Chapter 5 Traffic Analysis

5.1 Introduction

This chapter of the EIAR presents the assessment of the potential traffic impacts of the proposed N5 Ballaghaderreen to Scramoge Road Project. The traffic models used to analyse the proposed development, and future year traffic growth factors used to generate Annual Average Daily Traffic for all key roads in the study area are presented in this chapter.

5.2 Data Collection

5.2.1 Traffic Surveys

A series of traffic surveys were undertaken as part of the development of the 2015 Base Year N5 Local Area Model (LAM). The following traffic surveys were undertaken:

- Origin-Destination Surveys (O-D);
- Automatic Traffic Counts (ATC);
- Junction Turning Counts (JTC); and
- Journey Time Surveys.

A number of permanent TII/NRA Traffic Monitoring Unit (ATC counters) are located in the study area. Traffic data from these counters was also used as part of the development of the base year traffic models. The location of all traffic surveys are illustrated in **Plates 5.1 to 5.4**.

5.2.2 Journey Time Surveys

Journey time information was collected in order to ensure that the observed travel time on the existing roads was properly reflected within the base year traffic models, thereby ensuring that a robust assignment of traffic on the road network could be undertaken.

Journey time surveys were carried out using Automatic Number Plate Recognition (ANPR) cameras, which track the registration of a vehicle at various locations throughout the modelled road network and record the time at which the vehicle passed the camera.

The ANPR journey time data was supplemented with additional journey time data collected using Bluetooth tracking devices. Bluetooth devices track the anonymous Bluetooth signal from car kits and GPS devices within the vehicle or from mobile phones carried in the vehicles. Bluetooth devices were set up roadside at strategic locations to inform the development of the base year model. The location of the ANPR journey time survey data collection points are shown in Plate 5.2, while Plate 5.5 illustrates the location of the Bluetooth devices.

5.2.3 Existing Modelling Tools

The National Traffic Model (NTM) was initially developed by the National Roads Authority ((NRA) now Transport Infrastructure Ireland (TII)) in 2008 and is currently maintained as a central analysis tool for the assessment of the future needs of the national road network at a strategic level.

The modelled network includes all National Primary, Secondary and Regional Roads, plus other local roads of significance. The model currently represents a 2013 Base Year and Future Years of 2030 and 2050. Network information is thus available on existing and proposed road links throughout the country. The NTM was used as the initial starting point in the development of the N5 LAM.

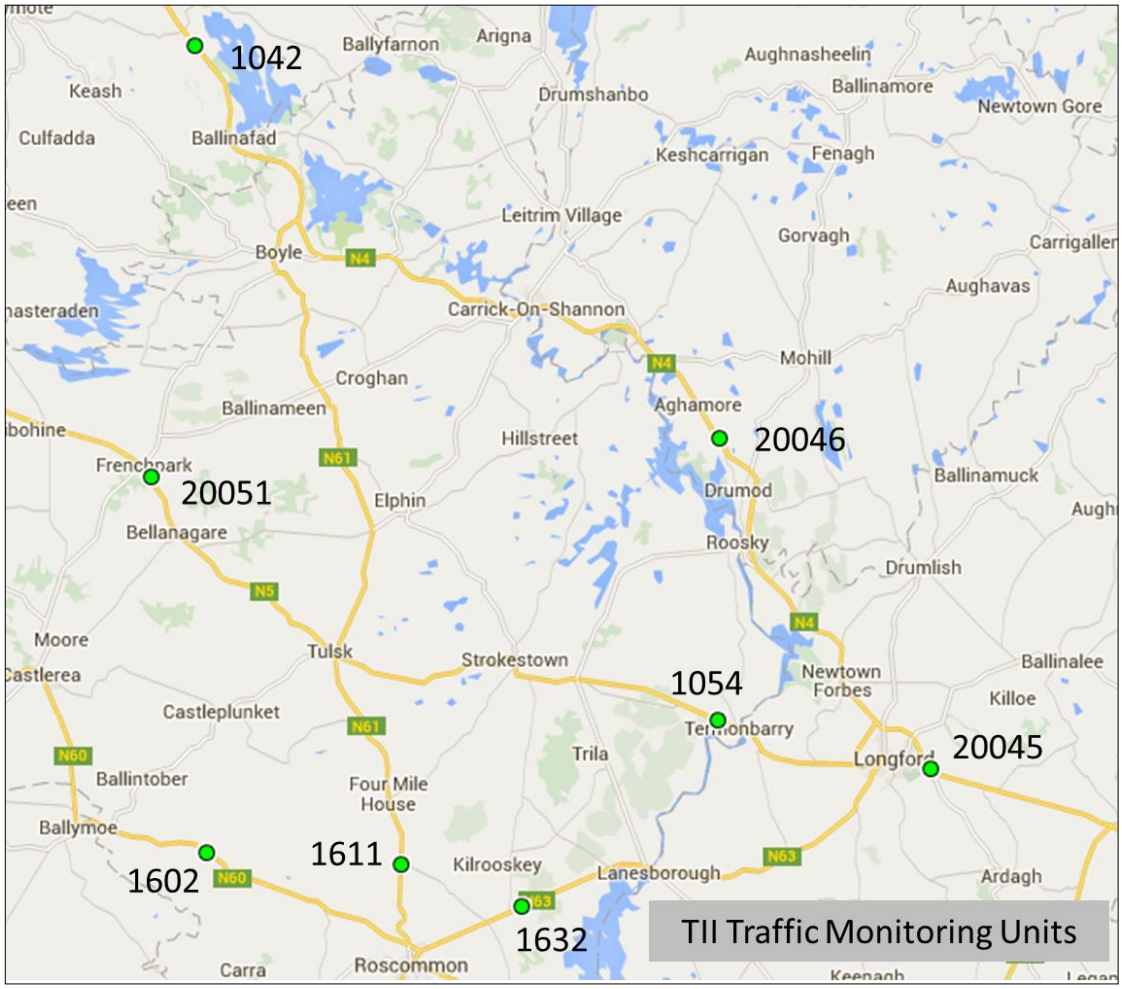

Plate 5.1 Traffic Survey Locations (TII/NRA Traffic Monitoring Units)

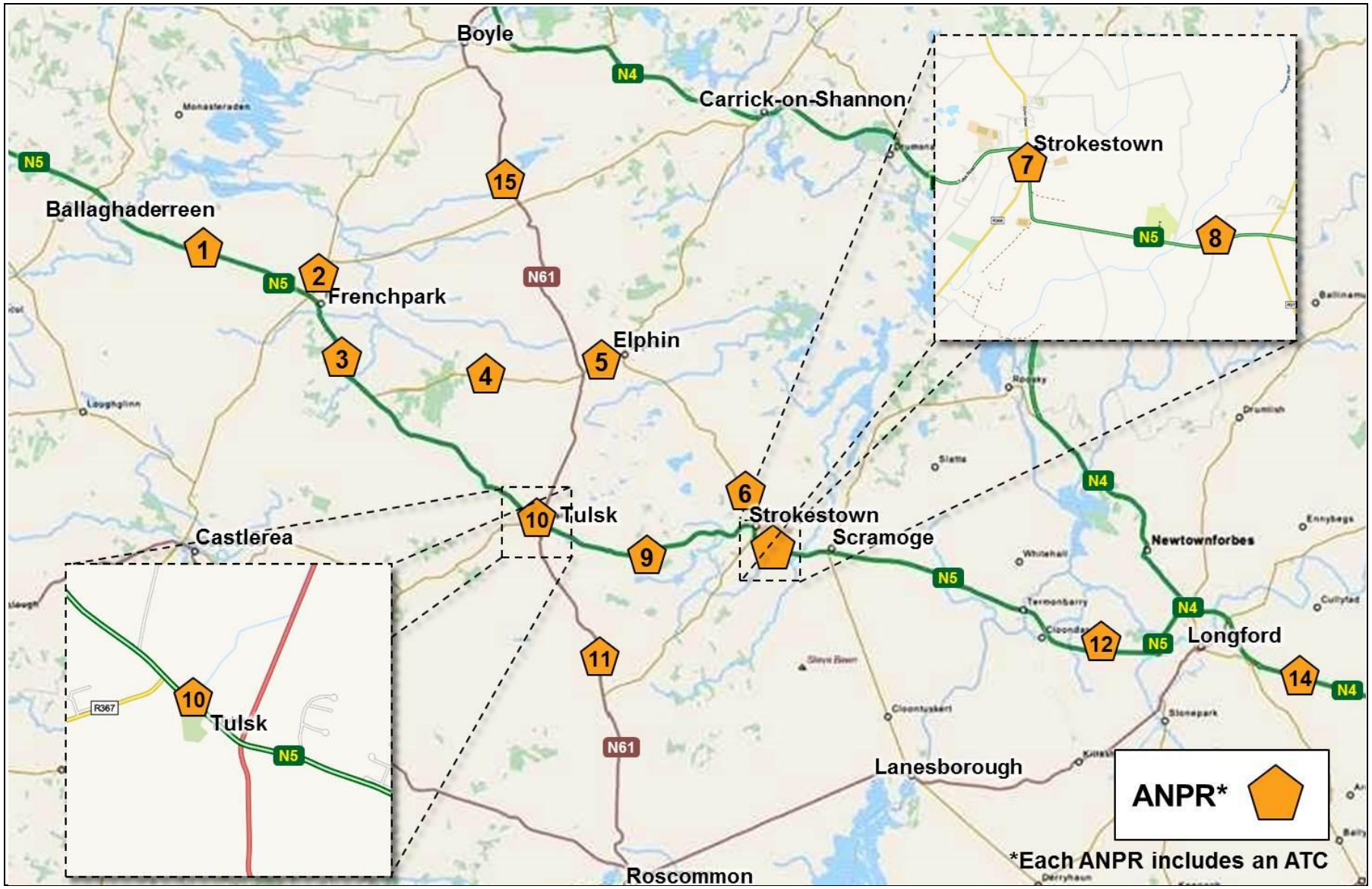

Plate 5.2 Traffic Survey Locations (Automatic Number Plate Recognition (ANPR) Camera Locations)

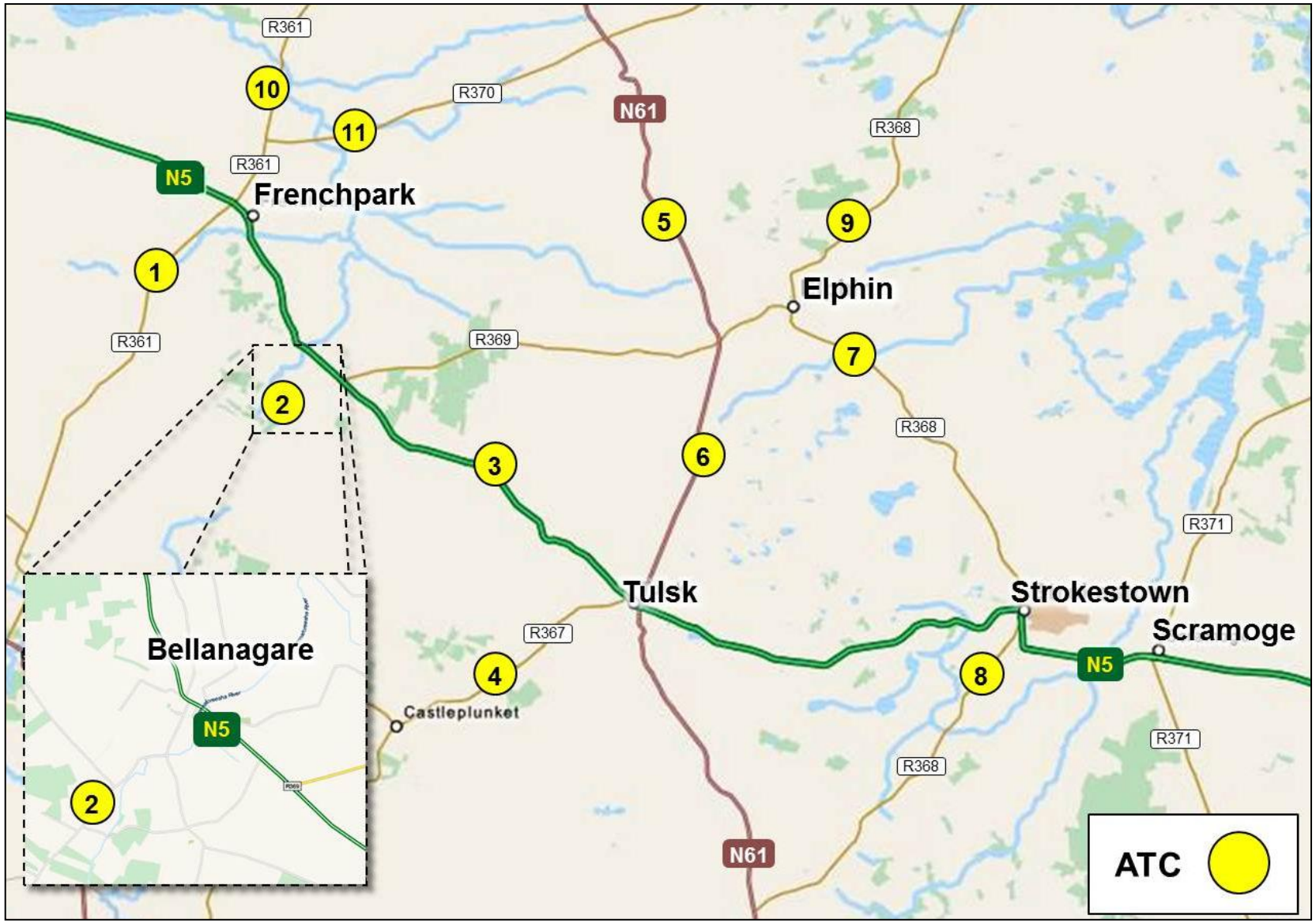

Plate 5.3 Traffic Survey Locations (Automatic Traffic Count (ATC) Locations)

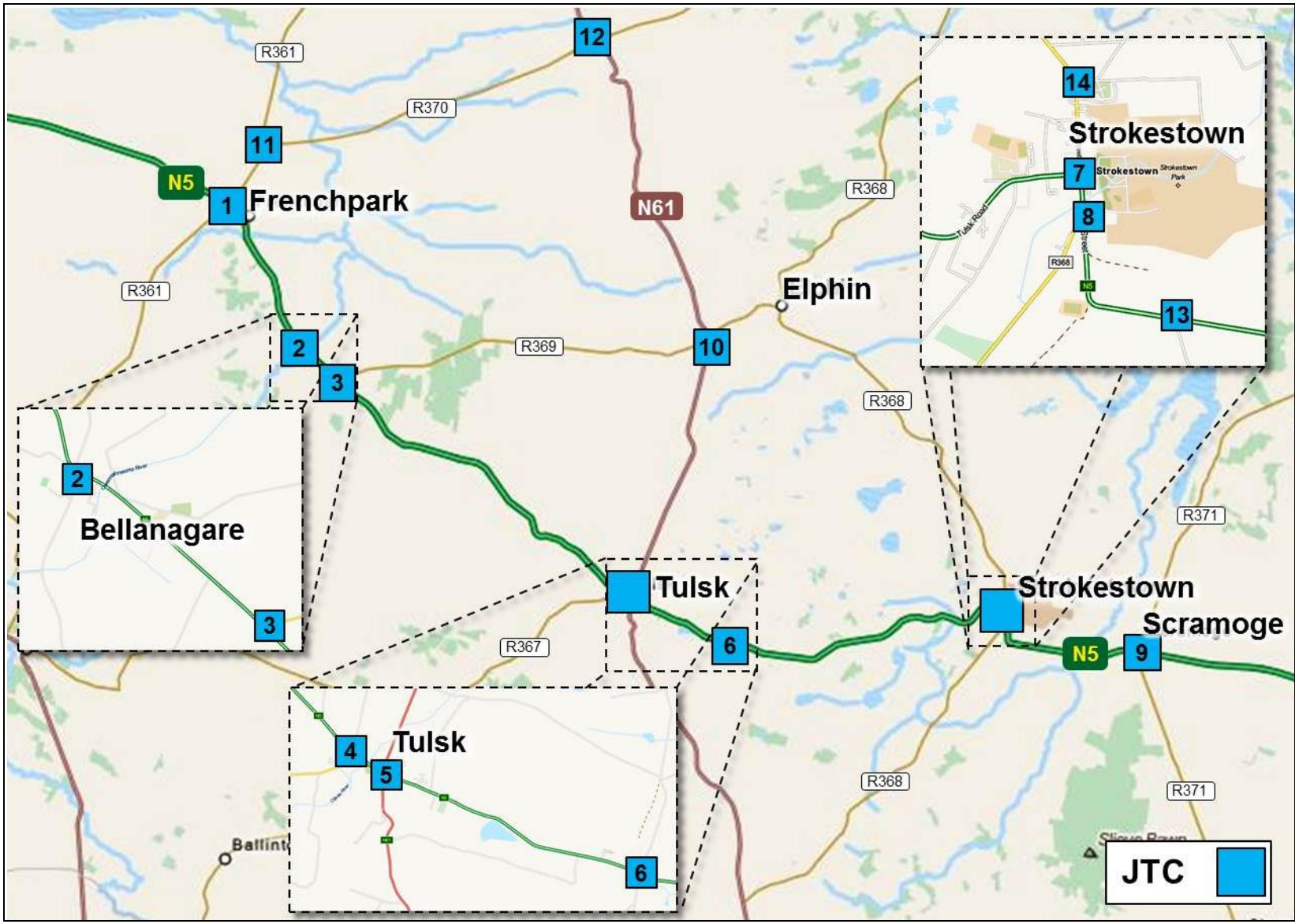

Plate 5.4 Traffic Survey Locations (Junction Turning Count (JTC) Locations)

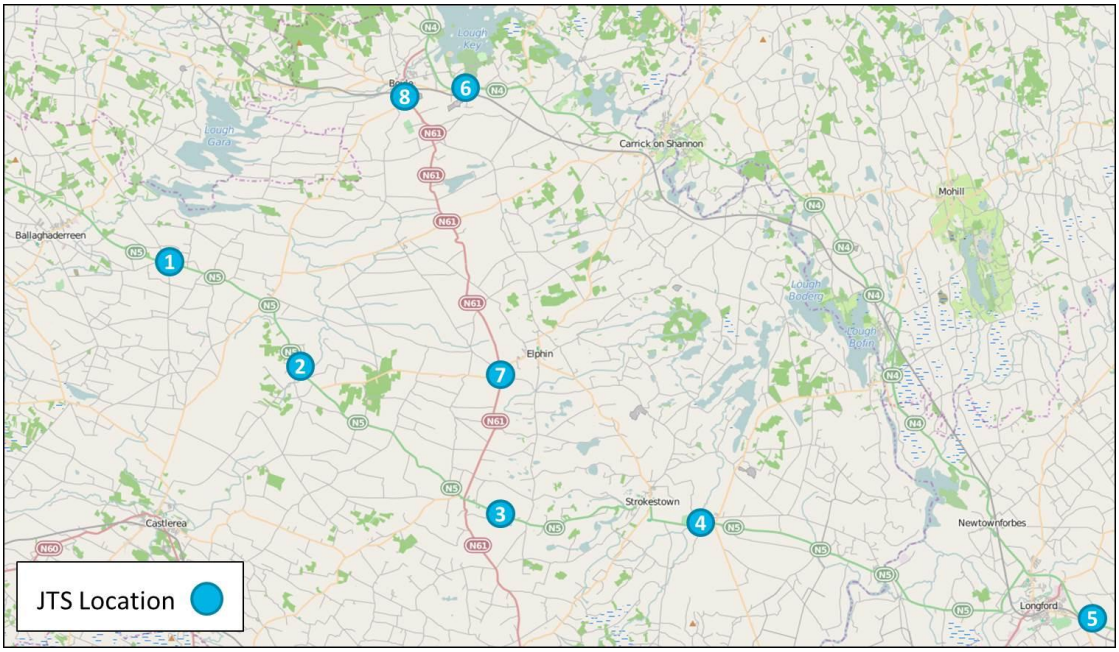

Plate 5.5 Journey Time Surveys (Bluetooth Tracking Devices)

5.3 Base Year Traffic Models (2015)

5.3.1 Network Development

The study area for the traffic model which was initially identified using the NTM is shown in Plate 5.6. The basic road network and zone structure was cordoned from the NTM and further refined to ensure that all network characteristics were reflective of the 2015 road network.

Plate 5.6 Modelled Road Network (Base Year)

5.3.2 Matrix Development

As part of the development of the LAM, the zones used in the NTM were refined to allow more precise movements in and out of the town centres to be modelled. Larger zones are used in the rural areas.

The N5 LAM consists of 147 zones, of these zones 111 represent demand within the study area (internal zones) with a further 36 zones feeding traffic into the study area (external zones).

Un-calibrated trip matrices were firstly constructed for the AM Peak Hour (09:00 – 10:00) and the average Inter Peak Hour (12:00 – 14:00). These trip matrices were then calibrated to reflect link flow data and junction turning movements. These models were then validated using a set of independent count data not used during the calibration process. The calibration and validation process was undertaken in accordance with the criteria as set out in the TII/NRA Project Appraisal Guidelines (PAG) 2011.

The PM Peak Hour matrices were generated by transposing the calibrated AM Peak Hour matrices. The PM models were calibrated and validated in accordance with the PAG.

5.3.3 Model Category

Traffic modelling for the proposed development is undertaken using an 'Assignment Model' and constructed in accordance with TII/NRA *PAG Unit 5.2: Construction of Transport Models*. The model therefore assigns a fixed demand matrix based on the lowest generalised cost route between defined origin and destination zones. Demand is assigned on an iterative basis to account for changes in generalised cost as a result of increased traffic volumes.

5.4 Future Year Traffic Models (2020 & 2035)

5.4.1 Network Development

The future year 'Do-Minimum' network includes the existing road network plus upgrade works along the N61 at Ratallen and Treanagry which are currently under construction. Plate 5.6 illustrates the Do-Minimum network.

The future year 'Do-Something' network includes all the assumptions of the Do-Minimum network plus the proposed development. The Do-Something network is shown in Plate 5.7.

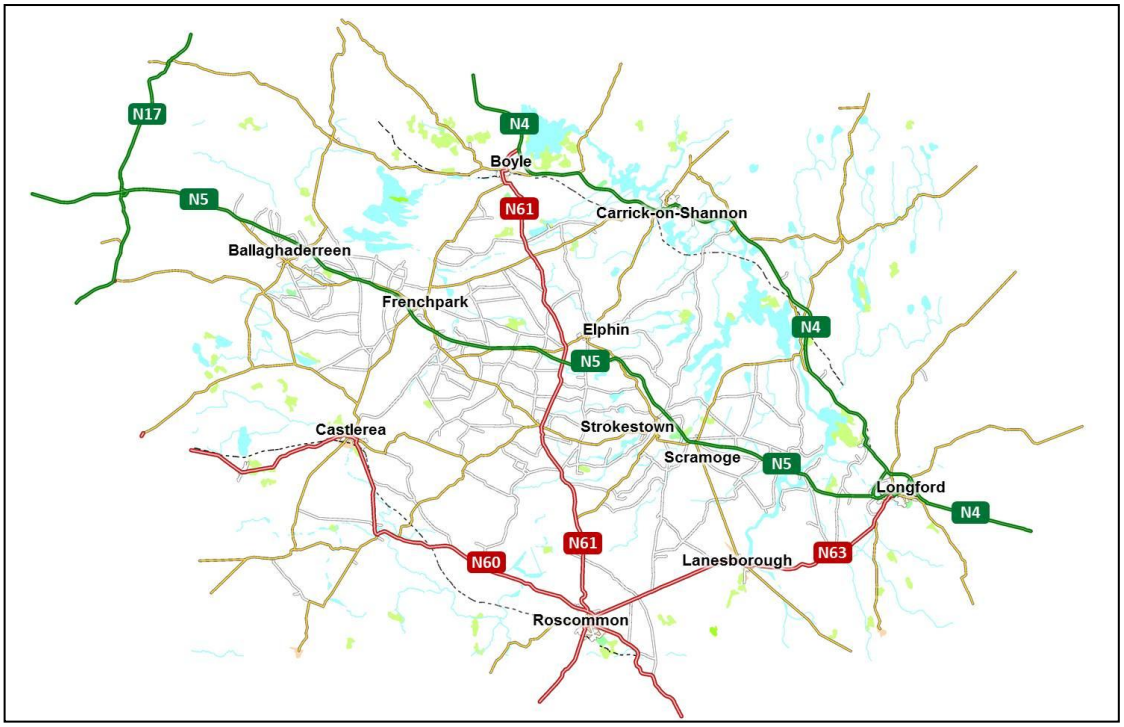

Plate 5.7 Do-Something Road Network

5.4.2 Traffic Growth

The development of the traffic growth forecasts for the future year N5 LAM has been based on the requirements as set out in TII/NRA *PAG Unit 5.4: Zone-Based Traffic Forecasting*. The guidance sets out separate methodologies for establishing trip end growth for internal and external zones in the LAM. Traffic models have been developed for the following years:

- Base Year – 2015;
- Scheme Opening Year – 2020; and
- Scheme Design Year – 2035.

The TII/NRA Project Appraisal Guidelines (PAG) specifies that the proposed development should be assessed using three future traffic growth scenarios, namely the TII/NRA central growth scenario and two sensitivity scenarios (low and high).

Each of the three growth scenarios is based on a forecast set of demographic and economic projections. The overall growth in traffic between the Base and the Opening Year and the Base and Design Year is outlined in Tables 5.1 and 5.2 respectively.

Table 5.1 Overall Trip End Growth in LAM (2015 – 2020)

TII Growth Scenario	Light Vehicles (LV)			Heavy Vehicles (HV)		
	AM	Inter	PM	AM	Inter	PM
Central	6.3%	3.5%	6.3%	12.6%	12.6%	12.6%
Low Sensitivity	4.1%	1.4%	4.1%	11.5%	11.5%	11.5%
High Sensitivity	7.1%	3.6%	7.1%	13.0%	13.0%	13.0%

Table 5.2 Overall Trip End Growth in LAM (2015 – 2035)

TII Growth Scenario	Light Vehicles (LV)			Heavy Vehicles (HV)		
	AM	Inter	PM	AM	Inter	PM
Central	19.5%	10.7%	17.8%	53.4%	53.4%	53.4%
Low Sensitivity	9.8%	1.9%	10.0%	47.0%	47.0%	47.0%
High Sensitivity	22.4%	11.2%	20.1%	55.6%	55.6%	55.6%

Future year models have been developed for all three growth scenarios. Only the TII/NRA central growth results are presented throughout the remainder of this chapter of the EIAR as these are considered the most realistic figures; however the high sensitivity figures have been used in the environmental assessments to predict a worst case scenario as presented in the following chapters.

5.4.3 Estimation of Annual Average Daily Traffic (AADT)

To estimate AADT, conversion factors were developed which allowed extrapolation of AM, Inter and PM peak hour traffic flows to AADT. A relationship was developed for both Light Vehicle (cars & light goods vehicles) and Heavy Vehicles (Other Goods Vehicles (OGV1) & Other Goods Vehicles 2 (OGV2) based on regression analysis of 8 permanent TII/NRA Traffic Monitoring Units (TMU) located with the modelled network.

The AM, Inter and PM Peak Hour flows were converted to AADT flows using the following formula:

Light Vehicle (LV) AADT = (3.16 * u) + (7.98 * v) + (3.34 * w)

Heavy Vehicle (HV) AADT = (3.16 * x) + (5.98 * y) + (3.34* z)

Total AADT = LV AADT + HV AADT

Where,

u = AM Peak Period LV Demand, x = AM Peak Period HV Demand

v= Inter Peak Period LV Demand, y= Inter Peak Period HV Demand

w = PM Peak Period LV Demand, z = PM Peak Period HV Demand

5.5 Project Impacts

5.5.1 Opening Year AADT (2020)

Forecast traffic volumes are shown in Table 5.3 for the Do-Minimum and Do-Something Opening Year (2020) scenarios. The traffic flows in each of these scenarios are illustrated graphically in Plate 5.8 and Plate 5.9 respectively.

The flows indicate that traffic levels along the N5 corridor in the 2020 Do-Minimum scenario between Rathkeery and Scramoge are forecast to increase by approximately 6% between 2015 and 2020.

Table 5.3 AADT Summary for 2020 Opening Year *

No.	Link	2015 Base	2020 Do-Min	2020 Do-Some
1	N5 West of Frenchpark	6000	6400	100
2	N5 West of Frenchpark	6200	6600	200

No.	Link	2015 Base	2020 Do-Min	2020 Do-Some
3	R361 South of Frenchpark	1800	1900	3300
4	R361 South of Frenchpark	1800	1900	2300
5	R361 North of Frenchpark	3000	3200	3000
6	N5 East of Frenchpark	5200	5500	200
7	N5 South of Bellanagare	5200	5500	1900
8	N5 North of R369	4900	5200	1700
9	R369 East of N5	700	700	500
10	R369 West of the N61	1000	1000	800
11	N5 South of R369	4600	4800	1400
12	N5 West of R367	4600	4900	1400
13	N5 East of R367	6500	7000	3300
14	N61 South of Tulsk	4000	4300	4600
15	N61 North of Tulsk	2600	2800	2900
16	N61 South of the R369	2700	2800	3400
17	N61 North of the R369	1800	1900	2400
18	R369 East of the N61	2800	2900	2200
19	R368 South of Elphin	1600	1700	900
20	N5 East of Tulsk	4600	4900	1000
21	N5 West of Strokestown	4600	4900	1300
22	N5 West of Strokestown	6800	7300	3700
23	R368 north of LP-1045	1300	1400	600
24	LP-1405 (Lavally Road)	2600	2700	3000
25	LP-1405 (Lavally Road)	2600	2700	3000
26	R368 North of Strokestown	4600	4900	4100
27	N5 South of Strokestown	5800	6200	1900
28	N5 Southeast of Strokestown	5300	5700	1700
29	N5 West of R371	5500	5900	6500
30	**N5 West of Frenchpark**	-	-	**6600**
31	**N5 West of Frenchpark**	-	-	**6500**
32	**N5 East of Frenchpark**	-	-	**5500**
33	**N5 East of Bellanagare**	-	-	**3800**
34	**N5 North of R369**	-	-	**4300**
35	**N5 West of N61**	-	-	**4000**
36	**N5 East of N61**	-	-	**4700**
37	**N5 North of LP-1405**	-	-	**4700**
38	**N5 South of LP-1405**	-	-	**4900**

**AADT values are rounded up to the nearest 100.*

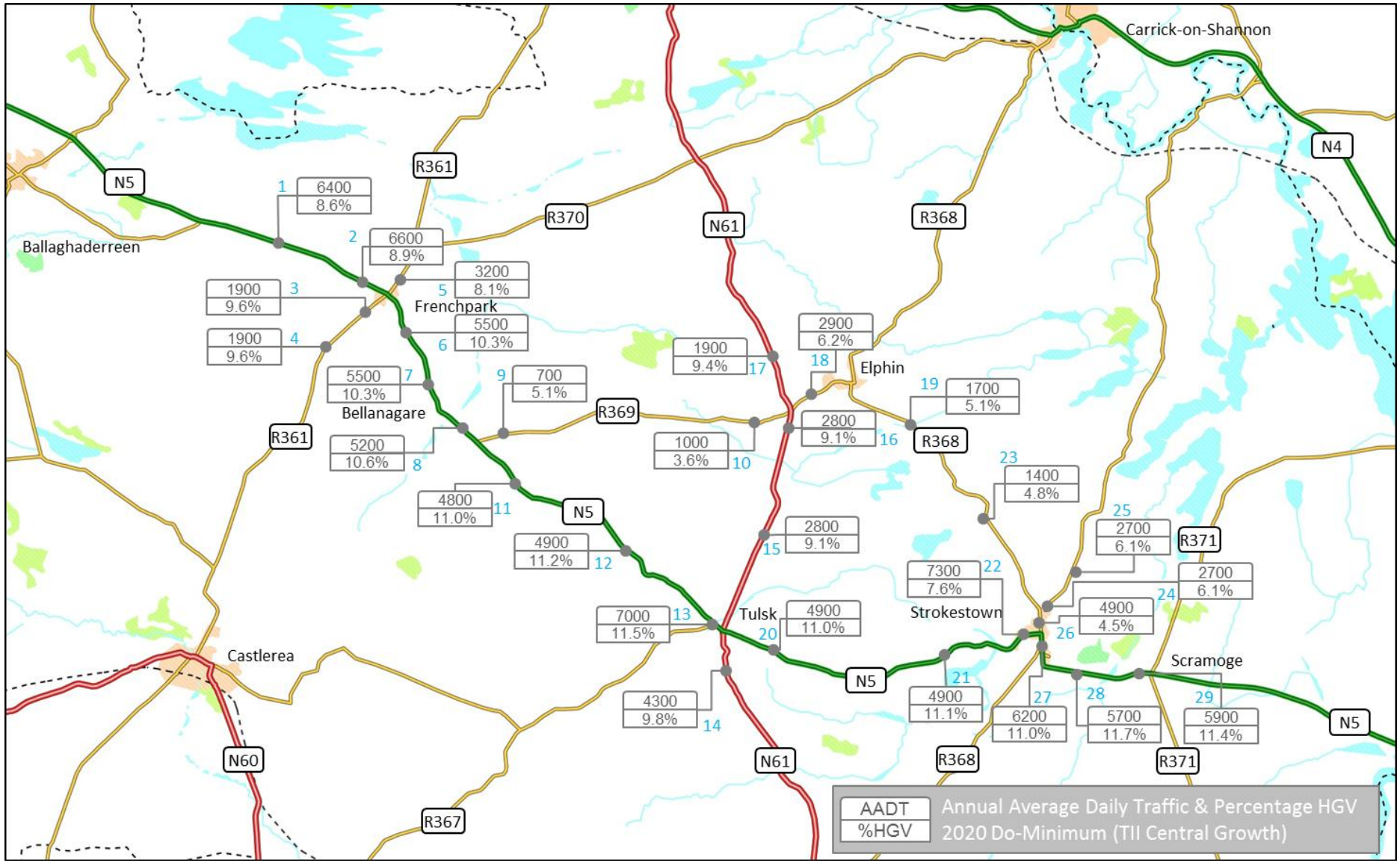

Plate 5.8 2020 Do-Minimum AADT

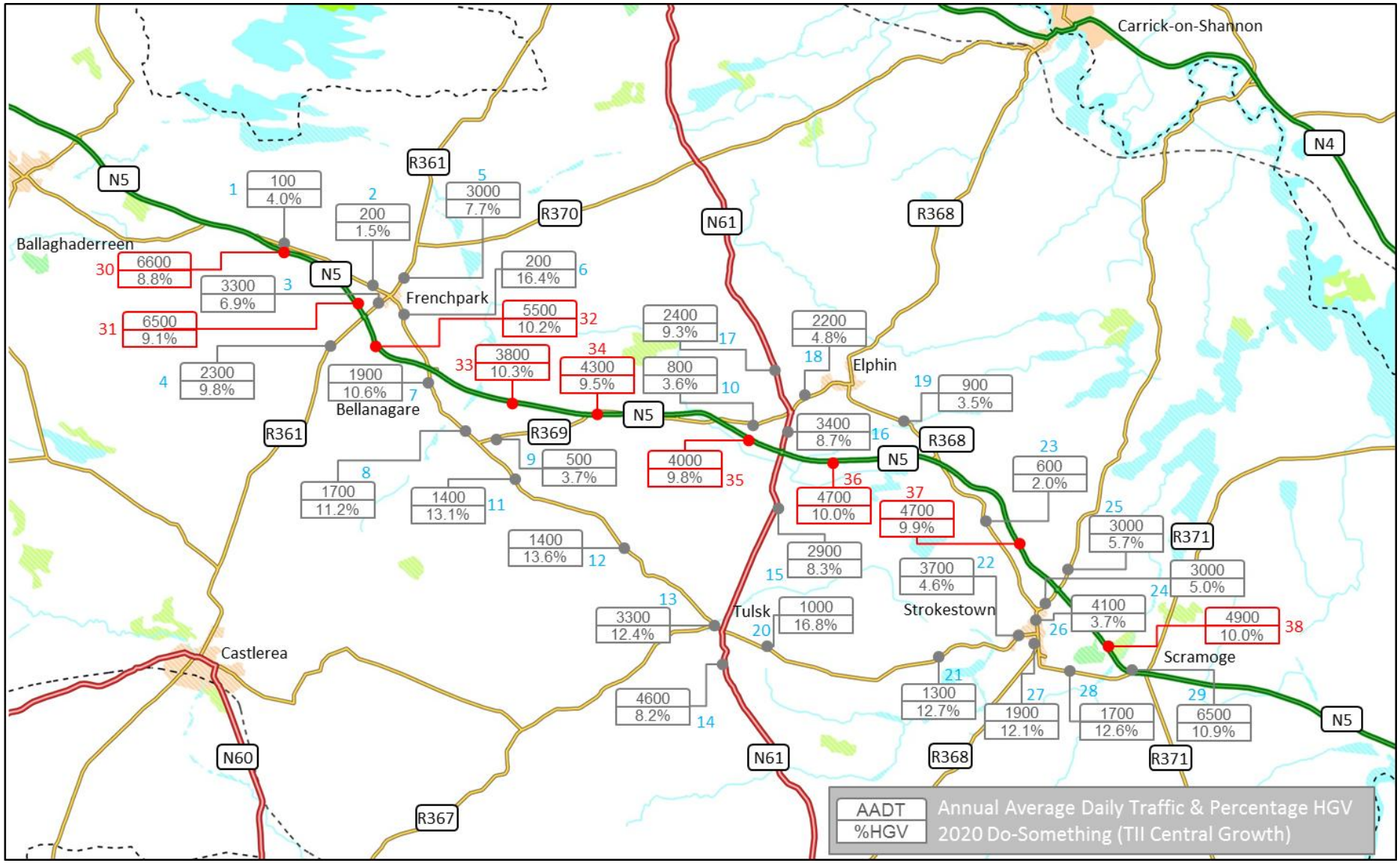

Plate 5.9 2020 Do-Something AADT

In the 2020 Do-Something scenario the proposed development is forecast to carry between 3,800 and 6,600 AADT. The traffic flows presented in Table 5.3 highlight a number of impacts as a direct result of the proposed development. These include:

- An overall reduction in traffic along the existing N5 between Rathkeery and Scramoge. This decrease is in the region of 70%, and is as a result of traffic transferring onto the proposed development due to the reduced journey time;
- A reduction in traffic along the existing N5 through Frenchpark, as the majority of traffic uses the proposed N5/R361 junction (Frenchpark Roundabout) to access the town. This leads to an increase in traffic on the R361 between Frenchpark and the proposed N5/R361 junction;
- A reduction in traffic along the R369 between the N5 and N61 as traffic utilises the proposed N5;
- A reduction in traffic on the R368 between Elphin and Strokestown as traffic utilises the proposed N5;
- A reduction in traffic through Strokestown both on the N5 and R368; and
- A net increase in traffic using the N5 corridor with the proposed development in place. This is due to the re-routing of traffic from the local and regional road network to access the proposed development.

The traffic flows also indicate an increase (approx. 500 AADT) in traffic on the N61 north of the proposed N5/N61 junction. This increase is a result of traffic transferring from the N4 corridor to the N5/N61 corridor to access areas to the south and west of Boyle due to the reduced journey time delivered by the proposed development. Traffic flows in the 2020 Do-Minimum scenario are relativity low (1900 AADT) on the N61 therefore the forecasted traffic flow remains within the capacity of the existing road.

Another matter of note is the level of HGV traffic remaining on the existing corridor in the Do-Something scenario. While the total number of HGVs reduces significantly on the exiting N5, the overall percentage of HGV in relation to total traffic increases. This is due to HGV remaining on the N5 to access the N61 towards Roscommon from the west and to access the R367 towards Castlerea from the east.

In summary, the proposed development substantially reduces the level of traffic on the existing N5 corridor, as traffic transfers to the proposed development due to the time saving benefits it delivers. There are also more modest reductions in traffic on sections of the regional road network. However, traffic levels on the existing N61 north of the proposed N5/N61 junction are estimated to increase as a direct result of the proposed development.

5.5.2 Design Year (2035)

Forecast traffic flows in the Do-Minimum and Do-Something 2035 Design Year scenarios are outlined in Table 5.4 and illustrated in Plate 5.10 and Plates 5.11 respectively. The flows indicate that traffic levels along the N5 corridor in the Do-Minimum scenario between Rathkeery and Scramoge are forecast to increase by approximately 20% between 2015 and 2035.

Table 5.4 AADT Summary for 2035 Design Year*

No.	Link	2015 Base	2035 Do-Min	2035 Do-Some
1	N5 West of Frenchpark	6000	7100	200
2	N5 West of Frenchpark	6200	7300	200
3	R361 South of Frenchpark	1800	2000	3600
4	R361 South of Frenchpark	1800	2000	2500
5	R361 North of Frenchpark	3000	3500	3300
6	N5 East of Frenchpark	5200	6100	300
7	N5 South of Bellanagare	5200	6100	2100
8	N5 North of R369	4900	5800	1900
9	R369 East of N5	700	800	500
10	R369 West of the N61	1000	1100	800
11	N5 South of R369	4600	5400	1500
12	N5 West of R367	4600	5500	1500
13	N5 East of R367	6500	7800	3700
14	N61 South of Tulsk	4000	4700	4900
15	N61 North of Tulsk	2600	3100	3100
16	N61 South of the R369	2700	3000	3700
17	N61 North of the R369	1800	2100	2600
18	R369 East of the N61	2800	3200	2200
19	R368 South of Elphin	1600	1800	1000
20	N5 East of Tulsk	4600	5600	1200
21	N5 West of Strokestown	4600	5600	1500
22	N5 West of Strokestown	6800	8100	4100
23	R368 north of LP-1045	1300	1500	600
24	LP-1405 (Lavally Road)	2600	3000	3300
25	LP-1405 (Lavally Road)	2600	3000	3400
26	R368 North of Strokestown	4600	5300	4500
27	N5 South of Strokestown	5800	7000	2200
28	N5 Southeast of Strokestown	5300	6500	2000
29	N5 West of R371	5500	6700	7500
30	**N5 West of Frenchpark**	-	-	**7400**
31	**N5 West of Frenchpark**	-	-	**7300**
32	**N5 East of Frenchpark**	-	-	**6100**
33	**N5 East of Bellanagare**	-	-	**4300**
34	**N5 North of R369**	-	-	**4900**
35	**N5 West of N61**	-	-	**4600**
36	**N5 East of N61**	-	-	**5300**
37	**N5 North of LP-1405**	-	-	**5400**
38	**N5 South of LP-1405**	-	-	**5600**

**AADT values are rounded up to the nearest 100.*

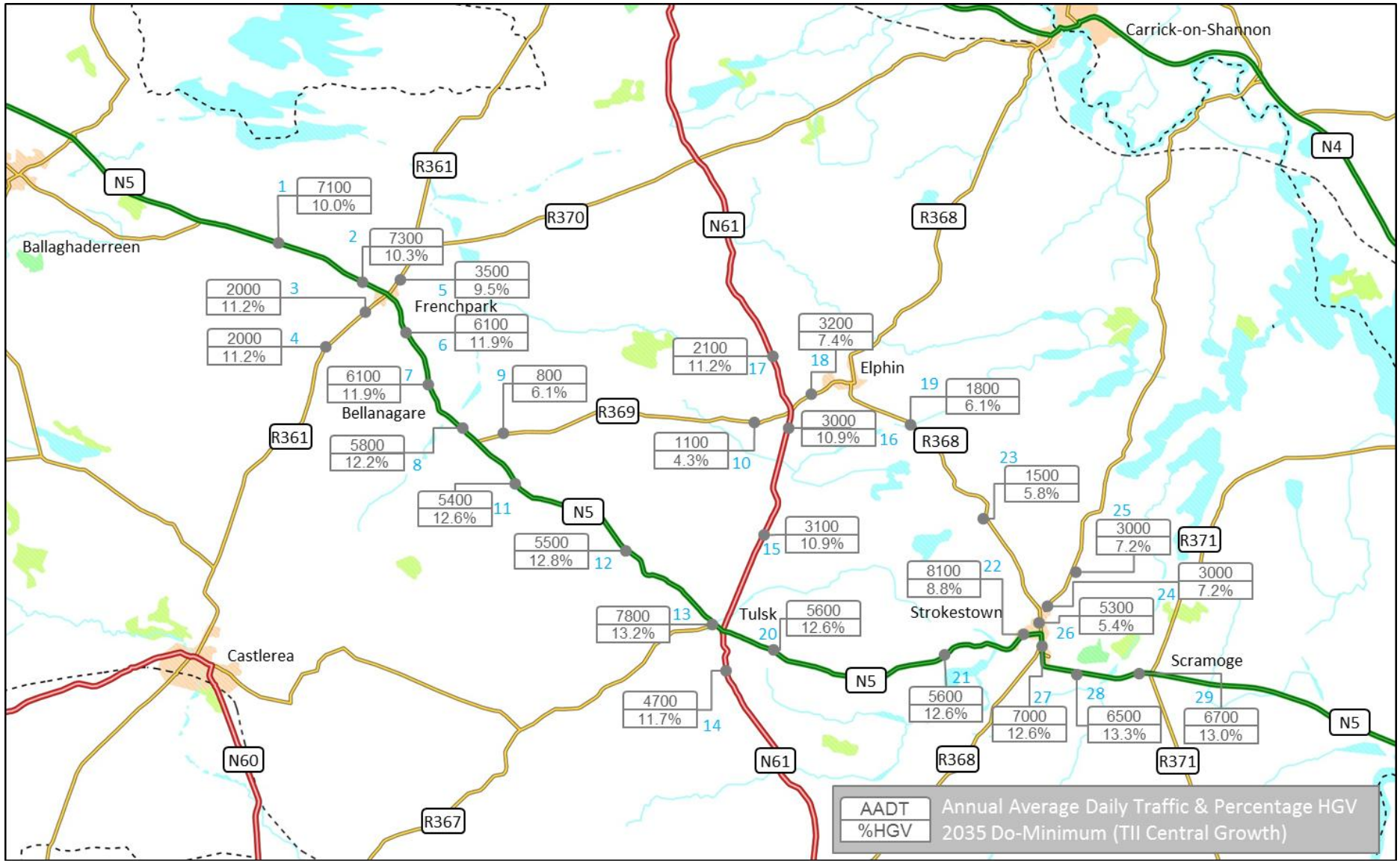

Plate 5.10 2035 Do-Minimum AADT

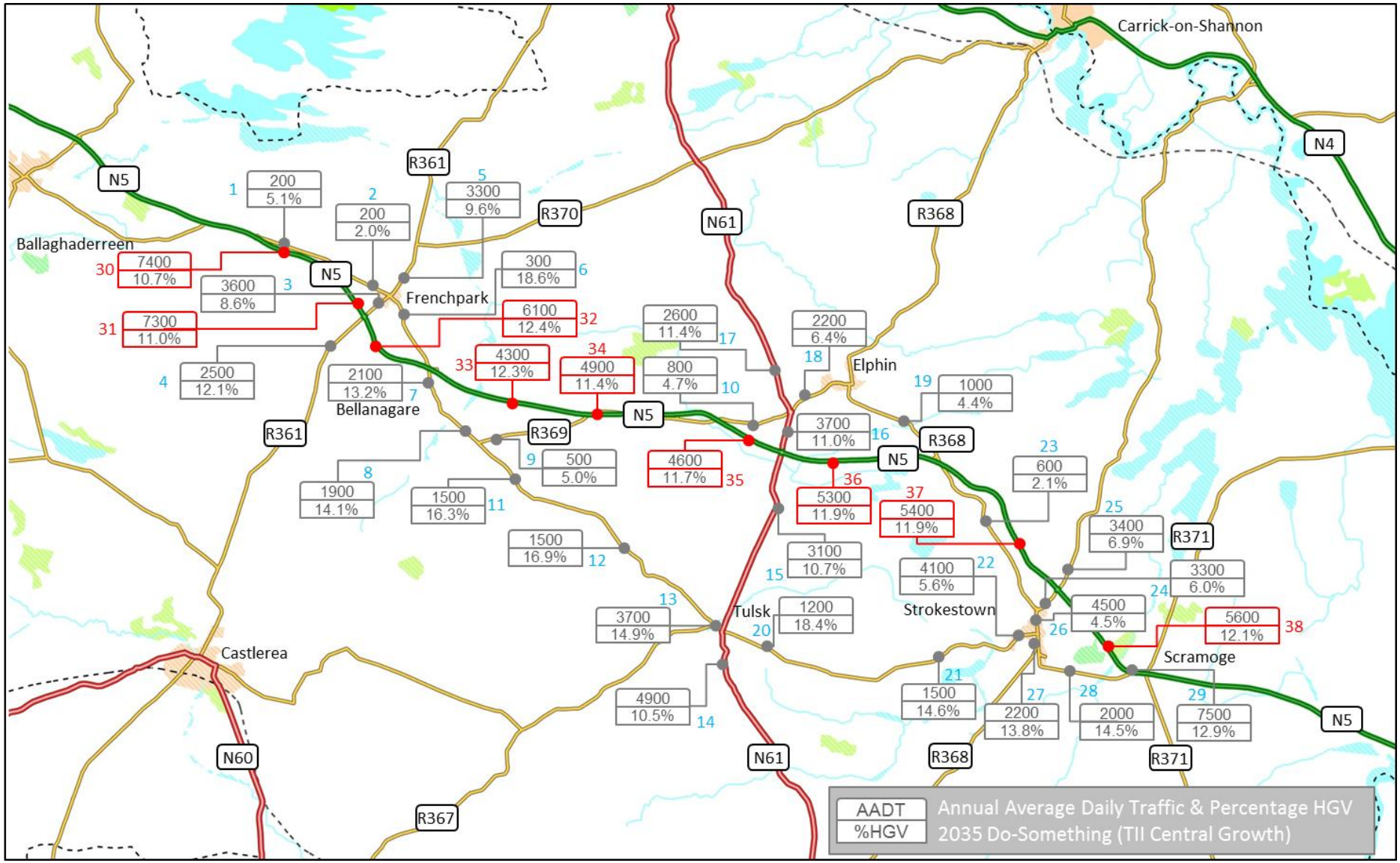

Plate 5.11 2035 Do-Something AADT

In the Do-Something scenario the proposed development is forecast to carry between 4,300 and 7,400 AADT. The traffic flows in the Do-Something scenario show a similar pattern of impacts as reported for 2020. These include:

- An overall reduction in traffic along the existing N5 between Rathkeery and Scramoge. This decrease is in the region of 70%, and is as a result of traffic transferring onto the proposed development due to the reduced journey time;
- A reduction in traffic along the existing N5 through Frenchpark, as the majority of traffic uses the proposed N5/R361 junction (Frenchpark Roundabout) to access the town. This leads to an increase in traffic on the R361 between Frenchpark and the proposed N5/R361 junction;
- A reduction in traffic along the R369 between the N5 and N61 as traffic utilises the proposed N5;
- A reduction in traffic on the R368 between Elphin and Strokestown as traffic utilises the proposed development;
- A reduction in traffic through Strokestown both on the N5 and R368; and
- An increase in traffic on the N61 north of the proposed N5/N61 junction.

5.6 Safety Benefits

As outlined in previous sections the opening of the proposed road development will lead to the re-routing of traffic from the existing road network onto the proposed development, with between 4,300 and 7,400 AADT using the proposed development in the Design Year.

The proposed development will be of a higher safety standard than the existing N5 corridor and will therefore contribute to a network wide reduction in collisions. This is reflected in the COBALT model which forecasts a reduction of 324 collisions over the 30 year scheme appraisal period. This equates to a reduction of 462 casualties categorised as follows:

- 8 Fatalities;
- 23 Serious Injuries; and
- 461 Slight Injuries.

5.7 Journey Time Benefits

The majority of the existing N5 between the tie-in of the N5 Ballaghaderreen Bypass and Scramoge is sub-standard in cross section and also both in its vertical and horizontal alignment. These network deficiencies combined with the high density of junctions, direct accesses and limited safe overtaking opportunities reduce the operating capacity of the N5 corridor leading to delays and driver frustration.

The existing average end to end journey time along this section of the N5 corridor is approximately 32 minutes. With the proposed development in place this end to end journey time would reduce by 10 minutes to a journey time of 22 minutes. This improvement in journey time would apply throughout the day as the existing delays experienced by drivers along this section of the N5 are related to the poor road alignment as opposed to the high level of traffic on the N5 corridor.

5.8 Benefit to Cost Ratio

A Cost Benefit Analysis (CBA) assessment of the proposed development was undertaken in line with the Department of Public Expenditure and Reform (DPER) 'Public Spending Code' guidelines and the Department of Transport, Tourism and Sport (DTTaS) 'Common Appraisal Framework' (2016) guidelines. The CBA assessment monetises the journey time, vehicle operating cost, emissions and safety benefits of the proposed development and compares these against the cost of delivering the proposed road development to produce a Benefit to Cost Ratio (BCR).

A BCR of less than 1 indicates that the monetised benefits do not outweigh the cost of delivering the proposed development. A BCR greater than 1 indicates that that monetised benefits outweigh the costs and that there is a positive return on the investment. The BCR for the proposed development is 1.36 which indicates that the proposed development is economically viable.

At present CBA does not take into account the potential benefits that a proposed development may bring to the wider region or the benefits of improved journey time reliability and travel quality, all of which are applicable to the proposed development. As such the BCR of 1.36 estimated for the proposed development may be considered to be a conservative estimate.

5.9 Conclusions

In order to assess the impact of the proposed road development in terms of traffic, a series of traffic models were developed and assessed. Firstly, base year traffic models (2015) were created based on observed traffic data collected throughout the study area. These models were developed to provide a representation of existing traffic flows and traffic patterns and were calibrated and validated in line with TII/NRA guidance.

Following on from this, traffic growth for the proposed road development Opening (2020) and Design (2035) years was forecast based on the TII/NRA growth factors outlined in TII/NRA Project Appraisal Guidelines. Once future growth was estimated, scheme impacts were assessed by comparing the Do-Minimum scenario (i.e. without scheme) with the Do-Something scenario (with scheme).

The impact of the proposed development in terms of the change in Annual Average Daily Traffic (AADT) on links on the road network was produce for key links throughout the study area.

In summary, the proposed development delivers a journey time saving of approximately 10 minutes, which equates to a 30% reduction in end to end journey time between Rathkeery and Scramoge. The time saving leads to the transfer of approximately 70% of traffic from the existing N5 to the proposed development, removing over 4,000 vehicles from Frenchpark, Bellanagare, Tulsk and Strokestown each day.

The proposed development will be of a higher safety standard than the existing N5 corridor and will lead to a reduction in collisions. It's projected that the scheme will lead to a reduction of 8 fatalities and 23 serious injuries over a 30 year appraisal period. A Benefit to Cost Ratio of 1.36 is estimated for the proposed development, which indicates a positive return of the required investment to deliver the project.