IN THE MATTER OF AN APPLICATION TO

AN BORD PLEANÁLA

FOR APPROVAL OF (I) THE N6 GALWAY CITY RING ROAD PURSUANT TO SECTION 51 OF THE ROADS ACT 1993 (AS AMENDED); (II) THE N6 GALWAY CITY RING ROAD MOTORWAY SCHEME 2018; and (III) THE N6 GALWAY CITY RING ROAD PROTECTED ROAD SCHEME 2018

ABP Ref. ABP-302848-18 and ABP-302885-18

ORAL HEARING

STATEMENT of Evidence

Responses to Traffic and Transport

Objection/Submissions

by

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And assisted by

David Conlon, BA (Hons) Economics, MRUP, Chartered Institute of Highways and Transport, Chartered Transport Planning Professional

18 February 2020

1. Qualifications and Experience

1.1 Lead Transport Planner

1.1.1 My name is Andrew Archer. I am a Transport Planner and Director for SYSTRA in Ireland. I have a bachelor's degree in Civil Engineering from Southampton University in the UK. I am a member of Engineers Ireland and a Chartered Engineer. I also serve as a committee member on the Irish branch of the Transport Planning Society.

1.1.2 I have over 20 years of experience in transport planning, engineering, modelling and scheme appraisal. I have acted as transport and traffic advisor on a wide range of public and private sector transportation projects including: highway scheme appraisals, public transport schemes appraisals, development masterplans, transport framework plans and conceptual designs of transport infrastructure schemes.

1.1.3 I am also a member of the National Transport Authority (NTA) Modelling Services Framework team which has developed a set of Regional Transport Models covering all of the major cities in Ireland.

1.1.4 Since 2016, I have been responsible for the modelling and appraisal of a number of complex urban projects, utilising the NTA's Regional Transport Models. This has included the Galway Transport Strategy (GTS), Transport Masterplans for 9 Local Area Plans in Metropolitan Cork, Limerick Urban Centre Revitalisation - O'Connell Street Project, the Clonburris SDZ and Fingal South Transport Strategy.

1.2 Senior Transport Planner

1.2.1 My name is David Conlon. I am a Transport Planner and Associate for SYSTRA in Ireland. I have a bachelor's degree in Economics and Geography from Trinity College Dublin and a Master's degree in Urban and Regional Planning from University College Dublin. I am a member of the Chartered Institute of Highways and Transport and a Chartered Transport Planning Professional.

1.2.2 I have over 12 years' experience in transport planning, modelling and scheme appraisal. I have acted as lead modeller and appraisal lead on a wide range of public and private sector transportation projects including; highway scheme appraisals (N55 Athlone to Ballymahon upgrade, the N11/M11 Junction 4 to 14 upgrade scheme), public transport scheme appraisals, along with a wide variety of local and regional model development projects.

1.2.3 I am an approved user of the National Transport Authority's regional modelling suite and was project manager for the development of the South East Regional Model (SERM) and technical advisor on the development of the West Regional Model.

2. Role in Proposed Road Development

2.1 SYSTRA's role in the proposed road development involved the transport and traffic assessments for the Phase 1: Concept and Feasibility Studies, Phase 2: Route Selection and Phase 3: Design Traffic Modelling Reports, as well as the preparation of the traffic assessment to support the Environmental Impact Assessment Report (EIAR), which was submitted as part of the application to An Bórd Pleanála (ABP) in October 2018.

2.2 SYSTRA were also involved in the transportation assessment for the Galway Transport Strategy (GTS) which was prepared from July 2015 to August 2016 whereby Galway County Council, Galway City Council and the National Transport Authority (NTA) worked in partnership to develop a transport vision for Galway where all elements of transport work together to achieve an integrated sustainable solution.

3. Key issues in relation to traffic and transport

3.1 EIAR Summary

3.1.1 Chapter 6 of the EIAR is to be taken as read in its entirety and is not replicated here. To assist the Board in its consideration of this application for Approval and for the convenience of all participants at this hearing, the key items pertaining to the traffic and transport assessment of the proposed road development detailed in Chapter 6 of the EIAR are summarised briefly below.

3.1.2 Chapter 6 of the EIAR presents the potential traffic and transport impacts that may arise from the proposed road development. The EIAR documents our assessment and evaluation of the strategic and local traffic and transport impacts associated with the proposed road development.

3.1.3 Future year scenarios for low growth, medium growth, and high growth were evaluated to demonstrate the effects of changes in travel demand (largely underpinned by population and employment forecasts) on the emerging preferred route corridor as described in Section 6.5 of Chapter 6 of the EIAR. These scenarios were used to estimate the impact of the proposed road development on the existing and future transport network (in terms of journey times and congestion), to determine whether it was necessary to mitigate for such impacts (for example whether there was a need for further local junction improvements), and to forecast what significant residual impacts remained post mitigation. This assessment is set out in Section 6.6 of Chapter 6 of the EIAR.

3.1.4 These traffic modelling results were used to inform the environmental assessments for the EIAR, including, but not limited to, air quality and climate, noise and vibration, human beings, population and human health.

3.1.5 The analysis (summarised in Chapter 6 of the EIAR), found that there will be no negative traffic impacts of major significance as a result of the introduction of the proposed road development. The traffic impact analysis shows that the introduction

of the proposed road development results in significant benefits in terms of junction operation, network performance and journey time savings. By adding new links to the Galway City's road network, alternative routes are provided to travel around the city centre and its environs, removing trips from congested links in the city centre. The Ratio of Flow to Capacity (RFC)[1] analysis in the peak travel periods shows that the proposed road development leads to almost a 50% reduction in the number of junctions operating at or close to capacity. Similarly, journey times on key routes around, and into, the city are reduced during peak periods because of the introduction of the proposed road development. For example, following the opening of the proposed road development, the existing N6 experiences journey time savings of between 40% to 50% during peak periods.

3.1.6 As a constituent element of the Galway Transport Strategy, the proposed road development will tackle the city's congestion issues and reduce the number of cars on the roads within the city centre, thereby helping to create a safer and calmed environment in the city centre more conducive to waking and cycling, and more efficient for cross city public transport journeys.

3.1.7 In the absence of the proposed road development, traffic conditions in the city centre will continue to deteriorate – resulting in a situation whereby crossing the city becomes increasingly difficult for people using all modes of transport. Simply put, the existing road and street network is not sufficiently developed to accommodate the number of trips. This restricted movement of people will lead to changes to where people live and work overtime, as the delay experienced travelling across the city becomes too great. This change in travel behaviour, or suppression of trip making, will constrain the economic development of Galway City and its environs and reduce accessibility to essential services.

3.1.8 The proposed road development will provide the required capacity for all modes of transport in Galway to support economic growth into the future. The Phase 3 cost benefit analysis of the project estimates that the Net Present Value of the proposed road development to the local and national economy will be in the region of €1.04bn - €1.46bn (with a benefit to cost ratio of approximately 4:1) over the 30-year assessment period. This positive Cost Benefit Ratio underlines the significant economic benefits the proposed road development will bring to Galway City and the Western Region.

[1] Ratio of Flow to Capacity (RFC) also referred to as Volume over Capacity (V/C) is a means to describe the capacity of each approach road to a junction. An RFC below 0.85 (or 0.90 for a signalised junction) implies an approach road is operating satisfactorily within capacity; between 0.85 (or 0.90 for signalised junctions) and 1.0 RFC implies the approach road is operating within capacity but at less than optimal efficiency; above 1.0 RFC the approach road is deemed to be above capacity, therefore, when a road is at capacity a slight increase in traffic volumes can have a disproportionate impact on the length of queuing and delays.

3.2 National Planning Framework

3.2.1 Since the completion of the EIAR, further work has been undertaken to assess the scheme. This additional work included a National Planning Framework (NPF) 2040 scenario to examine the impacts of the updated population and employments forecasts on the scheme. The NPF recognised the role that Galway and the other regional cities will play in providing a counter-weight to Dublin and assigned a population growth forecast of 50%-60% for Galway City. This compares to a population growth of only 14% for the city as presented in the TII Central growth forecast contained in Chapter 6 of the EIAR.

3.2.2 In keeping with the sustainable planning principles set out in the NPF, the future population and employment uses under the NPF scenario were distributed in the city in a compact form with growth centred on urban brownfield sites and along public transport corridors.

3.2.3 The outputs of the NPF scenario assessment are summarised in Section 8.2 of the Request for Further Information (RFI) Response submitted to the Board in August 2019 and detailed in the NPF Sensitivity Test Analysis Report included in Appendix A.8.1 to the RFI Response.

3.2.4 The results of the NPF analysis showed some increases in delay and congestion, however these increases are considered to be relatively minor in the context of the considerable growth in population and employment which are expected as part of the NPF assumptions.

3.2.5 As set out in Table 8.8 in Section 8.2 of the RFI Response, the results of the NPF analysis indicate a significant reduction in the car mode share in the city centre over a 24-hour period in the NPF scenario (61% car mode share) compared to the TII Central Growth forecasts set out in Section 6.2.3.2 of the EIAR (69% car mode share). The mode share analysis shows the significant benefits of locating the forecast population and jobs within the city centre and settlements easily served by public transport.

3.2.6 The modelling results indicate that, if the NPF policy is implemented in the absence of the new links provided by the proposed road development, the existing road network suffers significant operational issues at key junctions throughout the city. This in turn will act as a barrier to movement and connectivity in Galway having a detrimental impact on businesses and accessibility to key services in the city such as the hospital and University. The effect of restricted movement of people under the NPF scenario is much greater with greater changes to where people live and work overtime as the delay experienced travelling across the city becomes too great.

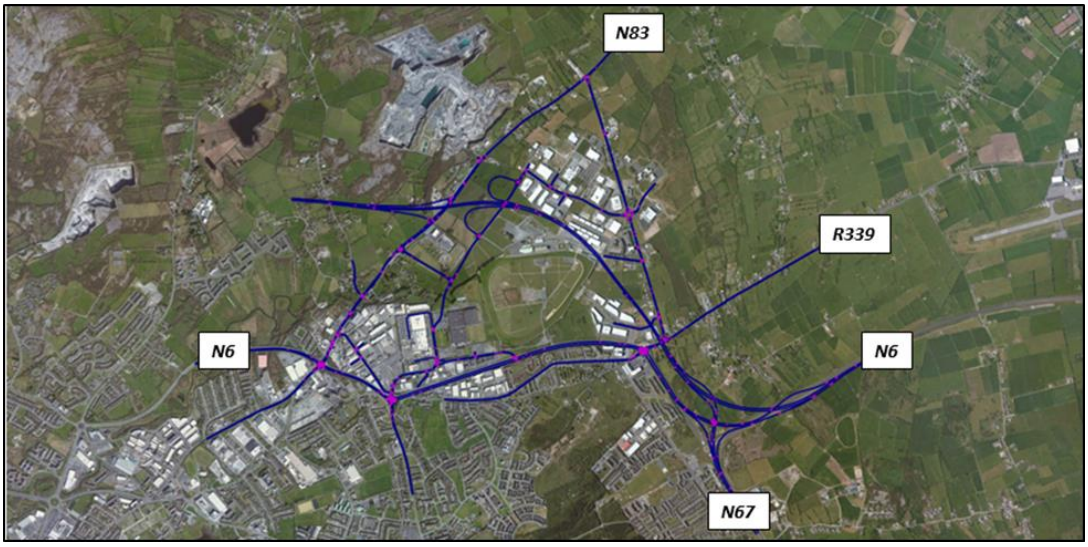
3.2.7 The assessment of the consequent implications on environmental receptors from a noise, air quality and climate, water quality, and human health perspective if the NPF scenario traffic forecasts are realised is included in Section 8.2.2.5 of the RFI Response.

Micro-simulation Analysis

3.2.8 In addition to the analysis mentioned above, since publication of the EIAR, micro-simulation modelling was undertaken to provide a more detailed operational assessment of the performance of the proposed road development and adjoining local network under NPF planning assumptions. A micro-simulation model of the busiest section of the proposed road development between the N83 Tuam Road and the existing N6 at Coolagh, Briarhill has been developed. This Microsimulation model was developed to provide a more granular and operational, assessment of the proposed road development under NPF population growth assumptions (as Micro-simulation models accurately simulate traffic patterns, providing a visual representation of queuing and individual driver behaviour, as well as showing the overall operational performance of the network). It provides a more detailed understanding of how traffic will behave and how individual junctions will operate with the proposed road development in place.

3.2.9 AM and PM peak hour models were developed to a base year of 2017 for the area shown in the figure below.

Figure 1: Micro-simulation model network

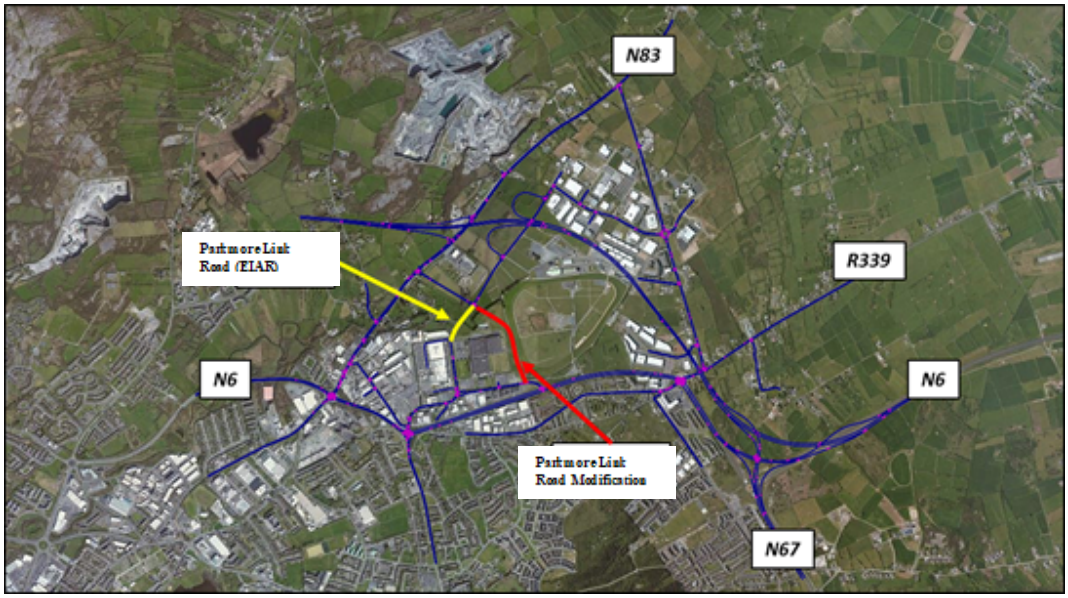


3.2.10 This detailed micro-simulation assessment found that, with the NPF growth assumptions in place, there would be no operational issues on the mainline of the proposed road development or any of its associated junctions. The analysis did indicate some issues on the existing local road network, which would require the implementation of some minor mitigation measures (additional flare lanes, etc.) in the longer term to protect the operational performance of the local network.

Micro-simulation Analysis – Parkmore Link Road Modification

3.2.11 A modification to the Parkmore Link Road has been assessed using the micro-simulation model to test its impact. The network modelled in shown in Figure 2 below. The detailed assessment found that the proposed modification will result in a similar network performance to the previous design and, in summary, there will be no operational issues on the mainline of the proposed road development or any of its associated junctions.

Figure 2: Micro-simulation model network with Parkmore Link Road Modification



3.2.12 The current NUIG planning permission application (Ref 19/373) to construct additional playing pitches and the two proposed strategic housing development applications Ob_229 and Ob_469 and S_003 do not change the conclusions of the cumulative impact assessment on Traffic and Transport contained in the EIAR.

4. Responses to Submissions/Objections

4.1 Overview

4.1.1 61 of the 296 submissions/objections submitted to An Bórd Pleanála of the N6 Galway City Ring Road (GCRR) Environmental Impact Assessment Report (EIAR), Natura Impact Statement (NIS), Motorway Scheme (MS) and Protected Road Scheme (PRS) relate to traffic. 5 of the 17 submissions/objections received in relation to the Request for Further Information Response related to traffic. The key traffic issues raised are:

- Trip generation for Ballybrit Business Park
- Internal impacts at Ballybrit Business Park
- Model calibration
- Suitability of model to assess forecast year impacts
- Assessment of alternatives
- The proposed road development will lead to increased traffic on certain local roads
- The proposed road development will lead to induced traffic which has not been accounted for
- Negative impacts on Rosán Glas/Bóthair Diarmuida area
- The travel patterns in Galway do not require a bypass
- Stand-alone solutions can solve local traffic problems
- The scheme will not help public transport and active modes
- Rapid Transit would solve existing traffic issues
- The proposed road development will not address the reasons for traffic congestion in the west of the city

4.1.2 These issues will be addressed in turn below.

4.2 Trip Generation Figures

Issues

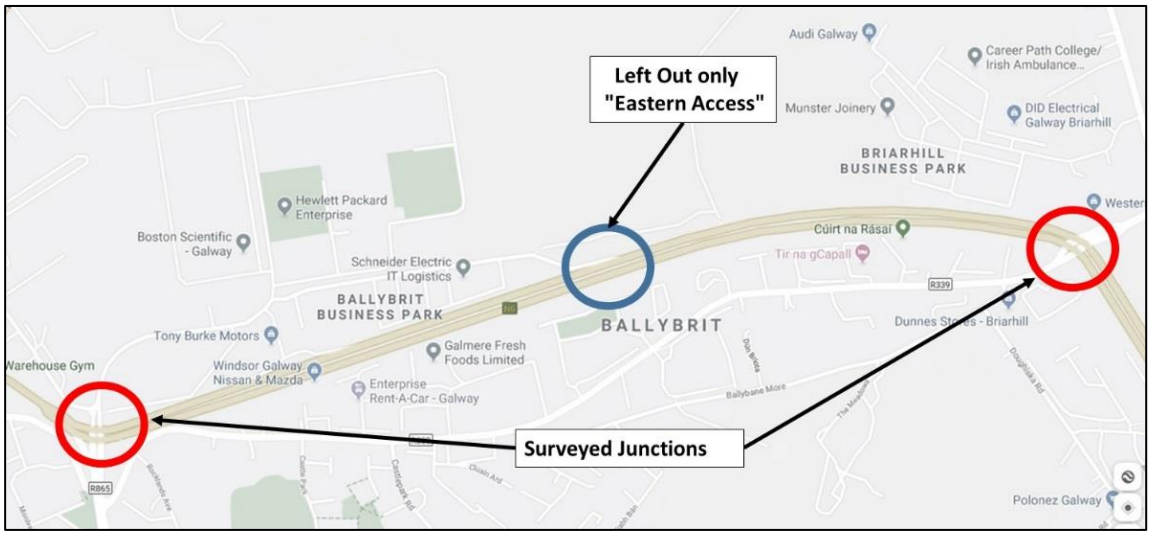
4.2.1 One submission/objection raised a concern in relation to the trip generation figures at Boston Scientific. In that submission, it is noted that EIAR Appendix A.6.1, Figure 2.2.1 reports that modelling information relating to the traffic generation characteristics of Ballybrit Business Park are based upon temporary junction count data at the N6 Bóthar na dTreabh signal controlled crossroads with the R865. It is stated that there is a second access from Ballybrit Business Park to N6 Bóthar na dTreabh located approximately 1km east of R865, referred to as the "eastern access". It is asserted that no evidence is provided to confirm that traffic counts were taken at the eastern access to inform the data upon which the traffic model relies. It is, therefore, asserted that the model is only partially informed as to the traffic flow characteristics of Ballybrit Business Park.

4.2.2 This issue was raised in submission/objection: Ob_695.

Response

4.2.3 The eastern access referred to in the submission is a "left-out", exit only, junction. As the model has been calibrated using traffic counts at junctions both upstream and downstream from what is described as the "eastern access", the net gain in traffic from this junction is accounted for in the base year model. For ease of reference, the following figure illustrates the location of the exit only junction and the position of the traffic counters used in the calibration of the base year model.

Figure 3: Ballybrit "Eastern Access"



4.3 Internal Impacts at Ballybrit Business Park

Issue

4.3.1 One submission relates to the internal impacts at Ballybrit Business Park and asserts that it can find nothing in the EIAR to indicate an evidence-based understanding of the internal traffic and road user circulation within the Ballybrit Business Park from which a satisfactory assessment of impact might be founded.

4.3.2 This issue was raised in submission/objection: Ob_695.

Response

4.3.3 The analysis contained within the EIAR includes all junctions on the local, regional and primary road network in Galway City and its environs; including all accesses points to key developments, such as Ballybrit Business Park, Galway University, Hospital University etc. Therefore, the strategic and local impacts of all major developments are included in the assessment documented in the EIAR.

4.3.4 In addition, as noted above, since the publication of the EIAR, a micro-simulation model encompassing the existing N6 between Coolagh, Briarhill and the N83 Tuam Road, including, Parkmore Road, Ballybrit Business Park has been developed with a base year of 2017.

4.3.5 This model captures movements on the internal local access road within the Ballybrit Business Park and has used recent count data within Ballybrit Business Park during its development. It therefore provides an excellent tool with which to estimate the internal traffic and road user circulation impacts of the proposed road development.

4.3.6 Analysis of the 2039 micro-simulation models shows that the introduction of the proposed road development proposals will have no perceptible impacts on the internal circulation of traffic within the Ballybrit Business Park when compared with the Base Year (2017) scenario. This is illustrated in the figures below which shows the maximum queue lengths experienced on the Ballybrit access road in the AM and PM peak respectively.

4.3.7 In the design year, the max queue extends just past the NSAI Regional Office which results in the road between both Boston Scientific's campus being kept free flow. This represents a considerable improvement on the existing base year scenario where queues are observed extending into the Boston Scientific campus.

Figure 4: PM Peak Hour Max Queueing

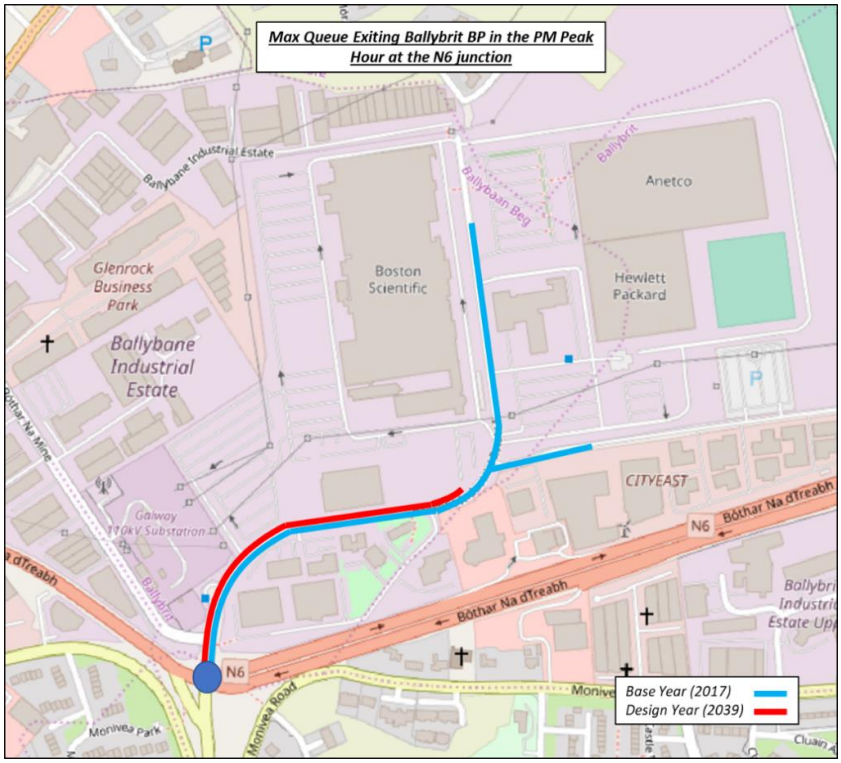
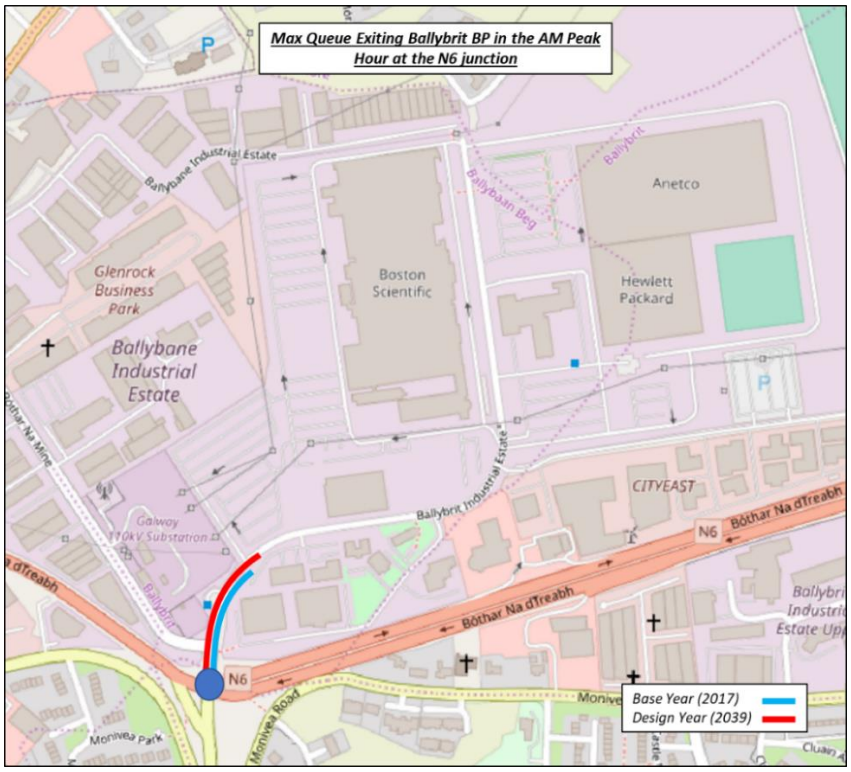


Figure 5: AM Peak Hour Max Queueing



4.4 Model Calibration

Issue

4.4.1 A submission/objection relating to the traffic model calibration near the Ballybrit Business Park has been made which references Section 4.4 of Appendix A.6.1 of the EIAR. Specifically, the submission/objection comments:

"the N6 Bóthar na dTreabh signal junction serving Ballybrit Business Park does not enjoy such good calibration. In the morning peak, the report outlines that the observed right turn into Ballybrit Business Park is 472 where the model flow returns a value of 180." "the total inbound modelled flow to the business park in the morning peak at this junction is 1,465 vehicles which is approximately 30% lower than the observed flow of 2,037".

4.4.2 The submission/objections also highlights three other turning movements over the four modelled time periods which have modelled turning flows outside of the TII calibration criteria.

4.4.3 This issue was raised in submission/objection: Ob_695.

Response

4.4.4 When calibrating a transport model, the GEH (Geoffrey E. Havers) statistic is used as a standard measure to determine the differences between the traffic flows derived from the model and the observed surveyed flows on the road network.

4.4.5 TII's Project Appraisal Guidelines sets a guideline that 85% of links should have a GEH value of less than 5 (when measured in vehicles per hour) as part of the model's calibration requirements. The WRM achieves this calibration criteria for all modelled periods in addition to meeting all other calibration and validation criteria. It is therefore considered an appropriate tool for the assessment of the proposed road development.

4.4.6 With respect to the N6 Bóthar na dTreabh signal junction, the submission/objection has selected one movement (out of 12 movements at the junction) at this junction which does not meet the calibration criteria. All other movements at this junction have much lower GEH values, with the average GEH at the junction being "4" across all time periods. All other movements into Ballybrit Business Park show an excellent level of calibration with GEH values of 1.3 and 0.5 and absolute differences of only 19 passenger car units2 (PCUs) and 7 PCUs in the AM peak hour referenced in the submission/objection.

4.4.7 As previously noted, a micro-simulation model has been developed to accurately assess the operational performance of the proposed road development. The micro-

[2] Passenger Car Unit (PCU) is a unit of traffic volume, with 1 LV = 1 PCU and 1 HGV = Approximately 2 PCUs

simulation model developed for this section of the N6 and Ballybrit Business Park has been calibrated using 2017 traffic count data and all movements at the junction in question have a GEH value of less than 5. The total traffic observed entering the Ballybrit Business Park in the AM peak hour was 868 vehicles and the total modelled traffic was 772 vehicles.

4.4.8 This model has been used to determine the impacts at this junction (and within Ballybrit) in more detail. Analysis of the 2039 micro-simulation models shows that the introduction of the proposed road development will have no significant impacts on the internal circulation of traffic within the Ballybrit Business Park or on the existing access junctions to Ballybrit when compared with the Base Year (2017 scenario).

4.5 Suitability of Model to assess Forecast Year Impacts

Issue

4.5.1 A submission/objection has been received which questions the suitability of the model to assess forecast year impacts. The submission/objection notes:

4.5.2 *"Weeklong traffic surveys undertaken in January 2017 show that the eastern portion of Boston Scientific campus alone, excluding all other traffic generators in the Ballybrit Business Park generates as much as 1,656 vehicles in the modelled morning peak 07:00 - 10:00. These figures suggest that the model of the existing main access to Ballybrit Business Park is not a sound or reliable basis upon which to forecast future traffic flows to / from and circulating Ballybrit Business Park under a future year where it is proposed that a new distributor road will cut through the middle of this business park."*

4.5.3 The submission/objection also claims that the Traffic Model provides no meaningful basis upon which to forecast the impact of the proposed road development, and in particular, the direct and indirect impacts arising from the proposed Parkmore Link Road upon the circulation of traffic movements of existing road users including pedestrians within the Ballybrit Business Park.

4.5.4 This issue was raised in submission/objection: Ob_695.

Response

4.5.5 In terms of the base year assessment, as previously noted, a micro-simulation model has been developed for this section of the existing N6 and Ballybrit Business Park which has been calibrated using 2017 traffic count data. The total inbound traffic to the Ballybrit Business Park during the AM peak hour was 868 vehicles. The total inbound modelled traffic during the 08:00 - 09:00 peak hour only was 772 vehicles, resulting in a GEH of 3.4. Additionally, all movements at the N6/ Ballybrit junction have a GEH value of less than 4 (average GEH = 1.8%). This indicated that:

- The total inbound traffic to Ballybrit Business Park, during the AM peak hour, has not changed significantly between 2012 and 2017 (886 vs 868).
- The micro-simulation model provides a good match of observed and modelled traffic flows in this area, which meets model calibration criteria.
- This micro-simulation model also made use of several traffic counts within Ballybrit Business Park during its development and has been used to determine the impacts at this junction (and within Ballybrit) in more detail. An examination of the traffic counts used in the development of the micro-simulation model from 07:00 - 10:00, indicates that 1,200 vehicles entered the Boston Scientific site during this three-hour period. In the busiest hour 500 vehicles were observed entering the Boston Scientific site, which is what was included in the assessment.
- Analysis of the 2039 micro-simulation models shows that the introduction of the proposed road development proposals will have no significant impacts on the internal circulation of traffic within the Ballybrit Business Park or on the existing access junctions to Ballybrit when compared to the base year scenario.

4.5.6 In terms of the forecast assessment, the submission/objection queries the ability of the WRM to forecast future traffic movements into Boston Scientific if the base year model under represents flows in the base year.

4.5.7 When forecasting, traditional **Incremental Highway Models** generally apply growth factors to a calibrated base year traffic demand matrix (trip levels and distribution of trips) thus linking the forecast travel demand to the base year traffic flows. This is not the case with the Regional Models, which are **Absolute Models.** In Absolute Models, the travel demand for each forecast year is based on the forecast land use assumptions (population, employment, etc.) combined with the base year calibrated travel behaviour parameters and trip rates contained in the Western Regional Model.

4.5.8 The behavioural responses which underpin the Western Regional Model forecasts were derived from the 2012 NTA National Household Survey (the base year). Travel behavioural responses (for example, the key factors which influence certain segments of the population to use car over public transport, or vice versa) take many years to change and, therefore, will not have altered in any material respect since 2012.

4.5.9 Therefore, as the WRM is an Absolute Model, generating and distributing demand based on future land use information, and because travel behaviour responses are relatively constant over the short to medium term, the base year traffic flows of the WRM do not play an important part in forecasting future year traffic flows. Instead, the key drivers of demand for the forecast years under consideration are the population, employment and other socio-economic factors assumed to be in place for the opening year (2024) and Design Year (2039).

4.5.10 Significantly, the values used for these key drivers are the up to date population, land use and economic forecasts which have been used in the project appraisal to date and

which include for all of the actual growth which has occurred from 2012 to present, in addition to the anticipated growth up to the assessment years of 2024 (Year of Opening) and 2039 (Design Year). In addition, each model scenario tested included the most up to date highway, public transport and active travel networks incorporating all network changes which have occurred between 2012 and present (May 2019).

4.5.11 Therefore, as the primary determinant of future year trip generation from the area is the future year land use assumptions, the submission/objections's concern that *"the Model provides no meaningful basis upon which to forecast the impact of the proposed road scheme"* is not valid.

4.6 Assessment of Alternatives

Issue

4.6.1 Several submissions/objections have been received which assert that there has not been a sufficient consideration of alternatives to the proposed road development.

4.6.2 Additionally, a number of submissions/objections contend that there should be more emphasis on sustainable transport to solve Galway's traffic problems, and that an improved public transport service offering would solve existing traffic congestion problems. These submissions claim that alternative options (including sustainable travel and traffic management options) were not properly considered as part of the EIA process.

4.6.3 This issue was raised in submissions/objections: Ob_220, Ob_510, Ob_511.06, Ob_519, Ob_521_O_ 517.14_02, Ob_677, Ob_678, S_002, S_004, S_006, S_009, S_012, S_013, S_017, S_021, S_028, S_041, S_068, S_070, S_074.

Response

4.6.4 Throughout the design of the proposed road development and preparation of the Galway Transport Strategy, the assessment of alternatives has been undertaken as detailed in Chapter 4, Alternatives Considered of the EIAR.

4.6.5 As part of the consideration of alternatives, a review of the impact of a Light Rail Transit System in the context of the increased population and employment forecasts as set out in the National Planning Framework was undertaken. The results of these assessments are summarised below.

4.6.6 As set out in Section 4.6.1 of Chapter 4 of the EIAR, the public transport alternative assessed was based on recommendations arising from the *Galway Public Transport Feasibility Study 2010*, and included:

- A Bus Rapid Transit (BRT) operating at a 10-minute frequency from Knocknacarra to the West, through the city centre, to Oranmore in the East
- All existing city bus services increased to 10-minute frequency

- Bus priority measures at signalised junctions along the BRT corridor
- Re-allocating road space on the Salmon Weir Bridge from general traffic to Public Transport only

4.6.7 As summarised in Section 4.6.1 of Chapter 4 of the EIAR, this analysis concluded that the improved public transport offering would result in a 17% increase in public transport trips relative to the Do-Minimum 2034 scenario. However, due to the overall low public transport mode share, this represents less than a 1% reduction in car trips. Full implementation of the 'Public Transport Only' alternative, as defined above, results in a 2% increase of delay to every vehicle journey across the key routes in the city, in the opening year. Analysis of the Public Transport Only Option in the 2039 design year, demonstrated that it does not provide a solution in isolation, however, it does form part of the overall holistic transportation solution and is included in the Galway Transport Strategy (GTS).

4.6.8 In addition to the consideration of alternatives in the development of the proposed road development, the GTS also contained an assessment of the measures required to meet the existing and future transport needs of the city.

4.6.9 The GTS places an emphasis on delivering sustainable transport solutions, to reduce the dependency on private car travel. Following this overriding principle, a hierarchal approach was adopted for the assessment of the GTS transport strategies which set out the order of interventions required to support sustainable travel choices. These started with interventions for walking and cycling, followed by the need for additional public transport infrastructure (including light rail), and were supported by traffic management and demand management measures aimed at encouraging a shift to sustainable modes. Finally, the need for further road interventions was examined as part of the strategy to provide additional capacity to the network, whilst not undermining the investment in sustainable transport.

4.6.10 During the development of the GTS a number of public transport scenarios supported by city centre traffic management solutions were assessed, without the proposed road development in place, based on a review of the future demand for travel in the city and county in 2039. This included an examination of various public transport options ranging from high frequency bus to a light rail system. Whilst the delivery of public transport solutions increased levels of sustainable travel, the analysis indicated that a vastly improved public transport network, in isolation, will not mitigate the forecasted congestion issues in the city. For example, the assessment of the GTS strategy in 2039 without the proposed road development in place, did result in a relative increase in sustainable mode share of circa 13% – however, the capacity of the overall network improved by only 6% (measured in traffic link over-capacity) when compared to the Do-Minimum Scenario.

4.6.11 The GTS concluded that, to fully realise the overall transport solution, a new crossing of the River Corrib will be required in the future in order to facilitate the public transport options identified and the modal shift envisaged in the GTS.

4.6.12 Following the publication of the National Planning Framework, and the associated population projections for Galway, and in the context of the increased population and employment forecasts, a review of the impact of a potential Light Rail Transit System for Galway was undertaken. The purpose of this assessment was to determine the following:

- Will the delivery of LRT encourage high levels of sustainable travel?
- Is there sufficient demand in Galway to support the delivery of LRT?
- Would the introduction of LRT in Galway resolve congestions issues in the city?
- How does the performance of the LRT compare to the delivery of the suite of measures proposed as part of the Galway Transport Strategy (GTS)?

4.6.13 The analysis undertaken looked at two light rail options for Galway:

1. An "East-West" Light Rail line, running from Parkmore and Ballybrit, through the city centre, to Knocknacarra

2. A Light Rail network consisting of 4 individual lines as follows:
   - Blue Line: Briarhill to Na Duganna/Galway Train Station
   - Red Line: Cappagh to Nimmo's Pier
   - Yellow Line: Oranmore Station to Na Duganna/Galway Train Station
   - Maroon Line: Corrib Village to Tuam Road interchange

4.6.14 Further detail of the analysis of the light rail assessments is provided in Section 4.13 of this Brief of Evidence. In summary, the demand analysis reveals that, even under NPF growth assumptions, there is insufficient demand in 2039 for an LRT service in Galway. This is largely due to the absence of the critical mass required to support such infrastructure.

4.6.15 The analysis carried out demonstrated that the delivery of a standalone Light Rail system will not resolve the existing or forecast congestion issues in Galway. The level of demand which is forecast to exist in the design year could be served more efficiently with a number of high frequency bus services as proposed in the GTS.

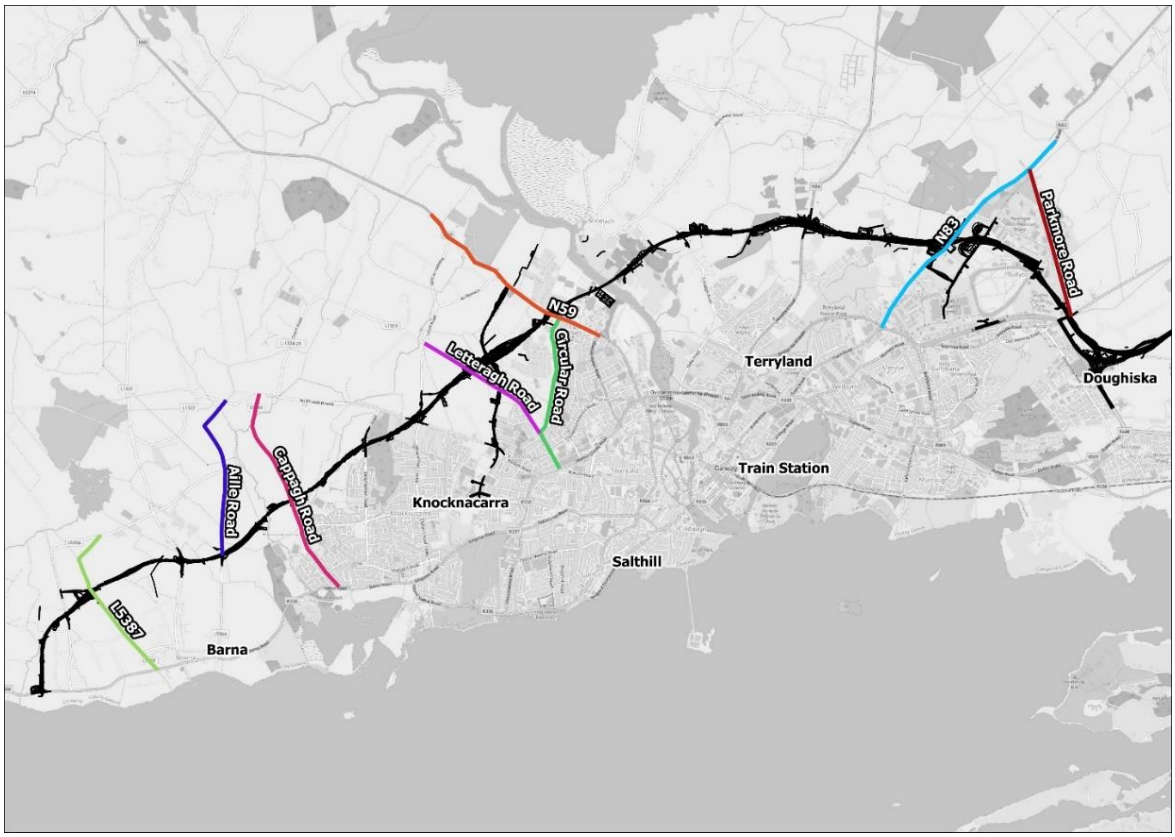
4.7 The proposed road development will lead to increased traffic on certain local roads

Issue

4.7.1 Several submissions/objections expressed concern that the proposed road development will lead to increased traffic close to their homes, on more local roads unsuited to large volumes of traffic. The roads include:

- L5387 (in Troscaigh)
- Aille Road
- Cappagh Road
- N59 (Moycullen Road)
- N83 (Tuam Road)
- Circular Road
- Parkmore Road
- Letteragh Road

Figure 6: Local Road locations



4.7.2 This issue was raised in submissions/objections: Ob_159, Ob_298, Ob_496, Ob_510, Ob_512.1, S_046, S_062, S_066; Ob_116; Ob_135; Ob_136; Ob_155; S_015.

Response

4.7.3 Table 1 below outlines how average annual daily traffic (AADT) levels at the locations indicated are forecast to change in the 2039 design year, as a result of the introduction of the proposed road development. The table also details the forecast peak hour two-way traffic flow at these locations with the proposed road development in place.

Table 1: Local Road Traffic forecasts

Location	Do-Minimum 2039 AADT	Do-Something 2039 AADT	2039 Do-Something Peak Hour Two-Way Flows
Trioscaigh Road (L5387)	600	750	70
Aille Road (L5384)	630	750	100
Cappagh Road - North of proposed road development	539	213	24
Cappagh Road – South of proposed road development	539	6,857	750
N59 Moycullen Road north of N59 Link Road North	18,771	19,372	1,890
N59 Moycullen Road south of N59 Link Road North	19,028	17,104	1,680
N83 Tuam Road (north of N83 Tuam Road Junction)	19,137	20,541	1,900
Circular Road	2,800	1,900	190
Parkmore Road Lower (South of Business Park roundabout)	16,700	10,381	1,130
Letteragh Road east of N59 Link Road	2,109	10,656	1,050

4.7.4 In the majority of cases outlined above, the inclusion of the proposed road development results in only small increases in traffic and in some cases decreases in volumes on adjoining or parallel roads.

4.7.5 In the case of the Letteragh Road east of the N59 Link Road Junction and the Cappagh Road south of the proposed road development, the introduction of junctions with the proposed road development will result in an increase in traffic on these, presently, local roads. However, both the Letteragh Road and Cappagh Road are within the urban street network. As per TA79/99 of the UK DMRB[3], these roads would be classified as

[3] There is no equivalent guidance in the republic of Ireland for the capacity of urban roads.

"Urban All Purpose (UAP) 3; variable standard road carrying mixed traffic" with a capacity of 900 vehicles, per hour in the busiest direction. This guidance assumes a 60/40 directional split giving a two-way capacity of 1,500 vehicles per hour.

4.7.6 As can be seen in the table above, the Letteragh Road east of the N59 Link Road has a forecast peak hour, two-way flow of approximately 1,050. The corresponding value for the Cappagh Road South of the proposed road development is 750 vehicles. Both of these forecasts are well within the guidance capacity.

4.8 The proposed road development will lead to increased traffic/induced traffic

Issue

4.8.1 Several submissions/objections state that the proposed road development will lead to increased levels of traffic and that it will encourage urban sprawl and unsustainable travel patterns. Some of these submissions/objections cite the M50 and Limerick Tunnel as examples of how additional road capacity can lead to increased congestion and lengthening of trips.

4.8.2 It is asserted that failure to account for induced traffic in forecast traffic levels will result in forecast traffic levels being underestimated and, therefore, the forecast environmental impacts (noise and emissions) will be understated.

4.8.3 By reason of induced demand, it is stated that the subject proposals would undermine the achievement of Smarter Travel Policy and would be contrary to planning policy guidelines. It is further stated that an important issue related to, and generated by, induced traffic is the degree to which the proposed road development affects land use patterns, and in particular the opening up of lands, stimulating urban fringe development (i.e. urban sprawl).

4.8.4 Rather than addressing inherited planning problems, it is asserted that the proposed road development will serve to further reinforce previous planning mistakes by opening up land to the west of the city (and along the coastal route) for new housing development, rather than concentrating housing growth in the centres and to the east. Furthermore, it is remarked that the proposed road development takes no account of the planned imminent development of the Galway Docklands and its requirement for city centre access, rather than provision of a disconnected orbital route.

4.8.5 This issue was raised in submissions/objections: Ob_512.1, Ob_220, Ob_521_O_517.14_02.4; S_002; S_006, S_009, S_012, S_013, S_021, S_028, S_032, S_070.

Response

4.8.6 The following response, firstly, provides a definition for induced traffic and summarises the various types of induced traffic which can occur when a new road

scheme is implemented. The response then, secondly, addresses how induced traffic resulting from the proposed road development has been assessed. Finally, the response summarises the positive impacts of induced traffic arising from the proposed road development and how 'urban sprawl', will be managed.

What is Induced Traffic?

4.8.7 When a new transport facility or service becomes available the users of the transport system can alter their behaviour in a number of ways:

- Change their **route** (Diverted Traffic)
- Change their **mode of travel**
- Change their **destination** to one easily reachable using the new system
- Change their trip **origin** to one that results in a longer trip (urban sprawl)
- Change their trip making **frequency**
- Change their **time of travel**

4.8.8 Induced traffic, or "new traffic", attracted by a capacity expansion is therefore comprised of several components or behavioural responses. Each of these components and their expected response to additional road capacity is detailed in the Table 2 below.

Table 2: Behavioural responses to components of induced traffic

Type of generated traffic	Expected outcome
Diverted Traffic	The provision of a new road will reduce journey times on the network, thereby attracting motorists away from more congested / slower routes
Mode Change	The provision of a new road will reduce journey times by road resulting in a shift towards travel by car
Destination Change	Reduced journey times allow drivers to choose destinations (Such as schools or places of work) further away from their home, leading to increased vehicle kilometres travelled
Time of travel Change	The provision of a new road will reduce traffic congestion in the peak travel periods which in turn releases the 'suppressed' trips of motorists who currently defer their journey to off-peak periods to avoid congestion
Trip Frequency Increase	The provision of a new road will improve travel times, which can encourage more trips to be made
Origin Change (resulting from different land use pattern)	The provision of a new road will improve travel times enabling motorists to live further away from their place of work or other end destinations. This can lead to dispersed land use patterns, which is often referred to as 'Urban-sprawl'

How has induced traffic resulting from the proposed road development been assessed?

4.8.9 A key component of the transport modelling suite used to assess the proposed road development is the NTA's Western Regional Model (WRM). The WRM is comprised of a variable demand model which provides a detailed representation of travel demand on the network broken down by journey purpose, mode of travel, person types, user classes and socio-economic classes. The WRM also provides a prediction of changes in trip destination in response to changing traffic conditions, transport provision and/or policy. This is in line with modelling best practice, including TII and WebTAG[4] guidance, which dictates that a variable demand model should be used to assess the impacts of a scheme such as the proposed road development.

4.8.10 This variable demand modelling approach allows for the majority of the induced traffic components to be accounted for in the scheme appraisal. Table 3 below details each of the components of induced travel and how they are accounted for in the transport modelling process.

Table 3: Modelling of induced travel components

Type of generated traffic	Included in Appraisal?	Details
Diverted Traffic	Yes	The Highway model assignment determines likely re-routing resulting from the proposed road development
Mode Change	Yes	The Multi-modal component of the WRM models the likely mode shift responses to the proposed road development
Destination Change	Yes	The Demand Model component of the WRM models how destinations change resulting from the changes in generalised cost of travel following introduction of the proposed road development
Time of travel Change	Yes (For overall daily movements) No (For Additional Peak hour traffic)	The WRM models all time periods throughout the day. Therefore, trips moving from one-time period to another will not change the overall Average Annual Daily Traffic (AADT) forecasts which have been produced to assess the proposed road development However, the WRM does not directly model the impact of additional trip making in a peak hour as a result of the provision of increased road capacity An estimation of the potential increase in trip making in the peak hour resulting from the introduction of the proposed road development has been derived based on evidence from similar schemes delivered in Ireland and is addressed in Section 4.8.28 of this Statement of Evidence

[4] Transport Analysis Guidance from the UK department of Transport

Type of generated traffic	Included in Appraisal?	Details
Trip Frequency Increase	No	Changes in trip frequency as a result of increases or decreases in the generalised cost of travel are not modelled within the WRM. However, evidence from the assessment of Household Data indicates that the provision of new transport infrastructure does not result in a noticeable increase in trip frequency during peak periods, but instead influences the choice of travel mode
Origin Change (resulting from different land use pattern)	No	Within the EIAR, the forecast growth in population and employment was based on TII growth forecasts derived from Central Statistics Office (CSO) forecasts. Subsequent to completion of the EIAR, the growth in population and employment for Galway City and County has been derived based on National Planning Framework (NPF) forecasts developed by Galway City and County Councils and the National Transport Authority. The WRM model assessments undertaken for the EIAR and NPF forecasts have the same land use assumptions in place with and without the proposed road development

What are the proposed road development effects in Galway?

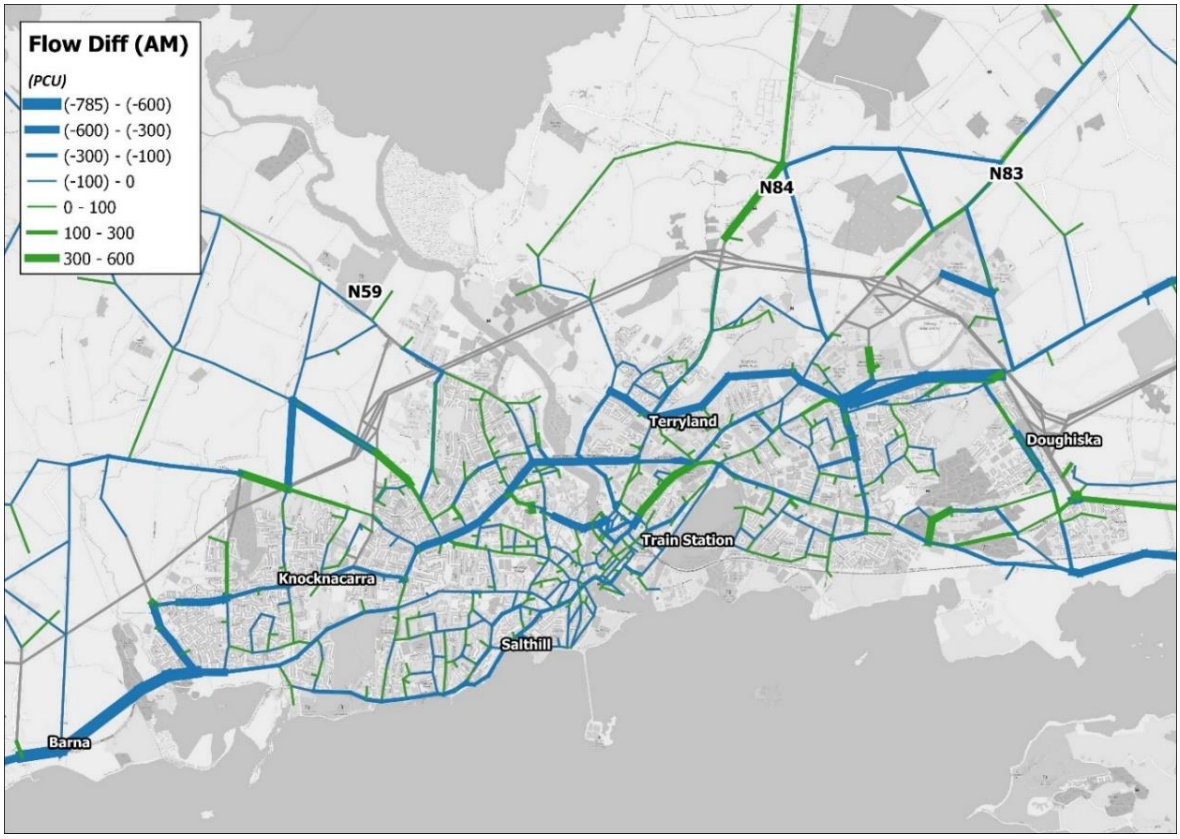
Diverted Traffic

4.8.11 The purpose of the proposed road development is to serve the forecast demand for strategic travel on national roads while also freeing up capacity within the city centre to support priority for sustainable travel measures. Therefore, traffic diverted from national/regional routes within the city centre onto the proposed road development is generally a positive impact and demonstrates that the proposed road development is serving its intended purpose.

Traffic Diversion

4.8.12 Figure 6 below shows how traffic flows will change in the AM peak hour, under NPF growth assumptions, when the proposed road development is in place. Blue lines on this map show roads where traffic flows will reduce, and green lines show roads where traffic will increase.

Figure 7: Do-Something flow difference plot



4.8.13 The above figure shows that there will be some increases in traffic on the radial routes leading into Galway, close to the new junctions on the proposed road development, and that there will be a significant reduction in traffic in the city centre as traffic diverts onto the proposed road development. Importantly, the implementation of the proposed road development will result in a circa 10% reduction in traffic within the city centre (and up to a 38% reduction in HGV traffic in the city centre during peak periods), freeing up capacity within the city centre to support priority for sustainable travel measures. The most notable reduction in traffic is on the existing N6. For example, traffic on the Briarhill to Ballybrit Business Park section in both directions is reduced by 31% following the introduction of the proposed road development. The reduction in traffic volumes on this route will facilitate proposed cross city bus services operating to Ballybrit and Parkmore as set out in the GTS.

4.8.14 This diverted traffic will therefore have significant positive impacts for Galway and its environs including:

- It will provide a much **safer environment for vulnerable road users** by removing significant amounts of traffic (notably up to 38% of HGV traffic) from the city centre

- This reduction in traffic will lead to a circa 16% **reduction in harmful emissions** (PM_{10}, NO_X and $PM_{2.5}$ etc.) in the city centre
- It will result in a more resilient transport network, providing more reliable and **quicker journey times for public transport** which will decrease by approximately 10% on the most congested routes even without additional bus priority measures in place.

Local and National Road Traffic

4.8.15 To examine the origin and destination for users of the proposed N6 GCRR, a select link analysis has been performed on the N6 GCRR between its interchange with the N59 and N84. The results of this analysis are shown in the figures 7 below for traffic on the new river crossing in the AM peak period in the eastbound and westbound direction respectively. These figures show how the proposed road development will generally facilitate long distance, strategic trips on the national road network, instead of local trips which could otherwise be made by walking, cycling or public transport. For example, in the eastbound direction approximately 60% of trips crossing the River Corrib at this point exit Galway City on the national road network. In the westbound direction, 23% of those crossing the River Corrib at this point exit Galway City on the N59 or R336.

Figure 8: N6 GCRR Eastbound Select Link Analysis

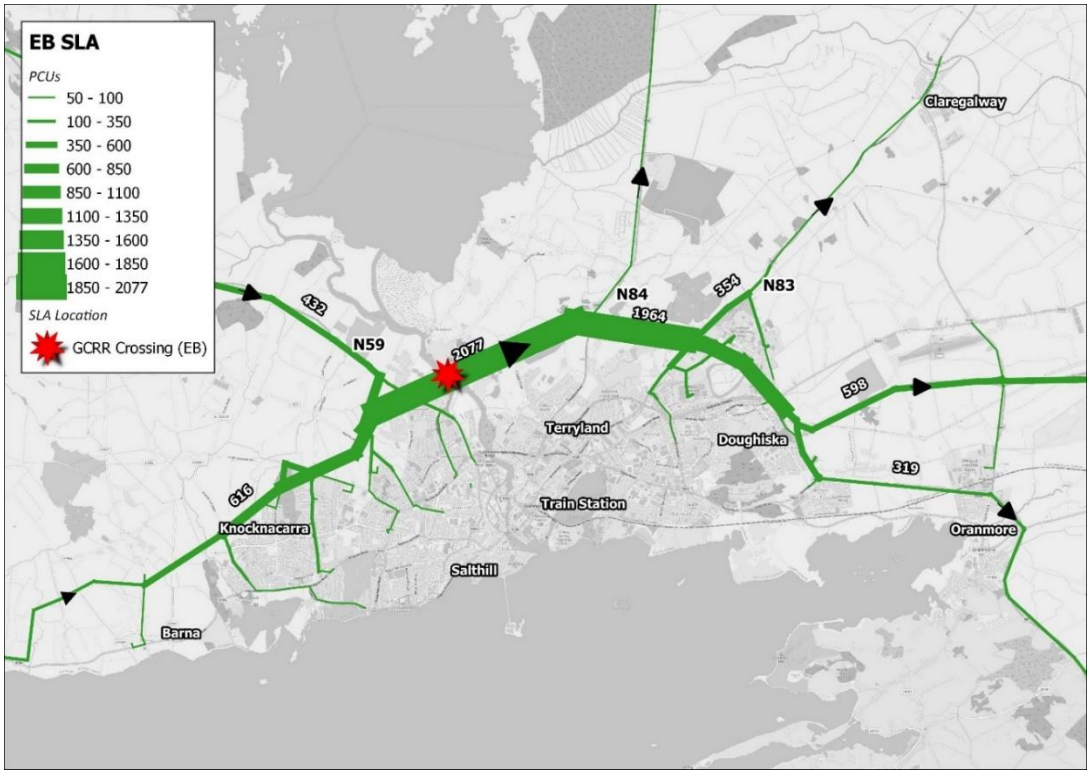
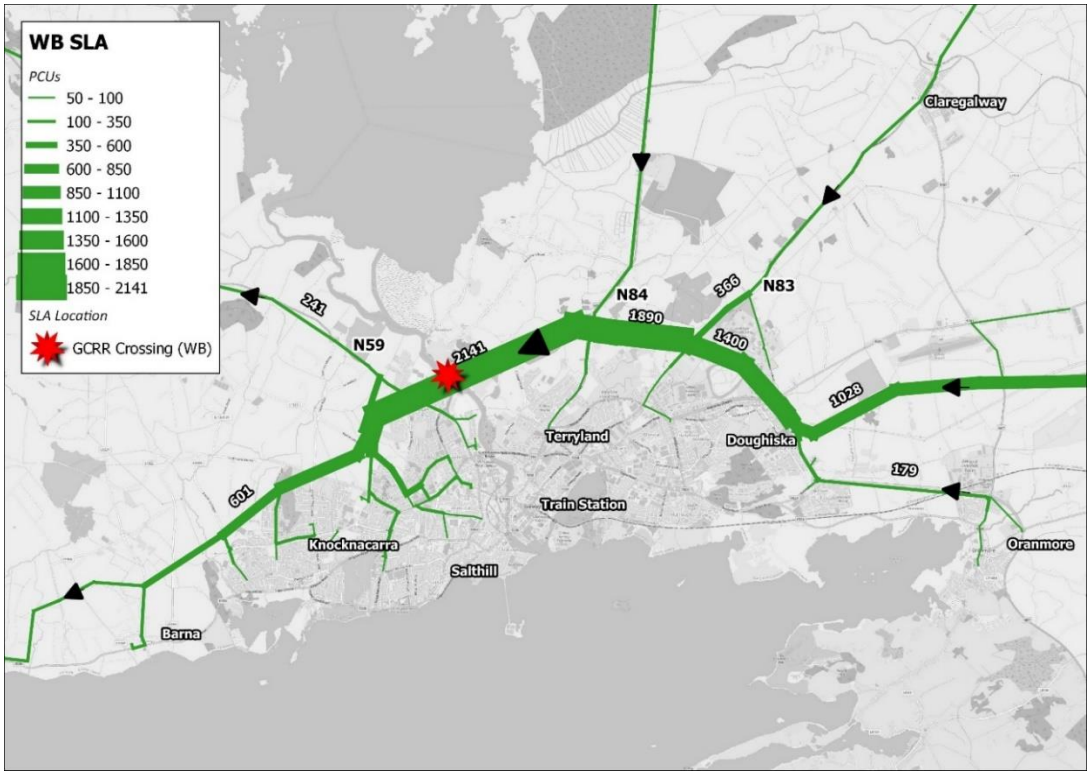


Figure 9: N6 GCRR Westbound Select Link Analysis



Mode Shift

4.8.16 All modes of travel (walking, cycling, public transport and car) are modelled in the WRM. The demand model component of the WRM is capable of modelling how people may change their mode of travel response to the increased capacity and reduced travel times provided by the proposed road development. Table 4 below outlines the 24-hour mode share for the "with and without scheme scenarios", under NPF growth assumptions for Galway City which will see a 50% increase in the population in the city centre.

4.8.17 The results of the analysis indicate that the implementation of the proposed road development in the 'Do-something' scenario will result in a 3.9% increase in car use when compared to the 'Do-Minimum' Scenario. What is not evident from reading this table in isolation are the factors behind the choice of mode decisions. In the Do-Minimum Scenario, significant levels of traffic congestion create a barrier to travel, constraining the economic growth of the city. The overall delay on the road network in the Do-Minimum Scenario is 74% higher than the Do-Something Scenario with the proposed road development in place. The journey times across the city, particularly in an East-West direction, along the existing N6 are 44% higher in the Do-Minimum scenario.

4.8.18 In the Do-Minimum scenario, movements across the city for both car traffic and public transport are significantly constrained. This situation would have a detrimental effect on the economy of Galway and the Western Region and would severely restrict the sustainable growth of the city, as set out in the NPF, undermining the objectives of the NPF.

4.8.19 With the introduction of the proposed road development, these restrictions on connectivity and growth are removed resulting in significant positive impacts, including:

- It will **facilitate sustainable modes of travel**, and create a favourable environment for sustainable travel, by removing car and HGV traffic volumes from the city centre
- It will provide a **safer environment** for vulnerable road users
- It will lead to a **decrease in public transport journey times** by approximately 10%
- It will lead to a healthier environment for residents and visitors to Galway due to a **reduction in harmful emissions** in the city centre

4.8.20 It should be noted that the WRM bases mode choice decisions on the total journey times by each mode. As the model does not consider other factors/benefits influencing a person's choice of travel, such as safer and healthier environment, then the mode shares presented above can be considered a robust or worst-case scenario. It is clear,

however, that the proposed road development will support the first principle of the GTS which is to promote and encourage sustainable transport, and in particular to make it convenient and attractive to walk, cycle or use public transport.

4.8.21 Following on from this, our analysis indicates that the full implementation of the GTS, which includes the delivery of the proposed road development as a core component, will result in a 5% reduction in the mode share for private car in the city centre and further improvements in the performance of the network for all transport modes.

Table 4: Mode Share Percentages

Option	% Car	% Public Transport	% Walk	% Cycle
2039 Do-Minimum	61.2%	5.4%	29.3%	4.1%
2039 Do-Something	64.1%	5.0%	27.6%	3.3%
2039 Do-GTS	56.0%	6.8%	31.2%	6.0%

Destination Change

4.8.22 The demand model element of the WRM is capable of modelling how trip destinations might change in response to the increased capacity and reduced travel times facilitated by the proposed road development. To demonstrate how trip destinations would change because of the proposed road development, we have analysed how trips to major destinations, such as places of employment, in Galway would change following the introduction of the proposed road development.

Trips to major destinations

4.8.23 Figure 9 below demonstrates how the trip length distribution of trips to one of the major destinations in Galway (Parkmore Industrial Estate) is forecast to change with the introduction of the proposed road development. Without the proposed road development in place (Do-Minimum Scenario), trips to this part of the Parkmore Industrial Estate originate largely from the eastern side of Galway City and County resulting with a relatively large proportion of trips being 4 kilometres or less. The reason for this is that, by 2039, congestion has increased to such a degree without the proposed road development in place that it discourages people travelling long distances into Parkmore or even from the western side of Galway City into Parkmore.

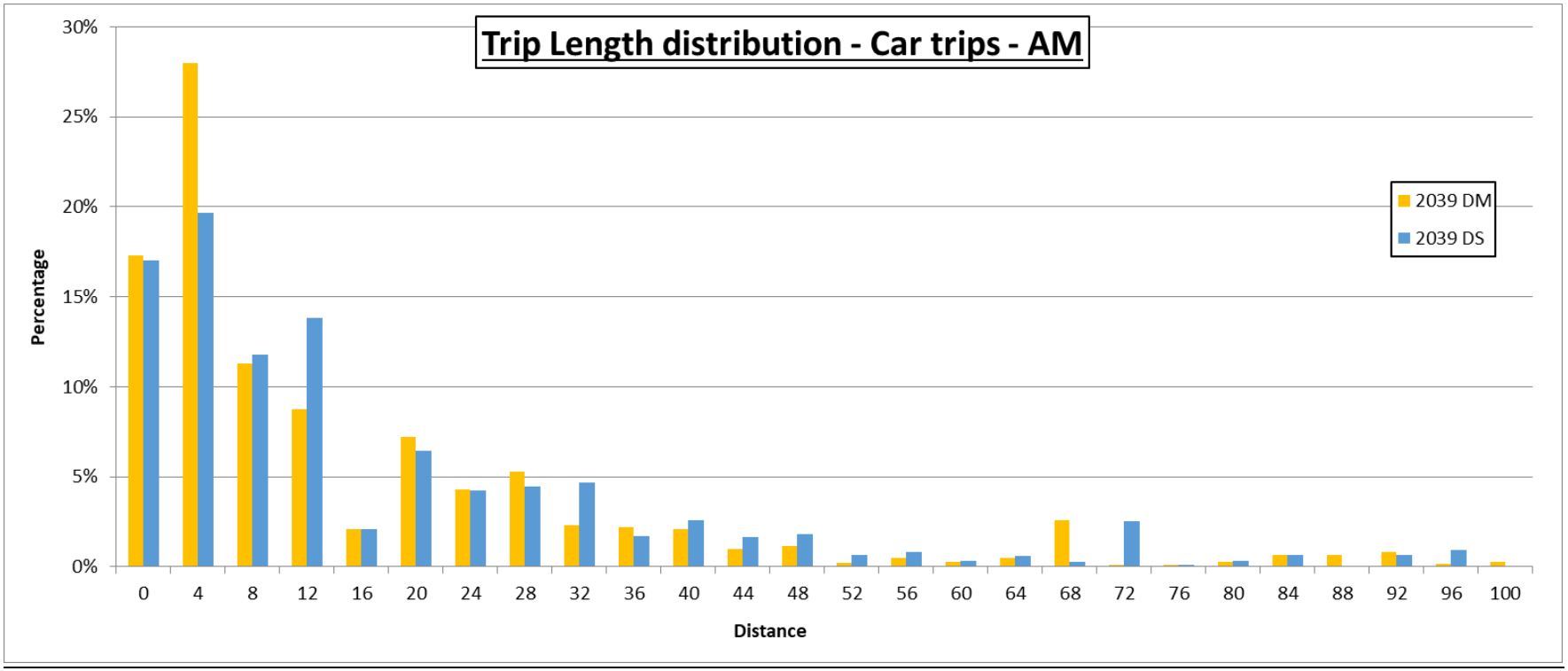
4.8.24 With the introduction of the proposed road development (Do-Something Scenario) this congestion is removed, allowing people to change their destination of work as indicated by the increase in the proportion of trips travelling longer distances to Parkmore (8km - 12km and 28km - 32km) and the reduction in shorter trips (those under 4km). What is not modelled is anticipated changes in Land Use Planning Policy which would mitigate this effect. As explained below, the National Planning

Framework, provides a legislative framework for spatial planning which will constrain future development in compact urban settlements supported by public transport.

4.8.25 Whilst the Do-Minimum Scenario results in shorter trip lengths and an increase in walking and cycling, the severe level of congestion experienced in this scenario by all transport modes would suppress travel movements either side of the River Corrib, as is evidenced by the substantial increase in journey times noted above. This would ultimately result in isolation of areas of the city and county, leading to further relocation of activities away from the city core, reduction in the range of employment opportunities and an overall reduction in the quality of life of the residents of the city. The introduction of the proposed road development will prevent this from happening and will:

- **Improve connectivity** between the east and west side of Galway City (and county)
- Improve **access to key resources and services**
- **Avoid the need to duplicate services** due to a lack of connectivity between east and west of the city

Figure 10: Trip Length Distriubtion – Car trips - AM



Time of Travel Changes

4.8.26 Increased congestion in the peak hour can encourage people to defer trips (leave earlier or later to avoid peak period traffic congestion) in what is known as "peak spreading". Conversely, the removal of congestion in the peak hour following the introduction of the proposed road development could encourage people to switch to travel in the peak period. In this instance, the extra trips that take place in the peak hour are not "new trips" but trips which have moved from one time-period to another.

4.8.27 One of the primary outputs from the transport modelling of the scheme is Average Annual Daily Traffic (AADT) estimates for the various roads in the study area. These AADT estimates are also used in the environmental appraisal by air, climate and noise specialists. AADT estimates are made for 24-hour periods and therefore trips shifting from one period to another, within the same 24-hour period, will not change the 24-hour traffic forecast.

4.8.28 Notwithstanding the above, it is possible that an increase in trips during the peak hours may lead to traffic impacts. In order to test this, analysis of historical traffic trends on the M50 was undertaken to determine the likely shift in traffic from outside the peak to the peak hour. The capacity of the M50 was significantly increased in 2012 following years of significant congestion. This M50 upgrade consisted of increasing the number of lanes in each direction from 2 to 3 and upgrading several interchanges to free-flow. By observing how this enhanced capacity (and reduced journey times) impacted the proportion of traffic travelling in the peak hour, it is possible to apply a similar change to the peak hour factors used in the WRM. This M50 analysis revealed a 20%-30% increase in the proportion of traffic travelling during the peak hour immediately following the upgrade of the road.

4.8.29 A sensitivity test has been carried out to determine the impact of a similar change in peak hour factor following the introduction of the proposed road development. Applying this updated peak hour factor to the 2039 Do-something Scenario results in approximately 20% increase in total delay experienced on the network and a 3% increase in the average journey time through the city. However, these values are still significantly lower than those observed in the Do-Minimum Scenario.

4.8.30 Such a re-timing of trips into the peak hours is possible, and likely, to occur as a result of the reduced congestion. This is reflective of the fact that the proposed road development will achieve its objectives and will have the following wider economic and social benefits:

- It will provide **shorter travel times** for all trips
- Improve **journey time reliability**

Trip Frequency Change

4.8.31 In theory, trip making from a particular zone may increase or decrease as a result of changes in total travel time by all modes. Certain models contain a trip frequency module which simulates this interaction. However, in general, if all modes of travel (including walking and cycling) are included in a model (which is the case for the WRM) then it is not necessary to include a trip frequency response. This is because any increase in trips by one mode is usually the result of mode shift from alternative modes. In particular, peak hour trip frequency is considered to be insensitive to changes in the generalised cost of travel, as demand for travel is largely derived by activity at the end destination (for example trips to school or place of work) as opposed to the capacity of the transport network.

4.8.32 Some increased frequency can occur for other, inter-peak, trip purposes such as tourism, leisure and business. An increase in such trips (tourism or shopping) arising from the implementation of the proposed road development would have considerable economic benefits for the city of Galway and the Western Region.

Origin Changes (Land Use Changes)

4.8.33 A transport project such as the proposed road development may result in an alteration of land use patterns by facilitating economic development that would not have been possible otherwise or by new developments locating in areas which are easily accessed by the new route. These altered land use patterns in turn may lead to additional or "induced" traffic as a result of the proposed road development.

4.8.34 Current land use policy, as set out in the National Planning Framework, provides a legislative framework for spatial planning which constrains future development in compact urban settlements supported by public transport. All local and regional planning authorities must legally adhere to the NPF and therefore the forecast modelling of both the Do-Minimum and Do-Something Scenarios is based on population and employment forecasts aligned to the NPF principles.

4.8.35 Whilst an infinite number of Land use scenarios could be modelled, these are considered irrelevant as the NPF guidelines must be adhered to and unsustainable land use patterns as described above will not be permitted to take place with or without the proposed road development in place. As evidenced in the Planning Statement of Evidence, the projected growth in Galway City and its suburbs will be consolidation in existing residential neighbourhoods at Knocknacarra, Rahoon, Castlegar and Roscam; through the regeneration of brownfield lands within the city and planned development at Ardaun. As recognised in the NPF, the implementation of the package of strategic transport measures contained in the GTS, in tandem with compact growth delivered in the city centre and along public transport corridors, is critical to the proper planning and sustainable development of the Galway Metropolitan Area.

Induced Traffic Summary

4.8.36 As outlined in the sections above, the modelling approach adopted for the proposed road development has assessed most components of induced traffic and, therefore, this has been accounted for in the development, design and assessment of the proposed road development.

4.8.37 As noted above, the planned growth of the city, as set out under NPF, without an additional river crossing will result in a severe level of congestion experienced by all transport modes which would suppress travel movements either side of the River Corrib. This would ultimately result in isolation of areas of the city and county, leading to further relocation of activities away from the city core, reduction in the range of employment opportunities and an overall reduction in the quality of life of the residents of the city. This scenario fails to meet the proposed road development project objectives or sustainable development goals of the NPF.

4.8.38 Our assessment of induced traffic has shown that the implementation of the proposed road development will result in improved journey times across the network for all modes including public transport, removal of traffic from the city centre, improvement in the city centre environment and improved safety across the city. Table 5 below shows how each of the components of induced travel will result in positive impacts for Galway and the Western Region.

Table 5: Positive Impacts of the proposed road development

Type of generated traffic	Benefits	Outcome
Diverted Traffic	Safer Environment for vulnerable road users Improved air quality in city centre	Up to 10% decrease in overall traffic in city centre during peak times 16% reduction in NOx, PM_{10} and $PM_{2.5}$ in city centre
Mode Change	Safer Environment for vulnerable road users Quicker more reliable Public Transport journey times	Up to 38% decrease in HGV traffic in centre during peak times 10% decrease in public transport journey times into city
Destination Change	Improves East-West connectivity of the city and region Improved access to key services	Journey time east- west on N6 31% faster Up to 43% less delay across city network thereby improving access to key services such as hospitals and education
Time of travel Change	Shorter travel times for all modes and purposes will lead to an improved quality of life and economic benefits	Up to 17% reduction in average journey times in peak period

Type of generated traffic	Benefits	Outcome
	with people spending less time in traffic	
Trip Frequency Increase	Reductions in Journey Times into, and around the city, combined with a decrease in traffic and improved city centre environment may lead to increased leisure and tourist trips in the region.	Wider social and economic benefits not quantified in the Cost Benefit Appraisal.
Origin Change (resulting from different land use pattern)	National Planning Framework will ensure that future land use planning takes place in a consolidated and sustainable manner in all scenarios (with and without the proposed road development)	City Centre mode share for sustainable modes will increase by 5% by implementing the sustainable planning policies of the NPF.

4.8.39 Whilst the delivery of the proposed road development in isolation will help meet the project objectives as set out in Chapter 3 of the EIAR, it's delivery in the context of the Galway Transport Strategy and the National Planning Framework (as envisaged), will help mitigate any potential negative effects of induced traffic.

4.8.40 The delivery of the proposed road development as a core component of the Galway Transport Strategy will provide more space and priority in the city centre for sustainable modes of travel. As indicated above, this will result in a positive modal shift and improved journey times for all modes of transport.

4.8.41 With respect to the potential impacts of the proposed road development on urban sprawl, the Government's 'National Planning Framework' sets a major new policy emphasis on concentrating future growth within brownfield sites in urban areas and along public transport corridors in order to promote sustainable travel patterns. Recent large-scale proposed developments in the city centre, such as the Land Development Agency's planned 1,000 residential development on Sandy Road, large scale Office/Retail development at Bonham Quay and the redevelopment of Céannt Station as a large mixed-use development, are aligned with these NPF sustainable development principles. As set out in the Planning Brief of Evidence, Galway City and County Councils will continue to ensure that future planning decisions and development plans adhere to these NPF forecasts and development principles.

4.8.42 The delivery of the city and county's future population in compact urban forms in accordance with the requirements of the NPF will support investment in sustainable infrastructure and limit urban sprawl within Galway city and its environs.

4.9 Impact on Rosán Glas Bothair Diarmuida Area

Issue

4.9.1 Several submissions/objections were received from residents in the Rosán Glas area. The main assertions made in these submissions/objections include:

- The closure of the junction of Bóthar Diarmuida/Rahoon Road will cause serious traffic problems
- The proposals for this area will elongate journey times and distances for residents
- Proposals will encourage traffic from other areas "rat-running" through residential roads to access the N59 Link Road
- Proposed signalised junction will impede movements to and from Rosán Glas.

4.9.2 This issue was raised in submissions/objections: S_004, S_011, S_029, S_043, S_044, S_056, S_057, S_060, S_065, S_075 (RFI).

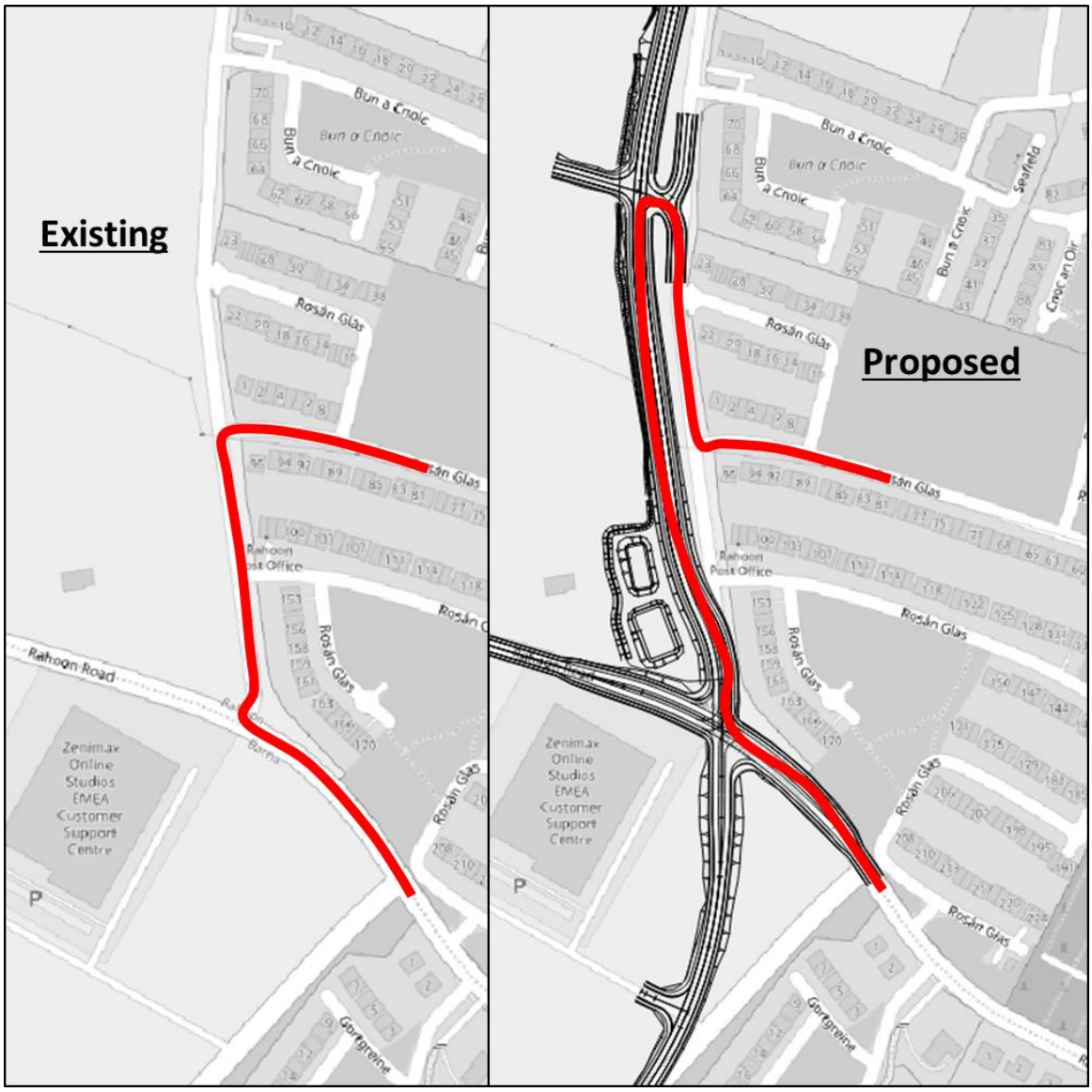
Response

4.9.3 Traffic modelling of the area (Bóthar Diarmuida/Rahoon Road) indicates that this junction will operate within capacity in the design year (2039) with the proposed road development in place. Additionally, detailed junction modelling of this area (N59 Link road/Rahoon Road) indicates that the junction will operate within capacity in the 2039 peak periods, with no overcapacity queuing reported. Therefore, it is not anticipated that the closure of the Bóthar Diarmuida/Rahoon Road junction will lead to any traffic problems or congestion issues in the area.

4.9.4 Additionally, strategic modelling undertaken as part of the EIAR indicates that no traffic will use the Rosán Glas area as a rat-run and only traffic originating or destined for the estate will use its internal road network.

4.9.5 As a result of the reconfiguration of the road network at this location, there will be a small increase in distance required for vehicular traffic to reach the Rahoon Road for a limited number of residents. However, this extra distance is not considered to be significant. The increase in distance will be approximately 450m and result in changes in journey times of less than 60 seconds for vehicular traffic.

Figure 11: Rosán Glas road configuration after the proposed road development is built



4.9.6 The design of the proposed road development will ensure that the level of accessibility for pedestrians and cyclists is enhanced. This will help to improve the level of accessibility of Rosán Glas and lead to additional connectivity for the area. The above therefore demonstrates that movements to and from Rosán Glas will not be impeded by the junction reconfiguration.

4.10 Travel patterns do not require a bypass

Issue

4.10.1 Several submissions/objections have been received relating to the nature of travel patterns in Galway and whether they necessitate a "bypass". In summary, these submissions/objections claim that:

- Census POWSCAR data indicates that only circa 3% of traffic requires a bypass of Galway City and therefore a bypass is not required
- Most trips made in Galway are short commuting trips, which would not be solved by the new road

4.10.2 This issue was raised in submissions/objections: Ob_116, Ob_511.06, Ob_519, Ob_678, S_013, S_017.

Response

4.10.3 The proposed road development substantially develops the road network of Galway City. This enhanced road network will have the space to increase the amount of it to be allocated exclusively to public transport and active travel modes. It will also reduce congestion improving the quality of life in Galway, better serve strategic traffic in the West Region and allow for the envisaged significant increase in population. The primary function of the proposed road development is not to facilitate traffic travelling from one side of Galway to the other and, therefore, it is not intended to serve as a full bypass. The functionality of the proposed road development is twofold as detailed in Eileen McCarthy's Brief of Evidence. Firstly, it provides for the strategic need of the TEN-T comprehensive road network and connectivity of Galway City and the West Region to the national road network. Secondly, it relieves the city centre roads of strategic traffic and provides the necessary road space for other modes of transport, namely walking, cycling and public transport.

4.10.4 The proposed road development will serve strategic traffic currently trying to cross the city via the existing N6 as well as strategic traffic that is currently travelling through the city centre and to strategic locations within the city itself. It will serve several "strategic" movements linking the M6/N6, M17/M18, N59, N84 and N83 and will remove the need for these traffic movements to enter Galway City unnecessarily. For example, in the eastbound direction, approximately 60% of trips crossing the River Corrib in the morning peak exit Galway City on the national road network.

4.10.5 The proposed road development will form part of the TEN-T network for Ireland, functioning in accordance with the European Union's TEN-T Transport Policy. The ultimate objective of this policy is to close gaps, remove bottlenecks and technical barriers, as well as to strengthen social, economic and territorial cohesion in the EU.

4.10.6 The proposed road development will support the economic and social development of the region and connectivity and accessibility to the city. It will facilitate the growth of the city, both economically and in terms of population, long into the future.

4.10.7 All of the analysis carried out to date indicates that the proposed road development will result in significant improvements in the level of congestion experienced in the city. Trips (including commuting trips) which currently travel through the city centre will be re-routed to the proposed road development freeing up capacity in the city centre and facilitating the effective operation of Public Transport and sustainable travel priority measures.

4.11 Stand-alone solutions can solve local traffic problems

Issue

4.11.1 One submission/objection claims that:

"existing local traffic problems (e.g. Parkmore) can be solved by stand-alone solutions".

4.11.2 This issue was raised in submission/objection: S_032.

Response

4.11.3 As noted previously, the detailed analysis carried out as part of the design of the proposed road development (and similarly the analysis carried out as part of the GTS) concluded that the forecasted congestion issues cannot be mitigated without the provision of additional capacity across all transport modes. This work assessed various stand-alone measures and public transport options, including light rail.

4.11.4 In particular, the existing transport network is constrained by the number of river crossings in the city which are operating at capacity during peak periods. The provision of an additional river crossing will provide the capacity required to relieve congestion issues, reduce traffic volumes in the city centre and improve east-west connectivity for all transport modes.

4.11.5 Notwithstanding the above, while the proposed road development (and GTS) provides an integrated transport solution for Galway City and its environs as a whole, additional measures will be needed in relation to preparing solutions for specific, localised, transport issues.

4.11.6 The GTS has identified a number of problem areas, including the Parkmore area, and detailed how these issues should be resolved. For example:

- A new link road between Ballybrit Business Park and Parkmore Business Park
- A new road link between Parkmore Link Road and the N83 Tuam Road (formerly known as the N17 Tuam Road)

- New entrance to Merlin Park Hospital from the old Dublin Road at the Galway Crystal junction

4.11.7 Additionally, a Parkmore Area Strategic Transport Framework is being prepared by the National Transport Authority and Galway City Council to address specific issues experienced at Parkmore.

4.11.8 A holistic solution is required to guide the development of the city and its environs in a co-ordinated manner into the future, as opposed to implementing one-off "Stand Alone" solutions on a case by case basis. The GTS provides this plan with which all other "stand-alone" solutions should be aligned.

4.12 Public Transport and Active Mode improvements

Issue

4.12.1 Some submissions/objections received query the potential for improvements in public transport and active mode use following the construction of the proposed road development. These submissions include the following comments:

- *"At just 3.9% in the base year, the modal share for public transport in 2012 is low. The forecast share of public transport in 2039 of 5% does not represent an ambitious target for sustainable development. This is further compounded by declining mode shares for both walking and cycling."*
- The proposal will perpetuate unsustainable car use

4.12.2 This issue was raised in submission/objection: Ob_511.06, S_006.

Response

4.12.3 The following table combines the mode share results for the various scenarios analysed under TII's central growth forecast as set out in Table 6.32 of the EIAR, with the latest figures which correspond with the analysis of proposed road development under the NPF growth forecasts.

Table 6: City Centre Mode Share Results

Option	% Car	% Public Transport	% Walk	% Cycle
2012 Base Year	66.70%	3.90%	26.30%	3.10%
TII Central Growth Forecast (From Table 6.32 of Section 6 of the EIAR)				
2039 Do-Minimum	67.40%	4.30%	25.20%	3.10%
2039 Do-something	68.60%	4.10%	24.50%	2.80%
2039 Galway Transport Strategy	67.30%	5.00%	24.90%	2.80%
NPF Forecast				
2039 Do-Minimum National Planning Framework Scenario	61.2%	5.4%	29.3%	4.1%
2039 Do-Something National Planning Framework Scenario	64.1%	5.0%	27.6%	3.3%
2039 Do-Something plus Galway Transport Strategy National Planning Framework Scenario	56.0%	6.8%	31.2%	6.0%

TII Central Growth Forecast

4.12.4 An examination of the design year (2039) reveals a marginal decrease in the mode share of walking and cycling when comparing the Do Something Scenario against the Do-Minimum. What is not evident from reading this table in isolation are the factors behind the choice of mode decisions. In the 2039 Do-Minimum Scenario, significant levels of congestion arise, creating a barrier to travel and constraining the economic growth of the city.

4.12.5 This level of congestion is undesirable and will have detrimental impacts on the economy of Galway City and the entire western region if not addressed.

4.12.6 In line with the project objectives, the introduction of the proposed road development leads to a considerable reduction in congestion and delay in Galway City. These changed travel patterns will result in significant positive impacts, including creating a favourable environment for sustainable travel by removing traffic volumes (notably HGVs) from the city centre, reducing harmful emissions in the city centre by up to 16%, and a 10% improvement in Public Transport journey times.

4.12.7 Whilst it is a requirement of planning to assess the proposed road development as a stand-alone scheme, as previously mentioned, the proposed road development

forms an integral part of the Galway Transport Strategy. The implementation of all measures in the Galway Transport Strategy results in a mode shift away from the private car and towards more sustainable forms of travel (public transport, walking and cycling).

NPF Forecast

4.12.8 As previously noted, since the publication of the EIAR, the National Planning Framework (NPF) 2040 has been published as a guide to the high-level strategic planning and development of Ireland over the next 20+ years. The NPF is a statutory document which must be adhered to by all County Development Plans and Regional & Spatial Economic Strategies. These NPF Guidelines include targets for Galway City, including a 50% growth in the city population between 2016 and 2040 and a greater integration of land uses within the city centre. By locating a large proportion of the forecast population and jobs in Galway City (which is easier to serve by public transport and active modes), growth under the NPF Policy assumptions will result in a greater integration of land uses which in turn will increase the mode share of sustainable modes. The GTS, including the proposed road development, supports the densification of the city as envisaged by the National Planning Framework. Modelling results, based on NPF policy assumptions, indicate that the introduction of the GTS measures will considerably increase the mode share for sustainable modes within the city centre.

4.12.9 Additional lines have been added to the table above to show the effect of the additional population per the NPF planning policy, with the cordon of the area of assessment matching exactly the cordon assessed in the EIAR. The mode share analysis shows the significant benefits of locating the forecast population and jobs within the city centre and settlements easily served by public transport. When compared to the 2039 Do-Minimum Scenario, the 2039 Do-Something plus GTS + NPF Scenario indicates:

- A 5.2% reduction in car travel in Galway City and environs down to 56%
- A relative 22% increase in public transport use
- A 6% increase in the amount of walking
- A 46% relative increase in the number of people cycling (6.0%)

4.12.10 Whilst the delivery of a Demand Management strategy for the city, addressing both policy and physical measures, is a key recommendation of the GTS, the above GTS assessments contain limited demand management interventions. The introduction of a co-ordinated Demand Management strategy for the city and its environs (for example containing measures such as managing the availability and cost of parking, traffic management restrictions, travel planning, Intelligent Transport Systems etc.) will complement the infrastructure investment in the GTS and support the densification of the city's growth as established in the NPF Policy, resulting in an even greater proportion of the future population travelling by sustainable modes of transport. Further to the above, it is worth noting that the Department for Transport Tourism and Sport have recently commissioned demand

management studies for Galway and all of the regional cities to identify city specific demand management measures to encourage sustainable travel.

4.13 Rapid Transit would resolve existing traffic issues

Issue

4.13.1 A large number of submissions/objections assert that a Rapid Transit Network (either BRT or LRT) in Galway would solve existing traffic problems and thus negate the need for the proposed road development.

4.13.2 Related submissions also contend that a fully integrated public transport solution, including light rail network, would remove commuting traffic from city centre streets and remove the need for the proposed road development.

4.13.3 This issue was raised in submissions/objections: Ob_155, Ob_220, Ob_521_O_517.14_02.4; Ob_510, Ob_531.2, S_002; S_004, S_006, S_009, S_012; S_013, S_015, S_017, S_021, S_032.

Response

4.13.4 As noted above, the consideration of a Rapid Transit system, in the form of Bus Rapid Transit or Light Rapid Transit, has been undertaken as part of the assessment of the proposed road development and, in particular, the assessment of alternatives.

4.13.5 As set out in Section 4.6.1 of Chapter 4 of the EIAR, the public transport alternatives assessed included:

- A Bus Rapid Transit (BRT) operating at a 10-minute frequency from Knocknacarra to the West, through the city centre, to Oranmore in the East
- All existing city bus services increased to 10-minute frequency
- Bus priority measures at signalised junctions along the BRT corridor
- Re-allocating road space on the Salmon Weir Bridge from general traffic to Public Transport only

4.13.6 As summarised in Section 4.6.1 of Chapter 4 of the EIAR, this analysis concluded that the improved public transport offering would result in a 17% increase in public transport trips relative to the Do-Minimum 2034 scenario (the design year at route option stage of the project). Full implementation of the 'Public Transport Only' alternative, as defined above, results in a 2% increase in delay to every vehicle journey across the key routes in the city, in the opening year. Therefore, the 'Public Transport Only' alternative does not alone represent an effective alternative, as it does not resolve these problems in isolation.

4.13.7 The GTS assessed various public transport solutions (including Light Rail Transit (LRT) and Bus Rapid Transit (BRT) for Galway in the design year of 203 (the design year at route option stage of the project) and identified that a high frequency bus-based network was the preferred solution. Modelling undertaken as part of the GTS development indicated that the introduction of an LRT or BRT, in

combination with a high frequency bus service, would not relieve forecasted traffic congestion in Galway and that this would only be resolved by the addition of the proposed road development.

4.13.8 Following the publication of the National Planning Framework, and associated population projections for Galway, a review of the impact of a Light Rail Transit System for Galway, in the context of the increased population and employment forecasts, was undertaken. This analysis included two separate LRT assessments:

- A network of 4 LRT lines as submitted by Sólás Uirbeach Iarnrod na Gaillimhe (SUIG) and presented in Figure 12 below
- An east-west LRT line running from Parkmore and Ballybrit, through the city centre, to Knocknacarra which was identified as having the highest potential demand based on a WRM assessment. This is presented in Figure 13

Figure 12: 4 LRT lines as submitted by SUIG

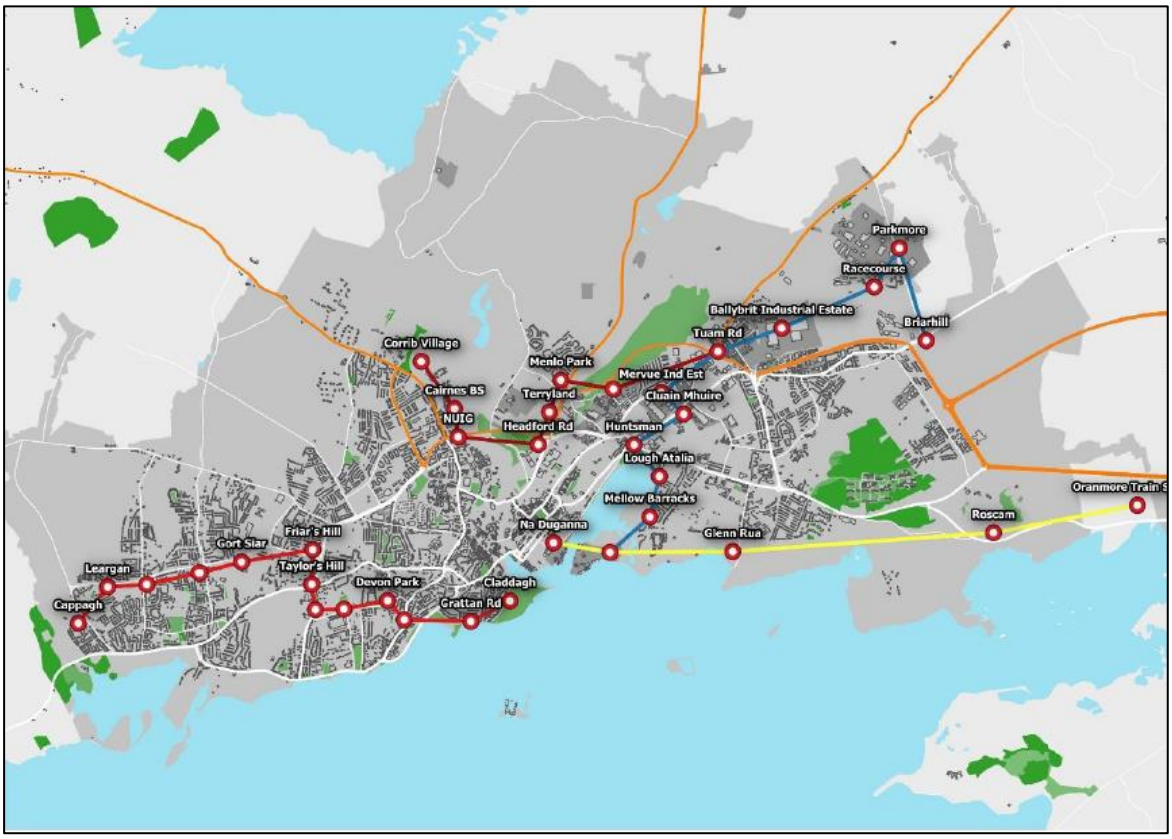
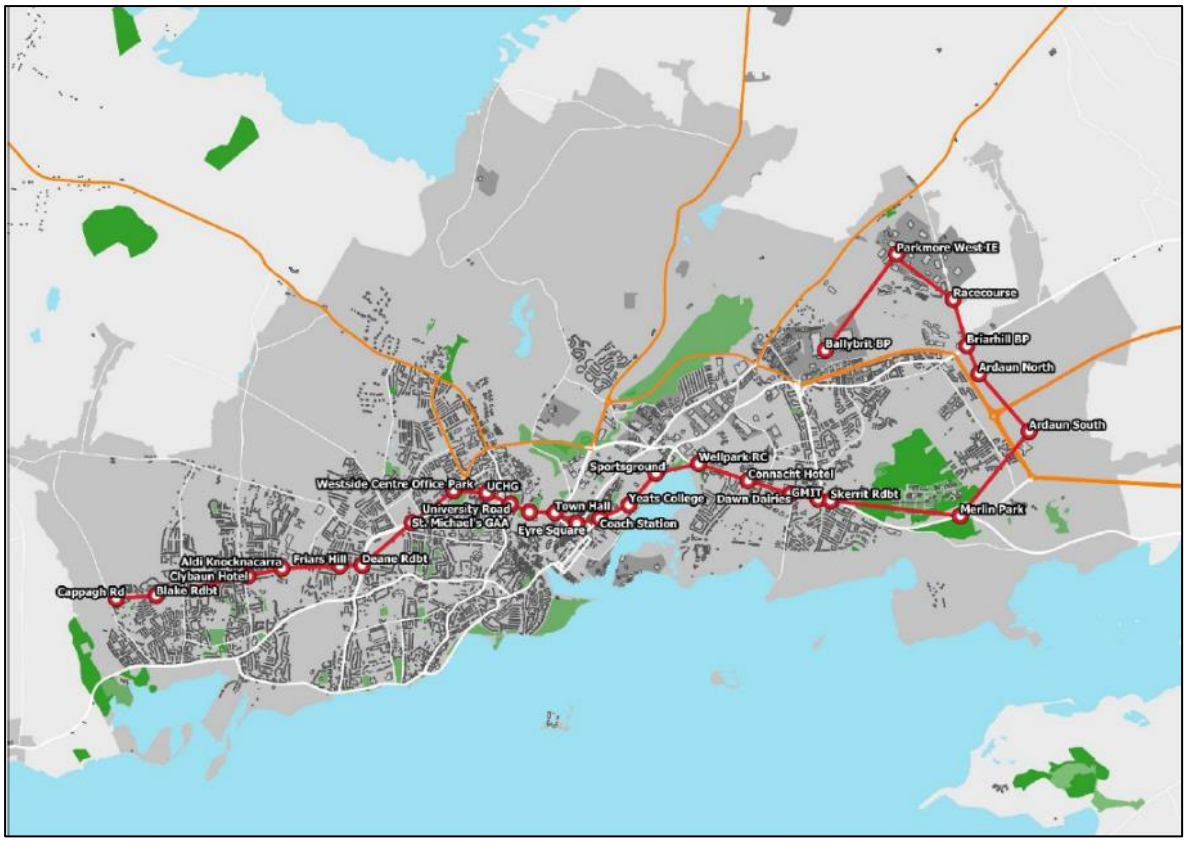


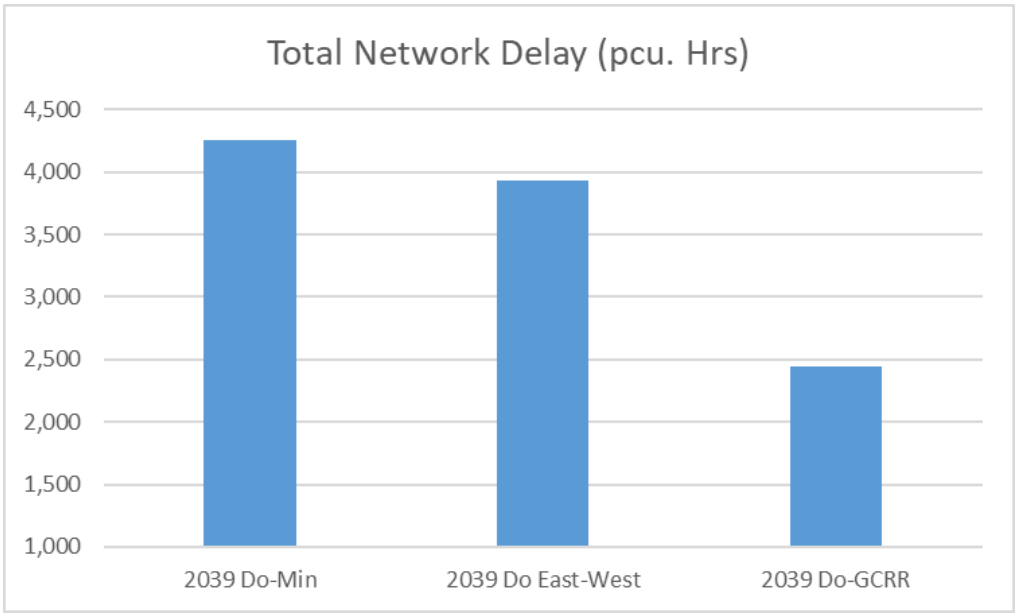
Figure 13: East-West LRT Line



4.13.9 Analysis of the SUIG proposed LRT lines and the east-west LRT revealed that the east-west LRT performed best in terms of mode share and demand. The assessment of the east-west LRT concluded that:

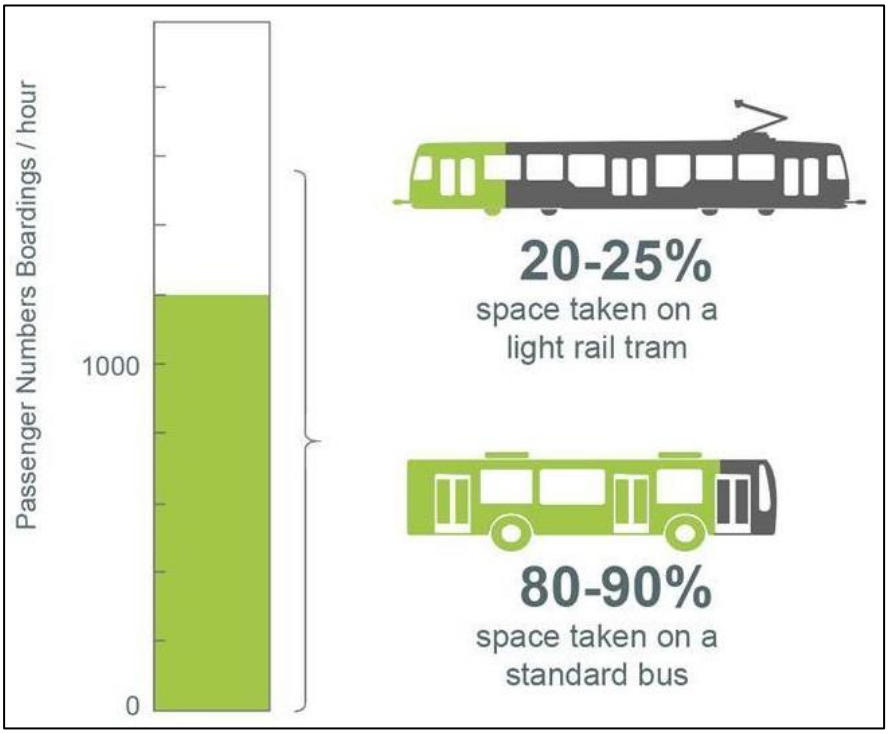
- Analysis of key network performance indicators (such as total delays, average speed and average journey times) revealed that the introduction of an LRT would have a minimal impact on the level of road congestion experienced on the design year traffic network
- It was estimated that an LRT line would lead to an 8% reduction in total delays experienced during the AM peak hour and a 6% decrease in average journey times when compared to the Do-Minimum Scenario. In contrast, the implementation of the proposed road development is estimated to result in a 38% reduction in delay and a 13% decrease in journey times during the AM period.

Figure 14: Total Network Delay (pcu. Hrs)



- The analysis of potential LRT routes showed that there is not sufficient demand to justify the implementation of a light rail system. As demonstrated in the figure below it was estimated that, at most, the demand for travel on an east-west LRT corridor would amount to approximately 25% of the capacity of an LRT system during peak periods.

Figure 15: 2039 Public Transport Demand and Capacity - LRT and Bus



- A comparison of the performance of LRT and proposed road development scenarios revealed that the proposed road development will result in considerably more relief from congestion and that an LRT system is not a viable alternative.

4.13.10 In summary, the analysis carried out demonstrated that the delivery of a standalone Light Rail system will not resolve the forecasted congestion issues in Galway. Furthermore, demand analysis reveals that, even under NPF growth assumptions, there is likely to be insufficient demand for an LRT service in Galway. This is largely due to the absence of the critical mass required to support such infrastructure. The level of demand which is forecast to exist in the design year could be served more efficiently with high frequency bus services as proposed in the GTS.

4.14 The proposed road development will not address the reasons for traffic congestion

Issue

4.14.1 One of the submissions/objections made asserts that construction of the proposed road development will not address the reasons for congestion on the western side of Galway City as no consideration was given to the relocation of secondary schools or alternative school transport methods and that most traffic congestion that occurs on the west of the city relates to school and college traffic.

4.14.2 Additionally, this submission states that "80% of car trips are destined for Galway City" and therefore congestion will not be alleviated by building a road to bypass the city.

4.14.3 This issue was raised in submissions/objections: O_Ob_116

Response

4.14.4 While it will not solve all congestion problems in the city, the proposed road development will lead to a significant reduction in the delay experienced on the Galway traffic network (35% - 40%), when compared to the Do-Minimum Scenario.

4.14.5 Additionally, the proposed road development is part of an integrated strategy for Galway which focuses on walking, cycling and Public Transport (GTS). As such, the proposed road development is only part of a package of measures, some of which will target school related traffic. By adding additional links to the road network on the western side trips are better distributed.

4.14.6 Several proposals contained within the GTS, which will be delivered in advance of the proposed road development, will aim to improve the accessibility of residents living west of Galway City to the city centre. These measures include:

- Bus priority along the Western Distributor Road, Bishop O'Donnell Road and Seamus Quirke Road
- An east-west public transport only corridor through the city
- Dedicated cycle lanes along the Western Distributor Road, Bishop O'Donnell Road and Seamus Quirke Road

5. Conclusion

5.1.1 The proposed road development has been subject to a comprehensive and detailed modelling appraisal, including numerous alternatives and sensitivity tests.

5.1.2 The primary tool used in this analysis was the NTA's West Regional Model (WRM). It represents the most sophisticated modelling tool available for assessing complex multi modal movements within an urban context. The model has been used on a consistent basis to assess the impacts of the measures proposed within the Galway Transport Strategy (GTS) and the proposed road development. Specific benefits of the model in the appraisal of this project include:

- Assessment of the full impact of the proposed road development across the entire western region
- Detailed representation of the transport network (walking, cycling, public transport and road) in Galway
- Ability to assess a number of components of induced travel including, diverted traffic, mode shift and change of destination

5.1.3 The proposed road scheme has been assessed in the context of the planned growth of Galway City and County as set out in the NPF and has concluded that:

- The planned growth of the city without an additional river crossing will result in a severe level of congestion experienced by all transport modes which would suppress travel movements either side of the River Corrib. This would ultimately result in the isolation of areas of the city and county, leading to further relocation of activities away from the city core, reduction in the range of employment opportunities and an overall reduction in the quality of life of the residents of the city. This scenario fails to meet the proposed road development project objectives or sustainable development goals of the NPF.
- The implementation of the proposed road development will achieve project objectives by providing improved journey times across the network for both private vehicles and public transport, reduction in traffic volumes and harmful vehicle emissions in the city centre, and improved safety across the city. Some further benefits of the proposed road development, and associated metrics, are detailed in Table 7 below.

Table 7: Positive Impacts of the proposed road development

Benefits	Outcome
Provision of safer urban streets	Up to 10% decrease in overall traffic in city centre during peak times
Improved air quality in city centre	16% reduction in NOx, PM_{10} and $PM_{2.5}$ in city centre
Safer Environment for vulnerable road users	Up to 38% decrease in HGV traffic in centre during peak times
Quicker more reliable Public Transport journey times	10% decrease in public transport journey times into city
Improves East-West connectivity of the city and region	Journey time east- west on N6 44% faster
Improved access to key services	43% less delay across city network thereby improving access to key services such as hospitals and education
Shorter travel times for all modes and purposes will lead to an improved quality of life and economic benefits with people spending less time in traffic	17% reduction in average journey times in peak period
Reductions in Journey Times into, and around the city, combined with a decrease in traffic and improved city centre environment may lead to increased leisure and tourist trips in the region	Wider social and economic benefits not quantified in the Cost Benefit Appraisal
National Planning Framework will ensure that future land use planning takes place in a consolidated and sustainable manner in all scenarios (with and without the proposed road development)	City Centre mode share for sustainable modes will increase by 5% by implementing the sustainable planning policies of the NPF.

- While it is a requirement to assess the proposed road development in isolation, the delivery of the project will be delivered in tandem with all other components of the GTS. The results of the GTS analysis concluded that, in addition to the benefits listed above, the full implementation of the GTS will result in a much greater mode shift to sustainable modes.
- With respect to the potential impacts of the proposed road development on urban sprawl, the Government's 'National Planning Framework' sets a major new policy emphasis on concentrating future growth within brown field sites in urban areas and along public transport corridors in order to promote sustainable travel patterns. The delivery of the city and county's future population in compact urban forms in accordance with the requirements of the NPF will support investment in sustainable infrastructure and limit urban sprawl within the city and its environs. The results demonstrate that there are considerable benefits to be gained from good integration of land use and transport and that the GTS measures will have a much greater impact (in terms of encouraging sustainable travel) when implemented in accordance with the NPF principles.

5.1.4 The issues raised in the submissions and observations in relation to traffic have been fully considered, and having considered those issues, the conclusions of the traffic and transport appraisal remain as set out in the EIAR and RFI Response.