Transport Scotland

National Speed Management Review

Milestone 3 Final Report

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WSP

King James VI Business Centre
Friarton Road
Perth

WSP.com

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Authorised by	J Gilles	R Lyng	R Lyng	
Signature			Lyng, Ronan (UKRXL002) Digitally signed by Lyng, Ronan (UKRXL002) DN: cn=Lyng, Ronan (UKRXL002), ou=Active, email=Ronan.Lyng@wsp.com Date: 2024.11.13 17:57:08	
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Executive summary

Strategic Transport Projects Review 2 (STPR2) identified a recommendation to undertake a National Speed Management Review, also a key commitment in Scotland Road Safety Framework to 2030. A key part of the recommendations of STPR2 was to consider altering National Speed Limits to promote reductions in collision rates and severity. This report identifies two specific options for consideration on Scotland's National Speed Limit roads.

Option 1 proposes altering National Speed Limits for single carriageways (all vehicles) and for dual carriageway (good vehicles (>7.5t)), whilst Option 2 proposes altering speed limits for all vehicles on single carriageways, dual carriageways, and motorways. Key objectives of the options are to reduce the differences in speed limits for HGVs in comparison with other traffic and to reduce the number and severity of road traffic collisions.

The appraisal of the options presented in this report has identified that some of the key impacts of reducing speed limits include reductions in road collision rates and severity, small increases in journey times, reduction in noise levels, and reductions in NO_x and greenhouse gas emissions.

The scale of these impacts is strongly linked to the level of speed limit compliance achieved. Education of the motoring public and enforcement strategies will be critical to ensure the impacts identified within this report can be obtained.

Reflecting that Option 2 will impact upon a wider proportion of the road network than Option 1 it is likely that Option 2 if successfully implemented would have a more significant effects than Option 1.

The options presented in this report can support Scotland's ambitious and compelling long-term goal for road safety where no-one dies or is seriously injured by 2050 on our roads (Vision Zero).

Glossary of Terms

Terms	Description
Accident ***or*** Collision	Occurs when a vehicle collides with another vehicle, pedestrian, animal, road debris, or other moving or stationary obstruction. These often result in injuries to road users. Road Safety Practitioners refer to Collisions whilst STAG guidance has historically referred to Accidents. With respect to casualties, some Collisions involve more than one casualty.
Cost and Benefit to Accidents Light Touch	COBALT (COst and Benefit to Accidents – Light Touch) is the Department for Transport's ('DfT') software tool for forecasting road accident impacts.
Heavy Goods Vehicles / Goods Vehicles	Heavy Goods Vehicles (HGVs) and Goods Vehicles are referred to in this report. HGVs and Goods Vehicles within the context of this report are those vehicles more than 7.5 tonnes maximum laden weight.
Mean Traffic Speed	Average speed of traffic
Net Zero	A target of completely negating the amount of greenhouse gases produced by human activity. This is aimed to be achieved by reducing emissions and implementing methods of absorbing carbon dioxide from the atmosphere.
Nitrogen Oxides (NO_x)	Nitrogen Oxides is a term which refers to gases-nitric oxide (NO), which is a colourless, odourless gas and nitrogen dioxide (NO_2), which is a reddish-brown gas with a pungent odour. These gases form part of the emissions of diesel vehicles in particular.
Rural Roads	Rural roads typically are minor and major roads outside of urban areas and are subject to the National Speed Limit.
Safe System	Is an approach to road safety which puts the human being at its centre, and which stems from the belief that every road death or serious injury is preventable.
Scottish Transport Appraisal Guidance (STAG)	STAG supports the Scottish Government's objectives by providing a clear framework to assess evidence based transport problems and opportunities. It does so by promoting robust, objective-led analysis that can be consistently applied in all transport appraisal contexts.

Terms	Description
Speed related factors	Speed related factors are contributory factors which have been recorded as “Exceeding speed limit” and “Travelling too fast for the conditions” as part of the STATS19 reporting of a collision.
STATS19	STATS19 is a nationwide standard approach for recording collision data. The data is collected and reported by Police Scotland.
Transport Model for Scotland (TMfS)	The TMfS is a strategic transport model, which provides a broad representation of transport supply and estimates of transport demand and is used to help appraise the potential impacts of major investments or policies decisions
Vision Zero	Is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy and equitable mobility for all.

This document and associated appendices contain hyperlinks. When text is underlined, this is a hyperlink.

1 Introduction

1.1 Background

The National Transport Strategy 2 (NTS2) for Scotland published in February 2020 sets out "an ambitious vision for Scotland's transport system for the next 20 years. The vision is underpinned by four priorities: Reduces Inequalities, Takes Climate Action, Helps Deliver Inclusive Economic Growth and Improves our Health and Wellbeing, each with three associated outcomes". The delivery of road safety is fundamentally linked to these priorities.

Scotland's Roads Safety Framework to 2030 (2030 Framework) was published in February 2021. The 2030 Framework sets out Scotland's ambitious and compelling long-term goal for road safety where no-one dies or is seriously injured on our roads by 2050 (Vision Zero). It aims to achieve this by adopting a Safe System approach to road safety as shown in Figure 1-1. Safe Speeds is one of the five outcomes of the Safe System approach which aims to encourage road users to understand and travel at speeds appropriate to the conditions and within the posted speed limits (Scotland's Road Safety Framework website expands on Safe Speeds).

Figure 1-1 - Safe System's approach to road safety

The delivery of Safe Speeds can be significantly enhanced through the development of speed management. Global Road Safety Partnership describes Speed Management as an active approach that encourages drivers to adopt speeds that offer mobility without compromising safety. Elements of Speed Management are:

- Speed Limits to reflect a safe speed;
- Road engineering measures such as speed humps/road narrowing etc;
- Enforcement; and
- Education.

In summer 2022, Transport Scotland commissioned WSP UK Ltd (WSP) to commence a review to inform the development of a National Speed Management Plan (NSMP) for Scotland. The NSMP identifies a range of speed management initiatives aligned to the Safe System including alterations of speed limits.

Aligned to NTS2, the Strategic Transport Projects Review 2 (STPR2) was then published in December 2022 which includes the specific Recommendation 38 for “a national review to establish appropriate speed limits for different road types within Scotland.”

1.2 Report Purpose & Structure

Flowing from the NSMP and reflecting the STPR2 recommendation, this report has been prepared to consider options for the initiative of changing National Speed Limits on Scotland’s road network. Aimed at improving Scotland’s road safety performance, the options are primarily focused on rural roads. Consideration of urban roads is beyond the scope of this study, reflecting the ongoing implementation of 20mph Speed Limit on all appropriate urban roads.

The purpose of this report is, therefore, to present the appraisal of alterations that could be made to National Speed Limits in Scotland. This report is structured as follows:

- Chapter 1 Introduction;
- Chapter 2 Road Safety in Scotland;
- Chapter 3 Transport Planning Objectives;
- Chapter 4 Option Generation and Sifting;
- Chapter 5 Option Appraisal Methodology;
- Chapter 6 Detailed Option Appraisal;
- Chapter 7 Option Appraisal Summary;
- Chapter 8 Further Reflections; and
- Chapter 9 Summary and Conclusions.

WSP has brought in Professor Adrian Davis from Edinburgh Napier University who has expertise in speed management with the Transport Research Institute for an independent review of this report.

2 Road Safety Context in Scotland

2.1 Scotland's Road Safety Framework to 2030

Transport Scotland's Road Safety Framework to 2030 sets out a long-term vision for road safety, Vision Zero, where there are zero fatalities and injuries on Scotland's roads by 2050. As per the framework's interim targets to 2030, four main casualty reduction targets have been outlined. These are identified in Table 2-1 below.

Table 2-1 - Casualty Reduction Targets: Scotland's Road Safety Framework to 2030

Casualty Reduction Target	2030 target % reduction
People killed	50%
People seriously injured	50%
Children (aged < 16) killed	60%
Children (aged < 16) seriously injured	60%

2.2 Review of Casualty Data

In Reported Road Casualties Scotland 2022, the progress made towards the four reduction targets has been assessed by comparing the 2030 targets against a 2014-2018 yearly average, which is used as the baseline and against the 2022 data; as per Table 2-2 below.

Table 2-2 - Comparison of casualty data

Target	2014-2018 average	2022 data	2030 target
People killed	174	173	87
People seriously injured	2771	1776	1454
Children (aged < 16) killed	6	5	2
Children (aged < 16) seriously injured	264	176	111

Key observations from the latest casualty figures of 2022 show that:

- 173 people were reported as killed in 2022, 0.3% below the 2014-2018 average of 174.
- 1,776 people were reported as seriously injured in 2022, 36% (995) below the 2014-2018 average of 2,771.

- 3 children were reported as killed in 2022, meaning the average for the 2020-2022 period was 5 per year, this is 17% below the 2014-2018 average of 6.
- 176 children were reported as seriously injured in 2022, 33% (88) below the 2014-2018 average of 264.

Table 5b of Reported Road Casualties Scotland 2022 identifies that local authority A roads in non-built up areas had the highest collision rates on Scotland's roads in 2022. These roads are predominantly rural single carriageways.

Table 2-3 – Selected outputs from Table 5(b) of Reported Road Casualties Scotland 2022. Reported collision rates by severity and road class for non built-up roads rates per 100 million vehicle km

Severity	Year	Motorway (Major Road)	Trunk A Roads (Non Built Up) (Major Road)	LA A Roads (Non Built Up) (Major Road)	Non Built Up (Minor Road)
Fatal	2022	0.05	0.56	0.64	0.18
Fatal	2018-2022 average	0.11	0.42	0.55	0.22
All severities	2022	2.79	4.93	8.9	3.85
All severities	2018-2022 average	3.24	6.23	9.14	5.06

From the published 2022 data shown in Table 2-3, motorways have the lowest collision rates. The published data does not differentiate between dual carriageways and single carriageways. However, from knowledge of Scotland's Road network, the collision rates presented for Trunk A Roads (Non Built Up) are likely to include for a substantial proportion of all rural dual carriageways collisions whilst the figures presented for LA A Roads (Non Built Up) is likely to predominately consist of rural single carriageways collisions. As the collision rates for Trunk A Roads (Non Built Up) is lower than the collision rate for LA A Roads (Non Built Up), this would suggest that Scotland's rural dual carriageways are safer than Scotland's rural single carriageways.

2.3 Review of Speed Related Contributory Factors

As part of the NSMP, a collision analysis was undertaken to understand current trends in Scotland. This was based upon data presented within Reported Road Casualties Scotland between 2010 and 2022. A focus was made on collisions where speed was identified as a contributory factor alongside types of vehicles.

Scottish injury collision data is currently recorded by the Police Scotland via the STATS19 proforma, which aims to ensure that data is recorded in a consistent way. As part of this

reporting, contributory factors are recorded and can include “Exceeding speed limit” and “Travelling too fast for the conditions” (speed related factors*).* Successful implementation of speed management is likely to have a direct impact upon the prevalence of these contributory factors.

2.3.1. Analysis of the collision data is summarised in Appendix A and illustrated in Figure 2-1 and Figure 2-2 below. It supports the following:

- The number of overall collisions with a speed related contributory factor has broadly mirrored the trend in total collision data. In recent years circa 10-11% of all collisions have been recorded with a speed related contributory factor, falling slightly from 13-14% of earlier years.
- Of these collisions with a speed related contributory factor, around 90% involve cars/taxis or motorcycles, with circa 10% Goods vehicles.

Figure 2-1 - Number of collisions involving vehicles with speed related contributory factor

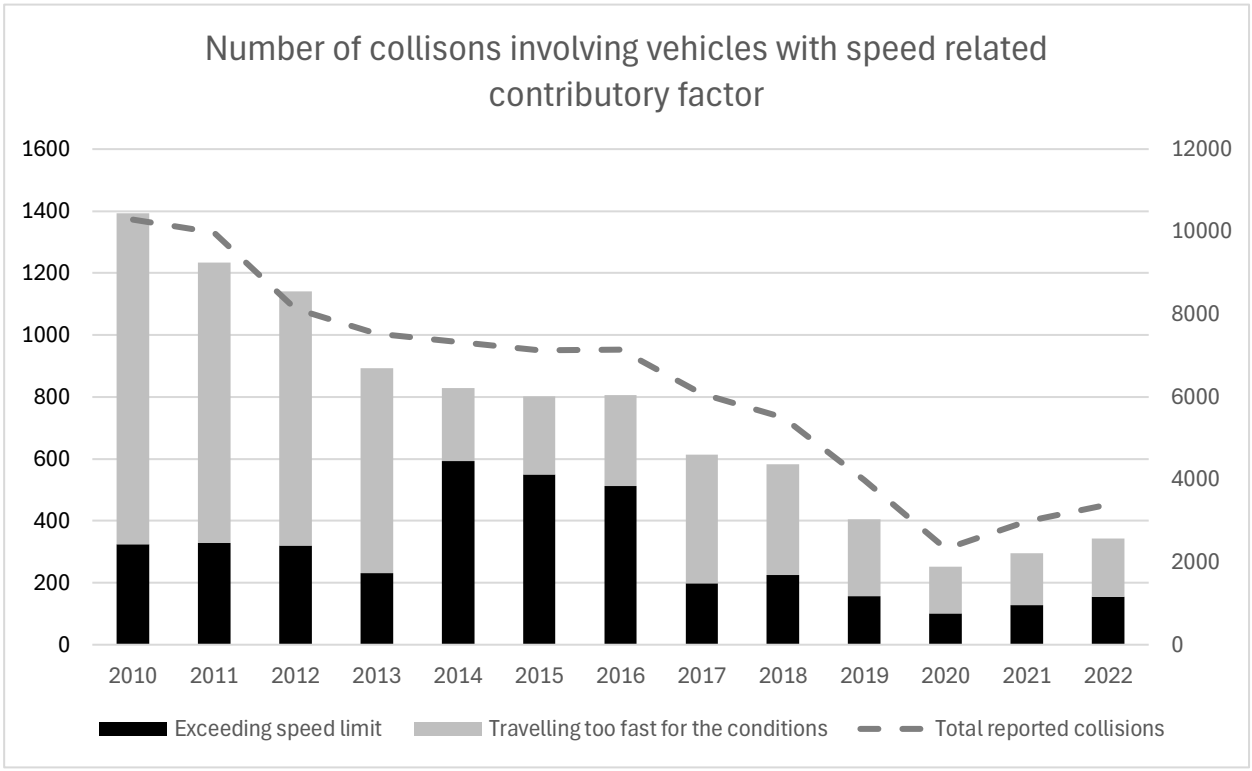
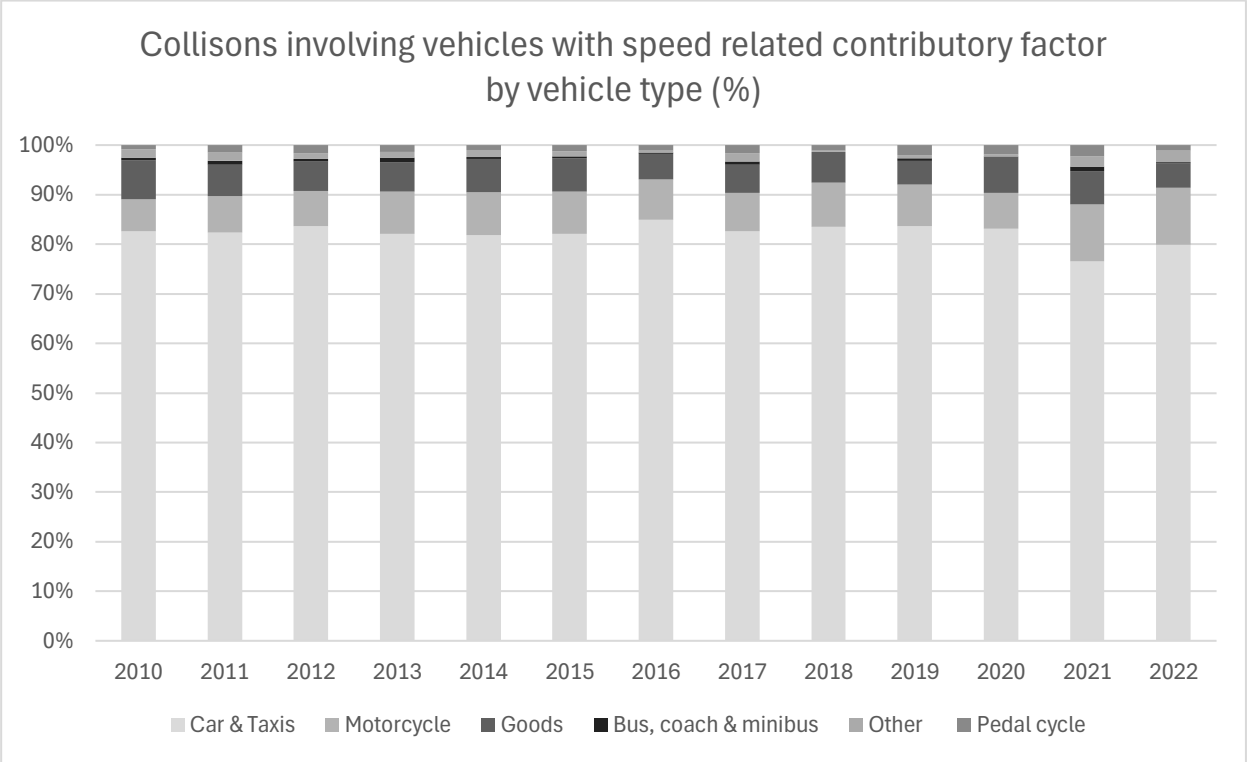


Figure 2-2 - Collisions involving vehicles with speed related contributory factor by vehicle type (%)



2.4 National Speed Limits in Scotland

The National Speed Limit across Scotland varies, based upon road type, road environment and vehicle type. The current National Speed Limits in Scotland are outlined in Table 2-4 below. The National Speed Limit on roads is often not reflective of actual traffic speeds. Analysis of actual speed data suggests that road geometry and traffic conditions can often influence speeds of traffic particularly on single carriageways subject to National Speed Limits.

Table 2-4 – Current National Speed Limit in Scotland

Vehicle Type	Built Up Area	Single Carriageway	Dual Carriageway	Motorway
Cars and motorcycles	30mph	60mph	70mph	70mph
Cars towing caravans	30mph	50mph	60mph	60mph
Buses and coaches	30mph	50mph	60mph	70mph
Goods vehicles (<7.5t)	30mph	50mph	60mph	70mph
Goods Vehicles >7.5t)	30mph	40mph	50mph	60mph

The Scotland Act 2012 provides the legal framework for the Scottish Government to set the levels of the National Speed Limit in Scotland.

The data provided in Appendix M shows that drivers in Scotland generally comply with the 60mph speed limit on single carriageway roads, with the average speed of cars noted as 51mph.

2.5 HGV Traffic in Scotland

The vast majority of Scotland's population and economic activity is located within the central belt. There are however rural communities, for example, within the Highlands and Islands which are further away from Scotland's land border with England. HGV traffic forms a substantial proportion of economic activity.

Within these remote areas there are significant industries including fisheries for which increased journey times would have a negative impact upon the value of perishable goods being transported. A significant proportion of this traffic heads towards the English border via the A74(M) at Gretna prior to onwards transit in England and onto Europe. This traffic often originates from ports across Northern Scotland and the Highlands such as Scrabster, Aberdeen, Ullapool, Uig, Mallaig and Oban.

Speed differentials between different traffic types

The difference in speed between two vehicles is referred to as speed differential. The closer the speed of two vehicles, the easier it is for drivers to make well informed decisions and reduce the likelihood of road traffic collisions.

The varying speed limits of different vehicle types is most significant where HGV speed limits are lower than that of faster vehicles such as cars. It is recognised that lower HGV speeds can lead to driver frustration and risky manoeuvres by other road users. In such circumstances STATS19 recording of collision may not record an HGV as being involved in a collision.

Transport Scotland carried out an evaluation in 2018, the evaluation has identified that there is poor compliance with National Speed Limits by HGVs within Scotland. The main findings of the evaluation include:

- On single carriageway trunk roads in Scotland (4% of the Scottish rural road network) the HGV 2016 baseline average free flow speed of HGVs was 48.2mph, well in excess of the existing 40mph speed limit;
- The speed differential between HGVs (44.6mph) and light vehicles (48.9mph) on single carriageway non-trunk roads (40% of the Scottish rural road network) in 2016 was lower than on trunk roads, reflecting the slower average speeds on such roads, despite the limit of 60mph for non-HGVs; and
- The free flow average speeds suggest that the characteristics and topography of these non-trunk single carriageway roads are likely to be contributing to constraining average speeds for both light and heavy vehicles.

2.6 Road Safety Context – Summary of Findings

The review of baseline road safety conditions and road safety context in Scotland has identified that whilst progress has been made towards achieving the desired Scottish Government Road Safety Framework 2030 targets, further interventions will be required to support their achievement.

Speed was reported as a contributory factor in circa 10% of all reported injury collisions and 26% of fatal collisions in Scotland in 2022. The majority of collisions (around 80%) involved cars/light vehicles with a further 11% involving motorcycles. Furthermore, Local authority A roads (Non Built Up) had the highest collision rates on Scotland's roads in 2022. These are typically single carriageways in rural environments.

HGV Speed Limit compliance with posted speed limits is poor in Scotland. Nonetheless, there is a speed differential between HGVs and other vehicles though this differential is lower on non-trunk than on trunk single carriageways. It is recognised that the lower HGV speed could cause driver frustration resulting in increased risk taking.

3 Transport Planning Objectives

In developing Transport Planning Objectives (TPOs) for these speed management proposals, we have considered the context within NTS2 and the related recommendations in Strategic Transport Projects Review 2 (STPR2).

Policy Context

NTS2 sets out a vision to "have a sustainable, inclusive, safe and accessible transport system, helping deliver a healthier, fairer and more prosperous Scotland for communities, businesses and visitors." STPR2 informs transport investment in the country to 2042, aligned to NTS2 and includes 45 recommendations across all modes of transport, for specific geographies as well as strategic initiatives. The National Performance Framework (NPF) focuses on creating a more successful country with opportunities for all in Scotland through increased wellbeing, sustainability and economic growth were also considered.

NTS2 sets out a hierarchy of a Vision for Scotland, the vision includes 4 priorities and 12 outcomes:

1. Reduce inequalities
   - Will provide fair access to services we need;
   - Will be easy to use for all; and
   - Will be affordable for all.
2. Takes climate action
   - Will help delivery our net-zero target;
   - Will adapt to the effects of climate change; and
   - Will promote greener, cleaner choices.
3. Helps deliver inclusive economic growth
   - Will get people and goods where they need to get to;
   - Will be reliable, efficient and high quality; and
   - Will use beneficial innovation.
4. Improves our health and wellbeing
   - Will be safe and secure for all;
   - Will enable us to make healthy travel choices; and
   - Will help make our communities great places to live.

Aligning with the vision and priorities of NTS2, STPR2 has established the following 5 key objectives:

- Takes climate action;
- Addresses inequalities and accessibility;
- Improves health and wellbeing;

- Supports sustainable economic growth; and
- Increases safety and resilience.

Recommendation 38 of STPR2 called for a national review of speed limits. As part of recommendation 38, the speed limit for HGVs over 7.5 tonnes was identified for consideration. This being reflected that NTS2 noted that the effective movement of goods is essential for trade and sustainable economic growth, with delays having a significant impact on businesses that rely on timely delivery such as those in the farming and fishing sectors. NTS2 also noted that emissions from HGVs have increased 5.2% since 1990.

During the development of STPR2, the Road Safety Framework to 2030 was published in February 2021. The framework sets out a long-term vision for road safety, Vision Zero, where there are zero fatalities and injuries on Scotland's roads by 2050, with interim targets for 2030 (as detailed in Section 2.1).

Transport Planning Objectives

Within this policy context, and considering the issues identified within road safety context in Scotland in relation to speed related collisions, the following TPOs have been agreed:

- To progress towards the Road Safety Framework 2030 targets for Scotland in:
  - Reduce collision rates and severity on single carriageways where speed has been identified as a contributory factor;
  - Reduce collision rates and severity on dual carriageways where speed has been identified as a contributory factor; and
  - Reduce speed differentials between HGVs and other traffic.

4 Option Generation and Sifting

Further to the publication of the 2030 Framework in February 2021, WSP undertook a review which led to the development of a National Speed Management Plan (NSMP) during Summer 2022.

The NSMP preparation process initially involved an extensive research phase to identify speed management initiatives that could form part of a NSMP for Scotland. This involved literature reviews and engagement with international peers and road safety partners across Scotland. Through these activities, a number of speed management initiatives were identified that linked to a number of key themes:

- Speed Limits on roads subject to the National Speed Limit;
- Speed Limits on Urban Roads;
- Speed Management through Roadworks;
- Event Driven Speed Limits;
- Speed Management for Environmental Improvements;
- Use of Technology for Speed Limit Enforcement;
- Penalties for Speed Violations; and
- Educational Programmes.

Sifting

An initial sifting process considered speed management initiatives to determine if they would be appropriate for the Scottish road network and support the 2030 Framework. This process assessed initiatives against compatibility with the Safe System approach and having a proven speed management benefit. Initiatives which did not meet both these objectives were discounted from further consideration.

The residual initiatives were then considered in a more detailed assessment, which considered the 2030 Framework challenges, road safety impacts, and Scottish Transport Appraisal Guidance (STAG) criteria. The most credible initiatives from this assessment were presented in the recommendations of the NSMP.

4.1 NSMP Recommendations

The conclusions of the NSMP identified several recommendations that could support Scotland’s journey to Vision Zero. These were grouped as:

- Primary Recommendations – proposed to promote initiatives that lower vehicle speeds and improve compliance with these lowered speed limits. These recommendations were considered to potentially have a significant short-term impact;
- Secondary Recommendation – Similar to the primary recommendation, however, these initiatives would likely require a longer time to deliver results than the primary recommendations;

- Research recommendations – where the evidence reviewed was considered inconclusive, these recommendations proposed that further research be undertaken; and
- Monitoring recommendations – These recommendations identified existing research/trials that were ongoing and proposed that the outcomes of these be monitored.

NSMP Speed Limit Initiatives

An overview of the NSMP speed limit related initiatives is presented below:

i1a - Reduced National Speed Limit on single carriageway roads to 50mph:

Scotland's current National Speed Limit on single carriageway roads is 60mph. This initiative proposes to lower the speed limit to 50mph for cars. Other countries such as Ireland, Sweden and France operate an 80km/h (50mph) speed limit on their rural single carriageways.

i1b - Reduced National Speed Limit on dual carriageways roads to 60mph:

Scotland's current National Speed Limit on dual carriageway roads is 70mph. This initiative proposes to lower the speed limit to 60mph.

i5a - Reduced speed limits during wet weather (variable speed limits) on Single Carriageways, Dual Carriageways and Motorways:

Wet weather can provide more dangerous driving conditions (obscuring vehicle driver vision, increasing stopping distances, etc) which can increase collision risk. Enforceable variable speed limits could be introduced via technology on specific routes in adverse wet weather in order to mitigate against these additional safety risks.

i5d - Reduced Speed Limits during winter month on Single Carriageways, Dual Carriageways and Motorways:

Adverse winter weather conditions, such as high winds, heavy rain and snow are more likely to occur during winter. This initiative is closely linked to initiative i5a. In this case, lower speed limits would be enforced during winter months only in order to mitigate against these additional safety risks.

i5n - Reduced speeds during high winds:

Similar to initiatives i5a and i5d, adverse weather conditions such as high winds may create dangerous driving conditions at higher speeds. This initiative proposes the use of variable speed limits on roads which are known to be affected by high winds (carriageways in rural environments and motorways). The speed limits would be displayed on variable message signs and could be enforced with average speed cameras in order to mitigate against the safety risk.

i5j - Implementation of localised speed limits to reduce collision rates/severity:

This initiative promotes the use of current road safety statistics to determine areas which would benefit from a localised speed limit. The reduction in speed limits aims to minimise

speed differentials to make driver decisions easier with a goal of achieving collision and casualty reductions.

i5l - Introduction of localised speed limits of 40mph (single carriageway) and 50mph (dual carriageway) at at-grade junctions:

This initiative would introduce localised speed limits of 40mph (single carriageway) and 50mph (dual carriageway) at at-grade junctions. The main objective is to lower speeds in order to reduce the risk (and/or severity) of collisions at junctions.

Options for Appraisal

Reflecting on the progress to date against the 2030 Framework targets, the development of the options has considered initiatives i1a and i1b that address National Speed Limits as those with the potential to make the most significant contribution towards the 2030 Framework targets. Those remaining initiatives remain initiatives that could be revisited in the future. The resulting two options generated are presented here.

Option 1

This option aims to improve road safety and reduce speed differential on single carriageways.

- On single carriageways:
  - Cars and motorcycles would have a decreased speed limit of 50mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 50mph.
- On dual carriageways as follows:
  - No alterations to speed limits proposed.
- On motorways:
  - No alterations to speed limits proposed.

Option 2

This option aims to improve road safety and reduce speed differential on Scotland's Road network.

- On single carriageways:
  - Cars and motorcycles would have a decreased speed limit of 50mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 50mph.
- On dual carriageways as follows:
  - Cars and motorcycles would have a decreased speed limit of 60mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 60mph.
- On motorways:
  - All vehicles limited to 60mph.

The recommendations of STPR2 were considered against the key objectives of STPR2. As the options presented within this report directly relate to these recommendations, Table 4-1 provides and overview of how the options may contribute to the STPR2 key objectives.

Table 4-1 – Option Alignment with STPR2 Key Objectives

STPR2 Objective	Option Alignment with STPR2
Takes climate action	Vehicle emissions are directly related to vehicle speeds, especially in free flow road environments.
Addresses inequalities and accessibility	Options proposed are generally aimed at reducing vehicle speeds in free flow road environments where there are links between vehicle speeds and accessibility in terms of travel time catchments.
Improves health and wellbeing	Lower vehicle speeds generally make active travel routes more attractive in lower speed environments. The options presented propose to alter speed limit within higher speed environments where the option impacts would be less perceptible to active travel users.
Supports sustainable economic growth	Business costs associated with transport are directly linked to time, which is directly linked to vehicle speeds.
Increases safety and resilience	Vehicles speeds are directly linked to collision rates and severity.

5 Option Appraisal Methodology

Extensive research has been undertaken to understand how the potential impacts of the options could be appraised, and this has informed the methodology used.

To provide a baseline comparison, the options have been assessed against a Do-Minimum scenario, which reflects the status quo in speed limits within Scotland.

5.1 Alignment with STAG Appraisal Criteria

STAG represents the first stage in the assessment of potential solutions to transport problems. As the options being considered within this report will have a significant impact upon the transport network, the appraisal of the options has been structured to align with NTS2 priorities and STAG Sub-criteria. Informed by the research undertaken, the process has appraised the options against the STAG Sub-Criteria outlined in Table 5-1 below.

STAG Criteria shown in have been included in the assessment. Other Sub-criteria have not been used in the appraisal due to these not being related to vehicle speeds on the road network.

Table 5-1 – Appraisal Criteria

NTS2 Priority	Associated STAG Criteria	Identified Appraisal Criteria (Aligned to STAG Sub-criteria) - Included	Identified Appraisal Criteria (Aligned to STAG Sub-criteria) – Not Included
Takes climate action	Environment	▪ Air Quality ▪ Noise and Vibration	▪ Biodiversity and Habitats ▪ Geology and Soils ▪ Land Use (including Agriculture and Forestry) ▪ Water, Drainage and Flooding ▪ Historic Environment ▪ Landscape
Takes climate action	Climate Change	▪ Greenhouse Gas Emissions	▪ Vulnerability to the Effects of Climate Change ▪ Potential to Adapt to the Effects of Climate Change
Improves our health and wellbeing	Health, Safety and Wellbeing	▪ Accidents	▪ Security ▪ Health Outcomes ▪ Access to Health and Wellbeing Infrastructure ▪ Visual Amenity
Helps deliver inclusive economic growth	Economy	▪ Economic Efficiency of the Transport System (TEE)	▪ Wider Economic Impacts (WEIs)
Reduces inequalities	Equality and Accessibility	▪ Comparative Access by Geographic Location	▪ Active Travel Network Coverage ▪ Public Transport Network Coverage ▪ Active Travel Network Coverage ▪ Comparative Access by People Group ▪ Affordability

5.2 Appraisal Methodology

The appraisal has identified six key criteria that will be considered. The methodology for each of these is outlined in this section of the report.

Transport Model for Scotland (TMfS)

The TMfS is a strategic transport model, that provides a broad representation of transport supply and estimates of transport demand and is used to help appraise the potential impacts of major investments or policy decisions. The current version is TMfS18 which has a base year of 2018. Key outputs of this model include journey routing, journey times and journey lengths of various types of road user that can be used to inform many parts of the appraisal. Amongst the key parameters the model uses road link types and traffic speeds.

The outputs from TMfS represent travel in Scotland on an average day in any given year. Representative modelling years outputted and used in the appraisal were for 2025, 2030 and 2045.

Future Scenarios

To allow the potential impacts of the options to be more clearly understood, different future scenarios have been modelled within TMfS. These have considered committed government policies and the level of compliance with proposed speed limits. Key areas of government policy identified includes:

- Achieving a 20% reduction in car kilometres by 2030 aims to reduce Scotland carbon footprint, improve public health and inequality by reducing the number and length of car journeys undertaken;
- Phasing out the need for new petrol and diesel cars and vans by 2030 aims to reduce Scotland Carbon footprint by facilitating the move to electric vehicles; and
- The commitment to achieving net zero carbon emissions by 2045 is a legally binding requirement for Scotland to have a neutral impact with respect to carbon emissions by 2045.

Within TMfS the impact of fulfilling these policies is represented by the application of rulesets (“with policy” and “without policy” future scenarios).

International evidence verifies that compliance with posted speed limits varies with respect to driver behaviours and the level of enforcement. These are represented within TMfS by varying free-flow speeds on different road link types. To demonstrate the significance of compliance, two future scenarios that have been considered within TMfS are:

- 100% Compliance – This future assumes that drivers will fully comply with posted speed limit alterations proposed under the option; and
- Realistic Compliance – This future assumes that drivers will reduce their actual speeds by an average of 2.5miles per hour (4kilometres per hour) for a reduction of 10miles per hour in posted speed limit (see Summary of Literature Review in Appendix B).

The four futures considered within this report are listed in Table 5-2 below.

Table 5-2 – Future Scenarios considered within the Detailed Appraisal

Future Scenario	Description
"With Policy"	This future considers the impacts with a 20 per cent reduction policy ambition on car kilometres'
"Without Policy"	This future considers no policy ambition on reduction of car kilometres
100% Compliance	This future considers the impacts of the travelling public fully complying with posted/ National Speed Limits.
Realistic Compliance	This future considers the impacts of the travelling public partially complying with posted/ National Speed Limits.

Environment – Noise and Vibration

A qualitative assessment of the potential noise impacts arising from the options based on the principles of the STAG Strategic Level of assessment. The assessment assumes that a change in speed will not lead to a change in vibration effects from the operation of the roads.

The appraisal is based on a sample of transport corridors considered to be representative of road links, and associated nearby noise sensitive receptors, potentially affected by the changes. The assessment focused on one representative future year, 2045. The selection of the sample of transport corridors was based on proximity to noise-sensitive receptors and length of the corridors.

This work utilised road traffic data in the form of Annual Average Daily Traffic (AADT) and average speeds outputs from TMfS. The assessment was undertaken using a combined approach utilising spreadsheets and GIS platforms to determine the likely noise level changes in proximity to key road links. The road links used are listed below with further details provided in Appendix C:

- A90 single carriageway – As a representative rural single carriageway;
- A702 single carriageway– As a representative rural single carriageway;
- A96 dual carriageway– As a representative rural dual carriageway; and
- M8 motorway– A representative motorway.

Relevant aspects of the methodology in the technical memorandum Calculation of Road Traffic Noise (CRTN) and DMRB LA111 have been used to inform the appraisal. Basic Noise Levels (BNLs) and noise level changes have been determined due to speed

variations in each of the option and future scenarios assessed. At this stage, a propagation noise model including topography and screening influence provided by intervening buildings has not been prepared. It is considered that the assessment of noise level changes at source provides a good indication of the likely changes potentially experienced by the nearest noise sensitive receptors. This level of detail is appropriate for Strategic Level of the STAG assessment. The study area for the assessment was set at 600m from the road links.

Noise level changes were assessed as having regard to the magnitude of noise change presented in DMRB LA111 for short term. All options and future scenarios were compared to a traffic dataset representing the traffic flows for the same year if the option does not go ahead.

Population density was included in the assessment as an early indication of the population likely to be affected by the change in noise levels. Population datasets published by the Scottish Government were used to assist in this assessment. The Small Area Population Estimates (SAPE) datasets published were used to derive population densities within the study area.

Environment – local air quality (airborne matter and Nitrous Oxide emissions)

A qualitative analysis of the potential air quality impacts associated with the Options and future scenarios have been carried out for the 100% compliance and the realistic compliance scenarios for 2025, 2030 and 2045.

Using output data from TMfS, annual emission rates (in kg per year) of NO_X, PM_{10} and $PM_{2.5}$ for each road link have been obtained by using Department for Environment, Food & Rural Affairs' (Defra) Emissions Factors Toolkit (EFT), published in December 2023.

For the prediction of future year emissions, the toolkit takes into account factors such as anticipated advances in vehicle technology and changes in fleet composition, such that emissions are assumed to reduce over time. The EFT allows for the calculation of emissions arising from road traffic for all years between 2018 and 2050. For the 2025 and 2030 modelled Options and future scenarios the respective data has been used but for 2045, 2030 emission factors have been used as this represents the limit of current available predictions. While the EFT provides emission rates for 2031-2050, these are provided for climate assessments and appraisals only. This approach also ensures a robust, conservative assessment of impacts beyond 2030.

Total emissions for each year associated with each Option and future scenarios for the whole of Scotland have been derived by summing together the annual emission rates for each road link. The resulting change in emissions of the Options and future scenarios has been compared to the Do Nothing scenario and used to determine the relative magnitude of change. The impact descriptor (minor, moderate, major) assigned has been based on the percentage change in emissions (1%, 5% and 10%). This approach has been adapted from Table 2.91 in the DMRB LA 105 air quality guidance.

Climate Change – Greenhouse Gas Emission

The GHG assessment is based on using the Department for Transport (DfT) Transport Analysis Guidance Databook and calculating emissions over the assumed 60-year appraisal period.

The calculations are based on the traffic forecasts for the Do Minimum (without policy) and Do Something (with policy). Information for the GHG assessment comes from TMfS outputs including Annual Average Daily Traffic (AADT), distance, speeds, and percentages of Heavy Goods Vehicles by transport model road link.

The future scenario baseline is considered over the assumed 60-year appraisal period. Non-traded CO_{2e} emissions (petrol and diesel vehicles) and CO_{2e} traded emissions (electric vehicles) have been calculated in accordance with STAG. The future baseline scenario involves no construction activities and therefore the construction baseline has been assumed to have zero emissions.

Health, Safety and Wellbeing – Accidents (All severity)

The Nilsson power law model (R. Elvik presented the Nilsson Power Law Model) was used to assess collision savings as it was expected that Cost and Benefits to Accidents – Light Touch (COBALT) would not be suitable due to the speed banding present within the accident rates not being sensitive enough to envisaged driver speeds. COBALT assigns accident rates based upon 10mph increments, while some of the options/future scenarios under consideration are expected to achieve a 2.5mph (4kph) reduction in traffic speeds.

This implies that if the modelled change in average speed is relatively slight, there may be no allocation to an alternative speed band within COBALT, resulting in no discernible impact. This issue will be enhanced in rural areas where alternative diversionary routes may not be available or attractive and consequently flow volumes also remain similar.

The impact of reduced speeds on the change in collisions was estimated using Nilsson (2019) power law model and disaggregated by road categories. This estimates the reduction in incidents using the following formula:

$$counter\ factual\ incidents = baseline\ incidents * \left(\frac{new\ speed}{old\ speed}\right)^{\alpha}$$

Where α was selected as the exponent (best estimate), based on the road categories and type of incident/collision to calculate the counter factual incidents with the help of new and old speed. The difference between baseline and counter factual incidents will be a reduction in collision savings for a particular incident type.

These values were then monetised using the latest Transport Appraisal Guidance (TAG) standard values. The Transport Appraisal Guidance (TAG) has historical and reference information on all appraisal and modelling values.

Accident savings are usually based upon the most recently available data. However, this data in Scotland is generally accepted as having been distorted by the Covid 19 pandemic. To reflect this a sensitivity test involving two scenarios have been appraised. These are:

- Core – The Core scenario uses recorded collisions data from 2021 and 2022 as a baseline to identify potential savings; and
- Uplift – The Uplift scenario applies a 35% uplift to the 2022 collisions data. This represents an observed jump in fatal collisions between 2023 and early 2024.

Economy – Economic efficiency of the transport system

User benefits, which include time savings, fuel-related Vehicle Operating Costs (VOC), non-fuel Vehicle Operating Costs and operator and Government revenues typically form the main part of benefits attributable to nationwide schemes. The assessment reported here uses the DfT's Transport User Benefit Appraisal (TUBA) software (November 2023 TAG update).

The matrix skims from the Do Minimum and Do Something option models were extracted and input into TUBA to calculate the difference in journey costs between future scenarios. The inputs used are:

- Demand – Traffic flow at an origin destination level;
- Journey Time – The time in hours for each origin destination pair within the model; and
- Distance – The length in km for each origin destination pair.

TUBA generates the following economic outputs:

- Time savings;
- Vehicle Operating Costs (VOC) savings;
- Greenhouse gases; and
- Taxes.

Comparative Access by Geographic Location

Routes from Scotland ports to the English border with their associated journey times are significant to many industries. The impacts on journey times for HGVs which have perishable goods have been assessed to understand the likely impact. Journey times have been assessed from key locations (Aberdeen, Scrabster, Ullapool, Uig and Oban) to nearby the English border at Gretna Green to demonstrate the impact of the options.

5.3 Appraisal of the options (seven-point scale)

STAG uses a seven-point scale against which options are appraised. As the options would be applied across all of Scotland, the assessment proposes to appraise the impact of the options relative to this national scale, as demonstrated in Table 5-3 below.

Table 5-3 – STAG Seven Point Scale

Scale	Overview
Major benefit	These are benefits or positive impacts which, depending on the scale of benefit or severity of impact, the practitioner feels should be a principal consideration when assessing an option's eligibility for funding
Moderate benefit	The option is anticipated to have only a moderate benefit or positive impact. Moderate benefits and impacts are those which taken in isolation may not determine an option's eligibility for funding, but taken together do so
Minor benefit	The option is anticipated to have only a small benefit or positive impact. Small benefits or impacts are those which are worth noting, but the practitioner believes are not likely to contribute materially to determining whether an option is funded or otherwise
No benefit or impact	The option is anticipated to have no or negligible benefit or negative impact
Minor negative impact	The option is anticipated to have only a moderate cost or negative impact. Moderate costs/negative impacts are those which taken in isolation may not determine an option's eligibility for funding, but taken together could do so
Moderate negative impact	The option is anticipated to have only a moderate cost or negative impact. Moderate costs/negative impacts are those which taken in isolation may not determine an option's eligibility for funding, but taken together could do so
Major negative impact	These are costs or negative impacts which, depending on the scale of cost or severity of impact, the practitioner should take into consideration when assessing an option's eligibility for funding

It should be noted that an impact under one category is not equivalent to the same impact in another category and no weighting of criteria is considered. The purpose of the impact criteria is to allow a comparison across the options.

6 Detailed Option Appraisal

6.1 Introduction

This section of the report presents the findings from the appraisal of the options and Future scenarios. For comparison purposes the options appraisal considers the status quo as a Do-minimum scenario (i.e. no changes to National Speed Limits on rural single, dual carriageway or motorways are made).

6.2 Option 1

This option aims to improve road safety and reduce speed differential on single carriageways.

- On single carriageways:
  - Cars and motorcycles would have a decreased speed limit of 50mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 50mph.
- On dual carriageways as follows:
  - No alterations to speed limits proposed.
- On motorways:
  - No alterations to speed limits proposed.

Presented in Table 6-1 is an overview of the options Appraisal for Option 1 and future scenarios.

Table 6-1 – Option 1 Future Scenarios Assessment Summary

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Environment – noise and vibration	Minor benefit	Minor benefit	No impact or benefit	No impact or benefit
Environment – local air quality (airborne particulate matter)	No impact or benefit	No impact or benefit	No impact or benefit	No impact or benefit
Environment – local air quality (Nitrous Oxide emissions)	No impact or benefit	No impact or benefit	No impact or benefit	No impact or benefit
Climate Change – Greenhouse Gas Emission	No impact or benefit	No impact or benefit	No impact or benefit	No impact or benefit
Health, Safety and Wellbeing – accidents (All severity)	Moderate benefit	Moderate benefit	Moderate benefit	Moderate benefit
Economy – Economic efficiency of the transport system	Major negative impact	Moderate negative impact	Moderate negative impact	Minor negative impact
Comparative Access by Geographic Location	No impact or benefit	No impact or benefit	No impact or benefit	No impact or benefit

Environment – Noise and Vibration

When considered “with policy” noise level changes will range from no benefit or impact to minor beneficial in this option, with a maximum predicted reduction in noise level of 2.7 dBA,

for 100% compliance, and 0.9 dBA for realistic compliance, due to changes in average speed and traffic flows.

When considered “without policy”, noise level changes will range from no benefit or impact to minor beneficial in this option, with a maximum predicted reduction in noise level of 1.9 dBA, for 100% compliance, and 0.9 dBA for realistic compliance, due to changes in average speed and traffic flows. The magnitude of changes in noise level evaluated as a comparison between the future appraisals and do-nothing scenarios in the year of assessment.

An overview of the Noise assessment is presented in Table 6-2, with further details provided in Appendix C.

Table 6-2 – Option 1 Noise levels Future Scenarios

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Environment – noise impact	1.9 dB	2.7 dB	0.9 dB	0.9 dB

Environment – local air quality (airborne matter and Nitrous Oxide emissions)

Both the “with policy” and “without policy” futures for the 100% compliance and realistic modelling scenarios show no benefit or impact in national road NOx, PM_{10} and $PM_{2.5}$ emissions for 2030. A brief summary of the findings for Option 1 is outlined in Section 7.3 with the full results are given in Appendix D for 2025, 2030 and 2045.

The 2030 data in Table 6-3 represents the potential change in traffic emissions five years after implementation of the scheme allowing for realistic uptake (which is unlikely to be immediate). The impacts for 2025 and 2045 are presented in Appendix D.

Table 6-3 – Option 1 local air quality Future Scenarios (2030)

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Change in NOx emissions (kg/year)	-13,777	-9,580	-9,142	-6,683
Change in PM_{10} emissions (kg/year)	8,419	7,987	4,432	4,122

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Change in $PM_{2.5}$ emissions (kg/year)	3,658	3,536	1,915	1,817

Climate Change – Greenhouse Gas Emissions

The various future scenarios considered do not show any significant change in greenhouse gas emissions. An overview of the Greenhouse Gas Emissions assessment is presented in Table 6-4, with further details presented in Appendix E.

Table 6-4 – Option 1 Greenhouse gas emissions Future Scenarios

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Total Changes CO_{2e} emissions (tonnes) over 60-year appraisal period following opening (t)	427,158.23	190,588.58	257,280.66	137,809.78
Percentage Change	-0.28%	-0.08%	-0.09%	-0.06%

Health, Safety and Wellbeing – Accidents (All severity)

All future scenarios under Option 1 show significant reductions in the number of collisions. These impacts are significantly increased under the 100% compliance futures. An overview of the envisaged collision savings is presented in Table 6-5, further details provided in Appendix F.

Table 6-5 – Option 1 Collision Savings Future Scenarios

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Collision Savings in first year (Core Scenario)	Fatal - 7 Serious - 28 Slight - 13 Total – 48	Fatal - 7 Serious - 26 Slight - 12 Total – 45	Fatal - 4 Serious - 15 Slight - 7 Total – 26	Fatal - 4 Serious - 14 Slight - 6 Total – 25
Collision savings over 60 year assessment period (Core Scenario)	Fatal - 415 Serious - 1743 Slight - 901 Total – 3059	Fatal - 294 Serious - 1237 Slight - 637 Total – 2167	Fatal - 243 Serious - 1034 Slight - 548 Total – 1826	Fatal - 170 Serious - 720 Slight - 378 Total – 1267
Collision Savings in first year (Uplift Scenario)	Fatal - 8 Serious - 28 Slight - 13 Total – 49	Fatal - 8 Serious - 26 Slight - 12 Total – 46	Fatal - 5 Serious - 15 Slight - 7 Total – 27	Fatal - 5 Serious - 14 Slight - 6 Total – 25
Collision savings over 60 year assessment period (Uplift Scenario)	Fatal - 489 Serious - 1743 Slight - 901 Total – 3134	Fatal - 350 Serious - 1237 Slight - 637 Total – 2224	Fatal - 293 Serious - 1034 Slight - 548 Total – 1875	Fatal - 206 Serious - 720 Slight - 378 Total – 1303

Economy – Economic efficiency of the transport system

Option 1 is expected to result in a minor to moderate adverse effect for economic efficiency across the future scenarios, with the primary type of user impacted being ‘other’ users while commuting and business users are impacted equally in person hours. However, when monetised the most significant economic impact is on business users due to the high value of their time.

If the 100% compliance future was achieved it would be expected that Option 1 would increase in disbenefit however, it would still be expected to be a moderate adverse.

An overview of economic assessment is presented in Table 6-6, with further detail presented in Appendix G and Appendix I.

Table 6-6 – Option 1 Transport Economic Efficiency (TEE) Benefits (£m, 2010 prices and values)

Transport Economic Efficiency (TEE) Benefits	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Consumer – commuting user benefits; Travel Time	-113	-81	-59	-42
Consumer – commuting user benefits; Vehicle operating costs	7	4	4	3
Consumer – commuting user benefits; Subtotal	-106	-77	-55	-39
Consumer – other user benefits; Travel Time	-126	-96	-64	-47
Consumer – other user benefits; Vehicle operating costs	11	5	7	3
Consumer – other user benefits; Subtotal	-116	-91	-58	-44
Business benefits; Travel Time	-204	-195	-100	-91
Business benefits; Vehicle operating costs	-28	-24	-14	-11
Business benefits; Subtotal	-231	-219	-114	-102
Total TEE benefit	**-453**	**-387**	**-227**	**-185**

Comparative Access by Geographic Location

The fisheries industry is a key industry within Scotland and the impacts on these journey times have been assessed to understand the likely impact. These trips have been assessed from key locations to nearby the Scotland border at Gretna Green. The realistic compliance results are presented in Table 6-7 below for the PM peak.

Table 6-7 - HGV journey times for Option 1, "without policy" and realistic compliance

From	To	Do Minimum	Option 1	Difference
Aberdeen	Gretna Green	04:10:10	04:10:27	00:00:17
Scrabster	Gretna Green	06:16:10	06:20:17	00:04:07
Ullapool	Gretna Green	05:05:40	05:07:26	00:01:45
Uig	Gretna Green	08:27:08	08:28:16	00:01:08
Oban	Gretna Green	03:40:04	03:41:11	00:01:08

Table 6-7 above shows the largest increase for the route from Scrabster to Gretna is an approximate four-minute increase to the current six-hour journey time. Therefore, it is unlikely the long HGV routes will be severely impacted by this option. Although the option increases the speed limit of HGV's on single carriageway, HGV traffic will interact with other vehicles that will have their speed limit reduced.

Other future scenarios considered result in trivial differences in journey times from the presented durations.

6.3 Option 2

This option aims to improve road safety and reduce speed differential on Scotland's Road network.

- On single carriageways:
  - Cars and motorcycles would have a decreased speed limit of 50mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 50mph.
- On dual carriageways as follows:

- Cars and motorcycles would have a decreased speed limit of 60mph; and
- Goods vehicles (>7.5t) would have an increased speed limit of 60mph.

- On motorways:
  - All vehicles limited to 60mph.

Table 6-8 presents and overview of the options Appraisal for Option 2 and future scenarios.

Table 6-8 – Option 2 Future Scenarios Assessment Summary

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Environment – noise and vibration	Minor benefit	Minor benefit	No benefit or impact	No benefit or impact
Environment – local air quality (airborne particulate matter)	No benefit or impact	No benefit or impact	No benefit or impact	No benefit or impact
Environment – local air quality (Nitrous Oxide emissions)	Moderate benefit	Moderate benefit	Minor benefit	Minor benefit
Climate Change – Greenhouse Gas Emission	Minor benefit	Minor benefit	Minor benefit	Minor benefit
Health, Safety and Wellbeing – accidents (All severity)	Major benefit	Major benefit	Major benefit	Major benefit
Economy – Economic efficiency of the transport system	Moderate negative impact	Moderate negative impact	Moderate negative impact	Moderate negative impact
Comparative Access by Geographic Location	Moderate negative impact	Moderate negative impact	Minor negative impact	Minor negative impact

Environment – Noise and Vibration

When considered “with policy”, noise level changes will range from no benefit or impact to minor beneficial in this option, with a maximum predicted reduction in noise level of 1.5 dBA, for 100% compliance, and 0.6 dBA for realistic compliance, due to changes in average speed and traffic flows.

When considered “without policy”, noise level changes will range from no benefit or impact to minor beneficial in this option, with a maximum predicted reduction in noise level of 1.5 dBA, for 100% compliance, and 0.7 dBA for realistic compliance, due to changes in average speed and traffic flows. The magnitude of changes in noise level evaluated as a comparison between the future appraisals and do-nothing scenarios in the year of assessment.

An overview of the noise assessment is presented in Table 6-9, with further details provided in Appendix C.

Table 6-9 – Option 2 Noise levels Future Scenarios

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	100% Compliance - Without Policy	100% Compliance - With Policy
Environment – noise impact	1.5 dB	1.5 dB	0.7 dB	0.6 dB

Environment – local air quality (airborne matter and Nitrous Oxide emissions)

Option 2 when considered “without policy” and 100% compliance, results in a moderate benefit in road NOx emissions, a minor negative impact in PM_{10} emissions and no benefit or impact for $PM_{2.5}$ emissions in 2025 and 2030. For 2045, the assessment predicts a minor benefit for road NOx emissions, a minor negative impact for PM_{10} emissions and no benefit or impact for $PM_{2.5}$ emissions.

Option 2 when considered “without policy” for realistic compliance, predicts a minor benefit in road NOx emissions, but no benefit or impact from PM_{10} and $PM_{2.5}$ emissions in 2025, 2030 and 2045.

The assessment shows that when considered “with policy”, the 100% compliance future predicts a moderate benefit in road NOx emissions and no benefit or impact for PM_{10} and $PM_{2.5}$ emissions. For 2030 the assessment predicts a moderate benefit for NOx emissions, a minor negative impact for PM_{10} emissions and no benefit or impact for $PM_{2.5}$ emissions. For 2045, the assessment predicts a minor benefit in road NOx emissions, a minor negative impact for PM_{10} emissions and no benefit or impact for $PM_{2.5}$ emissions.

Option 2 for the realistic compliance future predicts a minor benefit in road NOx emissions, but no benefit or impact for the PM_{10} and $PM_{2.5}$ emissions in all years.

An overview of the air quality assessment for Option 2 is provided in Table 6-10. The impacts for 2025 and 2045 are presented in Appendix D.

Table 6-10 – Option 2 local air quality Future Scenarios (2030)

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Change in NOx emissions (kg/year)	-213,165	-179,451	-93,960	-78,340
Change in PM_{10} emissions (kg/year)	12,803	10,376	4,838	3,866
Change in $PM_{2.5}$ emissions (kg/year)	3,944	3,429	1,485	1,306

Climate Change – Greenhouse Gas Emissions

The various future scenarios considered only show small reductions in greenhouse gas emissions. These savings are slightly increased in the “With policy” futures and with 100% compliance scenarios. An overview of the Greenhouse Gas Emissions assessment is presented in Table 6-11 with further details provided in Appendix E.

Table 6-11 – Option 2 Greenhouse gas emissions Future Scenarios

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Total Changes CO_{2e} emissions (tonnes) over 60-year appraisal	5,180,019.69	4,023,674.17	2,379,885.70	1,725,009.66

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
period following opening (t)				
Percentage Change	-4.24%	-1.73%	-0.82%	-0.74%

Health, Safety and Wellbeing – Accidents (All severity)

All future scenarios under Option 2 show significant reductions in the number of collisions. These impacts are significantly enhanced under the 100% compliance futures. An overview of the envisaged collision savings is presented in Table 6-12, with further details provided in Appendix F.

Table 6-12 – Option 2 Collision Savings Future Scenarios

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Collision Savings in first year (Core Scenario)	Fatal - 14 Serious - 52 Slight - 33 Total – 99	Fatal - 13 Serious - 49 Slight - 31 Total – 94	Fatal - 7 Serious - 25 Slight - 15 Total – 47	Fatal - 7 Serious - 23 Slight - 14 Total – 44
Collision savings over 60 year assessment period (Core Scenario)	Fatal - 817 Serious - 3095 Slight - 1991 Total – 5904	Fatal - 591 Serious - 2270 Slight - 1523 Total – 4384	Fatal - 418 Serious - 1602 Slight - 985 Total – 3005	Fatal - 289 Serious - 1045 Slight - 615 Total – 1949
Collision Savings in first year (Uplift Scenario)	Fatal - 17 Serious - 52 Slight - 33 Total – 102	Fatal - 16 Serious - 49 Slight - 31 Total – 96	Fatal - 9 Serious - 25 Slight - 15 Total – 49	Fatal - 8 Serious - 23 Slight - 14 Total – 45
Collision savings over 60 year	Fatal - 971 Serious - 3095	Fatal - 700 Serious - 2270	Fatal - 504 Serious - 1602	Fatal - 345 Serious - 1045

Category appraised	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
assessment period (Uplift Scenario)	Slight - 1991 Total – 6057	Slight - 1523 Total – 4493	Slight - 985 Total – 3091	Slight - 615 Total – 2005

Economy – Economic efficiency of the transport system

Option 2 is predicted to result in a large adverse effect for economic efficiency due to the large number of roads across Scotland having speed limits reduced. As expected, this is a slightly lower disbenefit in the without policy future as the lower number of trips means fewer people are impacted.

If 100% compliance with the new speed limits was achieved it would be expected that Option 2 would have a much larger adverse impact - by around three times. However, it would still be considered as large adverse.

An overview of economic assessment is presented in Table 6-13, with further detail of the economic appraisal presented in Appendix G and Appendix I.

Table 6-13 – Option 2 Transport Economic Efficiency (TEE) Benefits (£m, 2010 prices and values)

Transport Economic Efficiency (TEE) Benefits	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Consumer – commuting user benefits; Travel Time	-516	-396	-217	-159
Consumer – commuting user benefits; Vehicle operating costs	82	53	33	24
Consumer – commuting user benefits; Subtotal	-434	-344	-184	-136
Consumer – other user benefits; Travel Time	-470	-365	-196	-145

Transport Economic Efficiency (TEE) Benefits	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Consumer – other user benefits; Vehicle operating costs	92	65	38	26
Consumer – other user benefits; Subtotal	-379	-300	-158	-119
Business benefits; Travel Time	-992	-1,029	-386	-381
Business benefits; Vehicle operating costs	-67	-56	-29	-21
Business benefits; Subtotal	-1,059	-1,085	-415	-402
Total TEE benefit	**-1,871**	**-1,728**	**-757**	**-657**

Comparative Access by Geographic Location

The fisheries industry is a key industry within Scotland and the impacts on these journey times have been assessed to understand the likely impact. These trips have been assessed from key location to nearby the Scotland border at Gretna Green. The realistic compliance results are presented in Table 6-14 below for the PM peak.

Table 6-14 – HGV journey times for Option 2, "with policy" and realistic compliance

From	To	Do Minimum	Option 2	Difference
Aberdeen	Gretna Green	04:07:35	04:12:47	00:05:12
Scrabster	Gretna Green	06:14:46	06:27:10	00:12:25
Ullapool	Gretna Green	05:04:34	05:14:40	00:10:06
Uig	Gretna Green	08:25:54	08:29:48	00:03:54

Oban	Gretna Green	03:38:49	03:42:43	00:03:54

Table 6-14 above shows the largest increase is seen for the route from Scrabster to Gretna where this is an around 12-minute increase to the current six-hour journey time. Therefore, it is unlikely the long HGV routes will be severely impacted by this option. This is expected to be closer to a 30-minute impact within the 100% compliance scenario which would be a significant impact.

Although the option increases the speed limit of HGV's on single and dual carriageways, HGV traffic will interact with other vehicles that will have their speed limit reduced.

6.4 Other Assessment Considerations

The STAG appraisal process requires consideration of Equality Impact Assessment, Feasibility, Affordability and Public Acceptability and Risk and uncertainty. The appraisal of these are outlined within this section of the report.

Equality Impact Assessment (EQIA)

To comply with the requirements of the Equality Act 2010 (Specific Duties) (Scotland) Regulations 2012, an EQIA of the options has been undertaken.

The assessment shows that both Option 1 and Option 2 will result in an overall slight benefit for some protected characteristic groups, with no negative impact identified This is presented within Appendix H.

Feasibility, affordability and public acceptability

Option Implementation

There are two legal processes available in Scotland to alter speed limits on public roads. These are:

- Implementation Method A - a Parliamentary Act, which could vary the National Speed Limit (for varying vehicle types) across all Scottish roads; and
- Implementation Method B - promotion of Permanent Traffic Regulation Orders (PTROs), which would be processed by each individual local roads authority covering roads in their statutory area.

The PTRO route would require all 32 Local Authorities (as Road Authorities for their specific areas) and Transport Scotland (as Roads Authority for the Scottish Strategic Trunk Road Network) to promote their own individual PTRO and, consequently, would likely be more time intensive. It would also be more costly to promote this and require a significant change to existing speed limit signs across the country as the alterations would be classed as localised speed limits (rather than a change to the National Speed Limit) and would need to be signed accordingly. In addition, the timescales for promotion of these individual Orders may vary (possibly significantly) and therefore the implementation of the lowered speed

limits at a national level and the subsequent monitoring of their effects may be problematic. This may be further compounded by the fact that the promotion of some of the PTROs may be unsuccessful as each would be open to public consultation and ultimately determined by Local Authority Committees. The implementation of PTROs by Local Authority Committees may vary in adoption in terms of consistency and timescales. If there is a variation in timescales, this may lead to a safety issue as drivers may be travelling between Local Authorities and encountering varying speed limits.

Promoting PTROs would, however, provide flexibility in applying the new speed limits, allowing this to progress in areas where a PTRO can be promoted relatively quickly while other, more complex, areas are considered further. It may also be viewed as a more transparent route as the promotion of each Order would involve public consultation.

The use of a Parliamentary Act would require the preparation of one document that would be presented to the Scottish Parliament for MSPs to vote upon and therefore would potentially be significantly quicker promote. A successful promotion of the Bill would allow for all speed limits to be changed accordingly across the country, significantly simplifying the practical implementation of these changes, whilst minimising the need to change speed limit signing as the existing National Speed Limit signs would still be valid. It would also allow for more effective monitoring and evaluation of the measures as the alterations could be installed nationally over a relatively short period of time.

This approach, however, does not allow for a more incremental, localised approach that would allow speed limits to be varied in areas where the populace deem this more acceptable. In addition, it would necessitate an education strategy to ensure public awareness of the new National Speed Limits and may be a less popular approach with the public as it does not include direct consultation with them, although it is recognised that it does involve their representatives in Parliament.

Recognising that the legal processes involved with both implementation methods will involve specialist knowledge, it is recommended that competent advice on these legal processes is sought prior to implementation of the options presented in this report.

There are numerous guidance documents used within Scotland for the setting of speed limits and to inform on enforcement and education. The suitability of these guidance documents will require to be reviewed if any of the options considered are implemented.

Analysis of Monetised Costs and Benefits

The Analysis of Monetised Costs and Benefits (AMCB) for Implementation Method A is presented in Table 6-15 and Table 6-16, further detail of the economic assessment is presented in Appendix I. This summarises the monetised impacts of a scheme that are considered sufficiently robust for inclusion in the scheme's Net Present Value (NPV) and initial Benefit to Cost Ratio (BCR).

The AMCB table combines information from the TEE and Cost tables with monetised estimates of other impacts such as noise, air quality, and accidents. Positive values

represent benefits, while negative values represent disbenefits or costs. All values are shown in 2010 prices, discounted to 2010.

Based on the AMCB, the total monetised benefits are positive for Option 1 realistic compliance with policy (£33m PV) and without policy future scenarios (£6m PV) due to the accident savings outweighing the journey time disbenefits. For the rest of the future scenarios disbenefits are forecast with these being greatest for Option 2 100% compliance.

With a Net Present Value (NPV) above zero for Option 1 realistic compliance with policy, it is estimated to achieve benefit to cost ratios (BCR) between 2 and 5.6 depending on the method of implementation. For the comparable without policy scenarios the BCRs range between 0.3 and 1. All other future scenarios are estimated to deliver a negative NPV and negative BCR.

Table 6-15 - Analysis of Monetised Costs and Benefits (AMCB) Option 1

(£m, 2010 prices and values)	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Noise	0	0	0	0
Local Air Quality	0	0	0	0
Greenhouse Gases	7	3	4	2
Journey Quality	0	0	0	0
Physical Activity	0	0	0	0
Accidents	440	329	259	190
Economic Efficiency: Consumer Users (Commuting)	-106	-77	-55	-39
Economic Efficiency: Consumer Users (Other)	-116	-91	-58	-44
Economic Efficiency: Business Users and Providers	-231	-219	-114	-102
Wider Public Finances (Indirect Taxation Revenues)	-5	-2	-3	-2
Present Value of Benefits	**-11**	**-58**	**33**	**6**
Present Value of Costs National Legislation Change (Implementation Method A)	**6**	**6**	**6**	**6**
***Present Value of Costs Change existing statutory legislation (TROs)* (Implementation Method B)**	**16**	**16**	**16**	**16**

(£m, 2010 prices and values)	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Net Present Value National Legislation Change (Implementation Method A)	**-17**	**-64**	**27**	**0**
Net Present Value Change existing statutory legislation (TROs)	**-27**	**-74**	**16**	**-11**
Initial BCR National Legislation Change (Implementation Method A)	**-1.8**	**-9.9**	**5.6**	**1.0**
Initial BCR Change existing statutory legislation (TROs)	**-0.7**	**-3.5**	**2.0**	**0.3**

The BCRs are outlined in Table 6-16 below for Option 2.

Table 6-16 – Analysis of Monetised Costs and Benefits (AMCB) Option 2

(£m, 2010 prices and values)	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Noise	0	0	0	0
Local Air Quality	0	0	0	0
Greenhouse Gases	95	72	38	30
Journey Quality	0	0	0	0
Physical Activity	0	0	0	0
Accidents	846	646	433	299
Economic Efficiency: Consumer Users (Commuting)	-434	-344	-184	-136
Economic Efficiency: Consumer Users (Other)	-379	-300	-158	-119
Economic Efficiency: Business Users and Providers	-1,059	-1,085	-415	-402
Wider Public Finances (Indirect Taxation Revenues)	-75	-59	-30	-25
Present Value of Benefits	**-1,005**	**-1,069**	**-316**	**-352**
Present Value of Costs National Legislation Change (Implementation Method A)	**6**	**6**	**6**	**6**
Present Value of Costs Change existing statutory legislation (TROs) **(Implementation Method B)**	***16***	***16***	***16***	***16***

(£m, 2010 prices and values)	100% Compliance - Without Policy	100% Compliance - With Policy	Realistic Compliance - Without Policy	Realistic Compliance - With Policy
Net Present Value National Legislation Change (Implementation Method A)	**-1,011**	**-1,075**	**-322**	**-358**
Net Present Value Change existing statutory legislation (TROs)	**-1,021**	**-1,085**	**-333**	**-369**
Initial BCR National Legislation Change (Implementation Method A)	**-169.7**	**-180.5**	**-53.4**	**-59.5**
Initial BCR Change existing statutory legislation (TROs)	**-61.1**	**-65.0**	**-19.2**	**-21.4**

6.5 Risks and uncertainty

A risk and uncertainties assessment has been undertaken. The key findings of this are presented in Appendix K. Given the nature of the options and different future scenarios modelled within TMfS, there are a number of the risks and uncertainties that are the same across the options and future scenarios considered.

Option 2 proposes reducing speed limits on dual carriageway and motorways which are generally perceived by the public as being the safest roads designed to accommodate higher speeds. This may increase promotability and public acceptability risks in comparison with Option 1.

6.6 Scottish Trunk Road Infrastructure Project Evaluation (STRIPE)

Being able to demonstrate the impacts of an implemented option which involves public funding is essential to ensure accountability. STRIPE is a recognised framework for the evaluation of road schemes costing over five million pounds and considers the following core questions:

- Were the scheme's Transport Planning Objectives achieved and benefits realised?
- Were the outturn impacts of the project as forecast?
- How well was the project implemented?
- What were the impacts on established policy directives?
- What lessons can we learn to improve decision making?

A STRIPE plan will be developed that outlines the proposed evaluation strategy that will inform requirements regarding baseline data.

7 Option Appraisal Summary

7.1 Overview

This section of the report presents a comparative summary of the findings from the appraisal in Section 6 of the options and future scenarios. For comparison purposes, the options have been assessed against the TPOs in Table 7-1 and Table 7-2.

Table 7-1 - Option 1 and 2 Without Policy Assessment Against Transport Planning Objectives

Identified Road Safety Outcomes	100% Compliance - Option 1	100% Compliance - Option 2	Realistic Compliance - Option 1	Realistic Compliance - Option 2
Reduce collision rates and severity on single carriageways where speed has been identified as a contributory factor.	Major Benefit	Major Benefit	Major Benefit	Major Benefit
Reduce collision rates and severity on dual carriageways where speed has been identified as a contributory factor.	No impact or benefit	Moderate benefit	No impact or benefit	Moderate benefit
Reduce speed differentials between HGVs and other traffic.	Moderate benefit	Moderate benefit	Minor benefit	Minor benefit

Table 7-2 - Option 1 and 2 With Policy Assessment Against Transport Planning Objectives

Identified Road Safety Outcomes	100% Compliance - Option 1	100% Compliance - Option 2	Realistic Compliance - Option 1	Realistic Compliance - Option 2
Reduce collision rates and severity on single carriageways where speed has been identified as a contributory factor.	Major Benefit	Major Benefit	Major Benefit	Major Benefit
Reduce collision rates and severity on dual carriageways where speed has been identified as a contributory factor.	No impact or benefit	Moderate benefit	No impact or benefit	Moderate benefit
Reduce speed differentials between HGVs and other traffic.	Moderate benefit	Moderate benefit	Minor benefit	Minor benefit

In Table 7-3 and Table 7-4, the options have been compared against the Transportation Planning Objectives identified in section 3 of this report. From this comparison it is clear that Option 2 would contribute to all the objectives whilst Option 1 would contribute to all road objectives except reducing collision rates on dual carriageways. Option 2 is unlikely to obtain the full benefits as dual carriageways and motorways are the significantly safer than single carriageways.

An overview of the Options Appraisal is shown in Table 7-3 for Option 1 and Option 2 without policy and for Option 1 and Option 2 with policy.

Table 7-3 – Option 1 and Option 2 Without Policy Assessment Summary

Category appraised	100% Compliance - Option 1	100% Compliance - Option 2	Realistic Compliance - Option 1	Realistic Compliance - Option 2
Environment – noise and vibration	Minor benefit	Minor benefit	No impact or benefit	No impact or benefit
Environment – local air quality (airborne particulate matter)	No impact or benefit	No impact or benefit	No impact or benefit	No impact or benefit
Environment – local air quality (Nitrous Oxide emissions)	No impact or benefit	Moderate benefit	No impact or benefit	Minor benefit
Climate Change – Greenhouse Gas Emission	No impact or benefit	Minor benefit	No impact or benefit	Minor impact
Health, Safety and Wellbeing – accidents (All severity)	Moderate benefit	Major benefit	Moderate benefit	Major benefit
Economy – Economic efficiency of the transport system	Major negative impact	Moderate negative impact	Moderate negative impact	Moderate negative impact
Comparative Access by Geographic Location	No impact or benefit	Moderate negative impact	No impact or benefit	Minor negative impact

Table 7-4 - Option 1 and Option 2 With Policy Assessment Summary

Category appraised	100% Compliance - Option 1	100% Compliance - Option 2	Realistic Compliance - Option 1	Realistic Compliance - Option 2
Environment – noise and vibration	Minor benefit	Minor benefit	No impact or benefit	No impact or benefit
Environment – local air quality (airborne particulate matter)	No impact or benefit	No impact or benefit	No impact or benefit	No impact or benefit
Environment – local air quality (Nitrous Oxide emissions)	No impact or benefit	Moderate benefit	No impact or benefit	Minor benefit
Climate Change – Greenhouse Gas Emission	No impact or benefit	Minor benefit	No impact or benefit	Minor benefit
Health, Safety and Wellbeing – accidents (All severity)	Moderate benefit	Major benefit	Moderate benefit	Major benefit
Economy – Economic efficiency of the transport system	Moderate negative impact	Moderate negative impact	Minor negative impact	Moderate negative impact
Comparative Access by Geographic Location	No impact or benefit	Moderate negative impact	No impact or benefit	Minor negative impact

A comparison of Option 1 and Option 2 is shown in Table 7-3 and Table 7-4. When considering the Options against the appraisal criteria, the comparative impacts of the options is:

- Both options lead to small reductions in the amount of noise generated by road traffic;

- Option 2 would lead to a moderate reduction in NOx emissions that would not be observed under Option 1. Both options have a non-statistically significant impact on particulate matter;
- Option 2 leads to a minor reduction in greenhouse gas emissions than Option 1;
- Option 2 would achieve a greater reduction in road safety collisions than Option 1; and
- Option 1 would lead to a minor economic benefit compared to Option 2.

The differences in impacts in the appraisal are influenced by the proposed change in HGV speed limits on rural dual carriageways which are proposed under Option 2 but not Option 1. The appraisal of the options demonstrates that if impacts are to be achieved that they are highly sensitive to the level of speed limit compliance.

The initial BCRs of the options range from 5.6 to -180.5, depending on the future scenarios and implementation approach assumed. This implies the proposal could achieve value for money ranging from Very High to Very Poor on the basis of initial BCR impacts. The highest levels of value for money are achieved by Option 1 in particular when considering the realistic compliance future scenarios.

The appraisal work undertaken has considered the impacts of the options for several years into the future. Outcomes of the appraisal further into the future are more uncertain due to events and policies which cannot be accurately predicted.

7.2 Environment – Noise and Vibration

The appraisal of noise had identified that noise levels would be expected to fall most under Option 1, although the impacts would be significantly linked to the level of compliance achieved. The impacts of “with policy” and “without policy” future scenarios would be relatively minimal.

An assessment of the impacts of the options and future scenarios with respect vibration effects has not been undertaken as it is considered that such impacts would be imperceptible.

A theoretical 100% compliance in the change in speeds would result in noise level changes between no benefit or impact to minor beneficial impact.

7.3 Environment – local air quality (airborne matter and Nitrogen Oxide emissions)

Option 2 is likely to lead to a minor improvement in air quality with respect to NOx emissions with realistic compliance. The improvements are likely to increase to moderate improvement in NOx emissions if full compliance with speed limits is obtained. Option 2 is likely to have a negligible impact on particulate matter with realistic compliance. Option 2 with full compliance will have a negligible effect on $PM_{2.5}$ but a minor negative impact on PM_{10} in all futures except with policy in 2025 where a negligible impact is anticipated.

Under Option 1, the various futures considered do not suggest any change in NOx, PM_{10} and $PM_{2.5}$ emissions.

7.4 Climate Change – Greenhouse Gas Emissions

The emissions reductions in Option 2 both with and without policy are slightly greater than Option 1. A key factor contributing to the reduction was the increased speed of HGVs, as their emission efficiency improves at higher speeds as the HGVs will generate lower carbon emissions.

The assessment of the options demonstrates a significant difference in emission reduction between the 100% compliance and the realistic compliance futures. Emissions reductions being significantly greater for 100% compliance when compared to the realistic compliance futures.

When applying the DMRB LA111 scale to the 100% compliance scenario, the benefits ranged from minor for Option 2 with policy to moderate without policy. In contrast, the realistic scenario only showed negligible benefits.

7.5 Health, Safety and Wellbeing – Accidents (All severity)

All options presented are envisaged to lead to a significant reduction in recorded serious and fatal severity road collisions. These impacts are generally increased in Option 2 over Option 1 due to Option 2 impacting upon additional roads.

The increase of National Speed Limits for HGVs aims to reduce the speed differentials between vehicles and may lead to a reduction in driver frustration, reckless manoeuvres and reported collision data.

Obtaining greater levels of compliance with the proposed speed limits potentially leads to a significant increase in the lives that can be saved. The “with policy” and “without policy” future scenarios have a non-statistically significant impact on the collisions saved.

7.6 Economy – Economic efficiency of the transport system

Overall, the scheme is expected to have a negative impact on economic efficiency with the magnitude varying significantly depending on the option taken forward and the future that is achieved.

Within Option 1 the economic efficiency disbenefits may be offset by the benefits to collisions under the realistic compliance scenarios (and nearly offset under 100% compliance). However, this is not the case for Option 2, where the economic efficiency disbenefits significantly outweigh the collision benefits.

The amendments being proposed to HGV traffic under the realistic future scenarios is likely to be relatively minor as the options proposed legitimise current HGV behaviour with respect to speed. This would mirror the experience in England where HGV speed limits were altered in 2015.

7.7 Comparative Access by Geographic Location

The impacts of the options and future scenarios with respect to the fisheries routes for Option 1, it is unlikely the long HGV routes will be significantly impacted. This reflects that HGV traffic requires to interact with other traffic that will have its speed limits reduced under the options presented.

Under Option 2, journey times for long HGV routes will be more significantly impacted than Option 1. A high level of compliance may lead to journey times on some long distance routes being increased by up to 30 minutes.

8 Further Reflections

8.1 Overview

Research undertaken to inform this review identified related areas that could be affected by the options presented. These are discussed in this section of the report.

8.2 Kinetic energy in collisions

International evidence is strong on the link between relative vehicles speeds and outcomes when collisions occur. The Nilsson power law (see Health, Safety and Wellbeing – Accidents (All severity) Section for further details) demonstrates a relationship between recorded vehicles speeds and road safety outcomes. These are:

- Increasing vehicles speeds leads to greater numbers of road safety collisions with increased levels of severity; and
- Decreasing vehicles speeds leads to reduced numbers of road safety collisions with reduced levels of severity.

The amount of kinetic energy in a collision increases with vehicle speed and mass. Kinetic energy is dissipated when a collision occurs and is visibility demonstrated in the damage to vehicles and infrastructure and in injuries to road users.

Due to the mass of batteries in electric vehicles, they tend to weight significantly more than conventional petrol/diesel vehicles. Reducing National Speed Limits potentially offsets the road safety impacts of increasing vehicles mass. Similarly, HGVs are larger and weigh significantly more than other vehicles which may lead to more kinetic energy. However, the evidence from England and Wales does not show a significant increase in HGV traffic speeds and collisions which may be reflected on the Scotland Road Network.

8.3 Vehicle Standards

The Scottish Government is committed to phasing out the need for new petrol and diesel cars and vans by 2030. This aims to reduce Scotland's carbon footprint by facilitating the move to electric vehicles. This creates two significant road safety concerns.

- The mass of electric vehicles is significantly greater than conventional vehicles, so when a collision occurs more kinetic energy requires to be dissipated; and
- As the vehicles are quieter than conventional vehicles, they are less likely to be heard/noticed by other road users.

Since leaving the EU on the 31st December 2020, Great Britain has not been required to follow the rules of the EU single market, including the adoption of technical standards. From the 6th July 2022 the EU under the General Safety Regulation, introduced new requirements for safety features to be included in all new road vehicles. The features now required to be included in all new vehicles within the EU are identified within Table 8-1.

Table 8-1 – New Safety Vehicle Requirements in the EU

For All road Vehicles	For Cars and Vans	For Buses and Trucks
▪ Intelligent speed assistance ▪ Reversing detection with camera or sensors ▪ Attention warning in case of driver drowsiness ▪ Emergency stop signal ▪ Cybersecurity measures	▪ Lane keeping assistance ▪ Advanced emergency braking ▪ Event data recorders	▪ Detection and warnings to prevent collisions within pedestrians or cyclists ▪ Tyre pressure monitoring systems

It is considered that some of these new features potentially will have an impact upon driver behaviour with respect to the speed at which vehicles travel, in particular intelligent speed assistance. Great Britain could introduce more stringent vehicle standards however, it would be difficult to be certain on the impacts.

As the renewal of the national fleet will take a considerable period of time, it is unclear when the divergence in safety standards between the EU and Great Britain will impact upon road safety performance in Scotland.

8.4 20mph Speed Limit in Wales

Wales introduced the default 20mph legislation in September 2023 on restricted roads only in residential and built-up areas. Since the introduction, there has been a 20% drop in insurance claim for car collisions. The reduction in insurance claims in Wales suggests that there may be a reduction in road safety collisions including damage only collisions which are not recorded in STATS19.

It stands to reason that the implementation of the options presented may have a similar economic impact in reducing damage only insurance claims that is not accounted for in the economic appraisal undertaken.

8.5 Speed Limit Review in Ireland

Published on the 14th of September 2023, the Speed Limit Review in Ireland fulfils a Programme for Government commitment in Ireland that included their Road Safety Strategy 2021 – 2030. An overview of the approach taken in this work is presented within Appendix L of this report.

The Irish review had a number of recommendations including for National Secondary Roads, which are broadly equivalent to single carriageway A roads in Scotland to reduce speed limits from 100 km/h (62mph) to 80km/h (50mph). The conclusions from the Irish Work showed that they followed an approach broadly in line with international evidence and that of the approach taken to assess the options for the Scottish Road Network presented in this report.

8.6 Driver Education & Enforcement

Road Safety Scotland is part of the Scottish Government and aims to promote awareness of road safety issues in Scotland through educational materials and publicity campaigns (Educational materials and publicity campaigns are shared on the Road Safety Scotland website). The campaigns rolled out by Road Safety Scotland cover a wide range of driver behaviours including speed. These campaigns often involve a number of different mediums.

Evaluation of road safety campaigns typically involves target surveys to understand their impacts on driver attitudes. These impacts are not directly relatable to reported collision data in collisions.

It stands to reason if drivers are unaware of changes in speed limits that the road safety benefits of the options would not be obtained. Accordingly, it is considered imperative that road safety campaigns would require to support the implementation of the options presented in this report.

Police Scotland and the safety camera programme undertake ongoing enforcement of speed limits within Scotland. Their ongoing work helps support educational programmes and to ensure compliance with speed limits.

8.7 Heavy Goods Vehicles (HGV) Speed Limits

On 6th April 2015, the National Speed Limit for HGVs in England and Wales for more than 7.5 tonnes maximum laden weight (HGVs >7.5t) was increased from 50mph to 60mph on dual carriageways and from 40mph to 50mph on single carriageways. Scottish Ministers did not mirror these increases which has led to a discrepancy in speed limits for goods vehicles (<7.5t at the border between Scotland and England. As can be seen in Table 2-4, the current speed limit for HGVs >7.5t in Scotland is 40mph on single carriageways and 50mph on dual carriageways.

Following implementation of the changes to the National Speed Limit for HGVs in England and Wales, the impacts of the speed limit changes were monitored, and the findings reported. These include:

- No evidence of a change in collisions involving HGVs on all study roads, single carriageway roads or dual carriageway roads;
- On single carriageways the average speed of HGVs increased by 1.6 mph (from 44.1 to 45.7 mph);
- On single carriageways the average speed of light vehicles increased by 0.3 mph (from 47.9 to 48.2 mph);
- On dual carriageways, the average speed of HGVs increased by 0.5 mph (from 52.0 to 52.5 mph);
- On dual carriageway, the average speed of light vehicles increased by 0.1 mph (from 65.0 to 65.1 mph);

- No statistically significant effect on air quality, nor perceptible change in noise level was recorded over a typical 18-hour day or during individual hours at night; and
- Economic benefits have principally comprised of business user time savings and business user vehicle operating costs.

The evaluation of changes made to the National Speed Limit of goods vehicles (>7.5t) in England and Wales in April 2015, has concluded that the actual speeds of goods vehicles (>7.5t) has not significantly changed. Harmonised with this conclusion is that the wider impacts of the changes were considered to not be statistically significant.

Recognising these findings, it is proposed to amend the options appraised in this report to incorporate the changes made in England with respect to goods vehicles (>7.5t). This would:

- simplify speed limits for goods vehicles (>7.5t) between the two jurisdictions (Scotland and England);
- help reduce the speed differentials in Scotland;
- reduce driver frustration; and
- improve journey time reliability.

The resulting options are as follows:

Option 1

- On single carriageways:
  - Cars and motorcycles would have a decreased speed limit of 50mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 50mph.
- On dual carriageways as follows:
  - Goods vehicles (>7.5t) would have an increased speed limit of 60mph.
- On motorways:
  - No alterations to speed limits proposed.

Option 2

- On single carriageways:
  - Cars and motorcycles would have a decreased speed limit of 50mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 50mph.
- On dual carriageways as follows:
  - Cars and motorcycles would have a decreased speed limit of 60mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 60mph.
- On motorways:

- All vehicles limited to 60mph.

In considering appraisal of the likely impacts of each option, it is unlikely that changes to the options would affect the appraisals presented in section 7 of this report.

9 Summary & Conclusions

Recorded collision data in Scotland shows that high severity collisions are more likely to have speed recorded as a contributory factor. Drivers of lighter vehicles such as cars and motorcycles are more likely to have been recorded as travelling an inappropriate speed when involved in collisions. Conversely the number of goods vehicles involved in speed related collisions is comparatively low. It has been identified that local authority A roads have the highest accident rates on Scotland roads in 2022. These roads are predominantly single carriageways in rural environments. This highlights that lowering posted speed limits on these routes would be consistent with the Safe System approach.

International research has identified relationships between traffic speeds and collision data. Based upon this, the Nilsson's power law identifies that significant reductions in fatal and serious collisions can be obtained from reducing vehicle speeds.

Following on from an option generation and option sifting exercise, this report considers two options to change National Speed Limits within Scotland to work towards Scotland's long-term vision for road safety, Vision Zero, by 2050. The options aim to reduce vehicle speeds and speed differentials between vehicles such that driver decisions are easier to make and when collisions occur the consequences are reduced.

Reflecting upon the evaluation of changes made to the National Speed Limit of goods vehicles (>7.5t) in England and Wales (see section 8.7), it is considered that option 1 presented in this report can be adjusted to include the increasing of the National Speed Limit for goods vehicles (>7.5t) without significantly impacting upon option appraisal outcomes. Accordingly, a summary of the resulting options is presented below.

Option 1

This option aims to improve road safety and reduce speed differential on single carriageways.

- On single carriageways:
  - Cars and motorcycles would have a decreased speed limit of 50mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 50mph.
- On dual carriageways as follows:
  - Goods vehicles (>7.5t) would have an increased speed limit of 60mph.
- On motorways:
  - No alterations to speed limits proposed.

Option 2

This option aims to improve road safety and reduce speed differential on Scotland's Road network.

- On single carriageways:
  - Cars and motorcycles would have a decreased speed limit of 50mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 50mph.
- On dual carriageways as follows:
  - Cars and motorcycles would have a decreased speed limit of 60mph; and
  - Goods vehicles (>7.5t) would have an increased speed limit of 60mph.
- On motorways:
  - All vehicles limited to 60mph.

Recognising that future events and outcomes are uncertain, four future scenarios have been considered within the appraisal. These include "with policy" and "without policy" to reflect that government actively implements several aligned policies which may or not be achieved.

The other futures' appraised considers the level of compliance with speed limits that may be achieved. This has been represented by 100% compliance future and a realistic compliance future. The realistic compliance future assumes that vehicle speeds would be reduced by 2.5mph (4kph). The level of compliance achieved is likely to be heavily influenced by education and enforcement strategies.

The options presented propose to increase HGV speed limits and reduce the speed limits of lighter vehicles with the aim of reducing speed differentials. Considering vehicle interactions and the current poor compliance with existing HGV speed limits, it is the expected that the impact on HGV journey times would be insignificant.

Although the direct benefits of road safety education programmes in terms of collision data and vehicle speeds is uncertain, it is reasonable to assume that if drivers are not educated about changes in National Speed Limits the benefits sought from changing speed limits would not be attained.

Although both options are predicted to facilitate Scotland's journey to Vision Zero with similarly limited impact upon environmental factors. Option 2 is likely to have a significant adverse impact on the economy, whereas this is not expected for option 1.

9.1 Next Steps

To fully understand the implementation of the options considered by this report, a comprehensive stakeholder engagement exercise is recommended. This would include key stakeholders such as Police Scotland, Local Authorities and the Road Haulage Association.

To demonstrate the impacts of the options being realised it is recommended that monitoring strategy be defined and implemented. This should take cognisance of the STRIPE framework.

To obtain the maximum benefits of the options, it is recommended that a compliance strategy is defined and implemented.

Ensuring public awareness of changes in National Speed Limits is considered critical to obtain the benefits associated with the options. It is considered that implementation of the options via changes in legislation combined with appropriate publicity would achieve maximum driver awareness.

Guidance documents are used to inform the setting and enforcement of speed limits in Scotland. This guidance will require to be identified, reviewed and updated as part of the implementation of the options.

Appendix A

Recorded Collision Data

Appendix B

Summary of Literature Review

Appendix C

Noise Assessment

Appendix D

Air Quality

Appendix E

Climate Change

Appendix F

Road Safety Accident Analysis and Results

Appendix G

Economic Appraisal Approach

Appendix H

Equality Impact Assessment

Appendix I

Economic Assessment Report

Appendix J

Determination of Capex

Appendix K

Risk Register

Appendix L

Ireland Speed Limit Review

Appendix M

Agilysis - Scotland Scale of Change Analysis

King James VI Business Centre
Friarton Road
Perth

wsp.com