part of the road network.

Transportation Strategy 4 results show that the traffic may potentially redistribute to the western part of Carrigaline. Although the improvement on Ballea Road would provide a more direct link across Owenabue River; it does not appear to significantly relieve traffic on Cork Road and Main Street

Transportation Strategy 5 has the potential to cause a reduction in traffic on Main Street and a slight increase in traffic on the Bothar Guidel / Cork Road Corridor. It should also be noted that traffic would result in a redistribution from R613 (northwest) to Forest Road as the proposed bypass would provide a faster route to access the M28.

Transportation Strategy 6 does reduce traffic along Main Street to allow for the delivery of improved active and sustainable travel interventions on this corridor.

From a journey time point of view all of the options show a slight positive impact while Transportation Strategy 5 and 6 would have the most positive impact from a traffic flow point of view, due to the reduction in traffic on Main Street.

Based on the above a score of **5** is given for Transportation Strategy 3, a score of **6** to Transportation Strategy 4 while a score of **7** is given to Transportation Strategy 5 and 6.

Capital Cost

The proposed works for Transportation Strategy 3 is considered to be very high considering the need to provide a number of additional river crossings and the length of new roadway.

The proposed works for Transportation Strategy 4 are considered modest as the route primarily avails of an existing alignment and no new river crossings are proposed. Transport Strategy 5 would be more expensive than Strategy 4 as a substantial volume of earthworks and land acquisition would be required. Finally, Transportation Strategy 5 would be as expensive as Strategy 3 due to length of the roadway and the challenges of the topography 2.

A score of **1** is given for Transportation Strategy 1 and 5 while a score of **5** is given to Transport Strategy 2 and **3** to Transportation Strategy 5.

4.3.3 Road User Safety

The purpose of the Outer Relief Road is to reduce the through traffic within the town centre by providing an alternative route for vehicular traffic. Removing the through traffic provides the opportunity for less space for vehicles within the town, reduced parking, less complex junctions by banning traffic movements, and providing more space and infrastructure to active modes of travel.

The above result is expected to be achieved in all of the above options. However, road safety can potentially still be a major concern for Transportation Strategy 3, specifically along Mountain and Forest Hill Road, which are the local distributor routes for already established residential areas. An increase in traffic volumes along these routes may have a negative impact on road safety within these areas due to an increase in traffic and vehicles speeding along this road. It is possible to provide traffic calming measures to reduce these impacts, but this can lead to other issues such as an increase in noise and pollution levels due to vehicles slowing down and speeding up while negotiating speed humps.

The outer relief road in all of the options is expected to become local amenity routes for residents walking, cycling or jogging along these routes in a countryside setting. Therefore, it would be necessary to provide footpaths and cycleways adjacent to these routes for safety.

Therefore, in terms of road user safety, a score of **4** is given for Transportation Strategy 3 which is due to its potential impact on the established residential estates to the south. A score of **6** is given to Transportation Strategy 4, 5 and 6 as these options are expected to reduce vehicles in the town centre, creating space for active modes of transport.

4.3.4 Policy Integration

Both national and regional planning policies aim to decrease car travel and promote sustainable transport modes by:

- Improving the local conditions for pedestrians and cyclists;
- Creating more attractive environments for active modes of transport;
- Improving public realm; and
- Providing more priority to public transport networks.

Transportation Strategies 3 to 5 aim to decrease car travel and promote sustainable transport. The proposed options are expected to reduce vehicle volumes on roads within the town centre and provide the opportunity to provide space for other modes of transport.

However, new road infrastructure may have a secondary impact of inducing traffic due to an increase in road capacity on the overall network. Transportation Strategy 5 presents the least additional road infrastructure while Transportation Strategy 3 and 6 presents a substantial additional road infrastructure. Transportation Strategy 4 replicates the function of Ballea Road and L2473-0 and due to its convenience, may induce some additional traffic.

Therefore, in terms of policy integration, a score of **6** is given for Transportation Strategy 3, considering the potential induction of traffic. A score of **9** is given to Transportation Strategy 4 while a score of **7** is given to Transportation Strategy 5.

4.3.5 Environmental Impacts

The alignment of Transportation Strategy 3 follows existing routes to a large extent, although the section between R613 Ballea Road and Mountain Road traverse agricultural land. Additionally, the existing roads along which the route follows are narrow and will require road widening.

Transportation Strategy 3 is proposed to cross the River Owenabue three times and therefore may have a significant impact on this river. Furthermore, R613 Ballea Road is lined with trees adjacent which would potentially be affected by road realignment and widening.

The new road may affect the landscape and character of the area, as high volumes of vehicles can potentially be introduced. The R613 Ballea Road is not classified as a scenic route; however, the route curving through the trees does have an aesthetic appeal which may be affected by the introduction of a new route.

Sensitive receptors within the area include farmhouses but significant impact would be on the residents along Mountain Road and within the Forest Hill Estate to the south.

Transportation Strategy 4 follows an alignment along existing routes and only includes local road widening and strengthening except for the connection between the L2473-0 and the M28 Shannonpark Interchange.

The alignment of Transportation Strategy 5 follows through agricultural land, which may have visual and landscape impacts as the road follows along the edge of a ridge and could potentially be visible from the northern parts of Carrigaline. Transportation Strategy 6 follows the alignment of Strategy 5 to the north and Strategy 3 to the south of the Owenabue River and has significant environmental impacts.

Therefore, in terms of Environmental impact, a score of **1** is given for Transportation Strategy 3 and 6 while a score of 2 is given to Transportation Strategy 5. A score of **6** is given to Transportation Strategy 4.

Transportation Strategies 3, 5 and 6 traverses through agricultural land, and therefore would require significant land take. Additionally, for Transportation Strategy 3 some road widening would also be required on Mountain Road to accommodate the route; however, it is assumed that the route through Forrest Hill would remain as it is currently built.

Finally, limited land take would be required for facilitating the connection between the L2473-0 and the Shannonpark Interchange.

Therefore, in terms of Land Use impact, a score of **3** is given for Transportation Strategy 3, while a score of **2** is given to Transportation Strategy 5 and a score 1 is assigned to Transportation Strategy 6. A score of **6** is given to Transportation Strategy 4 due to the limited land take involved.

4.3.6 Accessibility and Social Inclusion

Reducing traffic within Carrigaline will be of a benefit for the majority of residents of the town. Overall, accessibility in Carrigaline is expected to increase as more vehicle route options are provided. These options also allow for improved public transportation as space is available for bus priority. The reduction in traffic also provides the opportunity for footpaths and cycle lanes, as well as to improve public space.

Transportation Strategies 3 to 6 therefore are expected to have a positive impact on accessibility and social inclusion. The difference that Transportation Strategies 3 to 6 have on accessibility and social inclusion is not significant and therefore the scores is expected to be quite similar.

Therefore, in terms of Accessibility and Social Inclusion, a score of **6** is given for Transportation Strategies 3 to 5.

4.3.7 Summary of Transport Strategy 3 - 6 Evaluation

Table 3 shows the summary of the evaluation of Transportation Strategies 3 to 6. Transportation Strategy 3 and 6 scored poorly due to high capital cost and high environmental and land use impact.

Transportation Strategy 5 scored a better score than Strategy 3 or 6 but Transportation Strategy 4 scored the best with a score of 44 due to its lower capital cost and more limited environmental impact.

Table 3: Transportation Strategy 3 to 6 Evaluation

No.	Criteria	Rating			
		Transportation Strategy 3	**Transportation Strategy 4**	**Transportation Strategy 5**	**Transportation Strategy 6**
1	Operational Performance	5	6	7	7
2	Capital Cost	1	5	3	1
3	Road User Safety	4	6	6	6

No.	Criteria	Rating			
		Transportation Strategy 3	Transportation Strategy 4	Transportation Strategy 5	Transportation Strategy 6
4	Policy Integration	6	9	7	6
5	Environmental Impacts	1	6	2	1
6	Land Use Impact	3	6	2	1
7	Accessibility and Social Inclusion	6	6	6	6
Total		**26**	**44**	**33**	**28**

4.4 Evaluation Assessment of Transportation Strategy 7

4.4.1 Introduction

Transportation Strategy 7 includes the provision of transportation infrastructure on both the western and eastern side of Carrigaline to accommodate additional planned development in addition to reducing vehicular traffic within the town centre and providing a western relief road.

This strategy builds on Transportation Strategy 4 which scored the best in the evaluation of Strategies 3 – 6.

The following section provides an evaluation of this Transportation Strategy.

4.4.2 Operational Performance

Network Performance

Journey times

Compared to the 2040 Do Minimum Scenario, the journey time for Transportation Strategy 7 can be summarised as follows:

Ballinrea Road to Church Hill	significant increase
Shannonpark to Crosshaven	quite similar
Kilmoney to Coolmore Cross	significant increase

Traffic Flows

One of the key objectives of the Carrigaline TPREP is to reduce the vehicle volumes on Main Street to create more space for public transport, walking and cycling and also to create opportunities for public realm enhancement. The change in traffic flows are therefore evaluated on meeting this objective.

Transportation Strategy 7 results showed that the strategy has significantly reduced the traffic on the central corridor, particularly Main Street between Ballinrea Road and Kilmoney Road Lower and achieves the best result in meeting the above objective.

Based on the above, a score of **6** is given to Transportation Strategy 7. Although it significantly reduces traffic flows on the central corridor, it is expected to increase journey time around the town which will have a negative impact. Therefore, a moderate score is given.

Capital Cost

The works involved would include the similar work as outlined in Transportation Strategy 4, plus the following:

- Upgrade of the L6472 between the junction with Rock Road and where it would terminate due to the M28 in the north;
- Construction of a new east-west road between the terminated L6472 and Rock Road;
- Provision of a new junction between the new east-west road and Rock Road;
- Upgrade of the Rock Road / N28 junction to roundabout with turning lanes.

For capital cost a score of **5** is given for Transportation Strategy 7 as it is expected that although the option intends to use existing infrastructure as far as possible, there would be additional road widening and the provision of new roads to link the network together. It should be noted that any new road infrastructure is dependent on the development of the Fernhill Expansion area.

4.4.3 Road User Safety

Apart from also providing infrastructure for future expansion of Carrigaline, the purpose of the proposed eastern and western relief roads is to reduce the through traffic within the town centre. Reducing through traffic provides the opportunity to provide infrastructure for other modes of transport. This would include wider footpaths and new cycle lanes along routes traversing the town which would improve safety conditions for vulnerable road users.

New footpaths and cycle routes would also be provided along the eastern and western relief roads to improve safety for residents walking, cycling or jogging.

Therefore, in terms of road user safety, a score of **8** is given for Transportation Strategy 7 as the strategy intends to increase the available active mode infrastructure significantly and it is also geared towards reducing conflict between vehicles and vulnerable users.

4.4.4 Policy Integration

Both national and regional planning policies aim to decrease car travel and promote sustainable transport modes by:

- Improving the local conditions for pedestrians and cyclists;
- Creating more attractive environments for active modes of transport;
- Improving public realm; and
- Providing more priority to public transport networks.

Transportation Strategy 7 promotes the aim of decreasing car travel and improve sustainable transport. The proposed options are expected to reduce the vehicle volumes on roads within the town centre and provide the opportunity to make space available for other modes of transport.

Therefore, in terms of policy integration, a score of **9** is given for Transportation Strategy 7.

4.4.5 Environmental Impacts

Transportation Strategy 7 includes both the eastern and western bypass routes in which the latter follows the alignment of existing roads including the L2473-0 and the R613-85. As outlined in Transportation Strategy 4, the upgrade of this route would include local road widening and strengthening and would require short sections of upgraded road infrastructure to improve road safety.

The proposed eastern bypass will also include local road widening of Rock Road, road strengthening and short new sections of road to link Rock Road to the N28.

Sensitive receptors along Rock Road include farmhouses and residents adjacent to the southern part of Rock Road that may impact on noise and air quality due to an increase in traffic.

Therefore, in terms of environmental impact, a neutral score of **6** is given for Transportation Strategy 7 as little agricultural land is disturbed, most of the work will be local in nature and receptors next to Rock Road is limited.

Therefore, in terms of Land Use impact, a score of **5** is given for Transportation Strategy 7 as there is some land take involved in this option.

4.4.6 Accessibility and Social Inclusion

Both the eastern and western sides of Carrigaline are expected to have a major benefit to the residents of Carrigaline. Traffic in the town centre would be significantly reduced allowing for public transport, pedestrian and cycle priority. Transportation Strategy 7 provides an opportunity to balance the road network and reduce pronounced traffic peaks and therefore reduces the need to provide additional lanes within the town centre to accommodate peaks. The option also utilises the road network more efficiently for instance both the north and south junctions of the M28 Shannonpark interchange is utilised to accommodate traffic.

This option provides the most flexibility to introduce sustainable modes of transport and is therefore considered to have the highest impact on accessibility and social inclusion.

Transportation Strategy 7 therefore is expected to have a positive impact on accessibility and social inclusion and therefore, a score of **9** is given to this option.

4.4.7 Summary of Transport Strategy 7 Evaluation

Table 4 shows the summary of the evaluation of Transportation Strategy 7. The Strategy scores the best so far in the evaluation and scored particularly well in terms of its operational performance, road user safety policy integration and accessibility and inclusion.

Table 4: Transportation Strategy7 Evaluation

No.	Criteria	Rating
		Transportation Strategy 6
1	Operational Performance	**6**
2	Capital Cost	**5**
3	Road User Safety	**8**
4	Policy Integration	**8**
5	Environmental Impacts	**6**
6	Land Use Impact	**5**
7	Accessibility and Social Inclusion	**9**
Total		**48**

4.5 Evaluation Assessment of Transportation Strategy 8

4.5.1 Introduction

Transportation Strategies 8 takes a different approach to the transportation challenges of Carrigaline by providing a new link across the Owenabue Estuary and diverting traffic away from Carrigaline along its eastern axis.

The following section provides an evaluation of this Transportation Strategy.

4.5.2 Operational Performance

Network Performance

Journey times

Compared to the 2040 Do Minimum Scenario, the journey time for Transportation Strategy 8 can be summarised as follows:

Ballinrea Road to Church Hill	slight reduction
Shannonpark to Crosshaven	significant increase

Kilmoney to Coolmore Cross	moderate reduction

Traffic Flows

One of the key objectives of the Carrigaline TPREP is to reduce the vehicle volumes on Main Street to create more space for public transport, walking and cycling and also to create opportunities for public realm enhancement. The change in traffic flows are therefore evaluated on meeting this objective.

Transportation Strategy 8 would reduce traffic volumes in Carrigaline town centre and Crosshaven Road as the traffic would divert on the proposed new crossing on Owenabue Estuary to access M28 at Ringaskiddy.

Based on the above a score of **9** is to Transportation Strategy 8 as this option overall will have a positive impact on traffic flow.

Capital Cost

The works involved will include the following:

- Lifting the approaches on the junction to the south of Owenabue River to avoid interfering with the greenway;
- Construction of a 600m + bridge structure; and
- A new road link between the bridge and the M28.

This work is significant and from a cost point of view is expected to be the highest of any of the preceding options. For capital cost a score of **0** is given for Transportation Strategy 8.

4.5.3 Road User Safety

The reduction in traffic in Carrigaline town centre can potentially have a positive impact on road user safety. Commuter traffic destined for Cork and other employment destinations would use the new crossing on Owenabue Estuary instead of Carrigaline town centre as it would be a faster route to the M28.

Therefore, in terms of road user safety, a score of **7** is given for Transportation Strategy 8 as this option would assist in segregating vehicles and vulnerable road users from one another.

4.5.4 Policy Integration

Both national and regional planning policies aim to decrease car travel and promote sustainable transport modes by:

- Improving the local conditions for pedestrians and cyclists;
- Creating more attractive environments for active modes of transport;
- Improving public realm; and
- Providing more priority to public transport networks.

Although this strategy would help promote sustainable transportation modes by improving local conditions for pedestrians and cyclists, provide the opportunity to create more attractive environments, improve the public realm and provide more priority to public transport, the option may induce overall more traffic in the wider vicinity due to the increase in traffic capacity.

Therefore, in terms of policy integration, a modest score of **5** is given to acknowledge the positive impact on sustainable transport, but the score is reduced to account for its potential to induce traffic.

4.5.5 Environmental Impacts

The proposed route crosses the Owenabue Estuary via a new bridge and the span of this bridge is expected to be more than 600m. This would have an impact on the Cork Harbour SPA Natura 2000 site which is designated for protection of a number of bird species. Due consideration will need to be given to the protection of the river (water quality, flows and habitats) during the operation and construction phases.

These are significant impacts and compared top any of the other options evaluated this Strategy has the most significant environmental impact. Therefore, in terms of Environmental Impacts a score of **0** is given to Transportation Strategy 8.

Land take would be required for both the northern and sections of the route to facilitate the roadworks to lift the junction approaches, and to provide a new road link to the M28.

Therefore, in terms of Land Use impact, a score of **3** is given for Transportation Strategy 8 as there are land take involved in this option.

4.5.6 Accessibility and Social Inclusion

This option has the potential to have a highly positive impact on accessibility and social inclusion. The new route can improve accessibility by all modes of transport by providing not only the vehicular lanes but also footpaths and cycle links across Owenabue River. These in turn could link back to the Crosshaven Greenway. In addition, the reduction of traffic in Carrigaline can provide opportunities to reduce the size of roads and junctions and to create a more inclusive urban environment for its residents.

It must be mentioned though that the new route has the potential to sever the existing Crosshaven Greenway and will provide a negative along this route. However, despite this in terms of Accessibility and Social Inclusion, a score of **9** is given.

4.5.7 Summary of Transport Strategy 8 Evaluation

Table 5 shows the summary of the evaluation of Transportation Strategy 8. The Strategy scores the best so far in the evaluation and scored particularly well in terms of its operational performance, road user safety policy integration and accessibility and inclusion.

Table 5: Transportation Strategy8 Evaluation

No.	Criteria	Rating
		Transportation Strategy 6
1	Operational Performance	**9**
2	Capital Cost	**0**
3	Road User Safety	**10**
4	Policy Integration	**8**
5	Environmental Impacts	**0**
6	Land Use Impact	**3**
7	Accessibility and Social Inclusion	**9**
Total		**39**

4.6 Emerging Preferred Transportation Strategy

Table 6 shows a summary of the transportation strategy evaluation results. Transportation Strategies 1, 2,3 and 6 performed significantly poorer than transportation strategies 4, 5, 7 and 8. Widening the central spine within Carrigaline would have a significant social and environmental impact and also carries a high cost to deliver.

Transportation Strategy 3 mitigates the social and environmental impact within Carrigaline, but due to the large extent of this infrastructure, the cost of this strategy is high while the operational benefit gained does not differ much from the other strategies. The rationalisation of Transportation Strategy 3 led to the development of Transportation Strategies 4, 5 which include more limited road infrastructure to perform more or less the same function as Transportation Strategy 3.

However, Transportation Strategies 3 to 6 do not allow for the expansion of Carrigaline on the lands that are the most suited for development on the eastern side of town and therefore does not allow for growth ambitions as per the National Planning Framework.

Transportation Strategy 7 was developed to address future growth of the town by providing a link road to the east of the town and to provide an additional alternative route to the M28. The additional road infrastructure resulted in lower scores considering capital cost, environmental and land use impact criteria, but scored high in terms of operational performance, policy integration and accessibility & social inclusion.

Transportation Strategy 8 scored high in operational performance, road user safety and accessibility and social inclusion, but scored very poorly on capital cost and environmental impact.

Table 6: Summary of Transportation Strategy Evaluation Results

No	Evaluation Criteria	Transportation Strategy							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Operational Performance	7	2	5	6	7	7	6	9
2	Capital Cost	3	4	1	5	3	1	5	0
3	Road User Safety	1	3	4	6	6	6	8	10
4	Policy Integration	3	2	6	9	7	6	8	8
5	Environmental Impact	2	4	1	6	2	1	6	0
6	Land Use Impact	5	7	3	6	2	1	5	3
7	Accessibility and Social Inclusion	4	5	6	6	6	6	9	9
	Total	**25**	**27**	**26**	**44**	**33**	**28**	**48**	**39**

5 Recommended Transportation Strategy

Based on the transportation strategy evaluation results, Transportation Strategy 7 is recommended as the preferred strategy to be developed in more detail. This option performed the best against all the criteria used in the evaluation.

Appendix A

Traffic Modelling Results

A1 Journey Time

A1.1 Introduction

The Carrigaline LAM was also used to extract journey times for three routes through Carrigaline. These routes included the following:

- Ballinrea Road to Rose Hill;
- Shannonpark Roundabout to Crosshaven; and
- Kilmoney to Coolmore Cross (Church Road).

Journey times were extracted for both directions (i.e. north to south /south to north or east to west / west to east) and this analysis was carried out for the 2018 Base Year, 2040 Do Minimum and 2040 Do Something (TS1 to TS8) scenarios.

A1.2 Ballinrea Road to Church Hill

The journey times for this route is summarised in **Table 7** below. The results show that the journey times during the AM peak for the 2040 Do Minimum Scenario is expected to increase slightly compared to the 2018 Base Year Scenario, while the journey times during the PM peak is expected to slightly decrease. Overall, the journey times will remain more or less the same. There is little change to the road network for the 2040 Do Minimum Scenario and a modest increase in traffic volumes and therefore the results as shown is as expected.

The journey times across all transport strategy options appear to be within a similar range, except for TS2 and TS7. Both TS2 and TS7 involve reconfiguration of Main Street to discourage traffic using this route by introducing traffic restrictions. Therefore, traffic heading between Ballinrea Road to Church Hill for both TS2 and TS7 would be required to find alternative routes. This increase is expected since this route follows through the town centre where traffic restrictions will be implemented to accommodate active travel modes and providing priority to public transport.

Table 7: Journey Times for Ballinrea Road to Rose Hill

Scenario	Northbound		Southbound	
	AM Peak	*PM peak*	*AM Peak*	*PM Peak*
2018 Base Year	5 min 59 sec	6 min 28 sec	5 min 53 sec	6 min 08 sec
2040 Do Minimum	6 min 6 sec	6 min 9 sec	5 min 56 sec	6 mins
2040 Do Something (TS1)	5 min 45 sec	6 min 15 sec	5 min 56 sec	6 min 16 sec
2040 Do Something (TS2)	8 min 46 sec	9 min 51 sec	11 min 06 sec	10 min 35 sec
2040 Do Something (TS3)	6 mins	5 min 58 sec	5 min 54 sec	5 min 59 sec
2040 Do Something (TS4)	6 min 6 sec	6 min 8 sec	5 min 55 sec	6 mins
2040 Do Something (TS5)	5 min 58 sec	6 min 10 sec	5 min 59 sec	6 min 4 sec
2040 Do Something (TS6)	5 min 52 sec	5 min 58 sec	5 min 58 sec	6 min 2 sec
2040 Do Something (TS7)	8 min 35 sec	8 min 39 sec	8 min 10 sec	8 min 17 sec
2040 Do Something (TS8)	5 min 41 sec	6 min 2 sec	5 min 49 sec	6 min 4 sec

A1.3 Shannonpark to Crosshaven

The journey times for this route is summarised in **Table 8** below. The results show that the journey times for the 2040 Do Minimum Scenario is expected to increase in both directions compared to the 2018 Base Year Scenario. This is due to expected traffic growth from 2018 to 2040 and no changes to the road network to accommodate the increase in demand.

The journey times across all transport strategy options appear to be within a similar range, except for TS1, TS2 and TS8. TS1 has the fastest journey time across all options, including 2018 base year and 2040 Do Minimum due to the duplication of capacity on Cork Road between Shannonpark Roundabout and Crosshaven Road.

TS2 has one of the longest journey times across all options which is due to the reconfiguration of Main Street to discourage traffic using this route by introducing traffic restrictions. Therefore, traffic heading between Ballinrea Road to Church Hill for TS2 would be required to find alternative routes. This increase is expected since this route follows through the town centre where traffic restrictions will be implemented to accommodate active travel modes and providing priority to public transport

Table 8: Journey Times for Shannonpark to Crosshaven

Scenario	**Northbound**		**Southbound**	
	AM Peak	*PM peak*	*AM Peak*	*PM Peak*
2018 Base Year	9 min 26 sec	9 min 36 sec	8 min 59 sec	10 min 10 sec
2040 Do Minimum	10 min 51 sec	10 min 14 sec	9 min 12 sec	9 min 54 sec
2040 Do Something (TS1)	8 min 47 sec	8 min 50 sec	8 min 29 sec	9 min 3 sec
2040 Do Something (TS2)	13 min 2 sec	12 min 51 sec	10 min 44 sec	10 min 59 sec
2040 Do Something (TS3)	10 min 40 sec	9 min 48 sec	9 min 4 sec	9 min 42 sec
2040 Do Something (TS4)	10 min 49 sec	9 min 57 sec	9 min 5 sec	9 min 46 sec
2040 Do Something (TS5)	10 min 39 sec	9 min 35 sec	9 min 1 sec	9 min 33 sec
2040 Do Something (TS6)	9 min 22 sec	9 min 10 sec	8 min 56 sec	9 min 28 sec
2040 Do Something (TS7)	10 min 14 sec	10 min 16 sec	10 min 8 sec	10 min 39 sec
2040 Do Something (TS8)	15 min 19 sec	15 min 57 sec	8 min 48 sec	8 min 59 sec

A1.4 Kilmoney to Coolmore Cross

The journey times for this route is summarised in **Table 9**below. The results show that the journey times for the 2040 Do Minimum Scenario is expected to increase in both directions compared to the 2018 Base Year Scenario. This is due to expected traffic growth from 2018 to 2040 and no changes to the road network to accommodate the increase in demand.

The journey times across all transport strategy options appear to be within a similar range, except for TS2 northbound/eastbound, where it takes longer in the AM peak to travel from Kilmoney to Coolmore Cross, which is potentially due to the delays caused by the reconfiguration of Main Street. TS8 generally has the fastest journey time across all options, including 2018 base year and 2040 Do Minimum which may be due to the Owenabue Estuary Bridge Crossing, as traffic originally using Church Road have reduced, hence resulted to less delays on this route.

Table 9: Journey Times for Kilmoney to Coolmore Cross

Scenario	**Northbound**		**Southbound**	
	AM Peak	*PM peak*	*AM Peak*	*PM Peak*
2018 Base Year	9 min 21 sec	8 min 58 sec	8 min 41 sec	9 min 33 sec
2040 Do Minimum	10 min 50 sec	9 mins	8 min 56 sec	9 min 37 sec
2040 Do Something (TS1)	9 min 43 sec	9 min 39 sec	9 min 39 sec	10 min 43 sec
2040 Do Something (TS2)	13 min 3 sec	11 min 1 sec	10 min 8 sec	10 min 9 sec
2040 Do Something (TS3)	10 min 40 sec	8 min 52 sec	8 min 44 sec	9 min 29 sec
2040 Do Something (TS4)	10 min 46 sec	8 min 55 sec	8 min 45 sec	9 min 31 sec
2040 Do Something (TS5)	10 min 25 sec	8 min 48 sec	8 min 43 sec	9 min 21 sec
2040 Do Something (TS6)	9 min 40 sec	8 min 43 sec	8 min 38 sec	9 min 11 sec
2040 Do Something (TS7)	10 min 33 sec	10 min 36 sec	10 min 7 sec	13 min 3 sec

2040 Do Something (TS8)	8 min 35 sec	8 min 42 sec	8 min 49 sec	9 min 11 sec

A2 Traffic Flows

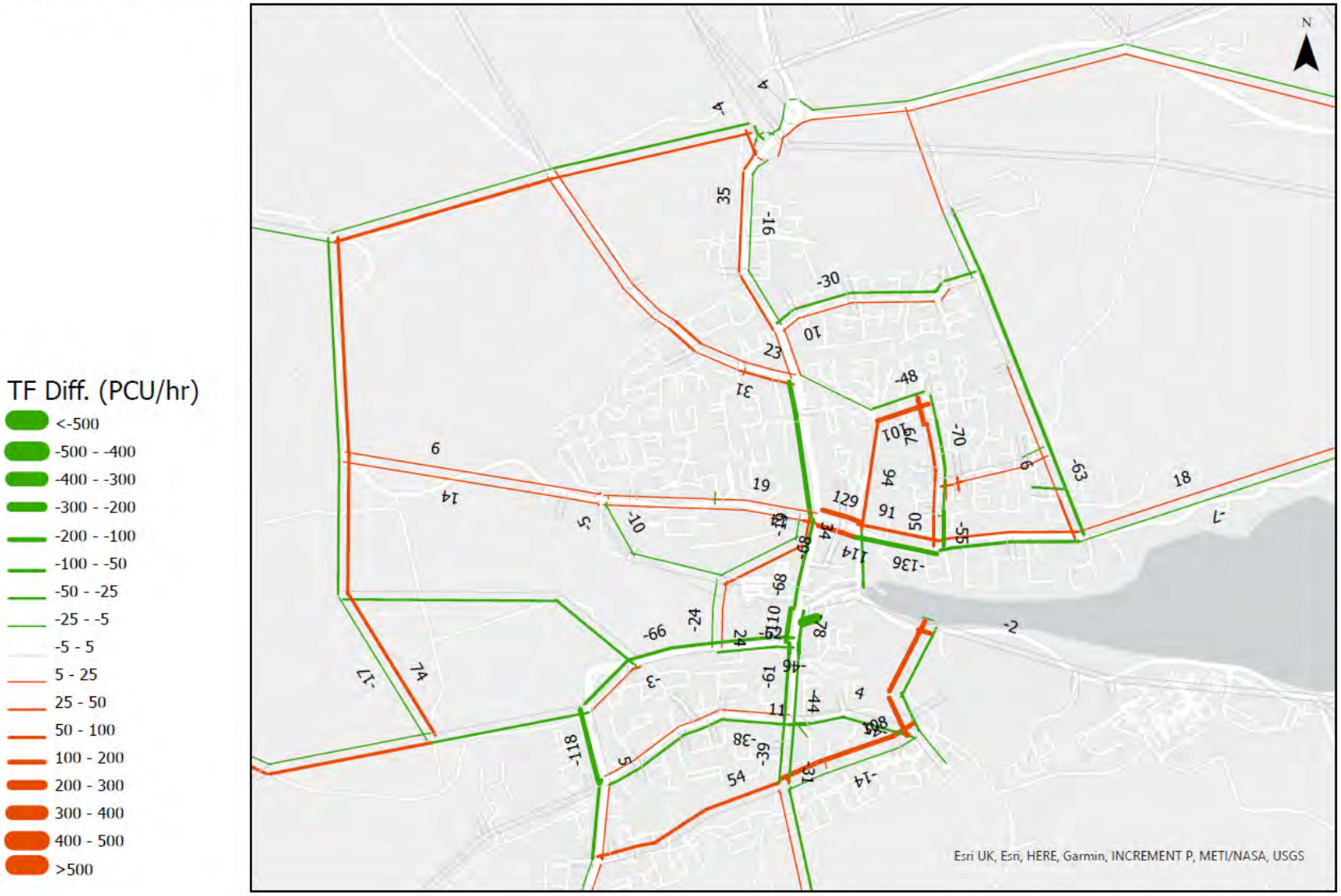
A2.1 Introduction

The Carrigaline LAM was used to understand the traffic impacts of each transport strategy option by comparing with the 2040 Do Minimum model. This will give an understanding of any redistribution in traffic depending on the road intervention(s) for each transport strategy option.

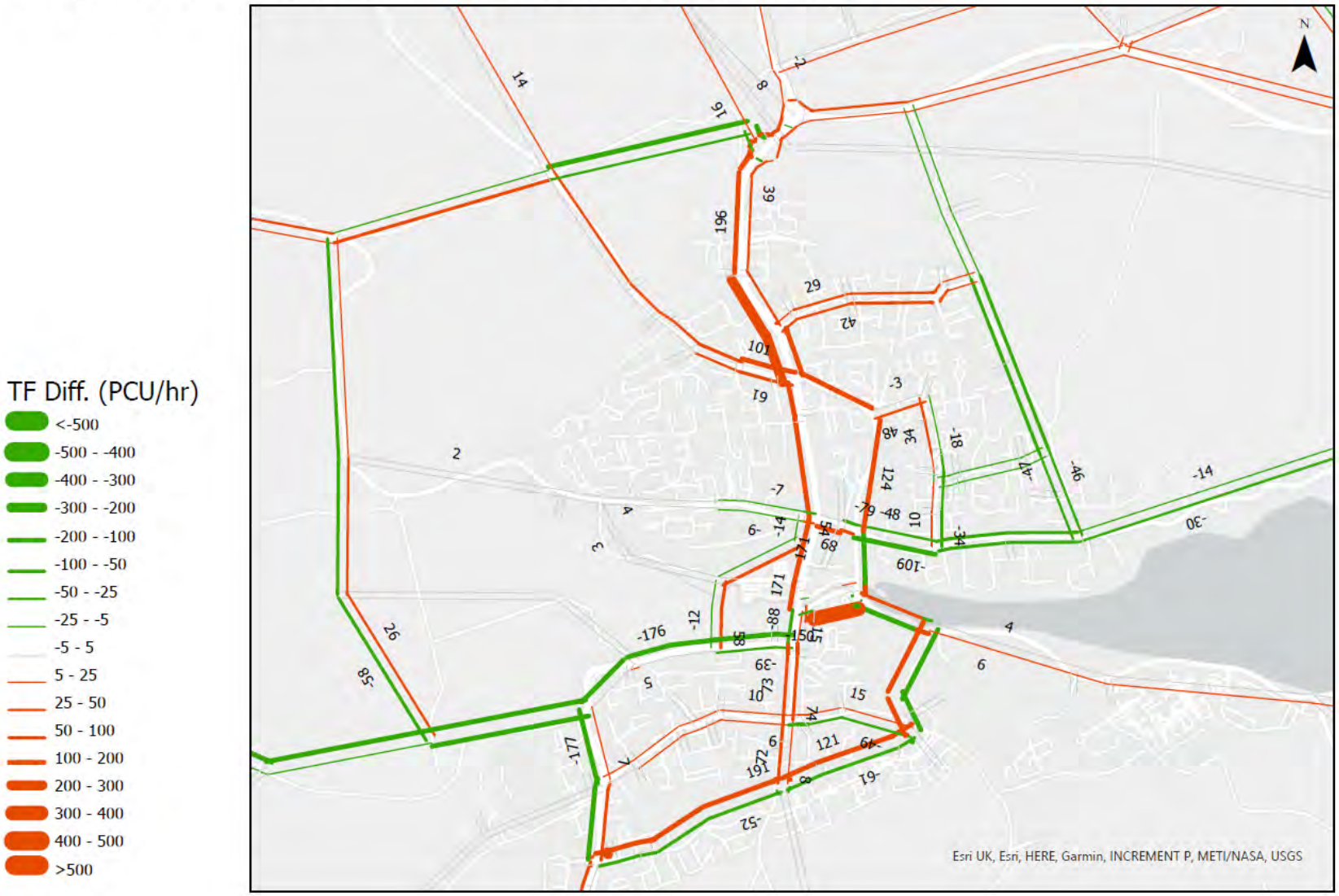
A2.2 Transportation Strategy 1: Central Line Upgrade

The duplication of Cork Road between Shannonpark Roundabout and Crosshaven Road has resulted in vehicles redistributing from Main Street (between Ballinrea Road and Ashgrove Roundabout) to the existing Cork inner bypass. Additionally, vehicles have also redistributed from Rose Hill/Church Hill to Fuschia Avenue/Crosshaven Road.

Carrigaline TPREP - 2040 Do Min AM vs 2040 Do Something TS1 AM



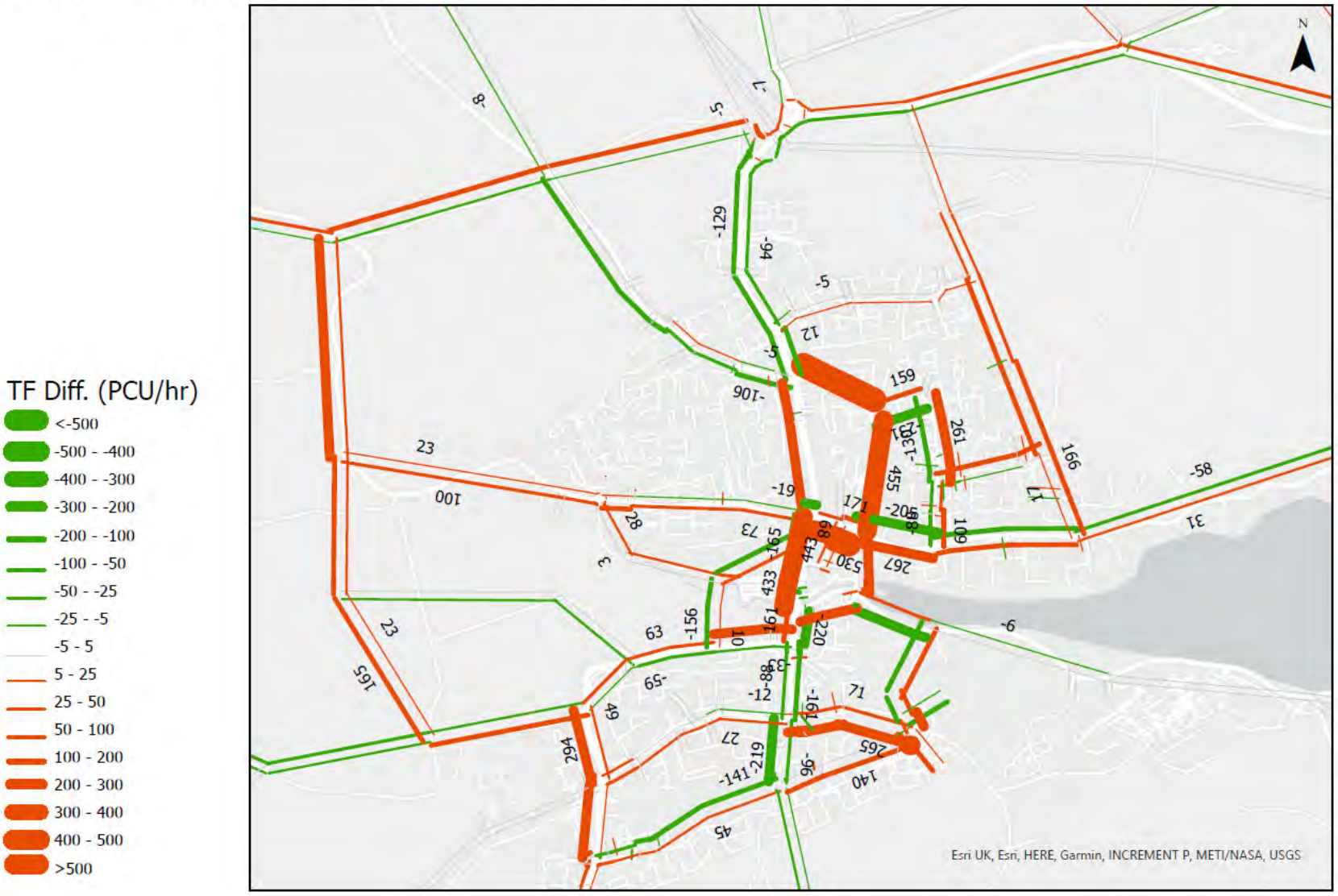
Carrigaline TPREP - 2040 Do Min PM vs 2040 Do Something TS1 PM



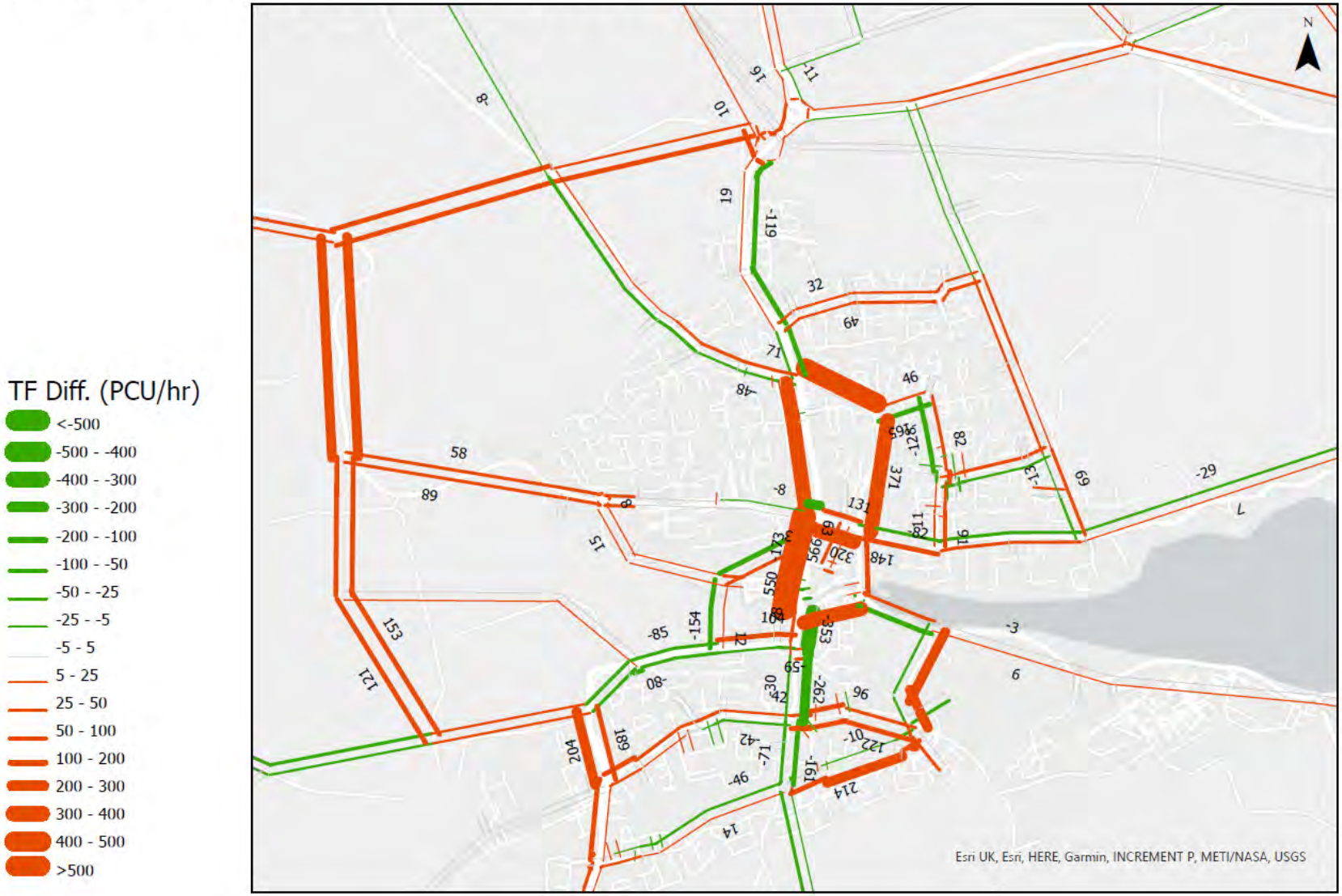
A2.3 Transportation Strategy 2: Central Line Upgrade & One-Way System

Although Cork Road between Shannonpark Roundabout and Ashgrove Roundabout has been duplicated in this option, it still had a reduction in trips overall due to the one-way system introduced on Cork Road inner bypass and Main Street. Traffic has redistributed on the outer western orbital route (i.e. Forest Road to Ballea Road) and Fernhill Road / Rock Road to the east.

Carrigaline TPREP - 2040 Do Min AM vs 2040 Do Something TS2 AM



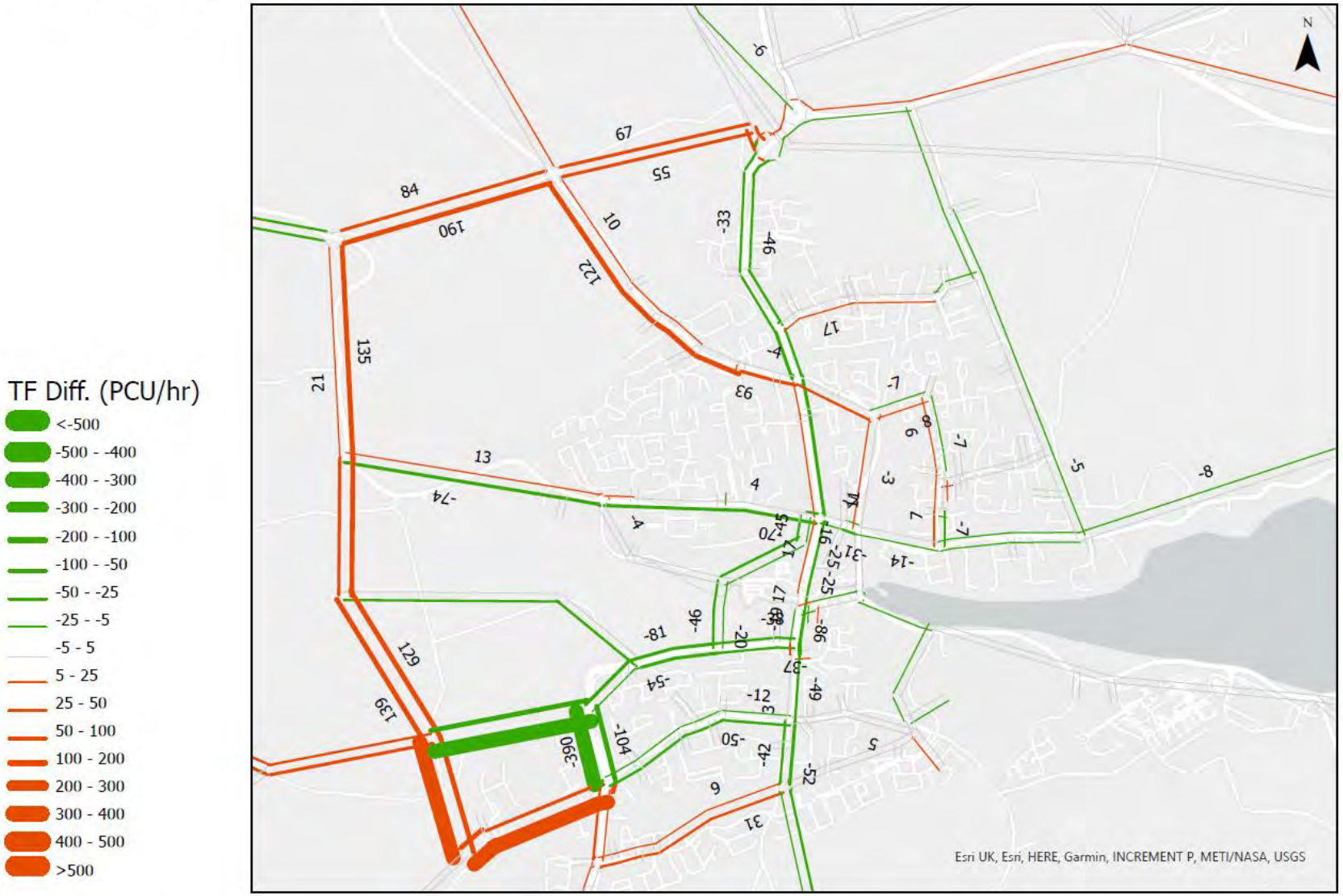
Carrigaline TPREP - 2040 Do Min PM vs 2040 Do Something TS2 PM



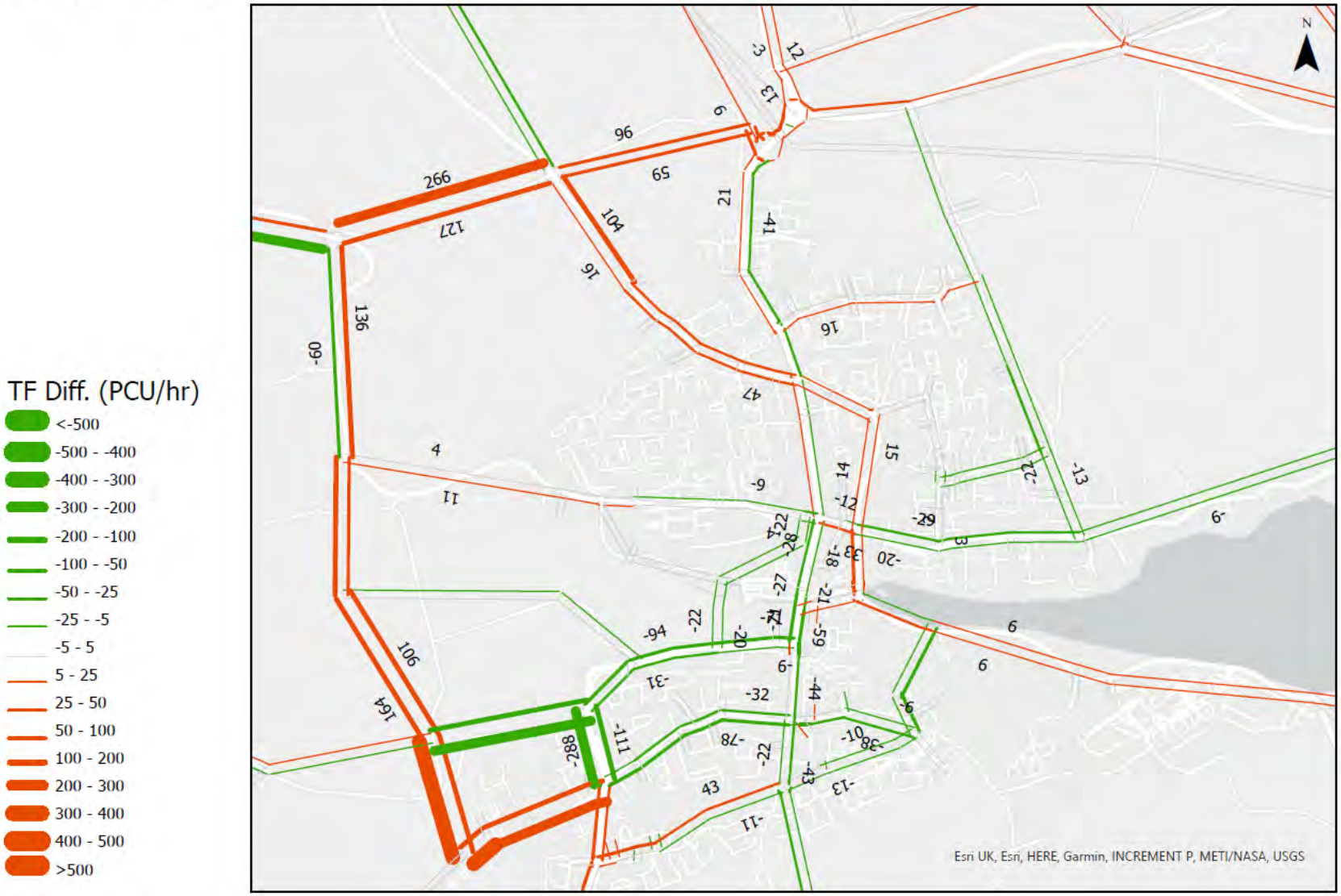
A2.4 Transportation Strategy 3: Carrigaline LAP Outer Western Relief Road

The Outer Western Relief Road has resulted to traffic redistributing to the western part of Carrigaline. There is an increase in traffic on Mountain Road and Ballinrea Road; however, due to the long distance of this proposed route, it does not appear to significantly relieve traffic on Cork Road and Main Street, with a maximum two-way reduction in the central corridor of approximately 100pcu/h in AM and PM peaks.

Carrigaline TPREP - 2040 Do Min AM vs 2040 Do Something TS3 AM



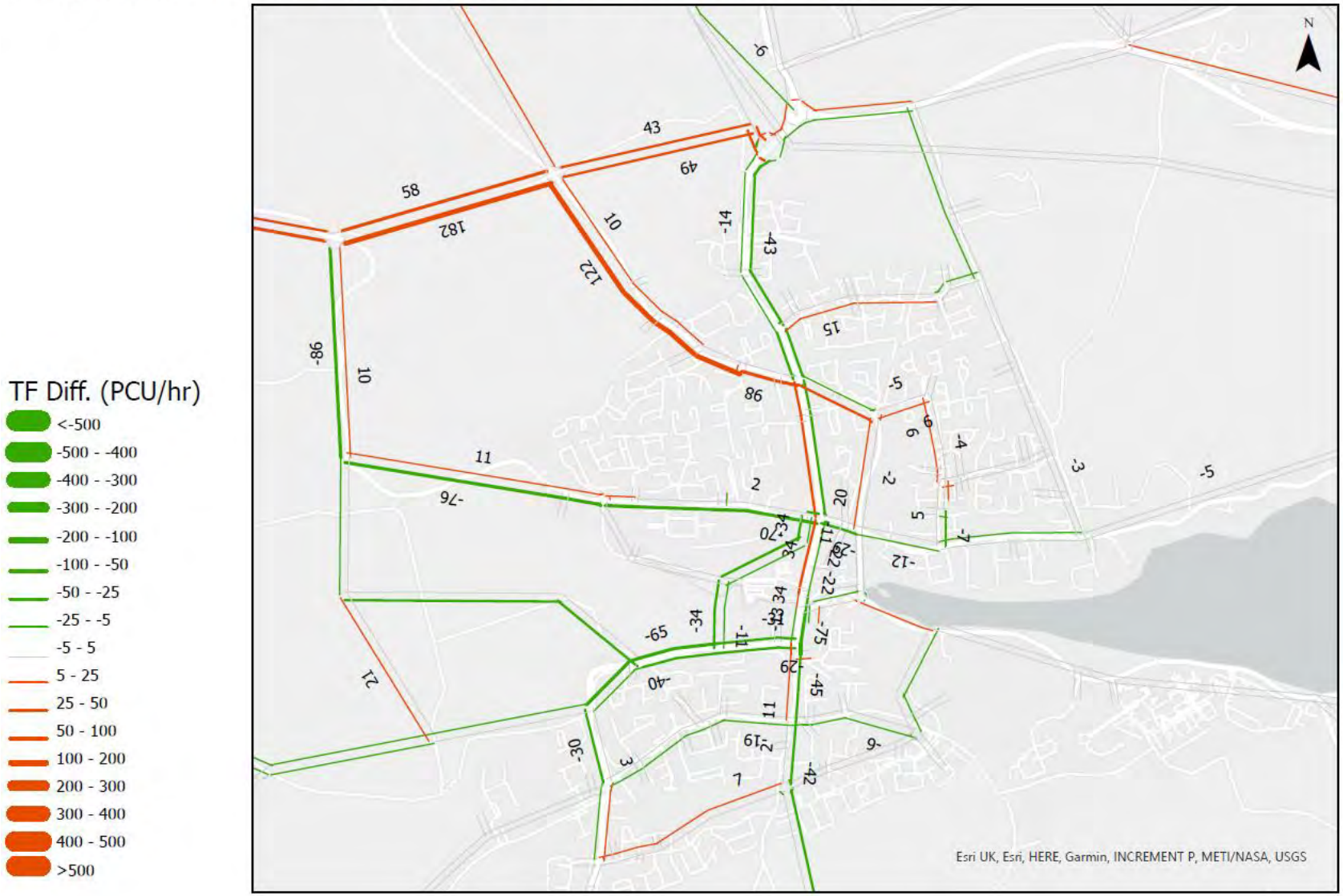
Carrigaline TPREP - 2040 Do Min PM vs 2040 Do Something TS3 PM



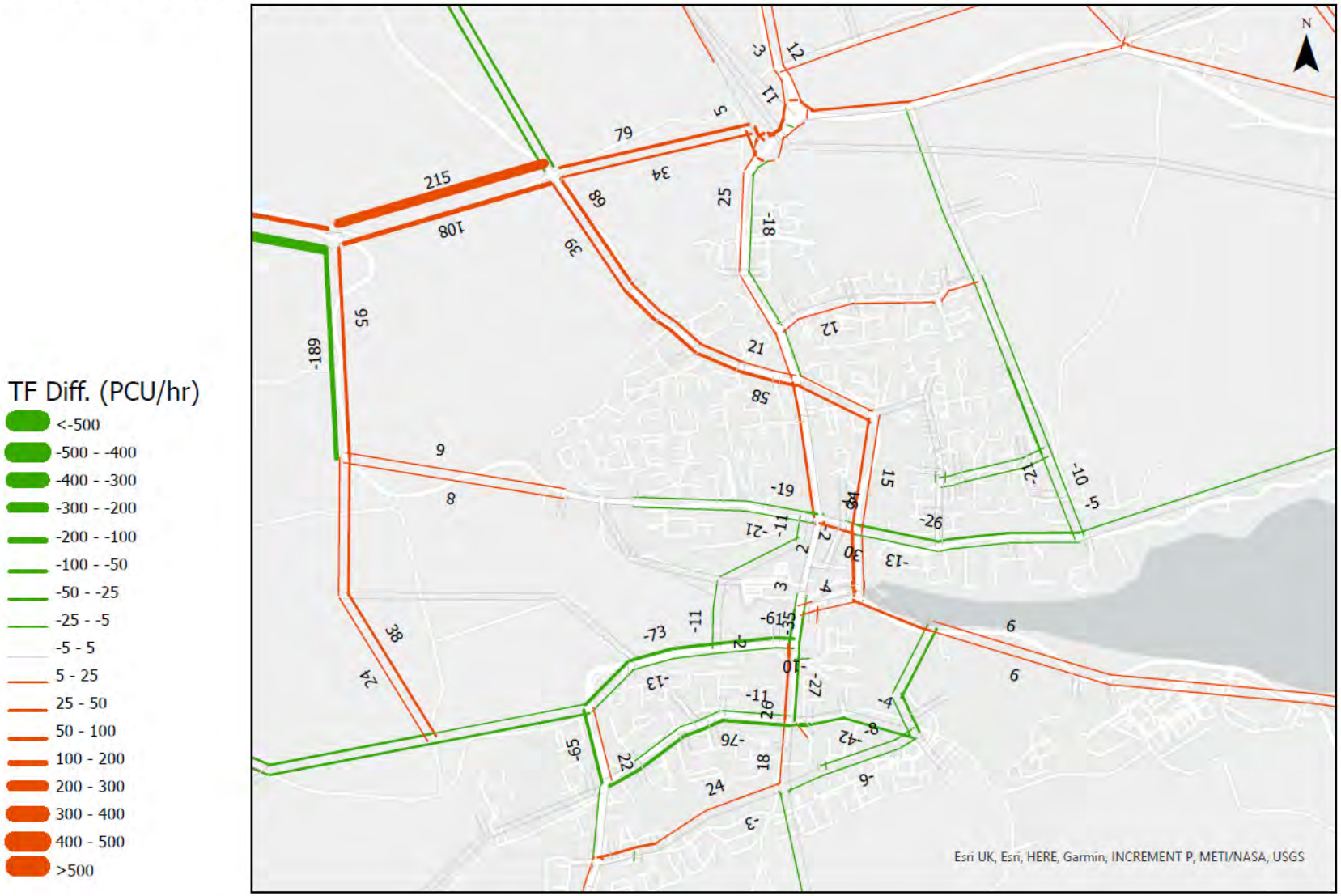
A2.5 Transportation Strategy 4: Rationalised Outer Relief Road Option 1

The Rationalised Outer Western Relief Road 1 option has resulted to traffic redistributing to the western part of Carrigaline. Although the improvement on Ballea Road will provide a more direct link across Owenabue River; it does not appear to significantly relieve traffic on Cork Road and Main Street, with a maximum two-way reduction in the central corridor of below 100pcu/h in AM and PM peaks.

Carrigaline TPREP - 2040 Do Min AM vs 2040 Do Something TS4 AM



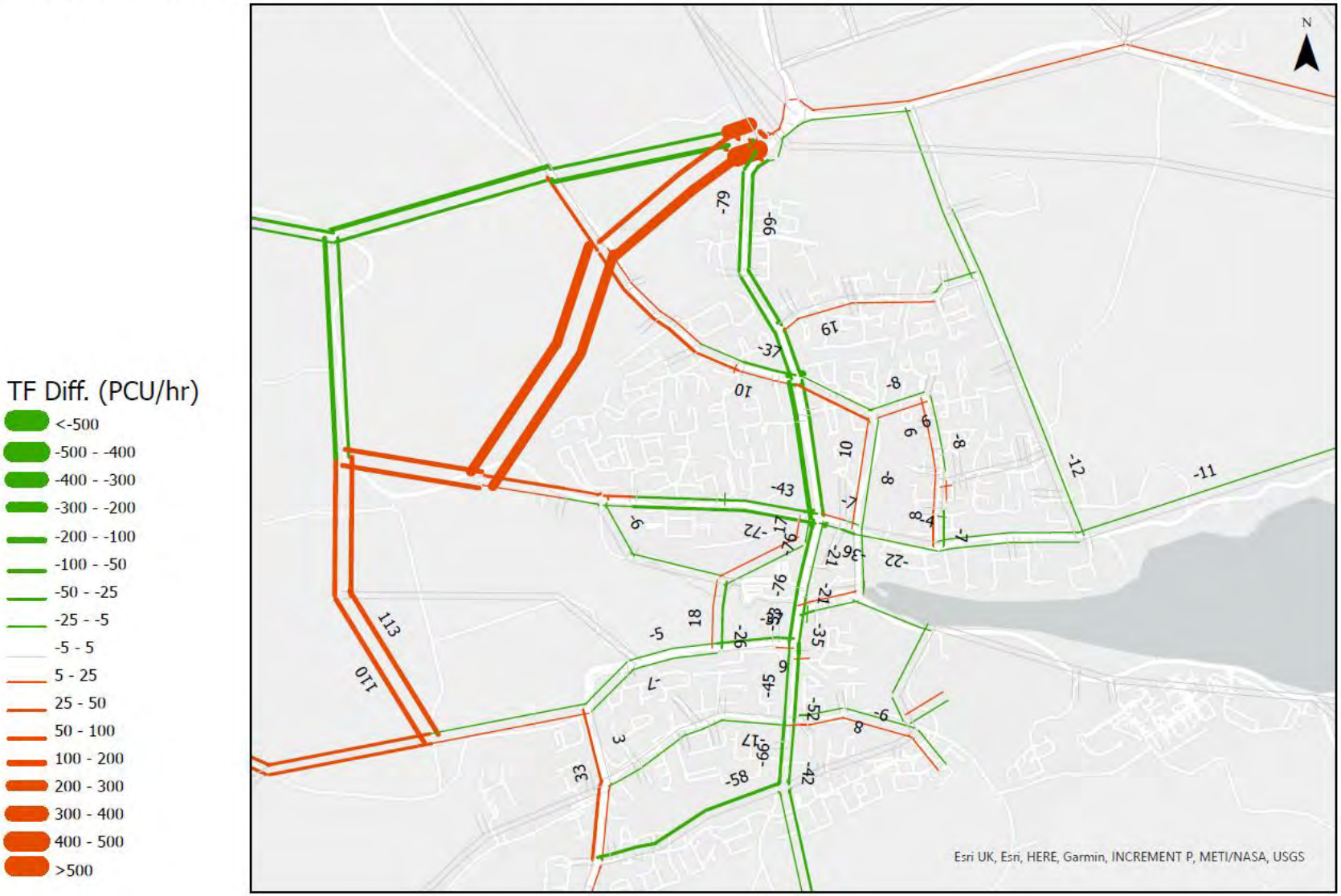
Carrigaline TPREP - 2040 Do Min PM vs 2040 Do Something TS4 PM



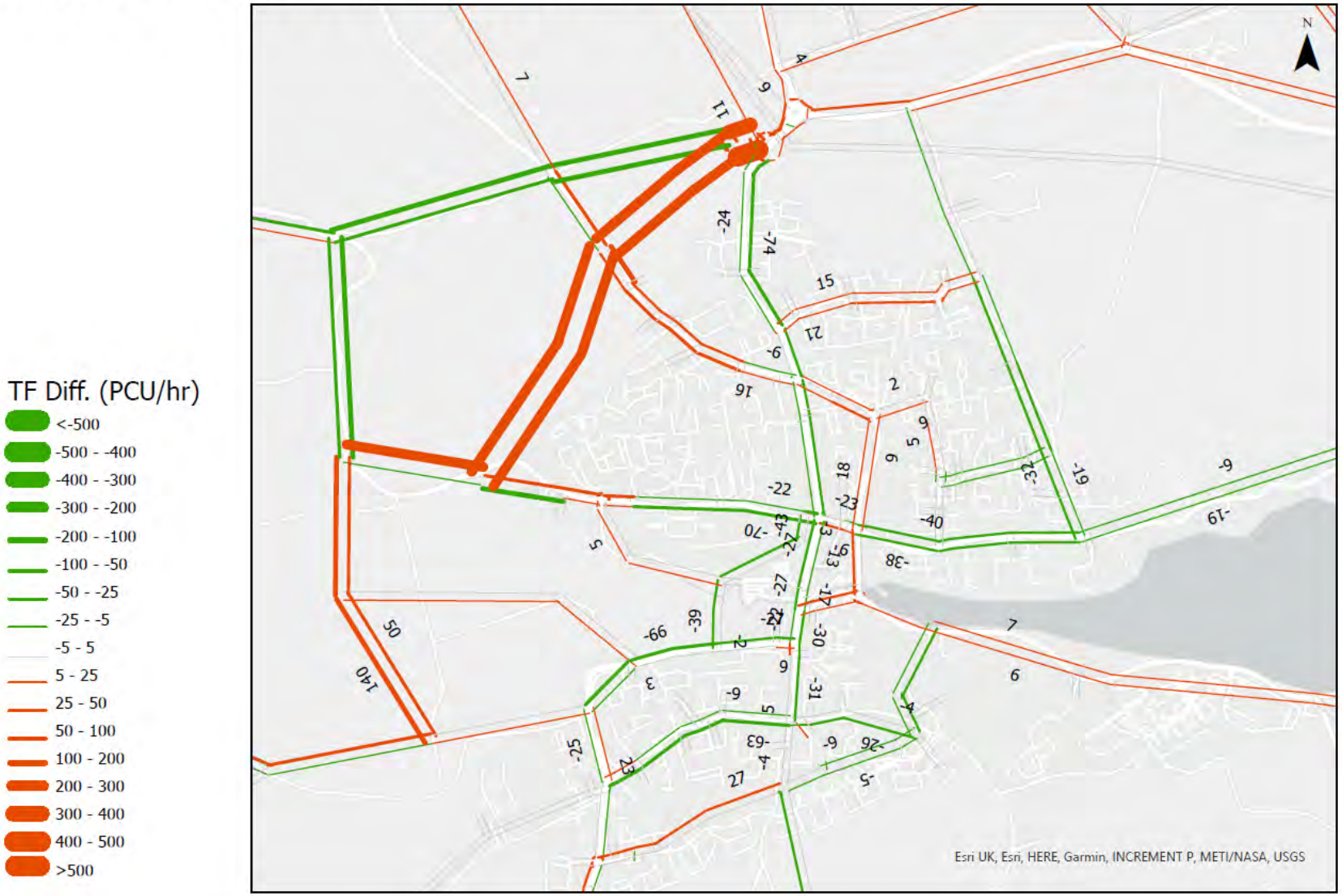
A2.6 Transportation Strategy 5: Rationalised Outer Relief Road Option 2

The Rationalised Outer Western Relief Road 2 option has resulted to traffic switching from R613 (northwest) to Forest Road as the proposed bypass provides a faster route to access the M28. This option appears to relieve traffic on Cork Road and Main Street, with a maximum two-way reduction in the central corridor of below 200pcu/h in AM peak.

Carrigaline TPREP - 2040 Do Min AM vs 2040 Do Something TS5 AM



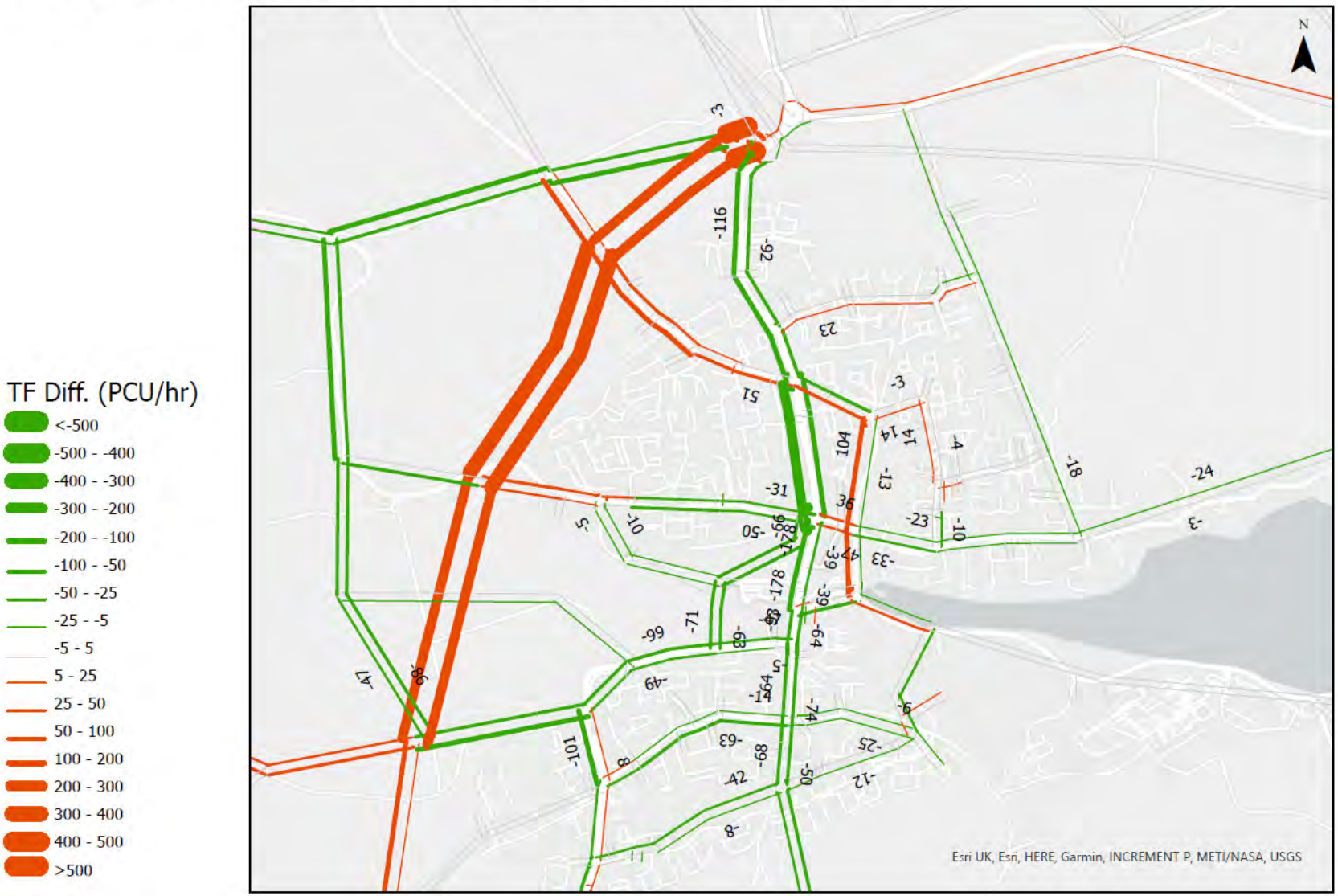
Carrigaline TPREP - 2040 Do Min PM vs 2040 Do Something TS4 PM



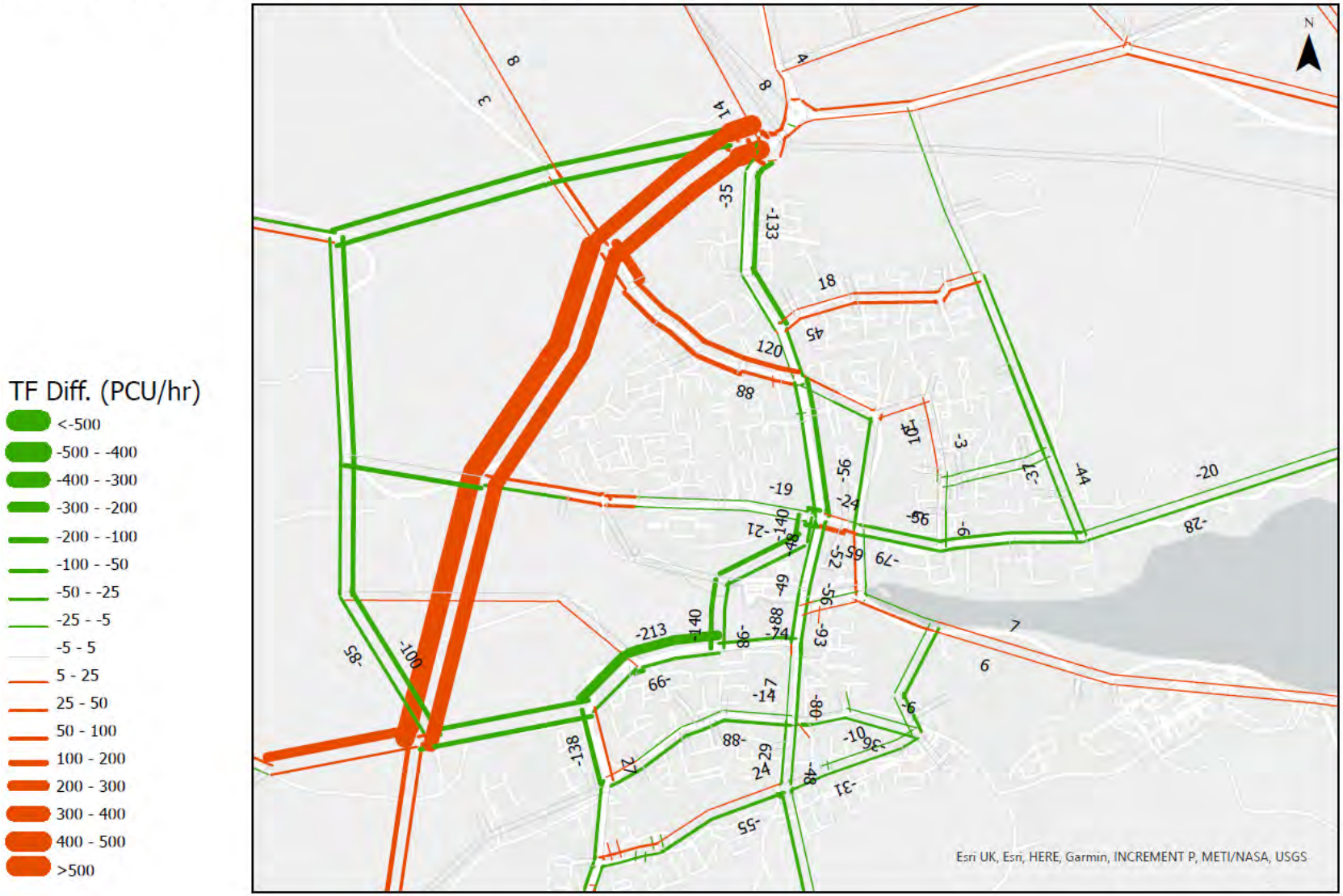
A2.7 Transportation Strategy 6: Long Term

The longer Outer Western Relief Road between R611 and M28 show that the majority of traffic using the proposed bypass are travelling between the southwestern area of Carrigaline (via Forest Road) and M28. The proposed Outer Western Relief Road has helped relieve traffic on both the western and central corridors. However, it should be noted that the modelling results showed that the southern end of the proposed relief road between Forest Road and R611 had low traffic of approximately 200PCU/h (two-way) in both AM and PM peaks.

Carrigaline TPREP - 2040 Do Min AM vs 2040 Do Something TS6 AM



Carrigaline TPREP - 2040 Do Min PM vs 2040 Do Something TS6 PM



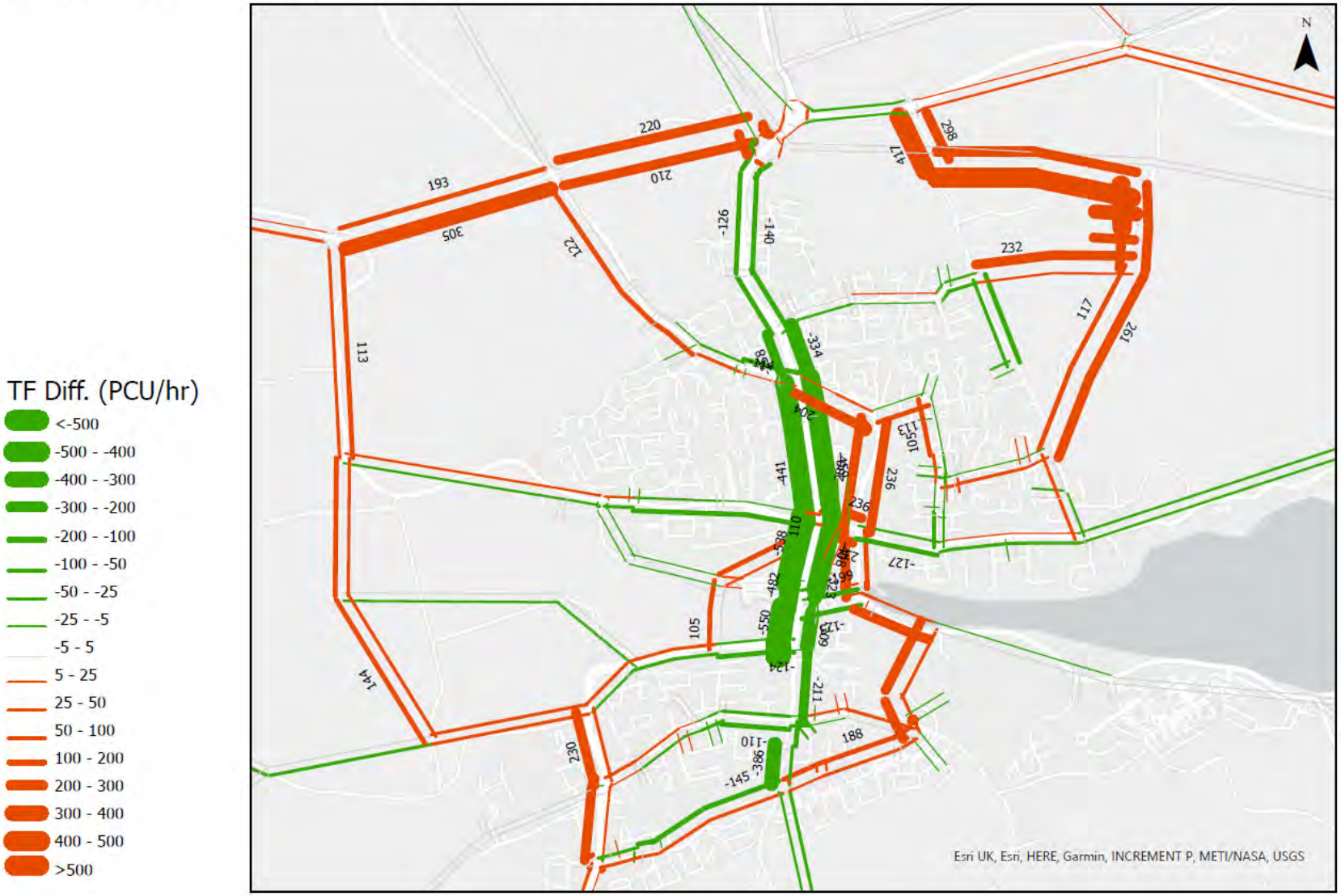
A2.8 Transportation Strategy 7: Accommodating short- and medium-term town growth

The reconfiguration of the network in Transport Strategy 7 has significantly reduced the traffic on the central corridor, particularly Main Street between Ballinrea Road and Kilmoney Road Lower. Due to the reduction in capacity on Main Street where the southbound lane between Ballea Road and Crosshaven Road has been changed to a bus-only lane, traffic has redistributed to Cork Road inner bypass to the east of the central corridor. Additionally, the proposed change on Church Hill and Rose Hill from two-way to one way southbound for general traffic has resulted to traffic redistributing to Kilnageary Road and Fuschia Avenue.

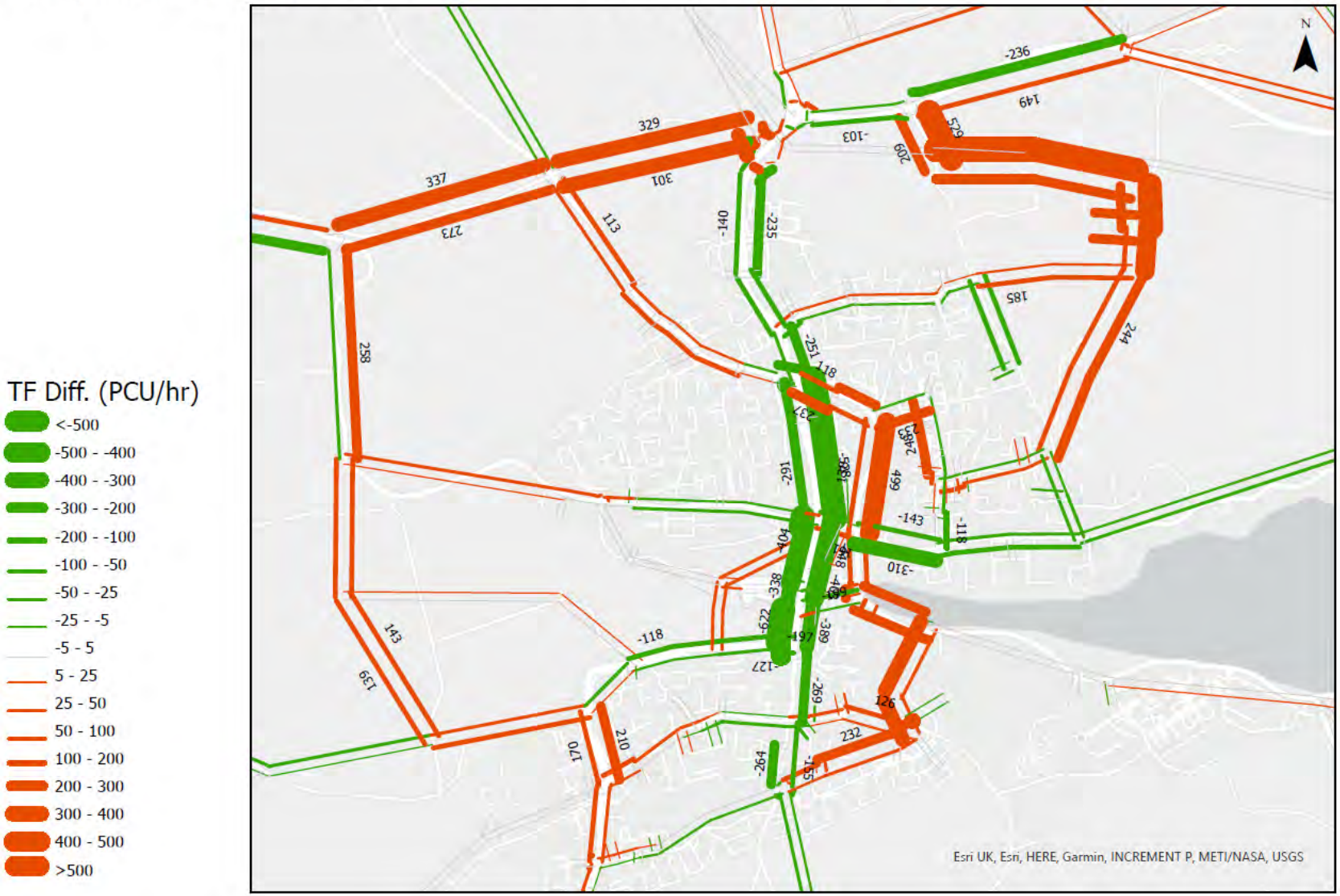
The addition of the northern section of the Outer Western Relief Road has also helped relieve traffic on the central corridor, with the relief road (i.e. Ballea Road north-south section) having an increase in trips of between 200-300PCU/hr in AM and PM peaks.

The Outer Eastern Relief Road also helps relieve the central corridor as it becomes the primary access point for trips travelling between Herons Wood and the Strategic Land Reserve (SLR) site on Fernhill and M28.

Carrigaline TPREP - 2040 Do Min AM vs 2040 Do Something TS7 AM



Carrigaline TPREP - 2040 Do Min PM vs 2040 Do Something TS7 PM

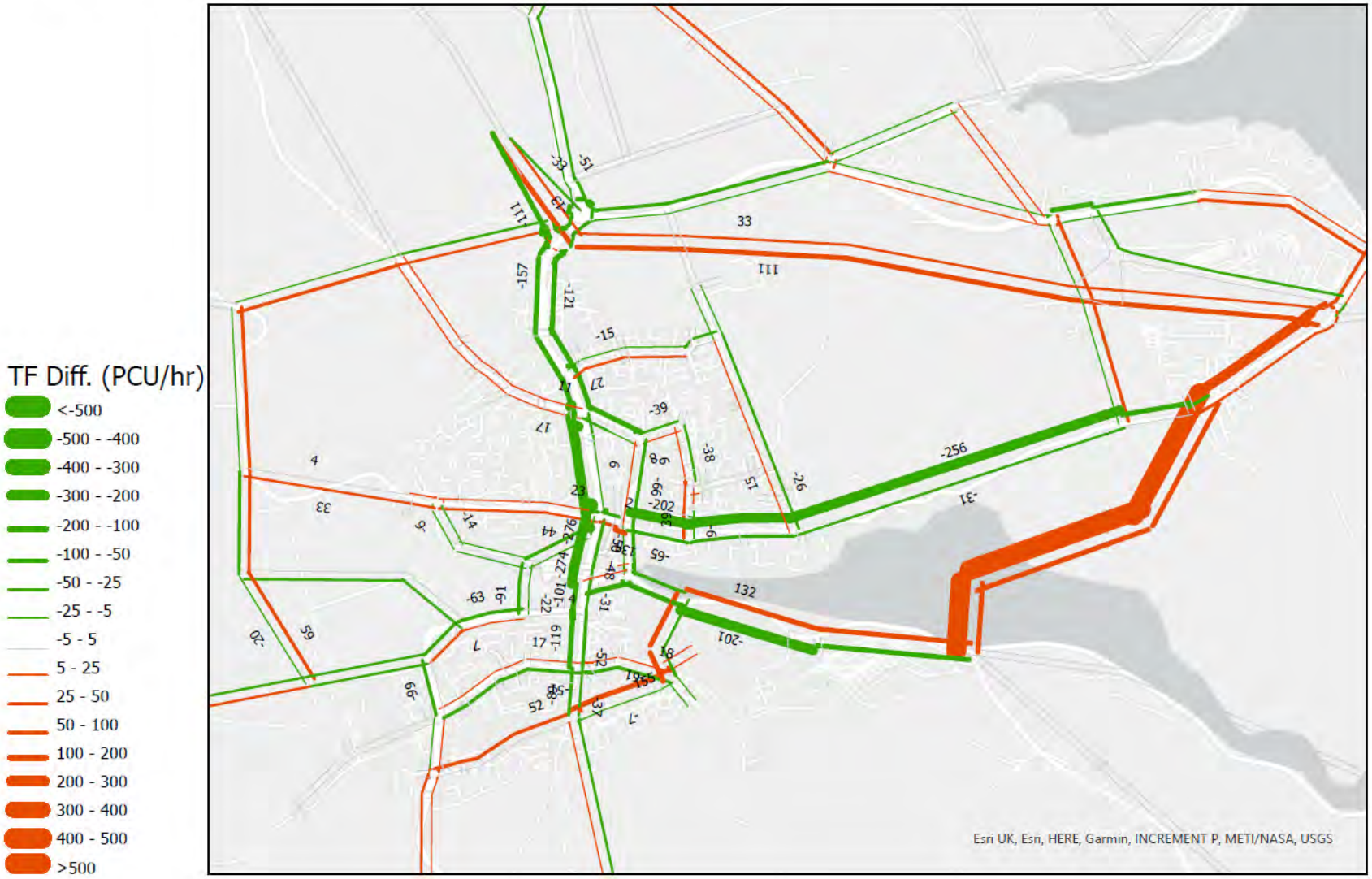


A2.9 Transportation Strategy 8: Owenabue Estuary Bridge Crossing

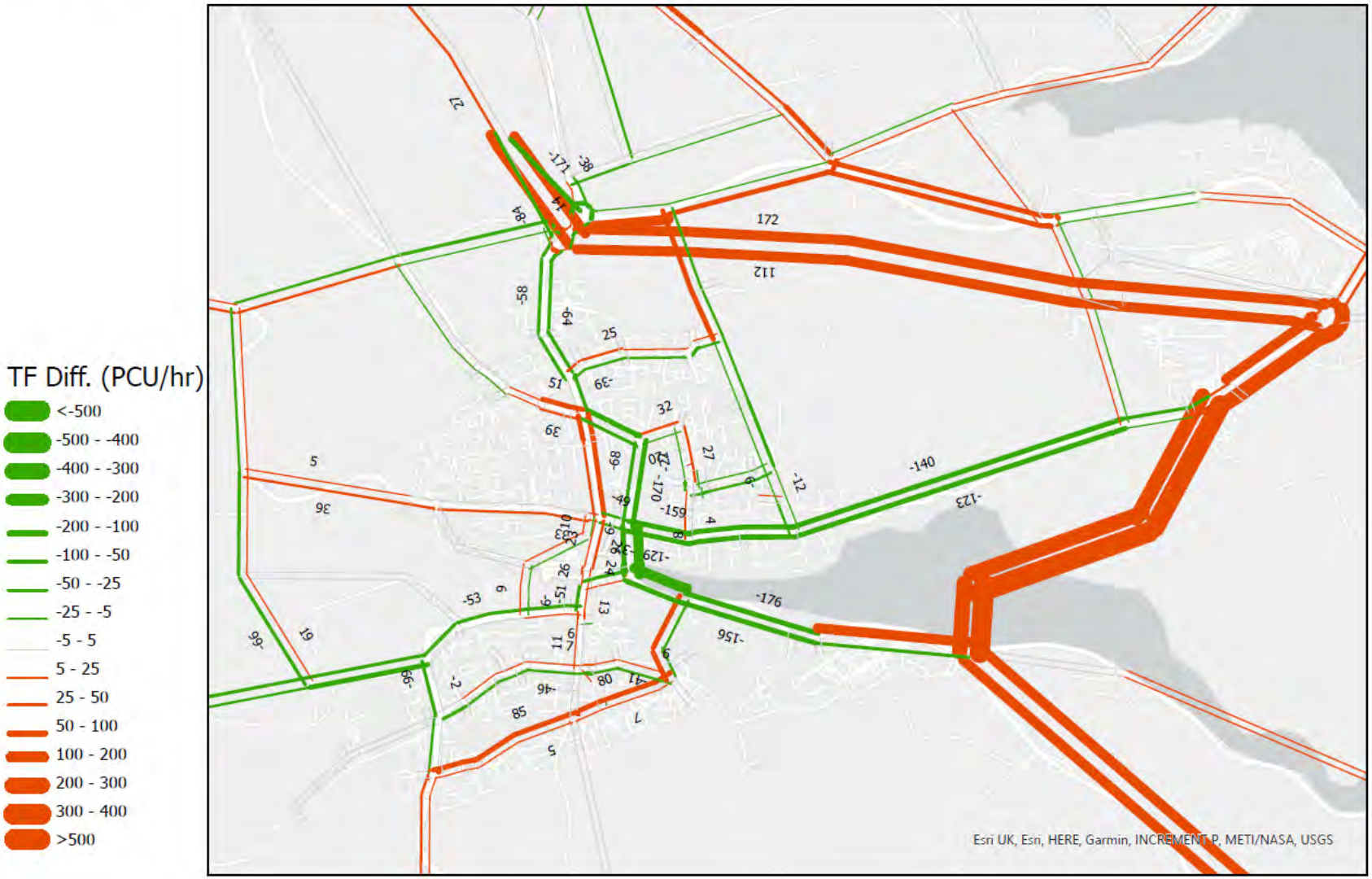
The proposed new bridge across the Owenabue River between R612 Myrtleville Road and R613 Church Road will provide a more direct route between south of Carrigaline and Ringaskiddy. Overall, a total of 600PCU/h (two-way total) are expected to redistribute to use the proposed new bridge across the Owenabue River. As a result, the central corridor is relieved, particularly in the AM peak with a reduction of approximately 250PCU/h.

As expected, Church Road between Bothar Guidel and the proposed bridge are also relieved, with a reduction of between 200-300PCU/h (two-way total) in both AM and PM peaks.

Carrigaline TPREP - 2040 Do Min AM vs 2040 Do Something TS8 AM



Carrigaline TPREP - 2040 Do Min PM vs 2040 Do Something TS8 PM



A3 Network Statistics

Network statistics were extracted from Carrigaline LAM for all transport strategy options to understand the overall network performance of each option and are summarised in

Table 10 and **Table 11**. The following outputs were extracted for the purposes of this analysis:

- Transient queues (PCUhrs/hr) – queue that develops during the red phase but clears at the green phase;
- Over-capacity queues (PCUhrs/hr – queues above capacity that do not clear in a single cycle;
- Link cruise time free flow (PCUhrs/hr) – time spent travelling on links within the network (free flow);
- Link cruise time delays (PCUhrs/hr) – time spent below free flow speed within the network;
- Total travel time (PCUhrs/hr) – Transient queues + over-capacity queues + link cruise time;
- Travel distance (km) – total distance travelled by all vehicles in the network; and
- Average speed (kph) – average speed travelled by all vehicles in the network.

Table 10 shows that the best-performing transport strategy option in terms of network stats in the AM peak is TS6. It had performed the best by having the least over-capacity queues, least link cruise time, least total travel time and fastest average speed. This is due to the proposed rationalised outer western relief road, which is a more direct route between the M28 and Ballea Road and therefore a large number of vehicles travel shorter distances at a faster posted speed.

Alternatively, the worst-performing transport strategy in both AM and PM peaks is TS2, with having the worst results in almost all categories. Although the central corridor between Shannonpark Roundabout and Ashgrove Roundabout are to be upgraded to a dual carriageway in TS2, the one-way system conversion of the remainder of Cork Road and Main Street has resulted to more delays and longer distance travelled as trips are not as direct in comparison to the Do Minimum scenario.

The results also show that TS7 in both AM and PM peaks have the longest travel distance as the traffic has generally redistributed to the outer western and eastern relief roads.

Table 10: Carrigaline LAM Network Statistics AM Peak

Network Stats	DM	TS1	TS2	TS3	TS4	TS5	TS6	TS7	TS8
Transient Queues *(PCU hrs / hr)*	239	211	301	223	229	219	201	269	186
Over-capacity queues *(PCU hrs / hr)*	61	65	99	56	56	56	55	83	58
Link Cruise Time *(PCU hrs / hr)*	1292	1287	1323	1276	1285	1284	1274	1291	1309
Link Cruise Time - Free Flow *(PCU hrs / hr)*	1212	1209	1237	1202	1208	1210	1201	1222	1235
Link Cruise Time - Delays *(PCU hrs / hr)*	80	78	85	74	76	75	72	69	74
Total Travel Time *(PCU hrs / hr)*	1592	1563	1722	1555	1569	1559	1529	1643	1553
Travel Distance *(km)*	81,726	81,713	82,887	81,738	81,949	81,957	81,785	83,153	82,406
Overall Average Speed *(kph)*	51	52	48	53	52	53	54	51	53

Table 11: Carrigaline LAM Network Statistics PM Peak

Network Stats	DM	TS1	TS2	TS3	TS4	TS5	TS6	TS7	TS8
Transient Queues *(PCU hrs / hr)*	252	263	323	245	249	239	227	321	225
Over-capacity queues *(PCU hrs / hr)*	141	114	151	117	133	123	108	149	94
Link Cruise Time *(PCU hrs / hr)*	1373	1371	1411	1361	1364	1366	1363	1383	1398
Link Cruise Time - Free Flow *(PCU hrs / hr)*	1297	1300	1324	1292	1294	1296	1295	1320	1333
Link Cruise Time - Delays *(PCU hrs / hr)*	76	71	86	69	69	70	69	63	65
Total Travel Time *(PCU hrs / hr)*	1766	1747	1885	1723	1746	1728	1697	1853	1717
Travel Distance *(km)*	88,570	88,724	90,061	88,923	88,829	88,906	89,311	90,664	90,010
Overall Average Speed *(kph)*	50	51	48	52	51	51	53	49	52