

Chapter 6

Population & Human Health

6.1 Introduction

This chapter addresses the potential social and economic impacts of the construction and operation of the N5 Ballaghaderreen to Scramoge Road proposed road development (hereafter referred to as “the proposed road development”) under the heading of Population and Human Health. Population also includes Socio-economic and Community Impacts. Actual and perceived impacts of the proposed development on the population and human health may arise from various aspects of the proposed road development. These impacts are dealt with throughout the Environmental Impact Assessment Report (EIAR), in particular, interactions may occur with effects described in the following chapters:

- Air Quality and Climate;
- Noise and Vibration;
- Water (Hydrology and Hydrogeology);
- Landscape and Visual; and,
- Material Assets and Land.

This chapter initially sets out the methodology used for the assessment (Section 6.2), then describes the receiving environment (Section 6.3), sets out the predicted impacts of the proposed road development (Section 6.4), describes the mitigation measures to be incorporated in the proposed road development (Section 6.5) and details any residual impacts (Section 6.6). The chapter also outlines any difficulties encountered in compiling information (Section 6.7) and, finally, any cumulative impacts and interactions (Section 6.8). A summary is provided in Section 6.9 and a list of reference material used in Section 6.10.

6.2 Population Assessment Methodology

6.2.1 Study Area

The project study area extends from the start of the N5 Ballaghaderreen Bypass 5km west of Frenchpark to a proposed tie-in with the existing N5 at Scramoge. It includes the Electoral Divisions (EDs) of Buckill, Frenchpark, Bellanagare, Mantua, Rossmore, Annaghmore, Cregga, Elphin, Strokestown and Bumlin (Scramoge). For the purposes of this chapter only this area has been extended to include EDs in the vicinity of the existing N5 (see Figure 6.1 in Volume 3), the town of Strokestown and the smaller settlements of Frenchpark, Bellanagare, Tulsk, Elphin and Scramoge.

6.2.2 Legislation and Guidelines

The following guidelines were referred to while preparing and writing this chapter:

- EPA: Guidelines on the Information to be contained in Environmental Impact Statements, 2002;
- EPA: Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) 2003;
- NRA: Environmental Impact Assessment of National Road Schemes - A Practical Guide (Revision 1, November, 2008); and
- Fáilte Ireland: Guidelines on the Treatment of Tourism in an Environmental Impact Statement, 2011.

Assessment of the community impacts has been undertaken in line with these guidelines. The EPA Guidelines provide advice on impact types including cumulative impacts which are often important for socio-economic assessments, for instance where improved accessibility presents opportunities or demand for new development. Reference has also been made to EPA Guidelines on The Information to be Contained in Environmental Impact Assessment Reports (Draft, May 2017) and the EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015).

In addition, reference is made to the guidelines provided on Community Effects in Volume 11 (Section 3, Part 8) of the UK Department of Transport Publication 'Design Manual for Roads and Bridges' (1993, updated 2009). Although the latter guidelines have not been adopted officially in Ireland, they provide further information that can be used to quantify community impacts.

6.2.3 Data Sources and Consultations

A socio-economic assessment requires that an understanding of the community is built up through background research, site visits, and discussions with local people and community representatives. Specifically, in the case of this study, data has been collected by means of:

- Primary data sources (e.g. preliminary demographic data from Census 2016 and demographic data from Census 2011 produced by the Central Statistics Office);
- Drawings of the proposed road development including associated junctions;
- Maps of the surrounding area, including Ordnance Survey 1:50,000 maps;
- Other relevant environmental data considered during the Environmental Impact Assessment (EIA), especially traffic volumes, noise and visual impacts;
- A review of relevant planning documents including the Roscommon County Development Plan 2014-2020, the Ballaghaderreen Local Area Plan 2012-2018, the Strokestown Area Plan, and Elphin Area Plan (the latter two form sections of the County Development Plan);
- A review of secondary sources including the Regional Planning Guidelines for the West Region 2010-2022, National Spatial Strategy 2002-2020, the Roscommon Enterprise and Innovation Strategy 2015-2020 and the County Roscommon Local Economic and Community Plan 2016-2021;
- Observation of local settlement and travel patterns and identification of community facilities;
- Surveys or discussion with users of local community facilities such as schools and sports clubs;
- Discussions with local businesses;
- Discussions with local organisations in the study area such as Rathcroghan Visitor Centre, Strokestown House and Famine Museum and with relevant statutory bodies such as Fáilte Ireland; and,
- Review of consultations undertaken by Roscommon NRRO.

6.2.4 Population Impact Categories and Their Assessment

6.2.4.1 Overview

The purpose of the community assessment is to identify the likely significant impacts as they might affect users of the proposed road development and local people.

6.2.4.2 Construction Impacts

Impacts on population and human health during the construction phase that are potentially relevant to a socio-economic assessment include:

- Impacts due to construction traffic on journey or general amenity;
- Impacts on environmental and residential amenity;
- Purchases of local materials and services; and,
- Construction employment and local expenditure by construction workers.

The construction phase is temporary in nature.

6.2.4.3 Operational Phase

Impacts during the operational phase fall into four key categories, namely:

- Journey characteristics: An assessment of potential impacts on local journey time, journey time reliability (i.e. the assurance of completing a journey within a predictable time range) and travel patterns including connectivity;
- Community severance: An assessment of potential impacts with regard to any severance from community facilities, particularly those used by older people, children or other sensitive or vulnerable groups (this category includes both new severance and relief from existing severance);
- Amenity: This category includes journey amenity arising from the exposure of pedestrians and cyclists to traffic (due to proximity, safety, noise, dirt, poor air quality), as well as impacts for all road users arising from factors such as visual intrusion and congestion. In addition, impacts on general amenity are addressed where amenities and residential quality of life are affected; and,
- Economic impacts: an evaluation of the proposed road development in the context of economic development and employment.

Impacts are compared between the Do-Minimum and the Do-Something scenarios and result from direct, indirect, secondary and cumulative effects on environmental conditions. Effects can be positive, neutral or negative. The significance of an effect is described as *Imperceptible*, *Slight*, *Moderate*, *Significant*, *Very Significant* or a *Profound* impact. Significance depends on, among other considerations, the nature of the environmental effect, the timing and duration of an effect and the probability of the occurrence of an effect. The impacts may be short-term, medium-term or long-term.

It usually follows that impacts of a socio-economic nature are a function of:

- The location and character of the local environment;
- The sensitivity of the local population and its capacity to absorb change;
- The nature of the environmental effect;
- The scale or extent of the effect in terms of area or population affected;
- The duration and frequency of an effect; and,
- The probability of an impact's occurrence.

The assessment generally addresses impacts at a community level rather than for individuals or identifiable properties, although impacts for individual businesses are discussed where these are located beside the road or are very dependent on road traffic or accessibility. Impacts on individual properties are addressed separately in Chapters 11, 12, 13 and 17 on Landscape and Visual Analysis, Noise and Vibration,

Air Quality and Climate, and Material Assets & Land in particular. The ‘significance’ of an impact as it would affect the worst hit subset of the population is summarised in Table 6.11. This column is followed by ‘duration’ and ‘scale’ which represents the number of people (or businesses) likely to be affected and is labelled as very high, high, medium or low. For example, an impact may be very significant for a particular population subset, but the number of people concerned could be small such that scale is labelled as “low”.

Journey Characteristics

Assessment of journey times and patterns is inevitably dependent on precisely where an individual journey originates and ends, when it is undertaken (e.g. within or outside peak hours) and by whom it is undertaken, i.e. by drivers, cyclists, users of public transport or pedestrians including individuals whose transport options may be restricted. The impact varies for each journey, but typical journeys to particular destinations can usually be identified. Impacts have been assessed in accordance with the significance criteria outlined in Table 6.1 with positive impacts resulting from a decrease in journey length or time and negative impacts resulting from an increase in journey length or time.

Table 6.1 Criteria Used in the Assessment of Changes in Journey Length or Duration

Impact Level	Significance Criteria
Imperceptible	No appreciable change to present journeys length or duration.
Slight	Slight improvement in journeys where impact is positive. Some inconvenience where impact is negative. Some likelihood of changes in journey habits.
Moderate	Moderate reduction in journeys where impact is positive, moderate increase where impact is negative. Greater likelihood of changes in journey habits.
Significant	Much shorter journey times where impact is positive, much longer journeys where impact is negative. High likelihood of changes in journey habits.
Very Significant	Considerably shorter journey times where impact is positive, considerably longer journeys where impact is negative. Very high likelihood of changes in journey habits.
Profound	An approximate doubling (or halving) in typical journey length or duration sufficient to cause marked change in behaviour of a sizeable proportion of population.

Journey length refers to the distance associated with a particular journey, whilst duration is the time taken to make the journey. Average walking speed for pedestrians is taken to be 5 km/h. Average cycling speed is assumed at 20 km/h. Impacts on journey amenity and community severance are addressed separately, although there are obvious interactions between each of these categories and with economic impacts. In addition, new transport facilities can improve accessibility or connectivity through the combined effect of reduced journey time and reduced severance. Improved connectivity can have implications for choice of transport mode, for land use and for economic development.

Journey Amenity, General Amenity and Health

The assessment of journey amenity relies on the significance categories given in Table 6.2 and is supported by cross-reference where necessary with Chapters 5, 11 and 12 on Traffic, Landscape and Visual, and Noise and Vibration. The level of

traffic on a road, the proximity and separation of footpaths and cycle-paths, the nature of any crossings/junctions to be negotiated, the legibility of a journey (including signage), visual intrusion (including sightlines) and safety for equestrians, are amongst the factors relevant to the assessment of amenity, as are the number and types of people affected. The principal concern is with pedestrians or cyclists, but journey amenity impacts also apply to drivers; for example, due to safety anxiety associated with the crossings of major roads. Such journeys could involve older drivers or school children as passengers. There are interactions too with the assessment of journey characteristics and community severance.

Observations can also be made with regard to impacts on the health and general amenity of people living in the vicinity of a proposed road development. The key criteria here are community wellbeing, including social sustainability and the effect of the interactions with traffic experienced by other road users (including pedestrians and cyclists) and nearby residents. Direct impacts on communities due to large numbers of residential demolitions or the loss of community facilities such as open space can also impact on community wellbeing or interaction. Indirect impacts may result from changes in environmental quality, for instance, from noise or visual intrusion. The possible impact of noise or air quality on people's health is specifically addressed in the relevant chapters of an EIAR. These impacts have a cumulative dimension in that human well-being is affected too; for example, where people live in a highly trafficked environment.

Table 6.2 Criteria Used in the Assessment of Amenity Impacts

Impact Level	Significance Criteria
Imperceptible	No significant amenity impacts are apparent.
Slight	A small impact on community wellbeing or an amenity can be attributed to the proposed development.
Moderate	A moderate impact on the community wellbeing or an amenity can be attributed to the proposed development.
Significant	A proposed development has the potential to impact on community wellbeing or an amenity such as to significantly affect many people's behaviour and quality of life or the functioning of the amenity.
Very Significant	A proposed development has the potential to substantially impact on community wellbeing or an amenity such as to affect most people's behaviour and quality of life or the viability of the amenity.
Profound	Effects of a scale to significantly impact on community wellbeing to an extent that people's behaviour or quality of life is substantially changed; for example, where significant health issues arise or where people may wish to relocate.

Severance

Severance is a typical impact of road development. Its effect is to discourage community interaction and it occurs where access to community facilities or between neighbourhoods is impeded by a lengthening of journey time or by the physical barrier of a road; for example, high traffic volumes or perimeter fencing. Social severance can occur due to restrictions on people's accessibility, but also where communities become identified by their containment within road boundaries. This can include the psychological effect of traffic or safety concerns as barriers to social interaction. Social severance could occur for busy roads such as motorways even where access is available. On the other hand, relief from existing severance may be provided by a new road where traffic volumes or speed are moderated, by the

inclusion of crossing facilities in the design or through the presence of overbridges or underpasses.

The definition of severance is not precise. It depends on the location of community facilities, the level of use of facilities, the time of day or duration when traffic conditions are experienced, the sensitivity of the population affected and the geographical spread of the community. Children, the elderly, the mobility impaired and people without access to a private car would be amongst those most affected by community severance and any corresponding loss of neighbourhood interaction.

New Severance

New severance is a negative impact and occurs whenever a barrier is created between people and community facilities. The barrier could take the form of a new road, fencing, additional traffic or the need to detour. Table 6.3 provides examples of how new severance can be assessed. The criteria are specific to pedestrians, although severance will apply also to cyclists and potentially to local vehicle journeys too, particularly for some sensitive population sub-groups. Quantitative criteria have not been included in the table as impact definitions may vary depending on the nature of road trips and crossings. Similarly, the introduction of crossing facilities could reduce severance even where traffic levels are increased.

Table 6.3 Criteria Used in the Assessment of New/Increased Severance

Impact Level	Significance Criteria
Imperceptible	Journey patterns maintained
Slight	Present journey patterns likely to be maintained, albeit with some hindrance to movement.
Moderate	Some residents, including children and elderly people, are likely to encounter severance. For others, journeys will be longer or less attractive.
Significant	Many residents, including children and elderly people, are likely to encounter significant severance which could dissuade them from making particular journeys.
Very Significant	Most residents, including children and elderly people, are likely to encounter significant severance which will be sufficient to induce a reorganisation of their activities, to cause them to make less frequent trips to nearby neighbourhoods or to make less use of particular community facilities.
Profound	People are likely to be deterred from making trips to an extent that includes permanent loss of access or a change in the location of centres of activity.

Relief from Severance

Relief from severance is a positive impact which can be defined in relation to existing severance. Relief from severance could follow from a transference of traffic including heavy goods vehicles (HGVs), from improvements to road design or sightlines, or from the introduction of crossing facilities, underpasses or bridges. The degree of relief from severance depends on the context in which this change occurs including the existing absolute volume of road traffic, the speed of traffic, sightlines and the number of crossings by pedestrians, cyclists or others. Table 6.4 provides a guide to criteria used in the assessment of relief from severance. Where the assessment varies from these definitions due to the context in which the relief occurs, the reasons for the assessment are discussed in the text. Where there are implications for real and perceived safety there are also potential interactions with Journey Amenity.

Table 6.4 Criteria Used in the Assessment of Relief from Severance

Impact Level	Significance Criteria
Imperceptible	<10% reduction in daily traffic levels (AADT) or current journey patterns maintained
Slight	10-30% reduction in traffic levels (AADT) or some reduction in severance
Moderate	31-50% reduction in traffic levels (AADT) or a reduction in severance sufficient to encourage some new journeys by foot or bicycle.
Significant	51-70% reduction in traffic levels (AADT) or a reduction in severance sufficient to allow residents to make more frequent journeys to particular community facilities by foot or bicycle.
Very Significant	71-90% reduction in traffic levels (AADT) or a very significant reduction in severance sufficient to allow most residents make more frequent journeys to particular community facilities by foot or bicycle.
Profound	More than 90% reduction in traffic levels (AADT) or reductions in severance such as to provide new access to community facilities or to cause a very significant increase in pedestrian or cycle journeys

Sensitive groups are identified specifically where they comprise a higher proportion of pedestrian journeys or where specific amenities are associated with these groups. Sensitive groups can include young and older population cohorts, the mobility impaired and people at risk of social isolation. Relevant facilities include schools, surgeries, hospitals, churches, post offices and shops.

Economic Impacts

Economic and employment impacts occur at both the regional and local scale and can be either positive or negative. Much road development is proposed with the intention of improving national competitiveness and economic/social linkages; for instance, in relation to reducing journey time and improving journey time reliability for commercial goods or for travel and commuting by employees. However, there can also be some negative impacts in relation to loss of passing trade to businesses such as newsagents, grocery stores, service stations, guest houses, etc. Impact levels are defined in Table 6.5 below:

Table 6.5 Criteria Used in the Assessment of Economic Impacts

Impact Level	Significance Criteria
Imperceptible	No significant economic impacts are apparent
Slight	A small effect on the business environment can be attributed to the proposed development
Moderate	A moderate effect on the business environment can be identified.
Significant	An effect that has the potential to impact on business performance or to influence the location decisions of new business.
Very Significant	An effect that has the potential to substantially impact on business performance or to influence the location decisions of new business.
Profound	Effects of a scale to substantially impact on the performance of a major business or several businesses. Where these businesses are important local employers there is the possibility of major impacts for the general prosperity of the local area or region.

Economic impacts may affect an identifiable local business and such businesses could be important local employers. In this case, impacts on individual companies are discussed in the text. Other economic impacts could affect the wider community, for

example where a number of businesses are affected or where the retail or business environment of a town is impacted. Again, such impacts can be positive or negative.

6.3 Description of Receiving Environment

6.3.1 Introduction

An accurate assessment of the receiving environment is necessary to predict the likely significance of the impacts of the proposed road development.

6.3.2 Context

As noted above, the study area includes the town of Strokestown and the smaller settlements of Frenchpark, Bellanagare, Tulsk, Elphin and Scramoge. With the exception of Elphin, each of these settlements is located on the existing N5, a National Primary Route connecting the east of the country with Castlebar and Westport and with Ballina via the N26. The town of Ballaghaderreen is located just outside the study area to the west, while Longford is located 20km to the east. Both of these towns have been bypassed in the last few years. In the case of Ballaghaderreen, this bypass extends to 13.5km and connects to the eastern end of the previously constructed Charlestown section of N5 realignment. In addition, the N5 east of Scramoge to Termonbarry has been realigned and improved along much of its length in recent years. This leaves the section of the N5 between Scramoge and the eastern end of the Ballaghaderreen Bypass as almost the only section of the National Primary Route between Longford and Charlestown that has not been improved.

The N5 in the study area is crossed by or connects with five important national and regional roads, namely the R361 Williamstown – Castlerea – Boyle, the N61 Athlone – Boyle, the R368 Four Mile House – Strokestown – Carrick-on-Shannon, the R369 Elphin – Gortnagoyne and the R371 Roosky – Ballyleague.

According to the preliminary data from Census 2016, the study area has a population of 7,084, which is almost unchanged at -0.2% from the figure of 7,100 recorded for the previous Census in 2011 and which in turn had increased by 3.6% since 2006. The population density is light at an average of 18.7 persons/km². EDs are identified in Figure 6.1. Some EDs have experienced higher population growth, but from a small base. Several EDs have experienced a decline in population, albeit from a small base, although others such as Scramoge and Tulsk have experienced a significant increase as vacant residential estates built during the previous period have been occupied.

Table 6.6 Population (*EDs in Core Study Area for Proposed Road Development)

Electoral Division	2016	2011	Percent Change	Persons/km ²
Buckill *	334	374	-11.5%	14.6
Frenchpark *	897	860	4.3%	26.9
Lisgarve/Mantua *	226	237	-4.6%	10.2
Bellanagare *	640	629	1.6%	12.7
Rossmore *	169	168	0.6%	9.3
Annaghmore *	295	325	-9.2%	16.2
Cregga *	155	164	4.9%	10.7

Electoral Division	2016	2011	Percent Change	Persons/km ²
Elphin *	764	794	-3.8%	50.3
Strokestown *	1,036	1,003	4.6%	58.0
Bumlin (Scramoge)*	472	408	15.7%	19.5
Fairymount	313	359	-12.8%	9.3
Baslick	155	163	-6.1%	8.9
Castleplunket	519	512	1.8%	13.9
Ogulla	340	330	3.3%	17.5
Killukin	191	207	-7.7%	11.4
Tulsk	314	279	12.9%	16.6
Cloonyquin	264	288	-9.4%	12.3
Total / average (route of proposed development)	4,988	4,962	0.5%	22.8
Total / average (all)	7,084	7,100	-0.2%	18.7
Co Roscommon	64,544	64,065	0.7%	

Only preliminary Census data is available for 2016 at this time. Other demographic detail is based on the 2011 Census. At this time, the age characteristics of the study area were similar to those of the county as a whole, although there was a higher proportion of people over 45 years and a slightly lower proportion of people between 25 and 45 years and under school age. Elphin has the highest proportion of people of retirement age at 20.0%.

On average across the EDs, 5.8% of family members are represented by children of under school age, 9.3% are of early school age and 8.5% are between 15 and 19 years. Lisgarve has the highest proportion of children under school age at 9.3%. Bumlin (Scramoge) has the highest proportion of children in the 4-11 year category at 13.0%.

Table 6.7 Age

Electoral Division	0-4 yrs	5-11 yrs	12-17 yrs	18-24 yrs	25-44 yrs	45-65 yrs	65+ yrs
Study Area Total	411	664	608	573	1,686	1,988	1,198
Percent	5.8%	9.3%	8.5%	8.0%	23.7%	27.9%	16.8%
Co Roscommon	4,642	6,310	5,124	4,607	17,779	16,207	9,396
Percent	7.2%	9.8%	8.0%	7.2%	27.8%	25.3%	14.7%

The largest number of private households is found in the EDs of Strokestown, Elphin, Frenchpark and Bellanagare. On average, 10.6% of these are one person households, the highest proportion of which is found in Elphin at 16.3% (noting also the relatively high proportion of people over 65). Two person households represent 20.1% of the total. Tulsk and Killukin have a relatively high proportion of large households of over seven and eight people at 5.2% and 7.8%, respectively.

The great majority of properties are represented by detached houses. Of the total housing stock, 30.2% properties were built since 2001. Frenchpark has the highest proportion of properties built between 2001 and 2006 at 113 or 39.7%.

Table 6.8 Households

Electoral Division	Number of Households
Buckill *	140
Frenchpark *	330
Lisgarve/Mantua *	89
Bellanagare *	256
Rossmore *	60
Annaghmore *	123
Cregga *	58
Elphin *	335
Strokestown *	445
Bumlin (Scramoge) *	148
Fairymount	136
Baslick	56
Ogulla	123
Castleplunket	191
Killukin	80
Tulsk	92
Cloonyquin	102
Total / average (Route of Proposed Development)	1,984
Total / average (All)	2,764
Co Roscommon	23,672

As of 2011, the proportion of people employed in agriculture, forestry or fishing was 19.1% or 24.9% of males. The proportion working in building and construction was 5.4%, or 10.7% of males. The highest proportion of people working in agriculture was in Killukin at 39.3%, although relatively high proportions are found in all of the EDs containing no nucleated settlements. The proportions of the population working in manufacturing, commerce and trade, transport and communications, public administration and professional services were respectively 7.5%, 23.6%, 3.3%, 10.1% and 22.7% (“other” accounted for 14.3%).

As of 2011, 43.9% of the study area population were in work, 13.4% were unemployed, 10.1% were students, 11.0% were carers and 15.7% were retired. A proportion of 5.5% were unable to work due to sickness or disability (0.4% were listed as “other”). By comparison, 48.3% of people in the county as a whole were in work. This situation is likely to have changed slightly since the last Census as recent economic growth begins to reach rural areas. A more stable picture is presented by socio-economic class in Table 6.9 which reveals the largest proportions of people belonging to the managerial or technical classes, non-manual or skilled manual.

Table 6.9 Social Class

Electoral Division	Professional	Managerial / Technical	Non-manual	Skilled	Semi-Skilled / Unskilled	Other
Study Area Total	333	1,583	1,438	1,323	974	1,440

Electoral Division	Professional	Managerial / Technical	Non-manual	Skilled	Semi-Skilled / Unskilled	Other
Percent	4.7%	22.3%	20.3%	18.7%	13.7%	20.3%
Roscommon Total	3,761	16,781	12,465	10,644	9,041	11,369
Percent	5.9%	26.2%	19.5%	16.6%	13.9%	17.7%

As regards travel to work, school or college, most people, i.e. 67.6%, do so by private car or van as drivers (46.9%) or passengers (20.7%). A figure of 9.9% applies to journeys by bus or coach, although this figure is largely represented by secondary school students. Only 8.4% travel by foot. The majority of these people reach their destination in under half an hour, 35.3% in less than 15 minutes and 29.5% between 15 and 30 minutes. A further 15.2% travel for between 30 and 45 minutes. These travel times correspond to local destinations or local towns such as Longford, Castlerea or Roscommon. Only 10.8% of people take more than 45 minutes to reach their destination. The figures are very similar to the county as a whole.

Table 6.10 Travel to Work, School or College

Electoral Division	By Foot	Bicycle	Bus, Minibus, or Coach	Car Driver	Car Passenger	Van	Other	Not Stated
Study Area Total	339	24	398	1,596	836	297	322	227
Percent	8.4%	0.6%	9.9%	39.5%	20.7%	7.4%	8.0%	5.6%
Roscommon Total	2,923	293	3,421	16,823	8,198	2,424	2,407	1,406
Percent	7.7%	0.8%	9.0%	44.4%	21.6%	6.4%	6.4%	3.7%

6.3.3 Character

The study area is rural in character with a low density of population (see Table 6.6). Although the population grew by 4.4% between 2006 and 2011, it is thought to have stabilised since this time as the national economic situation deteriorated. Strokestown is the largest settlement with a population of around 814 compared with 613 for Elphin, 420 for Frenchpark, 195 for Tulsk and 142 for Bellanagare. However, these figures relate to the town area and exclude the effect of population expansion into surrounding rural areas as captured by the figures for the respective EDs. Other residential development is in the form of individual residential properties and is low density in nature with the greatest number being found in the vicinity of Strokestown. The Strokestown Area Plan includes objectives (i.e. Policy 2.2 and Policy 6.4) to encourage new development within the existing town area together with the consolidation of the core settlement.

Most of the rural area is given over to pasture, predominantly beef or suckler production. Undulating topography and small shallow lakes are features of the landscape along with scattered areas of raised bog and commercial forestry. Ribbed glacial moraines are also a feature of the area. These landmarks are of potential tourism interest. There is also a modest amount of angling on some lakes.

The landscape around Tulsk is peppered with mounds and other prehistoric evidence of its former association with early settlement and as a ceremonial capital of Connacht. The Rathcroghan (Cruachan) Complex is of considerable significance as

an historic landscape, although tourism is not yet a major feature given that many of the archaeological remains are subsurface or earthen mounds that are rather difficult to interpret in a short visit. A visitor centre is located in Tulsk and houses a small café and occasional events.

Strokestown Park and House is a Palladian mansion (refer to Chapter 15 for further details) that is located on the edge of the town and is accessible from Bawn Street. The house hosts the Irish National Famine Museum and a restored walled garden. It is a popular destination for visitors and international tourists including tours. Many houses in the town are of Georgian design and Church Street is one of the widest in Europe. The songwriter Percy French was born nearby in the vicinity of Tulsk and there is a cultural heritage of music and writing. Strokestown has built on this local heritage with events such as an annual poetry festival and a traditional music festival (the Féile Frank McGann). Dr Douglas Hyde, the first President of Ireland, was born nearby in Castlerea and an interpretive centre is now housed in the church in Frenchpark where his father was the rector.

6.3.4 Significance

Although the study area is lightly populated, much of the local population is concentrated along the N5 corridor. There is physical severance in Frenchpark, Bellanagare, Tulsk and Strokestown that can be significant at times. Community facilities are identified in Figures 6.2-6.7. Access to community facilities such as schools, pre-school and after school facilities, churches, shops and sports grounds is significantly impacted by severance in each settlement and particularly in the vicinity of crossroads or junctions. National schools and churches are also found in Elphin, Kiltristan and Cloonyquinn on the N61 between Boyle, Tulsk and Roscommon town. Almost all children at these schools arrive by car or bus, although several also walk or cycle to Kiltristan NS.

Strokestown is described as a Key Satellite Village in the Roscommon County Development Plan 2014-2020 and has a range of community facilities including the Percy French Hotel (which often hosts local events), the Parish Church (Church of Immaculate Conception), Scoil Mhuire Primary and Secondary School, St. Patrick's NS, St. Mary's GAA, a post office, library, Garda station and the usual range of shops and services, pubs, cafes and convenience restaurants. Many of these facilities are located on the Elphin Road whereas the wide main street (Church Street) comprising the N5 west of the roundabout with the Elphin Street contains some shops, but is comprised of more residential or business development. Access to the primary and secondary schools, a community centre and to the sports hall, GAA and soccer pitches is from Church Street. There are listed Georgian buildings on Bawn Street, a quiet street preceding the entrance to Strokestown House. With some exceptions, many of the properties on Church Street are less grand, but traffic, including HGV traffic, could be argued to impact adversely on the amenity and sense of place presented by this wide thoroughfare. Employers in the town include the Westward Scania truck service centre and services in the town. Strokestown Golf Course is located 1km to the east off the existing N5.

Responsibility for the management of Strokestown Park House and Famine Museum has been leased to the Irish Heritage Trust. Strokestown House had hitherto been both privately owned and managed. It includes a café as well as the garden and museum. It is hoped that the new relationship will allow the destination to source additional funding, to attract more visitors and to expand the existing summer school programme. An Irish Famine Summer School was inaugurated by the Minister for Arts in 2016. Such a programme would provide an extension of the economic

relationship with the town through demand for accommodation and evening food/entertainment. The trust has already been involved in the running of a local heritage resource, Strokestown Learning Zone, and also manages Fota House in Cork.

Of the other settlements, Scramoge, to the east of Strokestown, is a small settlement recently supplemented by a residential estate. It possesses a parish church and is located on the road to Roosky, but is set back from traffic on the N5. Tulsk, to the west of Strokestown, has a small centre. The church and cemetery here are located along the N5 as is the GAA club and a service station. In Bellanagare, the school is located on the edge of the village. Small shops, cafes, a pub, a small service station and a community/sports hall are located along or near the main street comprising the N5. In Frenchpark, St. Patrick's National School is located just to the west of the crossroads with the R361 Boyle-Castlerea road on the N5 National Road. A service station is located on the opposite side of the road and the local GAA club occupies the corner between the N5 and R361 Boyle road. The very small Mantua School, once reported to be Ireland's smallest, is now closed. Kilnamryall Church is located just to the north. Many of the local bogs are used for cutting turf including bogs just south of Frenchpark and north-east of Bellanagare. Not all turbarry rights are practiced regularly on the local bogs some of which have largely converted to scrub and woodland.

In terms of amenities, quiet local roads are used for walking in the vicinity of each of the settlements, most notably Bellanagare, Strokestown and Scramoge. Cloonshanville Bog just outside of Frenchpark is being restored by Coillte under an EU LIFE project and has a short visitor walkway. Between Strokestown and Elphin, Annaghmore Lough has a small amenity area and is sometimes visited by birdwatchers. The nearby Caslin Hills are not generally accessible, but the hills and turloughs are a familiar feature for local people and complement the journey amenity between Strokestown and Elphin. Sliabh Bán, a forested hill to the south east of Strokestown, is the principal local walking destination. Opportunities for walking such as these have a particular public health value given that much walking elsewhere is restricted to local roads.

The substandard alignment and cross-section of the majority of the existing N5 between Ballaghaderreen and Scramoge provides for poor journey amenity and has contributed to a high number of single vehicle collisions. Journey times can be extended by the combination of local and regional traffic on the N5 and the difficulty of safely overtaking slower moving local traffic or HGVs especially given the frequency of connections with local roads. Journey times are not typically impacted by congestion, although the Strokestown Local Area Plan notes that informal parking on Bridge Street can interfere with traffic flow. Local and regional journey amenity is also greatly reduced by the hazard involved for vehicles in crossing the N5 at the crossroads and junctions as mentioned previously. Cycle journey amenity on the N5 is greatly reduced by the narrowness of the existing road and the proximity of fast moving traffic including HGVs. Consequently, there are very few cycle journeys along the N5 except perhaps to playing fields on the edge of the principal settlements. Similarly, the general amenity of people living alongside the N5 is greatly reduced and physical severance persists between houses even where located on the same side of the road.

6.3.5 Sensitivity

As discussed, the busy N5 has the effect of severing the historic landscape of Rathcroghan to an extent that its integrity, its relevance to local people and tourism

appeal, is diminished. More distinct physical severance had been experienced at Rathcroghan School which is located right beside a busy and narrow section of the N5. However, this school is now closed, although a short length of parking space opposite the school is used by small numbers of tourists to visit a prehistoric mound (Rathmore) beside the road.

Each of the settlements experiences physical severance which reduces the attractiveness of their centres for retail and social activity and potentially their ability to attract new residents or investment. This severance is imposed by road traffic and has potential implications for health, including limits on physical movement and social interaction. It has an effect on sensitive groups such as school children and elderly people given the proximity of various educational, religious and other facilities to the N5. Parallel parking on Bridge Street and Church Street in Strokestown also presents a hazard to pedestrians crossing these roads. Sports pitches in Strokestown are accessed by most users from Church Street. Local GAA pitches that are similarly used by children and young people are located beside the road in Tulsk and Frenchpark. The only signalised pedestrian crossing of the N5 is to be found outside the primary school in Frenchpark.

Severance extends to drivers too in that vehicle crossings of the existing N5 are hazardous and have been the scene of accidents (details of accident statistics are presented in Chapter 5). For example, the crossroads between the N5 and R361 in Frenchpark and with the N61 in Tulsk present potential hazards that impact on journey amenity, particularly for more insecure drivers. Cycling everywhere along the N5 is discouraged by the poor journey amenity and severance. The absence of off-road footpaths means that local roads are used for walking and are particularly attractive where circular walking opportunities arise. Only quiet local roads can be safely used for this purpose.

In the past Strokestown was a regular stopping point for journeys between the east and west of the country due to ease of parking provided by the wide street. This is less the case now, although the town retains a hotel and has a handful of convenience cafes that are largely dependent on passing trade. Strokestown House is more dependent on visitors' prior familiarity with its location. The economic relationship between the attraction and the town is reduced by its physical separation and its own café and parking, although it adds to the attraction of the area as a cultural and tourism destination.

The Regional Planning Guidelines 2010-2022 remark on the need to improve competitiveness by reducing transport costs and lists proposed investment in specific road infrastructure projects. Businesses found along the existing N5 are identified in Figures 6.2-6.7. The importance of smaller towns for sustaining local services, amenities and businesses is acknowledged too. Inevitably, a balance has to be struck in terms of development at the local and regional scale. Many small rural towns have incurred employment losses and out-migration during the recent economic recession and their economic and social sustainability is vulnerable to further external shocks. The Strokestown LAP, for instance, states that there is insufficient local industry and employment within the town to serve its population. Both the Regional Planning Guidelines and Roscommon Enterprise and Innovation Strategy emphasise the role of smaller towns and villages as potential centres for enterprise. They stress the potential greater contribution that the high quality environment can make to place making, creative industries, food product development and tourism.

6.4 Predicted Impacts on Population

6.4.1 Introduction

The proposed road development will transfer most through traffic from the existing N5. This will have the effect of improving journey times for regional and some local traffic, of improving journey amenity on and in the vicinity of the existing N5, and of reducing severance. The improvement in regional journey times will be cumulative together with other upgrades to the National Primary Route and this will make a positive contribution to the potential for economic development for locations to the west. However, there are likely to be significant impacts on local businesses in the study area that rely on passing trade.

6.4.2 Construction

Construction works will have a *slight* impact on regional traffic. Only short diversions or short delays due to works traffic lights are likely for local traffic. Some slight short-term inconvenience is possible at the tie-ins with the existing N5 and along the R369 which is crossed by the proposed road development at three locations in the area of Mantua. Construction works will have an impact on general amenity where the alignment is close to individual residences or where re-alignment of local roads is necessary (for which see relevant Chapters 11 and 12 on Landscape and Visual and Noise). Amenity impacts also occur due to visual impacts north of Bellanagare and along the stretch parallel to the R368. There are no direct significant impacts on fish populations, although small rivers such as the Strokestown River connect angling locations both up and downstream while small tributaries in the vicinity of Frenchpark and Bellanagare could have spawning populations. Chapter 7 on Flora and Fauna proposes adherence to a Construction Erosion and Sediment Control Plan (CESCP) which will ensure only minor impacts on watercourses.

Six locations have been proposed as potential sites for construction compounds, none of which will have a significant impact with respect to socio-economic factors. Three of the compounds are located beside primary roads and construction traffic will not add appreciably to total traffic volumes (AADT) on these roads. However, there will be an increase in HGV traffic on the R369 of between 30% and 38% just west of the N61 in years 1 and 2 of the construction phase and a corresponding increase of 15% and 19% on the R368 south of Elphin. Existing HGV traffic at these locations is low, but a *slight negative* impact can be expected on the journey amenity for cyclists and motor vehicles due to the addition of HGV traffic (e.g. due to limited overtaking opportunities) and for the residential amenity of people living beside these roads (see Chapter 5 Traffic Analysis for more details).

There is an opportunity to potentially source rock material from existing authorised quarries and from the proposed road cuttings that will be required in this area. The construction works will require local inputs of this nature and this will provide an economic and employment input to the area. A positive impact can also be expected from the expenditure and accommodation needs of workers directly employed on the proposed road development for the construction period.

6.4.3 Journey Characteristics

The proposed road development will have a *very significant* positive impact in terms of regional journey times and journey time reliability due to the separation of regional and much local traffic along with improved sightlines. Over the length of the road development, a reduction in journey time of 31% is projected from 32 to 22 minutes by the Design Year under the Do-something scenario. This is in addition to the

positive cumulative journey time impacts with other improvements to the National Primary Route. Local journey times will be shortened too for instance for individuals using the proposed road development to travel to workplaces in Longford or Ballaghaderreen. Compared with the Do-Minimum scenario, this impact applies especially to Elphin as the National Primary Route will be brought closer to the town. Some other local traffic can be expected to transfer to the proposed road development too, but most will remain on existing roads and on the existing N5 from which regional traffic will have been transferred.

The transfer of vehicles to the proposed road development will reduce traffic on the existing N5 between Strokestown and Bellanagare by 66% under a central growth scenario. Journey times on the existing N5 will be subject to a revised speed limit, but journey amenity will be improved (see below). Other local roads could see a very slight increase in journey times due to the need to cross the proposed road development, but the significance of any impact is minor in comparison with the gains to journey amenity. An increase of up to 26% (500 AADT) in daily traffic is projected for the N61 to the north of the proposed junction with the road development. This arises partly because the proposed road development will become a more attractive alternative to the N4 for some journeys, for example to Longford or Boyle. A roundabout with associated road improvements is proposed for the junction between the N61 and the R369 at Shankill where there are currently restricted sightlines with a consequent impact on journey amenity (see Chapter 3 Description of the Proposed Road Development and Chapter 5 Traffic Analysis for more details).

6.4.4 Amenity

6.4.4.1 Journey Amenity

The proposed road development will present a *significant positive* impact on journey amenity for regional drivers due to safer opportunities for overtaking provided by the separation of slower local and faster moving traffic, a safer cross section and improved alignment. The reduced volume of traffic on the existing N5 will also result in a *significant positive* impact on journey amenity. Access to the proposed road development from the R361 will be possible using a roundabout junction at Ch. 10+000 as well as at the western tie-in (for eastbound traffic) and junctions with the existing N5 at Ch. 2+700, and 1Ch. 2+800. Given the nature of the design, access to the proposed road development will be possible from existing minor side roads in most cases or, alternatively, from the existing N5 where there are nearby junctions with the new alignment.

Crossings of the existing N5 by drivers especially at the crossroads at Frenchpark, Tulsk and Rathcroghan will be much safer. The improvement is due only to the reduction in traffic volumes in most cases, although the R361 between Boyle and Castlerea will be given priority over the existing N5 in Frenchpark significantly improving safety at this location. Right hand exits to minor roads will also be safer.

Vehicle drop-offs at schools will be safer in Frenchpark, Bellanagare, Tulsk and Strokestown. Journeys by children to these schools will also be both more pleasant and safer due to reduced severance and reduced traffic volumes, noting the narrowness of footpaths at some locations. New road crossings due to the proposed road development could impact on the journey amenity of vehicle and school bus journeys in a few locations, although these crossings will be safer when compared with similar crossings of the existing N5. Of the towns on the existing road, only Strokestown has a secondary school, although within the study area a secondary school is also located at Elphin. The reduction in traffic in vicinity of Strokestown and

on the existing N5, together with safer road crossings, provides an opportunity for more walking and cycling by students.

For local traffic in Strokestown, journey amenity will be improved by the proposal for a roundabout junction to replace the current combination of a blind bend and junction in Kildalloge on the northern edge of the town between the R368 and the Lavally Road (LP1405). The realignment of Lavally Road will also provide new access via a local road to the graveyard and a residential estate. This will reduce the risk from parking associated with funerals causing prolonged congestion on the road. A new car park will be constructed for the graveyard too.

Journey amenity for cycling generally will be significantly improved by safer crossings of the existing N5 and by the transference of most traffic, especially of HGVs, from the road. This is a *significant positive* impact given the low volume of cycling in the current and Do-Minimum scenarios. Elsewhere, there is a slight loss of cycle journey amenity on some local roads where intercepted by staggered junctions, for example, the existing N5 west of Bellanagare or the R369 at Mantua, although this is mitigated by the presence of hard shoulders. There is also some loss of cyclist amenity on the R368 due to the proximity of the proposed road development. These impacts are significant (see Impacts Table), but to a lesser degree than the transference of traffic from the existing N5. The number of cycle and pedestrian journeys on the existing N5 is likely to increase as a consequence.

Although few at present, pedestrian journeys between properties and between heritage sites alongside the N5 will also be safer and more pleasant, representing a *moderate positive* impact. There will be opportunities to promote both walking and cycling due to the improvement in journey amenity. For instance, although the Type 1 single carriageway road will not include cycle paths, noting also the small numbers of people cycling on the existing N5, the 2.5m hard shoulders will provide a refuge facility for cyclists, most particularly longer distance cyclists who may choose to use the proposed development. Walking and cycling will also be provided for with dedicated facilities between Kildalloge and the Strokestown Roundabout which will provide connectivity to services in Strokestown for longer distance cyclists.

6.4.4.2 General Amenity

A *moderate positive* impact on general residential amenity will apply in Strokestown, although there will a loss of parking outside of three properties on the southern approach to the junction with the existing N5. A *significant positive* impact on general amenity will apply in Tulsk, Bellanagare and Frenchpark due to the transference of much traffic to the proposed road development and the beneficial impact that this will have in terms of the cumulative effect of reduced severance, noise, visual intrusion and improved local air quality. Much the same positive impact applies to individual residences along the existing road. A significant positive impact will extend to the Rathcroghan archaeological complex for the same reasons and the benefit this will have in terms of the ambience of the locality for local visitors and tourists. The reduction in traffic on the existing N5 provides an opportunity for the community to promote the area and its heritage features for tourism and leisure use with the added benefit of introducing new economic activity to the area.

The transfer of a proportion of traffic to the proposed road development will have a positive impact on the general amenity of people living along some local roads. For example, a *slight positive* impact also applies to residents on the R368 between Elphin and Strokestown, due to the potential for HGVs leaving the quarry at Largan to use the proposed road development via the junction at Ch. 34+750.

A *slight negative* amenity impact will apply to the Douglas Hyde Centre as most traffic will be transferred to the new road development and the facility will not be visible to people using the proposed road development. However, access will be possible immediately adjacent to the west and the impact can be reduced with appropriate signage (see Section 6.5).

A residual *moderate negative* amenity and severance impact applies to the cutting of two minor roads at Ch. 13+150 and Ch. 13+700 which together form a local circular walking route to the north of Bellanagare. Although lightly used, the walk is a local amenity. An impact on the route is inevitable, but the visual impact is mitigated by the proposed road being with a cutting between these points. A physical crossing of the proposed road development at Ch. 13+000 for the western arm of the footpath is not practicable, but a connecting 3m wide length of shared footpath/cycleway will be provided on both sides of the mainline providing an option to walk or cycle along the proposed road development and to connect with the minor road forming the eastern arm of the loop at the 13+700 and an underpass with segregated footpath at Ch 13+950. In this way two walking/cycling loops will be created, one of 2.95km completely to the south of the new road and one of 5.77km which uses the underpass and the northern loop also. A track from this location will also allow continued access to private peat cuttings on Drummin Bog.

The proximity of the proposed road development to hills and lakes in the vicinity of the R368 between Elphin and Strokestown will have a negative impact on the ambience of the location as regards general amenity, for example residential, angling, walking or recreational cycling. The impact is *slight* in socio-economic terms, but cross-reference should be made to the chapters on Visual and Noise Impacts. The impact is balanced to a degree by proposed woodland landscaping and the positive impact that elevated views will have on the journey amenity of those using the proposed road development. The road development is also likely to have a negative impact on some lands used by Strokestown Gun Club to the east of Strokestown Park in the vicinity of the Scramoge River as shooting will not be able to take place in the vicinity of the road.

6.4.5 Severance

The transference of traffic from local settlements will provide for safer crossings of the existing N5 and significant relief from severance by permitting less hazardous access to community facilities including shops on either side of the road. This represents a *significant positive* impact in Frenchpark, Bellanagare, Tulsk and parts of Strokestown. In Strokestown there will be relief from existing severance on Bridge Street and in both Frenchpark and Strokestown there are particular benefits from relief from severance in the vicinity of schools and sports grounds. In Frenchpark, both relief from severance and improved journey amenity is provided by the reduction in traffic combined with the transfer of priority to the R361 at the junction with the existing N5.

Partial new severance, mainly physical, but also psychological, is presented by the presence of a junction with the proposed development between Frenchpark and Bellanagare. This arises from the close ties between the two communities, for example, the shared use of soccer and GAA facilities. The physical severance would apply mainly to cyclists, although the staggering of the junction mitigates the potential hazard. However, at Peak a farm underpass will also be available for use by pedestrians or cyclists.

Between Ch. 10+800 and 11+300 a new track will be provided from the existing track off the R361 Castlerea Road to permit access to existing turf cutting at Leggatinty Bog. To the east at Ch. 13+950, an underpass crossing will provide a connection for local leisure walking and cycle traffic (as discussed under Amenity) and access to private peat cuttings on the west side of Drummin Bog. Access to bog will no longer be possible using the track at Ch. 14+950. Local traffic in this area may need to cross the road development at the staggered junction at Ch. 15+550 – Ch. 15+800 at Tonaknick to the east or at the Bellanagare junction 2km to the west presenting a *slight negative* impact prior to mitigation. Similar considerations apply to the staggered junction at Mullenduff (Ch. 17+600 and 17+900) where there are cutaway bogs to the north. Slow moving vehicles such as those pulling trailers or agricultural stock or turf will be able to use the hard shoulder for the short stretches between staggered junctions.

Direct access to Kilnamryall Church will be provided across an overbridge of the proposed road development at Ch. 19+700. To the east, a slight detour and crossing of the proposed road will apply to a small number of residents living along the minor road from Flaskagh or Raheen to Cartronagor when accessing Elphin.

A roundabout junction (proposed Strokestown Roundabout) is proposed at Lavally Road (LP-1405) at Ch. 50+000. Pedestrians and cyclists will be able to avoid the roundabout by crossing at a refuge area within a splitter island immediately to the east via the short section of the severed old road. A shared pedestrian and cyclist path extending to the proposed Kildallogge Roundabout will provide relief from severance and improved journey amenity between the community in the vicinity of Lavally Road and Strokestown. The LS8121, a minor road connecting Lavally and Scramoge will meet the proposed road development at a junction at Ch 52+250 with the short section south to the existing N5 connecting at Ch. 52+400. At Scramoge, an underpass crossing is proposed beneath the proposed road development at Ch 53+250 for local road LS-6144. This will also accommodate a lightly used informal circular walking route that uses local roads as well as a possible future Famine Walk from Strokestown House to commemorate the journey undertaken by 1,490 estate tenants in 1847, and re-enacted in 2016. In addition, the underpass will provide a continued vehicle connection between the community and the existing N5 to Strokestown avoiding any new severance impact while the development itself provides relief from severance noting the present volume of traffic on the existing N5.

6.4.6 Economic

The reduced journey time and improved journey time reliability will provide an economic stimulus to locations to the west by shortening journey times to the east of the country, including Dublin. The impact is cumulative together with improvements to other sections of the N5 National Primary Route and extends to journeys along the length of the route outside the study area.

The transference of through traffic from the existing N5 will, however, have a negative impact on businesses located beside the road that benefit from passing trade or from people's familiarity with the business. Reductions in traffic on the existing N5 average 68%. Service stations will be significantly affected. These businesses also serve as convenience stores in communities which have lost small shops in recent years. Cafes, accommodation (i.e. hotels, B&Bs) and other businesses are also vulnerable to loss of passing trade and the associated familiarity provided by road frontage. Improved parking and access will be possible at some locations mitigating impacts on businesses or smaller shops and cafes which are orientated more towards local journeys. Reduced journey times will stimulate

regional development, but could also impact on use of the existing N5 for some existing public transport services.

The impacts on businesses are indicated in Figures 6.2 and 6.7. For example, along rural sections of the existing N5, *significant* negative impacts can be expected for a stonemasonry, a tyre shop, a fuel depot and a pub/restaurant at Churchstreet to the west of Frenchpark which receives overnight stops by lorry drivers. There will be an impact on the community of Frenchpark where traffic reductions of over 90% are predicted on the existing N5. The impact will be *significant* for the service station located here. Impacts on a pub/restaurant, a butchers and grocers will be partly mitigated by more convenient and safer parking on the main street arising from the reduced traffic volumes.

In Bellanagare, there is likely to be a *significant* impact on a café along with lesser impacts on a small grocery store, a pub/restaurant and a bed and breakfast to the west of the village. In Tulsk, there is likely to be a *significant* impact on a pub/restaurant, but also impacts on the service station, a car dealership and butchers/grocery shop. A *moderate* negative impact is likely for the hotel in Strokestown and for the service station with impacts also anticipated for convenience restaurants and a supermarket in the town. Most shops are located on the Elphin Road which is projected to receive a small decrease in AADT.

Loss of business can have a knock-on impact of the local economy of small towns which have witnessed depopulation and shop closures in recent years. However, as the design permits an opportunity to leave and rejoin the proposed road development, there is potential to reduce the significance of these impacts in Frenchpark and Strokestown in combination with appropriate signage. This option is not available for Bellanagare or Tulsk.

The transfer of traffic to the proposed road development could have an impact on the number of visits to the Strokestown Park House and the Rathcroghan complex, but this can be mitigated through marketing and signage in line with TII policy guidance (see references below). Given its proximity to the proposed road development, signage can also be used to attract visitors to Elphin (including its historic windmill) which has hitherto been rather distant from the National Primary Route. The presence of attractions and facilities such as these, in particular the attractive countryside and under-developed archaeological heritage presents an opportunity to develop the tourism potential of the area. Such a strategy could include the promotion of the local area for tourism and cycle touring. Rathcroghan could potentially become an important visitor magnet for the County given that the transfer of through traffic will considerably enhance the ambience of the location and the character of this heritage asset allowing for its promotion and sensitive development for tourism and education.

6.5 Methodology for Human Health Impact Assessment

Generally, the “do nothing” scenario is that nothing significant will change and one simply has to consider primarily the “do something” scenario.

The do-nothing scenario here however is that traffic demands in the area will continue to grow whether the proposed road is given permission or not. The number of people driving in the area and its environs has increased and in all probability, will continue to do so. People decide where to live for many reasons including proximity

to their jobs, schools, family, etc. Proximity to roads is one consideration but often not the most important.

When one tries to determine the effects of a proposal on human beings, one must develop a methodology that is appropriate. Elsewhere within this Environmental Impact Assessment Report, there are detailed chapters giving the projection of impact on aspects as variable as air quality, noise, vibration, etc. These are reliable estimates based on predictions of the traffic usage of the road as well as modern emission data and modern modelling mechanisms which accurately determine the impact of the proposed development.

For this assessment, the United States Environmental Protection Agency (USEPA) Human Health Risk Assessment methodology has been followed. This was chosen as it outlines a step-by-step approach to human health risk assessment. It follows a logical progression. Other guidance such as issued by the Irish EPA is more generic in nature and less specific on methodology so less useful in actually making an assessment.

The USEPA Human Health Risk Assessment includes 4 basic steps:

Step 1 Hazard Identification

This examines whether a stressor has the potential to cause harm to humans and/or ecological systems, and if so, under what circumstances.

Step 2 - Dose-Response Assessment

This examines the numerical relationship between exposure and effects.

Step 3 - Exposure Assessment

This examines what is known about the frequency, timing, and levels of contact with a stressor.

Step 4 - Risk Characterisation

This examines how well the data support conclusions about the nature and extent of the risk from exposure to environmental stressors.

The USEPA Human Health Risk Assessment is represented graphically as:

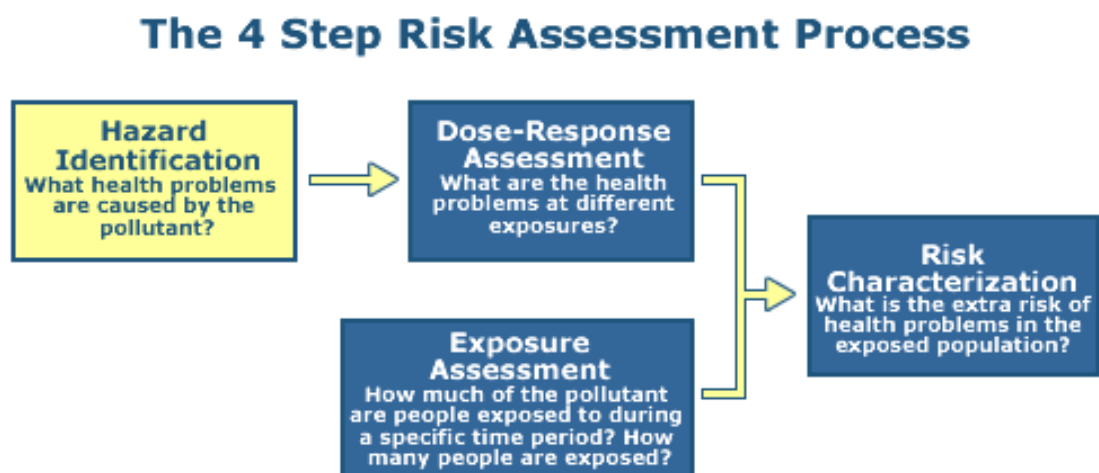


Figure 1 Human Health Risk Assessment (Ref USEPA)

The 4 components are hereby explained individually.

Step 1 – Hazard Identification

The objective of Step 1 is to identify the types of adverse health effects that can be caused by exposure to some agent in question, and to characterise the quality and weight of evidence supporting this identification.

Hazard Identification is the process of determining whether exposure to a stressor can cause an increase in the incidence of specific adverse health effects (e.g., cancer, birth defects). It is also whether the adverse health effect is likely to occur in humans. In the case of a road project one might consider an emission such as noise or air pollutants and examine its potential for harm.

Sources of Data

Statistically controlled clinical studies on humans provide the best evidence linking a stressor to a resulting effect. However, such studies are frequently not available since there are significant ethical concerns associated with human testing of environmental hazards.

Epidemiological studies involve a statistical evaluation of human populations to examine whether there is an association between exposure to a stressor and a human health effect. The advantage of these studies is that they involve humans while their weakness results from generally not having accurate exposure information and the difficulty of teasing out the effects of multiple stressors.

All this effectively means completing a literature review to examine data from other similar projects.

Step 2 – Dose Response

A dose-response relationship describes how the likelihood and severity of adverse health effects (the responses) are related to the amount and condition of exposure to an agent (the dose provided). The same principles generally apply for studies where the exposure is to a concentration of the agent (e.g., airborne concentrations applied in inhalation exposure studies), and the resulting information is referred to as the "concentration-response" relationship.

Typically, as the dose increases, the measured response also increases. At low doses there may be no response. At some level of dose the responses begin to occur in a small fraction of the study population or at a low probability rate. Both the dose at which responses begin to appear and the rate at which it increases given increasing dose can be variable between different pollutants, individuals, exposure routes, etc.

The shape of the dose-response relationship depends on the agent, the kind of response (tumour, incidence of disease, death, etc.), and the experimental subject (human, animal) in question. Typically, as the dose increases, the measured response also increases.

Some individuals may have a different dose response effect than others. Examples of this might be the elderly, the very young or the sick. Upon considering all available studies, the response (adverse effect), or a measure of response that leads to an adverse effect (known as a 'precursor' to the effect), that occurs at the lowest dose is selected as the critical effect for risk assessment. The underlying assumption is that if the critical effect is prevented from occurring, particularly in the most vulnerable, then no other effects of concern will occur.

As with hazard identification, there is frequently a lack of dose-response data available for human subjects. When data are available, they often cover only a portion of the possible range of the dose-response relationship, in which case some extrapolation must be done in order to extrapolate to dose levels that are lower than the range of data obtained from scientific studies. Also, as with hazard identification, animal studies are frequently done to augment the available data.

A No-Observed-Adverse Effect Level (NOAEL) is the highest exposure level at which no statistically or biologically significant increases are seen in the frequency or severity of adverse effect between the exposed population and its appropriate control population. In an experiment with several NOAELs, the regulatory focus is normally on the highest one, leading to the common usage of the term NOAEL as the highest experimentally determined dose without a statistically or biologically significant adverse effect. In cases in which a NOAEL has not been demonstrated experimentally, the term "lowest-observed-adverse-effect level (LOAEL)" is used, which is the lowest dose tested that causes an adverse health effect.

This is important as it introduces the concept of a THRESHOLD. That is the level of an agent at which, if maintained below, no adverse Human Health effect is anticipated.

This in turn leads on to the concept of Health Based Standards. These, when set by reliable agencies such as the World Health Organisation (WHO) or the European Union (EU) can help us in identifying health based thresholds below which no adverse Human Health Effect is anticipated. As referred to above these are set at levels to protect the vulnerable, not the robust.

Step 3 – Exposure Assessment

This is the process of measuring or estimating the magnitude, frequency, and duration of human exposure to an agent in the environment, or estimating future exposures for an agent that has not yet been released. An exposure assessment includes some discussion of the size, nature, and types of human populations exposed to the agent, as well as discussion of the uncertainties in the above information.

Exposure can be measured directly, but more commonly is estimated indirectly through consideration of measured concentrations in the environment, consideration of models of transport and fate in the environment, and estimates of human intake over time.

In a project such as this one, for relevant emissions, while it is possible to take baseline levels of various agents, we are reliant on models to predict the future outcome. These models are based on certain assumptions. These typically are assumed worst case scenarios, for example, worst case weather conditions. This means that in all likelihood actual exposures will be less than those modelled.

Exposure assessment considers both the exposure pathway (the course an agent takes from its source to the person(s) being contacted) as well as the exposure route (means of entry of the agent into the body). The exposure route is generally further described as intake (taken in through a body opening, e.g. as eating, drinking, or inhaling) or uptake (absorption through tissues, e.g. through the skin or eye). Modelling for relevant emissions is detailed in other chapters of this EIAR and will be referred to further in this assessment.

Step 4 – Risk Characterisation

A risk characterisation, conveys the risk assessor's judgment as to the nature and presence or absence of risks, along with information about how the risk was assessed, and where assumptions and uncertainties still exist.

In practice, each component of the risk assessment (e.g. hazard assessment, dose-response assessment, exposure assessment) has an individual risk characterisation written to carry forward the key findings, assumptions, limitations, and uncertainties. The set of these individual risk characterisations provide the information basis to write an integrative risk characterisation analysis.

The final, overall risk characterisation thus consists of the individual risk characterisations plus an integrative analysis.

The US EPA's Risk Characterisation Policy for conducting risk characterisations suggests the following principles:

Transparency - The characterisation should fully and explicitly disclose the risk assessment methods, default assumptions, logic, rationale, extrapolations, uncertainties, and overall strength of each step in the assessment. In places where professional judgement is required it should be based where possible on evidence based materials. An example of this would be to use health based Standards set by independent and reputable agencies rather than personal opinion, no matter how well educated or informed.

Clarity - The products from the risk assessment should be readily understood by readers inside and outside of the risk assessment process. Again this is aided by use of Health Standards which are freely available to the public with published evidence based criteria.

Consistency - The risk assessment should be conducted and presented in a manner which is consistent. The same Standards should be used throughout the assessment.

Reasonableness - The risk assessment should be based on sound judgment, with methods and assumptions consistent with the current state-of-the-science and conveyed in a manner that is complete and balanced, informative.

These four principles are referred to collectively as **TCCR**. In order to achieve TCCR in a risk characterisation, the same principles need to have been applied in all of the prior steps in the risk assessment which lead up to the risk characterisation.

Significance of Health Effects

There is a difficulty in assigning levels of significance to Human Health effects. In medicine as in all science we use the concept of statistical significance. That is putting a value, often in terms of percentage levels of our confidence in the data. We would often use confidence measures of 95% or even 99% to measure our levels of certainty that any changes are not due to chance alone.

This is a valid approach for the study of the effects on a population. It does not absolutely exclude a response on an individual.

This may be best explained with an example. Preventing one fatal road traffic accident may not make a significant impact on National accident figures in any one year but it is hugely significant for the individuals involved and their families. While it may not be statistically significant saving one life must be considered significant in human terms.

There is such a variability in human response that one could never hope to identify all possible individual effects. We can however more easily predict significance of effects on populations.

The significance criteria are therefore as follows:

Table 6.11 Criteria Used in the Assessment of Human Health Impacts

Impact Level	Significance Criteria
Imperceptible	No significant human health impacts are apparent.
Slight	A small impact on individual reported symptoms but no change in health status can be attributed to the proposed development.
Moderate	A moderate impact on health status of individuals but no change in morbidity or mortality can be attributed to the proposed development.
Significant	A proposed development has the potential to impact on individual health status
Very Significant	A proposed development has the potential to impact on the health status of groups.
Profound	A proposed development has the potential to impact on the health status of communities.

We can take the example of asthma using these criteria.

An **Imperceptible** effect would be one with no measureable effect on asthma.

A **Slight** impact might be a temporary increase in symptoms in an individual but no change in the severity of the underlying condition or treatment required.

A **Moderate** impact might be an individual increasing their use of inhalers attributable to the development but no change in underlying condition and no effect on the vast majority of asthmatics.

A **Significant** effect might be an individual becoming asthmatic or an individual's asthma becoming measurably more severe as a result of the proposed development.

A **Very significant** effect might be a group of individuals becoming asthmatic or their asthma becoming measurable more severe as a result of the proposed development.

A **Profound** effect might be a measurable increase in the incidence or severity of asthma in a community as a result of the proposed development.

Health Based Standards

Health based standards are set to protect the vulnerable, not the robust. They have an in-built measure of significance. They are set at levels where there will be no significant health effects. They do not exclude each and every effect, in other words Imperceptible, Slight and perhaps at times Moderate health effects are possible even at levels where health based standards are observed but certainly one would not predict Significant or higher effect.

In determining the most appropriate methodology a number of Guidance Notes were reviewed. The Irish EPA Guidance favours the Health Based Standards approach.

In it's publication: *EPA Revised Draft Guidelines on the Information to be contained in Environmental Impact Statements (August 2017)* it states:-

'The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on

health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment."

These Health Based Standards will be discussed further but it is appropriate to understand the principal behind the setting of such standards. In this, it is useful to consider Guidance by the US EPA in performing a Human Risk assessment.

Baseline environmental analysis, and predicting proposed emissions of the construction and operational phases of the proposed project, is highly scientific. Measurements particularly when they are taken over a period of time in a number of different sites can give a very detailed picture of the background environment. Modelling for likely changes in this baseline environment caused by potential emissions is also remarkably reliable. The knowledge of the potential human health effects of these changes is also growing to an extent where we can make confident assertions. We are also learning more all the time about health thresholds for environmental agents. Thresholds are levels below which we do not expect any detrimental health effects. This means we can reliably extrapolate from potential changes in environmental conditions to potential impacts on human health. The use of this method therefore has the benefit of providing a simpler but more reliable method of assessment for a project such as this.

It is true to say that it is difficult to measure potential effects not directly affected by emissions, such as psychological effects or social well-being. However the assessment of these areas is more subjective regardless of the method chosen and at any rate the vast majority of possible detrimental effects to human health are related to emissions. In this project therefore a Human Health section of an overall Environmental Impact Assessment is used in the assessment. Modelling and assessments contained elsewhere in the EIAR are utilised to assist in this process. Not alone is this approach consistent with planning law it is more practical and accurate than other approaches.

6.6 Human Health Impact Assessment

6.6.1 Hazard Identification

A literature review was performed. This attempted to identify recognised health effects of road building and road operation on populations in proximity to road building and operations.

The last fifteen years has seen an unprecedented growth in road projects within the Republic of Ireland. There has been the development of the modern motorway network between the major urban centres as well as relief roads in urban areas, such as the widening of the M50 around Dublin, the building of the N25 ring road around Cork and the tunnel under the Shannon and ring road around Limerick City. An attempt was made to identify any published data on any reported health effects from either the construction or operational phases of these roads. Using a "Pubmed" search, key words such as Health Effects Roads Ireland found that there were no published studies in peer review literature.

By expanding the search criteria by removing the Ireland key word, 436 articles were found. The vast majority of these deal with potential emissions from operational roads with a particular emphasis on Noise, Particulate Matter (including PM₁₀ and PM_{2.5}) as well as other air pollutants such as NO₂ and SO₂ amongst others. There is little doubt of the potential for adverse effects of these agents. The literature

however is strongly consistent with a dose response effect, the lower the dose the lower the effect. Health Based Standards such as WHO and EU standards incorporate literature evidence in the setting of these standards. In essence there is little evidence of significant health effects when these Standards are not exceeded.

A relatively recent article by Chen *et al* published in the Lancet in early 2017 showed a small (7%) increase in the incidence of dementia in those living less than 50m from major roads, but no increase in the incidence of Multiple Sclerosis or Parkinsons disease. They postulated that increased levels of PM_{2.5} and NO₂ may be associated factors. There were important limitations on the study however. It was based in Ontario, Canada where major roads would include motorways and very busy truck roads. The proposed N5 would not have likely qualified. Perhaps the most significant criticism of the study is that they could not control adequately for socioeconomic effects which we know are related to the incidence of dementia. If the individuals living within 50m of major roads in Ontario were of lower socioeconomic status than those living further away this might explain the relatively small effect. Overall while further studies are recommended we can draw relatively little from this one study and certainly no conclusions can be drawn in relation to causation.

While there are some difficulties making comparisons between the impact of road building in say China, far more relevant information can be gleaned with similar projects within Ireland while conscious of international published data.

The 2014 publication from the Organisation for Economic Co-Operation and Development (OECD) *The Cost of Air Pollution, The Health Impacts of Road Transports* points out that while the health impacts of air pollution in Western countries is decreasing, that it is increasing in countries like China and India. It is more important for us in Ireland to consider the data from this country and similar countries.

While it is now some twelve years old, an important document in Ireland was the *Health Impacts of Transport, a Review* published in March, 2005 by the Institute of Public Health in Ireland. This remains the most recent publication from this body on this subject.

The Institute of Public Health was established in 1998 to promote co-operation in public health across Ireland. It aims to improve health by working to combat health inequalities and influence public policies in favour of health. The document reviews the elements of health impacts of transport. It originated as part of the transport HIA in Ballyfermot organised by the Eastern Regional Health Authority and proceeds from the Institute's strategic objective to strengthen the capacity of those working for public health.

In the executive summary they commented:

“the effect of air quality on human health has been extensively researched and expert opinion is available in this area. Currently, evidence is strongest for air pollution as a cause for short-term health problems in certain groups such as the elderly and those with underlying health problems such as heart or lung disease. Longer term health impacts are suspected to result from certain components of air pollution. However, it has been difficult to ascribe a cause and effect with certainty. Traffic is a leading source of air pollution and any issues which would reduce traffic volume can have potential benefits to health by improving air quality. Vehicle speeds is also a factor warranting consideration. Low average speeds such as those on congested routes are less efficient in the use of fuel and result in greater pollution emissions.”

It appears that this is clear evidence that the principle of moving traffic to a road with higher average speeds has a potential benefit on health.

Identification of vulnerable groups

When assessing the impact of the proposed road development on Human Health an initial step is to identify the potentially vulnerable groups. These vulnerable groups which may be more subject to impact will include children.

Children and adolescents constitute a vulnerable group partly due to their need to be able to move around freely to and from school and recreational activities. They lack the experience and judgement displayed by adults when moving around traffic in public spaces, and studies show that they may also be more sensitive than adults to noise pollution and other environmental factors.

Older people constitute a very variable group when it comes to their need and scope for moving around the community. Generally speaking, the older they are, the slower their movements and the more health conditions that may occur. Older people in general have greater sensitivity to air pollution and potential effects on the respiratory system and cardiovascular system. There are many reasons for this including the possible presence of other medical condition such as respiratory or cardiovascular disease. Some subtle changes in the environment has the potential to have an adverse effect that would not be experienced by a younger more resilient persons. There are other vulnerable groups also, for example, the disabled or psychologically ill.

It is of course important to recognise that when health based standards are set that it is the vulnerable groups which are considered.

6.6.2 Exposure Assessment

It is obvious from the above that Standards, be they Air Quality Standards or Noise Guidelines, etc., provided they are issued by reliable or statutory agencies, are a useful method in assessing the impact of any proposed development.

As previously mentioned health standards are not there to protect the robust, who may be far more resilient but are primarily there to protect the vulnerable.

Impacts of Emissions to Air

When one looks at Air Quality Standards, for example, slightly higher levels of oxides of nitrogen may have no effect on the vast majority of the population but they may be significant for subsections of the population, such as those with respiratory illnesses, the old and infirm. Hence in this assessment we relied on Air Quality Standards to determine if any potential changes in levels of oxides of nitrogen generated by the proposed road development, and as detailed in Chapter 13 of this EIAR (Air Quality and Climate Change) would have an impact on human health. The conclusion of Chapter 13 was that the results of the air quality and climate assessment have shown that, with appropriate mitigation measures in place, residual impacts of the proposed road development on air quality and climate for the long and short term result in negligible impacts or, in the case of local air quality, slight beneficial impacts. Provided the standards are set by reliable bodies therefore and if we can determine that these standards are not breached, either in the construction or the operational phase of the development, we could be confident of no significant impact on human health. The standards used in Chapter 13 include the *Air Quality Standards Regulations 2011*, which incorporate *European Commission Directive 2008/50/EC*

which has set limit values for the pollutants SO₂, NO₂, PM₁₀, benzene and CO. The *Council Directive 2008/50/EC* combines the previous *Air Quality Framework Directive (96/62/EC)* and its subsequent daughter directives (including *1999/30/EC* and *2000/69/EC*). Provisions were also made for the inclusion of new ambient limit values relating to PM_{2.5}. These are clearly appropriate and robust standards.

Impact Assessment

Using the criteria for the significance of Health Impact detailed in **Table 6.11** above the impact is assessed as **Imperceptible**.

Impacts of Noise Emissions

With regards to noise pollution, which is dealt with in Chapter 12 Noise and Vibration, the review says that major reviews of the impacts of noise have found that while some studies indicate a possible impact on health from noise, many of these were of poor quality and therefore produced poor results. It concluded that a link between noise and health damage could not be drawn with certainty except in the case of annoyance.

Again, we have relied here on environmental noise standards. Here there are specific guidelines for roads issued by TII/NRA. Clearly these are the relevant standard. By comparing the predicted noise emissions as detailed in Chapter 12, with reliable noise standards, we can determine if any health effect is likely as a result.

In Chapter 12 it was identified that during the construction phase of the project there is potential for some temporary moderate to significant impact on nearby residential and business properties due to noise emissions from certain construction activities. The application of binding noise limits and hours of operation, along with implementation of appropriate noise control measures, will ensure that noise impact is kept to a minimum.

During the operational phase, noise modelling has shown that the predicted noise levels at nine receptors exceeded the specified TII/NRA Noise Mitigation Criteria. In this instance, mitigation measures have been specified. Once such measures are implemented, it was shown that all locations comply with the adopted criterion.

Properties along the existing N5 will experience a significant reduction in noise levels (of the order of 4 - 20dB L_{den}) depending on the distance from the road, traffic volume changes and speed reductions. The Candidate UNESCO World Heritage Site of the Rathcroghan Archaeological complex will also benefit from the removal of traffic and the visitor experience will be significantly improved with noise reductions of the order of 6-9 dB L_{den}.

It may be concluded that the project complies with the appropriate guidance in relation to noise, hence the associated human health impact is considered acceptable.

From a Human Health impact assessment it may also be useful to consider purely health based guidelines such as the WHO Guidelines.

In 2009 the WHO issued *Night Noise Guidelines for Europe*. This explores the effects of night time noise. It stated that in the two European countries studied (Switzerland and The Netherlands) that almost 60% of the population are exposed to night time noise in excess of 45dB L_{night}.

The unit L_{night} is a slightly different unit to the L_{den} used in TII Guidelines and predominantly therefore used in Chapter 12 of this EIAR. It reflects only on night time noise rather than the weighted 24-hour measurement of L_{den} .

It quotes some effects at quite low night time levels and proposed an ideal noise level of 40dB L_{night} outside residences. It does accept that this is essentially unachievable and suggests an interim value of 55dB L_{night} again outside residences. This level is still ambitious as a very significant proportion of the European population lives in conditions exceeding this and often significantly so.

It should also be stated that the effects detected at lower night time levels, below 55dB L_{night} are relatively benign such as increased motility (tossing and turning) while asleep. More significant health effects are only linked to much higher noise levels, usually well above 55dB.

In terms of the significance of Human Health Impact, and in conformance with the criteria referred to above in Table 6.11, the following would be interpreted:

If the L_{night} is below 40dB the Human Health impact is Imperceptible;

If the L_{night} is above 40dB but below 55 dB the Human Health impact is slight; and

If the L_{night} is above 55dB the Human Health impact is moderate or significant.

What determines its significance is the amount of the exceedance. For example an L_{night} of 65dB is likely to be significant whereas an L_{night} of 55dB or 56dB is likely to be moderate at worst. The other factor that needs to be considered is the baseline. If the change from the current baseline is 3dB or less, even if the absolute levels are above 55dB the change is likely to be imperceptible.

The overall effect will be beneficial as there will be noise reductions at residences along the current route. The predicted noise levels even at 2035 worst-case scenario suggests only five noise receptors, that is residences, are at or above 55dB L_{night} . The highest predicted level at any residence is 56dB so this suggest at most a moderate adverse effect even at worst case 2035 traffic conditions. This amounts to just over 1% of the 378 properties modelled. In all likelihood noise levels will never reach this because of reduction of emitted noise from vehicles with the use of electric vehicles et cetera. We can be confident therefore that the overall noise impact of the scheme is likely to be beneficial with a slight or at most moderate impact at a small number of residences.

6.7 Predicted Impacts on Human Health

Therefore it is found that only one receptor in the entire scheme will have even **Moderate** effect and that only barely so. For no other receptor will the adverse Human Health Impact be more than **Slight** and at most receptors the impact will be **Imperceptible**. In addition there is a considerable number of properties along the existing N5 where slow-moving, stop-start traffic will be removed, resulting in a **Positive** impact. The overall impact of the scheme therefore is deemed as **imperceptible** or **positive**.

6.7.1 Impact of Emissions to Water

The impact of emissions to water has been extensively assessed in Chapter 9 Hydrogeology. This assessment concluded that given the mitigation measures proposed, there is a slight residual impact from the proposed development with respect to groundwater quality as a resource. In terms of the quantity of groundwater

available within the aquifer (the yield of the resource) there will be an imperceptible effect at the regional scale.

As noted in Chapter 9 individual wells may be affected in terms of flow or water quality, however there will be no impact in potable water quality as alternative supplies will be utilised if necessary. At all times Water Quality standards will be observed to ensure public health.

6.7.2 Impact Assessment

Given that all residual water supplies will comply with water quality standards the impacts on Human Health are assessed as **Imperceptible**.

6.7.3 Impacts on Human Health Not Due to Emissions

While it is fair to say that most potential human health impacts are related to potential emissions either during the construction phase or the operational phase it is worthwhile considering other potential impacts, both positive and negative.

Potential impact on psychological health should be considered. In the planning process potential adverse effects on psychological health are often mentioned, for example, from annoyance due to the temporary impacts of traffic management and other effects during the construction phase. As against this there is the potential reduction in annoyance amongst road users during the operational phase where there will be reduced journey times. In reality in both cases annoyance is not in itself a health effect. Overall there are no mitigation measures or residual impacts.

In addition certain individuals will be affected either by compulsory purchase orders or changes in the environment in which they live. These people will often genuinely believe that their lives will be adversely affected. However there are such individuals in virtually every similar project ever developed. As outlined in 6.6.1 above a literature search failed to identify any evidence of adverse effect on psychological health from similar projects in the past.

There is however one area where we can be confident of a positive impact on human health. It is clear that in the operational phase there is going to be a reduction in road accidents and more particularly fatalities. This is more completely dealt with in Chapter 5 however the following section outlines the predicted result:

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.

Quite apart from the positive impacts on the individuals who will not die, one must also remember the wider impact on psychological health of every fatal accident. Families, friends and colleagues can have huge adverse impacts arising from each and every tragedy. Preventing these fatalities will have positive impacts not only on the road users but also their communities.

6.8 Mitigation Measures

6.8.1 Mitigation Measures for Population

The road design process and public consultation has allowed for the inclusion of mitigation measures such as junction improvements, pedestrian and cycle facilities and crossing facilities at roundabouts at Strokestown and Lavally Road, and an underpass at Ch. 13+950 (for local walking and bog access). A footpath is proposed between the junction on Lavally Road and community facilities in Strokestown.

Other mitigation measures included in the road design include, for journey amenity, staggered junctions with minor roads and a roundabout between the N61 and R369, and for general amenity and severance, new cemetery access and parking in Strokestown, a refuge area for pedestrian/cyclists crossings of the road development from the LP1405, and underpasses for walking routes in Bellanagare and Scramoge supplemented in the former case by additional looped walking facilities to the north and south of the proposed road development.

Although the proposed road development will contribute positively to regional development, the transference of traffic from the existing N5 will inevitably have an economic impact at a local level. Dedicated signage is proposed for Strokestown House, the Rathcroghan complex (including the visitor interpretation facilities in Tulsk) and the Douglas Hyde Centre. Town signage identifying the presence of service stations, restaurants/cafes and accommodation will be provided for Strokestown and for the smaller communities of Frenchpark, Bellanagare and Elphin. All signage will be in accordance with the Department of Transport, Tourism and Sport Traffic Signs Manual. In accordance with the TII Policy on the Provision of Tourist and Leisure Signage on National Roads, this must be generic in nature except where tourist facilities are of high significance or achieve a threshold of visitor numbers. Specific mitigation measures are listed alongside impacts in Table 6.11.

6.8.2 Mitigation Measures for Human Health

There are no specific mitigation measures required for human health.

6.9 Residual Impacts

The proposed road development will provide a *very significant positive* impact by reducing journey time and improving journey time reliability between the east and west of the country in combination with other recent or proposed improvements to the N5 National Primary Route. This will have a positive economic impact by improving the prospects for regional development.

At a local level, the transference of most traffic to the proposed road development will improve journey amenity along the existing N5 for local journeys. Crossings of the existing N5 will be significantly easier and safer, benefitting more vulnerable drivers. For cycling, in particular, there will be a significant improvement in journey amenity.

Hazardous vehicle and pedestrian crossings of the existing N5 can be found in each of the four communities along the existing N5. The transference of traffic from the road will improve both journey and general amenity in these communities.

Severance impacts are minimised by the continued presence of connections between the proposed road development and local roads. Where road closures are

proposed, nearby connections with the road development or existing N5 are available.

A loss of passing trade and reduced familiarity could impact on some businesses located beside or near the existing N5. However, this could be at least partially compensated by the enhanced environment provided for tourism given the concentration of natural and cultural heritage sites.

With respect to human health, based on the assessment above, we can be confident that there will be no residual adverse human health effects.

6.10 Difficulties Encountered

No particular difficulties were encountered in preparing the assessment.

6.11 Interactions and Cumulative Impacts

The reduction in journey times and related contribution to regional development represents a positive cumulative impact along with other recent or planned improvements to the N5 National Primary Route. The proposed road development is projected to attract additional traffic to the N61 between the proposed N61/N5 roundabout and Boyle. There is only low density housing along this road, although crossroads present existing journey amenity issues for current traffic volumes at Ratallen (R370) and Knockarush.

There are interactions between the assessment of population and human health in this chapter and those on Landscape and Visual, and Noise, and impacts discussed elsewhere in the EIAR. These interactions particularly relate to the amenity and tourism potential of the area with respect to positive and negative impacts on the integrity of the Rathcroghan complex, lakes and countryside within the R368 corridor, and local walking amenities such as the circular path at Bellanagare.

6.12 Summary

The principal impacts, positive and negative, of the proposed road development from the perspective of population and human health are as follows:

- Low level of construction impacts relevant to “population”;
- Reduced journey time for regional traffic;
- Closer connection between Elphin and National Primary Route;
- Improved journey amenity for regional and all modes of local traffic;
- Improved general amenity due to transference of traffic from the local communities of Frenchpark, Bellanagare, Tulsk and Strokestown;
- Residual impact on general amenity and partial severance of circular walking trail in Bellanagare, mitigated by the addition of new looped walking facilities;
- Improved general amenity and landscape integrity of Rathcroghan complex;
- Low severance impact due to connections between many local roads and either the proposed road development or the existing N5;
- Positive economic impact linked to reduced journey time and improved journey time reliability at regional level and at local level for some businesses;
- Significant loss of passing trade for some businesses beside the existing road; and,

- Potential to use improvements in general amenity of towns and heritage attractions to encourage more amenity use and tourism visits to the local area.

Of the local social and economic impacts, the most significant positive impact is the effect of the transference of traffic on the general amenity of local towns and improved journey amenity on the existing N5. The most significant negative impacts are the direct and indirect implications of the effect on passing trade and partial severance of the Bellanagare walking circuit, albeit mitigated by the new looped walking/cycling facilities. No significant impacts on human health are predicted and therefore no mitigation measures are proposed.

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Table 6.11 Impacts Summary

Construction

Nature of Impact	Location / Sub-Group	Current Situation	Impact of Road Development	Significance	Duration	Scale	Mitigation Proposed	Residual Impact
Journey time	Regional traffic Existing N5	n/a	Possible delays when road development nearing completion.	Slight negative	Short-term finite	Very high	Traffic Management Plan	Imperceptible – Slight negative
Journey time	Local roads	n/a	Short diversions for delays at works traffic lights.	Slight negative	Short-term finite	Medium	Appropriate light sequences	Slight negative
General and journey amenity	R369 and R368	Light HGV traffic	Small increase in overall AADT, but large proportional increase in HGVs especially in Years 1 and 2.	Slight-moderate negative	Short-term finite	Medium	Traffic Management Plan	Slight negative
Economic	Local economy	n/a	Purchase of local materials, including possibly road building materials. Spending and accommodation needs of workers.	Moderate positive	Short-term finite	Medium	-	Moderate positive

Operation

Journey Characteristics

Nature of Impact	Location / Sub-Group	Current Situation	Impact of Road Development	Significance	Duration	Scale	Mitigation Proposed	Residual Impact
Journey time	Regional traffic on N5	Delays due to mix of regional and local traffic and absence of safe overtaking opportunities	Proposed road development will reduce journey times.	Very significant positive (cumulative)	Long-term / perm	Very high	-	Very significant positive
Journey time	Local roads	n/a	Low severance, but use of staggered junctions on some roads. Some transfer of traffic to proposed road.	Imperceptible to slight positive	Long term / perm	Medium	Design includes junctions with most local roads	Imperceptible to slight positive

Health & Amenity

Nature of Impact	Location / Sub-Group	Current Situation	Impact of Road Development	Significance	Duration	Scale	Mitigation Proposed	Residual Impact
Journey amenity	Regional traffic	Delays due to slow moving traffic. Hazardous overtaking	Transference of most traffic to proposed road development.	Significant positive	Long-term / perm	Very high	-	Significant positive
Journey amenity	Local vehicle traffic	Hazardous overtaking and crossings of the N5	Transference of most traffic from existing N5.	Significant positive	Long-term / perm	High	-	Significant positive
Journey amenity	All traffic. N61 Boyle to proposed N61 junction	Moderate traffic levels. Some hazardous junctions	Slight increase in traffic projected.	Slight negative	Long-term / perm	High	Upgrade of N61/R369 to a roundabout junction	Moderate positive on balance at this location
Journey amenity	Minor road to Clooncullaan from R368	Blind bend for vehicles following others turning right to Clooncullaan from R368	Significant reduction in traffic on R368.	Imperceptible	Long-term / perm	Low	Improvement proposed to bend	Slight positive
Journey amenity	North Strokestown	Blind bend on R368 and junction with Lavalley Road (LP1405)	Upgrade to roundabout junction with pedestrian and cycle facilities.	Moderate positive	Long-term / perm	Medium		Moderate positive
Journey amenity	Cyclists existing N5	Proximity of traffic and HGVs on N5 discourage cycle traffic. Hazardous crossings of road.	Transference of through traffic from existing N5. Likely increase in cycling activity on existing N5.	Significant positive	Long-term / perm	Medium	-	Significant positive
Journey amenity	Cyclists crossing of the proposed road development	n/a	Staggered junctions at various locations, but with availability of hard shoulder.	Moderate negative	Long-term / perm	Low	Warning signs at locations used by more vulnerable cyclists, e.g. Bellanagare to Frenchpark	Slight-moderate negative

Nature of Impact	Location / Sub-Group	Current Situation	Impact of Road Development	Significance	Duration	Scale	Mitigation Proposed	Residual Impact
Journey amenity	Pedestrians existing N5	Proximity of high traffic volumes and HGVs. (see also severance)	Transference of through traffic from existing N5. Likely increase in pedestrian traffic.	Moderate positive	Long-term / perm	Medium	-	Moderate positive
Journey and general amenity	R368 Elphin to Strokestown	Quiet rural area containing hills and lakes	Environmental impacts due to proximity of proposed road project, but combined with positive impact on journey amenity for users of proposed road development.	Slight negative / Slight positive	Long-term / perm	Low	Visual and noise mitigation.	Slight - imperceptible negative / Slight positive
General amenity - residential	Local settlements properties on rural N5	Cumulative impact of severance, noise, visual intrusion and air quality	Transference of through traffic from existing N5.	Moderate to Significant positive	Long-term /perm	High	-	Moderate positive
General amenity / Tourism	Douglas Hyde Centre	Located and signposted beside N5	Transference of through traffic from existing N5.	Slight negative	Long-term /perm	Low	TII approved signage	Imperceptible
Health/ General amenity/ Recreation	Circular walk Bellanagare Ch 13+100-13+950	Quiet rural area	Walking route partially severed at one location with underpass at another. Background noise and visual impact.	Significant negative	Long-term /perm	Medium	Foot/ cyclepath between two arms of walk at Ch. 13+000 and 13+700 providing for two new looped walks	Moderate negative
General amenity	Rathcroghan complex	Cumulative impact of severance, noise and visual intrusion	Transference of through traffic from existing N5. Improved ambience and safer access.	Significant positive	Long-term /perm	High	-	Significant positive

Nature of Impact	Location / Sub-Group	Current Situation	Impact of Road Development	Significance	Duration	Scale	Mitigation Proposed	Residual Impact
Tourism	Rathcroghan Visits/Visitor Centre	Popular centre, but poor parking facilities and busy road	Risk of fewer visits due to transference of traffic.	Moderate negative	Long-term / perm	Medium	TII approved signage	Neutral
General amenity - residential	Communities located along LP1410 and R368 (S)	Severance, noise and dust due to quarry traffic	Transference of some HGV traffic to proposed road development.	Slight positive	Long-term / perm	Medium	-	Slight positive
General amenity - recreation	Strokestown Gun Club	Occasional shooting and shooting rights to east of Strokestown Demesne	Shooting prohibited in vicinity of proposed road project.	Slight negative	Long-term / perm	Low		Slight negative
Cemetery	Strokestown	Insufficient parking with slight congestion	New local and cemetery access to Lavally Road (LP1405).	Slight positive	Long-term / perm	Medium	New access and parking	Moderate positive

Severance

Nature of Impact	Location / Sub-Group	Current Situation	Impact of Road Development	Significance	Duration	Scale	Mitigation Proposed	Residual Impact
Relief form severance	Each of main settlements	Significant community severance in Frenchpark, Bellanagare, Tulsk and parts of Strokestown	Reduction in severance combined with journey amenity benefits.	Moderate positive	Long-term / perm	High	-	Moderate positive
Relief from severance	Strokestown & Lavally Road (LP1405)	Absence of pedestrian facilities along local road	Provision of shared pedestrian and cycle facilities.	Moderate positive	Long-term / perm	Low	-	Moderate positive

Nature of Impact	Location / Sub-Group	Current Situation	Impact of Road Development	Significance	Duration	Scale	Mitigation Proposed	Residual Impact
Relief from severance	Scramoge	Local traffic must cross or connect with busy N5	Proposed development presents risk of new severance of local road (LS-6144) from Scramoge.	Slight negative	Long-term / perm	Low	Proposed underpass avoids new severance and provides relief of severance by transfer of traffic from N5-	Slight positive
New severance	Between Frenchpark and Bellanagare	No severance, but poor journey amenity for cyclists	Improved journey amenity, but addition of new severance due to staggered crossing of proposed road development.	Moderate negative	Long-term / perm	Medium	Underpass at Ch+13+950.	Slight negative
New severance	Tonaknick (Ch. 15+550 & Ch. 15+800)	No access issues	Slight new severance due to staggered crossing of proposed road development.	Slight negative	Long-term / perm	Very low	Underpass to west	Imperceptible to Slight negative
New severance	Mulleduff (Ch 17+600 & 17+900)	No access issues	Slight new severance due to staggered crossing of proposed road development	Slight negative	Long-term / perm	Very low	-	Slight negative
New severance	R369 Cartronagor (Ch. 21+900-22+000)	No access issues	Slight new severance due to staggered crossing of proposed road development.	Slight negative	Long-term / perm	Low	-	Slight negative
New severance	Junction with Lavalley Road (LP1405) (Ch. 50+000)	No access issues	Slight new severance due to roundabout junction with proposed road development.	Slight negative	Long-term / perm	Medium	Refuge area and splitter island for pedestrians and cyclists	Imperceptible

Economic

Nature of Impact	Location / Sub-Group	Current Situation	Impact of Road Development	Significance	Duration	Scale	Mitigation Proposed	Residual Impact
Passing trade	Churchstreet (west of Frenchpark)	Small community. Pub/restaurant/accommodation, fuel depot, tyre shop and stone masons.	Transference of through traffic to proposed development.	Significant to Very significant negative	Long-term / perm	3 businesses	Services signage in accordance with TII manual	Significant negative
Passing trade	Frenchpark	Village. Trade from N5 and some R361	Transference of N5 through traffic to proposed development, but also reduction in severance and improvement in journey amenity.	Significant negative	Long-term / perm	several businesses	Services signage in accordance with TII manual where in urban centres	Moderate to significant negative
Passing trade	Service stations (all communities)	Trade from N5 traffic	Transference of through traffic to proposed development.	Moderate to very significant negative	Long-term / perm	4 businesses (1 small)	Services signage in accordance with TII manual where in urban centres	Moderate to very significant negative
Passing trade	Pubs/restaurants /cafes (all communities)	Trade from N5 traffic	Transference of through traffic to proposed development.	Slight to significant negative	Long-term / perm	several businesses	Services signage in accordance with TII manual	Slight to significant negative
Passing trade and familiarity	Accommodation Strokestown and Bellanagare	Trade and familiarity due to N5 traffic	Transference of through traffic to proposed development.	Moderate negative	Long-term / perm	at least 3 businesses	Services signage in accordance with TII manual	Slight to moderate negative

Nature of Impact	Location / Sub-Group	Current Situation	Impact of Road Development	Significance	Duration	Scale	Mitigation Proposed	Residual Impact
Passing trade and familiarity	General businesses alongside N5	Trade and familiarity due to N5 traffic	Transference of through traffic to proposed development.	Slight to moderate negative	Long-term / perm	several businesses	Services signage in accordance with TII manual where facilities located in urban centres	Slight to moderate negative
Passing trade and familiarity	Strokestown House and cafe	Trade and familiarity due to N5 traffic	Transference of through traffic to proposed development.	Slight to moderate negative	Long-term / perm	One business	Services signage in accordance with TII manual	Slight negative

Appendix 6.1

Lnight Noise Model Results

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
A01-001_B	46	47	
A01-002_B	47	48	
A01-003_B	48	49	
A01-004_B	55	56	
A01-005_B	42	43	
A01-006_B	44	45	
A01-007_B	44	44	
A01-008_B	44	45	
A01-009_B	43	44	
A01-010_B	42	43	
A01-011_B	42	43	
A01-012_B	50	50	
A01-013_B	52	53	
A01-014_B	53	54	Overall decrease in levels
A01-014b_B	47	48	Overall decrease in levels
A01-015_B	51	52	Overall decrease in levels
A01-015b_B	41	43	Overall decrease in levels
A01-016_B	51	52	Overall decrease in levels
A01-016b_B	42	44	
A02-001_B	48	49	
A02-002_B	48	48	
A02-003_B	48	49	
A02-003b_B	43	44	
A02-004_B	49	50	
A02-004b_B	44	45	
A02-005_B	52	53	Mitigation Confirmation
A02-005b_B	47	48	
A02-006_B	61	62	Not a receptor
A02-007_A	52	53	Mitigation Confirmation
A02-008_B	46	47	
A02-009_B	46	47	
A02-010_B	45	46	
A02-011_B	47	48	
A02-013_B	49	50	
A02-014_B	48	49	
A02-014b_B	42	43	
A02-015_B	49	50	

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
A02-015b_B	38	39	
A02-016_B	49	50	
A02-017_B	47	48	
A02-018_B	49	49	
A02-019_B	54	55	Not a receptor
A02-020_B	55	56	Mitigation Confirmation
A02-021_B	52	52	Mitigation Confirmation
A02-022_B	48	49	
A02-023_B	47	48	
A02-024_B	44	45	
A02-025_B	44	45	
A02-026_B	44	45	
A02-027_B	43	44	
A02-028_B	42	43	
A02-029_B	42	43	
A02-030_B	42	43	
A02-031_B	42	43	
A03-001_B	49	50	
A03-001b_B	43	44	
A03-002_B	50	51	
A03-002b_B	45	46	
A03-003_B	47	48	
A03-004_B	48	48	
A03-005_B	43	44	
A03-006_B	44	45	
A03-007_B	46	47	
A03-008_B	46	47	
A03-009_B	46	47	
A04-001_B	44	44	
A04-002_B	44	45	
A04-003_B	45	46	
A04-004_B	49	50	
A04-004b_B	44	45	
A04-005_B	49	50	
A04-006_B	46	47	
A04-007_B	46	47	
A05-001_B	49	50	
A05-001b_B	46	47	
A05-002_B	51	52	
B10-001_B	51	52	
B10-002_B	43	44	

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
B10-003_B	45	46	
B10-004_B	49	50	
B10-005_B	43	44	
B10-006_B	42	43	
B11-001_B	43	44	
B11-002_B	41	42	
B12-001_B	47	48	
B12-002_B	45	46	
B12-003_B	43	44	
B12-004_B	45	46	
B12-005_B	46	47	
B12-006_B	44	45	
B12-007_B	47	48	
B12-008_B	50	51	
B12-009_B	48	49	
B12-010_B	43	44	
B13-002_B	44	45	
B13-002_B	41	42	
B13-003_B	40	41	
B13-004_B	40	41	
B13-005_B	38	39	
B13-006_B	37	38	
B13-007_B	39	40	
B13-008_B	38	39	
B13-009_B	40	41	
B13-010_B	40	41	
B13-011_B	41	42	
B13-012_B	40	41	
B13-013_B	47	48	
B14-001_B	42	43	
B14-002_B	44	45	
B14-003_B	43	44	
B15-001_B	44	45	
B15-002_B	41	42	
B15-003_B	43	44	
B15-004_B	39	40	
B15-005_B	43	44	
B15-006_B	47	48	
B15-007_B	41	42	
B16-001_B	40	41	
B16-002_B	40	41	

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
B16-003_B	40	41	
B16-004_B	42	43	
B16-005_B	41	42	
B17-001_B	44	45	
B17-002_B	46	47	
B17-003_B	43	44	
B17-003_B	48	49	
B17-004_B	47	48	
B17-005_B	42	43	
B17-006_B	39	40	
B17-007_B	42	43	
B19-001_B	39	40	
B19-002_B	39	40	
B19-003_B	40	41	
B19-004_B	41	41	
B19-005_B	41	42	
B19-006_B	43	44	
B19-007_B	60	61	Not a receptor
B19-008_B	41	42	
B19-009_B	38	39	
B19-010_B	37	38	
B20-001_B	42	43	
B20-002_B	43	44	
B20-003_B	46	47	
B20-003_B	44	45	
B20-005_B	46	46	
B20-006_B	46	47	
B20-007_B	45	46	
B21-001_B	44	45	
B21-002_B	45	46	
B21-003_B	49	50	
B21-004_B	44	45	
B21-005_B	47	48	
B22-001_B	44	45	
B22-002_B	44	44	
B22-003_B	42	43	
B22-004_B	41	42	
B22-005_B	40	41	
B22-006_B	43	43	
B23-001_B	44	45	
B24-002_B	48	49	

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
B24-003_B	50	51	
B24-004_B	52	53	
B24-005_B	53	54	
B24-006_B	52	53	
B24-007_B	47	47	
B24-008_A	54	55	Mitigation Confirmation
B24-009_B	44	45	
B24-010_B	47	47	
B24-011_B	50	51	
B24-012_B	49	49	
B24-013_B	54	55	
B24-014_B	47	48	
B24-015_B	47	47	
B24-016_B	46	46	
B24-017_B	47	48	
B24-018_B	47	47	
B24-019_B	47	48	
B24-020_B	47	47	
B24-021_B	43	43	
B24-022_B	42	43	
B24-023_B	41	42	
B24-024_B	41	42	
B24-025_B	40	41	
C30-001_B	46	47	
C31-001_B	45	45	
C31-002_B	44	44	
C32-001_B	41	42	
C32-002_B	41	42	
C32-003_B	41	41	
C32-004_B	41	42	
C32-005_B	40	41	
C32-006_B	40	41	
C32-007_B	39	39	
C32-008_B	39	40	
C32-009_B	41	41	
C33-001_B	41	42	
C33-002_B	43	44	
C33-003_A	49	49	
C33-004_B	51	52	
C33-005_A	51	52	Mitigation Confirmation
C33-006_A	47	48	

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
C33-007_B	48	48	
C33-008_B	47	48	
C34-001_B	41	42	
C34-002_B	44	45	
C34-003_B	43	44	
C34-004_B	44	45	
C34-006_B	42	43	
C34-006_B	44	44	
C34-007_B	43	44	
C34-008_B	44	45	
C34-009_B	40	41	
C34-010_B	39	40	
C35-001_B	51	52	Mitigation Confirmation
C35-002_B	51	52	Mitigation Confirmation
C35-003_B	47	48	
C35-004_B	43	43	
C35-005_B	44	45	
C35-006_B	41	41	
C35-007_B	41	41	
C35-008_B	46	46	
C35-009_B	39	40	
C35-010_B	39	39	
C35-011_B	42	42	
C35-012_B	37	38	
C35-013_B	37	38	
C36-001_B	37	38	
C36-002_B	40	41	
C36-003_B	45	45	
C36-004_B	40	41	
C37-001_B	43	44	
C37-002_B	41	41	
C37-003_B	42	43	
C37-004_B	41	42	
C38-001_B	44	45	
C38-002_B	41	42	
C38-003_B	40	41	
C38-004_B	41	41	
C38-005_B	39	40	
C38-005b_B	44	44	
C38-006_B	40	41	
C39-001_B	41	42	

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
C39-001b_B	37	37	
C39-002_B	39	39	
C39-002b_B	40	40	
C39-003_B	41	42	
C39-004_B	43	43	
C39-005_B	44	44	
C39-006_B	37	37	
C39-007_B	41	42	
C39-008_B	39	40	
C39-009_B	39	40	
C39-011_B	44	45	
C40-001_B	43	44	
C40-002_B	42	43	
C40-003_B	41	42	
C40-004_B	40	41	
C40-005_B	41	42	
C40-006_B	40	41	
C40-007_B	40	41	
C40-008_B	40	41	
C40-009_B	38	39	
C40-010_B	38	38	
C40-011_B	38	39	
C40-012_B	38	39	
C40-013_B	39	39	
C40-014_B	42	42	
C40-015_B	36	36	
C40-016_B	37	38	
C40-017_A	47	48	
C40-018_B	48	49	
C40-019_B	50	51	
C40-020_B	51	52	
C40-021_B	51	52	
C40-022_B	44	45	
C40-023_B	41	42	
C40-024_B	41	42	
D50-001_B	46	47	
D50-002_B	47	48	
D50-003_B	43	44	
D50-003b_B	41	42	
D50-004_B	41	42	
D50-007_B	44	45	

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
D50-008_B	39	40	
D50-008_B	44	45	
D50-009_B	39	40	
D50-009_B	45	46	
D50-010_B	38	39	
D50-011_B	40	41	
D50-012_B	40	41	
D50-013_B	41	42	
D50-014_B	38	39	
D50-015_A	38	39	
D50-016_A	40	41	
D50-017_B	43	44	
D50-018_B	41	42	
D50-019_B	42	43	
D50-020_B	43	44	
D50-021_B	44	45	
D50-022_B	46	47	
D50-023_B	47	48	
D50-024_B	43	44	
D50-025_B	39	40	
D50-026_B	39	41	
D50-027_B	40	42	
D50-028_B	40	41	
D50-029_B	43	43	
D50-030_B	53	54	
D50-031_B	37	38	
D50-032_B	33	34	
D50-033_B	43	44	
D50-034_B	31	32	
D50-035_B	32	33	
D50-036_B	44	44	
D50-037_B	32	33	
D50-038_B	44	45	
D50-039_B	33	34	
D50-040_B	31	32	
D50-041_B	30	31	
D50-042_B	35	36	
D50-043_B	32	33	
D51-001_B	44	45	
D51-002_B	43	44	
D52-001_B	48	49	

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
D52-002_B	46	47	
D52-003_B	47	48	
D52-004_B	46	47	
D52-005_B	47	48	
D52-006_B	45	46	
D52-007_A	52	53	Mitigation Confirmation
D53-001_B	50	51	
D53-002_A	51	52	
D53-003_B	47	48	
D53-004_B	46	47	
D53-005_B	45	46	
D53-006_B	45	46	
D53-007_B	43	43	
D53-008_B	41	42	
D53-009_B	41	42	
D53-010_B	53	54	Overall decrease in levels
D53-010b_B	51	52	Overall decrease in levels
D53-011_B	48	49	
D53-012_B	48	49	
D53-013_B	54	55	
D53-014_B	51	52	
D54-001_B	41	42	
D54-002_B	42	43	
D54-003_B	24	25	
GOLF CLUB_B	43	44	
NR-01_B	43	44	
NR-01b_B	37	38	
NR-02_B	42	43	
NR-03_B	39	41	
NR-04_B	51	52	
NR-05_B	52	53	
NR-06_B	50	51	
NR-07_B	50	51	
NR-08_B	48	49	
NR-09_B	50	51	
NR-10_B	50	51	
NR-11_B	48	50	
NR-12_B	50	51	
NR-13_B	49	50	
NR-14_B	54	55	

Name	dB Lnight - Do Something (Post Mitigation)		Comment
	2020	2035	
NR-15_B	48	50	
NR-16_B	48	49	
NR-17_B	50	52	
NR-18_B	48	51	
NR-19_B	48	50	
NR-20_B	48	50	
NR-21_B	49	51	
NR-22_B	52	53	
NR-23_B	54	55	
NR-24_B	55	56	
NR-25_B	51	53	
NR-26_B	51	53	
NR-27_B	50	52	
NR-28_B	51	52	