Sligo County Council

Traffic Analysis – Brief of Evidence

N4 Collooney to Castlebaldwin Road Scheme

Presented by:
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N4 Collooney to Castlebaldwin Oral Hearing

Compulsory Purchase Order

and

Environmental Impact Statement Oral Hearing

Brief of Evidence

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1.0 INTRODUCTION

Qualifications & Experience

1.1 My name is Declan Keenan. I am a Senior Consultant with AECOM consultant engineers. I hold a Bachelor of Engineering degree from Dublin Institute of Technology, Dublin.

1.2 I present this evidence with my colleague Shane Dunny who is a Chartered Engineer and Associate Director with AECOM consultant engineers. Shane holds a Bachelor of Engineering degree and a Master's of Science Degree in Civil Engineering from Trinity College, Dublin.

1.3 We have been actively engaged in traffic, transportation and economic assessment work for almost 10 years both throughout Ireland and overseas.

1.4 We appear on behalf of Sligo County Council as the traffic witness covering traffic analysis at this Hearing.

Scope and Nature of Evidence

1.5 The evidence I am presenting relates to the traffic analysis undertaken for the proposed N4 Collooney to Castlebaldwin Road Scheme. I will detail the traffic modelling process, including base year model development, traffic forecasting and the impact of the scheme upon the assignment of traffic.

2.0 NEED FOR SCHEME

2.1 The main issues along this section of the N4 are the substandard alignment, the excessive gradients, insufficient capacity, limited overtaking opportunities and the high number of on road accesses which result in safety issues. Therefore, the primary need for the scheme is to improve safety along the N4.

2.2 In addition, the National Roads Authority (NRA) TD9 states that a Type 3 Single Carriageway road (as per existing N4) will operate at a Level of Service (LOS) D up to an Annual Average Daily Traffic (AADT) of 5,000. This section of the N4 is currently experiencing AADT flows in excess of 8,500.

3.0 TRAFFIC MODELLING

Aims and Objectives of the Traffic Modelling Process

3.1 The aim of the traffic modelling process was to establish existing traffic patterns and flows on the road network and to derive forecast traffic flows for the proposed N4 Collooney to Castlebaldwin Scheme.

3.2 The traffic forecasts are used for the assessment of journey time savings, road safety benefits and environmental impacts resulting from the proposed scheme. These outputs then inform the economic assessment of the scheme.

3.3 The traffic forecasting outputs are also required to inform the selection of the most appropriate design of the scheme, including the cross section, pavement structure and junction layouts. The traffic forecasting and economic assessment outputs are used to inform the incremental analysis process which assesses the validity of the selected cross section.

Methodology

3.4 The National Roads Authority (NRA) National Traffic Model was used as the starting point for the development of the local area models for the proposed Scheme. The NRA's National Traffic Model provided the basic road network, zone structure and trip matrices required to initiate the development of the local area models. The study area is shown in Figure 1.

3.5 Additional network coding and traffic data collection was required in order to develop a local area model which incorporated a more detailed road network and finer zoning structure than the NRA's National Traffic Model. Regional and local roads to the east and west of the existing N4 carriageway were added into the model. The zoning system was also further refined to make allowances for various land uses within key urban areas such as: Tobercurry, Collooney and Castlebaldwin.

3.6 The initial N4 Collooney to Castlebaldwin traffic model was developed in 2009 and was informed by the following traffic datasets:

- 11 no. Junction Turning Counts undertaken in November 2008;
- 3 no. Automatic Traffic Counts undertaken in November 2008 providing a week's survey data; and
- Journey Time Surveys undertaken along the N4 and N17 carriageways.

Since the original model was developed, additional traffic data was collected in 2012. This additional data was used to assess the change in traffic flow on the N4 corridor between 2008 and 2012. This exercise indicated that traffic levels along the N4 during 2012 remain comparable and reflective of 2008 traffic conditions with some sections of the N4 experiencing a slight increase in flows during that period. Therefore, the 2008 data and subsequent base models were considered fit for use in assessing the impact and benefits of the proposed scheme.

3.7 Base Year trip matrices were developed to represent the Average AM Peak Hour (07:00 – 09:00), Average Inter Peak Hour (12:00 – 14:00) and PM Peak Hour (17:00 – 18:00). Matrices were developed for two vehicle classifications, Light vehicles and Heavy vehicles.

3.8 In order to ascertain the level of through traffic on the proposed scheme origin-destination surveys were undertaken in late 2013. Of the traffic recorded on the N4 at Castlebaldwin during the AM, IP and PM peak hours over 53% had a destination north of Collooney.

3.9 As part of the oral hearing process further data collection was undertaken in early 2014 as shown in Figures 2 and 3. A comparison between March 2013 and 2014 suggests that flows along the N4 increased by nearly 2% in the last year which is roughly in line with forecasts used as part of the study as set out in Section 4.4.

Assignment Model

3.10 The assignment model applies the demand for travel, represented by the trip matrices, to the supply, in the form of the road network. The generalised cost of the journey, represented by a combination of time and distance, is compared in a route choice algorithm. The model then iterates through numerous assignments until a stable output is produced, where, ideally all possible routes between an origin and destination used all have the same travel cost, equal to the minimum cost. All unused routes have equal or higher cost.

Model Calibration/Validation

3.11 The calibration and validation of the local area models was undertaken with reference to the methodology set out in NRA Project Appraisal Guidelines *Unit 5.2 Construction of Traffic Models*, which provides guidance on both the calibration and validation process.

3.12 The local area models satisfied both the calibration and validation requirements of the NRA Project Appraisal Guidelines in terms of the following:

- Individual traffic flows; and
- Journey Times.

3.13 The Geoffrey E. Heavers (GEH) statistic is used to assess individual traffic flows and is a measure of comparability that takes account of not only the difference between observed and modelled flow, but also the significance of this difference with respect to the size of the observed flow. A GEH statistic of less than 5 is required for 85% of all observed and modelled flow comparisons. The local models have a GEH statistic of less than 5 for over 88% of compared flows in both the calibration and validation assessments.

3.14 Journey time validation demonstrates that the difference between modelled and observed journey times were within 15%, for 85% of links, during both the AM and PM peak hours, as required by the NRA Project Appraisal Guidelines.

3.15 The calibration and validation of the assignment model has demonstrated that the level of fit between modelled and observed data is good. These processes confirmed the quality of the trip matrices and that the model replicated individual link flows and existing journey times along the N4. The calibration and validation results therefore confirm that the model is an appropriate assignment tool and can adequately represent expected route choice and traffic behaviour on the proposed route.

Future Road Network

3.16 The future year Do-Minimum network includes the 2008 existing network with no further enhancements beyond general maintenance.

3.17 The future year Do-Something network includes all the assumptions of the Do-Minimum network plus the proposed N4 Collooney to Castlebaldwin Road Scheme.

4.0 TRAFFIC FORECASTING

Future Modelled Years

4.1 The proposed N4 Collooney to Castlebaldwin Scheme is intended to be opened in 2017. To inform the design of the scheme traffic forecasts were required 15 years beyond the opening of the scheme, therefore the design year traffic flows were forecast for 2032.

Traffic Growth

4.2 The process for forecasting traffic growth for the local area models is set out in NRA Project Appraisal Guidelines (PAG) *Unit 5.3 Traffic Forecasting.*

4.3 The PAG Unit provides guidance on the calculation of growth rates for three future scenarios, namely, High, Medium and Low growth. Growth rates vary throughout the country and take account of forecast population, employment and car ownership changes at Electoral District (ED) level.

4.4 The NRA medium growth scenario is the central forecast and is consistent with the M0F1 Central Statistics Office (CSO) growth projections. The future traffic flows provided in this report are based on the NRA medium growth scenario which provides average growth rates of 13% between 2008 and 2017 and 33% between 2008 and 2032 over the entire study area.

Estimation of Annual Average Daily Traffic

4.5 The Annual Average Daily Traffic (AADT) on the proposed scheme and parallel routes was estimated by applying conversion rates to modelled AM and Inter peak hour traffic flows. A relationship was developed based on regression analysis of permanent NRA counters within the study area. The formula developed is as follows:

$$AADT = (9.536 * AM\ Flow) + (7.936 * Inter\ Flow)$$

Annual Average Daily Traffic

4.6 AADT levels on existing roads and on the proposed N4 have been derived for a number of locations for the design year of 2032 as shown in Figure 4 for medium growth. The figure gives the derived AADT for the medium growth scenario at each of these locations for the 2032 Design Year, with and without the scheme in place.

5.0 INCREMENTAL ANALYSIS

A detailed incremental analysis of the road type along the proposed corridor was undertaken as part of the assessment, the headline findings are presented below;

5.1 During the course of the planning of the N4 scheme two road types were considered, Type 1 Single Carriageway and Type 2 Dual Carriageway the characteristics of which have been previously outlined by the design team, Figure 5 below provides a visual description of the difference in road widths.

5.2 The National Roads Authority (NRA) TD9 states that a Type 3 Single Carriageway road (as per existing N4) will operate at LOS D up to an AADT of 5,000. This section of the N4 currently has an AADT of 8,500.

5.3 The National Roads Authority (NRA) TD9 and National Road Needs Study documents provide guidance that a Type 1 Single Carriageway road will operate at LOS C up to 6,500 and at LOS D up to an AADT of 11,600. A Type 2 Dual will operate at LOS D up to an AADT of 20,000.

5.4 The NRA Project Appraisal Guidelines (PAG Unit 4: Definition of Alternatives) suggests that *"Capacity figures are indicative for general guidance. The appropriate cross section shall be selected in accordance with the NRA Project Appraisal Guidelines",* which suggests that the decision on road type should be based on the outcome of the appraisal process.

5.5 Following a detailed assessment it was decided by the NRA and Sligo County Council to progress with a Type 2 Dual Carriageway based on a number of reasons including the traffic related findings outlined below;

- The Type 2 Dual has significantly lower accident rates (50%) than the Type 1 Single;
- With maximum AADT flows in the region of 9,400 on the online retrofit section for the design year of 2032 for medium growth, both the Type 2 Dual and Type 1 Single can cater for forecast design year traffic flows however within 15 years of opening the Type 1 Single would be operating at 145% of road capacity under LOS C and over 80% of the road capacity under LOS D;
- The analysis suggests that the Dual Carriageway option will result in daily journey time savings of over 28 hours in 2032 when compared to the Single Carriageway option.
- A high level economic assessment which took account of scheme costs showed that the Type 2 Dual would provide more benefits to the economy than the Type 1 Single based on the travel time and safety benefits to users.

6.0 PREDICTED IMPACTS

Do-Minimum Scenario Impacts

6.1 A 25% increase in AADT on the N4 to the north of Castlebaldwin is forecast in the Do-Minimum Medium growth scenario with traffic increasing from 7,600 AADT in 2008 to 9,500 AADT in 2032. Farther north at Drumfin traffic flows on the N4 increase from 9,300 in 2008 to 11,600 in 2032 which represents a 25.7% increase. To the north of the N4/N17 roundabout at Toberbride, the forecast AADT in the 2032 Do-Minimum scenario is 30,100 which represents a 25.4% growth over the period 2008 to 2032.

Do-Something Scenario Impacts

6.2 The scheme results in design year flows on the existing N4 at Drumfin reducing from 11,600 to 2,300 whilst flows through Castlebaldwin will reduce from 9,500 to 1,200. AADT flows on the proposed scheme for the design year are predicted to be 9,400 south of Toberbride, 9,300 south of the junction at Ballymote and 9,400 south of Castlebaldwin.

6.3 The traffic forecasts in Figure 4 highlight a number of significant impacts that would result from the construction of the proposed scheme, these are as follows:

- A significant reduction in traffic using the existing N4 between Castlebaldwin and Collooney. This decrease is close to 80% in the vicinity of Drumfin, and is a result of traffic transferring onto the proposed N4;
- A notable reduction in traffic on the existing N4 through Castlebaldwin village with a decrease in AADT to the order of 89% forecast. The net effect is the re-routing of up to 8,100 vehicles onto the proposed N4 Collooney to Castlebaldwin scheme in the design year medium growth scenario. This offers significant safety and environmental benefits to the village of Castlebaldwin; and
- Some limited reassignment from regional and local roads to the proposed scheme to avail of improved safety, reduced travel time, reduced delays and increased average speeds.

6.4 When compared to the 2032 Do-Minimum Medium Growth scenario the proposed scheme reduces the total daily combined travel time for vehicles within the study area by approximately 361 hours or 15 days as well as improving average speed across the network. This equates to approximately 114,000 days of time savings over the 30 year appraisal period (2017 – 2047) of the scheme which provides significant benefits to the economy.

Safety Impacts

6.5 The proposed scheme will be of a higher safety standard and will contribute to a reduction in accidents both on the N4 and on other roads in the vicinity. A summary of existing accident statistics within the study area between 2005 and 2010 is presented in Figure 6.

6.6 This predicted increase in traffic on the N4 corridor would, in the no-scheme scenario, further expose the existing sub standard nature of the carriageway and deficient alignment. This predicted increase will also lead to increases in delays,

increase the likelihood of collisions and lead to a further reduction in journey time reliability.

6.7 The Cost Benefit Analysis (CBA) model developed to assess the economic impact of the scheme predicted a 10% reduction in the total number of accidents over the 30 year CBA appraisal period. The accident reduction includes all accidents that occur on all roads in the study area as shown in Figure 1. This equates to a reduction of 263 accidents within the medium growth scenario, categorised as follows:

- 27 Fatalities (an average of 1 fatality per annum)
- 87 Serious Injuries (an average of 2.9 serious injuries per annum)
- 897 Slight Injuries (an average of 29.9 slight injuries per annum)

Public Transport Impacts

6.8 The study area is currently served by Bus Eireann and Irish Rail. Bus Eireann currently operates up to 30 buses (both directions) stopping at numerous locations along this section of the N4 on an average day. A further 40 buses per day (both directions) serve the northern end of this section stopping at Collooney. It is therefore anticipated that any potential bus demand is catered for by existing services and the potential for further significant modal shift is minimal.

6.9 In terms of Irish Rail, there is an existing station at Ballymote where the current daily demand is in the region of 30-50 passengers. The first service from Ballymote to Sligo arrives in Sligo after 11am suggesting the potential for commuter use is limited.

Scheme Benefits Summary

6.10 Journey times and journey time reliability will be improved for all vehicles, but most particularly for through traffic between Castlebaldwin and Sligo and also for local users within the townlands along the N4 corridor.

6.11 The proposed cross-section of the scheme will allow for safe overtaking and reduce the likelihood of head on collisions, therefore significantly reducing the likelihood and severity of accidents.

6.12 The scheme will lead to improved facilities and safety for pedestrians and cyclists through the delivery of cycle/pedestrian facilities on the proposed Eastern Parallel Link Road and the significant reduction in traffic flows on the old N4.

6.13 The scheme will deliver environmental benefits to the village of Castlebaldwin in terms of air quality and noise pollution. The village of Castlebaldwin will also become a safer environment for all road users.

6.14 The economic assessment shows that the scheme provides a positive business case with benefits outweighing costs by a ratio of 1.6 to 1 under the medium growth scenario.

APPENDIX A – FIGURES

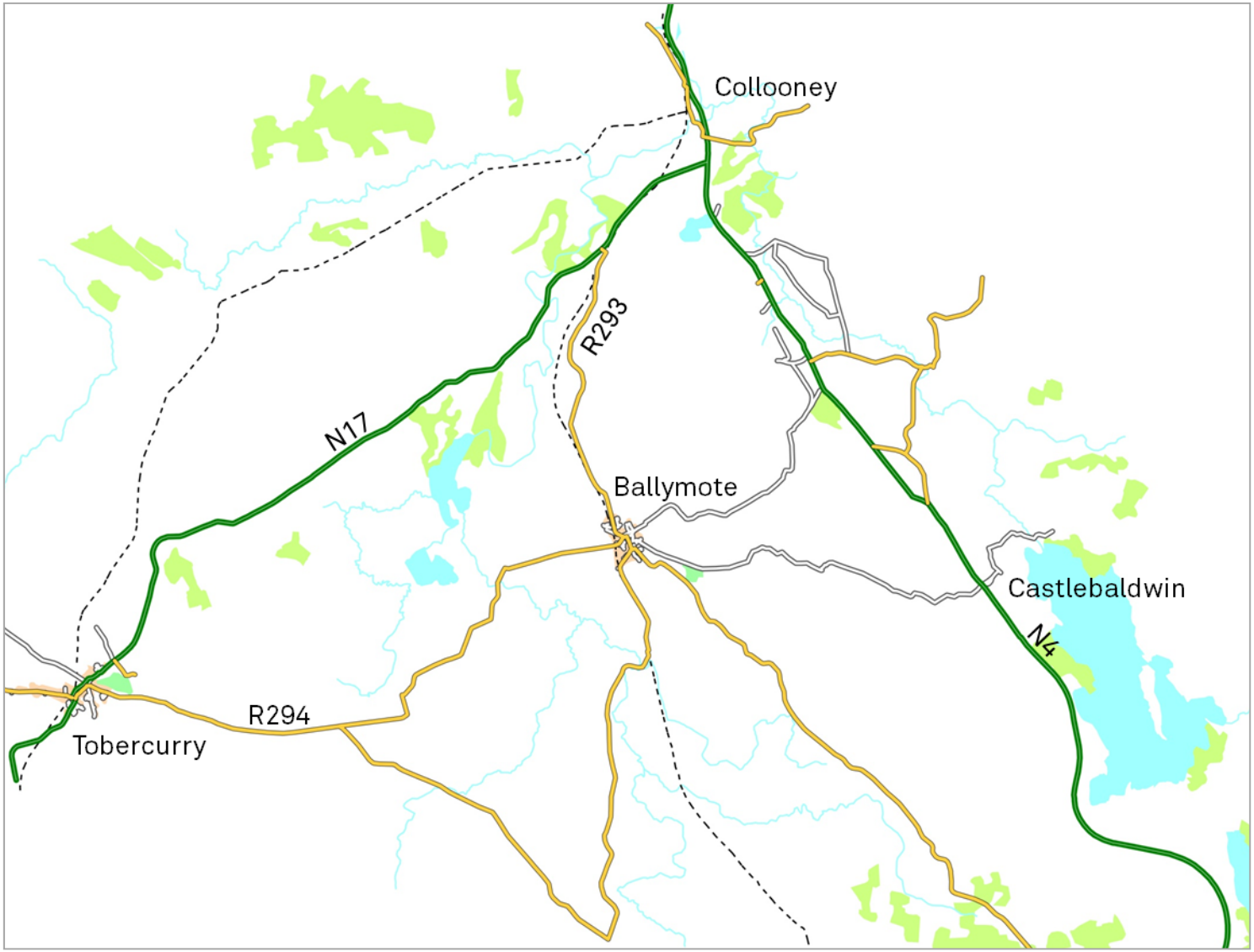

Figure 1 – Study Area of Traffic Modelling

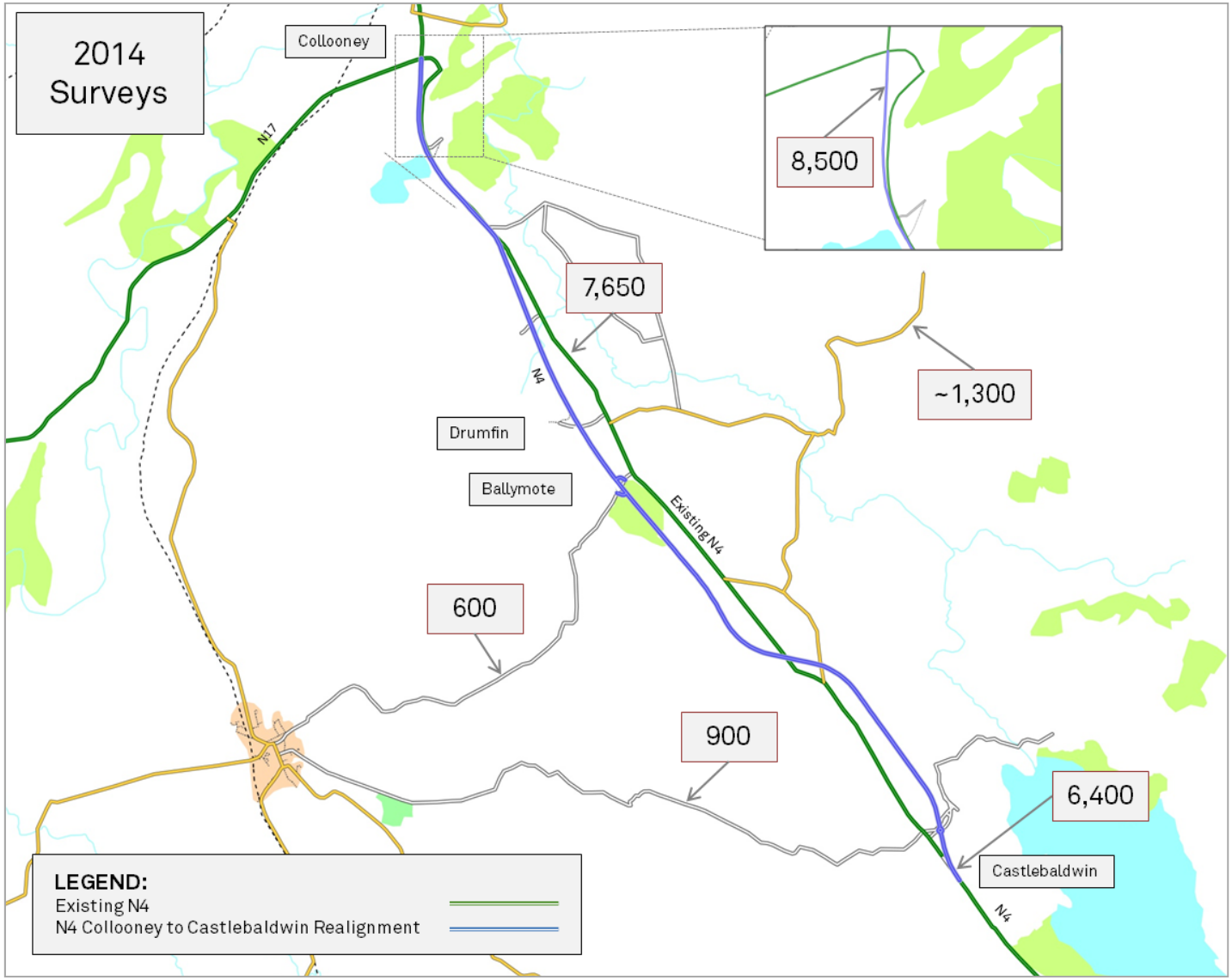

Figure 2 – 2014 AADT Traffic Flows – February 2014

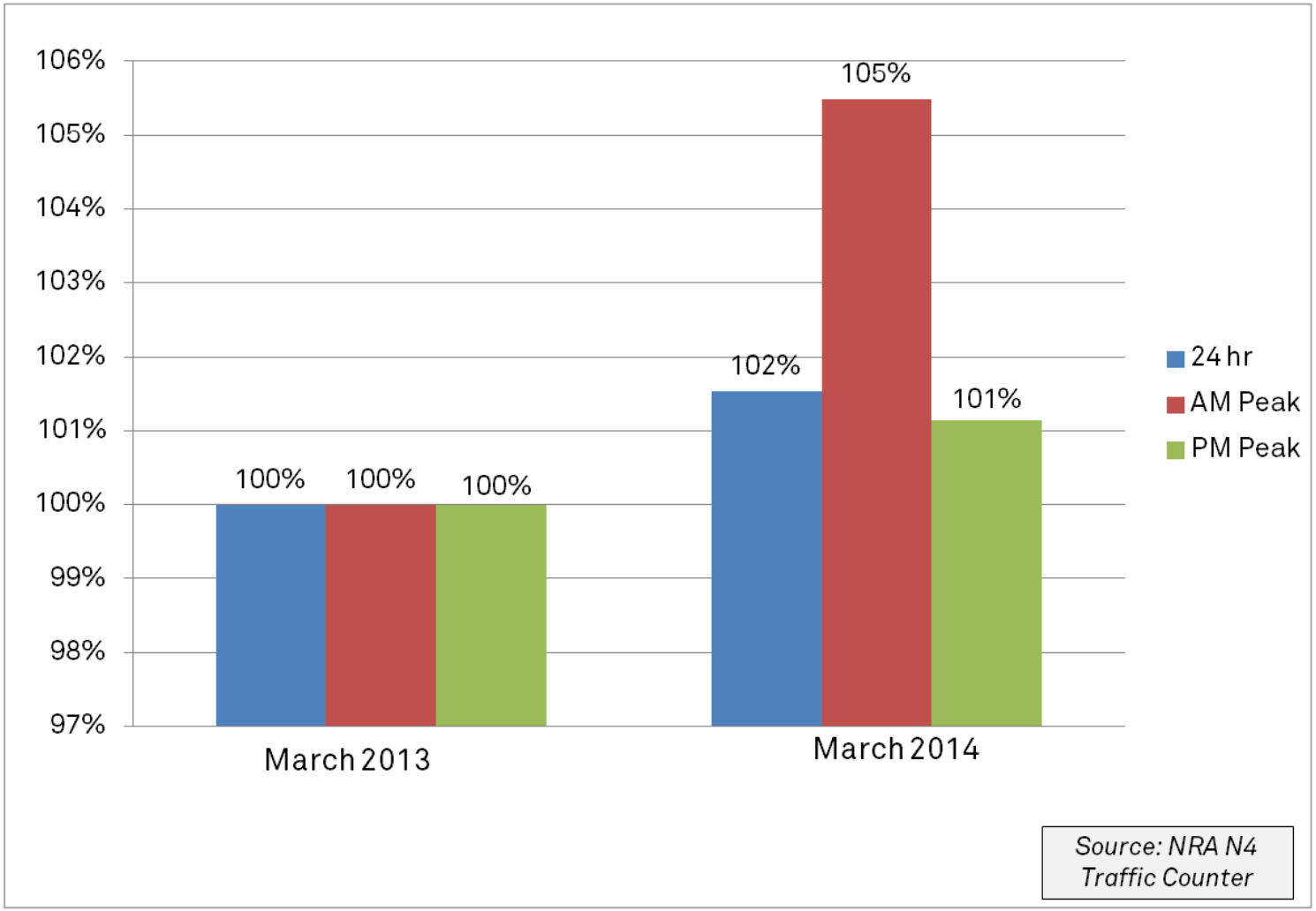

Figure 3 – Comparison of year of year flows for March from NRA Counter between Castlebaldwin and Boyle

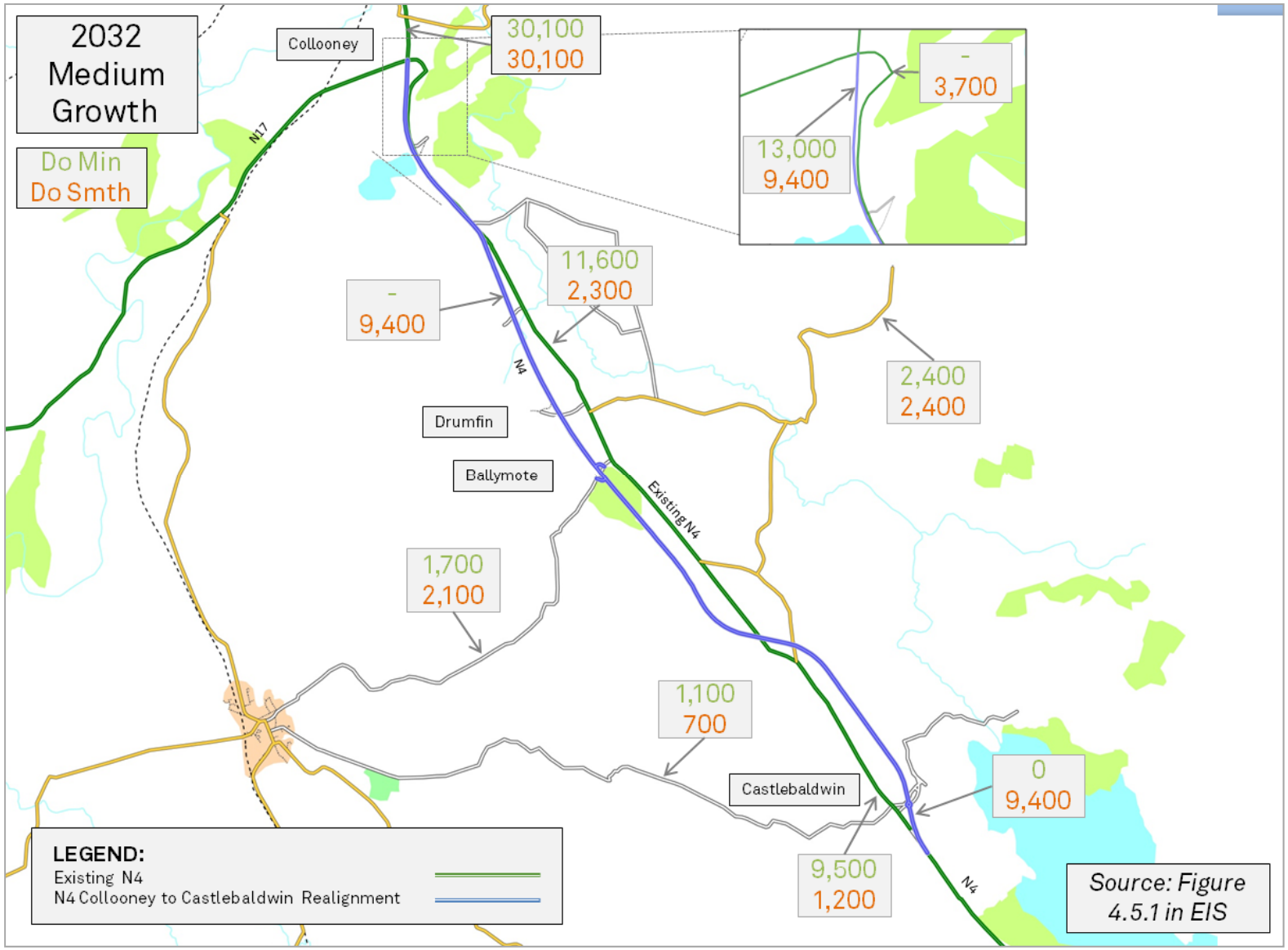

Figure 4 – Design Year Medium Growth Flows

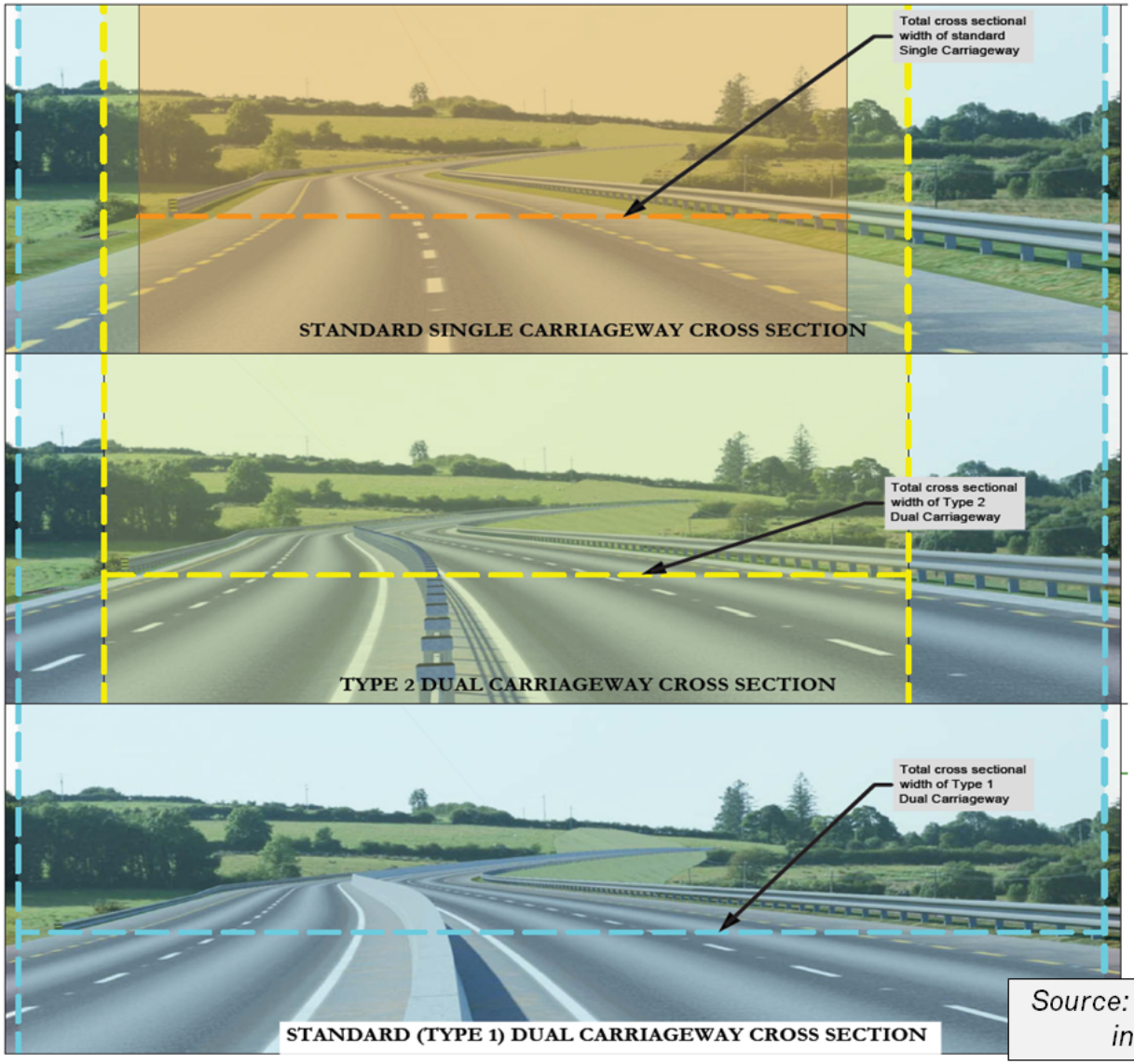

Figure 5 – Cross Section Comparison