STRATEGIC TRANSPORT PROJECTS REVIEW

PROTECTING OUR CLIMATE AND IMPROVING LIVES

Appendix I: Recommendation Appraisal Summary Tables

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1. Detailed Appraisal Summary

An 'Appendix I: Recommendation Appraisal Summary Tables (ASTs) Explanatory Note' accompanies this AST.

1.1. Recommendation 35 – Intelligent Transport System renewal and replacement

Recommendation Description

Intelligent Transport Systems (ITS) can make a significant contribution in the overall safety of travel and support enhanced transport resilience, smoother journeys, quicker reaction to incidents and environmental improvements across the Scottish network.

ITS infrastructure is embedded within the transport network, and includes equipment such as variable message signage, lane control signals, CCTV, emergency roadside telephones, traffic monitoring devices, weather monitoring devices and the networking equipment that connect these together and to the Traffic Scotland National Control Centre.

This coverage helps to ensure the availability and quality of the existing transport networks and can be used to monitor traffic flow, detect incidents and hazardous weather conditions and to manage the life-cycle of these events.

There is a significant amount of roadside ITS deployment which is now reaching or past its end of life and a substantial renewal and replacement programme is now required.

This recommendation involves investing in the renewal and replacement of the existing ITS roadside equipment to maintain the current high level of services to the road users and to provide greater resilience across the networks.

The enhanced functionality of new roadside ITS equipment would also contribute to reduced road accidents and the delivery of safer journeys.

This recommendation would cover the key future requirements for maintaining and enhancing ITS roadside provision, including:

- Renewal: Asset management and renewal programme to address issues of obsolescence in ITS infrastructure where equipment is life-expired or functionally inadequate. This includes CCTV, emergency roadside telephones, Variable Message Sign (VMS), lane control signals (LCS) -including gantries;
- Enhancement: Proactive deployment of modern ITS technology and infrastructure to replace existing ITS provisions that have low functionality thereby enhancing the utility and functionality of replaced equipment to deliver increased operational benefits;
- New Infrastructure: Deployment of modern, adaptable ITS technology using multi-functional VMS signs to improve network efficiency where ITS infrastructure currently exists;
- Alternative New infrastructure Deployment: Deployment of modern, adaptable

ITS technology in new deployment arrangements which minimise investment in structures and civil infrastructure;
- Communications Network: ITS Communications Infrastructure Replacement to support existing and new technology and infrastructure deployments and ITS Internet Protocol and;
- Network Refresh to support changes in technology and capability.

1.2. Relevance

Relevant to the Scottish trunk road and motorway network

This recommendation helps to ensure the availability, resilience, safety and quality of the transport infrastructure that is used to actively manage and control traffic during incidents and hazardous weather conditions.

This recommendation covers roadside ITS infrastructure, which is deployed on the transport network, and includes traditional equipment such as variable message signage, lane control signals, CCTV, emergency roadside telephones, traffic lights and traffic monitoring devices.

This recommendation applies to, and would benefit, the trunk road and motorway network across Scotland but may have several wider uses in terms of new technology.

1.3. Estimated Cost

£51million – £100million Capital

The capital cost for implementation of this recommendation is estimated to range from £51million to £100 million.

The current roadside ITS deployment has an existing revenue spend, which would need to continue into the future.

1.4. Position in Sustainable Investment Hierarchy

Maintaining and Safely Operating Existing Assets

This recommendation would contribute to seven of the 12 NTS2 outcomes, as follows:

- Help deliver our net-zero target;
- Adapt to the effects of climate change;
- Promote greener, cleaner choices;
- Get people and goods where they need to go;
- Be reliable, efficient and high quality;
- Use beneficial innovation; and
- Be safe and secure for all.

1.5. Summary Rationale

Summary of Appraisal

	TPO					STAG					SIA				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Low Scenario	+	0	0	+	+++	0	+	++	+	+	+	0	0	0	0
High Scenario	+	0	0	+	+++	0	+	++	+	+	+	0	0	0	0

This recommendation covers the key future requirements for the renewal and replacement of existing ITS roadside provision.

It has a positive impact on the majority of the STPR Transport Planning Objectives (TPOs) and STAG criteria, particularly in relation to safety and resilience, as a result of improved traffic flow conditions and network efficiency, and more reliable journey times which is of benefit to all users of the trunk and motorway network.

The impact across all of the Strategic Impact Assessment criteria is expected to be minor positive or neutral.

In terms of deliverability, provision of measures to renew, enhance or implement new ITS infrastructure is well defined. ITS applications have been accommodated on the new Queensferry Crossing and approach roads and Transport Scotland has considerable experience of operating such systems.

Overall, this recommendation is expected to be publicly acceptable, due to the benefits that would be delivered for users of the strategic transport network in terms of improving reliability, resilience and safety.

Details behind this summary are discussed in Section 3, below.

2. Context

2.1. Problems and Opportunities

This recommendation could help to tackle the following problems and opportunities:

Relevant Problem & Opportunity Themes Identified in National Case for Change:

- **Reliability:** without intervention, forecast increases in traffic volumes on the road network will impact negatively on reliability through increased congestion and more roadworks as greater pressure is placed on the operational efficiency of the network. Reliability can also be an issue on the rail network[i].
- **Safety and Security:** Scotland's transport system needs to be safe. Whilst the number of road accident casualties reduced by 11% between 2017 and 2018[ii], the number of fatalities has increased. Women and disabled people in particular feel vulnerable when using public transport – particularly at bus stops, train stations or other transport interchanges.
- **Information and Integration:** high-quality journey planning information, both digital and physical, is important to enable a resilient transport system that allows people and goods to get to where they need to get to. Some journeys are not possible due to a lack of connections or accessible modes of transport, and long wait times, the need for multiple tickets and complex connections deter people from some public transport services resulting in many running below capacity.
- **Resilience:** a key challenge is providing a transport system that is resilient and speedily recovers from disruption, thus minimising impacts of delayed journeys on networks and users.
- **Adapting to Climate Change:** climate change directly affects the transport sector through the increasing number of more severe and frequent extreme weather events and the disruption they cause to the transport system. Disruption often disproportionately impacts vulnerable communities with fewer and less resilient transport options and can lead to significant disruption and high economic costs.
- **Air Quality:** transport, and road transport in particular, remains a significant contributor to poor air quality. Air pollution increases the risks of diseases such as asthma, respiratory and heart disease, particularly for those who are more vulnerable. Air quality is often worse in areas of deprivation and is a health inequality issue.
- **Global Climate Emergency:** the Scottish Parliament committed to an ambitious target of net zero emissions by 2045 and transport needs to play its part. Transport is currently Scotland's largest sectoral emitter, responsible for 37% of Scotland's total greenhouse gas emissions (greenhouse gas emissions encompass CO_2 emissions)[iii] in 2018 (National Atmospheric Emissions Inventory 1990-2017)[iv]. Our transport system needs to minimise the future impacts of transport on our climate.

2.2. Interdependencies

This recommendation has potential overlap with other STPR2 recommendations and would also complement other areas of Scottish Government activity.

Other STPR2 Recommendations
▪ Changing road use behaviour (7) ▪ Provision of strategic bus priority measures (14); ▪ Trunk road and motorway safety improvements to progress towards 'Vision Zero' (30); ▪ Trunk road and motorway climate change adaptation and resilience (31); ▪ Trunk road and motorway renewal for reliability, resilience and safety (32); ▪ Future Intelligent Transport Systems (33); ▪ Traffic Scotland System renewal (34); and ▪ Speed Management Plan (38).
Other areas of Scottish Government activity
▪ Scotland's Road Safety Framework to 2030: The enhanced functionality of new roadside ITS services align closely with this long-term vision for road safety where there are zero road fatalities and injuries by 2050v ▪ Revised Draft Fourth National Planning Framework (Revised Draft NPF4)[vi] makes a number of references to resilience, however the North, North and West Coastal and Islands and South regional spatial priorities have a specific action on strengthening resilience.

3. Appraisal

This section provides an assessment of the recommendation against:

- STPR2 Transport Planning Objectives (TPOs);
- STAG criteria;
- Deliverability criteria; and
- Statutory Impact Assessment criteria.

The seven-point assessment scale has been used to indicate the impact of the recommendation when considered under the 'Low' and 'High' Transport Behaviour Scenarios (which are described in Appendix F of the Technical Report).

3.1. Transport Planning Objectives

1. A sustainable strategic transport system that contributes significantly to the Scottish Government's net-zero emissions target

Low Scenario	High Scenario
+	+

Improving traffic flow conditions also helps to reduce carbon emissions and so contributes towards net-zero emission targets; this includes measures such as enhancing and renewing existing ITS and implementing new infrastructure, which is anticipated to improve network efficiency. This would be anticipated to reduce fuel consumption and lower emissions from transport due to better management of incidents and congestion and through modal shift from car to bus achieved through aspects relating to bus priority on the trunk road and motorway network.

Overall, this recommendation is expected to have a minor positive impact on this objective in both the Low and High scenarios.

2. An inclusive strategic transport system that improves the affordability and accessibility of public transport.

Low Scenario	High Scenario
0	0

Whilst interventions under this recommendation would assist with bus priority on the trunk road and motorway network, it is considered that the overall impact would be neutral on this objective in both the Low and High scenarios.

3. A cohesive strategic transport system that enhances communities as places, supporting health and wellbeing.

Low Scenario	High Scenario
0	0

The focus of this recommendation is maintaining and enhancing ITS systems on the trunk road and motorway network and therefore this recommendation is unlikely to have any significant impacts in terms of enhancing communities as places or supporting health and well-being objectives.

As such, this recommendation is expected to have a neutral impact on this objective in both Low and High scenarios.

4. An integrated strategic transport system that contributes towards sustainable inclusive growth in Scotland.

Low Scenario	High Scenario
+	+

Each element of this recommendation helps to improve traffic flow conditions and network efficiency, providing more reliable journey times which is of benefit to all users of the trunk road and motorway network, particularly those travelling for business purposes, and would contribute towards sustainable inclusive growth.

For example, introduction of Managed Motorway type solutions on the M42 in England reduced journey time variability by 22%[vii].

Overall, this recommendation is expected to have a minor positive impact on this objective in both Low and High scenarios.

5. A reliable and resilient strategic transport system that is safe and secure for users.

Low Scenario	High Scenario
+++	+++

Providing a safe and secure transport system that is reliable and resilient is one of the main functions of ITS.

ITS improves traffic flows / network efficiency, which helps to improve reliability and reduce the number of incidents and accidents on the trunk road and motorway network.

Although measures which include use of the hard shoulder for bus priority could have a negative impact against the safety element of this objective, one pilot study in Israel, which allowed bus operations on hard shoulders of a rural motorway during peak hours, showed no observed increase in hazardous events nor in traffic accidents[viii].

A National Highways study[ix] considered the safety of Smart Motorways. This found that overall, the evidence shows that in most ways, smart motorways are as safe or safer than conventional ones; for example, in three of the past four years the study looked at, the proportion of fatalities occurring on Dynamic Hard Shoulder and All Lane Running was lower compared to the share of traffic carried. However, injury rates were slightly higher.

The renewal and replacement of ITS equipment would deliver more functionality across the network, including such measures as Variable Speed Limit signs and incident management and has been scored as having a minor positive impact

against this objective, though it is noted that further evidence to support this would be beneficial.

The Communications Network element also has a positive impact against this objective in supporting more efficient functioning of the ITS technology.

Increased surveillance is expected to improve actual and perceived security.

Overall, this recommendation is expected to have a major positive impact on this objective in both Low and High scenarios.

3.2. STAG Criteria

1. Environment

Low Scenario	High Scenario
0	0

See Strategic Environmental Assessment (SEA) below.

This recommendation is expected to have a neutral effect on this criterion in both the Low and High scenarios.

2. Climate Change

Low Scenario	High Scenario
+	+

This recommendation would support a wide range of ITS technology and applications, which would assist in addressing the impact from climate change.

This would be achieved from the reduction of fuel consumption and lowering emissions from transportation due to better management of incidents and congestion, and through modal shift from car to bus achieved through aspects of this recommendation relating to bus priority.

The recommendation would have a minor positive impact against Greenhouse Emissions.

There is no anticipated impact on Vulnerability to Effect of Climate Change and Potential to Adapt to Effect of Climate Change.

Overall this recommendation is expected to have a minor positive impact on this criterion in both Low and High scenarios.

3. Health, Safety and Wellbeing

Low Scenario	High Scenario
++	++

Improving traffic flows and network efficiency through renewal and replacement of ITS infrastructure would help to reduce incidents and accidents on the trunk road and motorway network.

For example, following the completion of the Fife ITS and M9 Junction 1a construction contracts, accidents have reduced by around two-thirds, demonstrating the safety benefits of ITS[x].

The renewal and replacement of ITS equipment would enable other measures such as Variable Speed Limit signs and incident management and has been scored as having a minor positive impact against safety, though it noted further evidence to support this would be beneficial.

The Communications Network element also has a positive impact against the accident sub-criteria through supporting more efficient functioning of the ITS technology.

A minor positive impact on security is anticipated due to increased surveillance associated with the ITS systems.

The recommendation is expected to have a neutral impact on Health, and Access to Health & Safety Wellbeing Infrastructure.

Although there may be additional infrastructure which could affect visual amenity (for example gantries or cameras), this is likely to be in locations where there is already road infrastructure, so the overall impact on visual amenity is expected to be neutral.

Overall, this recommendation is expected to have a moderate positive impact on this criterion in both Low and High scenarios.

4. Economy

Low Scenario	High Scenario
+	+

This recommendation is considered to have a positive impact on the Transport Economy Efficiency (TEE) sub-criteria.

Renewal and enhancement of, and new, ITS infrastructure improves the flow of traffic and network efficiency, improving journey time reliability and providing greater ease of access to destinations through reduced journey times and vehicle operating costs. This includes business users and HGVs.

This recommendation would help to ensure goods can get to markets on time. For

example, the introduction of Managed Motorway type solutions on the M42 in England found that journey times in congested conditions were reduced by 16%[xi].

Provision of new ITS equipment would be anticipated to deliver positive benefits.

The Communications Network element would also have a positive impact against this criteria in supporting more efficient functioning of the ITS technology.

The recommendation is not anticipated to have an impact on Wider Economic Impacts (WEIs).

Overall, this recommendation is expected to have a minor positive impact on this criterion in both Low and High scenarios.

5. Equality and Accessibility

Low Scenario	High Scenario
+	+

This recommendation has no impact on public transport network coverage, active travel network coverage nor affordability.

However, the recommendation does have the potential to allow enhanced functionality to ITS equipment as it is renewed including incorporation of public transport priority measures.

Also refer to EqIA / ICIA / CRWIA / FSDIA overleaf, as this provides additional impact assessment.

Overall, this recommendation is expected to have a minor positive impact on this criterion in both Low and High scenarios.

3.3. Deliverability

1. Feasibility
Measures to renew, enhance or implement new ITS infrastructure and technology to provide the level of operational control and management required by this recommendation are well defined. ITS applications have been accommodated on the new Queensferry Crossing and approach roads and Transport Scotland has considerable experience of operating such systems. The Renewal / Enhancement / New Infrastructure, and Communications Network aspects of this recommendation are therefore expected to perform well in terms of deliverability feasibility.

2. Affordability
The funding for this grouping would range from small scale replacement at key strategic locations on the network to major corridor renewal of technology and associated infrastructure. The current roadside ITS equipment has an existing revenue spend, which would need to continue into the future. Generally, ITS schemes yield significantly higher Benefit Cost Ratio (BCR) than traditional road schemes; a package of Smart Motorway schemes in England for example was found to have a BCR of 5.7[xii].

3. Public Acceptability
The deployment of ITS infrastructure, including renewing, enhancing and new infrastructure has been subject to considerable scrutiny across Europe and evidence is available for high levels of public support and compliance for several schemes. Satisfaction with the Fife ITS scheme is high along the full transport corridor, most so with 'feeling of safety' (97% satisfied) and 'travel information' (95% satisfied)[xiii]. The communications network provides improved efficiency for the operations of ITS and is therefore considered likely to be viewed positively.

3.4. Statutory Impact Assessment Criteria

1. Strategic Environmental Assessment (SEA)

Low Scenario	High Scenario
+	+

The recommendation is likely to support SEA objectives related to climate adaptation (Objective 2), quality of life (Objective 4) and safety (Objective 7) due to improved journey reliability and safety and resilience of the road network through the planning, monitoring, control, co-ordination and response to major travel incidents and severe weather incidents on the trunk road network. Minor positive effects are also assessed in relation to the sustainable use of the transport network (Objective 8), due to improvements in transport technology.

Effects in relation to SEA objectives for reducing greenhouse gas emissions (Objective 1) and improving air quality (Objective 3) are unclear at this stage and depend on whether the recommendation would result in a reduction or increase in the emissions of the transport system generally and the extent of modal shift. Effects in relation to the use of natural resources (Objective 9) need further assessment as the design/extent of new roadside infrastructure is unknown at this stage.

It is considered that there would be no significant effects on the remaining SEA objectives as the recommendation is not directly related to them. However, it is not assessed to result in any negative effects on the achievement of SEA objectives related to noise and vibration (Objective 5), the water environment, biodiversity, soil, cultural heritage and landscape and visual amenity (Objectives 10 to 14). However, if new infrastructure is proposed for areas where it doesn't currently exist (for example, new gantries and cameras), then further environmental assessment is likely to be required to ensure there are no, or minimal, negative effects on landscape/ townscape and visual amenity.

Overall, this recommendation is anticipated to have a minor positive effect on this criterion in both the Low and High scenarios.

2. Equalities Impact Assessment (EqIA)

Low Scenario	High Scenario
0	0

All users of the trunk road and motorway network with protected characteristics could benefit from roadside ITS infrastructure but there could be a specific minor additional beneficial impact from improved bus journey times and reliability (on sections of the network where hard shoulder running is implemented), and accessibility to travel information. This would be of benefit to those who rely on bus services including older people, the elderly, children, young people, women and people from certain ethnic minority groups.

There could also be some potential positive impacts on protected groups as a result of an improved sense of road safety and security for those walking, cycling and wheeling. This would provide some positive effects for protected characteristic groups who are more likely to walk or cycle or are more vulnerable to fear of road danger, including children, young people, women and older people.

However, the above effects are likely to be negligible and This recommendation is therefore expected to have a neutral impact on this criterion in both Low and High scenarios.

3. Island Communities Impact Assessment (ICIA)

Low Scenario	High Scenario
0	0

This recommendation focuses on the trunk road and motorway network and, therefore, is not directly relevant to island communities.

This recommendation is therefore expected to have a neutral impact on this criterion in both Low and High scenarios.

4. Children's Rights and Wellbeing Impact Assessment (CRWIA)

Low Scenario	High Scenario
0	0

Roadside ITS infrastructure is likely to have an overall neutral impact on children and young people. However, negligible positive effects could arise from an improved sense of road safety and security for children and young people who are more likely to walk and cycle and are also vulnerable to fear of road danger.

This recommendation is therefore expected to have a neutral impact on this criterion in both Low and High scenarios.

5. Fairer Scotland Duty Assessment (FSDA)

Low Scenario	High Scenario
0	0

Roadside ITS infrastructure is likely to have an overall neutral impact for reducing inequalities of outcome for disadvantaged communities.

There could potentially be an improved sense of road safety and security for those walking, cycling and wheeling as well as improved public transport journey times, reliability, and accessibility to travel information.

This would provide some positive effects for those on low incomes who are more dependent on walking, cycling and public transport to travel.

This recommendation is expected to have a neutral impact on this criterion in both the Low and High scenarios.

References

[i] ORR, Public Performance Measure – Table 3113, 2020-21 Q1, https://dataportal.orr.gov.uk/statistics/performance/passenger-rail-performance/table-3113- public-performance-measure-by-operator-and-sector/
The Public-Performance-Measure (PPM) is the standard industry measure for reporting performance. It counts all trains which arrive within 5 minutes of the scheduled performance time (ten minutes for the long-distance Train Operating Companies), compared with the number of trains planned to run. The Office of Rail and Road's data reported for Scotland are for ScotRail services only, which covers 95 percent of the trains run in Scotland.
[ii] Transport Scotland, Key Reported Road Casualties Scotland, 2018, https://www.transport.gov.scot/media/45015/sct05191903161.pdf
[iii] Greenhouse gas emissions encompass CO_2 emissions
[iv] National Atmospheric Emissions Inventory 1990-2017
[v] Scotland's Road Safety Framework to 2030, Transport Scotland, 2021, https://www.transport.gov.scot/publication/scotland-s-road-safety-framework-to-2030/
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[viii] Bus operations on hard shoulders during congested morning hours – a pilot evaluation in Israel, V Gtelman, S Hakkert, R Zilberstein, T Grof, Transport Research Procedia, available at sciencedirect.com
[ix] Smart Motorway Safety Evidence Stocktake and Action Plan Department for Transport, 2020.
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[xi] Future Intelligent Transport Systems Strategy, Transport Scotland, 2017: https://www.transport.gov.scot/media/40406/its-strategy-2017-final.pdf
[xii] The package of measures included: M6 J2-4; M60 J24-27 and J1-4; M1 J24-25; M3 J9-14; M62 J10-12; M27 J4-11; M6 J16-19; M20 J3-5; M1 J13-19; M56 J6-8; M23 J8-10; M5 J4a-6; M6 J21a-26; M4 J3-J12; and M6 J13-15. Road Investment Strategy: Economic analysis of the investment plan, Department for Transport, March 2015: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/411417/ris-economic-analysis.pdf
[xiii] https://www.transport.gov.scot/media/48814/frc-project-1ya-evaluation-report.pdf