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Forth Replacement Crossing Project One Year After Opening Evaluation

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Abbreviations

1YA	One Year After
3YA	Three Years After
AADT	Annual Average Daily Traffic
BCR	Benefit to Cost Ratio
BRES	Business Register and Employment Survey
CV	Coefficient of Variation
DMRB	Design Manual for Roads and Bridges
EALI	Economic Activity and Location Impacts
EDT	Employer’s Delivery Team
ES	Environmental Statement
FBOC	Forth Bridges Operating Company
FCBC	Forth Crossing Bridge Constructors
FETA	Forth Estuary Transport Authority
FRB	Forth Road Bridge
FRC	Forth Replacement Crossing
HGV	Heavy Goods Vehicle
ITS	Intelligent Transport Systems
LRT	Light Rapid Transit
NPF2	National Planning Framework 2
NMU	Non-Motorised Users
NTDS	National Traffic Data System
NTS2	National Transport Strategy 2
PTS	Public Transport Strategy
PVB	Present Value of Benefits
PVC	Present Value of Costs
RSA	Road Safety Audit
SRTDb	Scottish Road Traffic Database
STAG	Scottish Transport Appraisal Guidance
STPR2	Strategic Transport Projects Review 2
STRIPE	Scottish Trunk Road Infrastructure Project Evaluation
TEE	Transport Economic Efficiency
TPOs	Transport Planning Objectives
WEBS	Wider Economic Benefits

Environment-related, Chapter 9	
AQ	Air Quality (Sub-Objective)
ch	Chainage
CH	Cultural Heritage (Sub-Objective)
CoCP	Code of Construction Practice
CIRIA	Construction Industry Research and Information Association
DC	Disruption Due to Construction (Sub-Objective)
DIC	Design Interim Certificate
DCIC	Design Check Interim Certificate
ECoW	Ecological Clerk of Works
EE	Estuarine Ecology (Sub-Objective)
ELG	Environmental Liaison Group
EMP	Environmental Management Plan
ES	Environmental Statement
FRBC	Forth Road Bridge Constructors
FRBOC	Forth Road Bridge Operating Constructors
G	Geology, Groundwater and Land Contamination (Sub-Objective)
HRA	Habitats Regulations Assessment
ILCS	Intelligent Lighting Control System
L	Landscape (Sub-Objective)
LU	Land Use (Sub-Objective)
N	Noise and Vibration (Sub-Objective)
n/b	Northbound
NCR	National Cycle Route
NLG	Noise Liaison Group
NVMP	Noise and Vibration Management Plan
P	Pedestrians, Cyclists, Equestrians and Community Effects (Sub-Objective)
PCNV	Plan for Control of Noise and Vibration
PPGs	Pollution Prevention Guidelines
Ramsar	Ramsar Convention
RIAAs	Reports to Inform an Appropriate Assessment
s/b	Southbound
SAC	Special Area of Conservation
SNH	Scottish Natural Heritage
SPA	Special Protected Area
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Urban Drainage System
TE	Terrestrial and Freshwater Ecology (Sub-Objective)
V	Visual (Sub-Objective)
VT	Vehicle Travellers (Sub-Objective)
W	Water Environment (Sub-Objective)

I Summary of Key Findings

1.1.1 This section contains a short summary of the key elements and findings contained within this One Year After Opening Evaluation report of the Forth Replacement Crossing (FRC) Project.

1.2 The Forth Replacement Crossing Project

1.2.1 The FRC Project included:

- the construction of a replacement bridge, the Queensferry Crossing, to be used as the primary route across the Firth of Forth; and
- development and upgrading of the connecting roads either side of the new bridge.

1.2.2 The FRC Project and the continuing use of the Forth Road Bridge as a public transport corridor constitute the main elements of the “Managed Crossing Scheme” which was announced by the Minister for Transport, Infrastructure and Climate Change to the Scottish Parliament on 10 December 2008. The Forth Replacement Crossing Public Transport Strategy (PTS)¹ was developed as part of the Managed Crossing Strategy to ensure that the Forth Replacement Crossing offered opportunities to maintain and enhance sustainable public transport growth; to provide appropriate support for the Scottish Government’s purpose of increasing sustainable economic growth; and to contribute to the carbon emissions reduction targets in the Climate Change (Scotland) Act 2009.

1.2.3 The supporting infrastructure on the Queensferry Crossing includes hard shoulders and advanced wind shielding technology, which have been designed to improve the resilience and reliability of cross Forth travel. The bridge itself has been designed for reduced maintenance and minimal disruption during maintenance and repairs, and includes systems that will help maximise the life of the Queensferry Crossing by targeting maintenance timeously, which can be largely undertaken with minimal traffic disruption.

1.3 Objectives – Is the Project Moving Towards Achieving its Objectives?

1.3.1 The project is moving towards achieving most of its Objectives and most of its Traffic and Environment-related Commitments. The objectives that the project is on track to achieve are:

- 1: To maintain cross-Forth transport links for all modes to at least the level of service offered in 2006

¹ <https://www.transport.gov.scot/media/33660/frc - pts - forth replacement crossing - public transport strategy.pdf>

- 2: To connect to the strategic transport network to aid optimisation of the network as a whole
- 3: To improve the reliability of journey times for all modes of transport
- 4: To increase travel choices and improve integration across modes of transport to encourage modal shift of people and goods
- 5: To improve accessibility and social inclusion
- 6: To minimise the impacts of maintenance on the effective operation of the transport network
- 8: To minimise the impact on people, and the natural and cultural heritage of the Forth area

1.3.2 This initial evaluation at year 1 has found that it is too early to conclude the extent to which the project is impacting on the wider economy and also it is too early to conclude whether the project has delivered additional road safety benefits (both linked to Objective 7 - To support sustainable development and economic growth). This will be considered in future evaluations.

1.3.3 There are eight traffic-related and 13 environment-related Commitments listed in Chapter 4 and Chapter 9, respectively. Full details of the performance of the project against its Objectives and Commitments are provided in Chapter 11.

1.4 Operational Indicators – How is the Scheme Operating?

1.4.1 The findings from this initial evaluation at year 1 have shown that:

- The scheme is operating safely with no major issues emerging.

NB it is recognised that there have been incidents of closure of the Queensferry Crossing related to the risk of falling ice which sit outside of the one year after opening evaluation period.

- Observed Annual Average Daily Traffic (AADT) volume on the Queensferry Crossing in 2018 is higher than the observed AADT volume on the Forth Road Bridge (FRB) in 2014 – traffic increased by 3% (from 74,100 AADT to 76,600 AADT) across the Forth Estuary between 2014 and 2018. However, the volume of traffic on the new Crossing is substantially below what was forecast during the appraisal process – traffic on the Queensferry Crossing was forecast to grow by 60% (from 57,500 AADT to 92,000 AADT) between 2005 and 2017; however, in actuality growth of only 33% (from 57,500 AADT to 76,600 AADT) has occurred when compared to 2005. A multitude of factors, including the economic downturn between 2008 and 2012 and development of land and population growth, would impact the observed traffic growth and our forecasts, and there is also the positive impact that the supporting PTS is having on limiting traffic growth on the new Crossing.

- Average journey times for general traffic have increased on all selected strategic and local routes across the study area one year after the opening of the Queensferry Crossing, ranging from one to seven minutes. More specifically, the journey time comparison for traffic routing via the FRB in February 2014 and via the Queensferry Crossing in February 2019 shows similar journey times with increases of up to one minute in the weekday morning and evening peaks. These increases are considered relatively small and they reflect the increasing trend in traffic volumes across this part of the road network. In addition, there is an increase in the distance travelled when comparing the new road layout (traffic using Queensferry Crossing) with the old road layout (traffic using the FRB) of approximately 1.3km, which is contributing to the small journey time increases.
- Journey times are, on the whole, slightly more variable one year after the opening of the Queensferry Crossing; however, the analysis indicates low variance in day-to-day journey times across all routes and time periods. It should be noted that whilst journey times are, on the whole, slightly more variable ITS was not fully implemented, fully operational (automated) and fully optimised over the reporting period for the 1YA evaluation. At this stage, therefore, it is too early to consider any notable effects of the ITS on the operational efficiency of the network.
- The advanced wind shielding technology on the new Crossing has improved network resilience and reliability of cross Forth travel, particularly during times of bad weather – the Queensferry Crossing has remained opened to high-sided vehicles and HGVs on over 60 days when the Forth Road Bridge could have been closed or restricted. Additionally, the supporting infrastructure on the new Crossing has been designed for reduced maintenance and minimal disruption during maintenance and repairs. This infrastructure includes hard shoulders and systems that will help maximise the life of the Queensferry Crossing by targeting maintenance timeously, which can be largely undertaken with minimal traffic disruption – for example, cable replacement from within the bridge towers.
- The bridges and surrounding road network have been designed to facilitate all travel modes by making the most appropriate use of existing and new infrastructure. The Forth Road Bridge continues to be the route for walking and cycling through the Forth corridor, and with general road traffic removed from the Forth Road Bridge, the experience for pedestrians and cyclists is significantly improved.

1.5 Forth Replacement Crossing Public Transport Strategy – How well is the PTS operating?

- 1.5.1 The dedicated Public Transport corridor is operating successfully. Demand at both Ferrytoll and Halbeath Park & Ride sites has steadily increased over time and the number of buses using the Forth Road Bridge has also steadily increased following the opening of the Queensferry Crossing. Bus journey times and reliability across the Forth Estuary have improved, including journey

times from selected settlements in Fife to large employment areas in Edinburgh and West Lothian.

1.6 Process Indicators – How well was the Project Implemented?

- 1.6.1 The Process Evaluation outcomes associated with the Forth Replacement Crossing Project are, in general, captured within the Audit Scotland Report commissioned by the Auditor General in August 2018. This report found that Transport Scotland delivered the project effectively across the key elements of project cost, programme and management. Amongst its recommendations, the report concluded that the public sector could learn from the way Transport Scotland managed the FRC Project. Transport Scotland published the “Lessons Learned from the Forth Replacement Crossing Project 2007 to 2017” report in October 2020, highlighting aspects of delivery that worked well or that could be improved upon. The intention of the report is to influence best practice techniques that may be employed on future projects within Transport Scotland, whilst recognising that many of the lessons learned are also relevant to projects in general.

1.7 Cost to Government – Is the Project Delivering Value for Money?

- 1.7.1 From the outset, measures were built into the FRC Project to maximise value for money and to encourage savings, added value and innovation. Whilst the Present Value of Benefits may be lower than estimated at the time of appraisal, the project is continuing to provide benefits to transport users. Going forward, it is judged that the Queensferry Crossing will continue to provide a reliable primary road link between Edinburgh, the Lothians, and Fife and beyond in order to safeguard the economy, particularly of the east coast of Scotland.

2 Introduction

2.1 Project Evaluation

- 2.1.1 A One Year After (1YA) Opening Evaluation of the Forth Replacement Crossing (FRC) Project has been undertaken, providing early findings of the project's performance against its Objectives and Commitments as well as its impacts upon Scottish Transport Appraisal Guidance (STAG) criteria and Process criteria. The opening date from which this evaluation has been taken forward is 1 February 2018, the date when the Queensferry Crossing achieved motorway status and when all non-motorway traffic was required to move to the Forth Road Bridge.
- 2.1.2 This report is the first in a series of documents that will present the findings of the FRC Project Evaluation in accordance with Scottish Trunk Road Infrastructure Project Evaluation (STRIPE) guidance. The guidance draws on the Design Manual for Roads and Bridges (DMRB) and STAG methodology, and provides for three evaluation stages:
- **Initial Evaluation: One Year After (1YA) Opening Evaluation Report** – to provide an early indication (as far as is reasonably practical) that the FRC Project is operating as planned and is on track to achieve its objectives. The 1YA Opening Evaluation includes, but is not limited to, a Process Evaluation which considers actual versus forecast project cost, and programme, together with reasons for variance.
- 2.1.3 Further evaluations that will be undertaken for the FRC Project in line with STRIPE methodology are:
- **Detailed Evaluations: Three and Five Years After Opening Evaluation Reports** – these will consider the project impacts in the context of data gathered over a longer post-opening timescale. In addition to reviewing some of the elements covered by the Initial Evaluation at year 1, the Detailed Evaluations at year 3 and year 5 will provide a greater focus on whether the FRC Project has achieved its Objectives and Commitments.

2.2 Project Background

- 2.2.1 The FRC Project and the continuing use of the Forth Road Bridge as a public transport corridor constitute the main elements of the “Managed Crossing Scheme” which was announced by the Minister for Transport, Infrastructure and Climate Change to the Scottish Parliament on 10 December 2008. The key elements of the Forth Road Bridge public transport corridor and the FRC Project, as defined in the Forth Replacement Crossing DMRB Stage 3 Scheme Assessment Report (2009) are:

Forth Road Bridge public transport corridor

- Use of the existing Forth Road Bridge for public transport, buses, taxis, motorcycles with an engine capacity of 50cc or less, pedestrians and cyclists with future opportunity to upgrade for use by Light Rapid Transit (LRT) which may take the form of guided bus or a tram based light rail system.

FRC Project

- A new cable-stayed bridge (the Queensferry Crossing) with three mono-towers and a single level deck with wind shielding, providing two general lanes of traffic and a hard shoulder in each direction (the hard shoulders being capable of carrying public transport during Forth Road Bridge closures or general traffic in times of maintenance).
- North of the Main Crossing, provision of a new dual carriageway with hard shoulders connecting the Main Crossing to the A90 / M90, incorporating junction enhancements at Ferrytoll and road widening between Ferrytoll and Admiralty South of the Main Crossing, provision of a new dual carriageway with hard shoulders linking the bridge to the A90 and M9, making use of the recently completed M9 Spur with an enhanced M9 Junction 1a providing free-flow, all-ways access.
- Provision of a new junction arrangement providing access to South Queensferry and existing local routes.
- Provision of Intelligent Transport Systems (ITS) along the full length of the Managed Motorway Corridor from the M90 Halbeath Junction over the Main Crossing to the M9.
- Potential for both the development of the Park & Ride site at Ferrytoll and the introduction of further Park & Ride / Park & Choose facilities at Rosyth and Halbeath.

2.2.2 The FRC Project was delivered in phases via three separate design and build contracts, with parts of these contributing to the supporting Public Transport Strategy:

- **Fife ITS (contractor was John Graham (Dromore) Ltd):** Implementation of a Managed Motorway through use of ITS and public transport priority measures between the M90 Halbeath and Admiralty junctions.
- **M9 Junction 1A (contractor was Roadbridge and John Sisk and Son Ltd JV):** Re-construction of existing junction to provide better strategic connectivity between the M9 and M90, encompassing a Managed Motorway through use of ITS and public transport priority measures between the M9 Spur and Newbridge Roundabout.
- **Principal Contract (contractor was Forth Crossing Bridge Constructors comprising of Dragados, Hochtief, American Bridge**

International and Morrison): Construction of the Queensferry Crossing – a cable-stayed bridge crossing of the Firth of the Forth, associated strategic and local connecting roads to the north and south of the crossing, Managed Motorway through the installation of the ITS, and public transport initiatives, including the use of the Forth Road Bridge as a dedicated public transport crossing.

- 2.2.3 Construction works on the project started in September 2011. The Fife ITS and M9 Junction 1A contacts were delivered in December 2012 and February 2013 respectively.
- 2.2.4 The Queensferry Crossing opened to traffic on 30th August 2017 and was formally opened by the Queen on 4th September 2017. Initially, a 40mph speed limit restriction was in place on the new bridge. This was increased to 50mph on 6th November 2017 and subsequently to 70mph on 19th December 2017.
- 2.2.5 On 1st February 2018, motorway regulations came into force on the Queensferry Crossing and all non-motorway traffic was required to move to the Forth Road Bridge. However, the ITS infrastructure, which provides the queue management system for the project, was not fully automated on this date.

2.3 Project Area Study Map

- 2.3.1 A location plan of the project and a map showing the extents of the project study area are shown below in Figures 1 and 2 respectively. Full details of the scheme can be found in the Design Manual for Roads and Bridges (DMRB) Stage 3 Scheme Assessment Report, 2009².

² https://www.transport.gov.scot/media/3715/frc_stage_3_scheme_assessment_report_part_2_v3_final.pdf

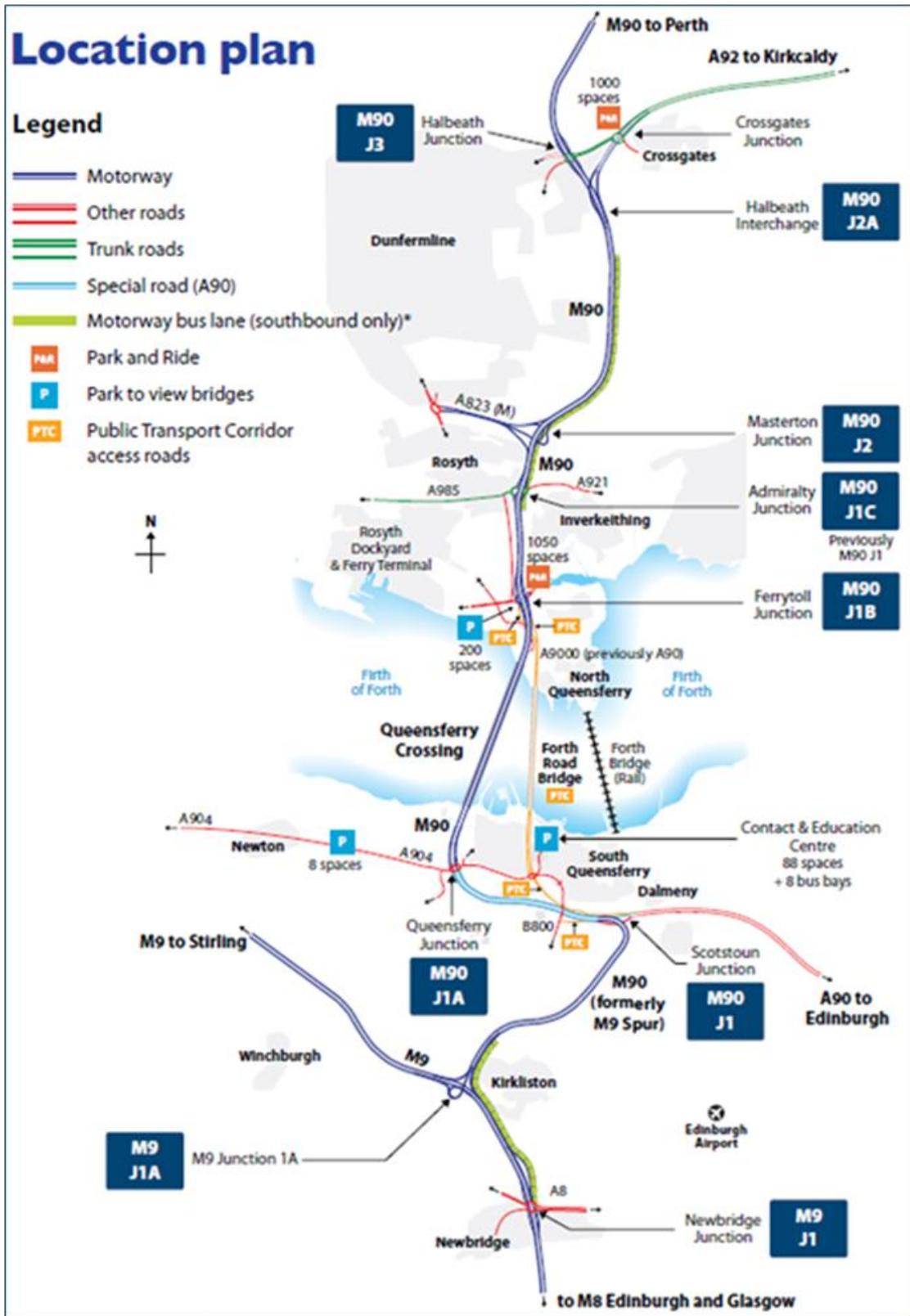


Figure 1: FRC Project Location Plan

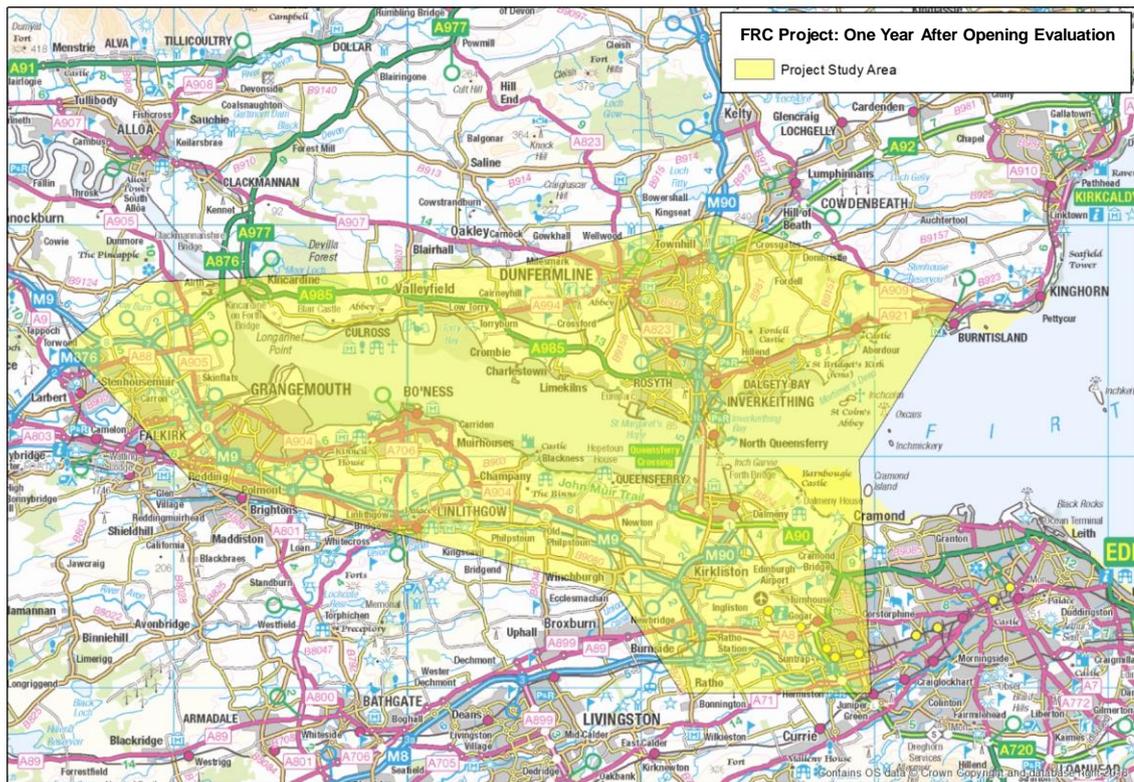


Figure 2: FRC Project Study Area Map

2.3.2 The study area includes two routes which go beyond the extent of the location plan shown in Figure 1 for the following reasons:

- **A904 between M9 J2 and Echline Roundabout.** This is a potential alternative route to the Queensferry Crossing via M9 Junction 1a.
- **Kincardine Bridge-A985-A994-A907 to M90 Junction 3.** This is an alternative route across the River Forth.

2.4 Report Structure

2.4.1 Following this introductory chapter, the remainder of the report is structured as follows:

- Chapter 3: describes the adopted methodology for this evaluation at year 1, including STRIPE methodology and Stakeholder Consultation.
- Chapter 4: sets out the project's Transport Planning Objectives and Commitments.
- Chapter 5: provides details of the supporting Public Transport Strategy and highlights progress towards delivering associated interventions and performance to date.
- Chapter 6: discusses how the project has impacted upon Process Evaluation criteria, including time, cost and quality aspects of project delivery.

- Chapter 7: provides detailed analysis of project performance against selected network operational indicators.
- Chapter 8: discusses the extent to which the project has impacted upon STAG criteria, including Safety, Economy, Integration, and Accessibility & Social Inclusion.
- Chapter 9: assesses whether the mitigation measures outlined in the Environmental Statement have been implemented and are operating as expected.
- Chapter 10: provides an assessment of the Cost to Government, particularly the forecast versus outturn project costs.
- Chapter 11: provides an overall summary of the evaluation, including performance of the project against its Objectives and Commitments.

3 Methodology

3.1 STRIPE Methodology

3.1.1 STRIPE methodology is the Monitoring and Evaluation Strategy for trunk road projects in Scotland.

3.1.2 Evaluation forms an essential part of the policy cycle, demonstrating what has been achieved with public resources and providing evidence and learning points for future interventions and investments. As such, the Scottish Government and Transport Scotland require evaluation to be undertaken and documented for any project for which it provides funding or approval.

3.1.3 Evaluation is a specific post-implementation event designed to identify whether or not a project is performing as originally intended, whether, and to what extent, it is contributing to established policy directives and whether the implemented project continues to represent value for money.

3.1.4 The core questions for evaluation are:

- **Objectives:** Did the project achieve, or is it moving towards, its stated Transport Planning Objectives?
- **Process Evaluation:** How well was the project implemented, and are there any lessons learned?
- **Operational Indicators:** How well is the project operating?
- How has the project impacted upon the areas covered by the key **STAG** and **DMRB** assessment criteria, how well were these impacts forecast and are there any lessons learned?
 - **Environment**
 - **Safety**
 - **Economy**
 - **Integration**
 - **Accessibility and Social Inclusion**
- **Cost to Government:** Has the project delivered value for money?

3.2 Establishing the Evaluation Baseline

3.2.1 The crux of any evaluation is determining, if possible, to what extent any change in the outcomes or outputs monitored are a result of the intervention, as opposed to other external factors. This can be determined by comparing actual outcomes with those of a counterfactual, which is defined as the most

likely transport situation over the course of the period had the project not gone ahead.

3.2.2 A review of the 2006 baseline, derived from the Transport Planning Objectives set out in the Forth Replacement Crossing Study (2007), was undertaken to determine whether the 2006 baseline remained appropriate or whether it was necessary to change the baseline year. The review considered:

- The availability of a comprehensive 2006 traffic dataset that would enable a robust project evaluation against 1YA opening criteria, including journey time information collected as part of traffic monitoring following construction of the Queensferry Crossing.
- The requirements to conduct interviews with walkers and cyclists, and to undertake a Benefits Realisation Research Public Survey as part of this 1YA Opening Evaluation.
- The direct or indirect impacts of other schemes unrelated to the FRC Project completed between 2006 and the start of construction in 2011, which may make it otherwise difficult to isolate the impact of the FRC project, including:
 - Completion of the M9 Spur Extension in 2007.
 - Removal of tolls on the FRB in 2008.
 - Opening of Clackmannanshire Bridge in 2008.

3.2.3 The review concluded that it was necessary to change the baseline year from 2006 to 2014 based on the following reasons:

- 2014 is the first year in which comprehensive traffic datasets would be available to form the pre-opening evaluation data and which would be appropriate for evaluation purposes [e.g. a year that provides comprehensive datasets that can be used to define indicators so that project performance can be measured against its Objectives].
- The collected journey time information between 2011/12 and 2015/16 is based on a small number of weekday runs and is considered insufficient for the purpose of the evaluation. INRIX Roadway Analytics data (see Appendix A, Data Sources) has been identified as the only comprehensive dataset covering journey times and vehicle speeds before and after scheme opening but is only available from 2014 onwards.
- Interviews with walkers and cyclists on the FRB, used to identify travel behaviours, were previously undertaken during 2014 and, similarly, a Benefits Realisation Research Public Survey was undertaken towards the end of 2013. Therefore, a 2014 baseline provides a degree of consistency between the original survey work and the comprehensive traffic datasets that are available.

- 3.2.4 Following this change, it was then necessary to validate the new 2014 baseline taking cognisance of Fife ITS (completed December 2012) and M9 Junction 1A upgrade (completed February 2013) – two of the three design and build contracts completed before 2014.
- 3.2.5 The validation process sought to identify the potential impact of both schemes on traffic levels across the Forth Road Bridge (FRB) between 2012 and 2014. If any change in traffic levels was identified and considered significant [i.e. defined in this case as five percent or greater] this would mean that a 2014 baseline would have to be reconsidered because it would be deemed not to reflect the pre-opening situation. Equally, if any change in traffic levels was identified and considered minor [i.e. less than five percent], then the new 2014 baseline would remain appropriate and be deemed to reflect the pre-opening situation. It should be noted that a number of factors, including the completion of Fife ITS and the M9 Junction 1A upgrade, would have influenced the levels of traffic on the FRB between 2012 and 2014. Nonetheless, the analysis concluded that the impact of both schemes and other influencing factors on FRB traffic growth could be somewhere between one and three percent, meaning the impact was identified and considered minor.
- 3.2.6 Based on the reasons for changing the baseline year and the outcome of the validation exercise, a revised **2014 Baseline** has been adopted for the 1YA Opening Evaluation. It should be noted that in a very limited number of cases, it has been necessary to use a different baseline year due to availability of other relevant data and this is noted in the report where applicable.

3.3 Traffic Monitoring Routes

- 3.3.1 Traffic monitoring has been undertaken before, during and after construction of the FRC Project in order to monitor the impacts of changing route provision and traffic management on traffic volumes and patterns within the Firth of Forth area.
- 3.3.2 As part of the monitoring programme, a number of strategic and local routes in the vicinity of the Forth Road Bridge (FRB) were identified and used to establish typical journey times and monitor any potential impacts, arising from such occurrences as changing traffic levels and patterns, on journey times for road users. The routes identified broadly covered the same geographic area as the traffic counters. To provide a degree of consistency between the traffic monitoring undertaken, the same routes have been used for the evaluation at year 1.
- 3.3.3 The strategic and local journey time routes are shown graphically below.

Strategic Journey Time Routes

1. M9 Junction 6 to M90 Halbeath Junction via Kincardine Bridge (blue route).
2. M9 Junction 6 to M90 Halbeath Junction via Forth Road Bridge (FRB) / Queensferry Crossing (red route)

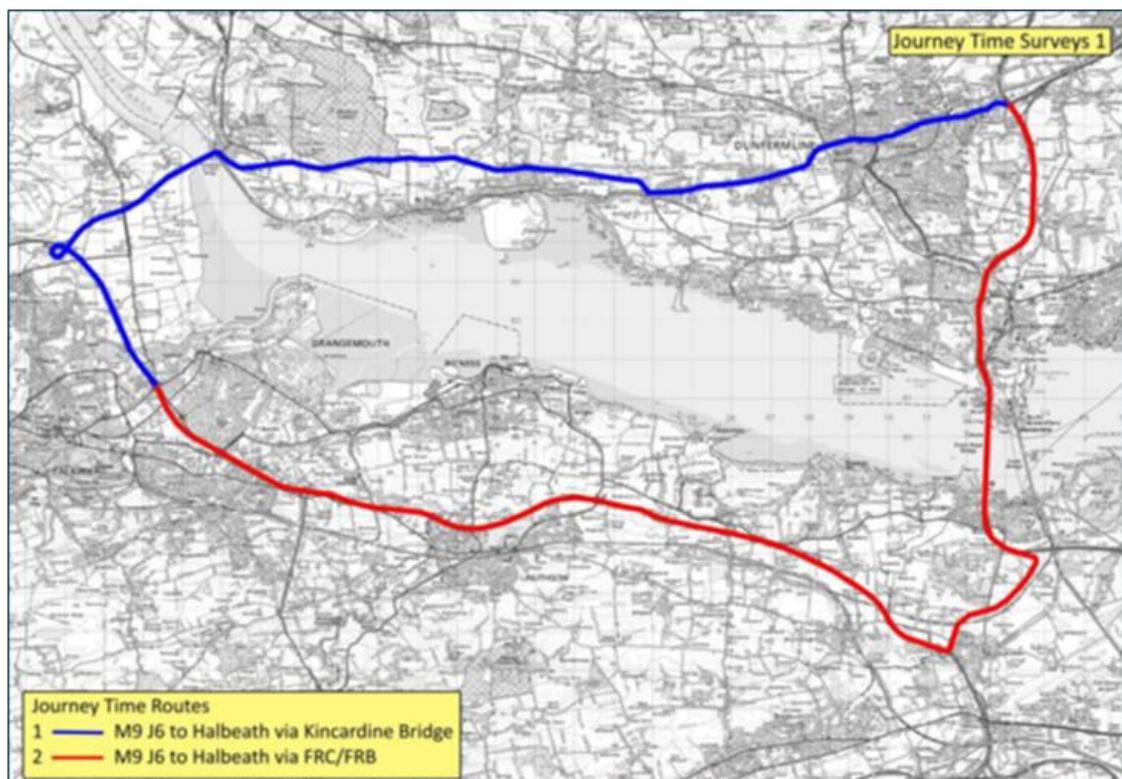


Figure 3: Strategic Journey Time Routes

Local Journey Time Routes

3. M90 / A90 between Queensferry Junction / Echline Junction and Maybury Junction.
4. M9 Newbridge Junction to Queensferry Junction / Echline Junction via the M9 Spur
5. M9 Newbridge Junction to A720 Hermiston Gait via the M8
6. A8 between Gogar Junction and Newbridge Junction
7. M90 Queensferry Junction / A90 Echline Junction to M90 Junction 3 (Halbeath)
8. A985 between M90 Junction 1 (Admiralty) and Cairneyhill Roundabout
9. A994 / A907 between Cairneyhill Roundabout and M90 Junction 3 (Halbeath)
10. A823 (M) between the A907 and M90 Junction 2 (Masterton)
11. A921 between the B9157 and M90 Junction 1 (Admiralty)
12. B981 between the A92 and M90 Junction 1B (Ferrytoll)
13. A904 between Old Philpstoun and Echline Junction

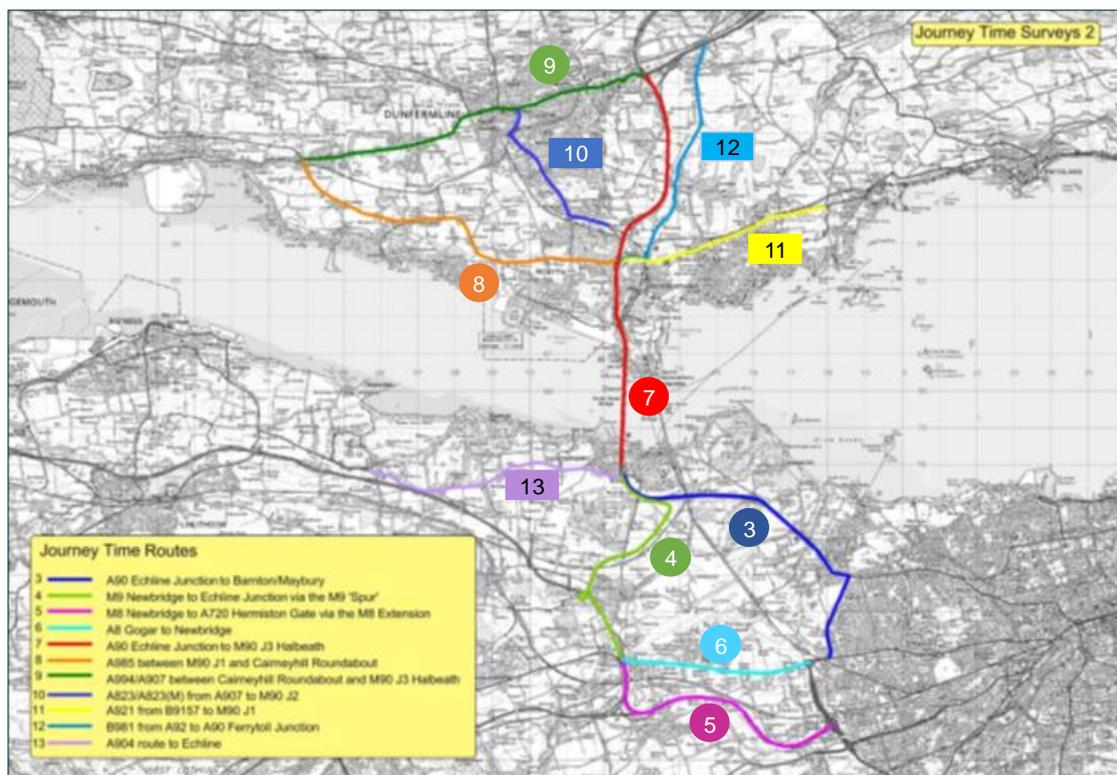


Figure 4: Local Journey Time Routes

3.4 Data Sources

3.4.1 The data generally used to inform evaluations can be broadly categorised into the following:

- **Background Data and Information (pre-opening)** – reports, models and drawings etc. from the appraisal / assessment phases. This material is generated throughout the development of a scheme.
- **Background Data and Information (post-opening)** – reports, drawings etc. from during and after the construction phase.
- **Pre-opening Evaluation Data** – data gathered to reflect network conditions in the absence of the proposed scheme. This data is important to establish an 'evaluation baseline' or counterfactual case.
- **Post-opening Evaluation Data** – as per pre-opening Evaluation Data but updated for the evaluation period in question [e.g. one year after scheme opening].

3.4.2 A list of the main data sources used in this initial evaluation at year 1 are provided in Appendix A to this report.

3.5 Stakeholder Consultation

3.5.1 A key part of the evaluation is consultation with relevant stakeholders. The stakeholder consultation strategy comprised several engagement approaches:

Discussions with Transport Scotland

3.5.2 Discussions were held between Stantec, Transport Scotland staff and contractors to discuss the details of the project management process and programme delivery, with outcomes informing the Process Evaluation as discussed in Chapter 6. Discussions were also held with Amey, the Forth Bridges Operating Company.

Table 1: Stakeholders who participated in Process Evaluation Discussions

Stakeholder	Participated
TS – Project Management	✓
TS – Employer’s Delivery Team	✓
TS – Structures Team Manager	✓
AMEY – Forth Bridges Operating Company	✓

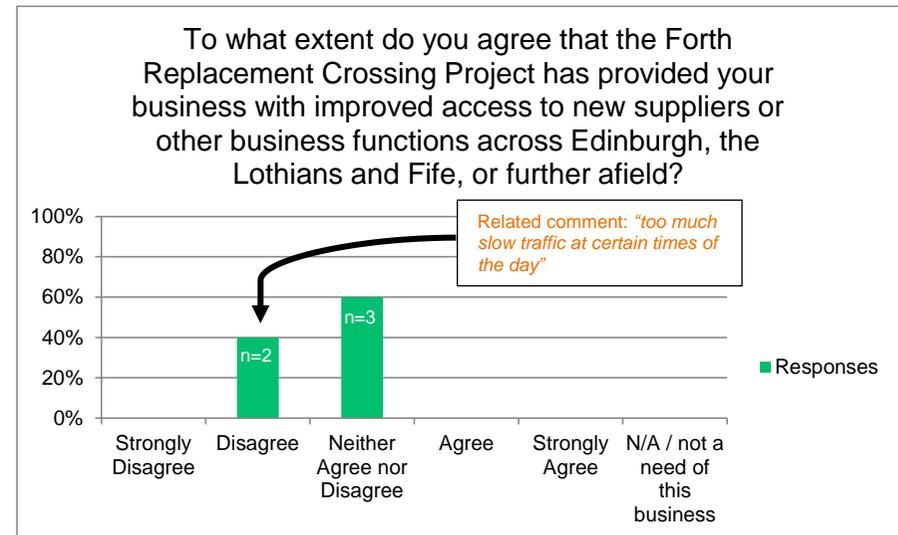
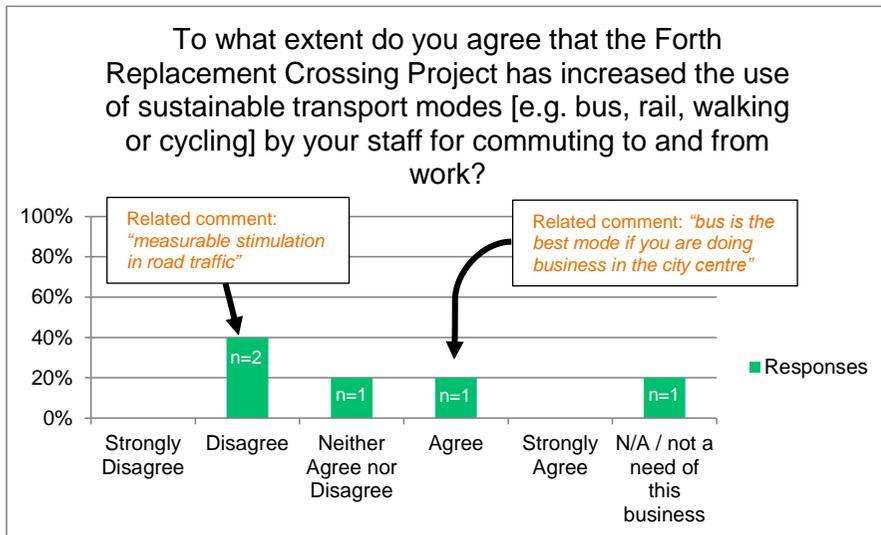
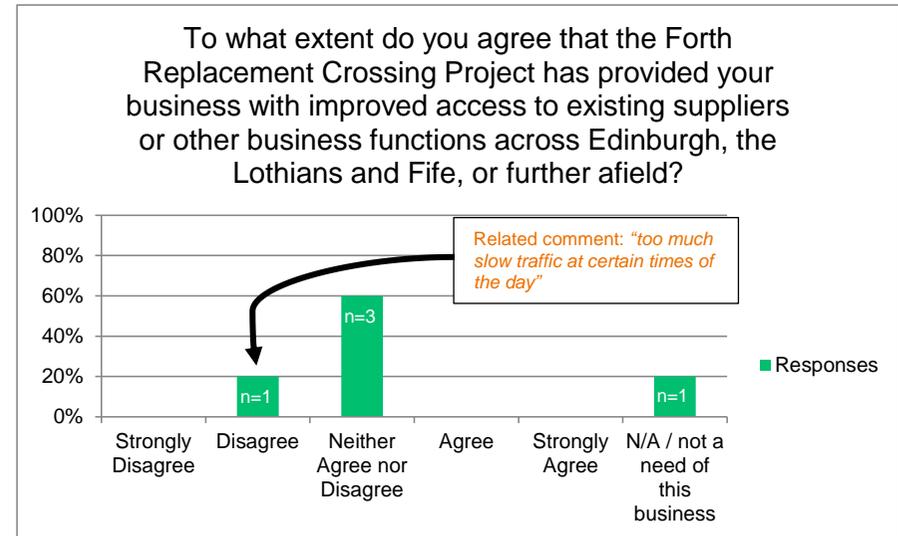
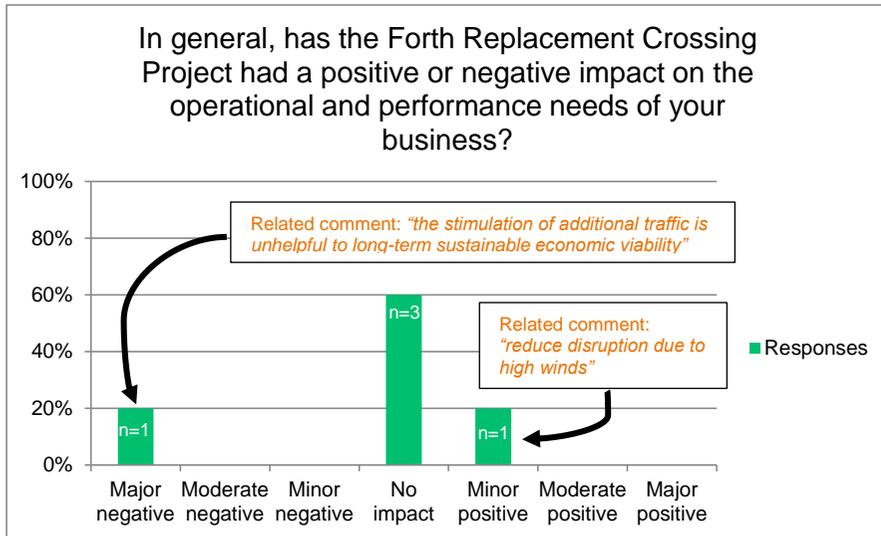
Business Survey

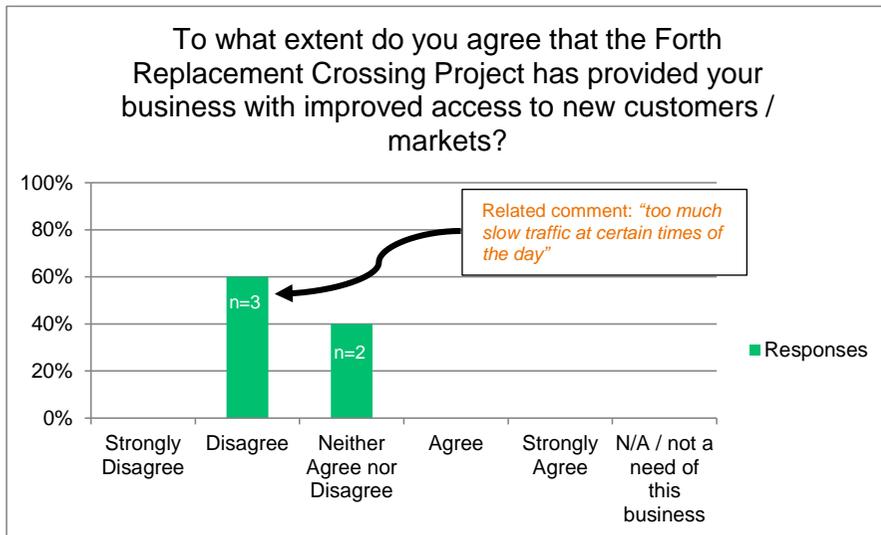
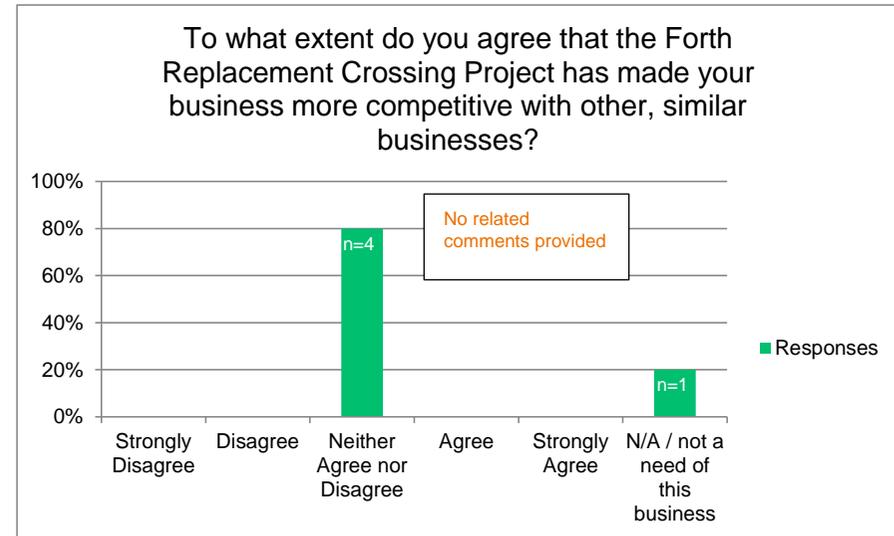
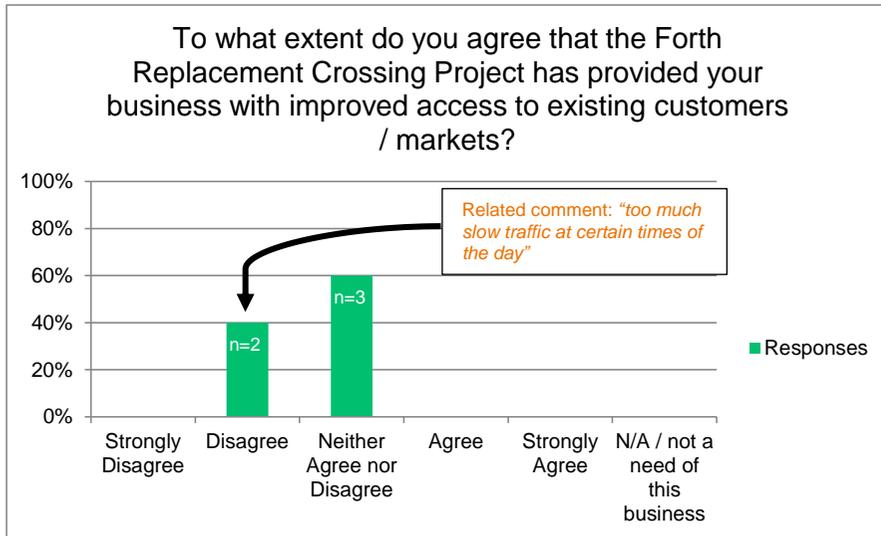
3.5.3 An online business survey was undertaken to contribute to understanding of any immediate impacts of the project on the labour market and distribution of goods. This was promoted by several organisations (listed below) via social media and other communication channels:

- Edinburgh Chamber of Commerce
- The City of Edinburgh Council
- SEStran
- Tactran
- Fife Council
- Fife Chamber of Commerce

3.5.4 A total of 11 businesses, covering a broad range of business activities, have taken part in the survey, predominantly located in Kirkcaldy, South Queensferry, Rosyth, Dunfermline and Edinburgh. Key results are shown graphically below and presented throughout the report where relevant. The business survey questionnaire is provided in Appendix B to this report.

- 3.5.5 On balance, the feedback indicates that the FRC Project has had a negative (small) impact on the operation and performance needs of businesses. The feedback also indicates that there has been no measurable improvement in access to the labour market or existing / new potential suppliers or business competition at this early stage of evaluation, which is unsurprising given such impacts are unlikely to occur in any measurable form in the one to five-year time horizon linked to evaluations undertaken in line with STRIPE methodology. Of particular note, however, both reduced disruption during times of high winds and commuting by bus into Edinburgh city centre were raised as a positive (minor) impact on business operations at this early stage, although traffic volumes and journey times at peak times was raised by a small number of businesses who participated as being no better than before.





Community Council Questionnaire

- 3.5.6 A Community Council questionnaire requesting views on how the project has impacted on the performance of the transport network, including access to key services, was issued to community councils in and around the Forth Estuary.
- 3.5.7 North Queensferry Community Council and Newton Community Council responded to the questionnaire. The responses are summarised below and presented throughout the report where relevant. The community council questionnaire is provided in Appendix C to this report.

Summary of Responses

North Queensferry Community Council (NQCC)

- In terms of active travel, it was noted that walking and cycling is now a more pleasant experience with the removal of general traffic from the FRB. However, safety concerns were raised, particularly around cycling provision on the Ferrytoll Gyratory. It was highlighted that some cyclists tend to ride with general traffic rather than use the designated crossing facilities to travel through the gyratory.
- It was also highlighted that better integration of the active travel network (north and south networks) could have provided more benefit to active travel users, with improved tie-ins to the Fife Coastal Path and St Margaret's Marsh (north network) and to South Queensferry to Hopetoun / Blackness / Bo'ness (south network).
- In terms of Public Transport, NQCC noted that bus journey time reliability has improved, but remains a concern. It also highlighted that the attractiveness of Ferrytoll P&R has generally improved. The new circular area for buses is well lit; however, there are some dark areas around the building on the north west and east sides.
- In terms of general road traffic, it was raised by the NQCC that traffic queues occur on the on-ramps at peak times causing delay. It was also highlighted that the timing sequence of the traffic lights at Ferrytoll has caused driver frustration; however, it was noted that once traffic is on the new Crossing it travels much better than what it did on the FRB. Journey time and journey time reliability were also noted to have slightly improved in the southbound direction outside of peak times and periods of maintenance.

Newton Community Council (NCC)

- NCC raised that the active travel experience had not changed following the opening of the new Crossing, highlighting that Newton village has no walking or cycle paths to connect to the Public Transport corridor and with

increased traffic volumes through the village, cycling can feel very dangerous.

- In terms of Public Transport, NCC noted that Newton village has limited public transport provision in the form of a taxi bus, which operates on a limited number of days, and following the opening of the Queensferry Crossing no change was noted with respect to bus journey times.
- In terms of traffic, it was raised that regular tail backs occur through the village when traffic builds up on the new Crossing, sometimes tail backs extend over a mile leading to extended journey times, particularly in the evening. It was noted that traffic conditions are much improved through the village during off-peak periods.

3.5.8 Transport Scotland has noted that in Autumn 2019, “Keep Clear” road markings were added to the roundabout at Queensferry Junction and adjustments made to the traffic signal phasing. This improved the situation regarding “rat-running” at the junction and the subsequent tailbacks that were being caused towards Newton.

Structured Telephone Interviews

3.5.9 Telephone Interviews with key representatives from transport operators and other relevant stakeholder organisations were undertaken to understand project impacts that act as barriers to the activities and interests of those organisations and, equally, to understand impacts of the project that have provided benefits.

Table 2: Stakeholders who participated in Structured Telephone Interviews

Organisation	Participated
West Lothian Council	✓
The City of Edinburgh Council	✓
Scottish Natural Heritage	✓
Forth Bridges Operating Company	✓
Scottish Citylink	✓
Stagecoach East Scotland	✓

3.5.10 Key points from each organisation are summarised in Table 3 below and presented throughout the report where relevant.

Table 3: Summary of Key Points from Telephone Interviews

Question	West Lothian Council	The City of Edinburgh Council	Scottish Natural Heritage	Forth Bridges Operating Company	Scottish Citylink	Stagecoach East Scotland
Before the Queensferry Crossing was constructed, what were the specific issues or challenges faced with Cross Forth travel, if there were any, which may have acted as a barrier to the activities and interests of your organisation?	Road traffic congestion Day-to-day journey time variability Build-up of traffic on A904 at Newton due to delays or incidents on FRB	High volume of traffic used the FRB into Edinburgh Council campaigned for a strategy to reduce car travel and encourage PT use	General environmental concerns - SPA, SAC, SSSI, Underwater noise, pollution, re-routing of the B981 (St Margaret's Marsh affected)	High traffic volumes on FRB Undertaking maintenance works with minimal disruption – all works undertaken overnight or weekends Strain on the FRB structure	Road traffic congestion	Disruption around Ferrytoll during construction Closure of FRB in December 2015 impacted on travel patterns Lack of journey time certainty and service timetables Road traffic congestion and disruptive networks from a user perspective

Question	West Lothian Council	The City of Edinburgh Council	Scottish Natural Heritage	Forth Bridges Operating Company	Scottish Citylink	Stagecoach East Scotland
<p>After the Queensferry Crossing was opened to traffic, what are the specific issues or challenges faced with Cross Forth travel, if there are any, which may still act as a barrier to the activities and interests of your organisation?</p>	<p>Day-to-day journey time variability, particularly northbound</p> <p>Lane merges</p> <p>Bus lanes not delivered, i.e. M9 to Newbridge</p> <p>Traffic leaving M9 J2 an issue and safety concern</p>	<p>A more joined up regional transport design needed to discourage car use</p>	<p>n/a</p>	<p>The full handover is taking time, which has impacted on time to complete outstanding work</p>	<p>Drivers using the new Crossing as this can reduce journey times</p>	<p>Journey times remain an issue on certain parts of the road network beyond the extents of the dedicated PT corridor (see bullets below) due to road traffic congestion; however, day-to-day journey time variability is much better</p> <p>Lack of PT priority measures from Cramond Brig to Edinburgh city centre</p> <p>Still have to factor in traffic times as no priority measures on M90 spur</p>

Question	West Lothian Council	The City of Edinburgh Council	Scottish Natural Heritage	Forth Bridges Operating Company	Scottish Citylink	Stagecoach East Scotland
<p>After the Queensferry Crossing was opened to traffic, what are the specific issues or challenges with Cross Forth travel, if there are any, that have been addressed which may have benefitted the activities and interests of your organisation?</p>	<p>Traffic signals at Newton Weather less of an impact [i.e. reduced disruption during times of high winds]</p>	<p>NTS2 will hopefully deliver and encourage PT cross Forth</p>	<p>St Margaret's Marsh</p>	<p>Road design is two lanes with a hard shoulder which is better when incidents / accidents occur. This means vehicles can be manoeuvred over to hard shoulders which keeps traffic flowing Wind shielding FRB as dedicated PT corridor Works can be carried out on FRB throughout the day and keep the traffic flowing. A contraflow is permanently in place with no disruption to traffic</p>	<p>Road traffic congestion has eased Nature of services are not stop-start therefore services flow through the network Less impact compared to other operators such as Stagecoach</p>	<p>Services were enhanced between fife and Edinburgh city centre in anticipation of the Queensferry Crossing opening Public transport corridor utilised once in full operation as most journeys made by Stagecoach operate along here – high demand for services pre COVID-19</p>

Question	West Lothian Council	The City of Edinburgh Council	Scottish Natural Heritage	Forth Bridges Operating Company	Scottish Citylink	Stagecoach East Scotland
<p>After the Queensferry Crossing was opened to traffic, what are the specific opportunities that are now being realised with Cross Forth travel, if there are any, that may have benefitted the activities and interests of your organisation?</p>	<p>Improvements in day-to-day journey time variability</p>	<p>Strategic Transport Projects Review 2 (STPR2)</p>	<p>St Margaret's Marsh now better managed Access has improved FRB as dedicated PT corridor Continuing protection of species [i.e. otters and badgers]. Promotion of paths and cycle ways and managing them in a green way</p>	<p>Undertaking works on the FRB as permanent fixes rather than temporary Iconic structure within the network has been beneficial in terms of marketing work</p>	<p>Passenger perception of services has improved Services have been well received by the public Hard Shoulder Running for buses on M90 north of Admiralty has been the biggest benefit to the organisation</p>	<p>Use of dedicated PT corridor Service increase [i.e. 2018 – new Fife to Livingston service introduced, running through to Glasgow, and 2019 – revised Fife to Edinburgh express services to increase frequency</p>

Queensferry Crossing Benefits Realisation Research Public Survey

- 3.5.11 A Benefits Realisation Research Public Survey was undertaken to gather information on how people use the road network around the Queensferry Crossing and Forth Road Bridge, and to identify any issues that users may face. A total of 1,206 responses were received. A similar survey was carried out in 2012 before the new Crossing opened allowing changes in travel behaviour before and after the Crossing opened to be identified.
- 3.5.12 Key points from the survey are listed below and presented throughout the report where relevant. The full survey results are provided in Appendix D to this report.

Key Points - Road Network

- Level of congestion and reliability of journey times was the most common reason for changing plans for all sections of the road with the exception of the Forth Road Bridge.
- Level of congestion as a reason for changing plans on the M90 has decreased significantly since 2012/13. For other roads, the level of congestion as a reason for changing plans has only changed marginally.
- Compared to 2012/13, respondents are now more likely to allow more time for their journey. They are now less likely to 'do something else.' It is also notable that in previous years 'do something else' was more likely to be 'do not go on their journey.'
- Feeling of safety is most satisfactory on all parts of the road network.
- Awareness of the Intelligent Transport Systems (ITS) on the road network is high in 2020 and not significantly different to 2013 when it was introduced.
- Satisfaction with the ITS is high along the full transport corridor, most so with feeling of safety (97% satisfied) and travel information (95% satisfied). The lowest level of satisfaction was with regard to drivers obeying the speed limit (86% satisfied).
- Satisfaction with information on road conditions is consistently high on all road sections.
- Effectiveness of incident response is also consistently high on all road sections.
- Just under three quarters of respondents (64%) have been travelling when variable speed limits have been in operation. They are seen to be effective by the majority (88%). This has increased from 75% in 2013.

Public Transport Network

- Almost one quarter of the respondents (24%, n=289) use the bus. This is down slightly compared to previous years. Convenience of the car is the main reason given for bus not being used (45% of responses, n=543). This was also the main reason given in previous years.
- The majority (80%, n=844) said 'nothing' would encourage public transport use. This has increased from 70% (n=848) in 2012 and 58% (n=701) in 2013. Previously better bus services (quicker, more direct) were noted by 30% (n=363) in 2012 and by 18% (n=218) in 2013, but this was only noted by 7% (n=84) in 2020.
- 6% (n=72) of respondents use Ferrytoll Park & Ride, down from 13% (n=157) in 2013. However, those that do are now more likely to use this for bus travel (96%, n=68) than was the case in 2013 (78%, n=122). NB Ferrytoll Park & Ride was not open in 2012.
- 4% (n=48) of respondents said they currently use Halbeath Park & Ride. This was used largely for bus travel (94%, n=45). NB Halbeath Park & Ride was not open at the time of previous surveys.
- 7% stated that they have changed their travel behaviour since the Queensferry Crossing opened (n=84) – this was most commonly changing the method of travel (25%, n=21). Where they have changed the method, 74% (n=16) use the bus more often.

Forth Road Bridge Pedestrians and Cyclists Survey

3.5.13 Pedestrian and cyclist surveys were not undertaken for the evaluation at year 1 due to the impacts of COVID-19 and will instead be considered as part of the detailed evaluation. In the absence of those surveys at the year 1 evaluation, it was anticipated that the Community Council questionnaire and the Queensferry Crossing Benefits Realisation Research Public Survey would be appropriate alternatives as both contained questions relating to the impacts of the new Crossing on pedestrians and cyclists; however, the number of responses and sample sizes are too small to allow for any meaningful analysis.

3.6 Stakeholder Consultation – Key Findings

- 3.6.1 Stakeholder consultation was undertaken via several approaches, including an online business survey; a community council questionnaire; structured telephone interviews with key representatives from several transport operators and stakeholder organisations; and a Benefits Realisation Research Public Survey.
- 3.6.2 Key points from the stakeholder consultation are:

Active Travel

- It was highlighted that walking and cycling are now more pleasant experiences on the Forth Road Bridge with the removal of general road traffic. Beyond the FRB, some safety concerns were raised, particularly around cycling provision on the Ferrytoll Gyratory and lack of shared-use paths between Newton village and the dedicated PT corridor.

Public Transport

- The dedicated Public Transport corridor has benefitted public transport users and operators alike, including improved bus journey times and reliability as well as increased service provision cross Forth. However, it was highlighted that there remains a lack of public transport priority on the A90 between Cramond Brig and Edinburgh City centre as well as on the M90 spur, meaning that service timetables still need to factor in traffic times on these parts of the network.

Road

- Wind shielding was seen as one of the main benefits of the new Crossing, leading to less disruption on the network during times of high winds.
- It was highlighted that regular tail backs occur through Newton village when traffic builds-up on the Queensferry Crossing, sometimes extending over one mile which leads to extended journey times. It was also highlighted that traffic leaving the M9 at Junction 2 rather than using the M90 spur is a cause for concern for Newton residents and could be a contributory factor to the traffic volume increase in the village.
- It was raised that traffic queues occur on the on-ramps at peak times causing delay and that the timing sequence of traffic lights at Ferrytoll junction has caused driver frustration; however, there was acknowledgement that signal timings were under review.
- Satisfaction with the ITS amongst road users is high, most so with the feeling of safety and travel information. Satisfaction has increased significantly, most so with drivers obeying the speed limit and the lane discipline of other drivers.

4 Transport Planning Objectives and Commitments

4.1 Introduction

- 4.1.1 This chapter sets out the Transport Planning Objectives for the FRC Project and Commitments. It also sets out the indicators that have been used to measure the performance of the project against its objectives and Commitments.
- 4.1.2 In January 2009, Transport Scotland staged a series of public information exhibitions in communities on the north and south side of the Firth of Forth to facilitate consultation on the (then) developing proposals for the FRC Project. Transport Scotland subsequently published the Forth Replacement Crossing Public Information Exhibitions: Feedback & Outcomes Report (June 2009)³. The report documents the feedback received, explains how this was taken into account and describes the outcomes of the consultation. The commitments were extracted from the responses to common/repeated comments related to traffic and the environment which were raised via the consultation exercise.

4.2 Transport Planning Objectives

- 4.2.1 The Transport Planning Objectives (TPOs) set out as part of the Forth Replacement Crossing Study (2007) became the objectives for the project. **It should be noted that there is no weighting or hierarchy applied to any of the TPOs. The numbering system is used for presentation and reference purposes only.**
- **TPO 1:** To maintain cross-Forth transport links for all modes to at least the level of service offered in 2006.
 - **TPO 2:** To connect to the strategic transport network to aid optimisation of the network as a whole.
 - **TPO 3:** To improve the reliability of journey times for all modes of transport.
 - **TPO 4:** To increase travel choices and improve integration across modes of transport to encourage modal shift of people and goods.
 - **TPO 5:** To improve accessibility and social inclusion.
 - **TPO 6:** To minimise the impacts of maintenance on the effective operation of the transport network.
 - **TPO 7:** To support sustainable development and economic growth.

³ <https://www.transport.gov.scot/media/25469/j11011.pdf>

- **TPO 8:** To minimise the impact on people, and the natural and cultural heritage of the Forth area.

4.3 Commitments – Traffic

4.3.1 Traffic Commitments are listed below, with project performance against these commitments discussed in Chapter 11. Project performance against Environmental Commitments is discussed in Chapter 9, Section 9.8.

4.3.2 **It should be noted that there is no weighting or hierarchy applied to any of the Commitments. The numbering system is used for presentation and reference purposes only.**

- **Commitment (traffic) 1:** The Scottish Government has made a commitment that the Forth Replacement Crossing project will replace but not increase the road provision for general traffic across the Firth of Forth.
- **Commitment (traffic) 2:** The junction on the proposed scheme at South Queensferry has been relocated to connect to the A904 to the west of the town. This will reduce the volume of traffic travelling along the A904 on Builyeon Road between the Bo'ness Road Junction and Echline Roundabout.
- **Commitment (traffic) 3:** The use of Intelligent Transport Systems, improvements to junctions and the inclusion of hard shoulders and wind shielding on the Forth Replacement Crossing will improve operational efficiency, smooth traffic flow and create a maintenance reserve.
- **Commitment (traffic) 4:** Intelligent Transport Systems including variable speed limits will be used to improve the flow of traffic on the proposed scheme, including the M9, and it is anticipated that this will result in some improvement to the operation of Newbridge roundabout by managing the flow of traffic towards the junction. In conjunction with this improvement, the M9 will be widened between Junction 1a and Junction 1 at Newbridge junction to ensure that traffic flow will not be adversely affected along this section of the M9 due to the proposed scheme.
- **Commitment (traffic) 5:** Implementation of Intelligent Transport Systems will manage the flow of traffic towards the junctions to ensure that the performance of the junction is optimised.
- **Commitment (traffic) 6:** Intelligent Transport Systems such as variable speed limits will be used to control the speed and flow of traffic on the main M90 carriageway and the flow of traffic merging from the slip roads. This will improve the operation of the existing and proposed roads on the M90 as far north as Halbeath Interchange.
- **Commitment (traffic) 7:** Whilst there will, therefore, be changes in traffic patterns, these are not anticipated to have a substantial adverse effect on local trips.

- **Commitment (traffic) 8:** Intelligent Transport Systems will be provided as part of the proposed scheme and it is intended that these will also be in place during the construction period to manage and improve the flow of traffic on the network and reduce congestion.

4.4 *Defining the Performance Indicators*

- 4.4.1 It was important to establish performance indicators to measure the performance of the project against its TPOs and the Forth Crossing Commitments. The Objectives, Commitments and indicators are shown below (NB TPO 8 is covered separately in Chapter 9, Environment).

TPOs

Indicators

To maintain cross-Forth transport links for all modes to at least the level of service offered in 2006

- Journey time reliability for all modes
- Journey times for all modes
- Network resilience
- Number of road accidents
- Results from Benefits Realisation Research Public Survey
- PT Timetable Punctuality / PT Service Frequency / Rail Crowding
- Review of public transport network coverage and access to local services

To connect to the strategic transport network to aid optimisation of the network as a whole

- Journey time reliability for all modes
- Journey times for all modes
- Network resilience
- Number of road accidents
- Observations with respect to successful delivery of projects to improve PT
- Observations with respect to traffic control interventions
- Feedback on ITS measures from consultation
- PT Timetable Punctuality / PT Service Frequency / Rail Crowding
- Traffic volumes / flow profiles / vehicle throughout

To improve the reliability of journey times for all modes of transport

- Journey time reliability for all modes
- Observations with respect to traffic control interventions
- Feedback on ITS measures from consultation
- PT Timetable Punctuality / PT Service Frequency / Rail Crowding

To increase travel choices and improve integration across modes of transport to encourage modal shift of people and goods

- Bus and Rail Patronage Levels
- Outcomes from Cycling Audit
- Results from benefits Realisation Research Public Survey

To improve accessibility and social inclusion

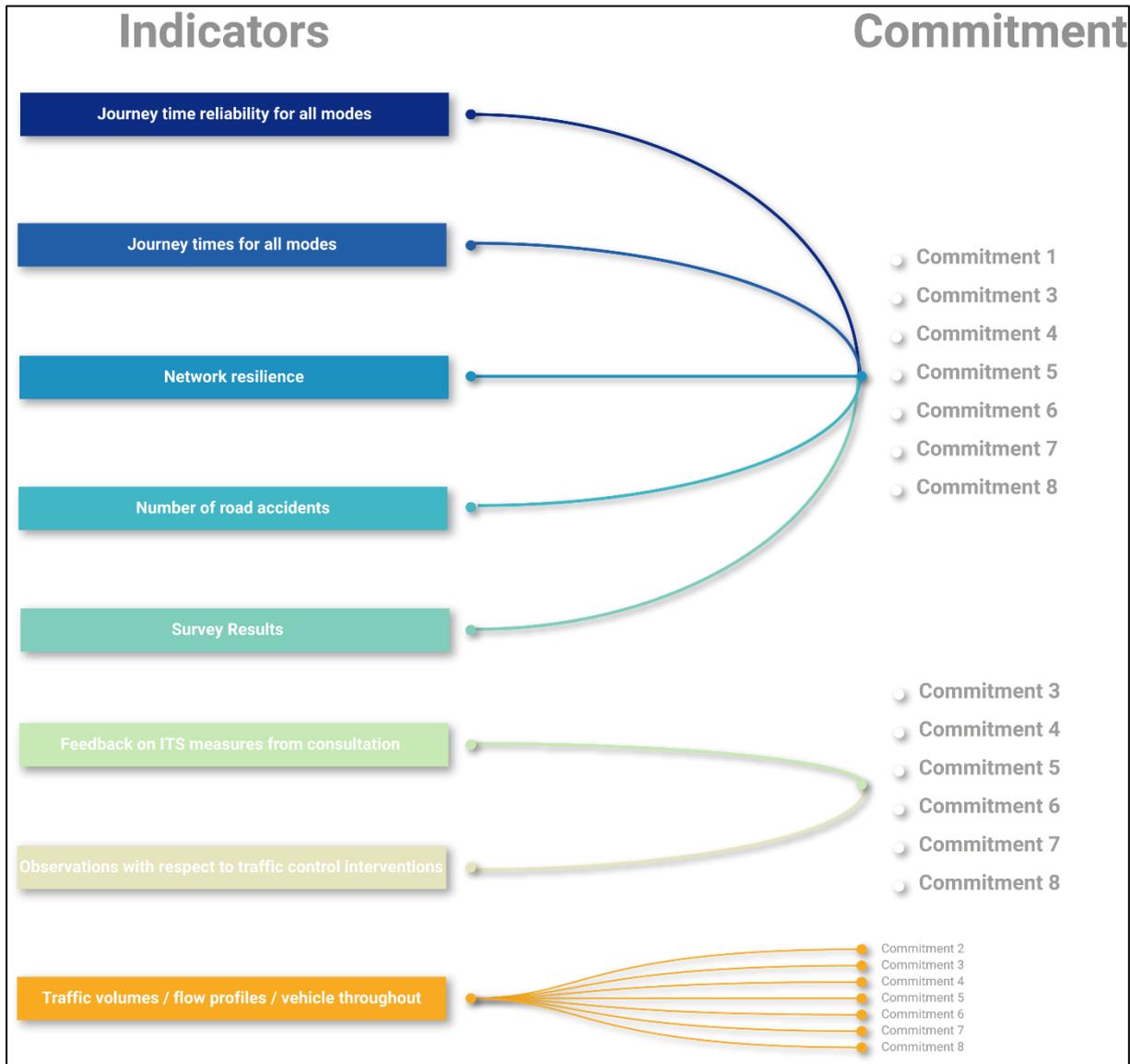
- Journey times for all modes
- Number of road accidents
- Feedback from consultation
- Provision for NMUs
- Review of public transport network coverage and access to local services

To minimise the impacts of maintenance on the effective operation of the transport network

- Journey time reliability for all modes
- Journey times for all modes
- Observations with respect to traffic control interventions
- Feedback on ITS measures from consultation
- Traffic volumes / flow profiles / vehicle throughout
- %HGVs

To support sustainable development and economic growth

- Feedback from consultation
- Results from Business Survey
- Review of public transport network coverage and access to local services



4.5 Basis for One Year After Opening Evaluation

4.5.1 The project’s Transport Planning Objectives as well as the Commitments form the basis for the evaluation against which the various project outcomes have been assessed and are discussed in the following chapters.

5 Supporting Public Transport Strategy

5.1 Introduction

5.1.1 This chapter provides details of the supporting Public Transport Strategy and highlights progress towards delivering associated interventions and performance of the Strategy to date.

5.2 Background

5.2.1 The FRC Public Transport Strategy (PTS) was developed in partnership with a range of organisations, including local authorities and providers of public transport. The strategy was first published in January 2010 and subsequently refreshed and republished in August 2012.

5.2.2 It was developed as part of the Managed Crossing Strategy to ensure that the Forth Replacement Crossing offered opportunities to maintain and enhance sustainable public transport growth; to provide appropriate support for the Scottish Government's purpose of increasing sustainable economic growth; and to contribute to the carbon emissions reduction targets required by the Climate Change (Scotland) Act 2009.

5.2.3 The PTS also sought to build on the Transport Planning Objectives for the project, particularly that of maintaining the levels of service for all transport modes to at least that which was provided in 2006.

5.3 Schemes and Measures

5.3.1 The refreshed PTS proposed 19 interventions to support the Managed Crossing Strategy and delivery of the PTS. Details of the interventions, the proposed delivery timescale from the PTS and current status of each intervention are set out in Table 4 below. Nine of the proposed interventions have been implemented to date by either Transport Scotland or partners to the PTS. The Strategy recognised that, while a number of the interventions were already committed to and would be delivered in the short term, most of the proposed interventions would be considered for delivery in the medium and longer term.

Table 4: Schemes and Measures to support the Managed Crossing Strategy in delivering the PTS

No.	Intervention	Timescale for delivery	Lead Authority	Status
1	Halbeath Park and Choose	Short Term (< 5 years)	Fife Council	Complete
2	Rosyth Park and Choose	Short Term (< 5 years)	Fife Council	Ongoing

No.	Intervention	Timescale for delivery	Lead Authority	Status
3	Hard Shoulder Running for buses on M90 north of Admiralty - Southbound (Works arrangement)	Short Term (< 5 years)	Transport Scotland	Complete
4	Improvements at Admiralty Junction. Included in Fife ITS Contract.	Short Term (< 5 years)	Fife Council / Transport Scotland	Complete
5	Hard Shoulder Running for buses on M9 approach to Newbridge	Short Term (< 5 years)	Transport Scotland	Complete
6	Improvements to Newbridge Interchange to improve both general and public transport	Medium Term (5-10 years)	City of Edinburgh Council, Transport Scotland	Partially complete
7	New slips from B800 to M9 Spur including dedicated right turn lane	Medium Term (5-10 years)	City of Edinburgh Council, Transport Scotland	Removed from strategy
8	Hard Shoulder Running for buses on M90 north of Admiralty - Southbound (Corridor enhancement) Intervention dependent on success of Item 3	Medium Term (5-10 years)	Transport Scotland	Complete
9	Newbridge and M9 Public Transport Improvements	Medium Term (5-10 years)	City of Edinburgh Council, West Lothian Council, Developers, Transport Scotland	Ongoing
10	M8 Public Transport Improvements	Long Term (> 10 years)	Transport Scotland, West Lothian Council	Ongoing

No.	Intervention	Timescale for delivery	Lead Authority	Status
11	Improved public transport links to the M90 at Masterton and Admiralty Junctions, along the A823(M), A985 and A921. This could include a Rosyth Bypass and improvements to the road infrastructure on the A921	Long Term (> 10 years)	Transport Scotland, Fife Council	Ongoing
12	Edinburgh Orbital Bus Project	Medium Term (5-10 years)	SEStran	Ongoing
13	Improve public transport connections between Gogar Roundabout and Maybury Junction	Short Term (< 5 years)	City of Edinburgh Council	Ongoing
14	Improve public transport connections westbound along A90 in Edinburgh on Hillhouse Road	Short Term (< 5 years)	City of Edinburgh Council	Partially complete
15	Additional and amended bus services	Short Term (< 5 years)	Bus Operators, Local Authorities and SEStran	Complete (ongoing)
16	Review and maximise rail service patronage across the Forth	Medium Term (5-10 years)	Transport Scotland, Network Rail, First ScotRail	Partially complete (ongoing)
17	Real Time Passenger Information	Short Term (< 5 years)	SEStran	Complete (ongoing)
18	Development of One Ticket with potential migration to Smart Ticketing	Short Term (< 5 years)	Bus Operators, ScotRail and SEStran	Complete

No.	Intervention	Timescale for delivery	Lead Authority	Status
19	Marketing	Short Term (< 5 years)	Local Authorities, SEStran, Transport Scotland, CPT-Scotland, Bus Operators and ScotRail	Complete

5.4 Consideration of Medium to Long Term Interventions

- 5.4.1 Transport Scotland is currently undertaking the second Strategic Transport Projects Review (STPR2) to inform the Scottish Government’s transport investment programme in Scotland over the next 20 years. STPR2 takes a national overview of the transport network with a focus on regions and will help deliver the vision, priorities and outcomes that are set out in the new National Transport Strategy (NTS).
- 5.4.2 The NTS provides a new policy context through which the recommendations from the first STPR that are not committed will be reviewed as part of STPR2. The appraisal work for STPR2 will include reassessing these remaining interventions from the first STPR and determining if they are still relevant to the new priorities and outcomes set out in NTS2, particularly within the context of the published Sustainable Travel and Sustainable Investment Hierarchies.
- 5.4.3 A number of the PTS medium and long-term interventions will be considered as part of STPR2. These include further bus priority measures on the motorway and trunk road network, which are over and above those already opened on the M90 (interventions 3 and 8) and M9 (intervention 5) and which are linked to potential new Park & Ride sites.
- 5.4.4 Whilst some interventions are still subject to consideration there is clear evidence of the PTS realising success for the dedicated Public Transport Corridor.

5.5 Performance of the Strategy

- 5.5.1 This evaluation at year 1 has considered the performance of the PTS through analysis of:
- several operational indicators, including:
 - bus journey times;
 - journey time accessibility analysis;

- bus and general road traffic volumes; and
- Ferrytoll and Halbeath Park & Ride utilisation
- analysis of impacts upon STAG criteria, particularly Accessibility and Social Inclusion; and
- stakeholder consultation.

5.5.2 This section briefly summarises the outcomes of this analysis; more specific details are provided in subsequent chapters.

Public Transport

5.5.3 Significant journey time savings have been observed for public transport travelling southbound along the dedicated public transport corridor between Halbeath and Barnton / Newbridge as opposed to amongst general traffic in the morning peak period. Journey times between Halbeath and Barnton were found to range from 24 to 27 minutes compared to journey times of 48 minutes when travelling amongst general traffic. Similarly, between Halbeath and Newbridge journey times along the corridor were found to range from 28 to 31 minutes compared to journey times of 48 minutes when travelling amongst general traffic. Whilst journey times southbound from Halbeath to both Barnton and Newbridge during the off-peak and PM Peak periods were found to be greater along the public transport corridor compared to those observed when travelling amongst general traffic, the savings achieved during the morning peak are substantial enough to indicate an overall net improvement.

5.5.4 Journey time accessibility analysis has also shown overall improvements in bus journey times southbound in the morning period (6am – 9am) from selected origins in Fife [i.e. Dunfermline, Glenrothes and Kirkcaldy] to some of the largest employment areas in Edinburgh and West Lothian such as the Gyle Centre and Broxburn East. These journey time improvements range from approximately four minutes to 19 minutes using the dedicated public transport corridor. This analysis is presented in Chapter 8, Section 8.6.10.

5.5.5 The number of buses using the Forth Road Bridge has steadily increased over time from around 400 each day in the first three months after motorway regulations came into place (in February 2018) to in excess of 500 buses per day in the three months to November 2019 – this aligns with feedback from Stagecoach as to increased frequencies of service (see 5.5.9 below).

5.5.6 Demand has increased at both Ferrytoll and Halbeath Park & Ride sites. In 2014, the average demand at Ferrytoll P&R was approximately 60% of capacity and this has increased to approximately 70% in 2018. At Halbeath P&R the demand has increased from 30% in 2014 to approximately 70% in 2018. Fife Council has reported anecdotal evidence that on occasion during summer months some users who have arrived at Halbeath Park & Ride have been unable to find a parking space. This has resulted in Fife Council creating an additional 70 spaces at the facility in November 2019. Furthermore, in response to the Community Council Questionnaire, North Queensferry

Community Council highlighted that bus journey time reliability has improved (although it remains a concern) and the overall attractiveness of Ferrytoll P&R has generally improved.

Stakeholder Consultation – Benefits Realisation Research Public Survey

5.5.7 Results from the Benefits Realisation Research Public Survey have shown of the seven percent who have changed their travel behaviour following the opening of the new Crossing, travel mode was the most common change with a significant percentage (74%, n=16) using the bus more often.

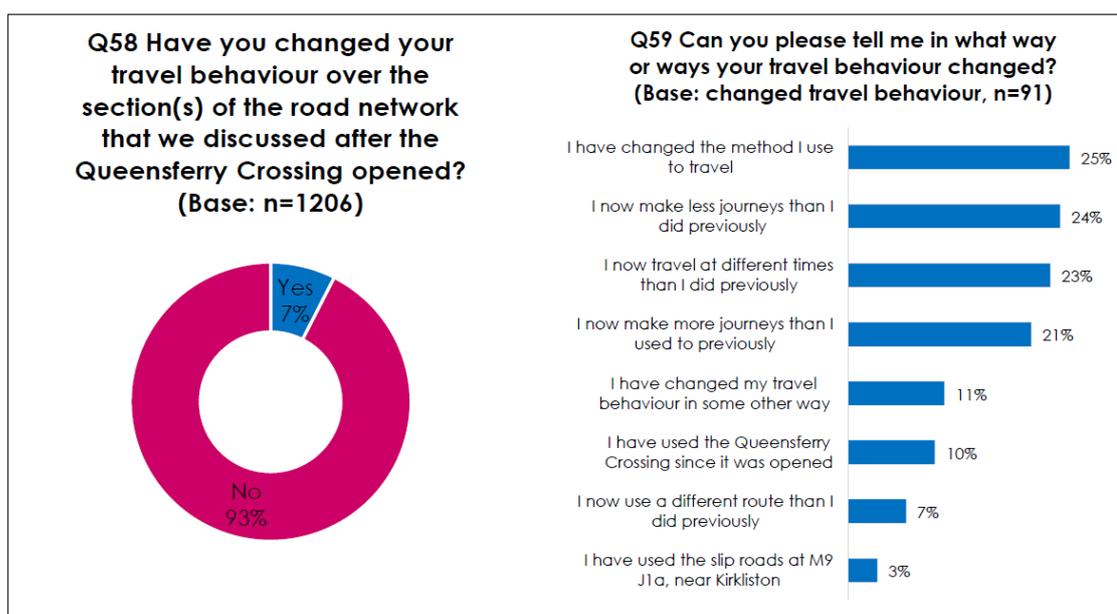


Figure 5: Changes in Travel Behaviour

5.5.8 Results from the survey have also shown that despite a decrease in the number of respondents using Ferrytoll P&R site, down from 13% (n=157) in 2013 to 6% (n=72) in 2020, a higher proportion of P&R users are now more likely to use bus for onward connections. For users of Ferrytoll P&R, the proportion using bus has increased from 78% in 2013 to 96% in 2020. For users of Halbeath P&R, the proportion using bus is 94% (n=45) – NB Halbeath P&R was not open at the time of previous surveys.

Stakeholder Consultation – Public Transport

5.5.9 Stagecoach East Scotland has reported that journey times have reduced by 8% and have become more reliable since the opening of the Queensferry Crossing. This has resulted in passenger growth of 17% (pre-COVID-19). Stagecoach has also increased their service frequency from a bus every five minutes to a bus every four minutes, that is an extra three buses per hour (15 in total) operating along the Fife to Edinburgh Express corridor. After the Queensferry Crossing opened, Stagecoach introduced new services from Fife to Livingston and onwards to Glasgow, created new routes and made improvements within Fife, and increased service frequency to and from

Edinburgh Airport. These improvements have resulted in a 53% increase in the number of journeys made compared to the situation before the new Crossing opened. Stagecoach also highlighted there remains a lack of public transport priority measures from Cramond Brig to Edinburgh city centre on the M90 spur, which continues to affect journey times on this part of the network. There was specific reference to the Stagecoach led joint marketing campaign with Transport Scotland called “Fife in the Fast Lane” (intervention 19) – they highlighted that this was a good campaign because it was bold and noticeable and stated that the growth on the public transport corridor could be a result of a combination of marketing at the start, ongoing marketing, service improvements, Park & Ride and quality of coaches.

- 5.5.10 Scottish Citylink confirmed that patronage numbers have increased between 2018 and 2019. In 2019 Citylink operated the exact same number of services as in 2018 (1,519); however, their patronage increased by 24% during 2018 and 2019, although they highlighted that increases are not entirely due to the opening of the Queensferry Crossing. In addition, and whilst there has been an overall improvement in journey time reliability since the new Crossing opened, they raised that due to increasing volumes of traffic and the bridge construction, reliability was being lost compared to the period prior to the public transport corridor opening. Since the new Crossing has opened, Citylink has been able to operate more reliably. Whilst Citylink has enjoyed the benefits of the new infrastructure, their routes operate long distances across the country and their wider network plans have been largely unaffected by the opening of the new Crossing. They also mentioned that “One Ticket” (intervention 18) is a positive measure.
- 5.5.11 Both operators highlighted that Halbeath Park and Ride has improved custom and Citylink mentioned that this is because it is a better facility and it is easier for people to access by car, meaning a better customer experience. Both operators also highlighted that the M90 bus lane hard shoulder running (interventions 3 and 8) has been very successful from a public transport perspective and with regard to hard shoulder running on the M9, Stagecoach highlighted that journey time penalties are avoided from Ferrytoll to Edinburgh Airport via Newbridge, which is contributing to its success.

Traffic

- 5.5.12 Traffic on the Queensferry Crossing was forecast as part of the DRMB Stage 3 Scheme Assessment Report: Part 2 – Engineering, Traffic and Economic Assessment⁴ to grow by 60% between 2005 and 2017 (with the Managed Crossing Strategy in place). In actuality, when comparing the traffic volumes observed from February 2018 to January 2019 on the Queensferry Crossing, growth of only 33% has occurred when compared to 2005. Whilst many factors will influence traffic demand, as highlighted in Chapter 7, Section 7.1.3, it could be a further indication that the Public Transport Strategy is operating successfully and is having a positive impact on limiting the traffic growth on

⁴ https://www.transport.gov.scot/media/3715/frc_stage_3_scheme_assessment_report_part_2_v3_final.pdf

the Queensferry Crossing below the levels that were forecast at the time of appraisal.

Stakeholder Consultation – Traffic

5.5.13 The Forth Bridges Operating Company (FBOC) highlighted that with the Forth Road Bridge being part of the dedicated public transport corridor, faster public transport journey times have been recorded – this aligns with feedback from public transport operators. Equally, the corridor has encouraged people to use public transport more often – feedback from consultation highlighted a 10% to 15% increase in the number of people using buses and trains across the Forth.

5.6 Public Transport Strategy – Key Findings

5.6.1 There is strong evidence of the Public Transport Strategy realising success for the dedicated Public Transport Corridor:

- Traffic levels on the Queensferry Crossing are lower than forecast at the time of appraisal indicating that the Public Transport Strategy could be having a positive impact on limiting traffic growth on the new Crossing.
- Morning peak bus journey times and journey time reliability across the Firth of Forth have improved, including journey times from selected settlements in Fife to large employment areas in Edinburgh and West Lothian (discussed in Chapter 8).
- Bus operators are reporting increases in patronage, for instance Stagecoach East Scotland has highlighted several contributing factors to growth on the public transport corridor such as the ongoing marketing campaign, improved service offering and completion of bus priority measures.
- Demand at both Ferrytoll and Halbeath Park & Ride sites has steadily increased over time and the number of buses using the Forth Road Bridge has also steadily increased following the opening of the Queensferry Crossing.

5.6.2 There is further work to be undertaken to consider the medium and long-term interventions associated with PTS and it is recommended that an update is provided as part of the detailed evaluation at year 3.

6 Process Evaluation

6.1 Scope

- 6.1.1 The Process Evaluation seeks to provide consideration on “how well was the project implemented?” providing evaluation across the key elements of project cost, programme and process [i.e. project management compliance].
- 6.1.2 As a starting point, a review of the Audit Scotland Report,⁵ commissioned by the Auditor General in August 2018, was undertaken to determine whether the information in this report aligns with the requirements for the Process Evaluation to a level of detail appropriate for this evaluation at year 1. It should be noted that the purpose of this report was “to assess whether the Scottish Government’s delivery of the project provided value for money⁶.”
- 6.1.3 The review found that the Process Evaluation outcomes were, in general, captured within the report, with some of the STRIPE requirements covered to a level of detail appropriate for the evaluation and did not require further investigation, including confirmation of the project management process and comparison of forecast and actual construction programme. A summary is provided in Section 6.2 below.
- 6.1.4 The STRIPE requirements not covered by the Audit Scotland Report and therefore needing further investigation are listed below and were discussed with Transport Scotland and the Forth Bridges Operating Company (FBOC).
- Establishing reasons for variance in programme.
 - Confirming that the Environmental Statement mitigation measures are in place (covered separately in Chapter 9).
 - Confirming that the Stage 4 Road Safety Audit (RSA); Cycling audit; Accessibility audit; and Land Compensation Surveys have been undertaken as required.
 - Lessons learned.

6.2 Outcomes

Project Programme

- 6.2.1 The Queensferry Crossing opened at the end of August 2017. This was eight months later than first estimated and ten weeks later than the mid-June contract completion date. The report highlighted bad weather during construction as the main reason for variance in the project programme.

⁵ <https://www.audit-scotland.gov.uk/report/forth-replacement-crossing>

⁶ Appendix 1 on Page 42 of above report

Discussions with Transport Scotland and FBOC confirmed that weather was the main reason for the delay in opening the Queensferry Crossing to traffic.

Process

6.2.2 The Audit Scotland Report is thorough in its coverage of project governance, management, including costs, and delivery processes. The audit found:

- **The Scottish Government identified a clear need for a new crossing** after extensive investigations of the existing Forth Road Bridge revealed corrosion of the main cables. Repairing the existing bridge was not economically viable. Transport Scotland assessed a cable-stayed bridge as the preferred option for a new crossing. It had several advantages over alternative designs and included features to make the crossing more reliable and resilient. Contributing factors to a clear need for the project included:
 - The project was in line with national policies and strategies at the time (as discussed in Chapter 8, Integration).
 - There was an evidence-based decision to proceed with replacement crossing.
 - There was a comprehensive business case.
- **Transport Scotland managed the project effectively.** There was a clear project scope, and the budget included all relevant costs. Sound governance and wide-ranging risk management and quality assurance measures were in place. The team provided regular, consistent and up-to-date information to the project board about costs, risks, quality and timescales. Other critical success factors were:
 - Relevant and wide-ranging skills and experience within the team and project board, and investment in external expertise early in the project.
 - Strong and consistent leadership, an open and transparent approach, timely decision-making, and positive working relationships with the contractors.
 - Drive and ambition of those involved in delivering the project to do it well and get it right first time.
 - Extensive engagement and communication with stakeholders.
- **Transport Scotland's management of the Forth Replacement Crossing project delivered value for money** although some of the wider benefits of the project have still to be demonstrated. Its procurement of the construction contracts was competitive and helped to deliver the project under budget. The final cost of the project was £1.34 billion – around 8-16 per cent lower than the £1.45 to £1.60 billion estimated at the start of construction. Contributing factors to delivering Value for Money included:

- Measures built into the principal contract to maximise value for money and to encourage savings, added value and innovation.
- Appropriate governance arrangements were in place throughout the project.
- There were effective controls in place to manage change.
- Extensive quality assurance measures were put in place.
- There was tight financial management of the project.

Stakeholder consultation

6.2.3 These key findings were discussed further with Transport Scotland and FBOC. It was highlighted that carrying out maintenance work on the Forth Road Bridge (FRB) was becoming difficult to restrict to just overnight and this was realised when the FRB had to close to all traffic for a month during December 2015 so that essential maintenance work could be carried out – this made the need for a new crossing even clearer. In terms of effective management of the project, it was highlighted that co-location [all parties located in the same site office for each contract] and continuity of knowledgeable and experienced staff was maintained throughout the project, contributing to the successful delivery. In terms of delivering value for money, it was also highlighted that the Audit Scotland Report focussed on the construction phase cost estimate (£1.45bn to £1.6bn), not the initial cost estimate of between £3.2bn and £4.2bn derived during the Forth Replacement Crossing Study (2007) which, following the process of Value Engineering, was reduced by half. This process included a decision to retain the Forth Road Bridge as a dedicated Public Transport Corridor allowing Scottish Government to substantially reduce the cost of the overall project, by reducing the scale and cost of the new Queensferry Crossing.

Cycling Audit

6.2.4 A Stage 3 Cycle Audit was undertaken by Sweco on behalf of Transport Scotland during June 2018 and considered the specific cycle facilities provided as part of the scheme proposals. The audit identified some specific issues related to both the north and south networks. In general, the audit concluded that the cycling provision on the Ferrytoll Gyratory (north network), South Queensferry Gyratory (south network) and the surrounding network provides a safe and continuous shared path that allows cyclists to travel through the gyratories away from the motorised traffic with designated crossing facilities. Specific issues that were raised generally covered signage, cycle path and road markings and silt and debris collecting on tactile paving. The project designer responded to all identified issues and stated that appropriate mitigating actions would be addressed. It has not been possible to confirm whether those actions have been addressed as required via site visits due to impacts of COVID-19. It is therefore recommended that confirmation is sought during the detailed evaluation at year 3.

Road Safety Audits

- 6.2.5 As part of Transport Scotland statutory responsibilities, Road Safety Audits (RSAs) have been undertaken throughout the design and construction of the scheme. The Stage 3 Road Safety Audit (RSA) was undertaken in July 2018 by Stewart Paton Associates on behalf of Forth Crossing Bridge Constructors (FCBC) and comprised an examination of the scheme as constructed. A review of this RSA has identified some issues, broadly covering foliage obscuring road traffic signs as well as poor lane discipline on certain junction approaches that could result in side-swipe traffic collisions. The project sponsor responded to all identified issues and appropriate mitigating actions were put in place.
- 6.2.6 The 1YA opening road safety audit is referred to as the Stage 4 RSA. This audit was undertaken in June 2019 by Stewart Paton Associates on behalf of FCBC and comprised a review of accident data following scheme opening along with revisiting actions arising from the Stage 3 RSA. More details are provided in Section 8.3, Safety. The Stage 4 RSA concluded that all the issues identified at Stage 3 have been completed and that any other issues are now dealt with through regular maintenance and the defect notification process.

Accessibility Audit

- 6.2.7 At the time of writing, no specific Accessibility Audit has been carried out. A review of accessibility provision has been carried out and the Forth Replacement Crossing Access Group. Depending on timing, the findings may be included in the detailed evaluation at year 3.

Land Compensation Surveys

- 6.2.8 As part of the process audit, Transport Scotland has confirmed that a number of land compensation surveys have been undertaken post-construction, including property condition surveys and property structural surveys, and a number of claims have been made under Part 1 of the Land Compensation (Scotland) Act 1973. Details, at the time of writing, are provided below:

Property Condition Surveys

- 45 Property Condition Surveys out of 62 have been issued to the Employers Delivery Team by Forth Crossing Bridge Constructors (FCBC).
- Eight Property Condition Surveys have been declined.
- Transport Scotland is awaiting nine Property Condition Surveys from FCBC.

Property Structural Surveys

- 23 Property Structural Surveys were expected to be undertaken; however, three were declined at the start of the project so are unlikely to be carried out.
- Two Property Structural Surveys have been received out of 20.

Claims under Part I of the Land Compensation (Scotland) Act 1973

6.2.9 Transport Scotland has received approximately 180 claims for depreciation in the value of property due to the use of the Queensferry Crossing and associated road network.

Lessons Learned

6.2.10 The Process Evaluation is an important part of recording the “story” of the FRC Project. Its overall aim is to identify any success factors or lessons learned which can be applied to the delivery of other projects.

6.2.11 The Audit Scotland Report concluded that there was a strong focus on sharing lessons learned from the project, both within Transport Scotland and more widely with engineering institutions and various government transport departments across the UK and overseas. Amongst its recommendations, the report also concluded that the public sector could learn from the way Transport Scotland managed the FRC Project.

6.2.12 From the initial stages of the project in 2007 through to the official opening of the Queensferry Crossing in September 2017, project staff across all disciplines and affiliated companies were tasked with contributing to the production of a Lessons Learned Register. Transport Scotland published the “Lessons Learned from the Forth Replacement Crossing Project 2007 to 2017” in October 2020 and full details can be found on the Transport Scotland website⁷.

6.2.13 Given the sheer extent and scale of the project, the lessons learned register covers many topics (listed below) highlighting areas of good practice and areas that required improvement. The register contains approximately 450 lessons learned, or proposals for future projects, across the various topics (approximate number of lessons learned by topic shown in brackets):

- | | |
|---|---|
| <ul style="list-style-type: none">• Communication (80)• Contract Administration (40)• Environmental (20)• Health and Safety (20) | <ul style="list-style-type: none">• Intelligent Transport Systems (10)• Network Connections (Roads) (30)• Opening Ceremony (10) |
|---|---|

⁷ [View Lessons Learned from the Forth Replacement Crossing Project 2007 to 2017](#)

- Policy / Governance (60)
- Procurement (100)
- Programme and Budget (40)
- Project Management (5)
- Queensferry (Main) Crossing (20)
- Statutory Procedures (20)

6.2.14 The intention of the “Lessons Learned from the Forth Replacement Crossing Project 2007 to 2017” being to influence best practice techniques that may be employed on future projects within Transport Scotland, whilst recognising that many of the lessons are also relevant to projects in general.

7 Operational Indicators

7.1 Traffic Analysis

- 7.1.1 This chapter summarises the operational indicators and compares the performance of the road network before the Queensferry Crossing was opened and after it achieved motorway status. The pre-opening time period covers February 2014 to January 2015 and the post-opening time period covers February 2018 to January 2019. A comparison of the 2017 opening year forecast with post-opening traffic volumes and journey times is also provided.
- 7.1.2 During the pre-opening time period, traffic travelling across the River Forth is based on vehicles routing via the Forth Road Bridge. During the post-opening time period, traffic is based on vehicles using the new Queensferry Crossing.
- 7.1.3 **It is important to bear in mind that any change in the performance of the road and public transport networks between the ‘before’ and ‘after’ positions may be influenced by factors other than the project itself. This may include, but not limited to:**
- Changes in land use patterns reflecting planned local or regional developments within the Firth of Forth area.
 - Other road infrastructure schemes and changes in public transport and service provision.
 - General background traffic growth.
 - Changes in speed limits (reductions) on selected routes.
- 7.1.4 Analysis of these potential causal factors has not been undertaken during this evaluation in detail. This analysis will be considered in subsequent detailed evaluations at year 3 or year 5 as further impacts emerge in the medium to longer term.

7.2 Traffic Volumes

- 7.2.1 Historically SRTDb and now National Traffic Data System (NTDS) have used automatic traffic counters with the most appropriate technology available at the time. As a consequence, there are a variety of counter types currently in use within the network as a whole. Each of the counters uses one of three vehicle classification systems: Euro6, CA10 and NADICS 3 Level Vehicle Length Classification. More details on these vehicle classification systems can be found in the annual traffic monitoring reports published on the Transport Scotland website.
- 7.2.2 Annual Average Daily Traffic (AADT) volumes are presented for selected locations on each journey time route, as described in Chapter 3, for both pre-

and post-opening time periods. The selected traffic volume locations are shown in Figure 6 below and the traffic volumes are shown in Table 5.

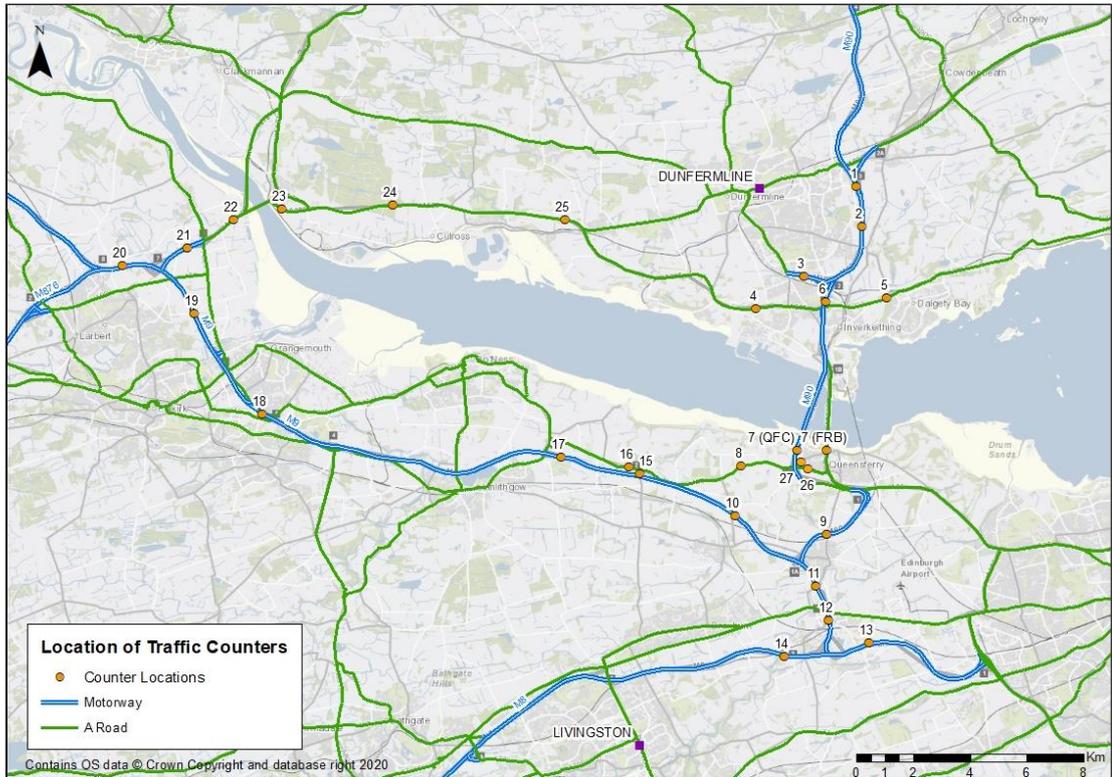


Figure 6: Traffic Volume Locations

7.2.3 Changes in traffic volumes have been coloured red or blue, with red indicating an increase in traffic volume and blue indicating a decrease in traffic volume.

Table 5: Pre- and Post-opening Annual Average Daily Traffic Volumes (in vehicles)

Ref.	Location	Direction	Annual Average Daily Traffic (AADT) Volumes		
			Pre-Opening	Post-Opening	Post vs Pre-Opening Differences
1	M90 Junction 2A (Halbeath)	NB	10,600	12,000	1,400 13%
		SB	15,500	17,500	2,000 13%
		Combined	26,100	29,500	3,400 13%
2	M90 between Junction 2 (Masterton) and Junction 2A (Halbeath)	NB	29,400	29,300	-100 0%
		SB	29,600	28,100	-1,500 -5%
		Combined	59,000	57,400	-1,600 -3%
3	A823(M) at Masterton	EB	9,800	10,200	400 4%
		WB	10,500	11,900	1,400 13%
		Combined	20,300	22,100	1,800 9%
4	A985 Admiralty Road, West of Brankholme Brae Roundabout	EB	5,800	6,500	700 12%
		WB	5,900	6,100	200 3%
		Combined	11,700	12,600	900 8%
5	A921 (Hillend)	EB	11,400	11,500	100 1%
		WB	11,400	11,500	100 1%
		Combined	22,800	23,000	200 1%
6	M90 between Junction 1C (Rosyth) and Junction 2 (Masterton)	NB	32,700	33,900	1,200 4%
		SB	32,100	33,500	1,400 4%
		Combined	64,800	67,400	2,600 4%
7	M90 Queensferry Crossing (NB FRB pre-opening)	NB	36,300	37,900	1,600 4%
		SB	37,800	38,700	900 2%
		Combined	74,100	76,600	2,500 3%
8	A904 at Newton	EB	5,700	7,100	1,400 25%

Ref.	Location	Direction	Annual Average Daily Traffic (AADT) Volumes			
			Pre-Opening	Post-Opening	Post vs Pre-Opening Differences	
		WB	5,900	6,900	1,000	17%
		Combined	11,600	14,000	2,400	21%
9	M90 between M9 Junction 1A and M90 Junction 1	NB	20,300	21,400	1,100	5%
		SB	21,700	22,400	700	3%
		Combined	42,000	43,800	1,800	4%
10	M9 between Junction 1A and Junction 2	NB	16,200	16,700	500	3%
		SB	16,500	16,600	100	1%
		Combined	32,700	33,300	600	2%
11	M9 between Junction 1 and Junction 1A	EB	19,700	20,900	1,200	6%
		WB	15,200	16,900	1,700	11%
		Combined	34,900	37,800	2,900	8%
12	M9 between Junction 1 and M8 Junction 2	NB	31,100	33,400	2,300	7%
		SB	32,200	34,400	2,200	7%
		Combined	63,300	67,800	4,500	7%
13	M8 between Junction 1 and Junction 2	EB	33,800	35,400	1,600	5%
		WB	34,200	36,500	2,300	7%
		Combined	68,000	71,900	3,900	6%
14	M8 between Junction 2 and Junction 3	EB	33,900	34,200	300	1%
		WB	34,900	36,200	1,300	4%
		Combined	68,800	70,400	1,600	2%
15	B8046 Old Philpstoun	NB	3,600	4,200	600	17%
		SB	3,800	4,600	800	21%

Ref.	Location	Direction	Annual Average Daily Traffic (AADT) Volumes			
			Pre-Opening	Post-Opening	Post vs Pre-Opening Differences	
		Combined	7,400	8,800	1,400	19%
16	A904 (Errick Burn)	EB	2,200	2,500	300	14%
		WB	2,200	2,400	200	9%
		Combined	4,400	4,900	500	11%
17	M9 between Junction 2 and Junction 3	EB	21,200	23,400	2,200	10%
		WB	21,200	23,500	2,300	11%
		Combined	42,400	46,900	4,500	11%
18	M9 between Junction 5 and Junction 6	NB	20,500	20,900	400	2%
		SB	21,100	22,300	1,200	6%
		Combined	41,600	43,200	1,600	4%
19 ⁸	M9 between Junction 6 and Junction 7	NB	30,200	31,100	900	3%
		SB	26,500	28,500	2,000	8%
		Combined	56,700	59,600	2,900	5%
20	M9 between Junction 7 and Junction 8	EB	No data available	No data available	-	-
		WB	32,900	25,400	-7,500 ⁹	-23%
		Combined	32,900	25,400	-7,500	-23%
21	M876 between M9 Junction 7 and M876 Junction 3 ¹⁰	NB	12,500	14,100	1,600	13%
		SB	13,100	14,600	1,500	11%

⁸ Traffic count site 19 – data only available up to 11 September 2018

⁹ Traffic count site 20 – no data available for lane 2 during post-opening time period due to equipment failure

¹⁰ Traffic count Site 21 – data only available up to 29 May 2018

Ref.	Location	Direction	Annual Average Daily Traffic (AADT) Volumes			
			Pre-Opening	Post-Opening	Post vs Pre-Opening Differences	
		Combined	25,600	28,700	3,100	12%
22	A876 between M876 Junction 3 and Higgins Neuk Roundabout	NB	16,800	18,100	1,300	8%
		SB	15,800	16,900	1,100	7%
		Combined	32,600	35,000	2,400	7%
23	A985 East of Kincardine - east of new bypass tie-in	EB	6,800	6,500	-300	-4%
		WB	6,400	6,000	-400	-6%
		Combined	13,200	12,500	-700	-5%
24	A985 High Valleyfield (WiM)	EB	6,500	6,600	100	2%
		WB	6,100	6,000	-100	-2%
		Combined	12,600	12,600	0	0%
25	A985 East of B9156	EB	8,200	8,100	-100	-1%
		WB	7,800	7,600	-200	-3%
		Combined	16,000	15,700	-300	-2%
26	B924 Bo'ness Road (South Queensferry)	NB	1,800	3,100	1,300	72%
		SB	1,900	3,300	1,400	74%
		Combined	3,700	6,400	2,700	73%
27	A904 Builyeon Road (South Queensferry)	EB	6,900	7,100	200	3%
		WB	6,900	6,700	-200	-3%
		Combined	13,800	13,800	0	0%
Values rounded to nearest hundred						

Comparison between Pre and Post Opening Traffic Volumes

7.2.4 The following key points can be determined from Table 5:

Area-Wide Traffic Volume Increases

- Traffic volumes at most selected locations within the study area have increased between the pre-opening period and post-opening to varying degrees.
- The largest increases in absolute terms have occurred at locations both north and south of the Firth of Forth, particularly at locations on the M90, M8 and M9:
 - M90 Junction 2A Halbeath (+3,400)
 - M8 between Junction 1 and M8 Junction 2 (+3,900)
 - M9 between Junction 1 and M8 Junction 2 (+4,500)
 - M9 between Junction 2 and Junction 3 (+4,500)
- There have been smaller absolute increases in annual average daily traffic volumes on local roads closer to the Queensferry Crossing, including the B924 Bo'ness Road (South Queensferry) (+2,700), the A904 at Newton (+2,400) and the B8046 at Old Philpstoun (+1,400).

Area-Wide Traffic Volumes No Material Change

- In some cases, annual average daily traffic volumes at selected locations were broadly similar to the 'before' position [i.e. defined in this case as traffic volume increases or decreases of less than 1,000 vehicles per day], particularly:
 - A985 East of Kincardine - east of new bypass tie-in (-700)
 - A985 East of B9156 (-300)
 - A985 High Valleyfield (0)
 - A904 Builyeon Road (0)
 - A921 (Hillend) (+200)
 - A904 (Errick Burn) (+500)
 - M9 between Junction 1A and Junction 2 (+600)
 - A985 Admiralty Road, West of Brankholme Brae Roundabout (+900)

Forth Road Bridge and Queensferry Crossing Traffic Volumes

7.2.5 AADT has increased across the Firth of Forth between pre- and post-opening time periods. The pre-opening AADT on the Forth Road Bridge was 74,100 and the post-opening AADT using the Queensferry Crossing was 76,600. However, this is substantially below what was forecast during the appraisal process as shown in Section 7.6. Whilst many factors will influence traffic demand, it could indicate that the Public Transport Strategy, as discussed in Chapter 5, is operating successfully and having a positive impact on limiting the traffic growth on the Queensferry Crossing below the levels that were forecast at the time of appraisal.

7.2.6 Shown below are weekday average daily traffic volumes (combined directions) by time of day on the Forth Road Bridge (pre-scheme opening) and Queensferry Crossing (post-scheme opening). The figure shows that traffic volumes were lower on the Queensferry Crossing in the morning peak, higher in the inter-peak period and broadly similar in the evening peak. The figure also shows that the build-up of traffic in the morning on the Queensferry Crossing occurred earlier than when it did on the FRB.

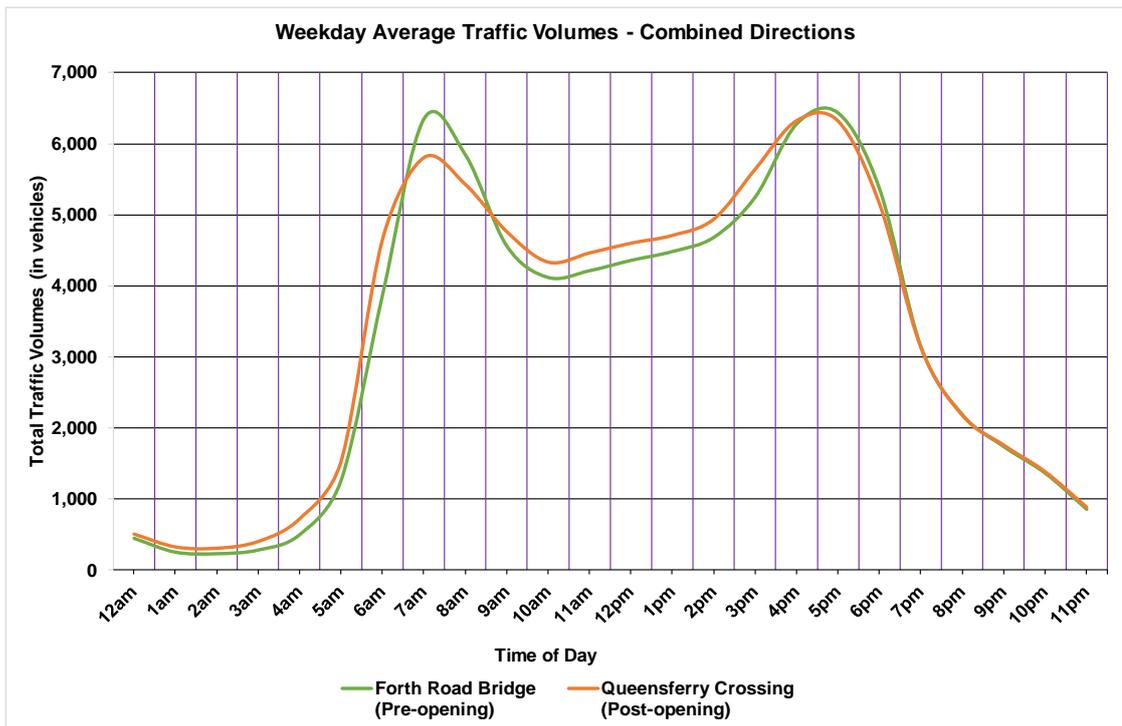


Figure 7: FRB and Queensferry Crossing, Weekday Average Traffic Volumes by Time of Day

7.2.7 The total vehicle flow over the Forth Road Bridge and Queensferry Crossing, and particularly the total flow of Heavy Goods Vehicles (HGVs), is directly linked to the requirement for maintenance and resurfacing work on the bridge carriageways. Shown below is the annual average daily HGV volumes on the

Forth Road Bridge and Queensferry Crossing, with percentage of total traffic in brackets. Due to the traffic counter vehicle classification system, “HGVs” include buses/coaches.

- 7.2.8 A small reduction in HGVs has been observed on the Queensferry Crossing when compared with the HGV volumes on the Forth Road Bridge; however, it should be noted that buses mixed with general traffic in the ‘before’ situation, whereas in the ‘after’ situation buses are, in the main, separated from general traffic and use the dedicated public transport corridor on this part of the network, which could, in part, reflect the reductions shown.

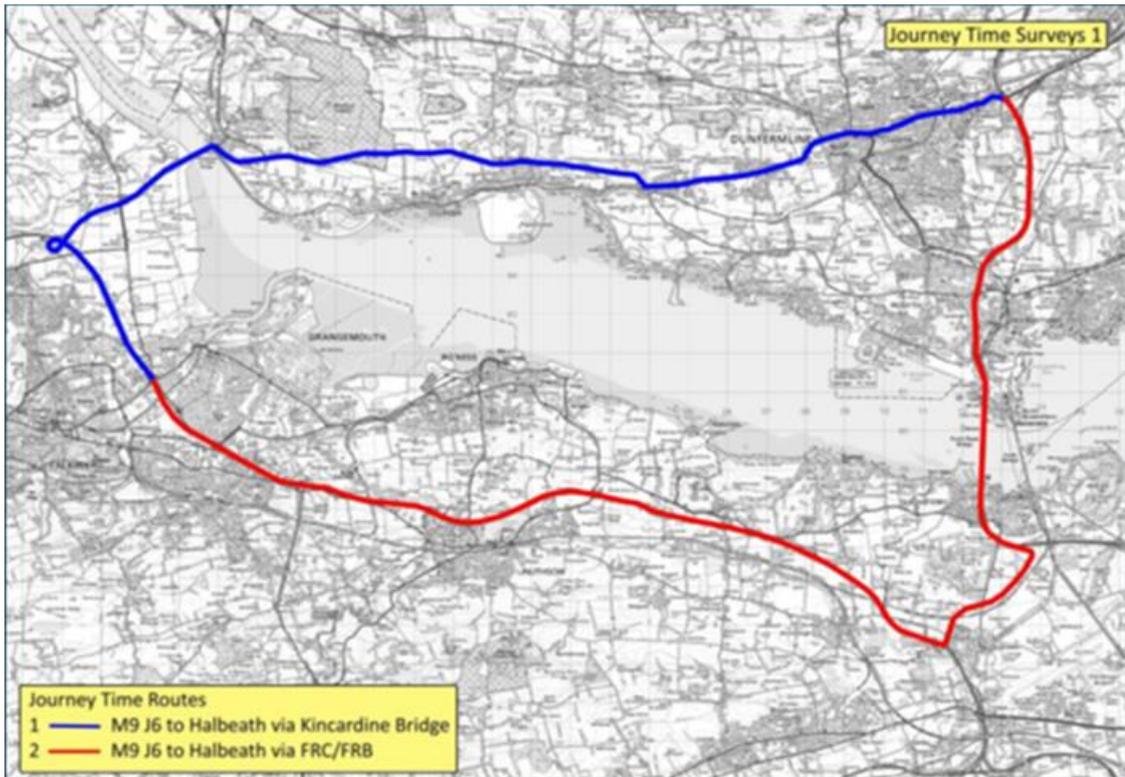
Table 6: Annual Average Daily HGV Volumes on FRB / Queensferry Crossing

Ref.	Location	Direction	Pre-Opening	Post-Opening	Post vs Pre-Opening Difference
7	M90 Queensferry Crossing (NB FRB pre-opening)	NB	2,300 (6%)	2,200 (6%)	-100 (0%)
		SB	2,300 (6%)	2,000 (5%)	-300 (-1%)
		Combined	4,600 (6%)	4,200 (5%)	-400 (-1%)
Values rounded to nearest hundred					

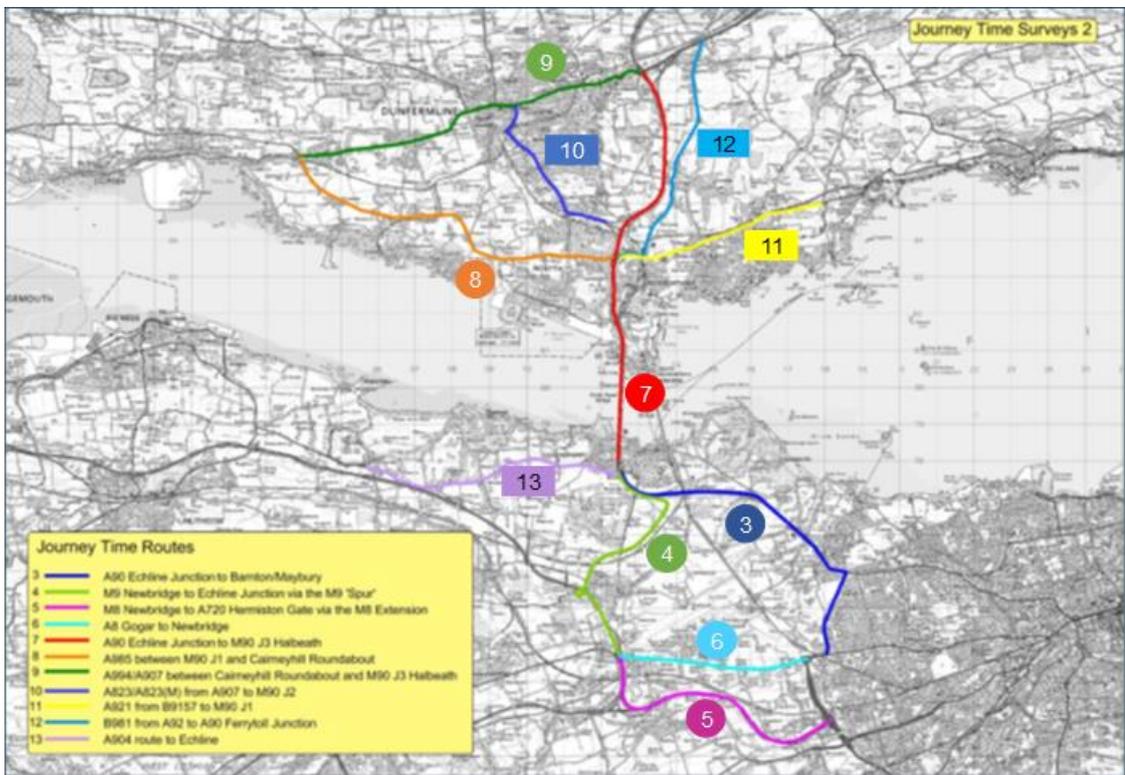
7.3 Journey Times

- 7.3.1 Traffic volume profiles at many of the selected count sites appeared relatively consistent across most months between February 2018 and September 2019. On this basis, February 2019 [i.e. one year after the Queensferry Crossing achieved motorway status] has been selected for the journey time and journey time reliability analysis. Additionally, a check was made by comparing September 2018 journey times [i.e. a neutral month] with February 2019 journey times to confirm consistency and this comparison showed that differences in journey times were relatively minor.
- 7.3.2 The journey times for the average weekday AM Peak hour and PM Peak hour, and the average Weekend Peak hour are presented for the strategic and local journey time routes shown below for both February 2014 (pre-opening) and February 2019 (post-opening).

Strategic Journey Time Routes



Local Journey Time Routes



7.3.3 The average weekday AM Peak hour journey times are shown in Table 7 and Figure 8 below.

- 7.3.4 Changes in journey times have been coloured red or blue, with red indicating an increase in the overall average journey time and blue indicating a decrease in the overall average journey time.
- 7.3.5 It should be noted that there is an increase in the distance travelled of approximately 1.3km when comparing the new road layout (post-opening) with the old road layout (pre-opening), affecting selected journey time routes 2, 3, 4, 7 and 13. This increase in distance will be a contributing factor to the journey time increases that have occurred across all time periods for those these routes.

Table 7: February 2014 and February 2019 Journey Times (in minutes), Average Weekday AM Peak Hour

Ref.	Route Description	Direction	February 2014 (pre-opening)	Feb 2019 (post-opening)	2019 vs 2014 Differences (in minutes)
			AM Peak Hour (8am-9am)		
1	M9 Junction 6 to M90 Halbeath Junction via Kincardine Bridge	EB	30.4	32.8	2.4
		WB	30.0	32.2	2.2
2	M9 Junction 6 to M90 Halbeath Junction via Forth Road Bridge (FRB) / Queensferry Crossing	EB	22.5	27.1	4.6
		WB	24.0	28.2	4.2
3	M90/A90 between Queensferry Junction (M90) and Maybury Junction (A90)	NB	8.1	10.2	2.1
		SB	13.0	19.7	6.7
4	M9 Newbridge Junction to Queensferry Junction via the M9 Spur	NB	5.4	6.3	0.9
		SB	6.3	9.2	2.9
5	M9 Newbridge Junction to A720 Hermiston Gait via the M8	EB	7.7	11.1	3.4
		WB	4.8	5.6	0.8
6	A8 between Gogar Junction and Newbridge Junction	EB	6.7	8.7	2.0
		WB	4.7	5.0	0.3
7	1.3km east of M90 Queensferry Junction to M90 Junction 3 (Halbeath) <i>(NB pre-opening route is A90 Echline Junction via FRB to M90 Junction 3)</i>	NB	5.6	6.2	0.6
		SB	6.2	6.5	0.3

Ref.	Route Description	Direction	February 2014 (pre-opening)	Feb 2019 (post-opening)	2019 vs 2014 Differences (in minutes)
			AM Peak Hour (8am-9am)		
8	A985 between M90 Junction 1 (Admiralty) and Cairneyhill Roundabout	EB	9.6	10.6	1.0
		WB	9.5	9.8	0.3
9	A994 / A907 between Cairneyhill Roundabout and M90 Junction 3 (Halbeath)	EB	13.8	14.9	1.1
		WB	13.5	14.7	1.2
10	A823 (M) between the A907 and M90 Junction 2 (Masterton)	EB	6.1	6.2	0.1
		WB	6.9	7.5	0.6
11	A921 between the B9157 and M90 Junction 1 (Admiralty)	EB	5.9	6.2	0.3
		WB	6.6	6.9	0.3
12	B981 between the A92 and M90 Junction 1B (Ferrytoll)	NB	5.7	5.7	0.0
		SB	5.3	6.6	1.3
13	A904 between Old Philpstoun and Queensferry Junction	EB	5.2	5.3	0.1
		WB	5.3	5.4	0.1

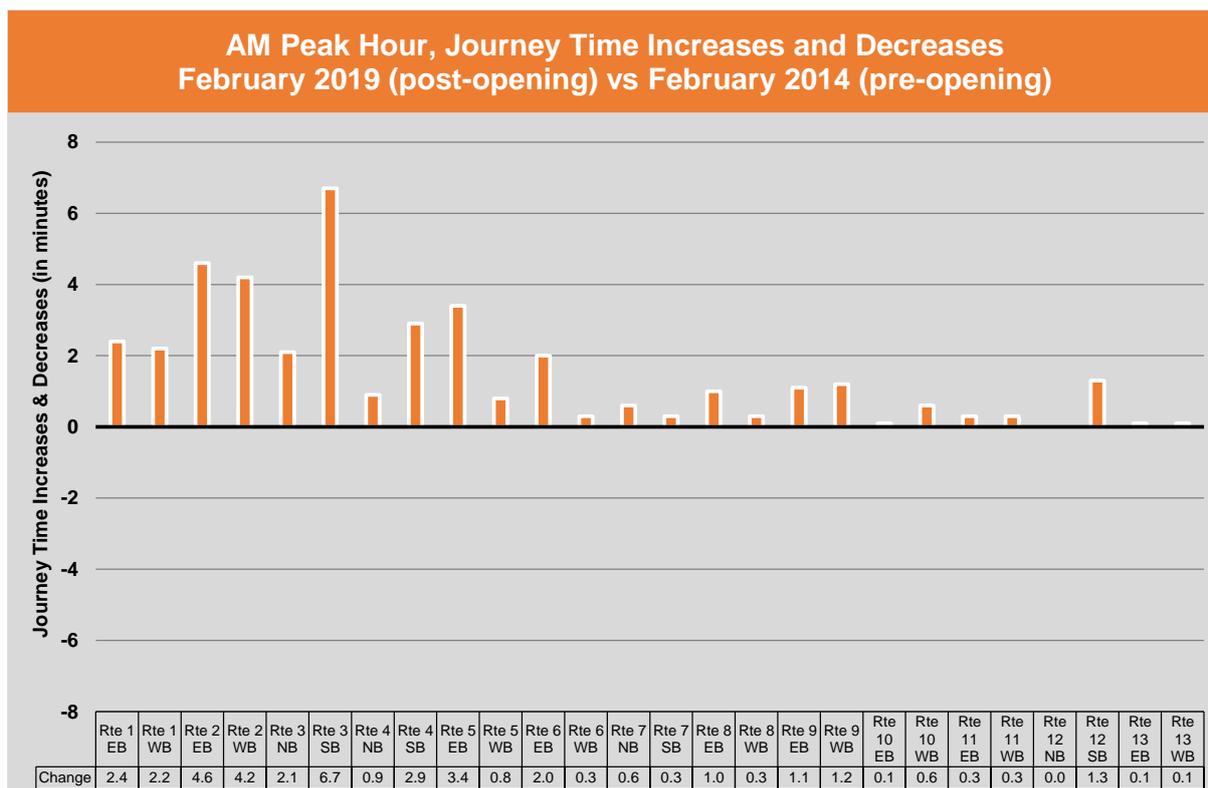


Figure 8: AM Peak Hour Journey Time Increases and Decreases (in minutes), February 2019 vs February 2014

Comparison between Pre and Post Opening Journey Times

AM Peak Hour

- 7.3.6 Figure 8 shows that traffic on the selected routes has experienced an increase in journey times to varying levels of degree.
- 7.3.7 The largest journey time increase of nearly seven minutes has occurred on route 3 between Queensferry Junction (M90) and Maybury Junction (A90) in the southbound direction towards Edinburgh City.
- 7.3.8 Other journey time increases of note that have occurred on routes when compared with the ‘before’ situation are immediately to the west of Edinburgh, including between M9 Newbridge Junction and Queensferry Junction via the M9 Spur (route 4) in the southbound direction and between M9 Newbridge Junction and A720 Hermiston Gait via the M8 (route 5) in the eastbound direction towards Edinburgh City, with journey time increases of approximately three minutes. Traffic on the longer strategic route 2 from the M9 Junction 6 to M90 Halbeath Junction via Forth Road Bridge (FRB) / Queensferry Crossing has experienced a journey time increase of approximately four minutes in both directions.
- 7.3.9 Journey times on all other routes were similar to the ‘before’ situation with increases of less than two minutes, including local route 7 between M90 Queensferry Junction and M90 Junction 3 (Halbeath) via Queensferry Crossing where traffic experienced an increase of less than one minute. This

increase is considered relatively small and it reflects the increasing trend in traffic volumes across this part of the road network – that is traffic has grown by 3% between 2014 and 2018 across the Forth Estuary as shown in Table 5 (ref. 7). In addition, and as highlighted previously, the increase in distance between the new and old road layout will be contributing to the small journey time increases that have occurred for general traffic now using the Queensferry Crossing. Therefore, it is not unreasonable to expect an impact on journey times on the Queensferry Crossing, which, in the AM Peak hour, are relatively minor.

7.3.10 The February 2014 and February 2019 journey times for the average weekday PM Peak hour are shown in Table 8, and Figure 9 below.

Table 8: February 2014 and February 2019 Journey Times (in minutes), Average Weekday PM Peak Hour

Ref.	Route Description	Direction	February 2014 (pre-opening)	Feb 2019 (post-opening)	2019 vs 2014 Differences (in minutes)
			PM Peak Hour (5pm-6pm)		
1	M9 Junction 6 to M90 Halbeath Junction via Kincardine Bridge	EB	30.8	33.6	2.8
		WB	30.7	34.4	3.7
2	M9 Junction 6 to M90 Halbeath Junction via Forth Road Bridge (FRB) / Queensferry Crossing	EB	24.2	31.1	6.9
		WB	22.6	27.1	4.5
3	M90/A90 between Queensferry Junction (M90) and Maybury Junction (A90)	NB	10.2	15.5	5.3
		SB	8.2	10.0	1.8
4	M9 Newbridge Junction to Queensferry Junction via the M9 Spur	NB	6.9	11.1	4.2
		SB	5.0	6.0	1.0
5	M9 Newbridge Junction to A720 Hermiston Gait via the M8	EB	5.4	5.0	-0.4
		WB	6.5	9.0	2.5
6	A8 between Gogar Junction and Newbridge Junction	EB	7.6	7.2	-0.4
		WB	9.8	9.4	-0.4
7	1.3km east of M90 Queensferry Junction to M90 Junction 3 (Halbeath) (NB pre-opening route is A90 Echline Junction via FRB to M90 Junction 3)	NB	5.6	6.7	1.1
		SB	5.4	6.2	0.8

Ref.	Route Description	Direction	February 2014 (pre-opening)	Feb 2019 (post-opening)	2019 vs 2014 Differences (in minutes)
			PM Peak Hour (5pm-6pm)		
8	A985 between M90 Junction 1 (Admiralty) and Cairneyhill Roundabout	EB	9.7	10.4	0.7
		WB	9.8	10.6	0.8
9	A994 / A907 between Cairneyhill Roundabout and M90 Junction 3 (Halbeath)	EB	14.4	15.6	1.2
		WB	14.3	17.1	2.8
10	A823 (M) between the A907 and M90 Junction 2 (Masterton)	EB	6.4	6.7	0.3
		WB	6.8	7.6	0.8
11	A921 between the B9157 and M90 Junction 1 (Admiralty)	EB	6.4	6.6	0.2
		WB	6.5	6.9	0.4
12	B981 between the A92 and M90 Junction 1B (Ferrytoll)	NB	5.7	5.7	0.0
		SB	5.2	6.5	1.3
13	A904 between Old Philpstoun and Queensferry Junction	EB	5.3	6.3	1.0
		WB	5.4	5.3	-0.1

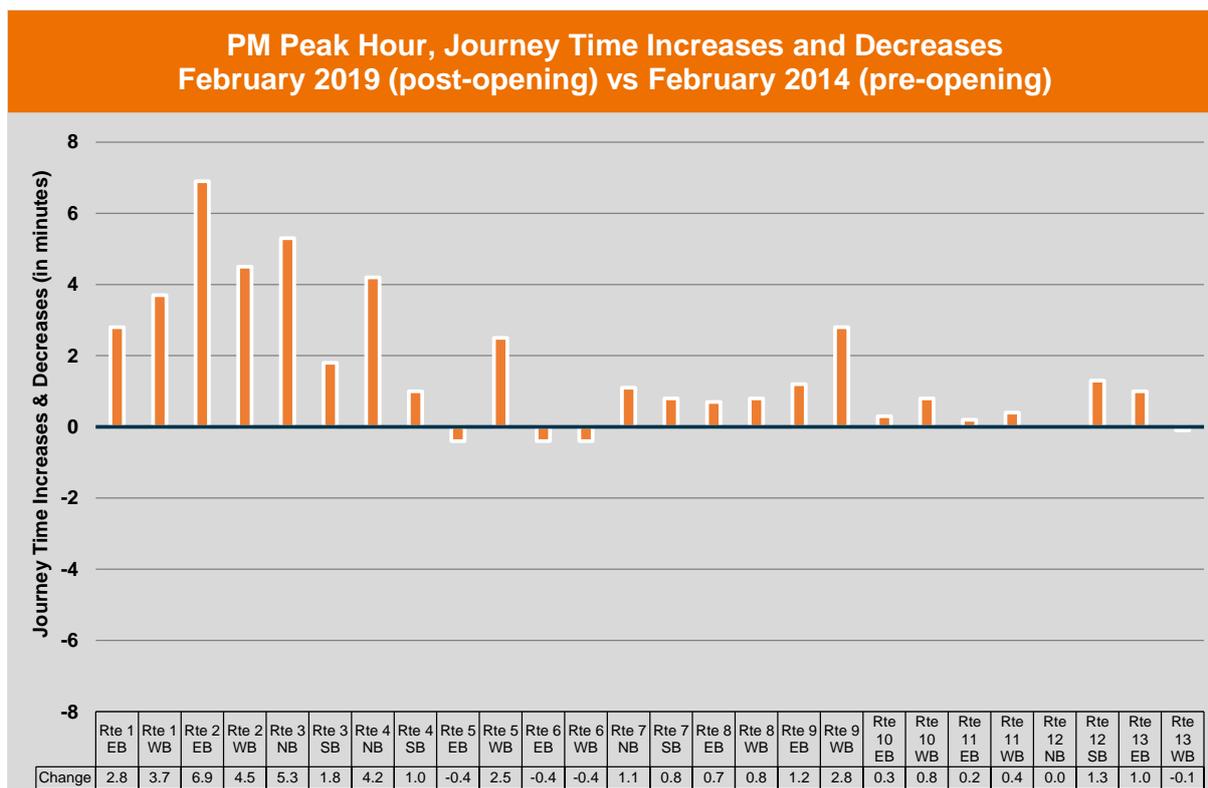


Figure 9: PM Peak Hour Journey Time Increases and Decreases (in minutes), February 2019 vs February 2014

PM Peak hour

7.3.11 A similar trend was evident in the PM Peak Hour compared with the AM Peak Hour insofar as traffic on the selected routes has generally experienced an increase in journey times to varying levels of degree one year after opening of the Queensferry Crossing, ranging from less than one to seven minutes.

7.3.12 The largest journey time increase of nearly seven minutes has occurred on the longer strategic route 2 from the M9 Junction 6 to M90 Halbeath Junction via the Queensferry Crossing in the eastbound direction.

7.3.13 On routes immediately west of Edinburgh, including the M90 / A90 between Queensferry Junction (M90) and Maybury Junction (A90) (route 3), M9 Newbridge Junction to Queensferry Junction via the M9 Spur (route 4) and M9 Newbridge Junction to A720 Hermiston Gait via the M8 (route 5), traffic has experienced an increase in journey times ranging from approximately three to five minutes travelling away from Edinburgh City. Traffic experienced a similar journey time increase ranging from approximately three to four minutes on the longer strategic route 1 from the M9 Junction 6 to M90 Halbeath Junction via Kincardine Bridge.

7.3.14 Journey times on most other routes were similar to the 'before' situation, generally with increases or decreases of less than one minute, including local route 7 between M90 Queensferry Junction and M90 Junction 3 (Halbeath) via Queensferry Crossing where traffic experienced an increase of approximately one minute. Again, the increase in the distance travelled of approximately

1.3km when comparing the new road layout (post-opening) with the old road layout (pre-opening) for route 7, together with the increasing trend in traffic volumes, will be contributing to the small journey time increases that have occurred for general traffic now using the Queensferry Crossing.

7.3.15 The February 2014 and February 2019 journey times for the average Weekend Peak hour are shown in Table 9, and Figure 10 below.

Table 9: February 2014 and February 2019 Journey Times (in minutes), Average Weekend Peak Hour

Ref.	Route Description	Direction	February 2014 (pre-opening)	Feb 2019 (post-opening)	2019 vs 2014 Differences (in minutes)
			Weekend Peak Hour (1pm-2pm)		
1	M9 Junction 6 to M90 Halbeath Junction via Kincardine Bridge	EB	29.7	31.4	1.7
		WB	28.5	30.6	2.1
2	M9 Junction 6 to M90 Halbeath Junction via Forth Road Bridge (FRB) / Queensferry Crossing	EB	21.7	24.2	2.5
		WB	24.9	26.0	1.1
3	M90/A90 between Queensferry Junction (M90) and Maybury Junction (A90)	NB	7.4	9.2	1.8
		SB	7.8	10.4	2.6
4	M9 Newbridge Junction to Queensferry Junction via the M9 Spur	NB	5.2	6.0	0.8
		SB	4.9	5.9	1.0
5	M9 Newbridge Junction to A720 Hermiston Gait via the M8	EB	4.5	4.4	-0.1
		WB	4.5	5.1	0.6
6	A8 between Gogar Junction and Newbridge Junction	EB	4.8	6.2	1.4
		WB	4.5	5.0	0.5
7	1.3km east of M90 Queensferry Junction to M90 Junction 3 (Halbeath) (NB pre-opening route is A90 Echline Junction via FRB to M90 Junction 3)	NB	5.4	5.8	0.4
		SB	5.5	5.6	0.1

			February 2014 (pre-opening)	Feb 2019 (post-opening)	2019 vs 2014 Differences (in minutes)
Ref.	Route Description	Direction	Weekend Peak Hour (1pm-2pm)		
8	A985 between M90 Junction 1 (Admiralty) and Cairneyhill Roundabout	EB	8.9	9.3	0.4
		WB	8.9	9.1	0.2
9	A994 / A907 between Cairneyhill Roundabout and M90 Junction 3 (Halbeath)	EB	14.2	15.0	0.8
		WB	13.0	14.9	1.9
10	A823 (M) between the A907 and M90 Junction 2 (Masterton)	EB	5.7	5.6	-0.1
		WB	6.1	6.3	0.2
11	A921 between the B9157 and M90 Junction 1 (Admiralty)	EB	5.6	6.1	0.5
		WB	6.0	6.5	0.5
12	B981 between the A92 and M90 Junction 1B (Ferrytoll)	NB	5.2	5.5	0.3
		SB	4.9	6.3	1.4
13	A904 between Old Philpstoun and Queensferry Junction	EB	5.1	5.3	0.2
		WB	5.4	5.2	-0.2

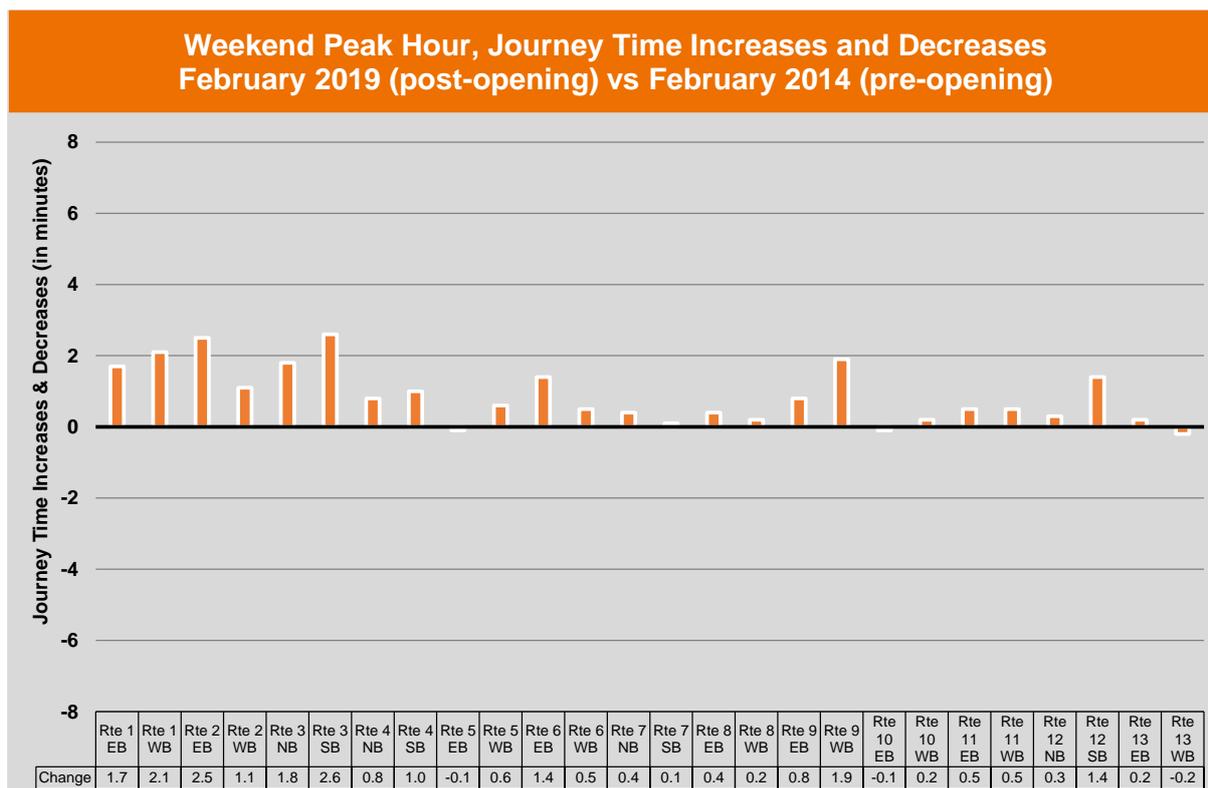


Figure 10: Weekend Peak Hour Journey Time Increases and Decreases (in minutes), February 2019 vs February 2014

Weekend Peak Hour

7.3.16 On most routes during the Weekend Peak hour journey time increases of less than two minutes occurred. There were a couple of exceptions, including on the longer strategic route 2 in the eastbound direction from the M9 between Junction 6 and M90 Halbeath Junction via the Queensferry Crossing (route 2) and southbound towards Edinburgh on the M90/A90 between Queensferry Junction (M90) and Maybury Junction (A90) (route 3) where a journey time increase of approximately three minutes occurred. Traffic experienced no real material change on any of the other routes, including on the local using the Queensferry Crossing (route 7) when compared with the ‘before’ situation.

7.3.17 Overall, the journey time comparisons have shown that traffic on the selected routes has generally experienced an increase in journey times to varying levels of degree one year after the opening of the Queensferry Crossing, ranging from less than one minute up to seven minutes.

7.3.18 The journey time comparison for traffic routing via the Forth Road Bridge in 2014 and via the Queensferry Crossing in 2019 (local route 7) shows similar journey times with increases of up to one minute in the weekday morning and evening peaks. These increases are considered relatively small and they reflect the increasing trend in traffic volumes across this part of the road network – that is traffic has grown by 3% between 2014 and 2018 across the Forth Estuary as shown in Table 5 (ref. 7). Again, the increase in distance travelled of approximately 1.3km will also be contributing to the small journey time increases that have occurred for general traffic now using the

Queensferry Crossing. Therefore, it is not unreasonable to expect an impact on journey times on the Queensferry Crossing, which, in the Weekend Peak hour, are relatively minor.

7.4 Journey Time Reliability

- 7.4.1 Journey time reliability is an important factor in the efficiency and comfort of the travel experience. Whilst the overall journey time is an important measure, the consistency and reliability of the same journey day to day is also important for both private motorists and business travel.
- 7.4.2 The INRIX journey time data has been analysed to provide an understanding of the variability of journey times, a measure of journey time reliability, across the average weekday AM Peak hour, PM Peak hour, and the average Weekend Peak hour during February 2014 (pre-opening) and February 2019 (post-opening) for each journey time route described above.
- 7.4.3 Journey time variability is calculated using standard deviations. However, it is important to note that standard deviations vary along with average journey times so a Coefficient of Variation (CV) has been used to facilitate comparison between routes and times of day. This coefficient is derived by dividing the standard deviation of the journey time by the average journey time.
- 7.4.4 The coefficient of variation shows the extent of the variability in the journey times compared with the average journey time. A coefficient of zero (or 0%) would indicate no variation in day-to-day journey time and a coefficient of one (or 100%) would indicate a high level of variation in day-to-day journey times. Therefore, the larger the coefficient, the greater the amount of day-to-day journey time variability.

Comparison between Pre and Post Opening Journey Time Reliability

- 7.4.5 The variation in average journey times is shown in Figures 11, 12 and 13 for the AM Peak hour, PM Peak hour and Weekend Peak hour respectively.

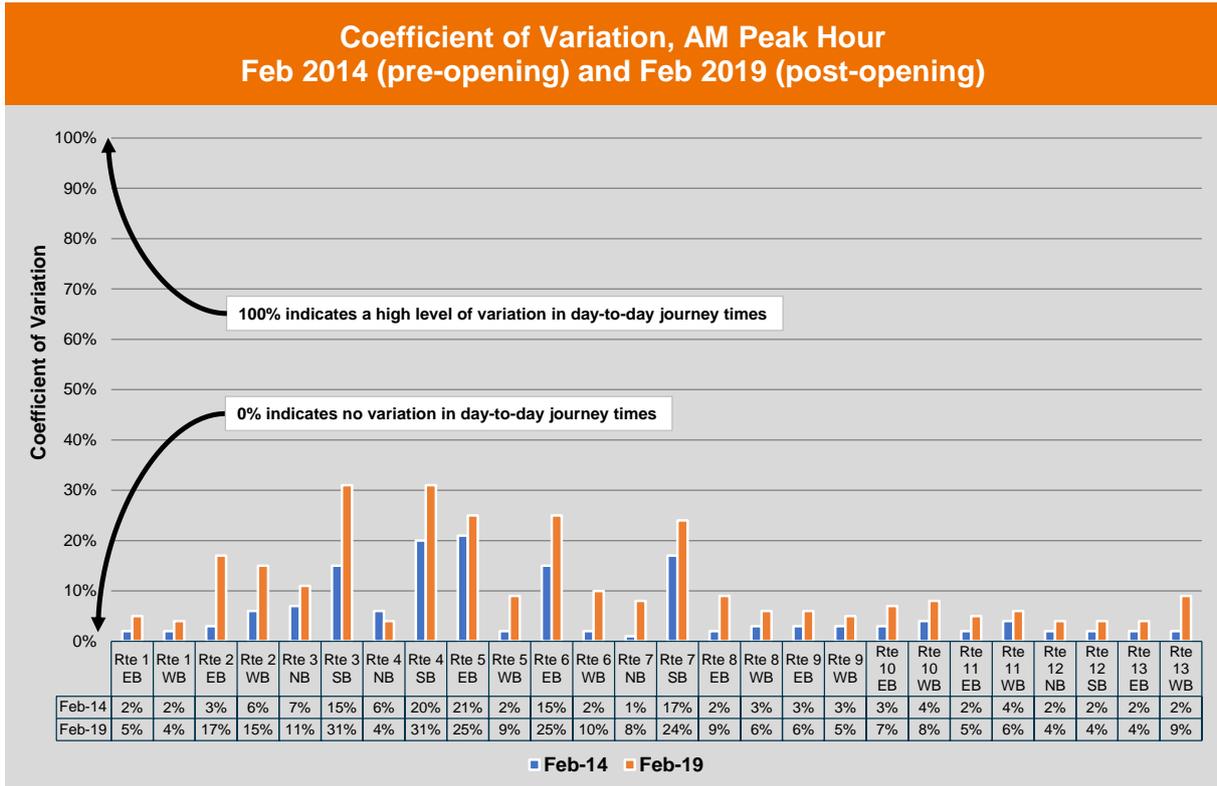


Figure 11: Coefficient of Variation, AM Peak Hour

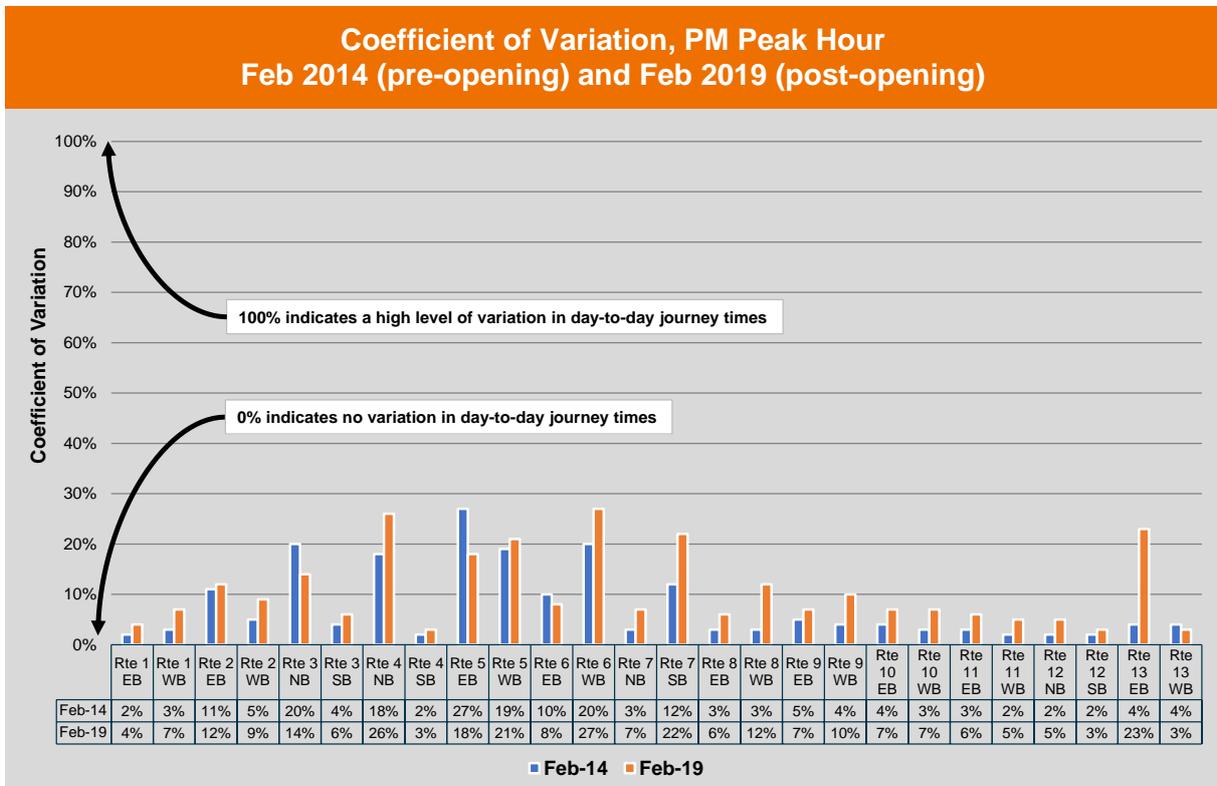


Figure 12: Coefficient of Variation, PM Peak Hour

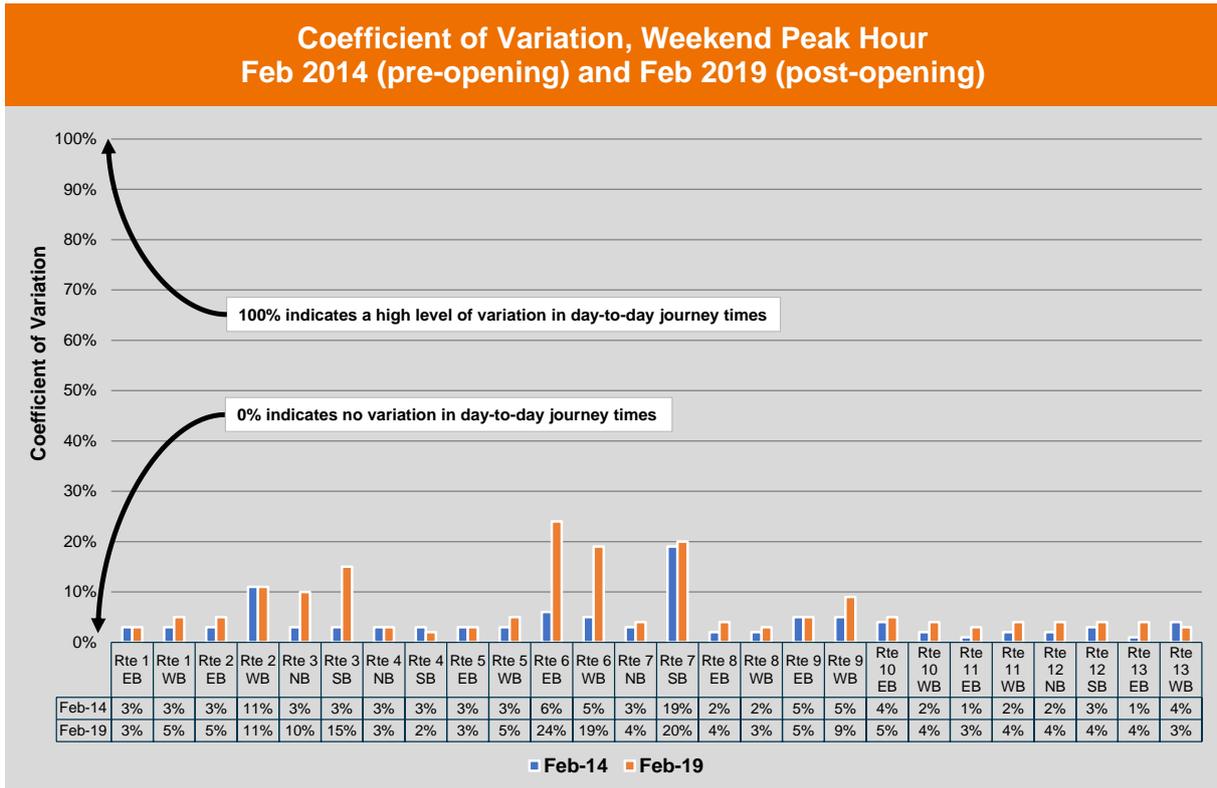


Figure 13: Coefficient of Variation, Weekend Peak Hour

- 7.4.6 Comparing the February 2014 and 2019 findings reveal that in both AM and PM Peak hours, on almost all routes the coefficient of variation was slightly higher in 2019 than in 2014, indicating day-to-day journey times were slightly more variable on those routes one year after the opening of the Queensferry Crossing.
- 7.4.7 The analysis shows that the largest changes in the levels of variability occurred during the weekday AM and PM Peak hours on routes immediately to the west of Edinburgh, including:
- M9 Junction 6 to M90 Halbeath Junction via the Queensferry Crossing (route 2)
 - M90/A90 between Queensferry Junction and Maybury Junction (route 3)
 - M9 Newbridge Junction to Queensferry Junction via the M9 Spur (route 4)
 - M9 Newbridge Junction to A720 Hermiston Gait via the M8 (route 5)
 - A8 between Gogar Junction and Newbridge Junction (route 6)
 - M90 Queensferry Junction to M90 J3 (Halbeath) via the Queensferry Crossing (route 7)
- 7.4.8 All other routes and time periods have similar results overall with respect to day-to-day journey time variability, including the extent of, and the changes in, the variability of journey times.
- 7.4.9 Whilst journey times are, on the whole, slightly more variable, the figures above show coefficients of variation that indicate low variance in day-to-day journey times across all routes and time periods – that is the Coefficient of Variation is shown to be typically less than 25% which is not considered to indicate unreliability.
- 7.4.10 The FRC Project includes the provision of Intelligent Transport Systems (ITS) along the full length of a “Managed Motorway Corridor” from the M90 Halbeath Junction over the Queensferry Crossing to the M9. The ITS was not fully implemented, fully operational (automated) and fully optimised over the reporting period for the 1YA evaluation. At this stage, therefore, it is too early to consider any notable effects of the ITS on the operational efficiency of the network.

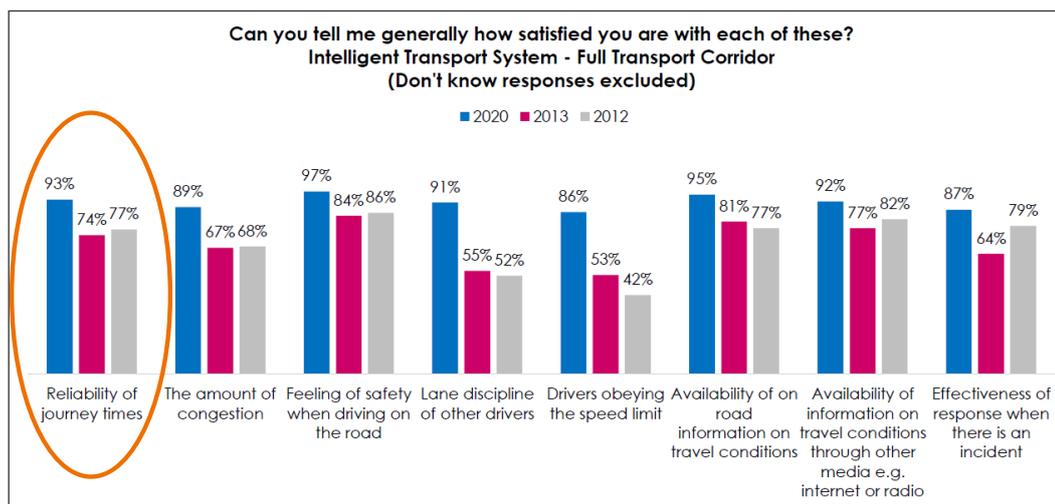


Figure 14: Transport Users satisfaction with Intelligent Transport Systems

7.5 Halbeath and Ferrytoll Park & Ride Sites

7.5.1 This section presents the pre- and post-opening observed daytime car park counts for Halbeath and Ferrytoll Park and Ride sites. The main purpose of the analysis is to show the utilisation trend of each site before the opening of the Queensferry Crossing and after it achieved motorway status. The analysis is not intended to provide a comparison of each site between the 'before' and 'after' positions.

7.5.2 Average daytime¹¹ car park counts for Monday to Saturday during pre- and post-opening time periods are shown below. Sunday and the overnight period in all days has been excluded from the analysis because only partial car park count data exists. Therefore, the average daily car park counts could therefore be higher than what is shown below.

Halbeath Park & Ride

7.5.3 Halbeath is a bus-based Park & Ride from the west of Fife to Edinburgh and Glasgow. It is a joint initiative between Fife Council and Transport Scotland and formed one of the complementary schemes for the FRC Public Transport Strategy. Its overarching aims were to tackle congestion problems during construction of the Queensferry Crossing; to provide an alternative travel option for travellers to Edinburgh and Glasgow; and to ease traffic congestion in Dunfermline by providing a high frequency link to the town centre.

7.5.4 Before the Queensferry Crossing opened, Halbeath was operating below its capacity of 1,000 spaces, with approximately 250 cars using the site at 2pm each day. The same trend was evident after the new Crossing opened, although there were significantly more cars¹² using the site with approximately 700 cars at 2pm, indicating an increase in popularity.

¹¹ Due to reporting format of observed P&R count data, the daytime count represents car park occupancy at 2pm.

¹² There is anecdotal evidence highlighting that on occasion during late summer users who have arrived at Halbeath Park and Ride some have been unable to find a parking space.

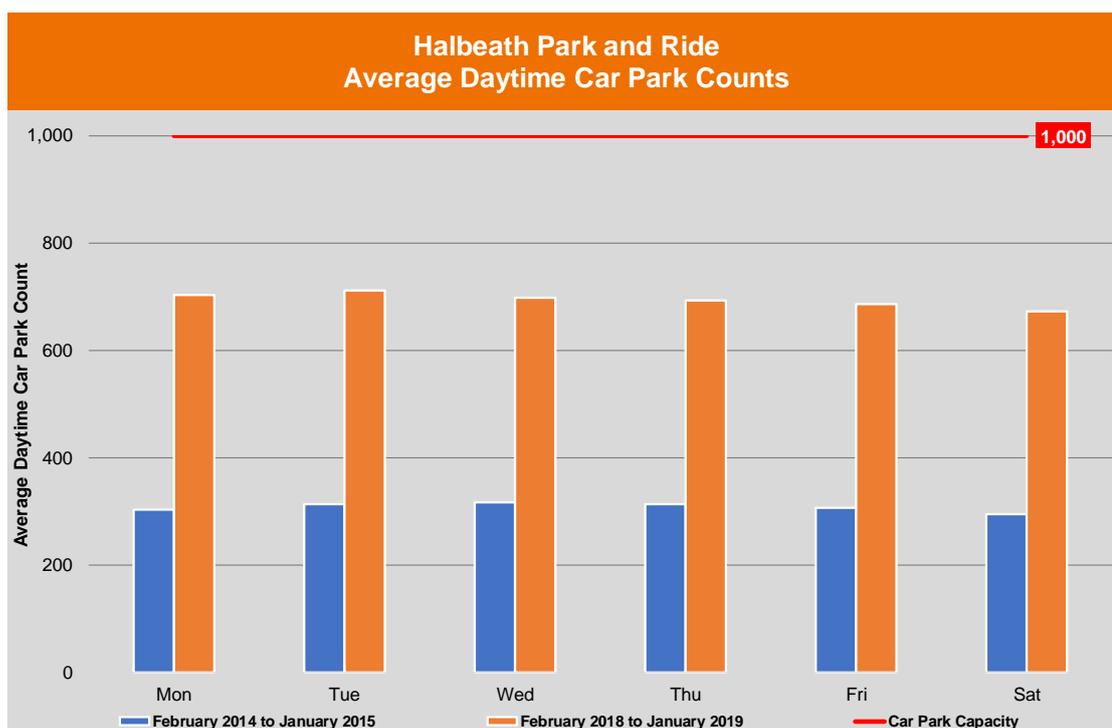


Figure 15: Halbeath Park & Ride¹³, Average Daytime Car Park Counts

Ferrytoll Park & Ride

- 7.5.5 Ferrytoll is also a bus-based Park & Ride but from the south of Fife to Edinburgh. It is a joint initiative developed between Fife Council and Stagecoach and has the overarching aim of tackling congestion problems across the Firth of Forth.
- 7.5.6 Before the Queensferry Crossing opened, Ferrytoll was also well used with more than half the car park spaces filled each day – weekdays were the busiest as expected with approximately 700 cars using the site. The same trend was evident after the new Crossing opened with more cars using the site at 2pm, showing a continued increase in popularity.

¹³ Car park capacity obtained from <http://www.halbeath.org/parking/>

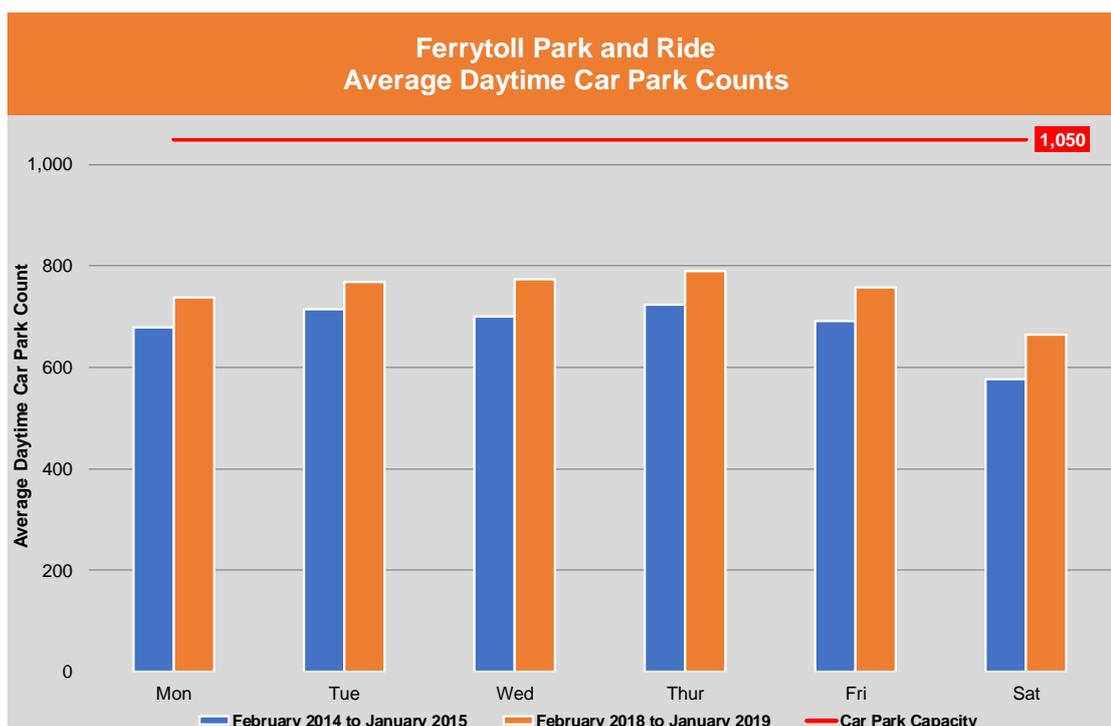


Figure 16: Ferrytoll Park & Ride¹⁴, Average Daytime Car Park Counts

Stakeholder Consultation – Benefits Realisation Research Public Survey

7.5.7 Results from the Benefits Realisation Research Public Survey have shown that despite a decrease in the number of respondents using Ferrytoll P&R site, down from 13% (n=157) in 2013 to 6% (n=72) in 2020, a higher proportion of P&R users are now more likely to use bus for onward connections. For users of Ferrytoll P&R, the proportion using bus has increased from 78% in 2013 to 96% in 2020. For users of Halbeath P&R, the proportion using bus is 94% (n=45) – NB Halbeath P&R was not open at the time of previous surveys.

7.6 Opening Year Forecast and Post-Opening Traffic Volumes

7.6.1 Opening year forecast and post-opening Annual Average Daily Traffic (AADT) volumes are presented in Table 10 below for the same selected locations shown in Section 7.2. Differences in traffic volumes have been coloured red or blue, with red indicating higher forecast AADT volumes and blue indicating lower forecast AADT volumes.

7.6.2 The forecast traffic volumes are based on outputs from the Transport Model for Scotland 05A (TMfS05A) which was used during scheme appraisal. Annualisation factors representing traffic in the SEStran Regional Transport Partnership area¹⁵ have been applied to the modelled average weekday peak hour forecast traffic volumes to derive forecast AADT volumes:

¹⁴ Car park capacity obtained from <http://www.ferrytoll.org/parking/>

¹⁵ https://www.transport.gov.scot/media/3715/frc_stage_3_scheme_assessment_report_part_2_v3_final.pdf

- AM Peak Hour to Annual = 560
- Inter-Peak Hour to Annual = 3,419
- PM Peak Hour to Annual = 651

Table 10: 2017 Opening Year Forecast and Post-Opening Annual Average Daily Traffic Volumes (in vehicles)

Ref.	Location	Direction	Annual Average Daily Traffic (AADT) Volumes			
			2017 Forecast	Post-Opening	Forecast vs Post-Opening Differences	
1	M90 Junction 2A (Halbeath)	NB	19,200	12,000	7,200	60%
		SB	17,500	17,500	0	0%
		Combined	36,700	29,500	7,200	24%
2	M90 between Junction 2 (Masterton) and Junction 2A (Halbeath)	NB	35,500	29,300	6,200	21%
		SB	34,100	28,100	6,000	21%
		Combined	69,600	57,400	12,200	21%
3	A823(M) at Masterton	EB	10,700	10,200	500	5%
		WB	9,800	11,900	-2,100	-18%
		Combined	20,500	22,100	-1,600	-7%
4	A985 Admiralty Road, West of Brankholme Brae Roundabout	EB	5,600	6,500	-900	-14%
		WB	4,900	6,100	-1,200	-20%
		Combined	10,500	12,600	-2,100	-17%
5	A921 (Hillend)	EB	9,100	11,500	-2,400	-21%
		WB	8,400	11,500	-3,100	-27%
		Combined	17,500	23,000	-5,500	-24%
6	M90 between Junction 1C (Rosyth) and Junction 2 (Masterton)	NB	40,700	33,900	6,800	20%
		SB	40,100	33,500	6,600	20%
		Combined	80,800	67,400	13,400	20%
7	M90 Queensferry Crossing	NB	47,400	37,900	9,500	25%
		SB	44,800	38,700	6,100	16%
		Combined	92,200	76,600	15,600	20%

Ref.	Location	Direction	Annual Average Daily Traffic (AADT) Volumes			
			2017 Forecast	Post-Opening	Forecast vs Post-Opening Differences	
8	A904 at Newton	EB	8,500	7,100	1,400	20%
		WB	10,100	6,900	3,200	46%
		Combined	18,600	14,000	4,600	33%
9	M90 between M9 Junction 1A and M90 Junction 1	NB	22,500	21,400	1,100	5%
		SB	22,300	22,400	-100	0%
		Combined	44,800	43,800	1,000	2%
10	M9 between Junction 1A and Junction 2	NB	17,500	16,700	800	5%
		SB	16,500	16,600	-100	-1%
		Combined	34,000	33,300	700	2%
11	M9 between Junction 1 and Junction 1A	EB	37,400	20,900	16,500	79%
		WB	38,100	16,900	21,200	125%
		Combined	75,500	37,800	37,700	100%
12	M9 between Junction 1 and M8 Junction 2	NB	30,400	33,400	-3,000	-9%
		SB	26,000	34,400	-8,400	-24%
		Combined	56,400	67,800	-11,400	-17%
13	M8 between Junction 1 and Junction 2	EB	38,500	35,400	3,100	9%
		WB	43,600	36,500	7,100	19%
		Combined	82,100	71,900	10,200	14%
14	M8 between Junction 2 and Junction 3	EB	37,700	34,200	3,500	10%
		WB	38,400	36,200	2,200	6%
		Combined	76,100	70,400	5,700	8%
15	B8046 Old Philpstoun	NB	1,100	4,200	-3,100	-74%

Ref.	Location	Direction	Annual Average Daily Traffic (AADT) Volumes			
			2017 Forecast	Post-Opening	Forecast vs Post-Opening Differences	
16	A904 (Errick Burn)	SB	700	4,600	-3,900	-85%
		Combined	1,800	8,800	-7,000	-80%
		EB	200	2,500	-2,300	-92%
		WB	900	2,400	-1,500	-63%
		Combined	1,100	4,900	-3,800	-78%
17	M9 between Junction 2 and Junction 3	EB	22,900	23,400	-500	-2%
		WB	21,300	23,500	-2,200	-9%
		Combined	44,200	46,900	-2,700	-6%
18	M9 between Junction 5 and Junction 6	NB	15,900	20,900	-5,000	-24%
		SB	19,600	22,300	-2,700	-12%
		Combined	35,500	43,200	-7,700	-18%
19 ¹⁶	M9 between Junction 6 and Junction 7	NB	21,600	31,100	-9,500	-31%
		SB	24,200	28,500	-4,300	-15%
		Combined	45,800	59,600	-13,800	-23%
20	M9 between Junction 7 and Junction 8	EB	-	No data available	-	-
		WB	24,200	25,400	-1,200 ¹⁷	-5%
		Combined	24,200	25,400	-1,200	-5%
21	M876 between M9 Junction 7 and M876 Junction 3 ¹⁸	NB	14,600	14,100	500	4%
		SB	12,500	14,600	-2,100	-14%
		Combined	27,100	28,700	-1,600	-6%
22		NB	14,600	18,100	-3,500	-19%

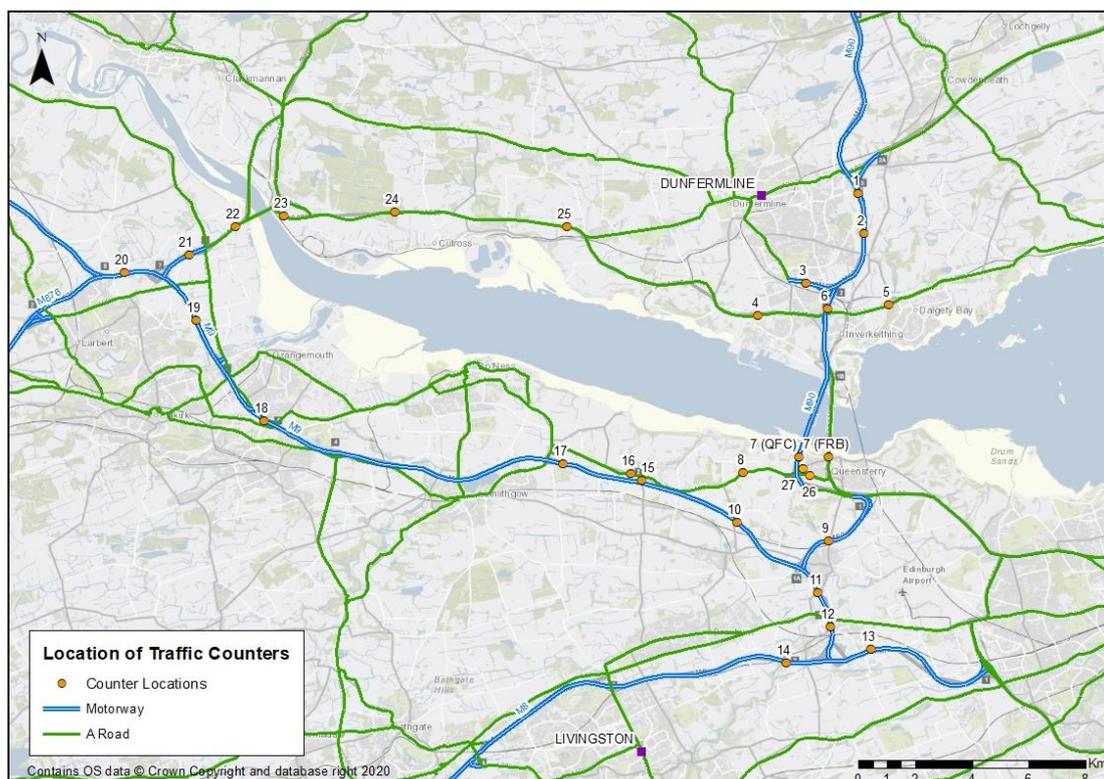
¹⁶ Traffic count site 19 – data only available up to 11 September 2018

¹⁷ Traffic count site 20 – no data available for lane 2 during post-opening time period due to equipment failure

¹⁸ Traffic count Site 21 – data only available up to 29 May 2018

Ref.	Location	Direction	Annual Average Daily Traffic (AADT) Volumes			
			2017 Forecast	Post-Opening	Forecast vs Post-Opening Differences	
	A876 between M876 Junction 3 and Higgins Neuk Roundabout	SB	12,500	16,900	-4,400	-26%
		Combined	27,100	35,000	-7,900	-23%
23	A985 East of Kincardine - east of new bypass tie-in	EB	5,900	6,500	-600	-9%
		WB	6,700	6,000	700	12%
		Combined	12,600	12,500	100	1%
24	A985 High Valleyfield (WiM)	EB	4,600	6,600	-2,000	-30%
		WB	4,700	6,000	-1,300	-22%
		Combined	9,300	12,600	-3,300	-26%
25	A985 East of B9156	EB	4,700	8,100	-3,400	-42%
		WB	4,800	7,600	-2,800	-37%
		Combined	9,500	15,700	-6,200	-39%
26	B924 Bo'ness Road (South Queensferry)	NB	2,300	3,100	-800	-26%
		SB	3,200	3,300	-100	-3%
		Combined	5,500	6,400	-900	-14%
27	A904 Builyeon Road (South Queensferry)	EB	1,300	7,100	-5,800	-82%
		WB	1,100	6,700	-5,600	-84%
		Combined	2,300	13,800	-11,500	-83%
Values rounded to nearest hundred¹⁹						

¹⁹ Minor differences may exist between forecast AADT volumes reported above and forecast AADT volumes reported in the DMRB Stage 3 Scheme Assessment Report, Traffic Assessment Figure 6.1 (https://www.transport.gov.scot/media/3317/figure_6_1.pdf) at common locations due to rounding.



Comparison between Forecast and Post-Opening Traffic Volumes

7.6.3 The following key points can be determined from Table 10:

Forecast Traffic Volumes Higher than Post-Opening Volumes

7.6.4 Traffic volume forecasts are higher than post-opening volumes at most locations along the full length of the managed motorway. **This means that traffic volumes are lower in reality at most locations along the full length of the managed motorway (there are some exceptions noted below).** These include at the following locations north and south of the Queensferry Crossing:

North of the Queensferry Crossing

- Ref. 1: M90 Junction 2A (Halbeath)
- Ref. 2: M90 between Junction 2 (Masterton) and Junction 2A (Halbeath)
- Ref. 6: M90 between Junction 1C (Rosyth) and Junction 2 (Masterton)

South of the Queensferry Crossing

- Ref. 8: A904 at Newton
- Ref. 9: M90 between M9 Junction 1A and M90 Junction 1

- Ref. 10: M9 between Junction 1A and Junction 2
- Ref. 11: M9 between Junction 1 and Junction 1A
- Ref. 13: M8 between Junction 1 and Junction 2
- Ref. 14: M8 between Junction 2 and Junction 3

EXCEPTIONS – At some locations along the managed motorway, traffic volumes are higher in reality:

North of the Queensferry Crossing

- Ref. 3: A823(M) at Masterton
- Ref. 4: M90 A985 Admiralty Road, West of Brankholme Brae Roundabout
- Ref. 5: A921 (Hillend)

South of the Queensferry Crossing

- Ref. 12: M9 between Junction 1 and M8 Junction 2
- Ref. 26: B924 Bo'ness Road (South Queensferry)
- Ref. 27: A904 Builyeon Road (South Queensferry)

Forecast Traffic Volumes Lower than Post-Opening Volumes

- 7.6.5 In general, traffic volume forecasts are lower than post-opening volumes at most other locations that are situated farther away from the managed motorway. **This means that traffic volumes are higher in reality at locations that are situated farther away from the managed motorway (there is one exception noted below).**

North of the River Forth

- Ref. 24: A985 High Valleyfield (WiM)
- Ref. 25: A985 East of B9156

South of the River Forth

- Ref. 15: B8046 Old Philpstoun
- Ref. 16: A904 (Errick Burn)
- Ref. 17: M9 between Junction 2 and Junction 3

- Ref. 18: M9 between Junction 5 and Junction 6
- Ref. 19: M9 between Junction 6 and Junction 7
- Ref. 20: M9 between Junction 7 and Junction 8
- Ref. 21: M876 between M9 Junction 7 and M876 Junction 3
- Ref. 22: A876 between M876 Junction 3 and Higgins Neuk Roundabout

EXCEPTION – At one location that is situated farther away from the managed motorway, the traffic volume is lower in reality:

North of the River Forth

- Ref. 23: A985 East of Kincardine - east of new bypass tie-in

Queensferry Crossing Forecast Traffic Volumes

- 7.6.6 Opening year forecast AADT volume on the Queensferry Crossing is higher than post-opening volume. The 2017 opening year forecast AADT is 92,200 compared with the post-opening AADT of 76,600 using the Queensferry Crossing – an approximate 20% difference (Ref. 7 in Table 10).
- 7.6.7 A multitude of factors, including the economic downturn between 2008 and 2012 and development of land and population growth, would impact the post-opening traffic volumes (and journey times set out in the next section) and our forecasts, and there is also the positive impact that the supporting PTS is having on limiting traffic growth on the new Crossing.

7.7 Opening Year Forecast and Post-Opening Journey Times

- 7.7.1 The opening year forecast and post-opening journey times for the average weekday AM Peak hour and PM Peak hour are presented for the strategic and local journey time routes shown in Section 7.3.
- 7.7.2 Similar to forecast traffic volumes, the forecast journey times are also based on outputs from the Transport Model for Scotland 05A (TMfS05A). No weekend journey time comparisons are presented as these are not available from the TMfS05A model.
- 7.7.3 Differences in journey times have been coloured red or blue, with red indicating the opening year forecast journey time is greater than the post-opening journey time and blue indicating the opening year forecast journey time is less than the post-opening journey time.

Table 11: 2017 Opening Year Forecast and Post-Opening Journey Times (in minutes), Average Weekday AM Peak Hour

Ref.	Route Description	Direction	2017 Forecast	Post-Opening	Forecast vs Post-Opening Differences (in minutes)
			AM Peak Hour (8am-9am)		
1	M9 Junction 6 to M90 Halbeath Junction via Kincardine Bridge	EB	29.9	32.8	-2.9
		WB	29.0	32.2	-3.2
2	M9 Junction 6 to M90 Halbeath Junction via Forth Road Bridge (FRB) / Queensferry Crossing	EB	28.6	27.1	1.5
		WB	27.3	28.2	-0.9
3	M90/A90 between Queensferry Junction (M90) and Maybury Junction (A90)	NB	15.4	10.2	5.2
		SB	16.9	19.7	-2.8
4	M9 Newbridge Junction to Queensferry Junction via the M9 Spur	NB	8.2	6.3	1.9
		SB	6.6	9.2	-2.6
5	M9 Newbridge Junction to A720 Hermiston Gait via the M8	EB	9.8	11.1	-1.3
		WB	5.7	5.6	0.1
6	A8 between Gogar Junction and Newbridge Junction	EB	5.9	8.7	-2.8
		WB	6.9	5.0	1.9
7	1.3km east of M90 Queensferry Junction to M90 Junction 3 (Halbeath)	NB	8.1	6.2	1.9
		SB	8.2	6.5	1.7
8	A985 between M90 Junction 1 (Admiralty) and Cairneyhill Roundabout	EB	9.7	10.6	-0.9
		WB	9.3	9.8	-0.5

Ref.	Route Description	Direction	2017 Forecast	Post-Opening	Forecast vs Post-Opening Differences (in minutes)
			AM Peak Hour (8am-9am)		
9	A994 / A907 between Cairneyhill Roundabout and M90 Junction 3 (Halbeath)	EB	12.4	14.9	-2.5
		WB	12.6	14.7	-2.1
10	A823 (M) between the A907 and M90 Junction 2 (Masterton)	EB	6.1	6.2	-0.1
		WB	6.2	7.5	-1.3
11	A921 between the B9157 and M90 Junction 1 (Admiralty)	EB	6.2	6.2	0.0
		WB	6.0	6.9	-0.9
12	B981 between the A92 and M90 Junction 1B (Ferrytoll)	NB	5.4	5.7	-0.3
		SB	5.5	6.6	-1.1
13	A904 between Old Philpstoun and Queensferry Junction	EB	6.4	5.3	1.1
		WB	4.8	5.4	-0.6

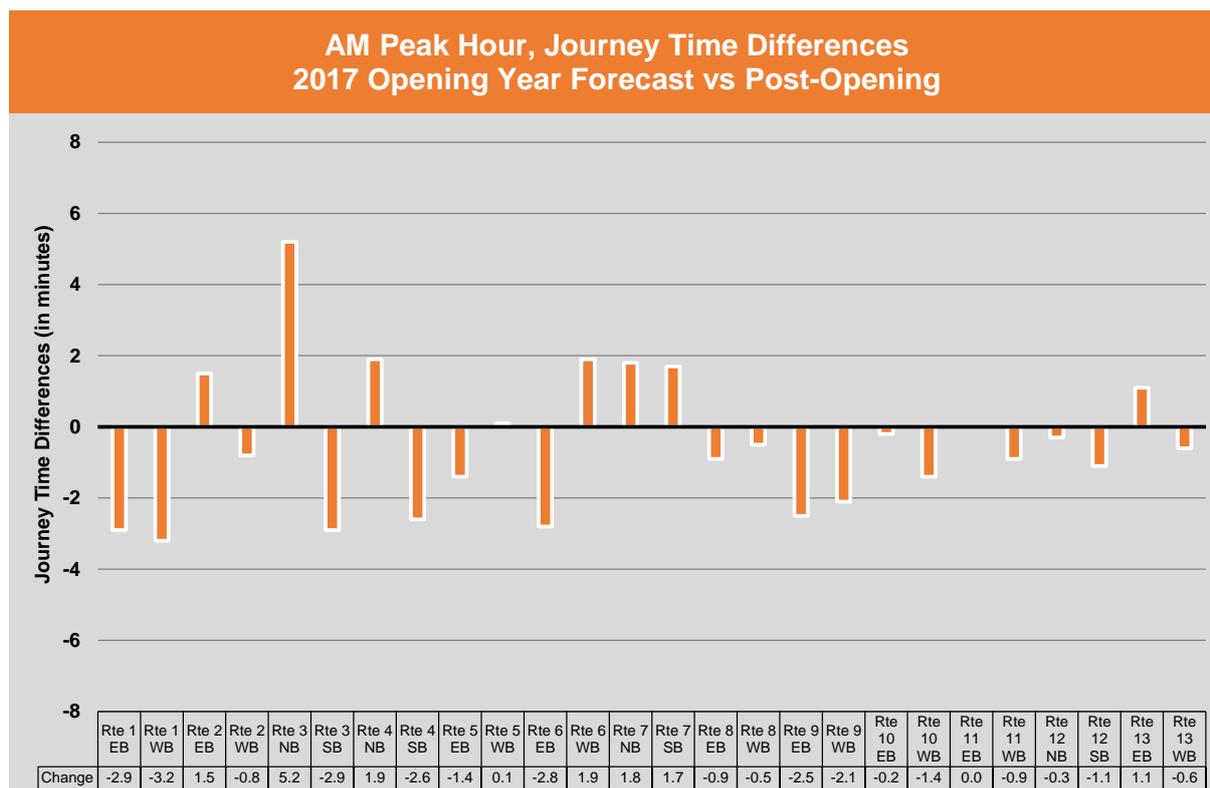


Figure 17: AM Peak Hour Journey Time Differences (in minutes), 2017 Opening Year Forecast vs Post-Opening

Comparison between Forecast and Post-Opening Journey Times

AM Peak Hour

- 7.7.4 Figure 17 shows that the opening year forecast journey times are greater than the post-opening journey times on some routes, generally ranging from one to two minutes. These routes include local route 7 between M90 Queensferry Junction and M90 Junction 3 (Halbeath) via Queensferry Crossing where the forecast journey time is greater than the post-opening journey time by approximately two minutes. This is consistent with the finding that the forecast Annual Average Daily Traffic (AADT) on the Queensferry Crossing was substantially higher (+20%) than the post-opening traffic volume.
- 7.7.5 Overall, the opening year forecast journey times are less than the post-opening journey times on the majority of routes in the AM Peak hour, generally ranging from one to three minutes.
- 7.7.6 The opening year forecast and post-opening journey times for the average weekday PM Peak hour are shown in Table 12, and Figure 18 below.

Table 12: 2017 Opening Year Forecast and Post-Opening Journey Times (in minutes), Average Weekday PM Peak Hour

Ref.	Route Description	Direction	2017 Forecast	Post-Opening	Forecast vs Post-Opening Differences (in minutes)
			PM Peak Hour (5pm-6pm)		
1	M9 Junction 6 to M90 Halbeath Junction via Kincardine Bridge	EB	29.9	33.6	-3.7
		WB	29.2	34.4	-5.2
2	M9 Junction 6 to M90 Halbeath Junction via Forth Road Bridge (FRB) / Queensferry Crossing	EB	39.0	31.1	7.9
		WB	27.3	27.1	0.2
3	M90/A90 between Queensferry Junction (M90) and Maybury Junction (A90)	NB	31.1	15.5	15.6
		SB	11.2	10.0	1.2
4	M9 Newbridge Junction to Queensferry Junction via the M9 Spur	NB	14.6	11.1	3.5
		SB	6.4	6.0	0.4
5	M9 Newbridge Junction to A720 Hermiston Gait via the M8	EB	5.2	5.0	0.2
		WB	8.1	9.0	-0.9
6	A8 between Gogar Junction and Newbridge Junction	EB	4.0	7.2	-3.2
		WB	8.3	9.4	-1.1
7	1.3km east of M90 Queensferry Junction to M90 Junction 3 (Halbeath)	NB	7.9	6.7	1.2
		SB	8.0	6.2	1.8
8	A985 between M90 Junction 1 (Admiralty) and Cairneyhill Roundabout	EB	9.6	10.4	-0.8
		WB	9.4	10.6	-1.2

Ref.	Route Description	Direction	2017 Forecast	Post-Opening	Forecast vs Post-Opening Differences (in minutes)
			PM Peak Hour (5pm-6pm)		
9	A994 / A907 between Cairneyhill Roundabout and M90 Junction 3 (Halbeath)	EB	12.4	15.6	-3.2
		WB	12.9	17.1	-4.2
10	A823 (M) between the A907 and M90 Junction 2 (Masterton)	EB	6.2	6.7	-0.5
		WB	6.2	7.6	-1.4
11	A921 between the B9157 and M90 Junction 1 (Admiralty)	EB	6.9	6.6	0.3
		WB	5.5	6.9	-1.4
12	B981 between the A92 and M90 Junction 1B (Ferrytoll)	NB	5.7	5.7	0.0
		SB	5.3	6.5	-1.2
13	A904 between Old Philpstoun and Queensferry Junction	EB	6.5	6.3	0.2
		WB	4.9	5.3	-0.4

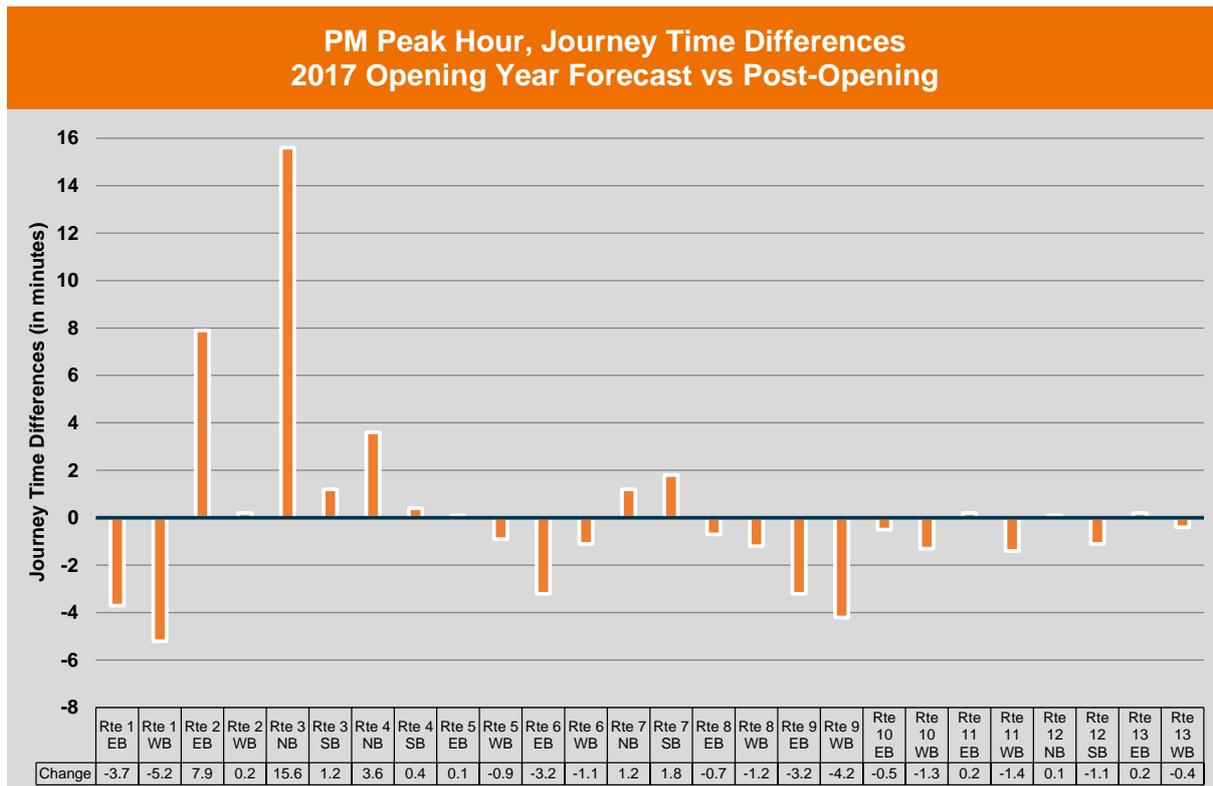


Figure 18: PM Peak Hour Journey Time Differences (in minutes), 2017 Opening Year Forecast vs Post-Opening

PM Peak hour

7.7.7 A similar trend is evident in the PM Peak hour when compared with the AM Peak hour insofar as the selected routes show a mix of opening year forecast journey times that are greater than or less than the post-opening journey times.

7.7.8 In general, journey time differences range from +/- 1 minute to +/- 4 minutes on most routes. There are a few outliers where some routes show forecast journey times ranging from five minutes less than post-opening journey times (route 1) to 15 minutes greater than post-opening journey times (route 3) – there is a large delay forecast at Barnton junction which is contributing to the difference shown for route 3.

7.7.9 Overall, the opening year forecast journey times are less than the post-opening journey times on the majority of routes in the PM Peak hour, generally ranging from one to five minutes.

7.8 Operational Indicators – Key Findings

7.8.1 In operational terms, this initial evaluation at year 1 has found that:

- Area-wide general traffic volumes have, on the whole, increased. The traffic volume on the Queensferry Crossing itself has also increased but is lower than forecast. A multitude of factors, including the economic downturn between 2008 and 2012 and development of land and population growth, would impact the post-opening traffic volumes (and journey times) and our forecasts, and there is also the positive impact that the supporting PTS is having on limiting traffic growth on the new Crossing.
- An assessment of pre- and post-opening journey times and journey time reliability for general traffic shows increases to varying levels of degree and low variance in journey times across all routes and time periods. The post-opening journey times across the Queensferry Crossing are similar to the 'before' situation with increases of up to one minute in the weekday morning and evening peaks. Whilst increases have occurred, they are considered relatively small and reflect the increasing trend in traffic volumes across this part of the road network as well as the increase in the distance travelled (approximately 1.3km) when comparing the new road layout (post-opening) with the old road layout (pre-opening).
- Forecast traffic volumes at most locations along the full length of the Managed Motorway Corridor are higher than post-opening volumes. Forecast traffic volumes at most other locations that are situated farther away from the Managed Motorway Corridor are lower than post-opening. On the Queensferry Crossing itself, the 2017 opening year forecast AADT volume is 20% higher than the post-opening volume. In overall terms, more traffic was forecast on the network at the selected locations within the study area when compared with post-opening volumes.
- On some local roads south of the new Crossing, including the A904 Builyeon Road and B924 Bo'ness Road in South Queensferry, forecast traffic volumes are lower than post-opening volumes. This means that there is more traffic on both roads post-opening when compared with the forecasts at appraisal stage. On the A904 at Newton the forecast traffic volume is higher than the post-opening volume, meaning that there is less traffic on this road in reality when compared with the forecast at the appraisal stage.
- An assessment of opening year forecast journey times for general traffic indicates that forecast journey times are generally less than the post-opening journey times on the majority of routes in both the morning and evening peak hours. The forecast journey time on the Queensferry Crossing itself is approximately two minutes greater than the post-opening journey time, which is consistent with the finding that the forecast traffic

volume on the new Crossing itself is substantially higher than the post-opening traffic volume.

- The differences between forecast and post-opening traffic volumes and journey times are likely due to the combination of the general economic downturn in 2008 and assumptions that were made in the transport model. Consequently, the comparisons need to acknowledge the limitations within the modelling tools available at the time and the likely economic benefits accruing from the project.
- Demand at both Ferrytoll and Halbeath Park & Ride sites has steadily increased over time and the number of buses using the Forth Road Bridge has also steadily increased following the opening of the Queensferry Crossing, indicating that the dedicated Public Transport corridor is operating successfully. The PT corridor could also be having a positive impact on limiting the traffic growth on the Queensferry Crossing.

8 STAG Criteria

8.1 Scope

- 8.1.1 This chapter describes the impact of the project against STAG criteria, consisting of Environment, Safety, Economy, Integration, and Accessibility & Social Inclusion. It also discusses the scale and nature of forecast impacts, where relevant, and if there are any lessons learned.

8.2 Environment

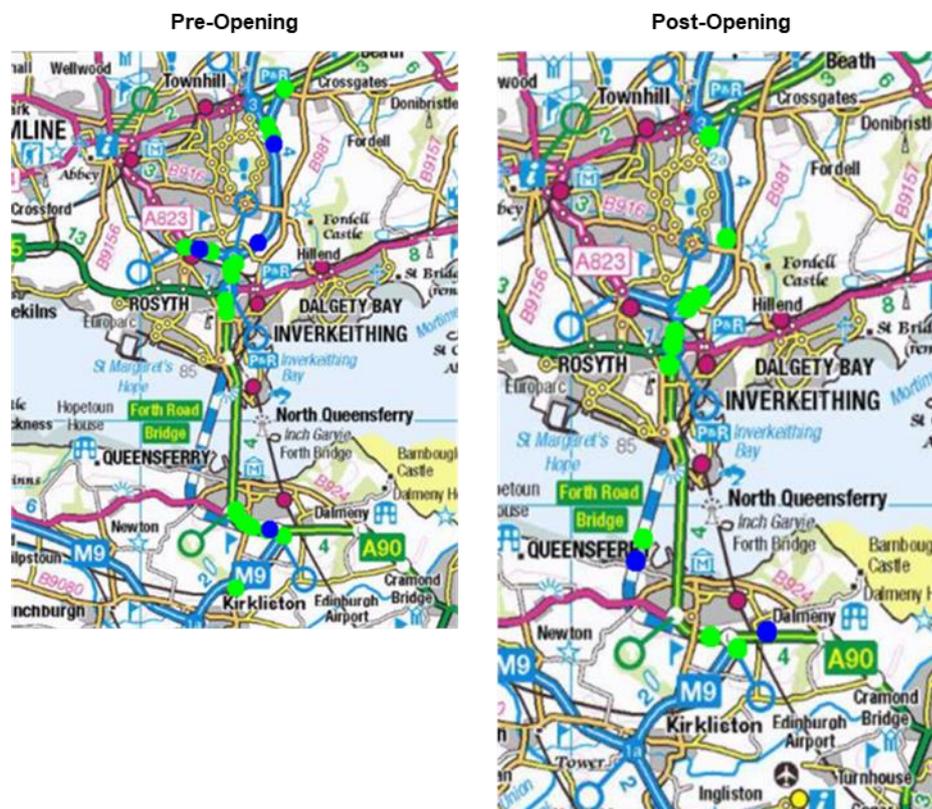
- 8.2.1 Confirmation of whether the mitigation measures outlined in the Environmental Statement have been implemented and are operating as expected is discussed separately in Chapter 9.

8.3 Safety

- 8.3.1 Accident data has been obtained from Police Scotland STATS19 reports. The number and severity of accidents that occurred on selected roads within the study area between February 2010 and January 2011 (pre-opening) and February 2018 and January 2019 (post-opening) is discussed below. NB the pre-opening timeframe differs from the adopted 2014 baseline due to data availability. It should also be noted that the analysis of accident data will be revisited during the three years after evaluation which will consider the number of accidents pre- and post-opening over a longer timeframe to provide a more meaningful comparison of accidents in line with standard practice. The main purpose of the analysis at this stage is to show an early indication of changes in accidents before the opening of the Queensferry Crossing and after it achieved motorway status.

Comparison between Pre and Post Opening Accidents

8.3.2 The location and severity of accidents that occurred is shown below. The green dots indicate slight accidents, and the blue dots indicate serious accidents.



8.3.3 Between February 2010 and January 2011, a total of 16 accidents occurred on the selected roads across the study area. 12 accidents were recorded as slight and four were recorded as serious. Most accidents occurred on the M90 (n=7), followed by the A90 (n=6), then the M823 (n=2) and the M9 (n=1). No fatal accidents occurred on any of the selected roads during the pre-scheme opening time period.

8.3.4 A total of 14 accidents occurred between February 2018 and January 2019 (post-opening), two fewer accidents compared to the equivalent time period pre-scheme opening. 11 accidents were recorded as slight and three were recorded as serious. Most accidents occurred on the M90 (n=10), followed by the A90 (n=3) and the M823 (n=1) – this is a very similar trend to that shown for the pre-scheme opening time period. There were no recorded accidents on the M9. No fatal accidents occurred on any of the selected roads during the post-scheme opening time period.

Road Safety Audits

8.3.5 As part of Transport Scotland statutory responsibilities, Road Safety Audits (RSAs) have been undertaken throughout the design and construction of the scheme. Reference has been made to the Interim Stage 3 RSA and Stage 4 RSA below.

- 8.3.6 The Stage 3 Road Safety Audit (RSA) was undertaken in July 2018 by Stewart Paton Associates on behalf of Forth Crossing Bridge Constructors (FCBC) and comprised an examination of the scheme as constructed. The Stage 3 RSA identified some issues, broadly covering foliage obscuring road traffic signs and poor lane discipline on certain junction approaches that could result in side-swipe traffic collisions. FCBC responded to all identified issues and appropriate mitigating actions were put in place.
- 8.3.7 The 1YA opening road safety audit is referred to as the Stage 4 RSA, undertaken in June 2019 by Stewart Paton Associates on behalf of FCBC, comprised a review of accident data following scheme opening along with revisiting actions arising from the Stage 3 RSA. The Stage 4 RSA concluded that all the issues identified at Stage 3 have been completed and that any other issues are now dealt with through regular maintenance and the defect notification process.
- 8.3.8 The Stage 4 RSA review of accidents occurring one year after opening concluded:
- A total of ten reported personal injury collisions occurred during the 12-month period for 19 December 2017 to 18 December 2018 inclusive.
 - The number of injury collisions and their spread across the different sections of the route, as used by FCBC, appears to be relatively small and favourable when compared to national figures.
 - The route functions in a consistent manner and that, at present, there are no apparent road safety deficiencies in the manner by which the road is operated and maintained.
- 8.3.9 The general observations of the Audit Team were that the road and its infrastructure is generally well-maintained, all street furniture is in good order and signs and markings are all as required by standards. Therefore, the Audit Team had no recommendations in relation to any required actions or improvements.

Stakeholder Consultation – Benefits Realisation Research Public Survey

- 8.3.10 Results from the Benefits Realisation Research Public Survey have shown that safety is most satisfactory on all parts of the network that were included in the survey, including the Queensferry Crossing.

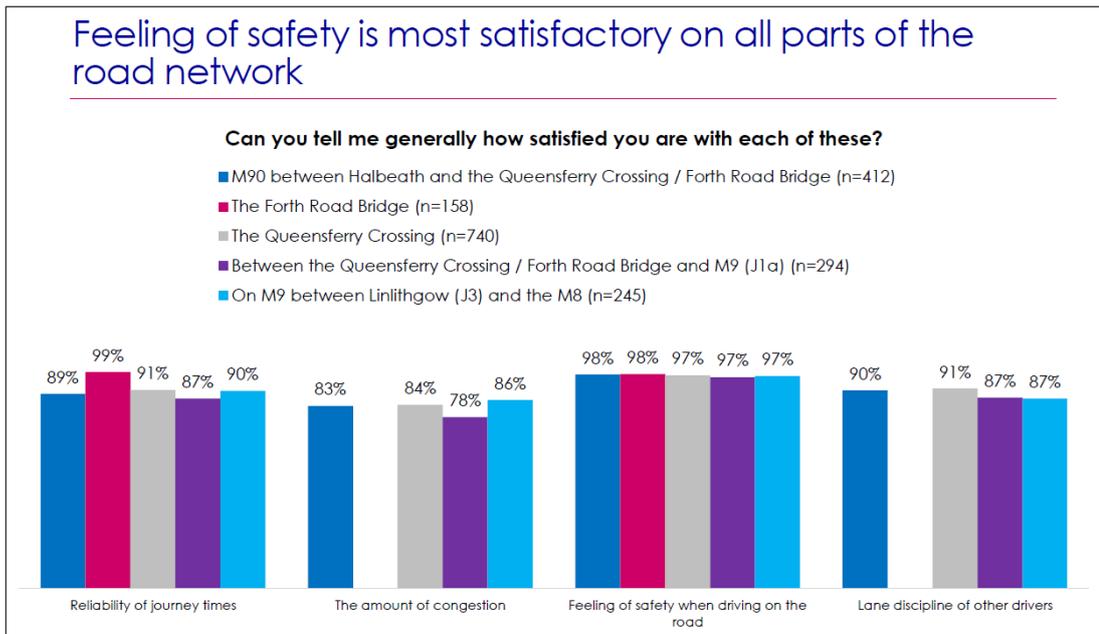


Figure 19: Feeling of Safety when Driving on the Road

Safety – Key Findings

8.3.11 In terms of safety, the scheme is operating with no major safety issues one year after opening. Recommendations outlined in the RSAs have been implemented and feeling of safety amongst transport users is most satisfactory on all parts of the network along the Forth corridor. Going forward, Transport Scotland and the Forth Bridges Operating Company will continue to monitor the operation of the route, and any safety issues arising will be captured as part of this on-going process.

8.4 Economy

- 8.4.1 User benefits are broken down into the four constituent parts of the TEE table. The key drivers behind user benefits are traffic volumes and journey time. Using such simple base data as traffic volumes and comparison back to project forecasts, it is possible to provide a commentary on the likely scale of such benefits in comparison to project forecast for the evaluation at year 1.

Transport Economic Efficiency – User Benefits

- 8.4.2 The comparisons between forecast and post-opening traffic volumes and journey times, presented in Section 7.6 and Section 7.7 respectively, can be considered a proxy for whether the forecast economic benefits of the project are likely to be realised and hence the likelihood of having under or overestimated the economic benefits during the appraisal process.

Comparison between Forecast and Post-Opening Traffic Volumes

- 8.4.3 Forecast traffic volumes²⁰ are higher than post-opening traffic volumes at most locations along the full length of the managed motorway corridor. Forecast traffic volumes are lower than post-opening volumes at most other locations that are situated farther away from the managed motorway corridor. On the Queensferry Crossing itself, the comparison indicates that the 2017 opening year forecast AADT volume is 20% higher than the post-opening volume covering the evaluation period (February 2018 to January 2019). In overall terms, however, more traffic was forecast to be on the network at the selected locations within the study area when compared with post-opening volumes.

Comparison between Forecast and Post-Opening Journey Times

- 8.4.4 The comparison of forecast and post-opening journey times indicates that the forecast journey times are generally less [i.e. quicker] than the post-opening journey times on the majority of selected routes within the study area. This indicates that the journey time benefits forecast at appraisal stage may be greater than the post-opening journey time benefits on the majority of routes. On the Queensferry Crossing itself (local route 7), the comparison indicates that the 2017 opening year forecast journey time is greater than the post-opening journey time. This indicates that the journey time benefit forecast at appraisal stage may be less than the post-opening benefit on the new Crossing.

Wider Economic Benefits

- 8.4.5 Notable impacts related to Agglomerative and Labour Market effects are unlikely to emerge in any measurable form in the one to five-year time horizon

²⁰ Source: Transport Model for Scotland 05A (TMfS05A) used during appraisal.

linked to evaluations undertaken in line with STRIPE. Therefore, no wider economic impacts have been assessed as part of this evaluation at year 1. However, a business survey has been undertaken to establish whether the project has had any early impact (positive or negative) on the activities and interests of businesses.

- 8.4.6 A range of businesses have taken part in the survey, predominantly located in Kirkcaldy, South Queensferry, Rosyth, Dunfermline and Edinburgh. On balance, the feedback indicates that the FRC Project has had a negative (small) impact on the operation and performance needs of the businesses that took part. The feedback also indicates that there has been no measurable improvement in access to the labour market or existing / new potential suppliers or business competition at this early stage of evaluation which was, to a degree, anticipated given the comment on timescales above. Of particular note, however, reduced disruption during times of high winds was raised as a positive impact on business operations and so was commuting by bus into Edinburgh city centre, but traffic volumes and journey times at peak times was raised by a small number of businesses who participated as being no better than before.

Economic Activity and Location Impacts

- 8.4.7 As with WEBs, EALIs can take many years to materialise. Therefore, no EALIs have been assessed as part of this initial evaluation at year 1.

Economy – Key Findings

- 8.4.8 A combination of differences between forecast and post-opening traffic volumes and journey times indicates that the benefits of the project may be less than forecast in the short-term. This is likely due to external factors that could not have been readily foreseen at the time of the appraisal [e.g. the economic downturn and resulting decline in traffic volumes]. Whilst the scheme is operating safely one year after opening with no major safety issues emerging, it is too early to conclude whether the project has delivered additional road safety benefits. It is also too early to confirm whether the project has generated any wider economic benefits, or whether any EALIs have materialised.

8.5 Integration

8.5.1 A review of national, regional and local transport and planning policy at the time has been conducted. Many of the policies and guiding principles that shaped how the proposed scheme would be managed and implemented were reflected in the Forth Crossing Bill (November 2009). This section briefly summarises those of key relevance, including:

- Scotland's National Transport Strategy (2006)
- Strategic Transport Projects Review (2008)
- National Planning Framework for Scotland 2 (2009)
- The SEStran Regional Transport Strategy (2008)
- The Forth Estuary Transport Authority (FETA) Local Transport Strategy (2005)
- Fife Council Local Transport Strategy (2006)
- The City of Edinburgh Local Transport Strategy (2007-2011)

8.5.2 The policy framework and the proposed scheme's compliance with set objectives is described below.

Scotland's National Transport Strategy (2006)

8.5.3 The strategic outcomes as set out in the National Transport Strategy were to:

- **Improve journey times and connections:** to tackle congestion and the lack of integration and connections in transport which impact on Scottish Government's high-level objectives for economic growth, social inclusion, integration and safety.
- **Reduce emissions:** to tackle the issues of climate change, air quality and health improvement which impact on Scottish Government's high-level objective for protecting the environment and improving health.
- **Improve quality, accessibility and affordability:** to give people a choice of public transport, where availability means better quality transport services and value for money or an alternative to the car.

8.5.4 It was stated at the time that the completion of the proposed scheme would ensure the provision of a reliable crossing, address carbon-producing congestion through the extension of hard shoulder provision and the implementation of Intelligent Transport Systems (ITS) and would provide a dedicated public transport corridor with the opportunity for further enhancement through the implementation of a tram-based light rapid transport system.

Strategic Transport Projects Review (2008)

- 8.5.5 The Strategic Transport Projects Review (STPR) identified a series of investment priorities for the strategic transport network which would benefit the whole of Scotland and deliver on priorities set out in the Scottish Government's Economic Strategy, the National Transport Strategy, the National Planning Framework and the Climate Change (Scotland) Act 2009. It identified improvements to meet challenges from 2012 and beyond.
- 8.5.6 The STPR undertook an objective led, evidence-based approach to appraise potential interventions to address transport problems in line with STAG methodology. This approach meant that the Scottish Government's priorities of a Wealthier and Fairer, Healthier, Safer and Stronger, Smarter and Greener Scotland could be achieved and that investment was targeted on those interventions that would most effectively support improving Scotland's sustainable economic development.
- 8.5.7 The STPR was announced by the then Minister for Transport, Infrastructure and Climate Change Stewart Stevenson MSP on 10 December 2008 at which he referred to the inclusion of the Forth Replacement Crossing as one of 29 major work package recommendations. Additionally, the Minister confirmed the Scottish Government's commitment to progress the crossing and a range of rail-based interventions, which directly and indirectly would benefit cross-Forth travel.

National Planning Framework for Scotland 2 (2009)

- 8.5.8 The proposed scheme was supported by National Planning Policy. Scotland's National Planning Framework (NPF) is a non-statutory document published by the Scottish Government initially in 2004 and updated in June 2009 (NPF2). The NPF looked at Scotland from a spatial perspective and identified key strategic infrastructure needs in order to guide development into the right places in Scotland to 2030.
- 8.5.9 The NPF2, scrutinised and debated by the Parliament in early 2009, identified the current Forth Road Bridge as an essential part of the national road infrastructure and that loss of the road crossing would have very significant adverse economic impacts, both nationally and regionally. The NPF2 designated the replacement crossing as a national development. That designation was the mechanism for establishing the need for the development in Scotland's national interest.

The SEStran Regional Transport Strategy (2008)

- 8.5.10 Following its establishment as a statutory partnership in 2006, the purpose of the South East of Scotland Transport Partnership (SEStran) is to develop and deliver a long term Regional Transport Strategy and take forward strategic transport improvements that support and improve the economy, environment and quality of life across south east Scotland.

- 8.5.11 The SEStran Regional Transport Strategy 2008-2023 set out a clear framework for the future direction of investment in, and management of, transport in the SEStran area. The strategy supported a sustainable solution to the problem of the deteriorating condition of the Forth Road Bridge and welcomed the commitment to a new crossing.
- 8.5.12 The strategy also highlighted the opportunities presented by the new crossing insofar as:
- *“The additional crossing at Queensferry creates significant opportunities for the development of public transport in the area, both cross-Forth and in the bridgehead areas. SEStran will seek to use these opportunities to maximise public transport use in the corridor, in terms of bus, HOVs, guided bus and light rail networks.”*

The Forth Estuary Transport Authority (FETA) Local Transport Strategy (2005)

- 8.5.13 The Forth Estuary Transport Authority (FETA) Local Transport Strategy recognised within its preface the need for an additional bridge:
- *“The new multi modal bridge will make a significant contribution to providing better facilities for public transport services, including provision for the extension of the Edinburgh tram into Fife, being able to cope with increasing weights for goods vehicles as well as providing much needed flexibility to manage the maintenance of the existing bridge and minimise impacts of road works and diversions on cross-Forth travellers.”*
- 8.5.14 The FETA Local Transport Strategy was developed in advance of the proposed scheme and promoted the existing Forth Road Bridge as a dedicated public transport crossing, enabling buses and taxis (as high occupancy vehicles) to use specific routing across the Forth. That strategy also provided for continued cross-Forth access for pedestrians and cyclists on the existing Forth Road Bridge. Multi-modal transport under the proposed scheme would therefore be provided or allowed for by using both the existing and the new bridge in combination.

Fife Council Local Transport Strategy (2006)

- 8.5.15 The Fife Council Local Transport Strategy advised at the time that any *“new crossing should integrate with the principles of efficient movement of numbers of people and therefore should favour high occupancy vehicles.”* That strategy was also written in advance of the proposed scheme which, through its promotion of the existing Forth Road Bridge as a public transport corridor, would enable buses (as high occupancy vehicles) to use dedicated routes across the Forth.

The City of Edinburgh Local Transport Strategy (2007-2011)

8.5.16 The City of Edinburgh Local Transport Strategy recognised several major connectivity concerns, including the need to maintain the regional connection across the Forth. That strategy also highlighted a desire for a new crossing to allow for future tram use and *“in a two-crossing scenario both [bridges] should prioritise buses and high occupancy vehicles.”* Under the proposed scheme bus priority would be provided by means of the existing bridge and dedicated routes to and from the A90. The proposed scheme also allowed for future provision of a tram-based light rail system across the Forth.

Integration – Key Findings

8.5.17 The objectives of the scheme resonated with transport and planning policy at all levels at the time. The national, regional and local strategies recognised the importance of the crossing, the role of the existing bridge and need for consideration of complementary public transport measures – the broad thrust of these needs was reflected within the proposed scheme. The outcomes from the operational evaluation, discussed earlier in this report, confirm that the FRC Project is on track to achieving most of its Transport Planning Objectives, and Traffic and Environment Commitments.

8.6 Accessibility and Social Inclusion

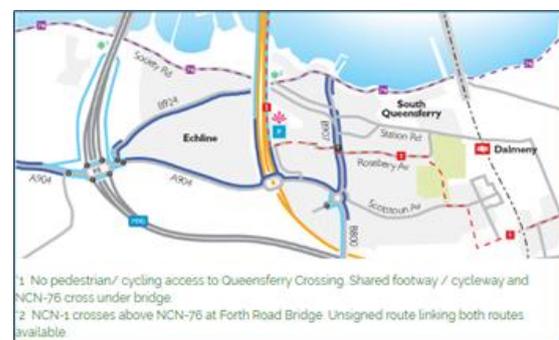
Community Accessibility

Walking and Cycling Infrastructure

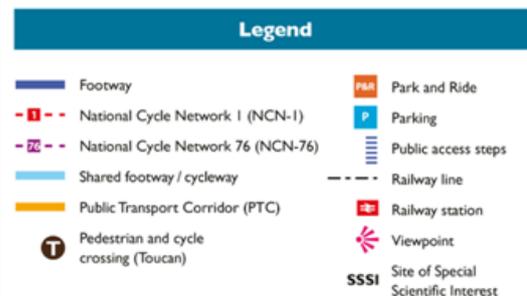
8.6.1 The bridges and surrounding road network have been designed to facilitate all travel modes by making the most appropriate use of existing and new infrastructure. The Forth Road Bridge continues to be the route for walking and cycling across the Firth of Forth. With general traffic removed from the Forth Road Bridge, the experience for pedestrians and cyclists is greatly improved and provides the opportunity to build in physical activity as an everyday trip. This aligns well with some of the feedback from the community council questionnaire, discussed in Chapter 3, Section 3.5.6.



Ferrytoll Junction



Queensferry Junction and Echline Junction



8.6.2 New sections of footpaths, cycleways and safe crossing points have been integrated as part of the road network. These features include:

- New and enhanced facilities for pedestrians and cyclists have been provided at the A904 around the Queensferry Junction and on a section of the B800 from Dundas northwards.
- Cyclists are permitted to use the bus lanes on the B800.
- A footway / cycleway in Echline Fields passes under the Queensferry Crossing to provide an alternative rural means of crossing the M90 in the vicinity of the Queensferry Junction.

Cycling Audit – Key Findings

- 8.6.3 A Stage 3 Cycle Audit was undertaken by Sweco on behalf of Transport Scotland during June 2018 and considered the specific cycle facilities provided as part of the scheme proposals. The audit identified some specific issues related to both the north and south networks. In general, the audit concluded that the cycling provision on the Ferrytoll Gyratory (north network), South Queensferry Gyratory (south network) and the surrounding network provides a safe and continuous shared path that allows cyclists to travel through the gyratories away from the motorised traffic with designated crossing facilities. Specific issues that were raised generally related to signage, cycle path and road markings and silt and debris collecting on tactile paving. The designer responded to all identified issues and appropriate mitigating actions were put in place. It has not been possible to confirm whether those actions have been addressed as required due to restrictions on site visits resulting from COVID-19. It is therefore recommended that confirmation is sought during the detailed evaluation at year 3.
- 8.6.4 In response to the Community Council questionnaire, North Queensferry Community Council also raised some safety concerns, particularly around cycling provision on the Ferrytoll Gyratory (north network), highlighting that some cyclists tend to ride with general traffic rather than use the designated crossing facilities to travel through the gyratory. Again, it is recommended that confirmation is sought as part of the three years after evaluation.
- 8.6.5 Newton Community Council raised that the active travel experience had not changed following the opening of the new Crossing, highlighting that Newton village has no walking or cycle paths to connect to the Public Transport corridor and with increased traffic volumes through the village, cycling can feel very dangerous.

Bus Services

- 8.6.6 As a Public Transport Corridor, the Forth Road Bridge links with adjacent bus priority measures to provide increased reliability of bus journey times across the Forth. Since its opening, the Queensferry Crossing also has authorised access to buses and taxis, which includes private hire vehicles.
- 8.6.7 Cross-Forth bus services operating in 2006²¹ and whether those services are currently operating are shown in the table below. On the whole, the number of bus services crossing the Forth have increased. This aligns with feedback from Stagecoach East Scotland and Scottish Citylink, although Citylink has confirmed that its increase in service frequency is related to a wider network review, not just due to the opening of the new Crossing.

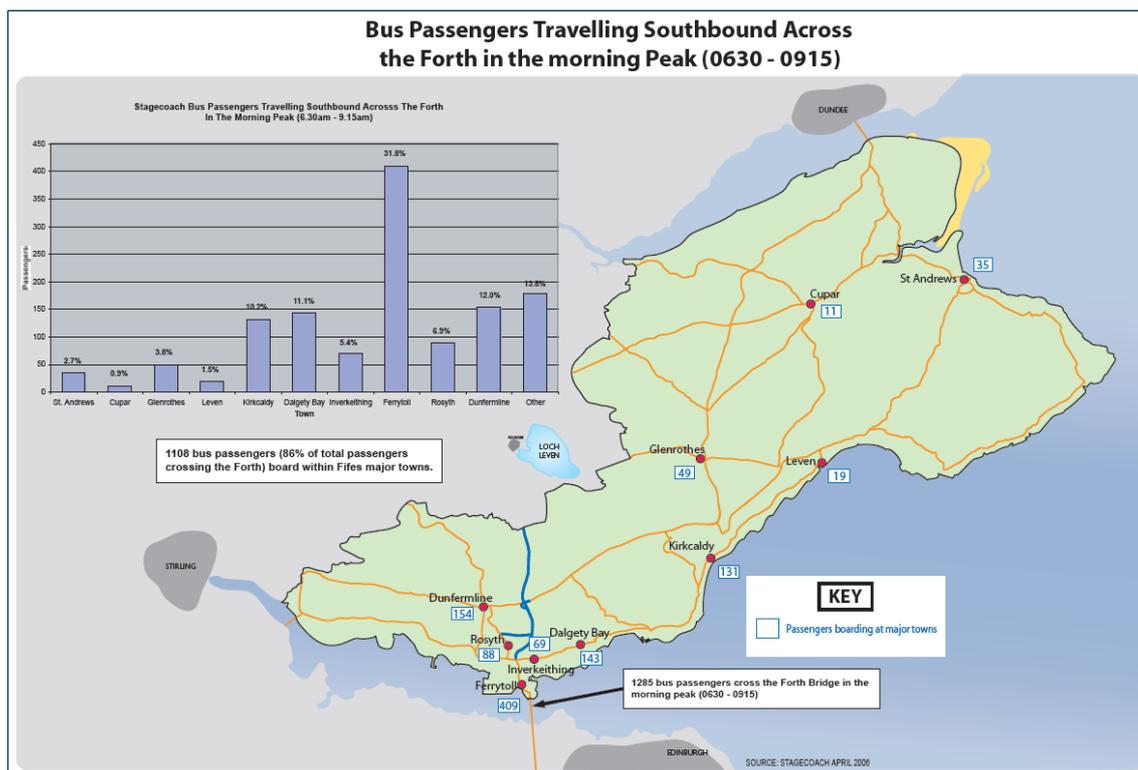
²¹ Data source: Forth Replacement Crossing Study (2007)

Table 13: Cross Forth Bus Services – Stagecoach

2006 Service / Route	2006 AM (06.30-09.30) frequency	2019 Service / Route	2019 AM (06.30-09.30) frequency	Does the service still exist?
X40 Dunfermline – Riccarton Campus	2	-	-	No
X50 Dalgety Bay – Leith	2	-	-	No
X54 Dundee – Edinburgh Royal	4	X54 Ninewells – Glenrothes	-	No
55/55A Kelty – Edinburgh	6	-	-	No
X55 Kelty – Edinburgh	1	X55 Dunfermline – Edinburgh	7	Yes
X57 Ballingry – Edinburgh	3	Incorporated into the X54	-	No
X58 Leven – Edinburgh	1	X58 Dundee – Edinburgh	3	Yes
X59 Cupar – Edinburgh	4	X59 St Andrews – Edinburgh	2	Yes
X60 St Andrews – Edinburgh	5	X60 St Andrews – Edinburgh	1	Yes
X61 Glenrothes – Edinburgh	2	X61 Leven – Edinburgh	3	Yes
747 Inverkeithing – Edinburgh Airport	7	747 Halbeath Park and Ride – Edinburgh Airport	10	Yes

Cross Forth Bus Passengers – Stagecoach East Scotland

8.6.8 The number of Stagecoach passengers travelling southbound across the Forth in the morning time period during a typical day in April 2006 is shown below. The graphic reveals that the largest percentage of bus passengers boarded at Ferrytoll Park & Ride site.



8.6.9 Discussions were held with Stagecoach during this initial evaluation at year 1 and they have confirmed a significant increase in passenger numbers on their services between Fife and Edinburgh following the opening of the Queensferry Crossing. Stagecoach also highlighted that their services are coordinated to operate through Ferrytoll Park & Ride site (and Halbeath Park & Ride). Increasing demand at Ferrytoll (and Halbeath) Park and Ride sites, as discussed in earlier chapters, has contributed to the increase in passenger numbers cross-Forth.

Comparative Accessibility

Comparison between Pre and Post Opening Journey Times to Workplace Locations

8.6.10 Differences in journey times for an average weekday morning time period (6am-9am) are presented in Figures 20 and 21 for routes between settlements in Fife and large employment areas in West Lothian (up to 11,000 employees) and Edinburgh (up to 20,000 employees) for both February 2014 (pre-opening) and February 2019 (post-opening).

8.6.11 The table below shows the route number from each settlement to the selected employment areas. The number corresponds to the route number shown on the figures below. For example, number 15 in the table corresponds to route 15 between Kirkcaldy and Broxburn East in West Lothian and the graphic shows a journey time difference by road of 5.9 minutes. The journey time differences are based on the quickest route between the settlements and employment areas.

Table 14: Fife Settlements to Selected Employment Areas in West Lothian and Edinburgh

Selected Settlement in Fife	Selected Employment Areas ²²					
	Bellsquarry, Adambrae and Kirkton (West Lothian)	Pumpherstons and Uphall Station (West Lothian)	Broxburn East (West Lothian)	Gyle Centre (Edinburgh)	Edinburgh City Centre (Princes Street)	Royal Infirmary of Edinburgh
Dunfermline	1	2	3	4	5	6
Glenrothes	7	8	9	10	11	12
Kirkcaldy	13	14	15	16	17	18

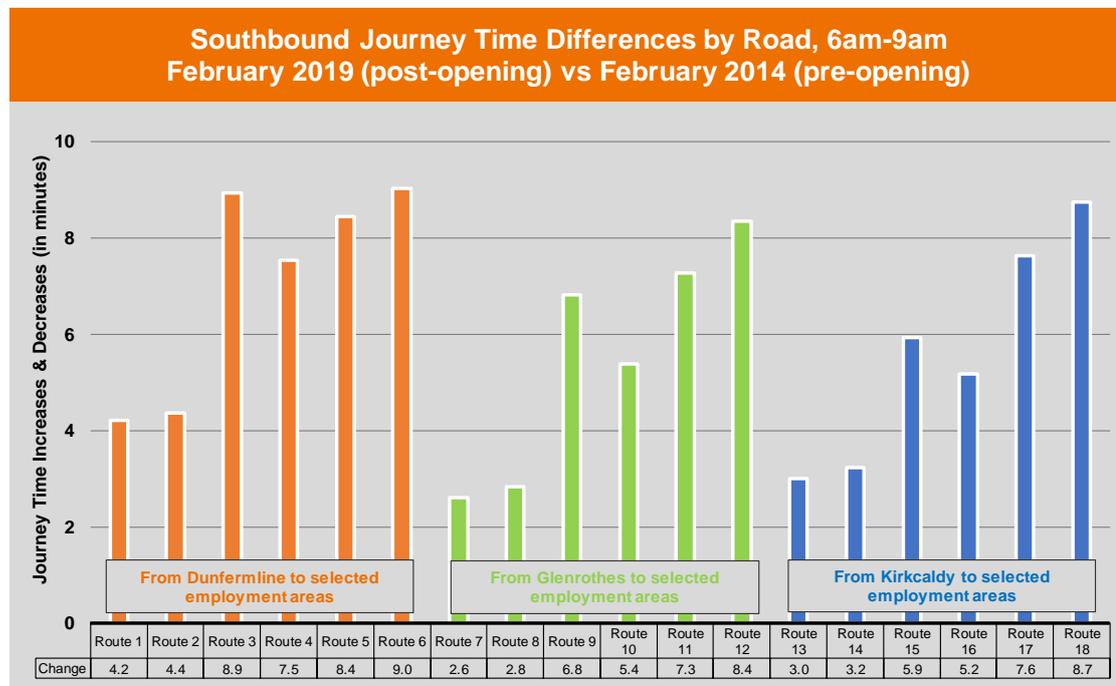


Figure 20: Southbound Journey Time Differences by Road, Morning Period

²² Source: Business Register and Employment Survey (BRES) data

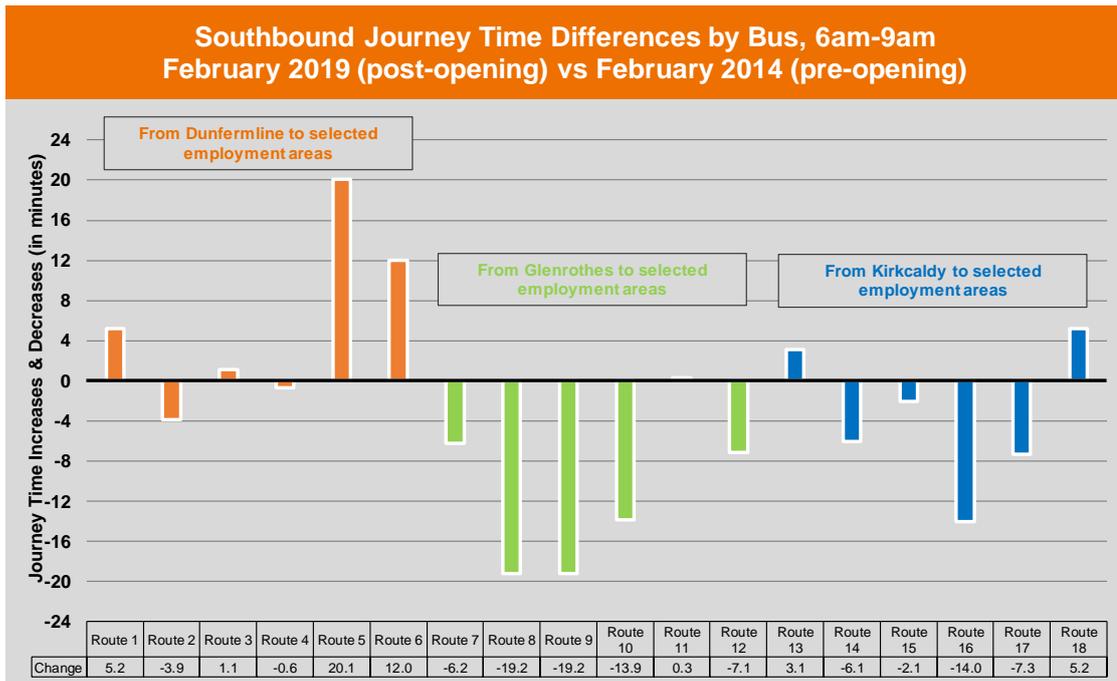


Figure 21: Southbound Journey Time Differences by Bus²³, Morning Period

8.6.12 Journey times by road have increased between the ‘before’ and ‘after’ situation shown by the positive differences in Figure 20. In general, traffic on routes to employment areas in West Lothian has experienced smaller journey time increases than traffic on routes to employment areas in Edinburgh. It is important to bear in mind that any change between the ‘before’ and ‘after’ positions may be influenced by factors other than the project itself. In this case, wider road network conditions beyond the extents of the new Crossing will be influencing changes in journey times. In terms of public transport, journey times by bus, on the whole, have improved. This aligns with feedback from bus operators. It also indicates that the Public Transport Strategy is realising success for the dedicated Public Transport Corridor.

Accessibility Audit

8.6.13 No specific Accessibility Audit has been carried out; however, a review of accessibility provision was undertaken and the FRC Access Group has been asked for their findings. It is recommended that the findings are reviewed and included in the detailed evaluation at year 3.

²³ Source: TRACC Accessibility Software

Accessibility & Social Inclusion – Key Findings

- With traffic removed from the Forth Road Bridge, the experience for pedestrians and cyclists is greatly improved and this aligns well with some of the feedback from the Community Council questionnaire.
- The cycle audit identified some issues and North Queensferry Community Council raised some safety concerns. Therefore, it is recommended that as part of the detailed evaluation at year 3 confirmation is sought that mitigating actions have been addressed.
- Bus operators have improved routes and service frequency after the opening of the new Crossing, for instance Stagecoach on its Fife to Edinburgh route, resulting in significant increases in passenger numbers cross-Forth.
- Most morning peak bus journey times from selected Fife settlements to large employment areas in West Lothian and Edinburgh have improved indicating that the public transport corridor is performing well. Access to these same employment areas by road shows an increase in journey times, particularly to employment in Edinburgh; however, increases may be influenced by wider road network conditions beyond the extents of the new Crossing.

9 Environment

9.1 Introduction

9.1.1 This chapter comprises details of the evaluation against environment criteria in line with STRIPE methodology. This initial evaluation at year 1 includes a 'high level' assessment of the project's environmental impacts (where possible); a review of evidence that the environmental mitigation measures proposed in the ES have been implemented (commenting on their apparent effectiveness where possible) and a check of whether specific requirements of the appraisal process have been met.

9.1.2 The environmental mitigation measures originally proposed for the project were obtained from its ES. The ES splits the mitigation into different environmental topics (known as sub-objectives in STRIPE methodology) and these topics are reflected below. In addition, the project has also been evaluated against relevant Forth Crossing Commitments.

9.2 Scope and Methodology

9.2.1 The ES proposed mitigation measures to address impacts under the environment criteria are:

- Land Use (LU)
- Geology, Land Contamination and Groundwater (G)
- Water Environment (W)
- Terrestrial and Freshwater Ecology (TE)
- Estuarine Ecology (EE)
- Landscape (L)
- Visual (V)
- Cultural Heritage (CH)
- Air Quality (AQ)
- Noise and Vibration (N)
- Physical Fitness, Pedestrians, Cyclists, Equestrians and Community Effects (P)
- Vehicle Travellers (VT)
- Disruption due to Construction (DC)

9.2.2 The ES included mitigation measures in relation to the pre-construction, construction and operational phases. This evaluation at year 1 focuses primarily on mitigation measures that relate to the operational phase of the project since it is possible to check these measures and comment on their effectiveness. The two exceptions are: cultural heritage and estuarine ecology, for which most of the measures will have been implemented exclusively during the pre-construction and construction phases. For these topics, records have been checked to provide commentary on whether the measures were implemented.

9.3 Data Sources

9.3.1 The main data sources that have been used are listed below. A full list of data sources is provided in Appendix A to this report.

- FRC ES and associated figures and appendices, including the Code of Construction Practice.
- Online aerial imagery and street view imagery.
- Contractors' Environmental Management Plans (for the Principal Contract, the M9 Junction 1A Contract and the Fife ITS Contract).
- Drainage as-built drawings and landscape as-built drawings (excluding M9 junction 1A).
- Post-construction noise survey for the M9 Junction 1A only.
- Noise Report for the Principal Contract.
- Historic building / structures records and survey reports.

9.4 Limitations

9.4.1 A review of the FRC ES mitigation measures was carried out in Q1 of 2020. It was initially anticipated that site visits would be carried out – which is standard practice and in line with the STRIPE methodology and Transport Scotland's STRIPE Plan for the Forth Replacement Crossing – to establish whether the proposed mitigation measures set out in the ES had been implemented. However, the evaluation was partly undertaken during the COVID-19 pandemic and the restrictions associated with COVID-19 meant that site visits to review mitigation measures were not possible. In order to proceed with the evaluation, the project team has relied upon the available aerial and street view imagery as well as drawings and documentation provided by various parties. This approach was agreed with Transport Scotland.

9.4.2 Of note, in some cases site visits are necessary to fully understand and evaluate the performance of a mitigation measure and consequently it has not been possible to provide an evaluation of some mitigation measures. In this

case, the evaluation will be undertaken as part of the detailed evaluations at year 3 and year 5.

9.5 Construction Phase Mitigation

- 9.5.1 A Code of Construction Practice (CoCP) was prepared in accordance with the Scottish Parliament Hybrid Bill Guidance and was revised several times during the Forth Crossing Parliamentary Bill Process with the latest version (revision 5) published in December 2010. The CoCP sets out a series of objectives and measures to be applied throughout the construction period to manage and operate the construction works; maintain satisfactory levels of environmental protection; and limit disturbance from construction activities. The CoCP required the contractor to prepare and implement Environmental Management Plans (EMP). The EMPs set out how the contractor intended to operate the construction sites and set out the specific control measures to be implemented to comply with the CoCP. Various monitoring programmes have been undertaken across the project during the construction phase, as required by the CoCP, including air quality monitoring, noise and vibration monitoring and surface water and groundwater monitoring. The monitoring results were discussed and presented to the relevant liaison groups, as evidenced by the liaison group meeting minutes on the Transport Scotland FRC document library²⁴.
- 9.5.2 The Environmental Liaison Group (ELG) operated throughout the construction phase and met regularly from June 2011 to June 2017. It was a joint initiative between Transport Scotland and the regulatory authorities to cement a collaborative and inclusive approach to assure and assess the management of environmental matters and mitigation of environmental impacts during construction of the project. The members of the ELG comprised Transport Scotland and its advisors (Jacobs Arup Joint Venture), Scottish Natural Heritage, Scottish Environment Protection Agency, Marine Scotland, Historic Scotland, the City of Edinburgh Council, Fife Council, West Lothian Council and the contractors.
- 9.5.3 The Noise Liaison Group (NLG) operated throughout the construction phase with meetings held monthly from June 2011 to September 2017. It was a joint initiative by Transport Scotland, local authorities and Scottish Natural Heritage to cement a collaborative approach to assure and assess the noise and vibration control regime for the FRC project for the benefit of stakeholders and affected parties, including local residents and protected species within the Forth Estuary. The members of the NLG comprised Transport Scotland and its advisors (Jacobs Arup Joint Venture), Scottish Natural Heritage, the City of Edinburgh Council, Fife Council, West Lothian Council and the contractors. One of the purposes of the NLG was to review the planning, execution and monitoring of construction works to provide assurances to those participating organisations that the construction works were being undertaken in

²⁴ Transport Scotland, Document Library, available at: <https://www.transport.gov.scot/projects/forth-replacement-crossing/document-library/>

accordance with the Forth Crossing Act 2011, ES, Appropriate Assessment documents and CoCP.

9.5.4 The remainder of this chapter will be structured as follows:

- **Sub-objectives:** includes a review of the environmental mitigation measures originally proposed for the FRC grouped by sub-objective category. This section should be read in conjunction with **Appendix E**.
- **Forth Crossing Act 2011 Commitments and Undertakings:** comments on progress towards the Act Commitments at the time of writing.
- **Appendix E Environmental Mitigation and 1YA Opening Evaluation Findings:** 163 environmental mitigation measures in total have been evaluated. This appendix comprises a description of each of the mitigation measures together with the comments and findings of the evaluation where possible.

9.6 Sub-objectives

9.6.1 In total 163 environmental mitigation measures have been included in this evaluation. It would not be practical to discuss every measure therefore the reader should refer to **Appendix E**, which describes each of the mitigation measures from the FRC ES, together with the comments and findings from the evaluation. The appendix also highlights whether further action is required. This section is therefore a summary of the pertinent findings of the environmental evaluation at year 1.

Land Use

9.6.2 ES items **LU1**, **LU2**, **LU3** and **LU8** are evaluated fully in **Appendix E** and discussed here more briefly.

9.6.3 In most cases, land use mitigation was identified in the ES to prevent adverse impacts on the agricultural land and woodland within the FRC project area.

9.6.4 With regard to the reinstatement of lost agricultural land and forestry, the temporary loss of land at the M9 Junction 1A that was temporarily occupied during construction has now been returned and there are no ongoing issues reported. However, it is understood that temporary and surplus land for the Principal Contract has not yet been declared and furthermore reinstatement plans are not yet available for review. Reinstatement of temporary and surplus land relating to the Principal Contract should therefore be verified during the detailed evaluation at year 3.

9.6.5 Various measures were undertaken to protect topsoil and subsoil during construction and reinstatement, as described in the contractors Agricultural Management Plan, including surveys of topsoil / subsoil before and after construction, and the removal and appropriate storage of topsoil and subsoil. Transport Scotland confirmed that topsoil storage was occasionally inspected

by the Employer's Delivery Team during construction and it is understood that no issues were raised.

- 9.6.6 Transport Scotland is content that access to agricultural land and woodland has been maintained throughout the project in line with the Commitments and continues to be maintained; however, site visits to a selection of agricultural and woodland areas during the detailed evaluation at year 3 are recommended to confirm this.
- 9.6.7 Mitigation requirements were also identified to avoid the spreading of soil borne pests and diseases, animal and crop diseases and invasive species. This was undertaken in line with the contractors' Ecological Management Plans and Transport Scotland further confirms that monitoring and treatment was carried out in the construction phase for Giant Hogweed and Japanese Knotweed and that ongoing monitoring and eradication, if necessary, will continue to be carried out by Transport Scotland's Operating Company in future.
- 9.6.8 In summary, land use mitigation is largely performing as anticipated; however, it is recommended that further assessment of **LU1** and **LU2** is undertaken at year 3 to confirm that land has been appropriately reinstated and that access has been maintained in line with the Commitments.

Geology, Groundwater and Contaminated Land

- 9.6.9 ES items **G11**, **G13**, **G18**, **G19 - G21**, **G24**, **G26** and **G28** are evaluated fully in **Appendix E** and discussed here more briefly.
- 9.6.10 Several of the mitigation measures identified for this ES topic related specifically to the protection of the groundwater (and surface water) through the lining of road drainage features, detention basin and swales.
- 9.6.11 In particular, lining of all detention basins was required throughout the scheme (**G19**, **G20**, **G28**) unless risk assessment during the design stage indicated otherwise. An Environmental Appraisal Report was undertaken by the contractor for a relaxation of the lined drainage requirement which was accepted by the Employer's Delivery Team and SEPA. The Employers Delivery Team confirmed to Transport Scotland that liners are present at all Sustainable Urban Drainage Systems (SUDS), either in the form of site won clay or synthetic liner. A sample photo provided by Transport Scotland was reviewed which illustrated a liner being placed at the Ferrymuir SUDS during construction. Furthermore, minutes of Environmental Liaison Group from December 2015 confirmed that clay had been spread at the northern SUDS. Monitoring of Linn Mill Burn was undertaken during the construction phase when the SUDS near the south abutment of the main crossing were used for construction run-off and it is understood that no issues were recorded.
- 9.6.12 Mitigation item **G11** states that ground gas monitoring of confined spaces will be undertaken before entry in specific locations identified as N1 – N29 (north of the main crossing) and S1 – S14 (south of the main crossing) shown in ES Figure 8.4a and 8.4b. At the time of writing, it was not possible to review the

operating company's Health and Safety Management Plan, which should have incorporated the procedure for the monitoring of ground gases at any confined spaces at these locations. This will be confirmed as part of the detailed evaluation at year 3. Records / documents should be made available for review at this time [i.e. the operating company's Health and Safety Management Plan, records of gas monitoring prior to entry at confirmed spaces at the locations above].

- 9.6.13 Mitigation item **G21 relates to site surveys of private water supplies (PWS) to determine whether the water quality is at risk.** Paragraph 1.1.2 of the FRC Geology, Groundwater and Land Contamination Management Plan states that: *"it should be noted that private water supplies will not be affected by the works and the requirement for limiting adverse impacts no longer applies."* Therefore, the evaluation of mitigation item **G21** is no longer required under this review.
- 9.6.14 The ES identified the need to determine if any properties at Ch3000-4250 (in the location of the Queensferry Cutting) are at risk of potential settlement associated with dewatering activities in the location of the cutting **G26**. Pre-condition surveys were carried out at several locations and a Hydrogeological Assessment of the cutting was undertaken (see **G26** in **Appendix E**) which concluded that dewatering activities were likely to have a negligible impact on all receptors at Echline Corner, Springfield and Linn Mill. Transport Scotland has confirmed that a number of surveys have been undertaken post-construction, including property condition surveys and property structural surveys. Paragraph 6.2.8 above provides further details about the land surveys.
- 9.6.15 In summary, it is recommended that mitigation item **G11** is reviewed further at the next evaluation stage.

Water Environment

- 9.6.16 ES items **W1, W28 - W36, W39 - W42, W45** and **W46** are evaluated fully in **Appendix E** and discussed here more briefly.
- 9.6.17 According to the FRC ES Chapter 9 (Water Environment) there are several environmentally sensitive waterbodies within the study area. These include the Firth of Forth which has two Special Protection Areas (SPA) designations (the Firth of Forth SPA and Forth Islands SPA), along with a Ramsar designation and a number of smaller Site of Special Scientific Interest (SSSI) designations. St. Margaret's Marsh is designated as a SSSI due to saltmarsh wetland and reedbed habitat, which in turn provide important habitats for breeding and migratory wintering birds and the River Almond is designated as salmonid waters as is one of its tributaries within the study area (i.e. Niddry Burn).
- 9.6.18 It is understood that mitigation during construction was managed through adherence to relevant SEPA Pollution Prevention Guidelines (PPGs) and the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR).

- 9.6.19 Water environment mitigation for the operational phase are discussed below and in **Appendix E** beginning with ES item **W1**. In summary, mitigation measures primarily comprise the implementation and operation of Sustainable Urban Drainage Systems (SUDS) for receiving waterbodies and provision of appropriate compensatory flood storage.
- 9.6.20 It was identified in the ES **W1** that throughout the scheme the contractor and operator should follow relevant SEPA PPGs and CIRIA guidelines to prevent, reduce or control pollution of surface water and groundwater. More than 20 PPGs and CIRIA guidelines were specifically identified in the ES. During this evaluation at year 1, it was noted by Transport Scotland that its Operating Company is required to operate in accordance with an EMP. Under normal conditions, during the evaluation at year 1 an observation would be made during the site visits [i.e. a comment on the appearance of the drainage systems]; however, due to COVID-19 restrictions during March, April and May 2020, this has not been possible. Site visits will be undertaken as part of the detailed evaluation at year 3 (subject to any COVID-19 restrictions) to comment on the appearance of the drainage systems, including general maintenance (as described in several **W** mitigation items, **Appendix E**) and the presence of adequate scour protection at outfalls.
- 9.6.21 With regards to **W28**, for each outfall at new sections of roads and road upgrades, the ES requires that a treatment train will be provided to maximise pollutant removal and will comprise three levels of SUDS (in accordance with CIRIA, 2007), including filter drains, swales and detention basins. As-built drawings of the drainage systems at the Principal Contract and the M9 Junction 1A were provided by Transport Scotland. A selection of the as-built drawings has been reviewed and the findings are summarised below. As-built drawings for Pond 700 (adjacent to River Almond) (ref 17867-H-500-0100) illustrates a three-level system has been constructed including connecting a detention basin to the River Almond. Filter drains are present along the M9 northbound and southbound carriageways which eventually pass to the lined detention basin via a carrier drain. With regards the detention basin near to the Ferry Burn, as-built drawings show the detention basin located immediately south west of the A9000. Three filter drains exit the A9000 road and enter two swales, one crossing above a BP pipeline, before entering the lined basin via carrier drains and an inlet.
- 9.6.22 The design objective of the scheme was to maintain the hydrological conductivity of the marsh and directional flow of groundwater at St. Margaret's Marsh (**G24, W29 and TE50**). A programme of groundwater monitoring was undertaken to provide assurance that there was no adverse effect on the groundwater regime at St. Margaret's Marsh. The contractor's Groundwater Monitoring Final Report Rev04 (January 2018) stated that data logger records have shown the groundwater hydraulic gradient to have been consistent throughout, reflecting a hydraulic gradient towards the marsh, as suggested in the original hydrogeological assessment. The report concluded that groundwater levels were stable and the routine monitoring at all locations may no longer be necessary. It is understood that this was acceptable to Transport Scotland.

- 9.6.23 To mitigate against an increase in flood risk from the carriageway drainage onto lands adjacent to the viaduct abutments at the Linn Mill area, excess runoff should be directed toward areas of detention, and / or conveyed toward the Firth of Forth without impacting areas of high risk **W30**. Transport Scotland has confirmed that all road carriageway drainage at this location, including intertidal area goes to the two SUDS ponds visible near the south abutment. Carriageway runoff on the Cable Stayed Bridge component of the Queensferry Crossing discharges to the Firth of Forth.
- 9.6.24 Where structures or embankments are constructed within the floodplain [i.e. at the Tributary of Niddry Burn, Niddry Burn, Swine Burn and River Almond] compensatory storage will be created by land forming directly adjacent to the watercourse **W31**. A selection of as-built drawings for the M9 Junction 1A were reviewed. On drawing 17867/H/500/108 Rev C for the Niddry Burn, flood compensation details are shown adjacent to the existing burn, including two separate flood compensation area 'Basins' upstream and downstream of the M9. Volumes for the compensation areas including band widths and volume loss during the construction works are shown for the upstream and downstream areas. Cross sections A-A and B-B illustrate the compensations storage areas. W31 has been implemented satisfactorily.
- 9.6.25 Several mitigation measures were identified specifically for the Swine Burn and its tributary, the former flows west to east immediately north of the M9 before passing beneath the M9 Junction 1A (**W32 – W35**). Two outfalls at the Swine Burn would be provided with scour protection and a two-treatment train would be provided. For flood flows in excess of carriageway drainage capacity, detention or conveyance of flood water toward areas of less risk should be implemented. The ES requires that one SUDS treatment level be constructed for the Tributary of Swine Burn and two SUDS treatment levels are constricted for the Swine Burn. As-built drawings indicate that a combination of filter drains and a detention basin have been constructed, as required by the ES.
- 9.6.26 One new depressed invert culvert and one double-barrel culvert extension will be provided at the Swine Burn **W32**. The culvert was to be designed in line with CIRIA 168 guidance and with allowance for freeboard above the 0.5% AEP (200-year return period event) flood level and mammal passage. It was recommended that regular inspections were required to ensure that the culvert was free from debris. The new depressed invert culvert and one double-barrel culvert extension on the Swine Burn are both visible on aerial imagery dated 24/06/18, however a site visit is recommended to check that the culvert is being adequately maintained, free of debris etc. Photographs of the Swine Burn were provided by Transport Scotland looking south west along the realigned watercourse and looking east at the new culvert under the northbound slip road off the M9. Whilst some scour protection is visible near to the new culvert, the two outfalls are not visible on the photographs. Due to the restrictions imposed by the lockdown, site visits to the watercourses have not been possible and in some cases site visits will be required during the detailed evaluation at year 3.

- 9.6.27 Mitigation items **W35** for the Tributary of Swine Burn states that a two-level treatment train was required comprising a filter drain and detention basin. On review of aerial imagery, it appears that no detention basin has been constructed at the area by the Tributary of Swine Burn. A filter drain and dry ditch is shown to run on an east-west axis immediately south of the M9 westbound carriageway on as-built drawing 17867/H/500/003. These drainage features are intended to replace the original drainage features noted in the ES. Transport Scotland has confirmed that the design change was reviewed and demonstrated no worse residual impacts than those reported in the ES. SEPA also approved the change.
- 9.6.28 In relation to **W36**, the ES states that a two to three level treatment train is required for the drainage run at the Niddry Burn. A detention basin near to the Niddry Burn is visible on aerial imagery dated 24/06/18 in the location shown on ES Figure 9.3f. As-built drawings for Pond 1200 (adjacent to the Niddry Burn) (ref 17867/H/500/202) illustrate that a two-level system has been constructed including connecting a detention basin to the Niddry Burn. Filter drains are present along the M9 northbound and southbound carriageways which eventually pass to the detention basin via a carrier drain. Dry ditches area also visibly present.
- 9.6.29 Mitigation item **W39** states that one treatment train will be provided adjacent to the River Almond. A detention basin near to the River Almond is visible on aerial imagery dated 24/06/18 and street view imagery dated May 2018 in the location shown on ES Figure 9.3f. As-built drawings for Pond 700 (adjacent to the River Almond) (ref 17867/H/500/203) illustrate that a three-level system has been constructed, including connecting a detention basin to the River Almond, as required by the ES. Filter drains are present along the M9 northbound carriageways which eventually pass to the detention basin via a carrier drain. A swale connects the detention basin to the River Almond via a carrier drain and an existing pipe which has been retained. Dry ditches area also present.
- 9.6.30 Three levels of SUDS are required for Ferry Burn according to **W40**, including filter drains, swale and a detention basin. A detention basin near to the Ferry Burn is visible on aerial imagery dated 24/06/18 and street view imagery dated September 2016 (taken from the A90) in the location shown on ES Figure 9.3d. The detention basin, two swales and an outfall are located on the as-built drawings provided by Transport Scotland.
- 9.6.31 In relation to **W41** and **W42**, as-built drawings were unavailable at the time of writing for Dolphinton Burn and the main crossing, therefore this evaluation will be undertaken as part of the detailed evaluation at year 3.
- 9.6.32 Mitigation items **W45** and **W46** relate to drainage and maintenance measures that should be implemented throughout the scheme. The ES required that a degree of maintenance of all of the drainage runs would be required, including the maintenance of filter drains and filtration devices, control of weeds, grasses, sediment and vegetation and the reinstatement of eroded areas. Under normal conditions, during evaluation at year 1 an observation would be

made during the site visits regarding the maintenance of drainage systems. However, due to COVID-19 restrictions during March, April and May 2020 these observations will be undertaken as part of the detailed evaluation at year 3.

Terrestrial and Freshwater Ecology

- 9.6.33 ES items **TE6**, **TE13**, **TE18**, **TE20 - TE27**, **TE29**, **TE31**, **TE32**, **TE34**, **TE37 - TE41**, **TE44 - TE 47**, **TE50** and **TE51** are evaluated fully in **Appendix E** and discussed here more briefly (note that **TE50** is discussed alongside item **G24** above).
- 9.6.34 With regards to **TE6**, the FRC Ecological Mitigation Report provides evidence that suitably constructed structures primarily for badgers, bats and otters, including underpasses and fencing, with associated planting were created on commuting corridors.
- 9.6.35 As per **TE18**, the FRCB FRC Specification Appendix 14/2 Location of Lighting Units and Feeder Pillars; the DCIC (L) 07 Rev C12 and 03 Rev C12; as well as the DIC (L) 07 Rev C12 and 03 Rev C12 demonstrate that lighting was designed in accordance to BS 5489. LED lighting was utilised throughout the mainline road corridor providing more directional lighting effect and less light spill/glow relative to traditional luminaires. Some pre-existing lighting at Scotstoun Interchange was also upgraded to LED.
- 9.6.36 The FRC Surface Water Management Plan states that appropriate methods would be used to mitigate impacts on the water environment **TE20**.
- 9.6.37 Transport Scotland confirmed that all designs were reviewed by the Employer's Delivery Team on site prior to construction. These designs include the extensions to existing culverts [i.e. the Niddry Burn under the M9 and the Swine Burn under the M90]; and new culverts for Swine Burn under the n/b slip from the M9 to M90. A site visit will be undertaken during the detailed evaluation at year 3 to verify this mitigation has been implemented.
- 9.6.38 With regards to **TE21**, **TE37** and **TE44**, the FRC Ecological Mitigation Report provides photographic evidence and states that a mammal ledge was installed at Niddry Burn culvert and a dry mammal tunnel was installed above Swine Burn culvert. The FRC Ecological Mitigation Report also indicates bat monitoring was carried out and maintained for a period of five years by licensed bat workers (**TE21** and **TE45**). Annual inspections recorded positive results with up to 30 common pipistrelle bats using boxes throughout the site. **TE21** also states that culverts will be appropriately maintained to ensure continual operation of the asset during operation, therefore a site visit to the culverts will be required at the detailed evaluation at year 3.
- 9.6.39 For mitigation items **TE22**, **TE24** and **TE25**, the FRC Ecological Mitigation Report states that landscape and ecological planting was undertaken to promote plant survival, growth and establishment throughout the site. The approach was reported to be beneficial in terms of replacing trees, woodland and ecological habitat, integrating the scheme into the surrounding landscape

and screening views of the new roads and traffic by achieving effective establishment of woodland areas prior to scheme completion.

- 9.6.40 Transport Scotland confirms that minimising removal of vegetation and replacement planting with native species of local provenance and wildflower seed mix has mitigated impacts to species of farmland species of conservation concern. It is recommended that a site visit to a selection of locations is undertaken at the year three stage to verify this.
- 9.6.41 Transport Scotland has confirmed that new planting such as hedges is currently being maintained by FCBC up to 2023 and the Transport Scotland Operating Company thereafter. With respect to road verges, trunk roads are maintained by the Operating Company and side roads are maintained by the relevant local authorities. It is recommended that a site visit is undertaken during the detailed evaluation at year 3 to a selection of locations to verify that these mitigation measures have been implemented.
- 9.6.42 As per **W1**, the ES stated that best practice measures should be incorporated to protect terrestrial and freshwater ecology against pollution incidents. Under normal conditions, during evaluation at year 1 an observation would be made during the site visits; however, due to COVID-19 restrictions during March, April and May 2020 this has not been possible. Site visits will be undertaken (subject to COVID-19 restrictions) as part of the detailed evaluation at year 3.
- 9.6.43 The report also states that to ensure that the ecological integrity of the site was protected, and the biodiversity enhanced, native species of local provenance (Forestry Commission region 203 or nearest available) were used. Furthermore, the FRC Ecological Mitigation Report states that clumps of riparian vegetation were transplanted from the edge of the original Swine Burn (Niddry Burn and Swine Burn) to the banksides of the realigned channel **TE26**.
- 9.6.44 Photographic evidence of replacement badger setts is provided in the FRC Ecological Mitigation Report for **TE27**. It also states two replacement setts were constructed at different locations in October 2010 to mitigate for the closure of existing setts.
- 9.6.45 With regards to **TE31**, the FRC Ecological Mitigation Report provides photographic evidence of an artificial otter holt and states that European Protected Species (EPS) licences were obtained to exclude two otter holts and construct one replacement holt at Niddry Burn in July 2011.
- 9.6.46 As per **TE32**, recent street view aerial imagery from December 2018 shows no street lighting on the M9 Junction 1a where the Niddry Burn and Swine Burn cross under the road. Transport Scotland confirmed that this is not as issue for the Principal Contract as no burns are directly adjacent to the new roads.

- 9.6.47 The FRC Ecological Mitigation Report states that the existing linear, engineered channel for the Swine Burn was realigned to include meander bends and areas for riparian zones to establish **TE34**.
- 9.6.48 **TE38** requires that detention basins, culverts, filter drains, swales and catchpits will be inspected and maintained as appropriate, similar to **W45** (see above). The site visit will be undertaken as part of the detailed evaluation at year 3.
- 9.6.49 As per **TE39**, Transport Scotland confirmed that three gantries on the Southern Network at approximately ch3350, ch2750 and east of ch1500 on the A90, from the Echline Strip woodland to Scotstoun were also intended to facilitate bat crossings. These gantries were constructed. The report also states that the requirement to incorporate badger fencing and an overhang on the landward side of the replacement stone walls, adjacent to the A904, was omitted, in consultation with Scottish Badgers, who confirmed that the stone walls constructed provided an effective barrier for badgers, provided that the walls were a minimum of 1.5 metres high. Furthermore, the requirement to add an overhang to the badger fencing, which had been installed along the full length of the M90 / A90 south mainline site boundary, was also omitted, in consultation with Scottish Badgers, who confirmed that the DMRB specification for badger fencing was acceptable.
- 9.6.50 The FRC Ecological Mitigation Report states that badger fencing was installed to prevent badgers from gaining access to the M90 / A90 and a badger gate incorporated at one location to enable badger access within fenced areas, where rabbit proof fencing may have restricted movement. The Noise and Vibration sub-objective provides evidence that noise barriers were also integrated with badger fencing at certain locations (**TE41**).
- 9.6.51 As noted in the FRC Ecological Management Plan, areas containing maiden pink (*Dianthus deltoides*) were not programmed to be disturbed. Transport Scotland confirmed that translocation was therefore not a requirement **TE46**.
- 9.6.52 The FRC Ecological Mitigation Report states that native bluebells within the woodland area designated for land take at St. Margaret's Hope Wood, were translocated, with necessary permissions, to aid new colonisation in adjacent woodland at Castlandhill. Initial monitoring indicated that no bluebells were establishing from translocated bulbs. However, two years later, it was reported that bluebells were colonising within the area where translocation had been undertaken and elsewhere in the new woodland area **TE47**.

Estuarine Ecology

- 9.6.53 ES items **EE1 – EE19** are evaluated fully in **Appendix E** and discussed here more briefly.
- 9.6.54 The ES included an ecological impact assessment specific to estuarine ecology and comprised intertidal and subtidal environments which includes

migratory and non-migratory fisheries, benthic habitats, marine mammals and estuarine birds. Where potential impacts to habitats were assessed as significant, mitigation measures, both generic and specific, are applied with the aim to reduce the level of impact on estuarine ecological receptors. Although mitigation measures largely applied to the construction phase and pre-construction phases, these are discussed below due to the importance of, and potential impacts to, the internationally designated nature conservation areas in the vicinity of the project. The Estuarine Ecology mitigation was only relevant for the Principal Contract area of the project.

9.6.55 Three HRAs were undertaken for the project which included the Firth of Forth (SPA); the Forth Islands and Imperial Dock Lock SPAs; and the River Teith SAC. These were documented as Reports to Inform Appropriate Assessments (RIAs).

For **EE1**, the FRC Ecological Mitigation Report provides evidence that ecological surveys were undertaken prior to and during construction works. This includes bird surveys, which were undertaken to inform the Habitats Regulations Assessments (HRAs), were conducted between 2007 and April 2009 (inclusive) across a large area extending between Limekilns and Dalgety Bay on the north shore of the Firth of Forth, and Abercorn Point and Hound Point on the south shore. The pre-construction surveys identified roosting curlew on the south shore, within 250m of the Queensferry Crossing, west of Port Edgar Marina, which were considered to be at risk of disturbance or displacement by construction activities for South Piers 4, 5 and 6. The bird monitoring undertaken during construction confirmed that, although birds were locally displaced, there was no significant disturbance and more than 40 roosting curlew were observed in the same vicinity, during Spring 2015.

9.6.56 The contractor for the Principal Contract prepared several management plans during construction which outlined measures to comply with the Code of Construction Practice (CoCP) and minimise disturbance to ecology, including mitigation specific to the HRAs. These include the FRC Ecology Management Plan; the FRC Noise and Vibration Management Plan; the FRC Marine Spillage Response Plan; and the FRC Surface Water Management Plans (**EE2 – EE6**).

9.6.57 The FRC Ecology Management Plan specifically relates to **EE2** and **EE3**, in stating that:

- Plant and personnel will be constrained to a prescribed working corridor through the use of temporary barriers, if required by the ECoW, specifically to protect terrestrial habitats and otters **EE2**.
- In relation to intertidal habitats, suitably constructed access roads / bridges will be created within the intertidal zone to limit activities in direct contact with habitat **EE3**.

9.6.58 The contractor for the Principal Contract employed an ECoW and an Environmental Manager to ensure measures in the management plans were

followed **EE4**. During construction, the ECoW was present onsite to undertake monitoring and inspection. The results are summarised in the Jacobs Arup FRC Ecological Mitigation Report, 2019.

9.6.59 With regards to **EE6**, The FRC Marine Incident Response Plan was implemented to ensure site works complied with statutory requirements with regards to preventing pollution and nuisance from environmental incidents and accidents. This plan was prepared in line with several of SEPA's Pollution Prevention Guidelines (PPGs) and relevant to works in the marine environment and any spill or potential spill of polluting materials into the Firth of Forth. The Marine Spillage Response Plan also adhered to the Forth Ports Limited (2011) oil spill contingency plan "Clearwater Forth". Furthermore, the Land Based Incident Response Plan covered spillages to land.

9.6.60 As per **EE7 - EE9**, reasonable precautions were undertaken to avoid / reduce noise disturbance from piling and blasting activities. The FRC Ecological Mitigation Report states that Marine Mammal Observers and Passive Acoustic Monitoring were employed during construction until June 2014 to ensure marine mammals were not present prior to blasting and piling works. Marine mammals included grey seals (possibly associated with the Isle of May SAC), harbour seals, harbour porpoises, and bottle-nosed dolphins (possibly linked to the Moray Firth SAC population).

9.6.61 Furthermore, the FRC Estuarine Bird Ecology Report (2008-2017) states that maximum noise levels were set at a level equivalent to published daytime noise limits for people based on the fact that noise levels which potentially disturb birds are similar to thresholds set for humans. Year-round monitoring of noise was used to assess whether absolute noise limits for Port Edgar and Long Craig Islands during the tern roosting periods were being met, and also to identify noisy activities year-round.

9.6.62 The FRC Ecological Mitigation Report states that with the exception of 2012, when Long Craig Island was temporarily abandoned as a breeding colony, common tern breeding numbers remained stable or increased at Long Craig Island throughout construction years. It was confirmed that noise levels at these colonies, from the FRC construction works, remained imperceptible above the baseline noise levels and therefore did not indicate adverse effects or contribute to this displacement **EE10**.

9.6.63 To further minimise noise disturbance **EE11**, the Plan for Control of Noise and Vibration (PCNV) was prepared and implemented. The following mitigation measures, identified in the Reports to Inform an Appropriate Assessment (RIAs) for marine mammals, were included in the plan:

- Acoustic shrouds around hammers to reduce noise during vibro- and percussive piling.
- Soft start for a minimum of 20 minutes.
- Restricting noisier activities to daytime wherever possible.

9.6.64 With regards to **EE12** and **EE13**, the FRC Ecological Mitigation Report states that estuarine bird monitoring was undertaken by Jacobs Arup to fulfil the commitments made in the Reports to Inform an Appropriate Assessment (RIAs) to monitor the effect of construction on bird populations. Monitoring of terns at Long Craig Island and Port Edgar was also undertaken by the Contractor's ECoW. The FRC End of Project Report on Estuarine Bird Ecology: 2008 – 2017 demonstrates the project was successfully delivered without implication for birds. Long term bird monitoring has confirmed there were no adverse effects on the integrity of the designated sites within the Forth Estuary due to the construction of the FRC.

9.6.65 In relation to mitigation measures **EE14 - EE19**, the FRC Ecological Management Plan states that the construction of the foundations associated with the Queensferry Crossing and approach viaducts within the Firth of Forth SPA were undertaken in line with the requirements of the ES and RIAs to mitigate the potential effects on fish, marine mammals and birds, including impacts associated with the following:

- Noise and vibration due to piling and blasting works.
- Habitat loss due to piling and dredging works, including the disposal of dredging.
- Release of sediment, including any contamination due to construction works.
- Chemical spills due to construction works.
- Light pollution due to temporary lighting.
- Disturbance from increased traffic / vessels.

9.6.66 The FRC Ecological Mitigation Report further states that neither dead fish nor other evidence of harm to migrating salmon or lamprey was observed during construction of the Queensferry Crossing.

9.6.67 The Surface Water Management Plan states that the contractor's Environment Team were on site during working hours to carry out inspections in relation to potential water related impacts and to maintain a log of relevant observations and any actions taken. Regular visual inspections of the construction site were carried out to check for activities and practices causing, or likely to cause, pollution of the water environment. For example, the release of sediment from dewatering discharge.

9.6.68 In summary, no recommendations have been identified for estuarine ecology.

Landscape

- 9.6.69 ES items **L4** to **L52** and **L54** to **L70** are evaluated in **Appendix E** and discussed here more briefly.
- 9.6.70 Mitigation measure **L4** states that noise barriers as determined by the noise assessment, will be provided in the form of barriers and false cuttings. The Noise and Vibration sub-objective provides evidence that these noise barriers have been implemented, as shown on recent street view imagery.
- 9.6.71 As per **L5**, **L6** and **L7**, section 3.7 of the FRC Ecological Mitigation Report confirms that appropriate measures were undertaken. The report states that planting was undertaken to: replace trees, woodland and ecological habitat, which was removed prior to construction works; integrate the FRC scheme into the surrounding landscape, by planting individual trees, hedges and areas of mixed or scrub woodland to reflect local landscape features; screen views of the new roads and traffic for adjacent properties; and enhance the experience for travellers by creating a variety of views.
- 9.6.72 **L8** – **L70** provide descriptions of the proposed landscape mitigation measures with their approximate chainages / locations of the scheme design (as shown in ES Figure 12.4). To evaluate whether these mitigation measures have been implemented, recent street view imagery dated between September 2010 and April 2019 has been assessed. The majority of the mitigation measures have been successfully implemented; however, in some cases more detailed evaluation will be required at the Three Years After (3YA) evaluation to verify these measures. Items **L41**, **L43**, **L47**, **L55** and **L65** relate to the planting of mixed woodland, hedgerows and grasslands to provide screening, integration and to replace lost trees. Here, mitigation items have generally been found to be satisfactory for this initial evaluation at year 1; however, additional review may be required during the detailed evaluation at year 3 (or at year 5 for woodland) to check that the planting is performing adequately once it has become more established.
- 9.6.73 It has not been possible to fully evaluate items **L48**, **L57**, **L59** - **L62**, **L66** and **L69** [i.e. due to site visits restrictions and pending as-built drawings] and therefore the evaluation will be undertaken as part of the detailed evaluation at year 3. Additionally, nursery certificates should be reviewed, where necessary, to confirm that planting is of local provenance.
- 9.6.74 Refer to **Appendix E** for further evaluation details on landscape mitigation.

Visual

- 9.6.75 ES items **V1** and **V2** are evaluated in **Appendix E** and discussed here more briefly.
- 9.6.76 As is typical in environmental impact assessment, most of the visual mitigation has been identified in conjunction with landscape mitigation, as described above, which includes a review of mitigation item **V1**.

9.6.77 In relation to mitigation item **V2**, the visual impact assessment in the ES also considers visual impacts from the introduction of Intelligent Transport Systems (ITS) and night-time lighting of the scheme. Where lighting is essential, mitigation is required, and all reasonable precautions should be undertaken to reduce energy consumption and avoid / reduce the amount of light pollution of the night sky and rural landscape **V2**. Transport Scotland confirmed via email that an Intelligent Lighting Control System (ILCS) is incorporated in the crossing and supporting infrastructure. Depending on traffic flow and ambient lighting conditions, this controls the artificial lighting which in turn reduces energy consumption. Lighting dims when not required (for example, under very low traffic conditions). LED lighting has been utilised throughout which reduces energy compared to sodium lamps. Further confirmation has been provided that the contractor was required to utilise the BS 5489-1:2013 revision in the mainline lighting design. This enabled further efficiencies to be developed within the lighting design and resulted in a lesser lighting class being utilised in some areas relative to that envisaged at the beginning of the construction phase.

9.6.78 In summary, no recommendations have been identified for visual.

Cultural Heritage

9.6.79 ES items **CH1** to **CH4** and **CH6** to **CH10** are evaluated in **Appendix E** and discussed here more briefly.

9.6.80 Given the study area is defined by contrasting historic landscapes north and south of the Firth of Forth, a number of mitigation measures were identified in ES Chapter 14 to protect and enhance the existing cultural heritage.

9.6.81 With regards to **CH1**, **CH8** and **CH9**, the Headland Archaeology Report Results of Land Based Invasive Archaeological Survey and Evaluation Volumes 1 to 5 confirms that archaeological trial trenching was carried out in the design and pre-construction phases of the project.

9.6.82 The FCBC Cultural Heritage Management Plan noted that an archaeological watching brief would be carried out of the proposed dredging around South Queensferry and would put in place a protocol for handling any discoveries and recoveries of archaeological material of interest.

9.6.83 The contractor for the Principal Contract confirms the historic building recording was undertaken at an appropriate level prior to the start of construction (**CH2**).

9.6.84 The FRC Construction Vibration Monitoring Reports confirm that vibration monitoring was also undertaken across the site during the construction phase in accordance with the requirements of the CoCP (**CH3**).

9.6.85 As per **CH4**, the FRC St. Margaret's Hope Archway Standing Building Survey Report demonstrates a Historic Building recording was undertaken for St. Margaret's Hope Archway prior to the dismantling of the arch.

- 9.6.86 The FRC Beamer Rock Beacon: NT 65 120 800 Survey and Recording, December 2011 confirms the topographic survey and recordings were undertaken, leaving open the possibility to re-erect the beacon at a suitable site later if appropriate (**CH6**).
- 9.6.87 Historic Scotland advised that marine archaeological surveys were not necessary for the FRC project (**CH7**).
- 9.6.88 As part of the protection and enhancement of the study area, planting proposed as part of the landscape (refer to Landscape sub-objective above) and terrestrial and freshwater ecology (refer to Terrestrial and Freshwater Ecology sub-objective above) mitigation measures as well as noise barriers (refer to Noise and Vibration sub-objective below) were provided to reduce the impacts on the cultural heritage (**CH10**).
- 9.6.89 In summary, no recommendations have been identified for cultural heritage.

Air Quality

- 9.6.90 ES Chapter 15 Air Quality states that the air pollutant levels in the vicinity of the FRC scheme are forecast to both increase and decrease, although the changes are generally minor. No significant adverse impacts to local air quality have been predicted other than at the area around St Margaret's Hope and ES Chapter 15 identifies no operational mitigation measures for air quality.

Traffic Volumes – Forecast versus Post-Opening

- 9.6.91 STRIPE guidance requires a comparison of the post-opening traffic volumes and forecast traffic volumes from the ES. On comparison of the post-opening versus forecast traffic volumes, forecast traffic volumes are lower than the post-opening volumes for some local roads to the south of the Queensferry Crossing. In South Queensferry, in particular, the 2017 forecast AADT volume for the A904 Builyeon Road was 2,300 compared to a post-opening AADT volume of 13,800 (+83% increase). Similarly, the 2017 forecast AADT volume for the B924 Bo'ness Road was 5,500 compared to a post-opening AADT volume of 6,400 (+14% increase). This means that in reality there is more traffic on both roads when compared to the forecast at the appraisal stage. STRIPE guidance states that if traffic flows are found to vary by more than +/- 10% AADT than expected, then an assumption can be made that the local air quality is likely to be either 'worse than' or 'better than' expected in some areas. This traffic volume comparison indicates that the local air quality could be worse than forecast in some areas. Due to the variance of >10% AADT than expected, it is recommended that this is considered further at the detailed evaluation.

Traffic Volumes – Pre-Opening versus Post-Opening

- 9.6.92 On comparison of the pre-opening and post-opening traffic volumes (i.e. the actual number of vehicles recorded in 2014 (pre-opening) and in 2018 (post-opening)), there is no change in AADT volumes on the A904 Builyeon Road

(0%), whereas for the B924 Bo'ness Road there is an increase in AADT volumes of 2,700 (73%).

9.6.93 In relation to the A9000, which routes above the centre of South Queensferry and across the Forth Road Bridge, the 2014 pre-opening AADT on the Forth Road Bridge was 74,100 and the 2018 post-opening AADT using the new Queensferry Crossing was 76,600. Notably, the Forth Road Bridge is now used as a dedicated public transport corridor with no access for cars. A significant volume of traffic has therefore been removed from the centre of South Queensferry, which is very likely to have a positive impact on air quality.

9.6.94 In summary, further assessment is recommended at the detailed evaluation stage to better understand whether the higher traffic volumes than forecast has had any implications on local air quality in South Queensferry, particularly on the A904 Builteon Road and B924 Bo'ness Road.

Noise and Vibration

9.6.95 ES items **N1** to **N10** are evaluated in **Appendix E** and discussed here more briefly.

9.6.96 An initial assessment of noise and vibration was carried out in order to identify initial noise impacts for the proposed scheme. The scheme design was to include various noise-reducing features such as earthworks.

9.6.97 All of the noise barriers referred to in ES Chapter 16 and **N1** - **N10** are visible on street view imagery dated December 2018 and primarily comprise timber fences and bunds.

9.6.98 Of note, with regards to the noise barriers at **N1** and **N5** on the Queensferry Crossing Viaduct, wind barriers are in place as part of the bridge design. Transport Scotland confirmed that the wind barrier on the viaduct has been designed to provide noise barrier properties at this location. The wind barrier typically has gaps in between slats to allow wind to pass through, however, on the viaduct the gaps have been closed to form a barrier which reportedly reduces noise transmissions from traffic. It is understood that this has been accepted by Transport Scotland.

9.6.99 A post-opening operational noise assessment (year 1) was undertaken by KSG Acoustics for the Principal Contract. Noise measurements were taken at 14 monitoring locations agreed by Transport Scotland in 2018. Locations included areas around Inverkeithing, South Queensferry, Linn Mill and Dundas Home Farm. The report concluded that, subject to the limitations of the assessment, the assessment indicates good correlation between the forecast levels in the 2017 ES 3D digital noise model and the levels of road traffic noise measured in the 2018 post-opening survey. The results therefore also confirm that the significance of effects in 2018 is no worse than forecast in the ES for the year of opening of the Queensferry Crossing (**N1-N8**).

9.6.100 The noise barrier (fence) referred to in Chapter 16 is visible on aerial imagery street view dated 12/3/2018. A fence is in place on the M9 motorway close to Kirkliston (**N9** and **N10**). A noise assessment at Kirkliston was carried out by an independent company. It was completed over two days on the 29 and 30 August 2013. The post-construction assessment concludes that there is a reduction in L10 (18 hour) sound pressure levels which was anticipated due to the introduction of noise barriers at the M9 Junction 1A. The results were included in the Operational Noise Report for the M9 Junction 1A and were accepted by Transport Scotland.

9.6.101 In summary, no recommendations have been identified for noise and vibration.

Physical Fitness, Pedestrians, Cyclists, Equestrians and Community Effects

9.6.102 Only one operational mitigation measure **P9** was associated with physical fitness, pedestrians, cyclists, equestrians and community effects (see **Appendix E**).

9.6.103 Landscape and ecological mitigation included the provision of planting (indicated in ES Table 23.6) at a number of specific local paths, core paths, rights of way and recreational areas primarily to reduce impact on amenity value. Due to COVID-19 restrictions at the time of writing, street view and aerial imagery was utilised in place of site visits.

9.6.104 Recent street view imagery dated between June 2017 and April 2019 show that landscape / ecology mitigation measures (ES Table 23.6 and ES Figure 12.4) have been provided to reduce the impacts on amenity value in the following locations:

- NCR1/ Local Path (path 6).
- NCR 76 (path 10).
- Right of way (path 16) / Local paths (21).
- Core path 23, 38, 46, and 78.
- Recreational areas at Ferry Hills and Echline fields.

9.6.105 In summary, no recommendations have been identified for physical fitness, pedestrians, cyclists, equestrians and community effects.

Vehicle Travellers

9.6.106 Only one mitigation measure **VT1** was identified for vehicle travellers which relates directly to landscape mitigation (see **Appendix E** for further details), stating that all landscape mitigation in ES Table 23.6 should be provided. Refer to Landscape sub-objective above for the evaluation of landscape mitigation measures.

9.6.107 In summary, no recommendations have been identified for vehicle travellers.

Disruption Due to Construction

9.6.108 The evaluation of ES items **DC1** and **DC3** are evaluated in **Appendix E** and discussed here more briefly.

9.6.109 Construction mitigation is largely scoped out of this evaluation at year 1, as discussed earlier, except for two measures which extend into the operational phase, namely **DC1** which relates to reducing damage and disturbance to agricultural soils (see **LU3**) and field / forestry drainage systems, and **DC3** which seeks to make sure that access to all properties is maintained or otherwise alternative access is provided. The latter does not strictly relate to the operational phase of the project but has been included here as it relates directly to a Forth Crossing Act commitment.

9.6.110 In relation to **DC1** and **LU3** it has been confirmed that measures were undertaken to protect topsoil and subsoil during construction and reinstatement, as described in the contractors Agricultural Management Plan Rev04. These measures included undertaking surveys of topsoil/subsoil before and after construction, removal and appropriate storage of topsoil and subsoil (separately). Transport Scotland confirmed that topsoil storage was inspected by Employer's Delivery Team and it is understood that no issues were raised.

9.6.111 Refer to **LU2** in the Land Use sub-objective above for the evaluation of **DC3**.

9.7 Key Findings – Environment

9.7.1 The mitigation measures included in the ES that can be observed during the operational phase have largely been implemented and are performing adequately. These are summarised below:

- The operational phase land use mitigation is largely performing as anticipated but it is recommended that further assessment is undertaken at year 3. This will confirm that agricultural land and forestry has been appropriately reinstated, and that access has been maintained in line with the Commitments.
- There are several mitigation measures that relate specifically to the protection of the groundwater and surface water through the lining of road drainage features, detention basin and swales. No issues were found during the One Year Evaluation. A more detailed review is required for

mitigation item G11, which relates to the monitoring of ground gases in confined spaces before entry in specific locations.

- Mitigation for the water environment primarily comprises the implementation and operation of Sustainable Urban Drainage Systems (SUDS) for receiving waterbodies and provision of appropriate compensatory flood storage. Due to COVID-19 and restrictions placed on non-essential travel between March and May, it was not possible to carry out site visits to observe the mitigation measures, so a desk-based appraisal was undertaken instead. On review of the available as-built drawings, it was possible to confirm that the construction of SUDS and compensatory flood storage met the requirements noted in the ES. Some mitigation relates to the maintenance of scheme drainage such as detention basins, culverts, filters etc. so site visits will be necessary to observe that drainage is being maintained, inspected appropriately and performing adequately. Drainage mitigation at the Dolphinton Burn and Firth of Forth should be confirmed, either through site visits or when as-built drawings are available for review.
- Terrestrial and freshwater ecology mitigation is largely satisfactory; however, some measures will require site visits to determine if they have been implemented effectively such as to check that detention basins, culverts, filter drains, swales and catchpits have been maintained appropriately.
- In relation to visual and landscape mitigation, the ES requires that landscaping planting and the creation of new habitats have been undertaken to promote plant survival, growth and establishment throughout the Scheme and to reinstate habitat lost during the temporary works. As-built drawings and the review of street view and aerial imagery generally shows the presence of landscape planting and habitat creation; however, it is recommended that spot checks are undertaken as part of the detailed evaluation to verify that mitigation has been effective. In some cases, it was not possible to confirm whether planting is present and adequate along the M9, M9 Spur and A90 near Dundas Estate and it is recommended that site visits are undertaken at the detailed evaluation.
- Air quality operational mitigation measures were not identified in the ES. However, as part of this evaluation at year 1, the forecast and post-opening traffic volumes have been reviewed. It should be noted that some local roads in South Queensferry, particularly the A904 Builyeon Road and B924 Bo'ness Road, have forecast traffic volumes lower than the post-opening traffic volumes; indicating there is more traffic on both roads than forecast at the time of appraisal. This may have an impact on local air quality; however, it is recommended that further assessment is undertaken at the year 3 and year 5 evaluations to better understand any impacts the scheme has had on local air quality. It is noted that the removal of general traffic from the A9000 is very likely to have had a positive impact on the local air quality in South Queensferry.

- Mitigation for Estuarine Ecology, Noise and Vibration, Cultural Heritage and Pedestrians, Cyclists, Equestrians and Community Effects was found to be performing adequately.

9.8 Commitments – Environment

Commitment (environment) 1: Ministers, when taking such action in relation to a tree or shrub, must make reasonable efforts to avoid unnecessary damage to the tree or shrub.

- 9.8.1 During the construction phase of the project, it is possible that damage to trees and shrubs may have occurred which was considered to be avoidable. As part of this evaluation, Transport Scotland was contacted for any records relating to unnecessary damage to trees or shrubs, including the total number of enquiries or complaints about a tree or shrub damage outside of the Act limits and the total number of non-conformance reports associated with the same concern. Transport Scotland confirmed that no non-conformance reports have been raised to date in relation to unnecessary damage to trees or shrubs. It is therefore considered that the project has met environment commitment 1.

Commitment (environment) 2: Ministers must take all reasonably practicable steps— (b)— to remedy any damage they cause while on such land.

- 9.8.2 For clarity, this commitment refers to the temporary possession of land under section 37 of the Act (land specified in schedule 10 of the Act) and the power to enter any land for other purposes under section 38 of the Act (e.g. land surveys, archaeological investigations, maintenance works under section 15(7)). Transport Scotland was contacted for information on steps taken to rectify any damage to land caused while on such land. It is understood through speaking to Transport Scotland that all temporary land which has been returned has now been remediated to the satisfaction of the landowner. Transport Scotland has, however, confirmed that the temporary land for the Principal Contract, such as the site compound area, have not yet been reinstated. It is therefore considered that the project is on track to meet environment commitment 2.

Commitment (environment) 3: Ministers must do everything which is reasonably practicable in order to ensure that the environmental impact of the construction and operation of the Forth Crossing works is not worse than the residual impact identified in the environmental statement.

- 9.8.3 The construction phase has been largely scoped out of this initial evaluation at year 1. Designers and contractors will have taken responsibility for compliance with the ES for example, through the implementation of appropriate environmental management and appropriate design of mitigation measures. Any change to the project design was required to go through a process of environmental assessment to ensure that the residual impacts

were no worse than those assessed in the ES. By commissioning this evaluation at year 1, with subsequent detailed evaluations at year 3 and at year 5 to follow, Transport Scotland is taking steps to demonstrate that the project conforms to environmental requirements set out in the ES. It is therefore considered that the project is on track to meet environment commitment 3.

Commitment (environment) 4: Pedestrian and cyclist access will be maintained to the south west of South Queensferry along the A904 Builyeon Road and the U221 Builyeon Road via dedicated footpath/cycleways through the relocated South Queensferry Junction.

- 9.8.4 New sections of footpaths, cycleways and safe crossing points have been integrated as part of the road network. These features include new and enhanced facilities for pedestrians and cyclists have been provided at the A904 around the Queensferry Junction and on a section of the B800 from Dundas northwards; cyclists are permitted to use the bus lanes on the B800; and a footway / cycleway in Echline Fields passes under the Queensferry Crossing to provide an alternative rural means of crossing the M90 in the vicinity of the Queensferry Junction. It is therefore considered that the project has met environment commitment 4.

Commitment (environment) 5: The removal of through traffic from South Queensferry will deliver improvements in air quality for large parts of the local community.

- 9.8.5 The impacts on local air quality as a result of the proposed scheme were generally forecast to be very small, therefore no mitigation measures were proposed in the ES with respect to operational traffic.
- 9.8.6 The introduction of the FRC should mean that some through traffic in areas of South Queensferry is removed, therefore, in theory lower volumes of traffic should result in lower concentrations of nitrogen dioxide, oxides of nitrogen and fine particulate matter being released to the local atmosphere. The relocation of general traffic from the A9000 to the Queensferry Crossing is very likely to have had a positive impact on the local air quality in South Queensferry.
- 9.8.7 The post-opening traffic flow volumes have been compared with the forecast volumes from the ES for major and minor roads in South Queensferry. Forecast traffic flow volumes are all higher than the actual post-opening volumes for the A904 at Newton, the M90 between M9 Junction 1A and M90 Junction 1 and the M90 Queensferry Crossing itself, thus there is less traffic on these roads than forecast at the appraisal stage. However, for some of the local roads around South Queensferry – namely the A904 Builyeon Road and B924 Bo'ness Road – the forecast traffic volumes are lower than the post-opening volumes meaning that there is more traffic on both roads than forecast.

- 9.8.8 When the actual pre-opening traffic volumes are compared to the post-opening traffic volumes (i.e. the actual number of vehicles recorded in 2014 (pre-opening) and in 2018 (post-opening)), there is no change in traffic volumes on the A904 Builyeon Road, whereas for the B924 Bo'ness Road there is an increase in traffic volume of +2,700 (73%).
- 9.8.9 It is considered that the project is on track to meet environment commitment 5; however, it is recommended that further assessment is undertaken to better understand the impacts on local air quality in South Queensferry.

Commitment (environment) 6: One of main objectives of the scheme is to minimise, where possible, the impact on people and the natural and cultural heritage of the Forth area.

- 9.8.10 Section 2 of the CoCP described the measures relating to community engagement and public information, including engaging proactively with the public, notification regarding construction works and dealing with enquiries and complaints. The CoCP further sets out the measures taken to protect the environment throughout the construction phase of the project, namely the protection of the water environment, pollutant incident planning, ecological protection, noise and air quality management and cultural heritage management. This year one evaluation has found (within the limitations in Section 9.4) that the majority of environmental mitigation measures have been implemented successfully. It is therefore considered that the project is on track to meet environment commitment 6. NB environment commitment 6 is the same as Transport Planning Objective 8 (TPO 8).

Commitment (environment) 7: Appropriate landscape mitigation will aim to provide a suitable level of visual screening and integration with the surrounding landscape.

- 9.8.11 ES Figure 12.4 Landscape and Ecological Mitigation illustrates that visual screening has been incorporated into the scheme and includes a range of features along the northern and southern routes. This initial evaluation at year 1 has confirmed that the majority of these landscape mitigation features are indeed present. It is therefore considered that the project has met environment commitment 7.

Commitment (environment) 8: The landscape and visual mitigation for the proposed scheme will respect the integrity of the surrounding landscape by reflecting and endorsing the character of the adjacent landform, land use, pattern and vegetation.

- 9.8.12 A review of the landscape and visual mitigation has been conducted as part of this evaluation at year 1 (refer to Landscape and Visual sub-objectives). The evaluation has shown that mitigation has largely been found to be implemented, including scrub and mixed woodland planting and grass planting to integrate the FRC project with the landscape. The planting of trees to replace lost trees and mark the transition to urban character at the A90 has

been implemented. It is therefore considered that the project has met environment commitment 8.

Commitment (environment) 9: Where lighting is required, the lighting scheme will be appropriately designed to seek to reduce or avoid excessive, unnecessary and obtrusive lighting whilst achieving the necessary safety standards and minimising intrusiveness from spillage, glare and reflection.

9.8.13 With respect to the mainline lighting design, Transport Scotland confirmed that the Contractor was required to utilise the British Standard BS 5489-1:2013 – Code of practice for the design of road lighting. This enabled further efficiencies to be developed within the lighting design and resulted in a lesser lighting class being utilised in some areas relative to that envisaged at the start of the construction phase of the project. It is understood that Transport Scotland is satisfied that the lighting scheme is sufficient. It is therefore considered that the project has met environment commitment 9.

Commitment (environment) 10: Planting will typically include native species of local provenance.

9.8.14 Landscape and visual mitigation measures in the ES specifically relate to enhancing biodiversity and conserving the integrity of existing habitats by planting primarily native species of local provenance. The available aerial and street view imagery has largely confirmed that planting has been undertaken where required by the ES; however, visits to site to confirm that the appropriate native species have been planted have not been possible at the time of writing due to the restrictions imposed by the COVID-19 lockdown. Site visits be undertaken as part of the detailed evaluation at year 3 (subject to COVID-19 restrictions) in addition to the review of nursery certificates to confirm that planting is of local provenance, where required. It is therefore considered that the project is on track to meet environment commitment 10.

Commitment (environment) 11: Intelligent Transport Systems such as variable speed limits will also be provided to manage and improve the flow of traffic on the network with associated benefits for emissions and air quality.

9.8.15 The FRC Project includes the provision of Intelligent Transport Systems (ITS) along the full length of a “Managed Motorway Corridor” from the M90 Halbeath Junction over the Queensferry Crossing to the M9. The ITS was not fully implemented, fully operational (automated) and fully optimised over the reporting period for the 1YA evaluation. At this stage, therefore, it is too early to consider any notable effects of the ITS on the operational efficiency of the network. It is recommended that performance of the project against commitment 11 is assessed as part of the detailed evaluation. It is therefore considered too early to conclude whether the project is on track to meet, or has met, environment commitment 11.

Commitment (environment) 12: The design of the lighting system will ensure that lighting is sensitive and focuses on enhancing the appearance of the bridge rather than being overly intrusive.

9.8.16 The appearance of the Queensferry Crossing has been a major consideration in the FRC design and has become the most visually prominent element of the project. The Queensferry Crossing features as a local and distant structure and the lighting has been considered in terms of practical safety, light pollution of the nights sky and aesthetics. However, the ES does not focus specifically on the aesthetics of the lighting on the crossing. A future site visit during the year 3 evaluation should provide a view on the FRC lighting and whether it is sensitive and enhances the appearance of the bridge (rather than diminishing it). It is therefore considered that the project is on track to meet environment commitment 12.

Commitment (environment) 13: Pedestrian and cyclist access will be maintained between Rosyth, Ferrytoll and Inverkeithing. Specific pedestrian and cyclist crossing facilities will be included at Ferrytoll Junction. The roundabout will be traffic signal controlled with pedestrian and cyclist phases activated on an on-demand basis.

9.8.17 The Stage 3 Cycle Audit concluded that the cycling provision on the Ferrytoll Gyratory, South Queensferry Gyratory and the surrounding network provides a safe and continuous shared path that allows cyclists to travel through the gyratories away from the motorised traffic with designated crossing facilities. It is therefore considered that the project has met environment commitment 13.

10 Cost to Government

10.1 Introduction

- 10.1.1 This section covers both outturn costs and the potential impact that cost and benefit changes between forecast and actual situations may have on key project economic indicators.
- 10.1.2 The Public Sector Investment Costs criteria provides, at the simplest level, a comparison of forecast versus outturn costs at year 1. In the detailed evaluations at year 3 and year 5, investment costs would be disaggregated into component elements (where data is available) and updated, as required. This should allow for a re-assessment of project Present Value of Costs (PVC), and hence Benefit to Cost Ratio (BCR) provided the spend profile is also available.
- 10.1.3 The detail reported in the project benefit section (see Present Value of Benefits (PVB) below) is closely linked to the extent of evidence gathered in the benefits sections of the main evaluation framework, as discussed in earlier chapters. Typically, therefore, at year 1, only an indicative direction of change is possible in PVB terms, but with running the economic models in year 3 and year 5 a more detailed re-assessment should be possible. The focus of the evaluation at year 1 is on elements that provide the greatest contribution to the PVB, namely the level of travel demand and journey time benefits.

10.2 Public Sector Investment Costs

- 10.2.1 A comparison between the forecast and outturn project costs is shown in Table 15 below. The outturn cost of the FRC Project was approximately 8% - 16% lower than what was forecast at the start of construction.

Table 15: Comparison of Project Costs

Assessment	Timescale	Project Cost ²⁵
Initial Forecast	Appraisal Stage	£3.2bn to £4.2bn
Forecast	Start of Construction	£1.45bn to £1.6bn
Outturn	Project Completion	£1.34bn
	Out-turn vs Forecast at start of construction	£110m to £260m lower, or 8% to 16% lower

²⁵ Source: <https://www.audit-scotland.gov.uk/report/forth-replacement-crossing>

Discussions with project Employer's Delivery Team (EDT)

10.2.2 Discussions were held with members of the Employer's Delivery Team to better understand reasons for variances in the project costs. It was highlighted that the initial cost estimate of between £3.2bn and £4.2bn derived during the Forth Replacement Crossing Study (2007) was reduced by half following the process of Value Engineering. It was also highlighted that the decision to retain the Forth Road Bridge as a dedicated Public Transport Corridor allowed for a substantial reduction in the cost of the overall project, by reducing the scale and cost of the new Queensferry Crossing.

10.3 Present Value of Transport Benefits

10.3.1 The economic appraisal results for the project estimated a range in Present Value of Benefits (PVB) based on the benefits associated with the basic scheme elements and a series of sensitivity illustrations. PVB ranged from £675.6m to £1.14bn (in 2002 prices) and the Benefit to Cost Ratios (BCRs) ranged from 1.34 to 2.03²⁶. The PVB of the project may be lower than estimated at the time of the appraisal, primarily due to journey time benefits forecast at appraisal stage being greater than the post-opening journey time benefits as discussed in Section 8.4.4 Further, detailed analysis under the Cost to Government criteria is recommended to be undertaken as part of the detailed evaluations at year 3 and year 5.

10.4 Cost to Government – Key Findings

10.4.1 The Present Value of Benefits may be lower than estimated at the time of appraisal although the project is continuing to provide benefits to transport users. With the outturn cost of the project being lower than what was forecast at appraisal stage, a more detailed assessment of costs and benefits is recommended at Year 3 and Year 5 to understand the scale of change on Net Present Value (NPV) and BCR.

²⁶ Source: https://www.transport.gov.scot/media/3715/frc_stage_3_scheme_assessment_report_part_2_v3_final.pdf

11 Working Towards Achievement of Objectives

11.1 Evaluation Summary

11.1.1 This report has documented the performance of the Forth Replacement Crossing (FRC) Project one year after opening and is the first in a series of documents that will present the findings of the FRC Project Evaluation in accordance with Scottish Trunk Road Infrastructure Project Evaluation (STRIPE) methodology. This final chapter summarises the project's progress towards achieving its Objectives as well as the Forth Crossing Commitments.

11.2 Performance against Transport Planning Objectives

ON TRACK TO ACHIEVE TPO 1: To maintain cross-Forth transport links for all modes to at least the level of service offered in 2006.

- 11.2.1 An assessment of the level of service offered post-opening has been undertaken, including reliability, time and safety.
- Pre- and post-opening journey times and journey time reliability for general road traffic shows increases to varying levels of degree and low variance in day-to-day journey times across all routes and time periods. The post-opening journey times across the Queensferry Crossing are similar to the journey times for traffic that previously routed via the FRB with increases of up to one minute in the weekday morning and evening peaks. Whilst increases have occurred, they are considered relatively small and reflect the increasing trend in traffic volumes across this part of the road network as well as the increase in the distance travelled (approximately 1.3km) when comparing the new road layout (traffic using the Queensferry Crossing) with the old road layout (traffic using the FRB).
 - An initial assessment of accident statistics shows fewer road accidents overall have been recorded (NB the analysis of accident data will be revisited as part of the detailed evaluation at year 3 which will consider the number of accidents pre- and post-opening over a longer timeframe to provide a more meaningful comparison than has been possible at this stage) and results from the Benefits Realisation Research Public Survey have shown that safety amongst transport users is most satisfactory on all parts of the network that were included in the survey.
 - The advanced wind shielding technology on the Queensferry Crossing has undoubtedly improved network resilience and reliability during times of bad weather. It has remained open to high-sided vehicles and HGVs on over 60 days when the Forth Road Bridge could have been closed or restricted. Feedback from consultation, including the business survey, which highlighted reduced disruption during times of high winds as a positive (minor) impact on business operations, and from stakeholder

organisations that participated in the telephone interviews highlighting wind shielding as a benefit to their organisation.

- Consultation with bus operators has highlighted that the dedicated public transport corridor has increased the overall attractiveness of public transport cross-Forth. Morning peak bus journey times have decreased and the demand for bus travel has increased substantially, resulting in new routes being created and service enhancements between Fife and Edinburgh.

ON TRACK TO ACHIEVE TPO 2: To connect to the strategic transport network to aid optimisation of the network as a whole.

11.2.2 An assessment of project corridor and the wider road network has been undertaken, including an assessment of the success of Public Transport initiatives.

- Several PT interventions have been delivered as discussed in earlier chapters and the positive impact on public transport cross-Forth is clear: morning peak bus journey times have decreased; the number of bus passengers has increased; and the service offering has greatly improved.
- An assessment of pre- and post-opening journey times and journey time reliability for general road traffic has also been undertaken. The assessment indicates most routes have experienced journey time increases ranging from less than one minute up to seven minutes – traffic using the Queensferry Crossing has experienced a journey time increase at the lowest end of this range; traffic has also experienced low variance in day-to-day journey times across all routes and time periods; and fewer road accidents overall have been recorded.
- Discussions with the Forth Bridges Operating Company (FBOC) has highlighted that several speed cameras are not yet operational; however, work with Police Scotland is ongoing in this regard which will improve safety in the future.
- Supporting infrastructure such as hard shoulders and advanced wind shielding technology on the new Crossing has improved network resilience and reliability. The FRC Project includes the provision of Intelligent Transport Systems (ITS) along the full length of a “Managed Motorway Corridor” from the M90 Halbeath Junction over the Queensferry Crossing to the M9. The ITS was not fully implemented, fully operational (automated) and fully optimised over the reporting period for the 1YA evaluation. At this stage, therefore, it is too early to consider any notable effects of the ITS on the operational efficiency of the network. However, results from the Benefits Realisation Research Public Survey (provided in Appendix D to this report) have shown that satisfaction has increased significantly with all aspects of the ITS system. FBOC has also highlighted that traffic operations through the Forth corridor have improved as a result

of the ITS system, including reduced traffic delays and quicker recovery times when incidents or accidents occur.

ON TRACK TO ACHIEVE TPO 3: To improve the reliability of journey times for all modes of transport.

11.2.3 An assessment of pre- and post-opening journey time reliability for general road traffic has been undertaken which indicates:

- Low variance in day-to-day journey times by road across all routes and time periods. It should be noted that whilst journey times are, on the whole, slightly more variable one year after opening, including on the Queensferry Crossing, ITS was not fully implemented, fully operational (automated) and fully optimised over the reporting period for the 1YA evaluation. At this stage, therefore, it is too early to consider any notable effects of the ITS on the operational efficiency of the network.
- As already mentioned above, the wind shielding on the Queensferry Crossing has improved network resilience and, hence, reliability during times of bad weather. Anecdotal evidence from bus operators has confirmed decreases in journey times through the Forth corridor (and validated through TRACC analysis) and improved punctuality of services.

ON TRACK TO ACHIEVE TPO 4: To increase travel choices and improve integration across modes of transport to encourage modal shift of people and goods.

11.2.4 A comparison between pre- and post-opening public transport patronage, pedestrian and cyclist movements has been undertaken.

- The public transport corridor is operating successfully. Analysis of both Halbeath and Ferrytoll Park and Ride sites usage shows an increase in popularity since the opening of the Queensferry Crossing; bus journey times cross-Forth have improved and the number of buses using the FRB has steadily increased over time.
- Results from the Benefits Realisation Research Public Survey have shown that of those who have changed their travel behaviour following the opening of the new Crossing, travel mode was the most common change with a significant percentage (74%, n=16) using the bus more often.
- Anecdotal evidence from stakeholder consultation has highlighted that there has been a shift from One Ticket to Smart Ticketing (PTS strategy intervention no.18), although there is a move towards contactless payments rather than use of smart cards.
- In terms of active travel, the Stage 3 Cycling Audit concluded that the cycling provision on the Ferrytoll Gyratory, South Queensferry Gyratory

and the surrounding network provides a safe and continuous shared path that allows cyclists to travel through the gyratories away from the motorised traffic with designated crossing facilities. North Queensferry Community Council raised some safety concerns, particularly around the Ferrytoll Gyratory.

- At this stage, it has not been possible to undertake a comparison between pre-opening and post-opening freight transportation due to availability of data. It is recommended that this assessment, should data become available, is undertaken as part of the detailed evaluation.

ON TRACK TO ACHIEVE TPO 5: To improve accessibility and social inclusion.

11.2.5 An assessment of the re-configured road network and changes to public transport and provision for Non-Motorised Users has been undertaken to establish the accessibility benefits generated as a result of the project.

11.2.6 In terms of accessibility, this includes an assessment of pre- and post-opening journey times for general road traffic.

- The assessment shows that most routes have experienced journey time increases of less than one minute up to seven minutes (largest increases are on selected routes immediately to the west of Edinburgh) across all routes and time periods. Traffic using the Queensferry Crossing has experienced a journey time increase of up to one minute in the weekday morning and evening peaks.
- With traffic removed from the Forth Road Bridge, the experience for pedestrians and cyclists is greatly improved, aligning well with some of the feedback from the Community Council questionnaire. The cycle audit identified some issues and so has North Queensferry Community Council with regard to some safety concerns. It is recommended that as part of the detailed evaluation at year 3 confirmation is sought that mitigating actions have been addressed.
- Bus operators have improved routes and service frequency after the opening of the new Crossing, for instance Stagecoach on its Fife to Edinburgh route, resulting in significant increases in passenger numbers cross-Forth.
- Most bus journey times from chosen Fife settlements to large employment areas in West Lothian and Edinburgh have improved indicating that the public transport corridor is performing well. Access to these same employment areas by road shows an increase in journey times, particularly to employment in Edinburgh; however, increases may be influenced by wider road network conditions beyond the extents of the new Crossing.

11.2.7 In terms of social inclusion:

- Fewer road accidents overall have been recorded (NB the analysis of accident data will be revisited during the three years after evaluation which will consider the number of accidents pre- and post-opening over a longer timeframe to provide a more meaningful comparison than has been possible at this stage).
- No operational mitigation is required for air quality as set out in the Environmental Statement and, as such, air quality mitigation has not been assessed in this initial evaluation at year 1. However, it is recommended that a review of air quality is undertaken as part of the detailed evaluation at year 3.

ON TRACK TO ACHIEVE TPO 6: To minimise the impacts of maintenance on the effective operation of the transport network.

11.2.8 An assessment of the consequential effects experienced as a result of road and bridge maintenance requiring traffic management within the project corridor, and incident or accident occurrence has been undertaken.

- Whilst an assessment of pre- and post-opening journey times and journey time reliability for general road traffic shows increases to varying levels of degree and low variance in day-to-day journey times across all routes and time periods, there have been very few incidents or accidents on the new Crossing or surrounding network. Since December 2019, there has been, in effect, no traffic management in place resulting from maintenance works. This means that there are other causal factors, as highlighted in Chapter 7, Section 7.1.3, influencing the changes in road journey times and journey time reliability.
- The effectiveness of the road network in dealing with the effects of maintenance, incident or accident, whilst minimising impact to other road users was discussed with FBOC. It was highlighted that repair work can be carried out on the FRB throughout the day (with associated safety and time benefits) and with a contraflow permanently in place, there has been no disruption to traffic. FBOC also highlighted that traffic operations through the Forth corridor have improved as a result of the ITS system, including reduced traffic delays and quicker recovery times when incidents or accidents occur – results from the Benefits Realisation Research Public Survey have shown that satisfaction has increased for effectiveness of incident response, from 64% (n=774) satisfied in 2013 to 87% [n=841] in 2020.
- The supporting infrastructure on the new Crossing has been designed for reduced maintenance and minimal disruption during maintenance and repairs. This infrastructure includes Structural Health Monitoring System (SHMS) and Supervisory Control and Data Acquisition (SCADA) systems that will help maximise the life of the Queensferry Crossing by targeting

maintenance timeously, which can be largely undertaken with minimal traffic disruption – for example, cable replacement from within the bridge towers.

- With no material impact on traffic operation as a result of incidents or accidents, nor during ongoing repair work on the FRB, it is judged, at this stage, that no consequential effects have been experienced requiring traffic management within the Forth corridor.

11.2.9 *NB it is recognised that there have been incidents of closure of the Queensferry Crossing related to the risk of falling ice which sit outside of the one year after opening evaluation period.*

TOO EARLY TO ASSESS WHETHER PROJECT IS ON TRACK TO ACHIEVE TPO 7: To support sustainable development and economic growth.

11.2.10 An assessment of changes in travel patterns encompassing increased use of public transport modes and improved bus journey time accessibility has been undertaken to contribute to the understanding of impacts of the project on economic development.

- As discussed in Chapter 8, notable impacts of the Agglomerative and Labour Market effects are unlikely to emerge in any measurable form in the one to five-year time horizon linked to evaluations undertaken in line with STRIPE. However, a business survey has been undertaken to establish whether the project has had any early impact (positive or negative) on the activities and interests of businesses. A range of businesses have taken part in the survey, predominantly located in Kirkcaldy, Rosyth, Dunfermline, South Queensferry and Edinburgh. On balance, the feedback indicates that the FRC Project has had a negative (small) impact on the operation and performance needs of businesses. The feedback also indicates that there has been no measurable improvement in access to the labour market or existing / new potential suppliers or business competition at this early stage of evaluation, which was, to a degree, anticipated given the likely timescales above. Of particular note, however, reduced disruption during times of high winds was raised as a positive (minor) impact on business operations and so was commuting by bus into Edinburgh city centre, but traffic volumes and journey times at peak times was raised by a small number of businesses as being no better than before.
- As discussed in Chapter 5, there is strong evidence of the Public Transport Strategy realising success for the dedicated Public Transport Corridor and supports the Scottish Government's purpose of increasing sustainable economic growth.
- Morning peak bus journey times and reliability across the Firth of Forth have improved, including journey times from selected settlements in Fife to large employment areas in Edinburgh and West Lothian.

- Bus operators are reporting increases in patronage, for instance Stagecoach East Scotland which has highlighted several contributing factors to growth on the public transport corridor such as the ongoing marketing campaign, improved service offering and completion of bus priority measures.
- Demand at both Ferrytoll and Halbeath Park & Ride sites has steadily increased over time and the number of buses using the Forth Road Bridge has also steadily increased following the opening of the Queensferry Crossing.

ON TRACK TO ACHIEVE TPO 8: To minimise the impact on people, and the natural and cultural heritage of the Forth area.

11.2.11 This objective is the same as Environment Commitment 6. The performance of the project against this objective / environment-related commitment is discussed in Chapter 9, Section 9.8.10.

11.3 Performance against Forth Crossing Commitments – Traffic

11.3.1 The assessment of the project's performance against traffic-related Commitments draws upon some of the same operational indicators and analysis presented in Chapter 7 and outcomes from the stakeholder consultation that have informed the assessment of performance against objectives, as summarised in Section 11.2 above. This, therefore, results in some of the same conclusions being drawn in both assessments.

Commitment (traffic) 1: The Scottish Government has made a commitment that the Forth Replacement Crossing project will replace but not increase the road provision for general traffic across the Firth of Forth.

11.3.2 The project has provided a new cable-stayed bridge (the Queensferry Crossing) with two general lanes for traffic and a hard shoulder in each direction – the new Crossing is now used as the primary route for traffic across the Firth of Forth. Before the Queensferry Crossing opened to traffic in August 2017, the Forth Road Bridge (FRB) was the primary route for traffic cross Forth. It also provided two lanes in each direction for general traffic. It is clear, there has been no step change in capacity, or increase in road provision, for general traffic cross Forth from the time the FRB was used as the primary crossing. **It is therefore considered that the project has met Commitment (traffic) 1.**

Commitment (traffic) 2: The junction on the proposed scheme at South Queensferry has been relocated to connect to the A904 to the west of the town. This will reduce the volume of traffic travelling along the A904 on Builyeon Road between the Bo'ness Road Junction and Echline Roundabout.

- 11.3.3 An assessment of pre- and post-opening traffic volumes has been undertaken, as discussed in Chapter 7, Section 7.2.
- 11.3.4 This assessment has shown that there has been no material change in the volume of traffic at this location. A further review of the traffic volume at this location will be undertaken as part of the detailed evaluation at year 3, which will consider change over a longer post-opening timescale. The initial evaluation at year 1 has shown no reduction in traffic at this location, although there has been no resulting increase in traffic overall. Therefore, it is recommended that this is considered further at the detailed evaluation stage. [At this early stage, it is therefore considered too early to assess if the project has met Commitment \(traffic\) 2.](#)

Commitment (traffic) 3: The use of Intelligent Transport Systems, improvements to junctions and the inclusion of hard shoulders and wind shielding on the Forth Replacement Crossing will improve operational efficiency, smooth traffic flow and create a maintenance reserve.

Commitment (traffic) 4: Intelligent Transport Systems including variable speed limits will be used to improve the flow of traffic on the proposed scheme, including the M9, and it is anticipated that this will result in some improvement to the operation of Newbridge roundabout by managing the flow of traffic towards the junction. In conjunction with this improvement, the M9 will be widened between Junction 1a and Junction 1 at Newbridge junction to ensure that traffic flow will not be adversely affected along this section of the M9 due to the proposed scheme.

Commitment (traffic) 5: Implementation of Intelligent Transport Systems will manage the flow of traffic towards the junctions to ensure that the performance of the junction is optimised.

Commitment (traffic) 6: Intelligent Transport Systems such as variable speed limits will be used to control the speed and flow of traffic on the main M90 carriageway and the flow of traffic merging from the slip roads. This will improve the operation of the existing and proposed roads on the M90 as far north as Halbeath Interchange.

Commitment (traffic) 7: Whilst there will, therefore, be changes in traffic patterns, these are not anticipated to have a substantial adverse effect on local trips.

Commitment (traffic) 8: Intelligent Transport Systems will be provided as part of the proposed scheme and it is intended that these will also be in place during the construction period to manage and improve the flow of traffic on the network and reduce congestion.

- 11.3.5 For traffic-related Commitments 3 to 8, an assessment of pre- and post-opening journey time variability, including evaluation of the bus hard shoulder running schemes and the ITS system as a whole, and a comparison of

disruption due to incidents on the FRB and Queensferry Crossing has been undertaken. This has shown that:

- Journey times are, on the whole, slightly more variable one year after the opening of the Queensferry Crossing; again, it should be noted that ITS was not fully implemented, fully operational (automated) and fully optimised over the reporting period for the 1YA evaluation. At this stage, therefore, it is too early to consider any notable effects of the ITS on the operational efficiency of the network. This will be reviewed further as part of the detailed evaluation at year 3.
- The advanced wind shielding technology on the new Crossing has undoubtedly improved network resilience and reliability of cross Forth travel, particularly during times of bad weather – the Queensferry Crossing has remained opened to high-sided vehicles and HGVs on over 60 days when the Forth Road Bridge could have been closed or restricted. Feedback from consultation, including the business survey, which highlighted reduced disruption during times of high winds as a positive (minor) impact on business operations, and from stakeholder organisations that participated in the telephone interviews highlighting wind shielding as a benefit to their organisation.
- The supporting infrastructure on the new Crossing has been designed for reduced maintenance and minimal disruption during maintenance and repairs. This infrastructure includes hard shoulders and systems that will help maximise the life of the Queensferry Crossing by targeting maintenance timeously, which can be largely undertaken with minimal traffic disruption – for example, cable replacement from within the bridge towers.
- Results from the Benefits Realisation Research Public Survey have shown that satisfaction has increased significantly with all aspects of the ITS system along the full length of the managed motorway corridor, particularly lane discipline of other drivers (increasing from 55% [n=665] satisfied in 2013 to 91% [n=1,173] in 2020); drivers obeying the speed limit (increasing from 53% [n=641] satisfied in 2013 to 86% [n=1,166] in 2020); and effectiveness of response when there is an incident (increasing from 64% [n=774] satisfied in 2013 to 87% [n=841] in 2020). FBOC has also highlighted that traffic operations through the Forth corridor have improved as a result of the ITS system, including reduced traffic delays and quicker recovery times when incidents or accidents occur.
- As discussed in Chapter 5, Section 5.5.9, consultation with Stagecoach East Scotland and Scottish Citylink highlighted that the M90 bus lane hard shoulder running (Public Transport Strategy interventions 3 and 8) has been very successful from a public transport perspective. With regard to hard shoulder running on the M9, Stagecoach highlighted that journey time penalties are avoided from Ferrytoll to Edinburgh Airport via Newbridge, which is contributing to its success.

11.3.6 It is therefore considered that the project is on track to meet traffic-related Commitments 3 to 8 inclusive.

11.4 Performance against Forth Crossing Commitments – Environment

11.4.1 This initial evaluation at year 1 has concluded that the project is on track to meet, or has met, the majority of Environment Commitments. The performance of the project against Commitments relating to the Environment is discussed in Chapter 9, Section 9.8.

11.5 Next Steps

11.5.1 The subsequent project evaluations in line with STRIPE methodology at year 3 and year 5 will consider the projects impacts in the context of data gathered over a longer post-opening timescale. In addition to reviewing some of the elements covered by this initial evaluation at year 1, the detailed evaluations will provide a greater focus on whether the project has achieved its Objectives and Commitments, and whether the benefits attributed to the project are continuing to be realised.

Appendix A: Data Sources

Background Data and Information (pre-opening) – reports, models and drawings etc. from the appraisal / assessment phases.

- Forth Replacement Crossing Study (2007)
- Forth Replacement Crossing DMRB Stage 3 Scheme Assessment Report (2009)
- Forth Crossing Bill Policy Memorandum, 2009
- FRC Performance and Compliance Measurement Monitoring and Evaluation Plan, 2013
- Forth Replacement Crossing Ecological Mitigation Report 2019 by Jacobs Arup
- Forth Replacement Crossing Code of Construction Practice Rev 5 December 2010 by Transport Scotland
- Principal Contract Construction Environmental Management Plan 2012 by FCBC
- M9 Junction 1a Construction Environmental Management Plan 2012 by Sisk Roadbridge
- Fife ITS Construction Environmental Management Plan 2012 by Graham (Dromore) Ltd
- Historic building / structures records and survey reports (various)

Background Data and Information (post-opening) – reports, drawings etc. from during and after the construction phase.

- Forth Replacement Crossing Refreshed Public Transport Strategy, 2012
- Aerial imagery from Google Maps and Bing Maps
- Drainage as-built drawings for the Principal Contract and M9 Junction 1A by Jacobs-Arup
- Landscape as-built drawings for the Principal Contract by Jacobs Arup
- Post-opening noise assessments for the Principal Contract by Jacobs Arup
- Noise Liaison Group meeting minutes

- “Lessons Learned from the Forth Replacement Crossing Project 2007 to 2017”, 2020

Pre- and post-opening Evaluation Data – data gathered to reflect network conditions in the absence of the proposed scheme and updated for the evaluation period in question [e.g. as in this initial evaluation, one year after scheme opening]

- National Traffic Data System (NTDS)
- INRIX Roadway Analytics data
- Halbeath and Ferrytoll Park & Ride counts
- Police Scotland STATS19 reports (various)
- TRACC (GIS-based multimodal accessibility tool)
- Business Register and Employment Survey (BRES) data
- Audit Scotland Report, 2018
- Stage 3 Cycle Audit, 2018
- Stage 3 and Stage 4 Road Safety Audits, 2018 and 2019
- Transport Model for Scotland 05A (TMfS05A)

Appendix B: Forth Replacement Crossing - Business Survey

Introduction and Background

The Forth Replacement Crossing (FRC) Project is the project behind the Queensferry Crossing. The Project involved the construction of a new bridge, the Queensferry Crossing, to be used as the primary route across the Firth of Forth and development and upgrading of the connecting roads either side of the new bridge. The Project also included a supporting Public Transport Strategy developed for the existing bridge, creating a dedicated public transport corridor for buses, taxis, cyclists and pedestrians.

Stantec UK Limited is undertaking the FRC Project One Year After Evaluation on behalf of Transport Scotland. The primary aim of the evaluation is to gather and analyse evidence to understand, as far as is reasonably practical, whether or not the Project is operating as planned and is on track to achieve its objectives.

As part of the evaluation, we are undertaking a comprehensive stakeholder engagement exercise. We are very keen to hear your views as a business on if / how the Crossing has impacted on the activities and interests of your organisation. As such, we would appreciate you taking the time to complete this survey on behalf of your business. The survey should take no longer than 10 minutes to complete and you can return to complete it at any time by using the original link.

The deadline for completion is **Friday 20th March 2020**.

Please be assured that all responses will be anonymised. All responses received will be processed by Stantec UK Limited under Data Protection Rules. We will inform Transport Scotland that your business has participated in the research; however, we will not attribute any comments specifically to your business. No personal details or contact details will be passed to any other party.

Thank you for taking the time to complete this survey.

About your Business

1. What is the name of your business?

2. What is the primary activity of your business?

- Agriculture, Forestry and Fishing
- Mining, quarrying and utilities
- Manufacturing
- Construction
- Motor trades
- Wholesale
- Retail
- Transport and Storage
- Accommodation and Food Services (including tourism)
- Information and communication
- Financial and Insurance
- Property
- Professional, Scientific and Technical
- Business Administration and Support Services
- Education
- Health
- Public Administration
- Other (please specify)

3. Where are your business premises located?

4. What is the postcode of your business premises?

5. How long has your business operated from this location?

Less than 1 year

1 – 2 years

2 – 5 years

5 – 10 years

10+ years

6a. If you have located to your business premises recently, to what extent do you agree that the Forth Replacement Crossing Project was an influencing factor?

Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A / not a need of this business
Please explain:					

6b. If you have recently relocated, where was your business previously located?

7. How many full and part-time staff do you employ?

Impact of Forth Replacement Crossing Project on the activities and interests of your business

8. In general, has the Forth Replacement Crossing Project had a positive or negative impact on the operational and performance needs of your business?

Major negative	Moderate negative	Minor negative	No impact	Minor positive	Moderate positive	Major positive
Please explain:						

9. To what extent do you agree that the Forth Replacement Crossing Project has had a positive impact on your operational needs for the following purposes?

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A / not a need of this business
Staff commuting to/from work						
Meeting with customers or suppliers						
Travelling to other business branches						
Distribution /Movement of goods						
Please explain:						

10. To what extent do you agree that the Forth Replacement Crossing Project has increased the use of sustainable transport modes [e.g. bus, rail, walking or cycling] by your staff for commuting to and from work?

Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A / not a need of this business
Please explain:					

11. To what extent do you agree that the Forth Replacement Crossing Project has provided your business with improved access to existing and potentially new suppliers or other business functions across Edinburgh, the Lothians and Fife, or further afield?

Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A / not a need of this business
Existing suppliers:					
New suppliers:					
Please explain:					

12. To what extent do you agree that the Forth Replacement Crossing Project has provided your business with improved access to existing or new customers / markets?

Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A / not a need of this business
Existing customers / markets:					
New customers / markets:					
Please explain:					

13. To what extent do you agree that the Forth Replacement Crossing Project has improved your ability to recruit and retain staff?

Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A / not a need of this business
Please explain:					

14. To what extent do you agree that the Forth Replacement Crossing Project has made your business more competitive with other, similar businesses?

Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A / not a need of this business
Please explain:					

15. Please provide any further relevant information regarding how the Forth Replacement Crossing Project has affected the activities and interests of your business.

End of Survey

Next steps:

The information you have provided on behalf of your business will inform the One Year After Evaluation of the Forth Replacement Crossing Project. Specifically, your information will help us to determine how well the Queensferry Crossing is moving towards achieving its objectives.

On behalf of Stantec UK Limited and Transport Scotland we would like to thank you for completing this survey.

Please click the button below to exit the survey.

Appendix C: Community Council Questionnaire

Introduction and Background

The Forth Replacement Crossing (FRC) Project is the project behind the Queensferry Crossing. The Project involved the construction of a new bridge, the Queensferry Crossing, to be used as the primary route across the Firth of Forth and development and upgrading of the connecting roads either side of the new bridge. The Project also included a supporting Public Transport Strategy developed for the existing bridge, creating a dedicated public transport corridor for buses, taxis, cyclists and pedestrians.

Stantec UK Limited is undertaking the FRC Project One Year After Evaluation on behalf of Transport Scotland. The primary aim of the evaluation is to gather and analyse evidence to understand, as far as is reasonably practical, whether or not the Project is operating as planned and is on track to achieve its objectives.

As part of the evaluation, we are undertaking a comprehensive stakeholder engagement exercise to fully capture the wider criteria to be assessed. As a Community Council we are very keen to hear your views on how the Crossing has impacted on several network performance indicators such as journey times, congestion, journey time reliability, as well as enabling accessibility to key services, as representative of your local community.

We have prepared a short questionnaire below, which we would be grateful if you could complete on behalf of your community and return to us at the email address below. The questions are split by mode of travel (Active Travel, Bus, Park & Ride and Car) and by direction of travel (northbound and southbound). It is acknowledged that buses do not use the Queensferry Crossing, but journeys by bus have been affected by it.

If you have any questions you can also send them to the email address below.

Thank you for your cooperation and inputs. Your response will be very useful and appreciated.

PLEASE SEND COMPLETED QUESTIONNAIRE

BY FRIDAY 20 MARCH 2020

How to complete this questionnaire

This questionnaire can be completed electronically.

To answer the Yes or No questions, please click on the relevant box to the right.

To answer the questions related to the scale of change, please click on the box below the relevant number.

To provide further explanation, please fill in the box accordingly.

Key for scale:

Worsened			Stayed the same	Improved		
Major	Moderate	Minor	Neutral	Minor	Moderate	Major
-3	-2	-1	0	+1	+2	+3

For travel by **Active Travel modes** (walking and cycling) go to **Page 3**

For travel by **Bus** go to **Page 7**

For travel using **Halbeath Park & Ride** go to **Page 11**

For travel using **Ferrytoll Park & Ride** go to **Page 21**

For travel by **Car** go to **Page 31**

**If travelling by Active Travel modes (walking and cycling):
 For journeys southbound**

1. Do you think the **overall active travel experience** has changed since the Queensferry Crossing opened?

Yes	
No	

2. On a scale of -3 (worsened) to +3 (improved), how do you think the **overall active travel experience** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

3. Do you think **accessibility by active travel** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

4. On a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by active travel** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

5. Do you think **safety along walking and cycling routes**, in terms of pedestrian / cycling conflicts and / or accidents, has changed since the Queensferry Crossing opened?

Yes	
No	

6. On a scale of -3 (worsened) to +3 (improved), how do you think **safety along walking and cycling routes** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

7. Do you think **personal security along walking and cycling routes** has changed since the Queensferry Crossing opened?

Yes	
No	

8. On a scale of -3 (worsened) to +3 (improved), how do you think **personal security along walking and cycling routes** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

If travelling by Active Travel modes (walking and cycling):
For journeys northbound

9. Do you think the **overall active travel experience** has changed since the Queensferry Crossing opened?

Yes	
No	

10. On a scale of -3 (worsened) to +3 (improved), how do you think the **overall active travel experience** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

11. Do you think **accessibility by active travel** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

12. On a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by active travel** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

13. Do you think **safety along walking and cycling routes**, in terms of pedestrian / cycling conflicts and / or accidents, has changed since the Queensferry Crossing opened?

Yes	
No	

14. On a scale of -3 (worsened) to +3 (improved), how do you think **safety along walking and cycling routes** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

15. Do you think **personal security along walking and cycling routes** has changed since the Queensferry Crossing opened?

Yes	
No	

16. On a scale of -3 (worsened) to +3 (improved), how do you think **personal security along walking and cycling routes** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

If travelling by bus:

For journeys southbound

17. Do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Yes	
No	

18. On a scale of -3 (worsened) to +3 (improved), how do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

19. Do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Yes	
No	

20. On a scale of -3 (worsened) to +3 (improved), how do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

21. Do you think **bus journey time reliability**, that is the day-to-day variability in bus journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

22. On a scale of -3 (worsened) to +3 (improved), how do you think **bus journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

23. Do you think **accessibility by bus** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

24. On a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by bus** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

If travelling by bus:

For journeys northbound

25. Do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Yes	
No	

26. On a scale of -3 (worsened) to +3 (improved), how do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

27. Do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Yes	
No	

28. On a scale of -3 (worsened) to +3 (improved), how do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

29. Do you think **bus journey time reliability**, that is the day-to-day variability in bus journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

30. On a scale of -3 (worsened) to +3 (improved), how do you think **bus journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

31. Do you think **accessibility by bus** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

32. On a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by bus** to key services has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

If travelling using Halbeath Park & Ride:

For journeys southbound

33. Do you think the **attractiveness** of using Halbeath Park & Ride for onward travel by **bus** has increased since the opening of the Queensferry Crossing?

Yes	
No	

34. For onward travel by bus, do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Yes	
No	

35. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

36. For onward travel by bus, do you think **bus journey time reliability**, that is the day-to-day variability in bus journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

37. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **bus journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

38. For onward travel by bus, do you think **accessibility by bus** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

39. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by bus** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

40. For onward travel by bus, do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Yes	
No	

41. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **road traffic congestion** has changed since the Queensferry Crossing was opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

42. Do you think the **attractiveness** of using Halbeath Park & Ride for onward travel by **car share** has increased since the opening of the Queensferry Crossing?

Yes	
No	

43. For onward travel by car share, do you think **journey times by car** have changed since the Queensferry Crossing opened?

Yes	
No	

44. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **journey times by car** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

45. For onward travel by car share, do you think **car journey time reliability**, that is the day-to-day variability in car journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

46. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **car journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

47. For onward travel by car share, do you think **accessibility by car** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

48. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by car** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

49. Do you think **personal security at Halbeath Park & Ride** has changed since the Queensferry Crossing opened?

Yes	
No	

50. On a scale of -3 (worsened) to +3 (improved), how do you think **personal security at Halbeath Park & Ride** has changed since the Queensferry Crossing was opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

If travelling using Halbeath Park & Ride:

For journeys northbound

51. Do you think the **attractiveness** of using Halbeath Park & Ride for onward travel by **bus** has increased since the opening of the Queensferry Crossing?

Yes	
No	

52. For onward travel by bus, do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Yes	
No	

53. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

54. For onward travel by bus, do you think **bus journey time reliability**, that is the day-to-day variability in bus journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

55. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **bus journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

56. For onward travel by bus, do you think **accessibility by bus** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

57. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by bus** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

58. For onward travel by bus, do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Yes	
No	

59. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **road traffic congestion** has changed since the Queensferry Crossing was opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

60. Do you think the **attractiveness** of using Halbeath Park & Ride for onward travel by **car share** has increased since the opening of the Queensferry Crossing?

Yes	
No	

61. For onward travel by car share, do you think **journey times by car** have changed since the Queensferry Crossing opened?

Yes	
No	

62. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **journey times by car** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

63. For onward travel by car share, do you think **car journey time reliability**, that is the day-to-day variability in car journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

64. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **car journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

65. For onward travel by car share, do you think **accessibility by car** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

66. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by car** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

67. Do you think **personal security at Halbeath Park & Ride** has changed since the Queensferry Crossing opened?

Yes	
No	

68. On a scale of -3 (worsened) to +3 (improved), how do you think **personal security at Halbeath Park & Ride** has changed since the Queensferry Crossing was opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

If travelling using Ferrytoll Park & Ride:
For journeys southbound

69. Do you think the **attractiveness** of using Ferrytoll Park & Ride for onward travel by **bus** has increased since the opening of the Queensferry Crossing?

Yes	
No	

70. For onward travel by bus, do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Yes	
No	

71. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

72. For onward travel by bus, do you think **bus journey time reliability**, that is the day-to-day variability in bus journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

73. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **bus journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

74. For onward travel by bus, do you think **accessibility by bus** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

75. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by bus** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

76. For onward travel by bus, do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Yes	
No	

77. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **road traffic congestion** has changed since the Queensferry Crossing was opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

78. Do you think the **attractiveness** of using Ferrytoll Park & Ride for onward travel by **car share** has increased since the opening of the Queensferry Crossing?

Yes	
No	

79. For onward travel by car share, do you think **journey times by car** have changed since the Queensferry Crossing opened?

Yes	
No	

80. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **journey times by car** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

81. For onward travel by car share, do you think **car journey time reliability**, that is the day-to-day variability in car journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

82. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **car journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

83. For onward travel by car share, do you think **accessibility by car** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

84. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by car** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

85. Do you think **personal security at Ferrytoll Park & Ride** has changed since the Queensferry Crossing opened?

Yes	
No	

86. On a scale of -3 (worsened) to +3 (improved), how do you think **personal security at Ferrytoll Park & Ride** has changed since the Queensferry Crossing was opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

If travelling using Ferrytoll Park & Ride:

For journeys northbound

87. Do you think the **attractiveness** of using Ferrytoll Park & Ride for onward travel by **bus** has increased since the opening of the Queensferry Crossing?

Yes	
No	

88. For onward travel by bus, do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Yes	
No	

89. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **journey times by bus** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

--

90. For onward travel by bus, do you think **bus journey time reliability**, that is the day-to-day variability in bus journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

91. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **bus journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

92. For onward travel by bus, do you think **accessibility by bus** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

93. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by bus** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

94. For onward travel by bus, do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Yes	
No	

95. For onward travel by bus, on a scale of -3 (worsened) to +3 (improved), how do you think **road traffic congestion** has changed since the Queensferry Crossing was opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

96. Do you think the **attractiveness** of using Ferrytoll Park & Ride for onward travel by **car share** has increased since the opening of the Queensferry Crossing?

Yes	
No	

97. For onward travel by car share, do you think **journey times by car** have changed since the Queensferry Crossing opened?

Yes	
No	

98. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **journey times by car** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1		0	+1	+2
Please provide further explanation if required:						

99. For onward travel by car share, do you think **car journey time reliability**, that is the day-to-day variability in car journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

100. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **car journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

101. For onward travel by car share, do you think **accessibility by car** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

102. For onward travel by car share, on a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by car** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

103. Do you think **personal security at Ferrytoll Park & Ride** has changed since the Queensferry Crossing opened?

Yes	
No	

104. On a scale of -3 (worsened) to +3 (improved), how do you think **personal security at Ferrytoll Park & Ride** has changed since the Queensferry Crossing was opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

If travelling by car:

For journeys southbound

105. Do you think **journey times by car** have changed since the Queensferry Crossing opened?

Yes	
No	

106. On a scale of -3 (worsened) to +3 (improved), how do you think **journey times by car** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

107. Do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Yes	
No	

108. On a scale of -3 (worsened) to +3 (improved), how do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

109. Do you think **car journey time reliability**, that is the day-to-day variability in car journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

110. On a scale of -3 (worsened) to +3 (improved), how do you think **car journey time reliability** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

111. Do you think **accessibility by car** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

112. On a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by car** to key services has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

If travelling by car:

For journeys northbound

113. Do you think **journey times by car** have changed since the Queensferry Crossing opened?

Yes	
No	

114. On a scale of -3 (worsened) to +3 (improved), how do you think **journey times by car** have changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

115. Do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Yes	
No	

116. On a scale of -3 (worsened) to +3 (improved), how do you think **road traffic congestion** has changed since the Queensferry Crossing opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

117. Do you think **car journey time reliability**, that is the day-to-day variability in car journey times, has changed since the Queensferry Crossing opened?

Yes	
No	

118. On a scale of -3 (worsened) to +3 (improved), how do you think **car journey time reliability** has changed since the Queensferry Crossing Opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3
Please provide further explanation if required:						

119. Do you think **accessibility by car** to key services such as employment, educational, health, leisure and cultural on the other side of the Crossing has changed since it opened?

Yes	
No	

120. On a scale of -3 (worsened) to +3 (improved), how do you think **accessibility by car** to key services on the other side of the Crossing has changed since it opened?

Worsened			Stayed the same	Improved		
-3	-2	-1	0	+1	+2	+3

Please provide further explanation if required:

End of Questionnaire

Next steps:

The information you have provided on behalf of your community will inform the One Year After Evaluation of the Forth Replacement Crossing Project. Specifically, your information will help us to determine how well the Queensferry Crossing is moving towards achieving its objectives.

On behalf of Stantec UK Limited and Transport Scotland we would like to thank you for completing this questionnaire.

Appendix D: Benefits Realisation Research Public Survey results



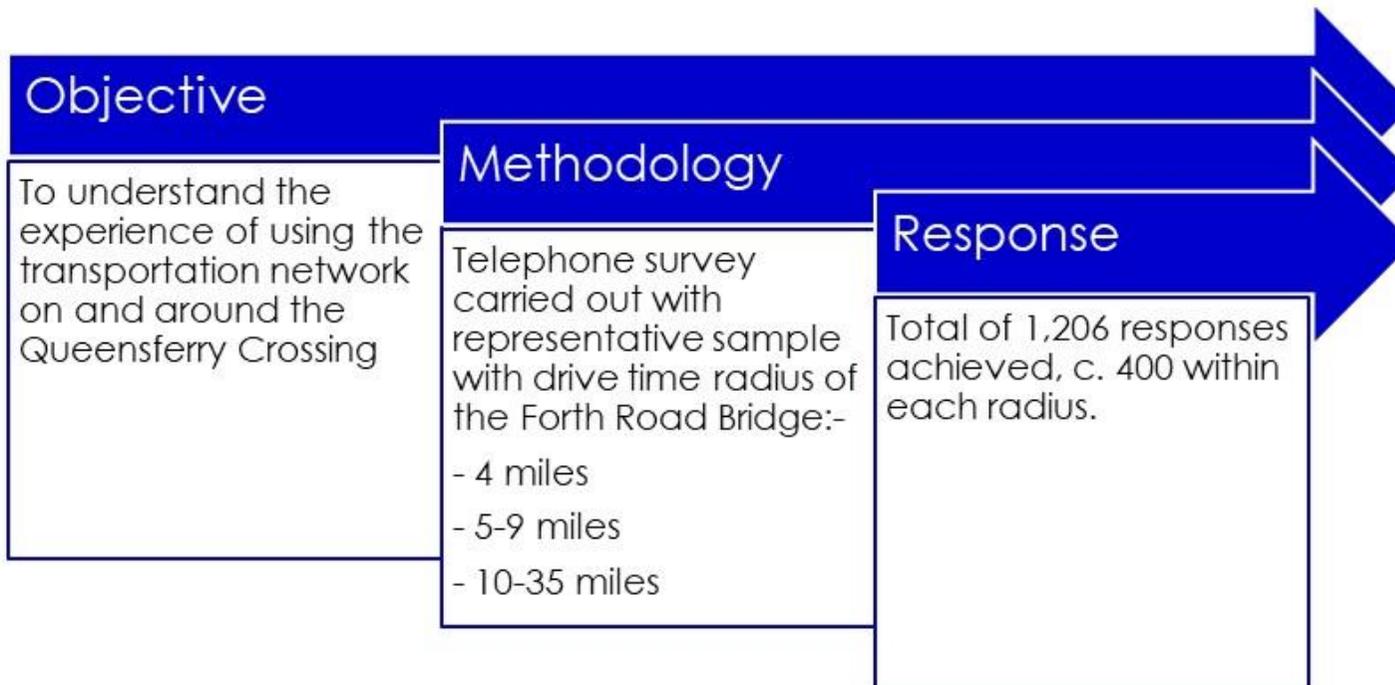
Queensferry Crossing Benefits Realisation Research

FINAL RESEARCH RESULTS

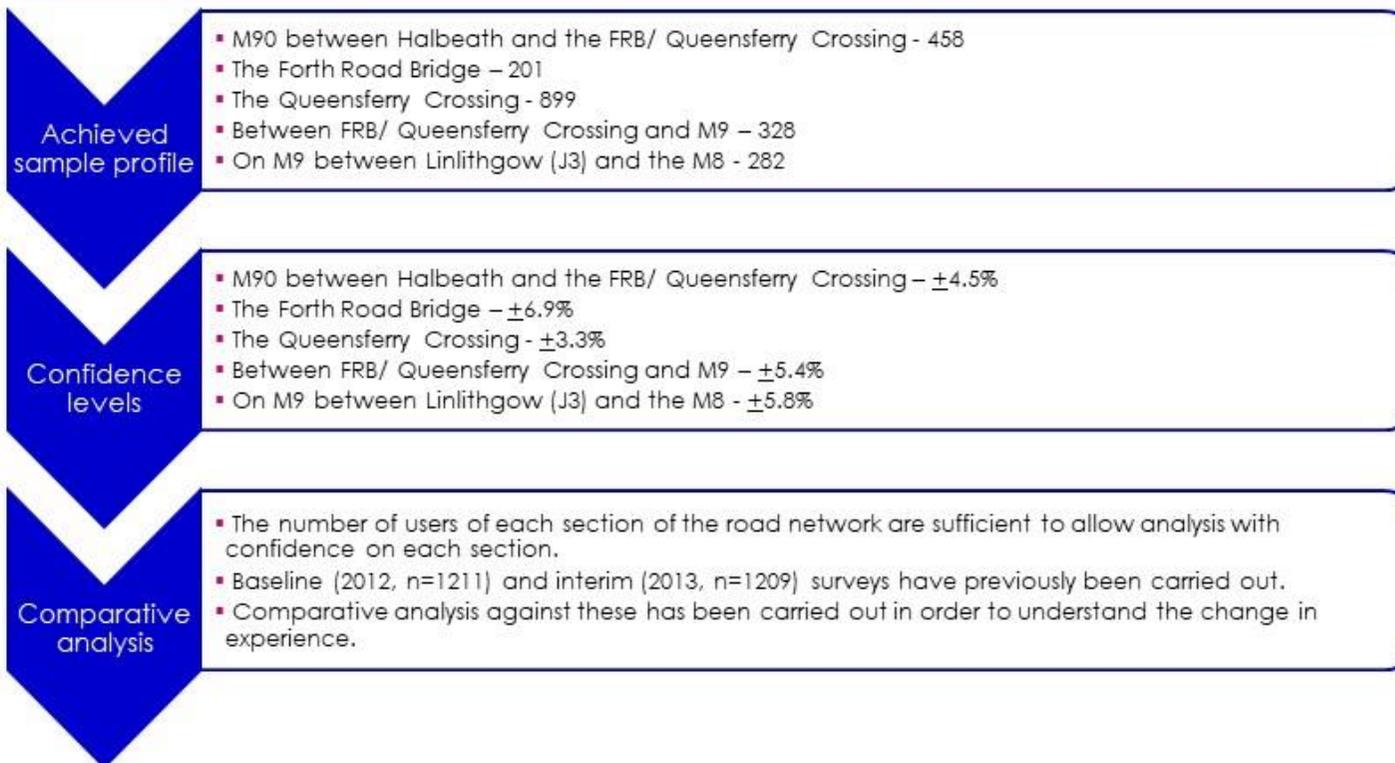




Methodology



Analysis





Respondent profile

50% male; 50%
female

57% of sample of
working age; 43%
aged 65+

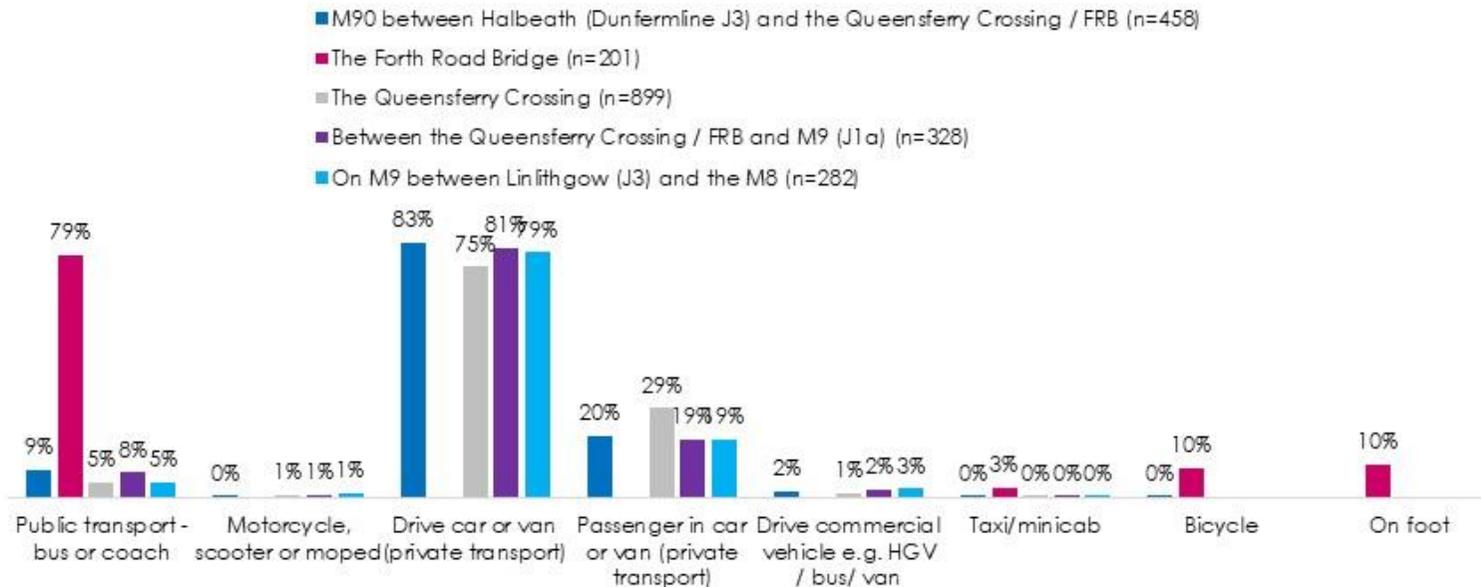
48% in employment;
43% retired

27% single adult
households; 41% two
adult households;
17% have children in
household



Driving in a car or being a passenger in a car was the most commonly used method of transport (all methods of transport used) on all sections of road. However, public transport was most commonly used on the Forth Road Bridge

Which method or methods of transport do you use on this section of the road. I will read out a list of options, please mention any that you have used in the last 6 months. [MULTI]





Significant changes can be seen in terms of the use of the Forth Road Bridge between 2012/13 and 2020. Private transport remains the most used on all other road sections.

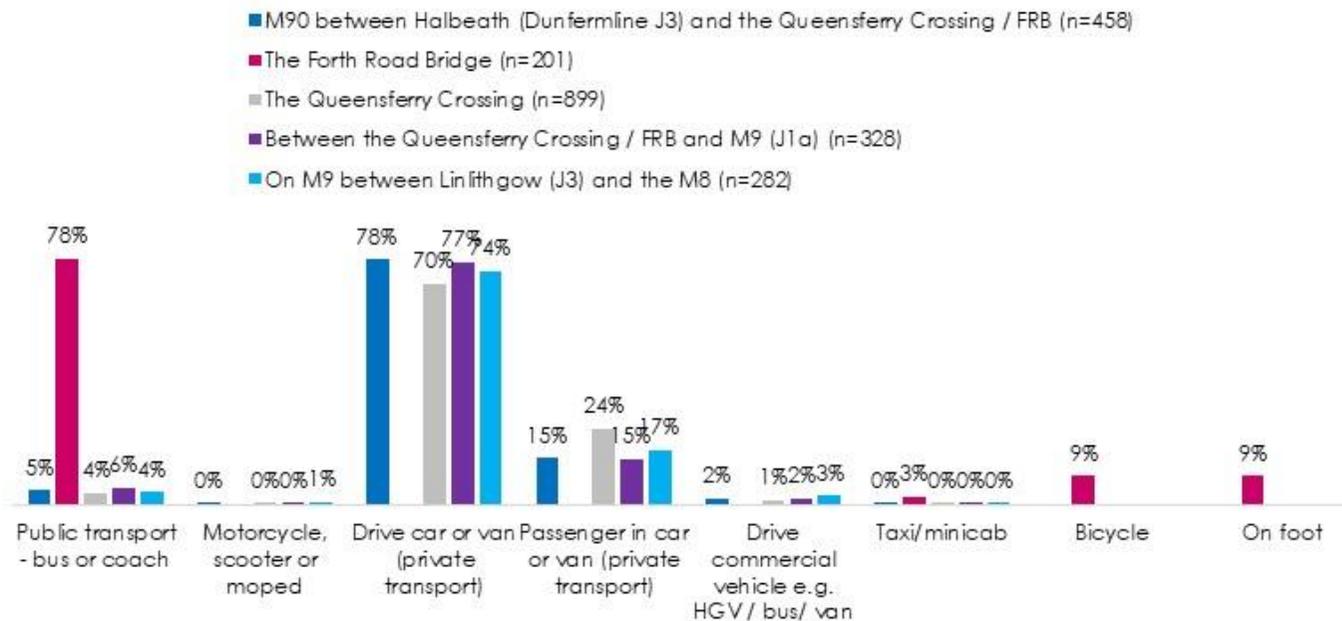
Which method or methods of transport do you use on this section of the road. I will read out a list of options, please mention any that you have used in the last 6 months. [MULTI]

	M90 between Halbeath (Dunfermline J3) and the Queensferry Crossing / FRB			The Forth Road Bridge			The Queensferry Crossing	Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a)			On M9 between Linlithgow (J3) and the M8		
	2020	2013	2012	2020	2013	2012	2020	2020	2013	2012	2020	2013	2012
Public transport - bus or coach	9%	14%	8%	79%	13%	9%	5%	8%	8%	5%	5%	8%	3%
Motorcycle, scooter or moped	0%	1%	0%		1%	0%	1%	1%	1%	1%	1%	2%	1%
Drive car or van (private transport)	83%	80%	81%		78%	78%	75%	81%	84%	86%	79%	82%	84%
Passenger in car or van (private transport)	20%	26%	21%		27%	22%	29%	19%	23%	15%	19%	20%	17%
Drive commercial vehicle e.g. HGV / bus/ van	2%	2%	2%	3%	1%	2%	1%	2%	2%	2%	3%	2%	2%
Taxi/minicab	0%	1%	0%	10%	1%	0%	0%	0%	1%	0%	0%	1%	1%
Bicycle	0%	0%	0%	10%	1%	1%			0%	0%		1%	0%
On foot		0%	0%	3%	0%	2%			0%	0%		0%	0%



Private transport, either as a driver or passenger was most commonly used on all sections of the road. Public transport was most commonly used on Forth Bridge

Which method of transport do you use on this section of the road most often? [SINGLE]





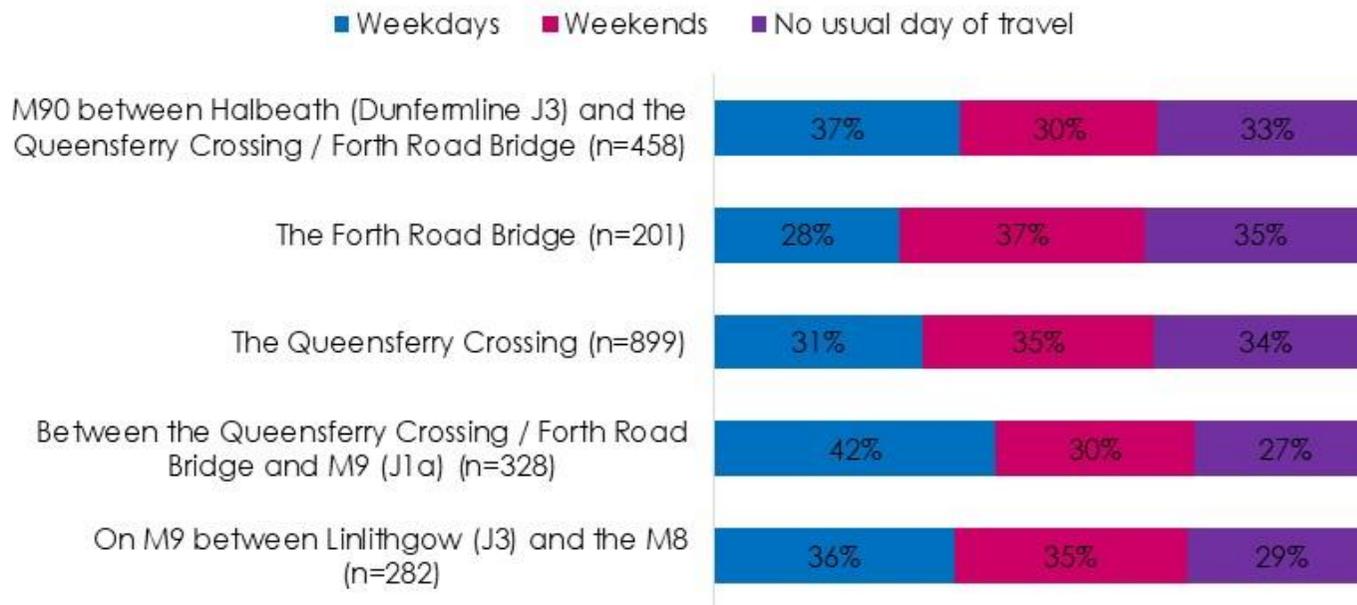
In terms of the most used method of transport, again, significant changes can be seen in the use of the Forth Road Bridge between 2012/13 and 2020. Private transport remains the most used on all other road sections.

Q2 Which method of transport do you use on this section of the road most often? [SINGLE]													
	M90 between Halbeath (Dunfermline J3) and the Queensferry Crossing / Forth Road Bridge			The Forth Road Bridge			The Queensferry Crossing	Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a)			On M9 between Linlithgow (J3) and the M8		
	2020	2013	2012	2020	2013	2012	2020	2020	2013	2012	2020	2013	2012
Public transport - bus or coach	5%	6%	3%	78%	6%	6%	4%	6%	3%	2%	4%	4%	2%
Motorcycle, scooter or moped	0%	1%	0%		1%	0%	0%	0%	1%	0%	1%	2%	1%
Drive car or van (private transport)	78%	75%	81%		72%	76%	70%	77%	79%	83%	74%	78%	82%
Passenger in car or van (private transport)	15%	15%	13%		18%	15%	24%	15%	13%	12%	17%	13%	13%
Drive commercial vehicle e.g. HGV / bus/ van	2%	2%	1%		1%	1%	1%	2%	2%	2%	3%	2%	2%
Taxi/minicab	0%	0%	0%	3%	0%	0%	0%	0%	1%	1%	0%	1%	1%
Bicycle				9%	0%	0%						0%	
On foot		0%		9%	0%	0%							



Respondent travel pattern varies with Queensferry Crossing/ FRB to J1a most likely to be used on weekdays (42%) and the Forth Road Bridge more likely to be used at weekends (37%)

Thinking of the method you use most often, when you use this section of road can you tell meWhen do you normally travel?





Compared to 2012/13 there is now more of a normal pattern of travel with respondents now more likely to state they travel either weekdays or weekends as opposed to no usual day of travel

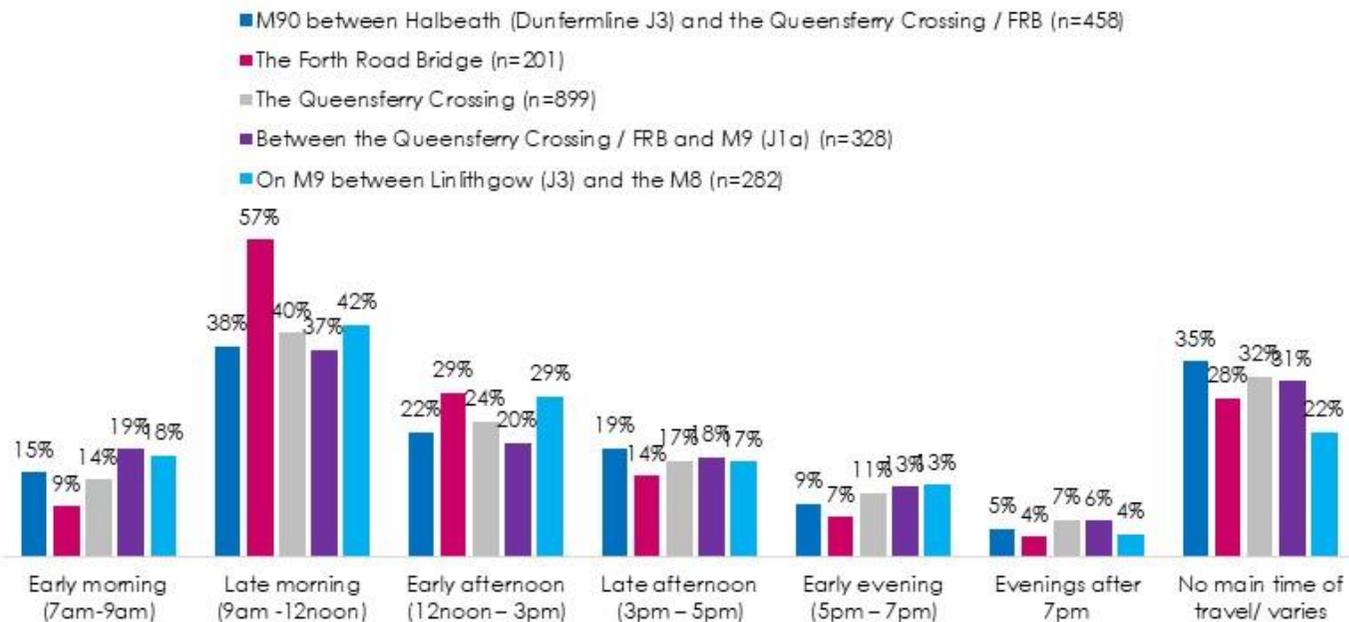
Thinking of the method you use most often, I'd like to ask you some questions to help us understand your usage of this section of road. When you use this section of road can you tell meWhen do you normally travel? [SINGLE]

	M90 between Halbeath (Dunfermline J3) and the Queensferry Crossing / FRB			The Forth Road Bridge			The Queensferry Crossing	Between the Queensferry Crossing / FRB and M9 (J1a)			On M9 between Linlithgow (J3) and the M8		
	2020	2013	2012	2020	2013	2012	2020	2020	2013	2012	2020	2013	2012
Weekdays	37%	23%	20%	28%	23%	20%	31%	42%	22%	20%	36%	24%	19%
Weekends	30%	24%	24%	37%	24%	23%	35%	30%	20%	19%	35%	18%	20%
No usual day of travel	33%	53%	55%	35%	53%	57%	34%	27%	58%	60%	29%	57%	61%



The greatest proportion of respondents travel late morning 9am to 12 noon. This is particularly the case on the Forth Road Bridge where 57% of travel is undertaken at this time

What are the main times that you would travel on this section of the road? [MULTI]





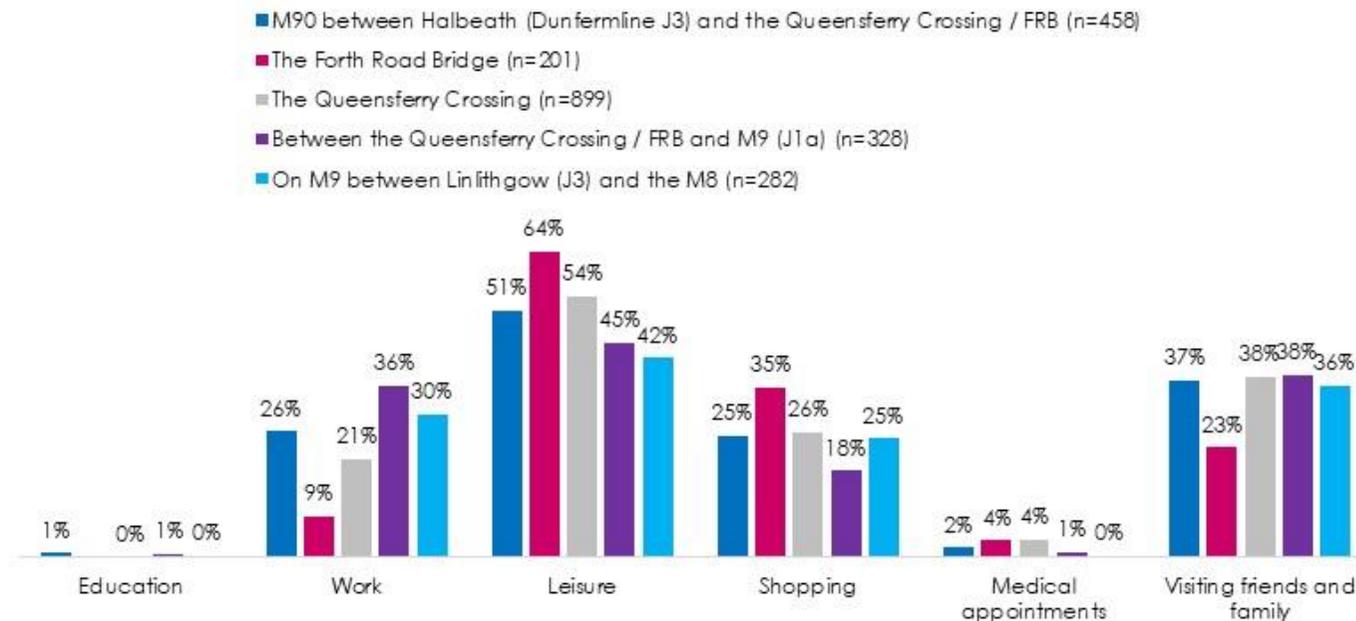
Early morning travel on the connecting roads to the Bridges has increased significantly since 2012/13. No main time of travel has decreased significantly on all sections of the road network.

Q4 What are the main times that you would travel on this section of the road? [MULTI]													
	M90 between Halbeath (Dunfermline J3) and the Queensferry Crossing / Forth Road Bridge (n=458)			The Forth Road Bridge (n=201)			The Queensferry Crossing (n=899)	Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a) (n=328)			On M9 between Linlithgow (J3) and the M8 (n=282)		
	2020	2013	2012	2020	2013	2012	2020	2020	2013	2012	2020	2013	2012
Early morning (7am-9am)	15%	9%	7%	9%	9%	6%	14%	19%	10%	9%	18%	9%	7%
Late morning (9am -12noon)	38%	25%	18%	57%	27%	20%	40%	37%	22%	17%	42%	20%	19%
Early afternoon (12noon – 3pm)	22%	16%	15%	29%	17%	13%	24%	20%	14%	11%	29%	15%	8%
Late afternoon (3pm – 5pm)	19%	13%	10%	14%	15%	9%	17%	18%	11%	9%	17%	11%	8%
Early evening (5pm – 7pm)	9%	12%	8%	7%	11%	7%	11%	13%	10%	7%	13%	9%	7%
Evenings after 7pm	5%	7%	4%	4%	6%	4%	7%	6%	6%	5%	4%	3%	5%
No main time of travel/ varies	35%	51%	61%	28%	51%	63%	32%	31%	56%	64%	22%	61%	65%



Leisure is the main purpose of travel on all sections of the road network, most so the Forth Road Bridge (64%)

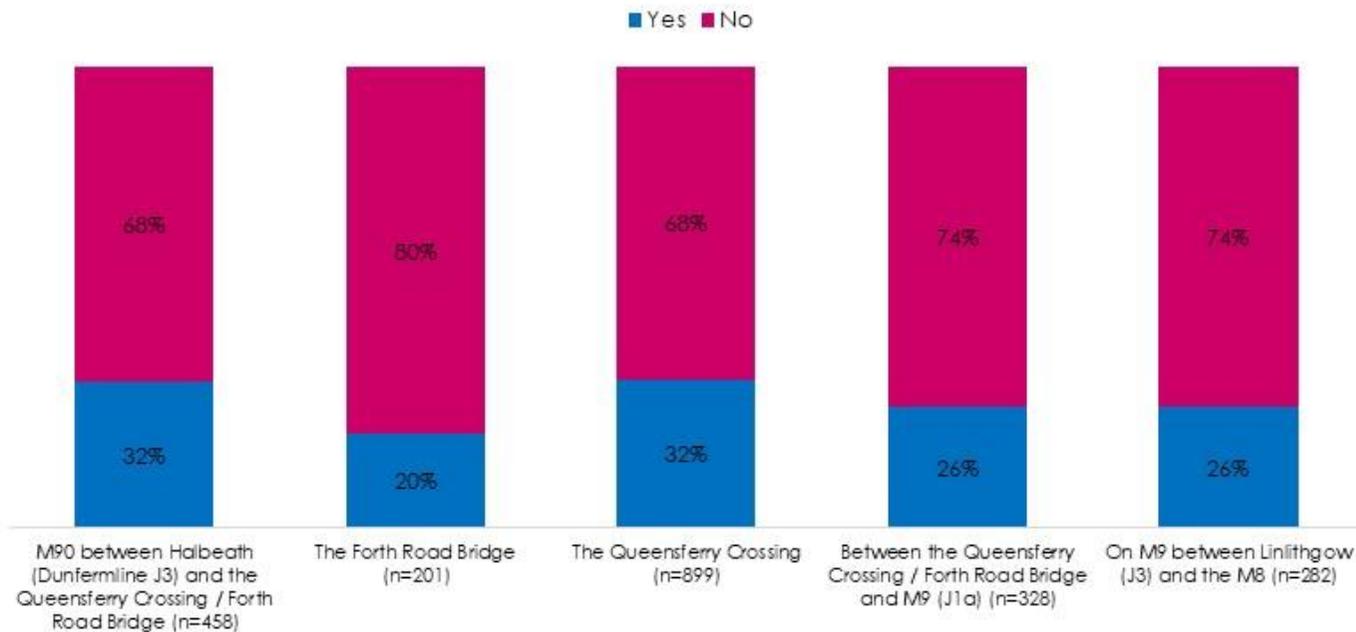
**What is the main purpose(s) of your journeys on this part of the road?
 [MULTI]**





32% of respondents change their plans due to traffic conditions on the Queensferry Crossing and M90. this is lower for M9 J1a and J3 (both 26%).

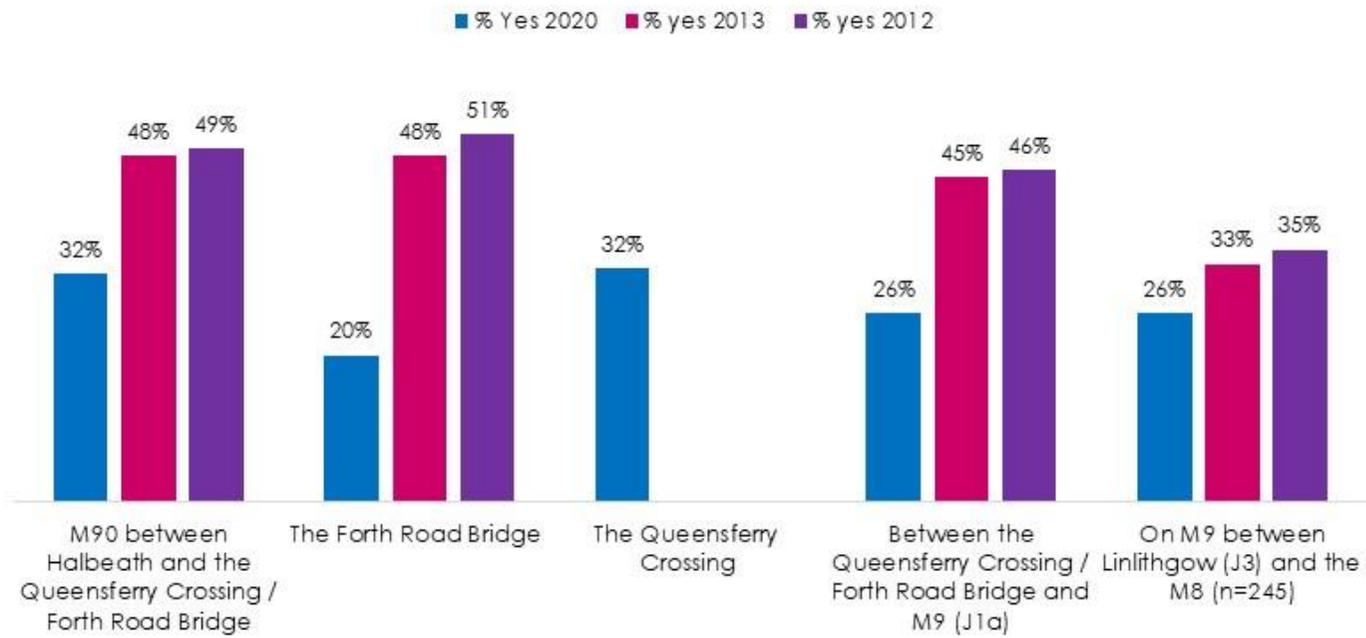
Are there any times you avoid travelling or change your journey plans due to traffic conditions on this part of the road?





Respondents significantly less likely to change their plans than was previously the case in 2012/13. This is most notably the case for the Forth Road Bridge, which is now mainly used for leisure purposes.

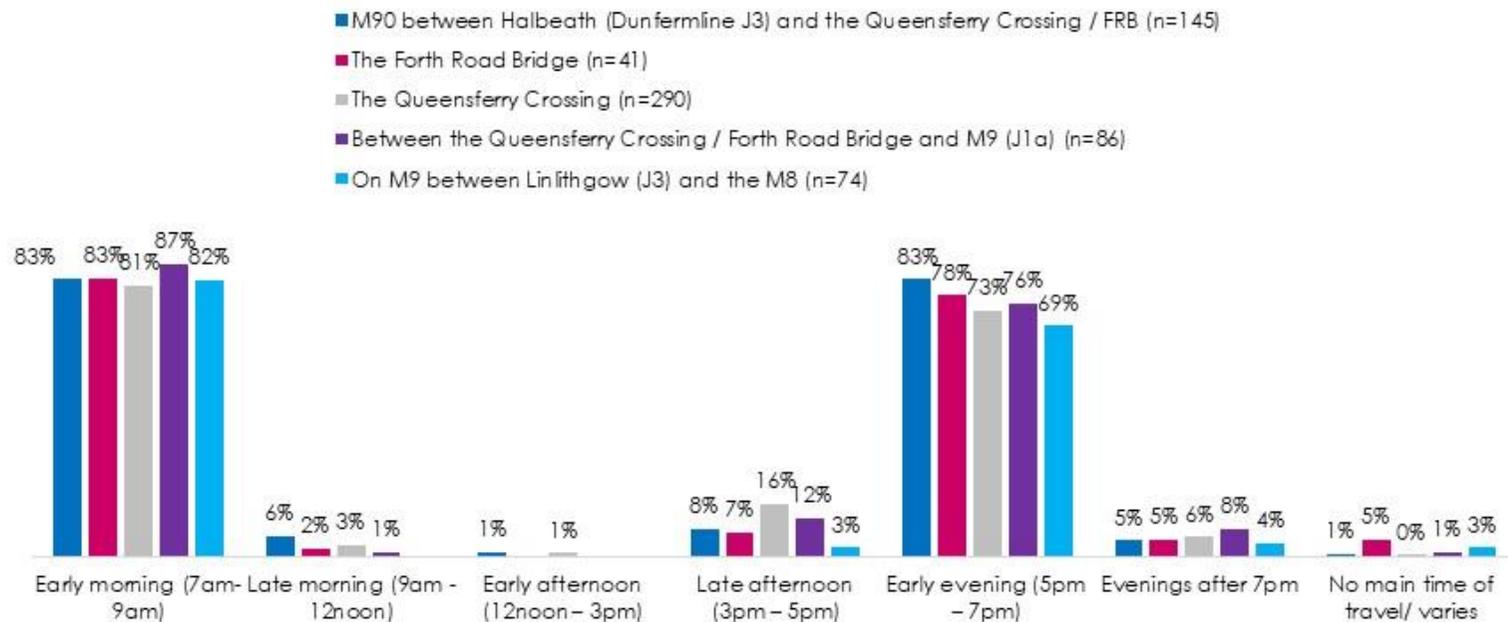
Are there any times you avoid travelling or change your journey plans due to traffic conditions on this part of the road? Trend Analysis





Those that do change their plans due to traffic conditions are most likely to avoid morning and evening rush hours

If yes, what are the times you avoid using or change your journey plans on this part of the road? [MULTI]





Whilst there are fewer respondents changing their plans due to road conditions, this is more likely to be done in the early morning and evening than in 2012/13. However, avoidance of late afternoon traffic has fallen significantly.

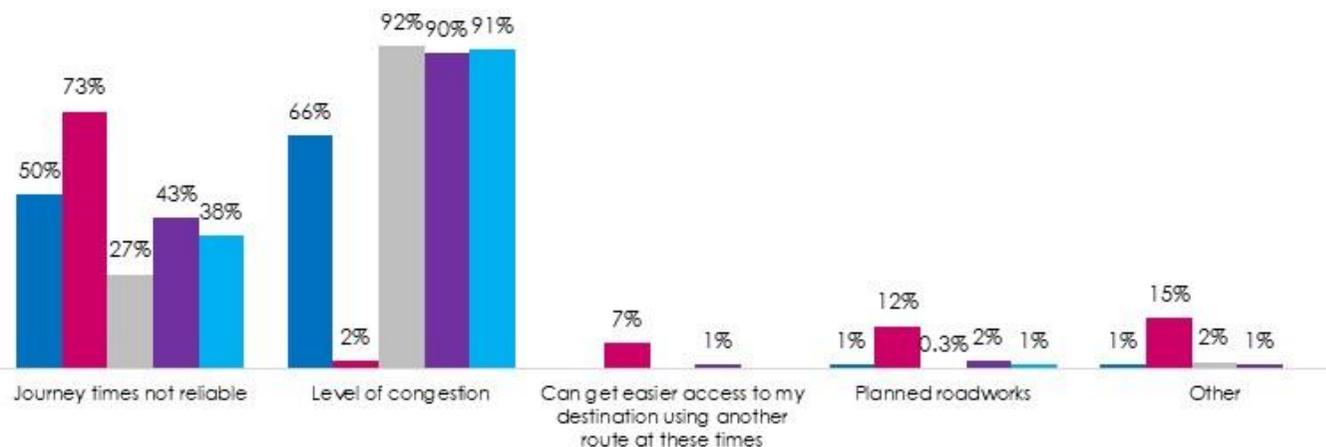
Q7 If yes, what are the times you avoid using or change your journey plans on this part of the road? [MULTI]													
	M90 between Halbeath (Dunfermline J3) and the Queensferry Crossing / Forth Road Bridge (n=145)			The Forth Road Bridge (n=41)			The Queensferry Crossing (n=290)	Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a) (n=86)			On M9 between Linlithgow (J3) and the M8 (n=74)		
	2020	2013	2012	2020	2013	2012	2020	2020	2013	2012	2020	2013	2012
Early morning (7am-9am)	83%	69%	75%	83%	69%	71%	81%	87%	71%	75%	82%	78%	78%
Late morning (9am - 12noon)	6%	2%	4%	2%	3%	3%	3%	1%	3%	4%	-	2%	3%
Early afternoon (12noon – 3pm)	1%	1%	1%	-	1%	1%	1%	-	0%	2%	-	1%	1%
Late afternoon (3pm – 5pm)	8%	34%	40%	7%	33%	37%	16%	12%	37%	35%	3%	42%	31%
Early evening (5pm – 7pm)	83%	64%	73%	78%	66%	67%	73%	76%	71%	70%	69%	66%	70%
Evenings after 7pm	5%	4%	2%	5%	3%	1%	6%	8%	3%	1%	4%	2%	0%
No main time of travel/ varies	1%	9%	10%	5%	10%	13%	0%	1%	7%	10%	3%	5%	8%



Level of congestion and reliability of journey times was the most common reason for changing plans for all sections of the road with the exception of the Forth Road Bridge.

Why is this? (Those who avoid using or change their route)

- M90 between Halbeath (Dunfermline J3) and the Queensferry Crossing / Forth Road Bridge (n=145)
- The Forth Road Bridge (n=41)
- The Queensferry Crossing (n=290)
- Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a) (n=86)
- On M9 between Linlithgow (J3) and the M8 (n=74)





Level of congestion as a reason for changing plans on the M90 has decreased significantly since 2012/13, however reliability of journey times has increased. For other roads, the level of congestion as a reason for changing plans has only changed marginally.

Q8 Why is this? [MULTI. PROBE FULLY]													
	M90 between Halbeath (Dunfermline J3) and the Queensferry Crossing / Forth Road Bridge (n=145)			The Forth Road Bridge (n=41)			The Queensferry Crossing (n=290)	Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a) (n=86)			On M9 between Linlithgow (J3) and the M8 (n=74)		
	2020	2013	2012	2020	2013	2012	2020	2020	2013	2012	2020	2013	2012
Journey times not reliable	50%	30%	34%	73%	27%	37%	27%	43%	26%	36%	38%	33%	34%
Level of congestion*	66%	94%	95%	2%	94%	93%	92%	90%	96%	95%	91%	93%	97%
Can get easier access to my destination using another route at these times		0%	1%	7%	0%	0%		1%	1%	0%		2%	0%
Planned roadworks	1%	4%	12%	12%	7%	15%	0%	2%	4%	12%	1%	4%	11%
Other	1%		4%	15%		9%	2%	1%		2%			3%

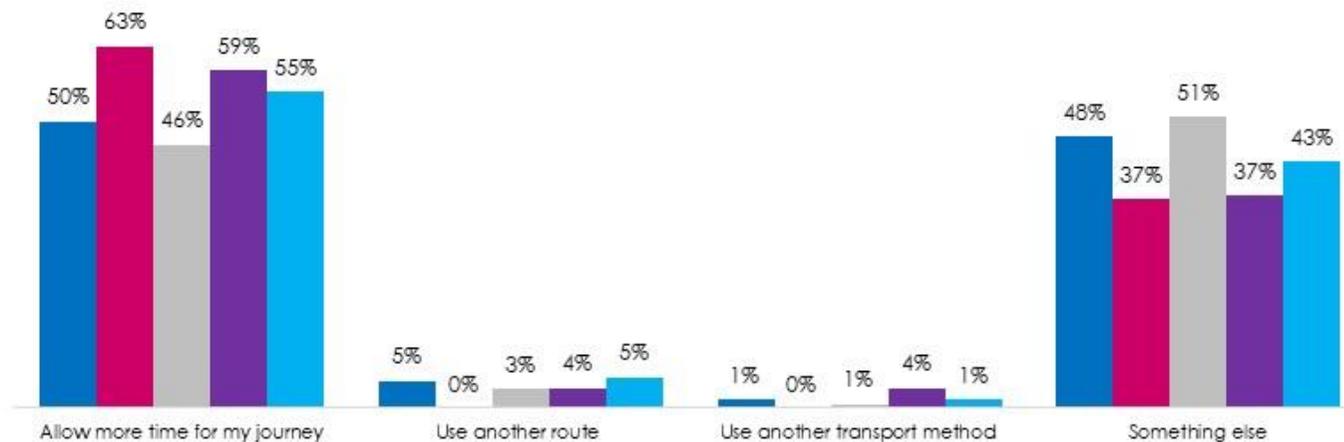
*When asked what was meant by level of congestion, this mainly defined as too busy/ too much traffic or rush hour/ peak time traffic



Respondents are most likely to allow more time for their journey or something else (which was mainly go at another time)

What do you do as an alternative? (Those who avoid using or change their route)

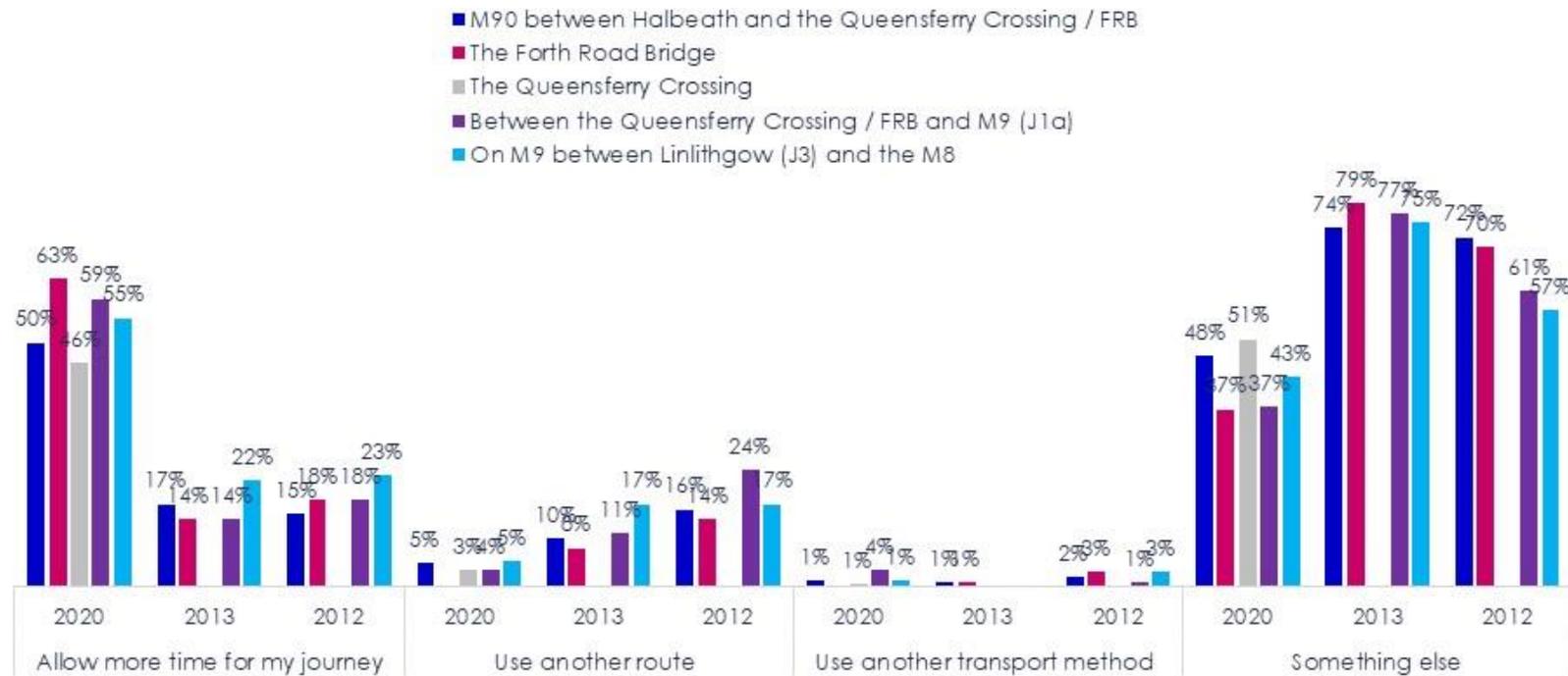
- M90 between Halbeath (Dunfermline J3) and the Queensferry Crossing / Forth Road Bridge (n=145)
- The Forth Road Bridge (n=41)
- The Queensferry Crossing (n=290)
- Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a) (n=86)
- On M9 between Linlithgow (J3) and the M8 (n=74)





Compared to 2012/13, respondents are now more likely to allow more time for their journey. They are now less likely to do something else. It is also notable that in previous years do something else was more likely to be don't go on their journey

What do you do as an alternative? (Those who avoid using or change their route) Trend Analysis

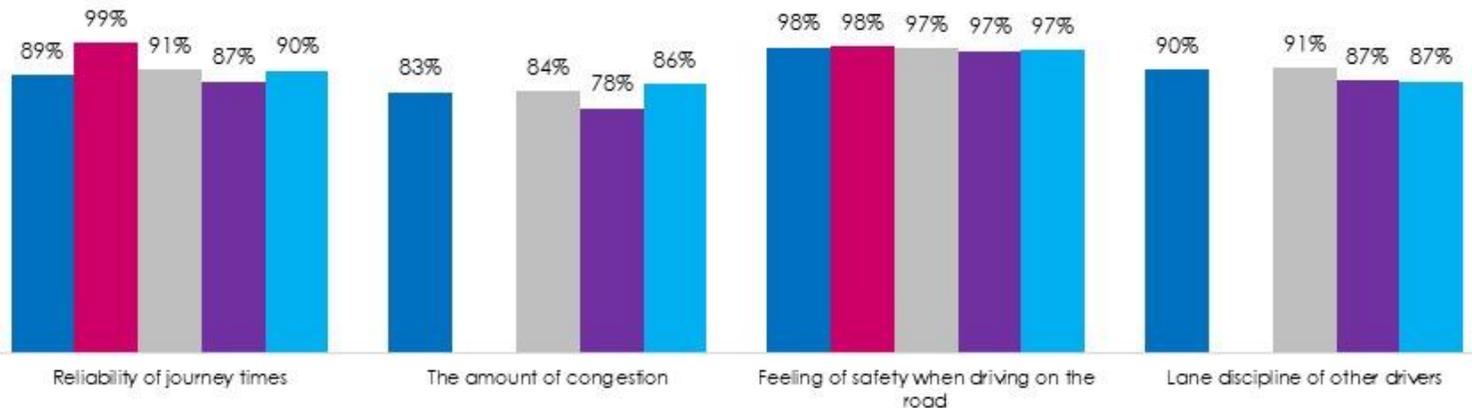




Feeling of safety is most satisfactory on all parts of the road network

Can you tell me generally how satisfied you are with each of these?

- M90 between Halbeath and the Queensferry Crossing / Forth Road Bridge (n=412)
- The Forth Road Bridge (n=158)
- The Queensferry Crossing (n=740)
- Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a) (n=294)
- On M9 between Linlithgow (J3) and the M8 (n=245)

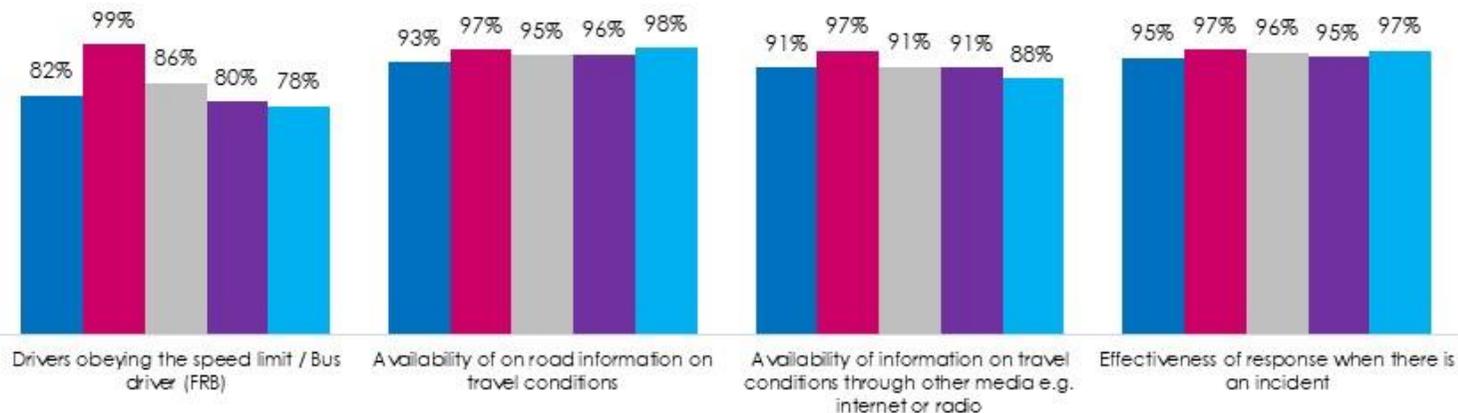




Satisfaction with information on road conditions and effectiveness of response if there is an incident is consistently high on all road sections.

Can you tell me generally how satisfied you are with each of these?

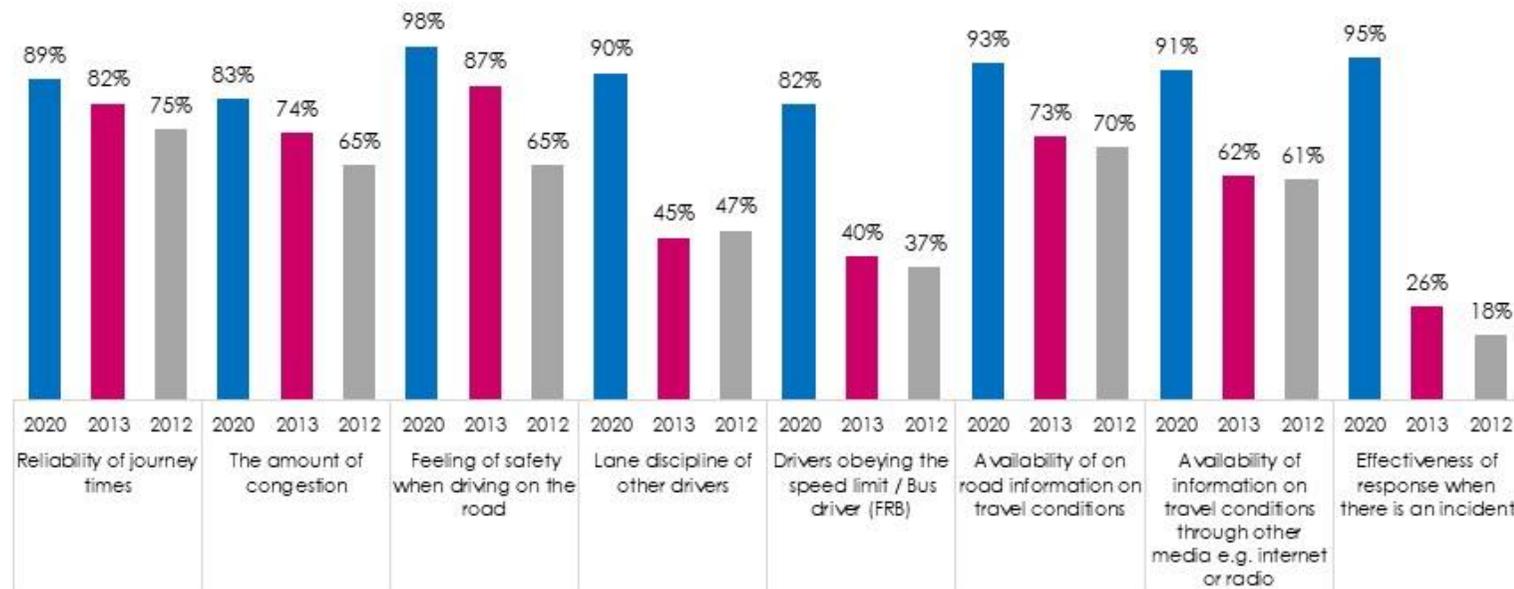
- M90 between Halbeath and the Queensferry Crossing / Forth Road Bridge (n=412)
- The Forth Road Bridge (n=158)
- The Queensferry Crossing (n=740)
- Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a) (n=294)
- On M9 between Linlithgow (J3) and the M8 (n=245)





M90 – satisfaction has increased significantly for all aspects, most so with response to incidents followed by lane discipline

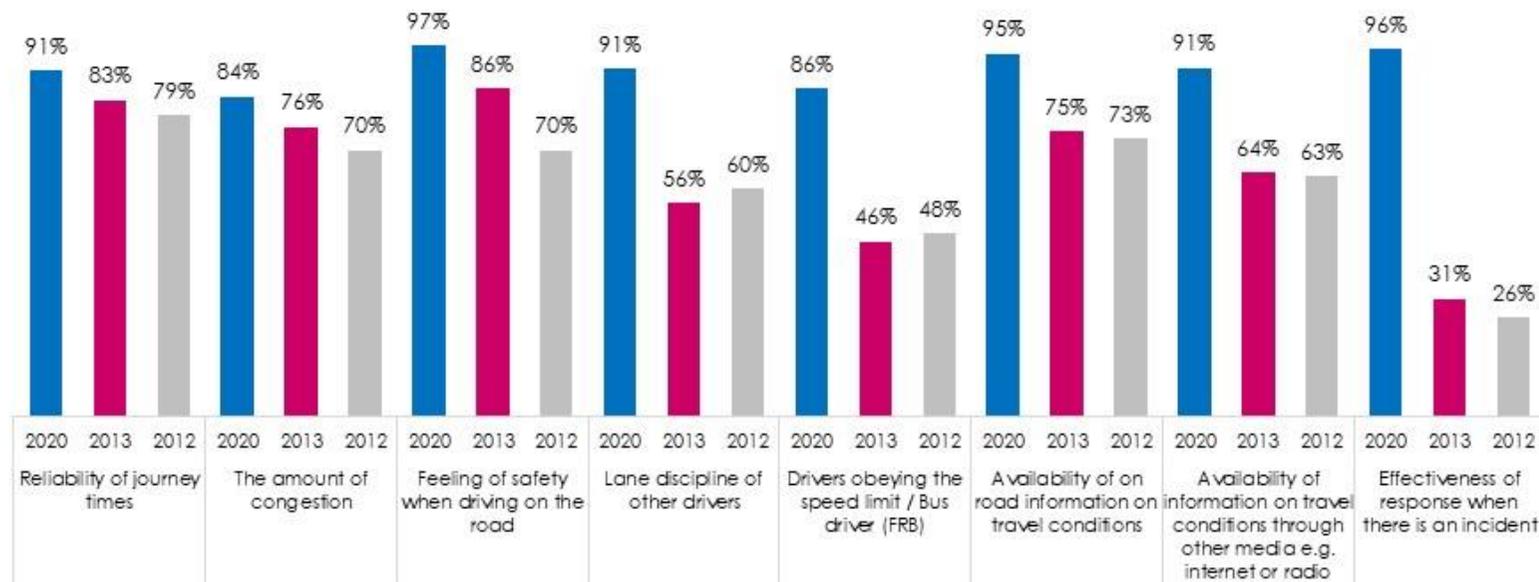
Can you tell me generally how satisfied you are with each of these? M90 between Halbeath and the Queensferry Crossing / Forth Road Bridge comparative analysis





Queensferry Crossing/ FRB – satisfaction has increased for all aspects, most so for effectiveness of incident response, followed by lane discipline and obeying speed limit

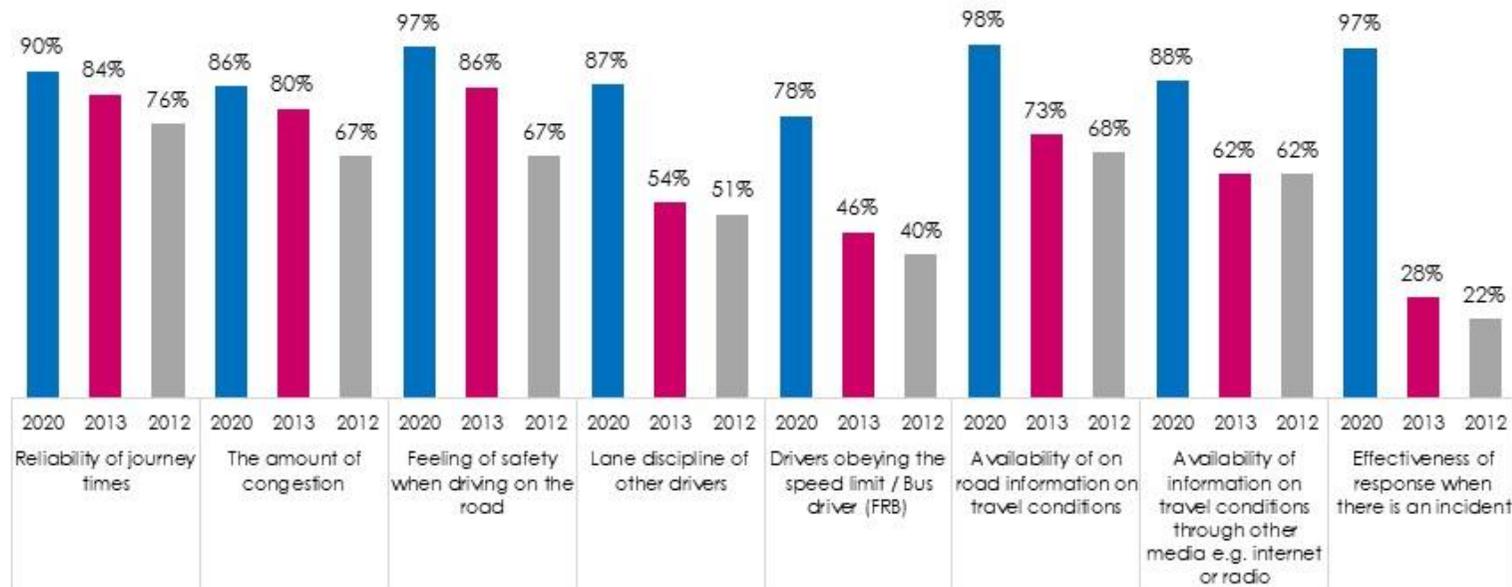
Can you tell me generally how satisfied you are with each of these? The Queensferry Crossing (2020) / Forth Road Bridge (2013/ 2012) - comparative analysis





M9 – satisfaction has increased, most so with response to incidents followed by lane discipline and obeying speed limits. Availability of information on travel conditions has also increased significantly

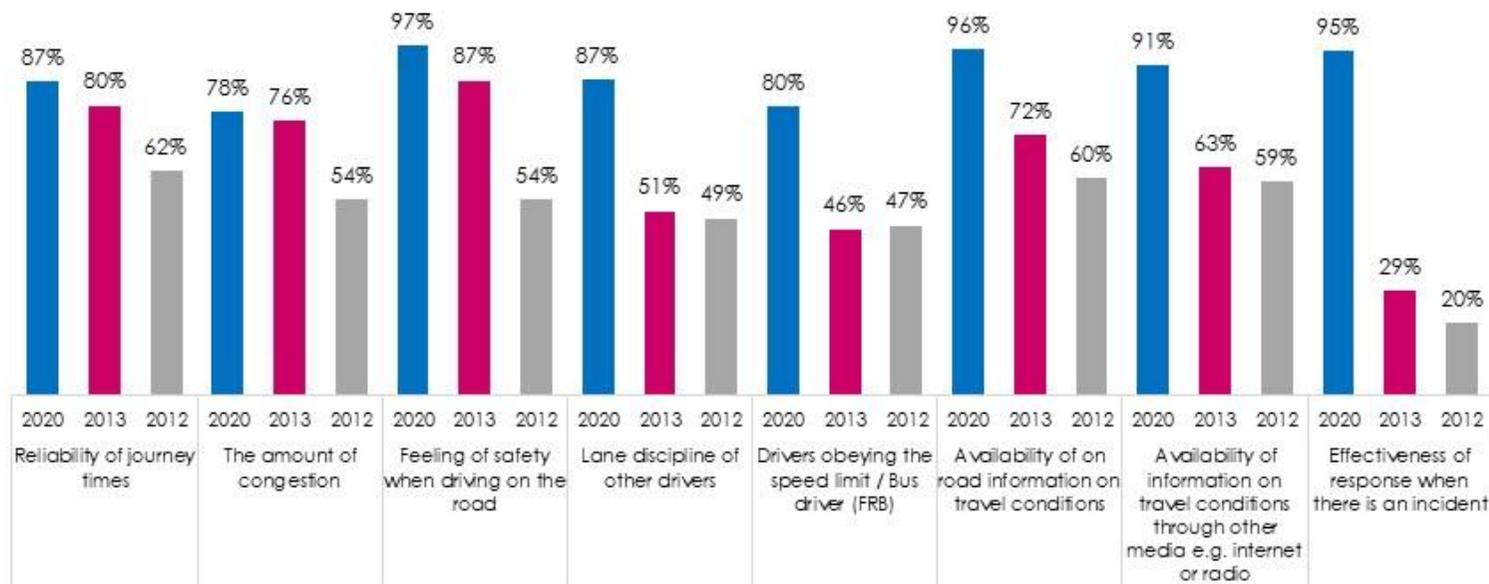
Can you tell me generally how satisfied you are with each of these? On M9 between Linlithgow (J3) and the M8 - comparative analysis





J1a- satisfaction has increased, most so with response to incidents, followed by lane discipline and obeying the speed limit

Can you tell me generally how satisfied you are with each of these? Between the Queensferry Crossing / Forth Road Bridge and M9 (J1a) - comparative analysis



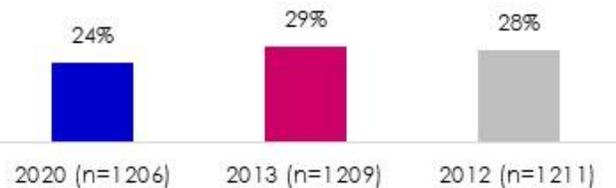


Bus Journeys

ALMOST ONE QUARTER OF RESPONDENTS (24%) USE THE BUS. THIS IS DOWN SLIGHTLY COMPARED TO PREVIOUS YEARS

Can I just confirm, do you ever use bus on the journeys on any of the sections of road we have discussed? % stating yes

■ 2020 (n=1206) ■ 2013 (n=1209) ■ 2012 (n=1211)



CONVENIENCE OF THE CAR IS THE MAIN REASON BUS IS NOT USED (45% OF RESPONSES) THIS WAS ALSO THE MAIN REASON GIVEN IN PREVIOUS YEARS

Q52 Why don't you use public transport on these journeys?





The majority (80%) said 'nothing' would encourage public transport use. This has increased from 70% in 2013 and 58% in 2013. Previously better bus services (quicker, more direct) were noted (30% in 2012; 18% in 2013) but this was only noted by 7% in 2020.

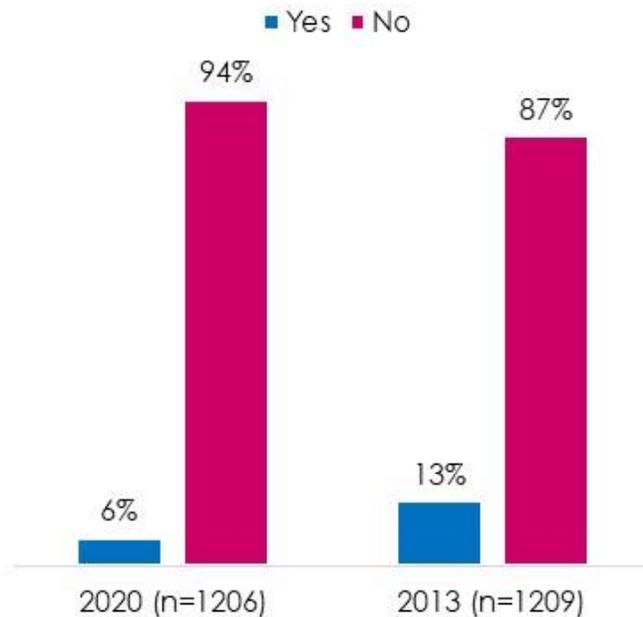
Q53 What would encourage you to use public transport on these journeys more often?



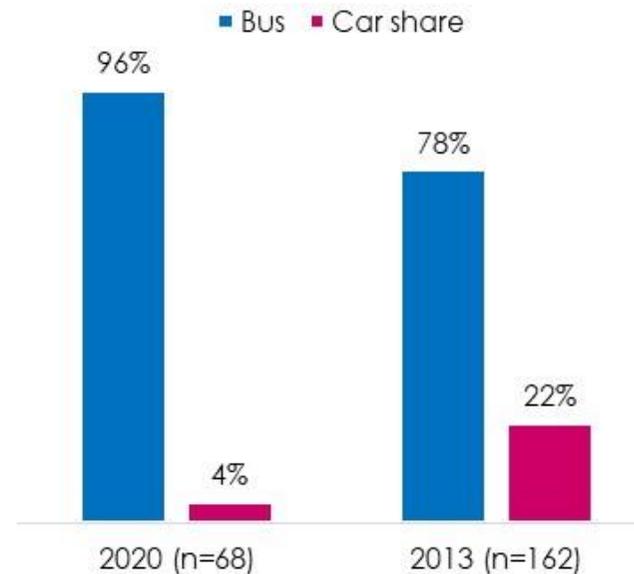


6% of respondents use the Ferrytoll Park and Ride (down from 13%). However, those that do are now more likely to use this for bus travel (96%) than was the case in 2013 (78%). NB this was not open in 2012.

Q54 Do you currently use the Ferrytoll Park and Ride?



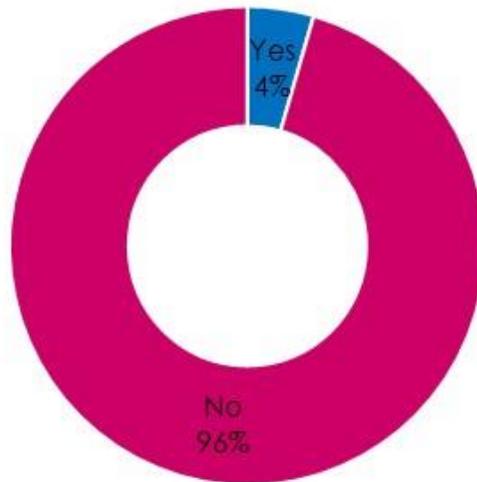
Q55 Do you use this for travelling by bus or for car share? (those that use Ferrytoll Park and Ride)



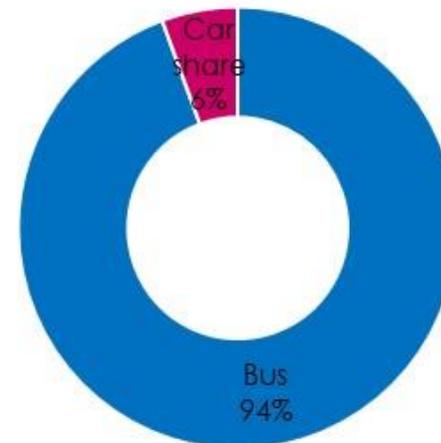


4% of respondents said they currently use the Halbeath Park and Ride. This was used largely for bus travel (94%). NB Halbeath Park and Ride was not open at the time of previous surveys

Q56 Do you currently use the Halbeath Park and Ride? (Base: n=1206)

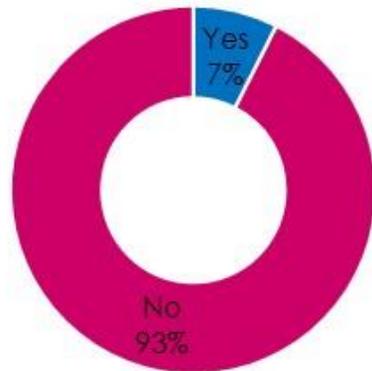


Q57 Do you use this for travelling by bus or for car share? (Base: Use Halbeath Park and Ride, n=54)

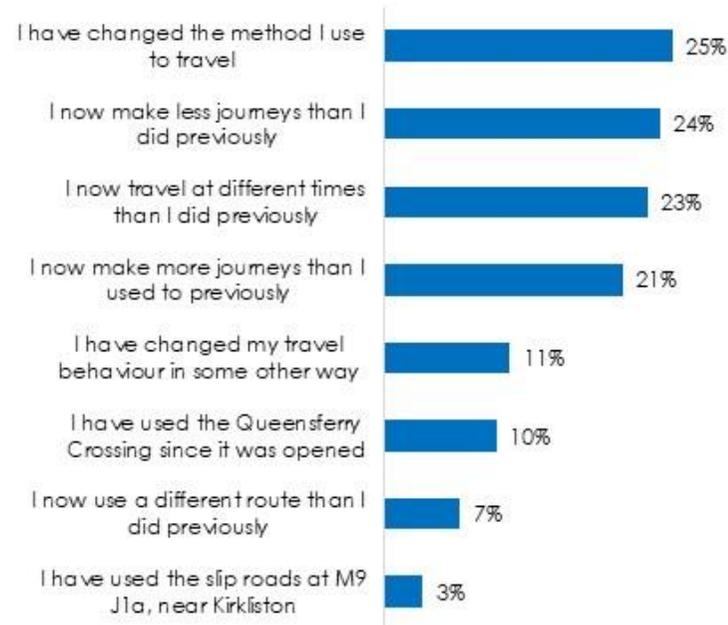


7% stated that they have changed their travel behaviour since the Queensferry Crossing opened (n=91). This was most commonly changing the method of travel (25%), making less journeys (24%) and travelling at different times (21%). Where they have changed the method, 74% use the bus more often.

Q58 Have you changed your travel behaviour over the section(s) of the road network that we discussed after the Queensferry Crossing opened?
 (Base: n=1206)



Q59 Can you please tell me in what way or ways your travel behaviour changed?
 (Base: changed travel behaviour, n=91)

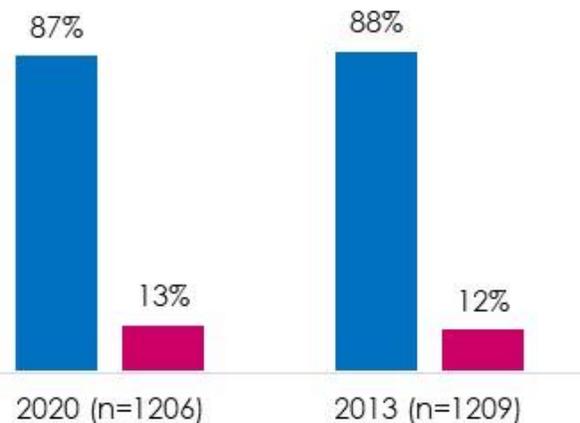




Awareness of the Intelligent Transport System in the road network is high and not significantly different to 2013 when it was introduced

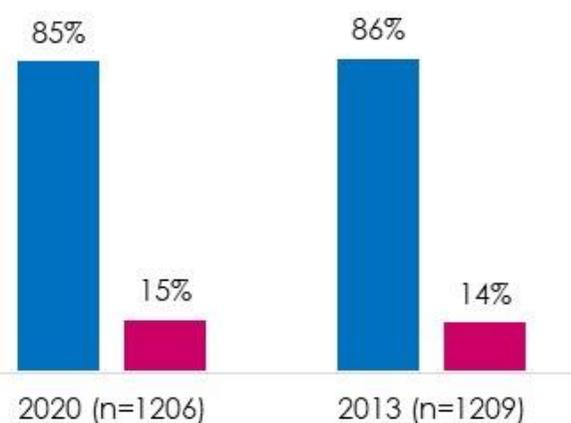
Q62 Are you aware that there are variable message signs on the overhead gantries to display information to advise drivers of traffic conditions?

■ Yes ■ No



Q63 Are you aware that the speed limits displayed within the red rings on the overhead gantries along the route are mandatory?

■ Yes ■ No

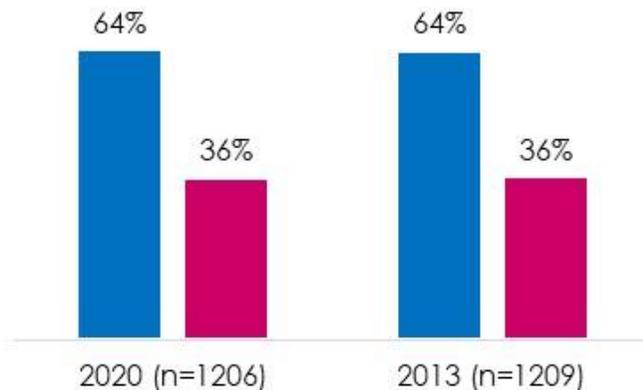




Just under three quarters of respondents (64%) have been travelling when variable speed limits have been in operation. They are seen to be effective by the majority (88%). This has increased from 75% in 2013.

Q64 Have you been travelling when the variable speed limits have been in operation?

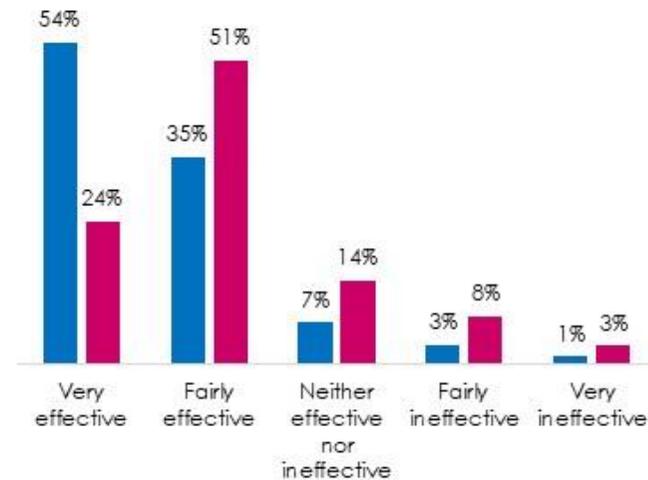
■ Yes ■ No



If YES, how effective do you think these are?

(Base: travelled when variable speed limits in operation)

■ 2020 (n=773) ■ 2013 (n=769)

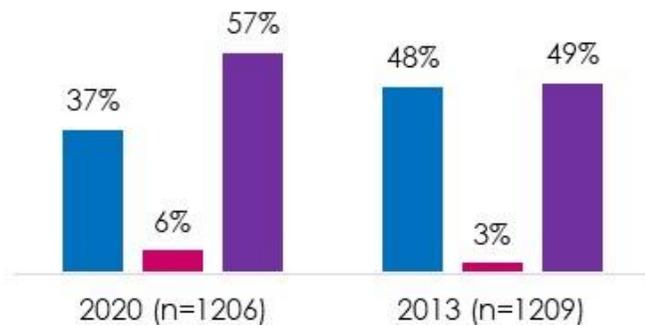




Buses using the hard shoulder during periods of congestion had been seen by 43% of respondents in 2020, decreasing from 51% of respondents in 2013. This was mainly positively perceived

Q66 During periods of congestion are you aware that buses are likely to use the hard shoulder in various locations north and south of the Forth?

■ Yes – as a car user ■ Yes – as a bus user
 ■ No



Car users
 (2020, n=446
 2013, n=578)

- 36% have seen buses use the hard shoulder (42% in 2013)
- 16% said this was a concern for them (12% in 2013)

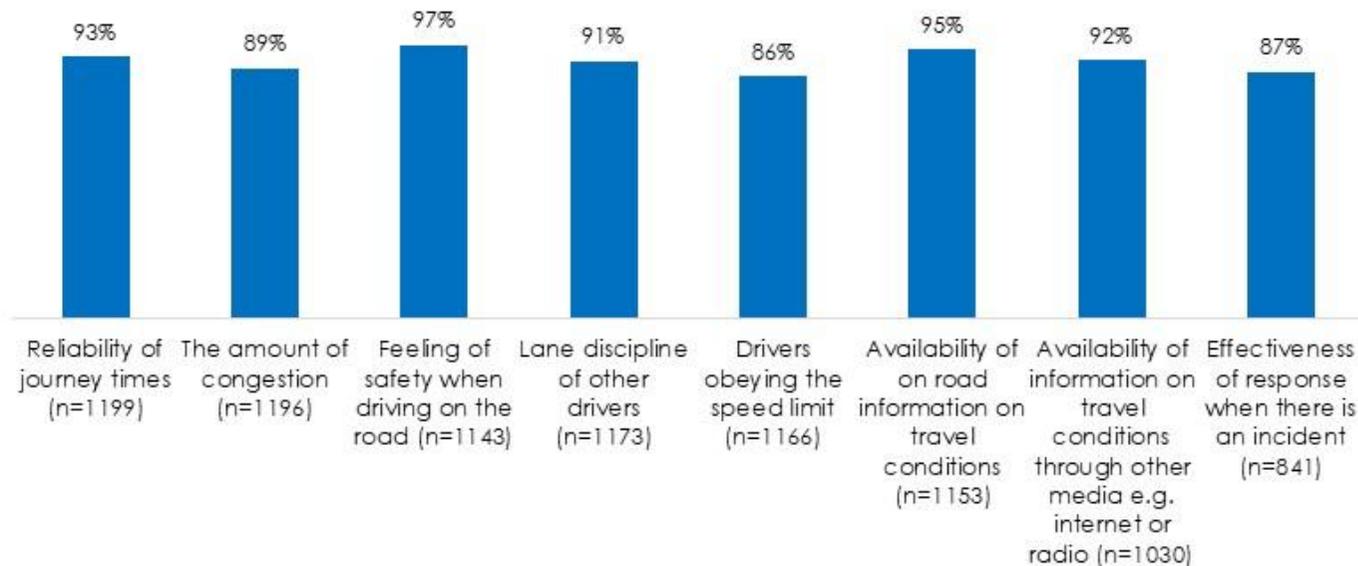
Bus users
 (2020, n=76
 2013, n=36)

- 88% of bus users felt buses using the had shoulder was beneficial for their commute in 2020
- 64% of bus users felt this was beneficial for their commute in 2013



Satisfaction with the ITS is high, most so with feeling of safety (97% satisfied) and travel information (95% satisfied). The lowest level of satisfaction was with regard to drivers obeying the speed limit (86% satisfied).

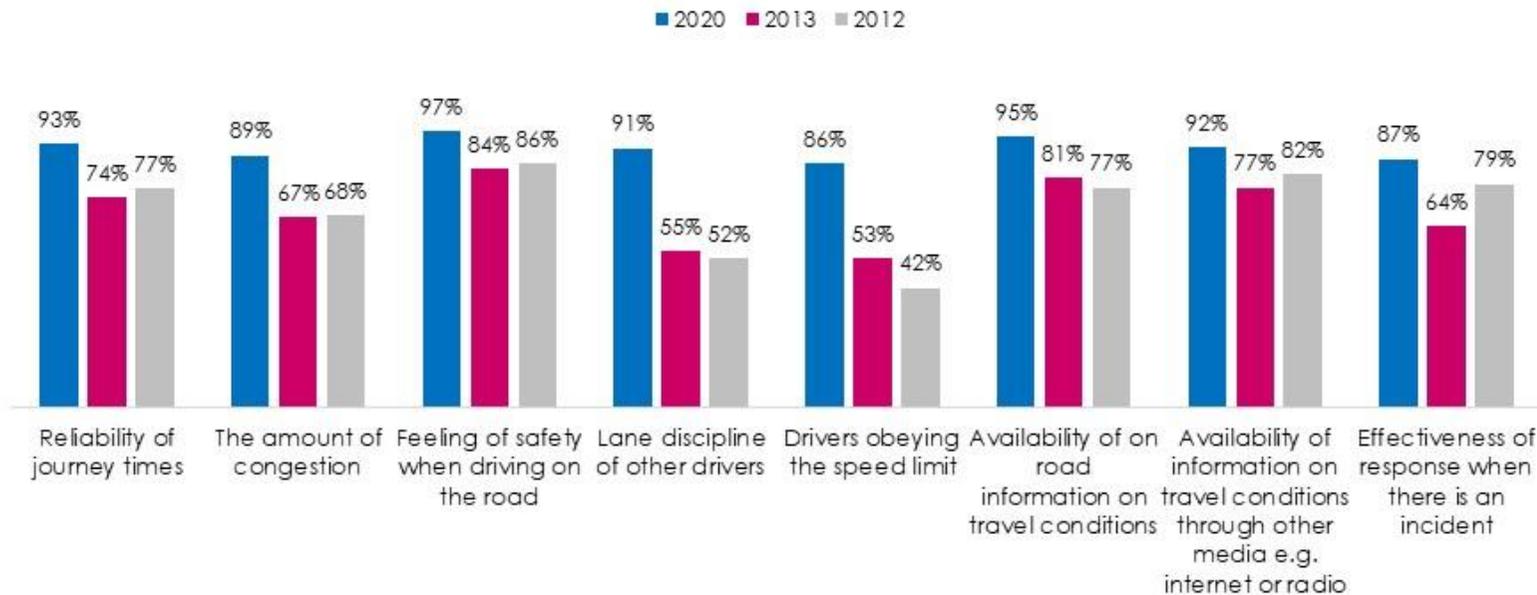
Can you tell me generally how satisfied you are with each of these?
 Intelligent Transport System - Full Transport Corridor
 (Don't know responses excluded)





Satisfaction has increased significantly with all aspects of the Intelligent Transport System along the full transport corridor, most so with drivers obeying speed limit and the lane discipline of other drivers.

Can you tell me generally how satisfied you are with each of these?
 Intelligent Transport System - Full Transport Corridor
 (Don't know responses excluded)



Appendix E: Environmental Mitigation Measures and IYA Opening Evaluation Findings

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
Land Use						
LU1	<ul style="list-style-type: none"> • Dundas Estate (Land Ref 1, 6, 9 & 23) • Humbie Farm (Land Ref 3) • Newliston Estate (Land Ref 11 & 16) • Overton Grazing (Land Ref 15) 	Loss of agricultural land and forestry will be reduced by implementing re-instatement plans i.e. returning land to agricultural use, where appropriate, post construction. Agricultural land will be re-instated in accordance with the requirements of the Bill. A photographic and video survey is to be undertaken to ensure all land is restored as near to its original state as is reasonably practicable and will be made available to the owner or occupier.	Not visible on imagery.	Temporary land for M9 Junction 1a has been returned and no ongoing issues have been reported to Transport Scotland. However, temporary and surplus land for the Principal Contract has not yet been declared and reinstatement plans are not available for review at the time of writing. Reinstatement of temporary and surplus land relating to the Principal Contract should be confirmed at the 3YA evaluation.	No	Yes
LU2	All agricultural land	Access to agricultural land and woodland will be maintained during the construction process and post construction in accordance with the requirements of the Bill.	Not visible on imagery.	Transport Scotland is content that access to this land has been maintained and continues to be maintained. It is recommended that site visits to a small selection of agricultural land parcels should be conducted during the 3YA evaluation to confirm this.	No	Yes
LU3	All agricultural land	Potential for damage to the agricultural capability of soils will be minimised by the adoption of appropriate measures during construction and reinstatement. This includes the careful excavation, storage and replacement of topsoil and subsoil.	Not visible on imagery.	Various measures were undertaken to protect topsoil and subsoil during construction and reinstatement, as described in the contractors Agricultural Management Plan Rev04 (ref REP-00051). These measures included undertaking surveys of topsoil/subsoil before and after construction, removal and appropriate storage of topsoil and subsoil (separately). TS confirmed that topsoil storage was inspected by Employer's Delivery Team and it is understood that no issues were raised.	No	No
LU8	All agricultural land	Reasonable precautions will be taken during construction to avoid the spreading of soil borne pests and diseases, animal and crop diseases and invasive species.	Not visible on imagery.	The Ecology Management Plan Rev03 (ref REP-00055) outlines precautions for avoiding the spread of soil borne pests and diseases, animal and crop diseases and invasive species. TS confirms that the contractor carried out monitoring and removal of Giant Hogweed and	No	No

				Japanese Knotweed during the construction phase. The contractor's Ecology Management Plan sets out a specific management plan which was developed for dealing with onsite Japanese Knotweed and Giant Hogweed.		
Geology, Land Contamination and Groundwater						
G11	N1-N29 (refer to Figure 8.4a); S1-S14 (refer to Figure 8.4b and 8.4c).	Ground gas monitoring of confined spaces will be undertaken before entry.	Not visible on imagery.	At the time of writing, it was not possible to review the operating company's (Forth Bridges Operating Company) Health and Safety Management Plan, which should incorporate the procedure for the monitoring of ground gases at any confined spaces at locations N1-N29 and S1-S14 (shown in Figure 8.4). Transport Scotland is not aware of enclosed spaces in these areas that require trunk road maintenance operatives to enter, however, it may be necessary to revisit this in more detail at the 3YA evaluation. Records/documents should be made available for review at this time, i.e. the operating company's Health and Safety Management Plan, records of gas monitoring prior to entry at confirmed spaces at locations N1-N29 and S1-S14 etc.	No	Yes
G13	S13 (refer to Figure 8.4a).	Groundwater, surface water and soil sampling results from the 2009 GI will be assessed. Surface water and groundwater monitoring will be undertaken during construction. Where necessary, post construction groundwater monitoring will be undertaken.	Not visible on imagery.	TS confirms that no post opening groundwater monitoring is necessary or currently being undertaken in the area of S13.	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
G18	Throughout scheme	Refer to mitigation measures proposed for protection of surface water (mitigation measure W1 in Table 23.3).	Not visible on imagery.	Surface water monitoring was undertaken during construction as required by the Construction Code of Practice (CoCP) Rev05. The CoCP notes that the contractor's Environmental Management Plan (EMP) will include a Surface Water and Management Plan which will include details of controls to prevent contamination of surface water resources including monitoring during construction and emergency responses. A sample of ELG meeting minutes were reviewed. The ongoing water quality monitoring of the Linn Mill Burn was discussed during EGL meeting no. 21 on 01/10/2013.	No	No
G19	Ch0-350 (Castlandhill Road) Ch0-290 (Ferrytoll Road) Ch0-1050 (temporary access road) Proposed scheme around M9 Junction 1A Ch2000-2500 (Queensferry Junction) Ch3200-4600 (mainline including associated roads and part of the main construction compound). Ch7900-8430 (mainline and associated side roads) Ch8500-8800 (mainline)	Road drainage, detention basins and swales will be lined to protect the surrounding water environment in the locations specified.	Not visible on imagery.	Under normal conditions, during a 1YA evaluation an observation would be made during the site visits regarding the drainage system, however due to the COVID-19 restrictions during March, April and May 2020 this has not been possible. Monitoring of Linn Mill Burn was undertaken during construction when the SUDS near the South Abutment of the Crossing were used for construction run-off. In addition the following were provided by TS: -Report for Principal Contract which removed the requirement for lining the drainage; -Employers Delivery Team confirm liners at all SUDS – either site won clay or synthetic liner (an example photo was provided which illustrated a liner being placed at the Ferrymuir SUD); and -Minutes of ELG Dec 2015 confirming that clay was spread at northern SUDS. As per the email received from Transport Scotland on 22/04/2020 the contractor was not required to prove how effective the measures were only to provide them to a satisfactory specification, so there	No	No

				are no monitoring results available for the drainage from the SUDS or the GW underneath for post construction.		
G20	Throughout scheme	All detention basins and swales will be lined unless risk assessment during design development indicates that lining is not necessary at specific locations.	Not visible on imagery.	<p>Under normal conditions, during a 1YA evaluation an observation would be made during the site visits regarding the drainage system, however due to the COVID-19 restrictions during March, April and May 2020 this has not been possible. Monitoring of Linn Mill Burn was undertaken during construction when the SUDS near the South Abutment of the Crossing were used for construction run-off.</p> <p>In addition the following were provided by TS:</p> <ul style="list-style-type: none"> -Report for Principal Contract which removed the requirement for lining the drainage; -Employers Delivery Team confirm liners at all SUDS – either site won clay or synthetic liner (an example photo was provided which illustrated a liner being placed at the Ferrymuir SUD); and -Minutes of ELG Dec 2015 confirming that clay was spread at northern SUDS. <p>As per the email received from Transport Scotland on 22/04/2020 the contractor was not required to prove how effective the measures were only to provide them to a satisfactory specification, so there are no monitoring results available for the drainage from the SUDS or the GW underneath for post construction.</p>	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
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G21	PWS N03, N04, N23	Site surveys will be undertaken to confirm if PWS are at risk. If confirmed, monitoring of the water quality of PWS will be required to determine background supply quality. Private water supplies will be maintained where practicable or alternatively, a connection to the public water supply will be provided.	Not visible on imagery.	The FRC GEOLOGY, GROUNDWATER AND LAND CONTAMINATION MANAGEMENT PLAN paragraphs 1.1.2 states that "it should be noted that private water supplies will not be affected by the works and the requirement for limiting adverse impacts no longer applies." Therefore the evaluation of mitigation item G21 is no longer required under the 1YA Opening Evaluation.	No	No
G24	St. Margaret's Marsh	The design will maintain the hydrological connectivity of the marsh whilst ensuring that the directional flow of groundwater is not affected. A groundwater monitoring network will be installed within St. Margaret's Marsh. Groundwater levels will be monitored for a minimum of one year prior to construction to ensure seasonal fluctuations in water levels are adequately assessed; groundwater levels will be monitored during construction.	Not visible on imagery.	A programme of groundwater monitoring was undertaken to provide assurance that there would not be an adverse effect on the groundwater regime at St Margaret's Marsh. A GW monitoring system network was installed within the marsh to monitor levels during and post construction. The contractor's Groundwater Monitoring Final Report Rev04 (January 2018) stated that data logger records have shown the groundwater hydraulic gradient to have been consistent throughout, reflecting a hydraulic gradient towards the marsh, and as suggested in the original hydrogeological assessment. It was concluded that groundwater levels were stable and the routine monitoring at all locations may no longer be necessary.	No	No
G26	Ch3000-4250	Quantitative stability analyses based on results of 2009 GI will be carried out to determine if any properties are at risk of settlement. In the eventuality of some properties being confirmed as at risk, appropriate measures including condition surveys and monitoring of buildings and groundwater levels may be required.	Not visible on imagery.	The contractor's Geology, Groundwater and Land Contamination Plan Rev04 (ref REP-00046) report states that the zone of influence arising from the South Queensferry cutting and temporary South Launch excavation was estimated to be less than the distance to the nearest properties at Echline Corner, Springfield and Linn Mill as well as Linn Mill Burn, even under the worst case hydrogeological scenarios. Despite the estimated zone of influence from the cutting not extending to any properties in the area, pre- condition surveys were	No	No

				<p>carried out at several dozen local properties in 2011.</p> <p>More recently, Transport Scotland has confirmed that a number of land compensation surveys have been undertaken post-construction, including property condition surveys and property structural surveys, and a number of claims have been made under Part 1 of the Land Compensation (Scotland) Act 1973 as follows:</p> <p><u>Property Condition Surveys:</u></p> <ul style="list-style-type: none"> -45 Property Condition Surveys out of 62 have been issued to the Employers Delivery Team by Forth Crossing Bridge Constructors (FCBC). -Eight Property Condition Surveys have been declined. -Transport Scotland is awaiting nine Property Condition Surveys from FCBC. <p><u>Property Structural Surveys:</u></p> <ul style="list-style-type: none"> -23 Property Structural Surveys were expected to be undertaken; however, three were declined at the start of the project so are unlikely to be carried out. - To date, two Property Structural Surveys have been received out of 20. <p><u>Claims under the Land Compensation (Scotland) Act:</u> Transport Scotland has received approximately 180 claims for depreciation in the value of property due to the use of the Queensferry Crossing and associated road network. Whilst the Valuation Office Agency has been advised of these claims, none have been agreed as yet.</p>		
G28	S13	Where necessary, lining of drainage to prevent the ingress of contaminated groundwater or lateral migration through granular backfill will be undertaken by the Contractor.	Not visible on imagery.	As per Transport Scotland's email received on 22/04/2020: the report for Principal Contract removed the requirement for lining the drainage.	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
Water Environment						
W1	Throughout scheme	Best practice guidance including but not limited to the following will be adhered to: SEPA Pollution Prevention Guidelines - PPG01, PPG02, PPG03, PPG04, PPG05, PPG06, PPG07, PPG08, PPG10, PPG13, PPG14, PPG18, PPG20, PPG21, PPG22, and PPG26; CIRIA Guidelines Report 142 Control of Pollution from Highway Drainage Discharges; CIRIA Report 168 Culvert Design Guide; CIRIA C609 Sustainable Drainage Systems; CIRIA C648 Control of Water Pollution from Linear Construction Projects; CIRIA C649 Control of Water Pollution from Linear Construction Projects Site Guide; CIRIA C697 The SUDS Manual; BS6031:1981 Code of Practice for Earthworks; and Defra Code of Practice for Using Plant Protection Products.	Not visible on imagery.	The operating company will be using best practice for maintenance and they will have an Environmental Management Plan, however this cannot be confirmed at the time of writing. Under normal conditions, during a 1YA evaluation an observation would be made during the site visits (i.e. a comment on the appearance of the drainage systems), however due to the COVID-19 restrictions during March, April and May 2020 this has not been possible. Site visits have been deferred to the 3YA evaluation.	Yes	No
W28	Throughout Scheme	For each outfall, a treatment train will be provided to maximise pollutant removal. For new sections of road and roads to be upgraded, the treatment train will consist of 3 levels of SUDS in accordance with CIRIA (2007) and approved by SEPA, including filter drains, swales and detention basins.	Some outfalls visible on imagery.	As-built drawings of the drainage systems at the Principal Contract and M9 Junction 1A were provided. A selection of drawings were reviewed, summarised below. As-built drawings for Pond 700 (adjacent to River Almond) (ref 17867-H-500-0100) illustrates a three level system has been constructed including a connecting a detention basin to the River Almond. Filter drains are present along the M9 northbound and southbound carriageways which eventually pass to the detention basin via a carrier drain. The detention basin near to the Ferry Burn is visible on aerial imagery dated 24/06/18 and street view imagery dated September 2016 (taken from the A90) in the location shown on Figure 9.3d. The detention basin, two swales and an outfall are located on the as-built drawings provided by Transport Scotland.	No	No

W29	St Margaret's Marsh (refer to Figure 9.3a)	The design will maintain the hydrological connectivity of the marsh whilst ensuring that the directional flow of groundwater is not affected (as per mitigation measure G24 in Table 23.2).	aerial imagery shows SUDS and outfalls locations on Figure 9.3.	A programme of groundwater monitoring was undertaken to provide assurance that there would not be an adverse effect on the groundwater regime at St Margaret's Marsh. A GW monitoring system network was installed within the marsh to monitor levels during and post construction. The contractor's Groundwater Monitoring Final Report Rev04 (January 2018) stated that data logger records have shown the groundwater hydraulic gradient to have been consistent throughout, reflecting a hydraulic gradient towards the marsh, and as suggested in the original hydrogeological assessment. It was concluded that groundwater levels were stable and the routine monitoring at all locations may no longer be necessary.	No	No
W30	Linn Mill Burn (refer to Figure 9.3c)	To mitigate against an increase in flood risk from the carriageway drainage onto lands adjacent to the viaduct abutments, excess runoff will be directed toward areas of detention, and/or conveyed toward the Firth of Forth without impacting areas of high risk.	Drainage/runoff not visible on aerial or street view imagery.	Transport Scotland has confirmed in writing that all road carriageway drainage, including intertidal area goes to the two SUDS ponds visible near the south abutment. Drainage from the bridge goes directly to the Firth of Forth.	No	No

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W31	Tributary of Niddry Burn, Niddry Burn, Swine Burn, River Almond (refer to Figure 9.3e)	Where structures or embankments are constructed within the floodplain, compensatory storage will be created by landforming and this will be provided directly adjacent to the watercourse floodplain where practicable.	Not visible on imagery.	<p>A selection of as-built drawings for the M9 Junction 1A were reviewed. As-built drawings for the rest of the FRC scheme are not available at the time of writing.</p> <p>On drawing 17867/H/500/108 Rev C for the Niddry Burn, flood compensation details are shown adjacent to the existing burn, including two separate flood compensation area 'Basins' upstream and downstream of the M9. Volumes for the compensation areas including band widths and volume loss during the construction works are shown for the upstream and downstream areas. Cross sections A-A and B-B illustrate the compensations storage areas.</p>	No	No
W32	Swine Burn (refer to Figure 9.3e)	Two outfalls appropriately positioned with scour protection will be provided. Two treatment trains will be provided. For flood flows in excess of carriageway drainage capacity, detention or conveyance of flood water toward areas of less risk.	The western most outfall is visible from street view imagery dated March 2019 taken from the M9. The eastern outfall however is not visible on aerial or street view imagery.	<p>Two drainage runs are associated with the Swine Burn, drainage run A which consists is shown on Figure 9.3e upstream of the realignment of the Swine Burn, and drainage run E which consists of the realigned Swine Burn and the beginning of the M9 spur. The ES requires that 1 SUDS treatment level is constructed for drainage run A and two SUDS treatment levels are constricted for drainage run E. As- build drawings 17867/H/500/004 and indicate that 17867/H/500/005 a combination of filter drains and a detention basin have been constructed, as required by the ES.</p> <p>It is not possible to view the scour protection on aerial/street view imagery. Photographs of the Swine Burn were provided by Transport Scotland looking south west along the realigned watercourse and looking east at the new culvert under the northbound slip road off the M9. Whilst some scour protection is visible near to the new culvert, the two</p>	No	Yes

				drainage discharge outfalls are not visible on the photographs. A site visit will be required at the 3YA evaluation to review scour protection at the Swine Burn.		
W33	Swine Burn (refer to Figure 9.3e)	One new depressed invert culvert and one double-barrel culvert extension will be provided. The culvert will be designed in line with CIRIA 168 guidance and with allowance for freeboard above the 0.5% AEP (200-year return period event) flood level and mammal passage. Regular inspection to ensure the culverts are free from debris is recommended.	New culvert visible on aerial imagery dated 24/06/18. Need to check that the culvert is being inspected regularly to be free of debris etc., as required by the mitigation W34.	The new depressed invert culvert and one double-barrel culvert extension on the Swine Burn are both visible on aerial imagery dated 24/06/18, however a site visit is required to check that the culvert is free of debris etc. A site visit will be required at the 3YA evaluation to observe maintenance practices at the Swine Burn	No	Yes
W34	Swine Burn (refer to Figure 9.3e)	Two stage channel with sinuous low flow channel will be provided. An adequately sized floodplain channel within the realignment will be provided to compensate for encroachment of the floodplain by the new proposed crossing and the culvert extension if required.	Aerial imagery shows Swine Burn appears to have been realigned sometime between 03/09/10 and 20/05/12. Street view dated Aug 2010 shows that dense mature trees line the north of the M9 in the location of the Swine Burn. By Jul 2012 shows the construction phase - the trees have been felled, the burn is visible from M9 and meanders.	Aerial and street view imagery indicates that the Swine Burn has been realigned between 03/09/10 and 20/05/12. Earthworks have been undertaken in the area of the Swine Burn to create a floodplain channel within the realignment. The Google Earth measurement tool indicates the channel is at least 7m wide to the north and south of the Swine Burn.	No	No

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W35	Tributary of Swine Burn (refer to Figure 9.3e)	One treatment train will be provided.	Treatment train and associated SUDS pond visible on aerial imagery dated 24/06/2018.	On review of aerial imagery, it can be confirmed that no detention basin has been constructed at this area by the Tributary of Swine Burn. Transport Scotland has confirmed that this detention basin was not constructed due to the presence of a high pressure gas main. A filter drain and dry ditch is shown to run on a east-west axis immediately south of the M9 westbound carriageway on as-built drawing 17867/H/500/003. These drainage features are intended to replace the original drainage features noted in the ES. Transport Scotland has confirmed that the design change was reviewed and demonstrated no worse residual impacts than those reported in the ES. SEPA also approved the change.	No	No
W36	Niddry Burn (refer to Figure 9.3e)	One treatment train will be provided.	SUDS feature and outfall to the Niddry Burn are visible on aerial imagery dated 24/06/18 in the location shown on Figure 9.3e and f.	Detention basin near to the Niddry Burn is visible on aerial imagery dated 24/06/18 in the location shown on Figure 9.3f. As-built drawings for Pond 1200 (adjacent to the Niddry Burn) (ref 17867/H/500/202) illustrate that a two level system has been constructed including a connecting a detention basin to the Niddry Burn. Filter drains are present along the M9 northbound and southbound carriageways which eventually pass to the detention basin via a carrier drain. Dry ditches area also present.	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
W39	River Almond	One treatment train will be provided.	SUDS feature and outfall to the River Almond are visible on aerial imagery dated 24/06/18 in the location shown on Figure 9.3e.	Detention basin near to the River Almond is visible on aerial imagery dated 24/06/18 and street view imagery dated May 2018 in the location shown on Figure 9.3f. As-built drawings for Pond 700 (adjacent to the River Almond) (ref 17867/H/500/203) illustrate that a three level system has been constructed including a connecting a detention basin to the River Almond, as required by the ES. Filter drains are present along the M9 northbound carriageways which eventually pass to the detention basin via a carrier drain. A swale connects the detention basin to the River Almond via a carrier drain and an existing pipe which has been retained. Dry ditches area also present.	No	No
W40	Ferry Burn	One treatment train will be provided.	SUDS feature and outfall to the Ferry Burn are visible on aerial imagery dated 24/06/18 in the location shown on Figure 9.3d.	Detention basin near to the Ferry Burn is visible on aerial imagery dated 24/06/18 and street view imagery dated September 2016 (taken from the A90) in the location shown on Figure 9.3d. The detention basin, two swales and an outfall are located on the as-built drawings provided by Transport Scotland.	No	No
W41	Dolphinton Burn (refer to Figure 9.3d)	Tie in with existing drainage network and SUDS will be provided.	Not visible on imagery.	The as-built drainage drawings for this area of the scheme are not available at the time of writing. This evaluation has been deferred to the the 3YA stage.	Yes	No
W42	Firth of Forth (refer to Figure 9.3c)	Two land-based treatment trains will be provided. Drainage over intertidal areas on both shores will be taken back to land-based SUDS systems. Drainage on Main Crossing will include droplet-dispersal system to disperse discharge and any road contaminants. Outfalls will be positioned at reasonably regular spacings (15m indicatively) on either side of bridge deck. Enhancement of drainage system along the viaduct to capture flood flows from the 0.5% AEP (200-year return period) event if practicable will be undertaken.	SUDS features relating to drainage runs P and Q are visible on most recent aerial imagery dated 14/12/18.	Land based drainage including SUDS features relating to drainage runs P and Q are visible on most recent aerial imagery dated 14/12/18. SUDS feature associated with drainage run Q (Firth of Forth) appears to be positioned slightly further north than the location shown on Figure 12.4a, however it is present. As-built drawings for the Firth of Forth drainage have been reviewed. The as-built drainage drawings for the bridge deck of the main crossing are not available at the time of writing. This	Yes	No

				evaluation has been deferred to the the 3YA stage.		
W45	Throughout scheme	Filter drains and filtration devices will be maintained through inspection and weed control, grass cutting, removal of sediment and vegetation build up, annual reinstatement of eroded areas or damaged vegetation and replacement of clogged filter material as required.	Mitigation relates to a maintenance programme. Review of imagery is not considered to be valuable in this case.	Under normal conditions, during a 1YA evaluation an observation would be made during the site visits regarding the maintenance of drainage systems, however due to the COVID- 19 restrictions during March, April and May 2020 this has not been possible. Site visit deferred to the 3YA evaluation.	Yes	No
W46	Throughout scheme	Scour protection will be provided at the drainage discharge outfall to protect the banks and bed of the receiving watercourse and to limit erosion.	Not visible on imagery.	It is not possible to view scour protection on aerial and street view imagery. Photographs of the Swine Burn were provided by Transport Scotland looking south west along the realigned watercourse and looking east at the new culvert under the northbound slip road off the M9. Whilst some scour protection is visible near to the new culvert, the two drainage discharge outfalls are not visible on the photographs. Due to the restrictions imposed by the lockdown, visiting the Swine Burn is not possible. This evaluation has been deferred to the the 3YA stage.	Yes	No
Terrestrial and Freshwater Ecology						
TE6	Throughout scheme	Suitably constructed structures primarily for badgers, bats and otters including overbridges, underpasses, and fencing, with associated planting will be created on commuting corridors.	No	'Forth Replacement Crossing Ecological Mitigation Report', January 2019, provides photographic evidence that mitigation measures have been implemented.	No	No

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TE18	Throughout scheme	Lighting design will be according to BS 5489 and best practice guidance on lighting (e.g. Bat Conservation Trust and Institute of Lighting Engineers, 2007). Where practicable, night time working (undertaken between sunset and sunrise) will be avoided. Where night-time working is unavoidable, mitigation will be agreed with the ECoW.	No	As per email received from Transport Scotland on 12/05/20 Transport Scotland has confirmed that the contractor was required to utilise the BS 5489-1:2013 revision in the mainline lighting design. This enabled further efficiencies to be developed within the lighting design and resulted in a lesser lighting class being utilised in some areas relative to that envisaged at Contract Award. With regards new road lighting, the contractor has been required to provide road lighting: - at the locations detailed in Table 12 of the ER and where Reference Points are prescribed, with reference to drawings FRC/J/431/CD/001 to 005; to lighting levels in accordance with BS5489-1 and BS EN 13201-2 as detailed in Table 12 of the ER; and grouped by dimming / switching group as detailed in Table 12 of the ER.	No	No

TE20	Throughout scheme	<p>Construction work at watercourses will not prevent the movement of animals along the bank throughout the works period.</p> <p>Watercourse realignments in low gradient areas will be designed to minimise sedimentation and in high gradient areas to minimise erosion. The opportunity to create suitable habitat will be incorporated through the inclusion of meander bends, secondary channels or, riparian zones where appropriate.</p> <p>Where bridging is not practical and culverts are required, their length will be kept to a practical minimum. Where practical, the insertion of each culvert will not alter the gradients markedly from existing conditions so as to avoid altering flow patterns and resulting habitat loss and to avoid excessive siltation or erosion.</p> <p>Altered flow regimes resulting from the use of culvert extensions or channel realignments will be avoided. Culverts will be oversized to allow natural bed and bank profiles to remain, where practicable.</p> <p>On sites where dewatering is anticipated, the creation of a temporary diversion channel with suitable sized replacement substrate or transplanted substrate from the section being dewatered will be undertaken, making sure that the size and flow in the diversion channel is as near to the existing channel as practicable.</p> <p>Fish will be removed from channels to be dewatered for construction of culverts, realignments or bridges.</p> <p>In salmonid waters, in-channel works and piling will be avoided during sensitive periods for migrating and spawning fish (October-May inclusive).</p> <p>Drainage systems will be designed to prevent otter entering and becoming trapped. There will be no stockpiling of material within 10m of any watercourse.</p> <p>Mammal ledges will be installed in new culverts and will comprise the installation of a ledge of minimum 500mm wide with access to the bank via ramps. Ledges must be a minimum of 150mm above high water levels and allow 600mm headroom. Ledges must take account of the preferred bank used by otters.</p>	No	<p>As per email received from Transport Scotland on 10/04/20: "There was a CAR licence for M9J1a culverts (none on the Principal Contract) - so approval from SEPA. All designs were approved by the Employer's Delivery Team on site prior to construction. Extensions to existing culverts -the Niddry Burn under the M9 and the Swine Burn under the M90. New culvert for Swine Burn under the n/b slip from the M9 to M90. Normally for this you could have a look at the culverts and make an observation during a site visit. I have attached a photo showing the extension to the Niddry Burn culvert and Swine Burn culvert. Also, a photo showing the realignment of the Swine Burn - this is a huge improvement as the burn was previously a straightened ditch".</p> <p>Fish surveys: in relation to the realignment of the Swine and Niddry Burns, two surveys were undertaken at Swine Burn and three at Niddry Burn during spring and summer 2012, prior to temporary closures of the Swine and Niddry burns to enable realignment of the channels.</p>	No	No
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ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
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TE21	Throughout scheme	<p>Any maintenance works required during the breeding bird season will be subject to the same restrictions as during construction. Mammal proof fencing will be maintained during operation of the proposed scheme. Crossing points for bats will be monitored as part of the operational aftercare management contract to assess whether additional provision will be required.</p> <p>Culverts will be appropriately maintained to ensure continual operation of the asset during operation.</p>	No	<p>The 'Forth Replacement Crossing End of Project Report on Estuarine Bird Ecology: 2008 to 2017', July 2018, notes "The FRC illustrates how a nationally significant infrastructure project situated in an area of international importance to birds can be successfully delivered without implication for birds. Long-term bird monitoring has confirmed there were no adverse effects on the integrity of the designated sites within the Forth Estuary due to the construction of the FRC" (p8-2).</p> <p>The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, notes "a mammal ledge was installed at Niddry Burn culvert and a dry mammal tunnel was installed above Swine Burn culvert"; "Otter-proof fencing was installed around the above culverts, on the west side of Kirkliston and along the B981 boundary with St. Margaret's Marsh" (p3-4) and "Bat boxes were monitored and maintained for a period of five years by licensed bat workers. Annual inspections recorded positive results with up to 30 common pipistrelle bats using boxes throughout the site" (p3-3).</p> <p>A site visit will be required to check that the culverts are being maintained adequately to allow for continual operation of the asset.</p>	No	Yes

TE22	Throughout scheme	<p>Landscape planting and newly created habitat will be comprised of predominantly native species of local provenance where available, and will comprise a mixture of species. Where loss or degradation of valuable habitat is unavoidable and where watercourses are realigned, they will be returned to their former quality or improved once construction is complete where practicable. Sowing/planting will be undertaken as soon as possible following completion of the works to reduce the likelihood of the areas being colonised by invasive, non-native species which are of lower value to wildlife.</p> <p>All areas of habitat loss due to temporary works, site compounds, easements, working areas or access roads will be reinstated following construction on a like for like basis. Habitat creation will contribute to biodiversity targets identified in local (LBAP) and national (UKBAP) strategies.</p> <p>During the operation of the proposed scheme, management and maintenance of roadside verges is to be undertaken to maintain and enhance floral diversity.</p> <p>Appropriate management will be undertaken of existing boundary habitats such as hedgerows or rough edges for the benefit of key farmland species of conservation concern such as yellowhammer (<i>Emberiza citronella</i>), skylark (<i>Alauda arvensis</i>), linnet (<i>Carduelis cannabina</i>), tree sparrow (<i>Passer montanus</i>), meadow pipit (<i>Anthus pratensis</i>) and grey partridge (<i>Perdix Perdix</i>).</p> <p>Replacement roosts will be monitored during the aftercare and operation phase of the road in order to identify further roost requirements.</p>	No	<p>The FRC Ecological Mitigation Report states that landscape and ecological planting was undertaken to promote plant survival, growth and establishment throughout the site. The approach was beneficial in terms of replacing trees, woodland and ecological habitat, integrating the scheme into the surrounding landscape and screening views of the new roads and traffic by achieving effective establishment of woodland areas prior to scheme completion.</p> <p>Transport Scotland confirmed that new planting, such as hedges, is currently being maintained by FRBC up to 2023 and the FRBOC thereafter. With respect to road verges, trunk roads are maintained by FRBOC and side roads are maintained by the relevant local authorities.</p> <p>It is recommended that a site visit is undertaken at the 3YA stage to a selection of locations to verify that these mitigation measures have been implemented.</p> <p>The FRC End of Project Report on Estuarine Bird Ecology: 2008 – 2017 provides evidence that appropriate management was undertaken to protect species of farmland species of conservation concern.</p>	No	Yes
TE23	Throughout scheme	<p>Best practice measures will be implemented to prevent pollution (see mitigation measure W1 in Table 23.3).</p>	No	Refer to W1 above.	Yes	No

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TE24	Mixed woodland planting adjoining existing woodland west of M9 Junction 1A; replacement planting south of Queensferry Junction between ch2700-2900; and mixed woodland planting west of Ferrytoll Junction within the agricultural field adjoining Castlandhill Wood.	Habitat creation to be undertaken using broad-leaved and mixed plantation woodland of native species of local provenance where available.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, notes "Planting was undertaken to: replace trees, woodland and ecological habitat, which was removed prior to construction works" (p3-12); and "To ensure the ecological integrity of the site was protected and the biodiversity enhanced, native species of local provenance (Forestry Commission region 203 or nearest available) were used" (p3-13)	No	No
TE25	Along existing hedge south of Inchgarvie House. Along the access road north of Queensferry Junction (ch3700- 4300) and on the western side of the proposed scheme (ch3600-3900). Along the A904 west of Queensferry Junction and along the minor road southwest of Queensferry Junction. Along the proposed scheme east of Queensferry Junction (ch2500- 3500) and alongside the bus links east of ch500. North of Lindsay's Craigs Woodland alongside M9 WB from the M9 Spur Interchange Link to Overton Road (ch1700-2200).	Hedgerow and tree planting will be provided.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, notes "Planting was undertaken to replace trees, woodland and ecological habitat, which was removed prior to construction works; integrate the FRC scheme into the surrounding landscape, by planting individual trees, hedges and areas of mixed or scrub woodland to reflect local landscape features; screen views of the new roads and traffic for adjacent properties; and enhance the experience for travellers by creating a variety of views" (p3-12).	No	No
TE26	Areas of Habitat Creation [Swine Burn]	Bankside habitat creation comprising planting and enhancement of detention basins will be undertaken.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, notes "Clumps of riparian vegetation were transplanted from the edge of the original burn to the banksides of the realigned channel" (p3-16).	No	No
TE27	Confidential	Replacement badger setts will be provided prior to the exclusion of badgers from social group A from their parent sett and population group C for a main and two outlier setts. Where practicable, replacement setts will be created within the same woodland area as the existing setts. Where this is not possible, the alternative site will be located such that a clear path leads to it from an existing sett.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, provides photographic evidence that these mitigation measures in place. The report also notes "Two replacement setts were constructed at different locations in October 2010 to mitigate for the closure of existing setts" (p3-1).	No	No

TE31	Niddry Burn	An artificial otter holt will be provided.	No	"European Protected Species (EPS) licences were obtained to exclude two otter holts and construct one replacement holt at Niddry Burn in July 2011". Photographic evidence corroborates (p3-4).	No	No
TE32	Watercourses	In order to reduce disturbance of otters, lighting will be sensitively sited to reduce light spill onto burns and where required screens will be provided.	No	Recent street view aerial imagery dated 14/12/18 shows no street lighting on the M9 Junction 1a where the Niddry Burn and Swine Burn cross under the road. However, Transport Scotland confirmed this is not an issue for the Principal Contract as no burns are directly adjacent to the roads. Recommendation: a site visit should be deferred to the 3YA evaluation.	No	No
TE34	Swine Burn. Niddry Burn.	Habitat enhancement/creation will be incorporated through the inclusion of meander bends, secondary channels and riparian zones, where appropriate.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, notes "The existing linear, engineered channel for the Swine Burn was realigned to include meander bends and areas for riparian zones to establish" (p3-16).	No	No
TE37	Swine Burn (ch1850) .	Swine Burn will be culverted at ch1850 where the proposed scheme crosses the watercourse. This culvert is to include integral mammal ledges to enable otters to continue to commute along the Swine Burn corridor.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, provides photographic evidence of mitigation measures in place. The report also notes "A mammal ledge was installed at Niddry Burn culvert and a dry mammal tunnel was installed above Swine Burn culvert" (p3- 4).	No	No
TE38	Scheme drainage including detention ponds	Detention basins, culverts, filter drains, swales and catchpits will be inspected and maintained as appropriate (refer to Table 23.3).	No	As per item W45. A site visit will be undertaken at the 3YA stage, as advised by Transport Scotland	Yes	No
TE39	Ch3350. Ch2750. East of ch1500 on the A90.	Suitable structures such as temporary fencing during construction and ITS/ADS gantries during operation will be provided to act as bat bridges.	No	As per email received from Transport Scotland on 10/04/20: "Three gantries on the Southern Network at approx. ch3350, ch2750 and east of ch1500 on the A90, from the Echline Strip woodland to Scotstoun were intended to provide bat crossings. These gantries were constructed.	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
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TE41	Ch1700-4300.	Badger proof fencing will be provided. Note at certain locations integrated with noise barriers refer to Table 23.6.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, notes "Badger fencing was installed to prevent badgers from gaining access to the M90/A90 and a badger gate incorporated at one location to enable badger access within fenced areas, where rabbit proof fencing may have restricted movement" (p3-1);	No	No
TE44	Between ch2500-3100.	A dry mammal passage will be provided.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, notes "A mammal ledge was installed at Niddry Burn culvert and a dry mammal tunnel was installed above Swine Burn culvert" (p3-4).	No	No
TE45	Castlandhill Woods. Woodland at St Margaret's Hope. East Shore Wood adjacent to Society Rd (west of Main Crossing). Echline Strip (ch2920).	Bat surveys will be undertaken to determine the species, seasonal and dimensional requirements of replacement roost habitat including provision of bat boxes.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, notes "Sixty bat boxes were installed, as advance mitigation works, in nine locations throughout the site to mitigate for the loss of potential bat roosts. Two additional bat boxes were installed at St. Margaret's Hope Wood and five additional boxes were installed in the woodland area next to Inchgarvie Lodge by the Contractor during the construction period" (p3-3); and "Dawn and dusk emergence bat surveys were undertaken prior to site clearance being commenced in Autumn 2011" (p3-3).	No	No
TE46	Ch8200-8300 (cemetery)	If required, maiden pink (<i>Dianthus deltoides</i>) to be translocated to a suitable adjacent location. Translocation will be undertaken with necessary permissions under the supervision of an ECoW in accordance with a detailed method statement prepared in advance .		As per email from Transport Scotland received on 10/04/20: This wasn't required as the area where Maiden Pink had been observed wasn't required during construction. This is mentioned in the Forth Replacement Crossing Ecological Management Plan, July 2014".	No	No

TE47	Woodlands	If native bluebells (LSAP species) are within the woodland areas designated for land take, these will be translocated with necessary permissions and used as "plant plugs" to aid new colonisation in suitable, adjacent woodland.	No	The 'Forth Replacement Crossing Ecological Mitigation Report', January 2019, notes "Native bluebells within the woodland area designated for land take at St. Margaret's Hope Wood, were translocated, with necessary permissions, to aid new colonisation in adjacent woodland at Castlandhill" (p3-15); and "Initial monitoring indicated that no bluebells were establishing from translocated bulbs. However, two years later, bluebells were colonising within the area where translocation had been undertaken and elsewhere in the new woodland area" (p3-15)	No	No
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					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
TE50	Realigned B981	The design will maintain the hydrological connectivity of the marsh whilst ensuring that the directional flow of groundwater is not affected (as per mitigation measure G25).	No	As per mitigation measure G25: Ch8 of the ES notes that “with regards to cuttings intercepting groundwater, additional groundwater sampling has been included in the 2009 GI to complement knowledge on groundwater quality. The containment facilities and discharge location for abstracted groundwater during construction will be defined as part of the detailed design by the Contractor and will take into account baseline groundwater quality characteristics (mitigation item G25). In addition, permeability tests have been included in the 2009 GI to enable, if required, groundwater assessment and estimate the volumes of groundwater that will be dewatered during the first part of the construction phase. This information will be provided to the Contractor”.	No	No
TE51	St. Margaret's Marsh	A management strategy to enhance the site's condition will be implemented in consultation with stakeholders.	No	The 'St. Margaret's Marsh Site of Special Scientific Interest Site Management Plan', February 2019, notes “The Management Plan was developed in consultation with Scottish National Heritage (SNH) and finalised in 2011”.	No	No
Estuarine Ecology						
EE1	Firth of Forth	Ecological surveys will be undertaken as appropriate prior to commencement of project works and during works in order to identify sensitive sites, vulnerable species and changes in environment. During construction, ecological surveys will be undertaken in order to establish level of significant impacts on ecological receptors are as expected.	Not visible on imagery.	The Jacobs Arup Ecology Mitigation Report indicates that a range of ecological surveys were undertaken prior to and during construction work, including: -Bird surveys to inform the Appropriate Assessments were conducted between September 2007 and April 2009 (inclusive) across a large area extending between Limekilns and Dalgety Bay on the north shore of the Forth, and Abercorn Point and Hound Point on the south shore (Figure 3). -Preconstruction surveys identified roosting curlew on the south shore, within	No	No

				250m of the bridge, west of Port Edgar Marina, which were considered to be at risk of disturbance or displacement by construction activities for South Piers 4, 5 and 6. The bird monitoring confirmed that, although birds were locally displaced, there was no significant disturbance and more than 40 roosting curlew were observed in the same vicinity, during Spring 2015.		
EE2	Firth of Forth	Plant and personnel will be constrained to a defined working corridor thereby minimising damage and disturbance to ecological receptors.	Not visible on imagery.	<p>Transport Scotland confirmed in an email received on 04/05/20 that during construction, the Contractor had an Ecology Management Plan and a Noise & Vibration Management Plan which outline measures to minimise disturbance to ecology, including the mitigation specific to HRAs.</p> <p>The FRC Ecology Management Plan Rev03 states that plant and personnel will be constrained to a prescribed working corridor through the use of temporary barriers, if required by the Ecological Clerk of Works (ECoW), specifically to protect terrestrial habitats and otters.</p> <p>The Contractor further had an ECoW and Environmental Manager to ensure the measures in these Management Plans were undertaken.</p>	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
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EE3	Firth of Forth	Suitable constructed access roads/bridges will be created within the intertidal zone to limit activities in direct contact with habitat.	Generic mitigation across various locations at the site - it may not be possible to pinpoint specific constructed structures	Transport Scotland confirmed in an email received on 04/05/20 that during construction, the Contractor had an Ecology Management Plan and a Noise & Vibration Management Plan which outline measures to minimise disturbance to ecology, including the mitigation specific to HRAs. Paragraph 5.9.41 of the FRC Ecology Management Plan Rev03 specifically relates to intertidal habitat and states that suitable constructed access roads/bridges will be created within the intertidal zone to limit activities in direct contact with habitat.	No	No
EE4	Firth of Forth	An Ecological Clerk of Works (ECoW) will be on site to monitor construction activities to ensure the effective implementation of the construction methodology plan and appropriate environmental safeguards.	Not visible on imagery.	ECoW were present onsite throughout the construction phase to undertake monitoring and inspection of several estuarine species, as indicated by the FRC Ecological Mitigation Report by Jacobs Arup (2019). Ecological quarterly reports were submitted throughout the construction period by the Contractor's ECoWs (Forth Crossing Bridge Constructors, 2012-2017).	No	No
EE5	Firth of Forth	The Contractor will adhere to an Environmental Management Programme (EMP) and Code of Construction Practice (CoCP). Method statements will detail full construction methodologies and specific rules in order to prevent environmental contamination.	Not visible on imagery.	Transport Scotland confirmed in an email received on 04/05/20 that during construction, the Contractor had an Ecology Management Plan Rev03 and a Code of Construction Practice (CoCP) Rev 05 which outline measures to minimise disturbance to ecology, including the mitigation specific to HRAs. The contractor had an Ecological Clerk of Works and Environmental Manager to ensure the measures in these Management Plans were undertaken.	No	No

EE6	Firth of Forth	Best practice measures will be implemented to prevent pollution (see mitigation measure W1 in Table 23.3).	Not visible on imagery.	A Marine Spillage Response Plan was in place to set out the controls and arrangements to be implemented to ensure that site works comply with statutory requirements and good practice with regard to preventing pollution and nuisance from environmental incidents and accidents. The plan was prepared in line with several of SEPA's Pollution Prevention Guidelines (PPGs) relevant to managing fire water and major spillages, pollution incident response planning, incident response for dealing with spills, safe storage of drums and intermediate bulk containers. The Marine Spillage Response Plan also adhered to the Forth Ports Limited (2011) oil spill contingency plan "Clearwater Forth".	No	No
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ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
EE7	Beamer Rock	Reasonable precautions will be undertaken to avoid/reduce noise disturbance from blasting including: . Consider undertaking explosive excavation in intertidal zones during low water periods to restrict underwater noise (i.e. when area is exposed). . Consider undertaking explosive excavation within Beamer Rock so that edges of the Rock act as noise buffers reducing emissions to water. . Incorporation of non-explosive techniques for fracturing rock, where constructionally effective. . Use acoustic deterrents at appropriate frequency during key construction periods and bubble curtains if appropriate, to attenuate sound waves. An equipment maintenance programme will be required. . Use a string of explosions milliseconds apart to reduce the peak emission rather than one explosion that will reach a higher peak emission (JNCC, 2008). . The dBht (salmon) should not exceed the maximum tolerance exposure for this species across 50% of the river, thus enabling migrating salmon to pass the construction area. The remaining 50% would be permitted to experience levels above this, provided all other mitigation listed here is implemented.	Not visible on imagery.	The FRC Ecological Mitigation Report states that Marine Mammal Observers and Passive Acoustic Monitoring were employed during construction until June 2014 to ensure marine mammals were not present prior to blasting and piling works. Marine mammals included grey seals (possibly associated with the Isle of May SAC), harbour seals, harbour porpoises, and bottle-nosed dolphins (possibly linked to the Moray Firth SAC population).	No	No
EE8	At piling locations in the Firth of Forth	Reasonable precautions to be undertaken to avoid/reduce noise disturbance from piling including: . Use acoustic deterrents at appropriate frequency during key construction periods and bubble curtains if appropriate, to attenuate sound waves. An equipment maintenance programme will be required. . Soft-start approach or ramp-up approach to piling to allow any receptors in the vicinity to leave the area, procedure to follow JNCC guidelines (JNCC, 2009). . Consider using a low noise alternative to impact piling. . Best practice piling procedures to be followed with guidance taken from JNCC procedures.	Not visible on imagery.	The FRC Ecological Mitigation Report by Jacobs Arup (2019) states that Marine Mammal Observers and Passive Acoustic Monitoring were employed during construction until (June 2014) to oversee that marine mammals were not present prior to blasting and piling works. Marine mammals included grey seals (possibly associated with the Isle of May SAC), harbour seals, harbour porpoises, and bottle-nosed dolphins (possibly linked to the Moray Firth SAC population).	No	No

EE9	Beamer Rock and piling locations in the Firth of Forth	<p>A trained Marine Mammal Observer (MMO) will be present when blasts occur and for the periods of inactivity following cessation of piling and blasting before these activities restart. If e3 are present, blasting and piling activities will be delayed until the cetacean/group of cetaceans have passed beyond a threshold distance. This exclusion zone will be set dependant on predicted noise levels.</p> <p>Passive Acoustic Monitoring (PAM) will be used by a trained operative to identify mammals within the mitigation zone prior to piling. Piling will not commence if marine mammals are detected within the mitigation zone or until 20 minutes after the last visual or acoustic detection. The PAM operative will follow JNCC guidance (JNCC, 2008 and JNCC, 2009).</p>	Not visible on imagery.	The FRC Ecological Mitigation Report by Jacobs Arup (2019) states that Marine Mammal Observers and Passive Acoustic Monitoring were employed during construction until (June 2014) to oversee that marine mammals were not present prior to blasting and piling works. Marine mammals included grey seals (possibly associated with the Isle of May SAC), harbour seals, harbour porpoises, and bottle-nosed dolphins (possibly linked to the Moray Firth SAC population).	No	No
EE10	Beamer Rock	There will be no explosive blasting on Beamer Rock between 01 May and 15 August to avoid the risk of impacts on breeding terns on Long Craig Island.	Not visible on imagery.	The FRC Ecological Mitigation Report states with the exception of 2012, when Long Craig Island was temporarily abandoned as a breeding colony, common tern breeding numbers remained stable or increased at Long Craig Island throughout construction years. It was confirmed that noise levels at these colonies, from the FRC construction works, remained imperceptible above the baseline noise levels and therefore did not indicate adverse effects or contribute to this displacement.	No	No

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EE11	Firth of Forth	<p>Noisy activities will be avoided at night (between 1 hour before dusk and 1 hour after dawn) during the post-breeding/ passage period for terns (between 15 August and 31 October). If it is unavoidable that noise limits will be breached between 15 August and 31 October, then Port Edgar and Long Craig Island will not be simultaneously impacted as one can be used as a refuge for roosting terns if the other is disturbed.</p> <p>The Contractor will employ a 'soft-start' to all noisy activities (see definition above). Each time the activity is started up after a period of inactivity, the noise levels will be gradually increased over a period of 30 minutes to allow birds (and other animals) relocate. This will apply year round. For the first seven days after the commencement of each noisy activity, the soft-start must be applied each time the machinery is stopped, even if this is only for very short periods. The duration of periods of inactivity requiring a soft start will be increased incrementally over this seven day period.</p> <p>Subject to assessment of bird responses to the activity, after seven days a soft start will only be required overnight or after an extended period of inactivity.</p>	Not visible on imagery.	<p>A Plan for the Control of Noise and Vibration (PCNV) was prepared and followed which included the mitigation measures identified in the Reports to Inform an Appropriate Assessment (RIAs) for marine mammals as follows:</p> <ul style="list-style-type: none"> - Acoustic shrouds around hammers to reduce noise during vibro and percussive piling; - Soft start for minimum of 20 minutes; and - Restricting noisier activities to daytime whenever possible. 	No	No
EE12	Firth of Forth	<p>Best practicable means will be made to maintain noise levels below 75 dBLAeq day and night: at: (i) Long Craig Island at all times of day and night during the tern breeding season (01 May until 15 August in a given year) and (ii) Long Craig Island and the Port Edgar tern roost site at night (between 1 hour before dusk and 1 hour after dawn) during the post- breeding/ passage period for terns (between 15 August and 31 October in a given year).</p>	Not visible on imagery.	<p>The FRC Estuarine Bird Ecology Report (2008-2017) states that maximum noise levels were set at a level equivalent to published daytime noise limits for people based on the fact that noise levels which potentially disturb birds are similar to thresholds set for humans.</p> <p>Year-round monitoring of noise was used to assess whether absolute noise limits for Port Edgar and Long Craig Islands during the tern roosting periods were being met, and also to identify noisy activities year-round. Maximum noise levels were set at a level equivalent to published daytime noise limits for people based on the fact that</p>	No	No

				noise levels which potentially disturb birds are similar to thresholds set for humans.		
EE13	Long Craig Island and Port Edgar	Monitoring of noise levels from construction activities will be undertaken at Long Craig Island during the breeding season for terns (May to mid-August) and at Long Craig Island and Port Edgar tyre raft from 1 hour before sunset until sunrise between mid-August and October. The ECoW will identify and assess the significance of these levels on the tern population. Monitoring of bird responses to construction activities will be undertaken. Assessment of the significance of these activities on estuarine birds will be undertaken.	Not visible on imagery.	The FRC Ecological Mitigation Report by states that estuarine bird monitoring was undertaken by Jacobs Arup to fulfil the commitments made in the Reports to Inform an Appropriate Assessment (RIAs) to monitor the effect of construction on bird populations. Monitoring of terns at Long Craig Island and Port Edgar was also undertaken by the Contractor's ECoW.	No	No
EE14	Temporary trestle bridges on northern and southern shores of Firth of Forth	Visual screens will be installed along the perimeter of the temporary trestle bridges on both shores to reduce the impact of construction activities on birds using adjacent areas of the Firth of Forth.	Not visible on imagery.	In Section 4.1.4 of the FRC Ecological Management Plan, it states that construction of the foundations associated with the main crossing and approach viaducts within the Firth of Forth SPA are undertaken in line with the requirements of the Environmental Statement and RIAs to mitigate the potential effects on fish, marine mammals and birds, including impacts associated with the following: - noise and vibration due to piling and blasting works; - habitat loss due to piling and dredging works, including the disposal of dredging's; release of sediment, including any contamination, due to construction works; - chemical spills due to construction works; - light pollution due to temporary lighting; and - disturbance from increased traffic/vessels.	No	No

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EE15	Firth of Forth	<p>For boats/barges transporting personnel and supplying materials for construction, the ECoW (in consultation with SNH and the Harbour Master) will identify where construction boat traffic is not permitted so that the constructor can stipulate routes in consultation with the Harbour Master. The compliance of boats/barges to defined routes will be determined by ECoW.</p> <p>No construction boat traffic including small water vessels will go within 100m of Long Craig Island (except in the case of an emergency). The compliance of boats/barges to defined routes will be determined by the ECoW.</p> <p>If in exceptional circumstances, encroachment within 100m of Long Craig Island is unavoidable, prior approval by the ECoW will be required and the ECoW will oversee the specified activity.</p>	Not visible on imagery.	<p>The FRC Marine Incident Response Plan states that:</p> <p>1.1.1 This plan sets out the controls and arrangements that will be implemented to ensure that site works comply with statutory requirements and good practice with regard to preventing pollution and nuisance from environmental incidents and accidents. This plan is relevant to works in the marine environment and any spill or potential spill of polluting materials into the Firth of Forth. The Land Based Incident Response Plan covers spillages to land.</p> <p>1.1.2 This plan has been prepared in line with the following Pollution Prevention Guidelines and reports: -SEPA PPG 18: Managing fire water and major spillages; - SEPA PPG21: Pollution Incident Response Planning; - SEPA PPG 22: Incident Response – dealing with spills; -SEPA PPG 26: Safe Storage – drums and intermediate bulk containers.; and -Forth Ports Limited (2011) oil spill contingency plan “Clearwater Forth”.</p> <p>1.1.3 This plan covers all construction operations within the principal contract construction site(s) area. It also includes the following key locations: <input type="checkbox"/> FCBC facilities at Rosyth Docks; <input type="checkbox"/> Mobile operations from vessels operating within the Forth estuary and port area; and <input type="checkbox"/> Operations occurring within intertidal areas.</p> <p>1.1.4 All construction activities will be undertaken in accordance with an approved Method Statement, which will</p>	No	No

				provide additional task-specific and location-specific controls to augment those identified in this Incident Response Plan where applicable. "		
EE16	Firth of Forth	Dredging footprint will be reduced as much as practicable.	Not visible on imagery.	Section 4.1.4 of the FRC Ecological Management Plan states: Construction of the foundations associated with the main crossing and approach viaducts within the Firth of Forth SPA are undertaken in line with the requirements of the Environmental Statement and RIAAs to mitigate the potential effects on fish, marine mammals and birds, including impacts associated with the following: <input type="checkbox"/> noise and vibration due to piling and blasting works; <input type="checkbox"/> habitat loss due to piling and dredging works, including the disposal of dredging's; <input type="checkbox"/> release of sediment, including any contamination, due to construction works; <input type="checkbox"/> chemical spills due to construction works; <input type="checkbox"/> light pollution due to temporary lighting; and <input type="checkbox"/> disturbance from increased traffic/vessels.	No	No

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EE17	Firth of Forth	<p>Design of lighting arrangements will ensure minimal light spillage out with the boundary of the construction sites and associated site compounds, with compliance determined by the ECoW.</p> <p>Monitoring of construction site lighting will be undertaken at night by the ECoW to identify any potential adverse impacts on birds.</p> <p>If identified by the ECoW, preventative measures (e.g. installation of shields) will be taken if any adverse impacts are detected.</p>	Not visible on imagery.	<p>Section 4.1.4 of the FRC Ecological Management Plan states: Construction of the foundations associated with the main crossing and approach viaducts within the Firth of Forth SPA are undertaken in line with the requirements of the Environmental Statement and RIAAs to mitigate the potential effects on fish, marine mammals and birds, including impacts associated with the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> noise and vibration due to piling and blasting works; <input type="checkbox"/> habitat loss due to piling and dredging works, including the disposal of dredging's; <input type="checkbox"/> release of sediment, including any contamination, due to construction works; <input type="checkbox"/> chemical spills due to construction works; <input type="checkbox"/> light pollution due to temporary lighting; and <input type="checkbox"/> disturbance from increased traffic/vessels. <p>In particular, Section 5.5.15 states: Monitoring of construction site lighting will be undertaken at night by the ECoW to identify any potential adverse impacts on birds.</p>	No	No

EE18	Port Edgar	Between 15 August and 31 October, works for the relocation of the sewage outfall will not take place at night-time (1 hour before dusk and 1 hour after dawn) and within 200m and in direct view of the Port Edgar floating tyre raft.	Not visible on imagery.	<p>The FRC Marine Incident Response Plan:</p> <p>1.1.1 This plan sets out the controls and arrangements that will be implemented to ensure that site works comply with statutory requirements and good practice with regard to preventing pollution and nuisance from environmental incidents and accidents. This plan is relevant to works in the marine environment and any spill or potential spill of polluting materials into the Firth of Forth. The Land Based Incident Response Plan covers spillages to land.</p> <p>1.1.2 This plan has been prepared in line with the following Pollution Prevention Guidelines and reports: <input type="checkbox"/> SEPA PPG 18: Managing fire water and major spillages; <input type="checkbox"/> SEPA PPG21: Pollution Incident Response Planning; <input type="checkbox"/> SEPA PPG 22: Incident Response – dealing with spills; <input type="checkbox"/> SEPA PPG 26: Safe Storage – drums and intermediate bulk containers.; and <input type="checkbox"/> Forth Ports Limited (2011) oil spill contingency plan “Clearwater Forth”.</p> <p>1.1.3 This plan covers all construction operations within the principal contract construction site(s) area. It also includes the following key locations: <input type="checkbox"/> FCBC facilities at Rosyth Docks; <input type="checkbox"/> Mobile operations from vessels operating within the Forth estuary and port area; and <input type="checkbox"/> Operations occurring within intertidal areas.</p> <p>1.1.4 All construction activities will be undertaken in accordance with an approved Method Statement, which will provide additional task-specific and location-specific controls to augment those identified in this Incident Response Plan where applicable.</p>	No	No
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ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
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EE19	Firth of Forth	Vessels involved in the construction activities for the FRC should adhere to the industry recommended guidelines for preventing the introduction of non-native marine species. UKMarineSAC (2009) recommends that vessels comply with International Maritime Organisation guidance wherever possible, seek guidance from the local port authority regarding areas where ballast water uptake should be avoided (e.g. near sewage outfalls), encourage the exchange of ballast water in the open ocean, and discourage/prohibit the unnecessary discharge of ballast water in port and harbour areas (mitigation item EE19).	Not visible on imagery.	<p>"The FRC Marine Incident Response Plan:</p> <p>1.1.1 This plan sets out the controls and arrangements that will be implemented to ensure that site works comply with statutory requirements and good practice with regard to preventing pollution and nuisance from environmental incidents and accidents. This plan is relevant to works in the marine environment and any spill or potential spill of polluting materials into the Firth of Forth. The Land Based Incident Response Plan covers spillages to land.</p> <p>1.1.2 This plan has been prepared in line with the following Pollution Prevention Guidelines and reports: <input type="checkbox"/> SEPA PPG 18: Managing fire water and major spillages; <input type="checkbox"/> SEPA PPG21: Pollution Incident Response Planning; <input type="checkbox"/> SEPA PPG 22: Incident Response – dealing with spills; <input type="checkbox"/> SEPA PPG 26: Safe Storage – drums and intermediate bulk containers.; and <input type="checkbox"/> Forth Ports Limited (2011) oil spill contingency plan "Clearwater Forth".</p> <p>1.1.3 This plan covers all construction operations within the principal contract construction site(s) area. It also includes the following key locations: FCBC facilities at Rosyth Docks; <input type="checkbox"/> Mobile operations from vessels operating within the Forth estuary and port area; and <input type="checkbox"/> Operations occurring within intertidal areas.</p> <p>1.1.4 All construction activities will be undertaken in accordance with an approved Method Statement, which will provide additional task-specific and</p>	No	No

				location-specific controls to augment those identified in this Incident Response Plan where applicable. "		
Landscape						
L4	Throughout scheme	Noise barriers, as determined by the noise assessment, will be provided in the form of barriers and false cuttings.	Yes	The noise barriers referred to in Chapter 16 are visible on street view imagery . Details are available in N1-N10 below. Post-opening noise monitoring results are available for the main crossing areas and Kirkliston, which are understood to be acceptable by Transport Scotland.	No	No
L5	Throughout scheme	Existing trees and vegetation will be retained wherever practicable and incorporated with new planting proposals.	No	Section 3.7 Landscape and Ecological Planting demonstrates that ecological mitigation was undertaken to fulfil the commitments made in the FRC Environmental Statement.	No	No
L6	Throughout scheme	Planting will be undertaken to promote the following: <ul style="list-style-type: none"> · screen views, integrate new cuttings, embankments, junctions and bridges and reflect the character of the existing landscape; · enhance biodiversity and conserve the integrity of existing habitats by planting predominantly native species, of local provenance; · replace lost trees and woodland; · utilise severed field corners and landlocked areas where appropriate; and · enhance the experience for travellers by creating a variety of views. 	No	Section 3.7 Landscape and Ecological Planting demonstrates that ecological mitigation was undertaken to fulfil the commitments made in the FRC Environmental Statement.	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
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L7	Throughout scheme	Grass seeding for verges will be Roadside Verge Mix which is low maintenance, fast establishing and tolerant of traffic and salt spray. Grass seeding for all other soft areas, outwith planting areas, will be Species Rich Grassland Mix consisting of native, non-invasive grasses and wildflower species to reflect locally occurring semi-natural flora.	No	Section 3.7 Landscape and Ecological Planting demonstrates that ecological mitigation was undertaken to fulfil the commitments made in the FRC Environmental Statement.	No	No
L8	ch8200-8450 s/b	Regrading of cutting beside A90 will promote naturalistic grading of new rock and soft cuttings and promotion of natural regeneration.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for ch8200-8450 s/b	No	No
L9	ch8200-8230 s/b	Scrub woodland planting will be provided to replace lost vegetation and soften appearance of cutting.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for ch8200-8430 s/b. Section 3.7 Landscape and Ecological Planting says that planting was undertaken to integrate the FRC scheme into surrounding landscape, by planting individual trees, hedges and areas of mixed or scrub woodland to reflect local landscape features.	No	No
L10	ch8230-8310 s/b at relocated cemetery boundary	Stone wall will be reinstated.	Yes	The stone boundary wall is shown more prominently in aerial Satellite Imagery dated on 14/12/18, compared with previous imagery (e.g. 07/09/2015).	No	No
L11	ch7900-8000 n/b between realigned B980 and proposed slip road.	Mixed woodland planting will be provided to replace lost woodland.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for ch7900-8000 n/b.	No	No
L12	West of ch8000-8300 n/b around edge of agricultural land.	Mixed woodland planting at Castlandhill will be provided to extend existing woodland pattern and provide coherent quantity of habitat replacement.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for the west of ch8000- 8300 n/b around edge of the agricultural land.	No	No

L13	ch8200-8450 between B980 and A90. ch8600-8930 n/b either side of footbridge to Inverkeithing.	Scrub woodland planting will be provided to soften appearance of cutting, embankment and visually separate local road from A90.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for ch8200-8450 between B980 and A90 as well as ch8600-8930 n/b either side of footbridge to Inverkeithing.	No	No
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ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
L14	ch9100-9150 n/b	Mixed woodland planting will be provided to assist integration and provide screening for properties in Rosyth.	Yes	aerial Imagery dated 22/04/19 projects the landscape characteristics shown in Figure 12.4a for ch9100-9150 n/b	No	No
L15	ch7300-7500 beneath A90 and slip roads on viaduct.	Stone facings and local gravel will be provided beneath viaducts with ivy planting where daylight permits.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for ch7300-7500 beneath A90 and slip roads on viaduct	No	No
L16	ch7300-7500 s/b east of A90 and slip road to Forth Road Bridge.	Mixed woodland planting will be provided to replace lost vegetation and soften appearance of embankments and cuttings.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for ch7300-7500 s/b east of A90 and slip road to Forth Road Bridge	No	No
L17	West of ch7900-7500 n/b north and west of WWTW.	Mixed woodland planting will be provided to screen WWTW.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for the west of ch7900- 7500 n/b north and west of WWTW	No	No
L18	ch7300-7800 n/b both sides of n/b slip roads to and from Ferrytoll gyratory and on embankment west of realigned B981. ch7250 n/b around SUDS detention basin.	Scrub woodland planting will provide landscape integration of embankments, cuttings and SUDS detention basin.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for ch7300-7800 n/b both sides of n/b slip roads to and from Ferrytoll gyratory and on embankment west of realigned B981 as well as ch7250 n/b around SUDS detention basin.	No	No
L19	West of ch7850-7900 n/b	Standard tree planting will be provided beside Ferrytoll Road to provide formal entrance to Europarc.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for the west of ch7850- 7900 n/b.	No	No
L20	ch7800-7900 area contained by Ferrytoll gyratory.	Scrub woodland planting will be provided with rock/boulders and species rich grassland.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for ch7800-7900 area contained by Ferrytoll gyratory.	No	No
L21	ch8000-8200 s/b between Park and Ride and s/b slip road to Ferrytoll gyratory.	Scrub woodland planting will be provided to enhance existing scrub and replace scrub lost to cutting.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b for ch8000-8200 s/b between Park and Ride and s/b slip road to Ferrytoll gyratory.	No	No

L22	ch7500-7700 s/b	Naturalistic grading of rock cut adjacent to existing A90 and railway line will be provided as permitted by safety issues and promotion of natural regeneration.	Yes	aerial Imagery dated 24/06/2018 projects the landscape characteristics shown in Figure 12.4b for ch7500-7700 s/b. N.B. Most recent satellite imagery dated 14/12/18 was not used as it contains cloud cover.	No	No
L23	Cuttings and embankments to the east and west of approach to Forth Road Bridge. ch7100-7500 s/b.	Mixed woodland planting will be provided to replace lost woodland and soften appearance of embankments and cuttings.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4b & 14c for cuttings and embankments to the east and west of approach to Forth Road Bridge (ch7100-7500 s/b).	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
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L24	ch7100-7300 s/b	Mixed and scrub woodland planting will be provided to replace lost woodland.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4c for ch7100-7300 s/b.	No	No
L25	ch7000-7100 n/b, s/b and east of B981	Naturalistic grading of rock cuttings and promotion of natural regeneration will be provided.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4c for ch7000-7100 n/b, s/b and east of B981.	No	No
L26	ch3600-3650) west of realigned B924 junction with A904	Standard tree planting will replace lost trees at the southwest corner of South Queensferry.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4f for ch3600-3650 west of realigned B924 junction with A904.	No	No
L27	ch3600-3650) west of realigned B924 junction with A904	Species rich grassland will be provided in disturbed soft area.	Yes	aerial Imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4f for ch3600-3650 west of realigned B924 junction with A904.	No	No
L28	ch3760-4450 n/b ch3800-4514 s/b	Noise barriers in the form of false cuttings and/or barriers as per mitigation items N1-N7 will provide visual screening and noise mitigation.	Yes	Noise barriers have been installed as per noise mitigation items N1-N10. See evaluation comments for N1 - N7 for more information.	No	No
L29	East of ch3700-4400 s/b at east boundary of construction and maintenance access road, SUDS detention basin area and Inchgarvie House south boundary.	Hedgerow and hedgerow tree planting will provide screening and tie in with existing boundaries.	Yes	Aerial imagery dated 28/06/18 projects the landscape characteristics shown in Figure 12.4e for the east of ch3700-4400 s/b at east boundary of construction and maintenance access road, SUDS detention basin area and Inchgarvie House south boundary. Most recent imagery (14/12/18) not used due to cloud cover restricting view of site.	No	No
L30	ch4200-4320 n/b and s/b	Mixed woodland planting will screen and integrate southern route north of cutting, where at grade and on embankment.	Yes	Aerial imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4e for ch4200-4320 n/b and s/b	No	No
L31	ch4320-4400 s/b ch4150-4200 n/b	Scrub woodland planting will integrate SUDS detention basins.	Yes	Aerial imagery dated 14/12/18 projects the landscape characteristics shown in Figure 12.4e for ch4320-4400 s/b and ch4150-4200 n/b	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
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L32	ch3600-4440 n/b and s/b	Species rich grassland will be provided in disturbed soft areas outwith planting, including SUDS detention basins.	Yes	Aerial imagery dated 28/06/18 projects the landscape characteristics shown in Figure 12.4e for ch3600-4440 n/b and s/b. Most recent imagery (14/12/18) not used due to cloud cover restricting view of site.	No	No
L33	ch3600-3900 s/b slip beside s/b slip road to Queensferry junction.	Mixed woodland planting will provide screening for southwest corner of South Queensferry.	Yes	Aerial imagery dated 28/06/18 projects the landscape characteristics shown in Figure 12.4e for ch3600-3900 s/b slip beside s/b slip road to Queensferry junction Most recent imagery (14/12/18) not used due to cloud cover restricting view of site.	No	No
L34	ch3600-3750 s/b slip	Mound will provide screening for southwest South Queensferry	Yes	Street view imagery from March 2019 projects the landscape characteristics shown in Figure 12.4e for ch3600-3750 s/b slip.	No	No
L35	ch3600-3880 n/b slip. West of Queensferry Junction, on north side of A904. West of ch3200-3500, both sides of realigned Builyeon Road. ch2850-3550 e/b. ch2950-3350 w/b. ch500-1440 A90 e/b.	Hedgerows and hedgerows with tree planting will reinforce landscape boundaries and provide connectivity for bats.	Yes	Aerial imagery projects the landscape characteristics shown in Figure 12.4e for ch3600-3880 n/b slip west of Queensferry Junction, on north side of A904 (Figure 12.4e, imagery dated 24/06/2018); west of ch3200-3500 both sides of realigned Builyeon Road (Figure 12.4f, imagery dated 24/06/2018); ch2850-3550 e/b (Figure 12.4f, imagery dated 24/06/2018); ch2950-3350 w/b and ch500-1440 A90 e/b (Figure 12.4m, imagery dated June 2018).	No	No
L37	Southeast boundary of A904 Queensferry Junction. Southwest boundary of A904 Queensferry Junction from Former Builyeon Road to sewage works access.	Stone walls will be replaced.	Stone walls evident	Stone walls have been replaced in the locations shown on Figure 12.4e, evident on street view images dated March 2019.	No	No
L38	ch3094-3350	Noise barrier in the form of false cutting will be provided as per mitigation item N9.	False cutting noise barrier is in the location shown on Figure 12.4f is evident on street view imagery from March 2019.	A false cutting in the location shown on Figure 12.4f (ch3094- 3350) is evident on street view imagery from March 2019. The false cutting is a continuation of the noise barrier (timber fence atop a false cutting) at N7 for West Dundas. Notably, mitigation item L38 references "item N9". According to Chapter 23 of the	No	No

				ES, item N9 is the noise barrier at Kirkliston (ch1015 - 1260). It is therefore assumed that this has been a typo in the ES.		
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ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
L39	North of ch2080-2200	Scrub woodland planting will integrate SUDS detention basins.	Scrub woodland planting has been provided in the areas on Figure 12.4g, evident in street view imagery dated May 2017	Scrub woodland planting (seedlings not yet established) have been provided in the areas on Figure 12.4g, evident in street view imagery dated May 2017	No	No
L40	A8000 n/b and s/b north of A90.	Standard trees will be provided to replace lost trees and mark transition to urban character.	Seedlings have been planted in the areas shown on Figure 12.4h, evident on street view imagery dated March 2019.	Seedlings have been planted in the areas shown on Figure 12.4h, evident on street view imagery dated March 2019.	No	No
L41	A8000 embankments and ch1450-1570 w/b	Mixed woodland planting will be provided to replace existing woodland and provide screening and integration.	Seedlings appear to have been planted in the areas shown on Figure 12.4h, evident on street view imagery dated March 2019. Seedlings have not become well established yet.	Seedlings have been planted in the areas shown on Figure 12.4h, evident on street view imagery dated March 2019. Although this is satisfactory for this 1YA evaluation, it is recommended that a site visit should be undertaken once the woodland planting has become more established to confirm that it provides satisfactory screening and integration.	No	Yes
L42	ch500-3600 n/b and s/b	Species rich grassland will be provided in disturbed soft areas outwith planting.	Generally rich grassland has been provide in the locations in Figure 12.4, evident on street view imagery dated March 2019.	Generally species rich grassland appears to have provided in disturbed soft areas outwit planting according to the most recent street view imagery.	No	No
L43	M9 Spur west embankment, west of Kirkliston.	Mixed woodland planting will be provided to replace lost woodland.	Mixed woodland planting has been planted and is becoming established to the west of the M9 Spur, as evident in street view imagery dated March 2019. However to the east of the M9 Spur, west of Kirkliston, a noise barrier has been installed between the road and any mixed	Mixed woodland planting has been planted and is becoming established to the west of the M9 Spur, as evident in street view imagery dated March 2019. However to the east of the M9 Spur, west of Kirkliston, a noise barrier has been installed between the road and any mixed woodland, therefore it is not possible to comment whether the planting is present and adequate. Landscape as built drawings as not available for this area. This mitigation item is generally satisfactory however, a site visit is recommended at 5YA	No	Yes

			woodland, therefore it is not possible to comment whether the planting is present and adequate.	evaluation to check that mixed woodland has been planted behind the noise barrier (M9 Spur s/b only).		
L44	East and west of M9 eastbound to M9 Spur northbound link, north of M9 ch1700-2180, M9 J1A	Scrub woodland planting will be provided to screen and integrate SUDS detention basin and realigned Swine Burn.	Scrub woodland planting has been provided in the areas on Figure 12.4m on street view imagery dated March 2019. This planting adequately screen and integrate the SUDS basin and aligned Swine Burn.	Scrub woodland planting has been provided in the areas on Figure 12.4m on street view imagery dated March 2019. This planting adequately screen and integrate the SUDS basin and aligned Swine Burn.	No	No
L45	East and west of M9 eastbound to M9 Spur northbound link, north of M9 ch1700-2180, M9 J1A	Species rich grassland will be provided in disturbed soft areas outwith planting.	Species rich grassland has been provided in street view imagery dated June 2017	Species rich grassland has been provided in street view imagery dated June 2017	No	No
L46	ch2500-2950 w/b ch2660-2850 e/b ch2210-2480 e/b	Mixed woodland planting will be provided to replace SINC and loss of woodland at Echline strip and adjacent woodland blocks.	ch2500-2950 w/b - mixed woodland has been planted in the location that the SINC was lost and appears to have become well established in aerial imagery dated 24/06/2018	Mixed woodland has been planted in the locations that the SINC was lost and appears to have become well established in aerial imagery dated 24/06/2018	No	No
L47	ch1750-2350 w/b	Mixed woodland planting will provide screening for Dundas Home Farm	Planting along this chainage is evident on most recent street view imagery dated Mar 2019.	Planting along this chainage is evident on most recent street view imagery dated Mar 2019. Although this is satisfactory for this 1YA evaluation, it is recommended that a site visit should be undertaken once the woodland planting has become more established to confirm that it provides satisfactory screening for Dundas House Farm.	No	Yes

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
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L48	ch2480-2660 e/b ch2350-2500 w/b	Hedgerow planting will reinforce landscape boundaries.	Westbound - seedlings have been planted along the noise barrier extending far beyond the extent required in L48. Seedlings have been planted from chainage 1700 to 3100 w/b according to the most recent street view imagery dated Mar 2019. Eastbound - no hedgerow planting is visible on most recent imagery however it is possible that planting is present but not visible from the M90 due to the boundary being lower than the road and therefore not visible.	Westbound - seedlings have been planted along the noise barrier extending far beyond the extent required in L48. Seedlings have been planted from chainage 1700-3100 w/b according to the most recent street view imagery dated Mar 2019. Eastbound - no hedgerow planting is visible on most recent imagery however it is possible that planting is present but not visible from the M90 due to the boundary being lower than the road and therefore not visible. A site visit is deferred to the 3YA evaluation.	Yes	No
L49	ch2350-2500 w/b.	Standard tree planting to reflect Dundas Estate's character will be provided.	Not visible on imagery.	Not possible to view standard tree planting on aerial or street view imagery. Fencing is situated between the A90 and any planting, preventing visibility from the A90. Future site visit at the 3YA or 5YA evaluation required to check trees have been planted and reflect Dundas Estate's character.	No	Yes
L50	A90 to A8000 public transport link and A90 public transport link	Hedgerow tree planting will be provided to replace trees lost beside public transport links, provide screening and provide connectivity for bats.	Seedlings appear to have been planted in the locations shown in Figure 12.4h along the A8000	Seedlings appear to have been planted in the locations shown in Figure 12.4h. Although this is satisfactory for this 1YA evaluation, it is recommended that a site visit should be undertaken to verify that hedgerow has become established and is sufficient to replace lost hedgerows, provide screening and provide bat connectivity.	No	Yes

L51	ch1700-2850 e/b and w/b	Species rich grassland will be provided in disturbed soft areas outwith planting.	The grassland has not become fully established on street view imagery from Mar 2018 and Mar 2019. Future site visit to confirm that species rich grassland has established to sufficiently integrate the proposed scheme into the surrounding landscape pattern.	The grassland has not become fully established on street view imagery from Mar 2018 and Mar 2019. Future site visit to confirm that species rich grassland has established to sufficiently integrate the proposed scheme into the surrounding landscape pattern.	No	Yes
L52	ch2550-3904 w/b ch1861-2364 w/b	Noise barriers in the form of false cuttings and barriers as per mitigation items N8 and N10 will provide visual screening and noise mitigation.	A continuous timber-built noise barrier is visible in the locations of ch2550-3904 w/b ch1861-2364 w/b on aerial and street view imagery dated 26/05/2017 and Mar 2019 respectively. It is not possible to determine the height of the noise barrier from the imagery.	A continuous timber-built noise barrier on a is visible in the locations of ch2550-3904 w/b ch1861-2364 w/b on aerial and street view imagery dated 26/05/2017 and Mar 2019 respectively. It is not possible to determine the height of the noise barrier from the imagery but it appears to be approximately 2m high atop a bund which appears to be at least 2m high.	No	No
L54	M9 Spur s/b embankment at northwest edge of Kirkliston	Mixed woodland planting will replace lost woodland.	Mixed woodland planting on northwest edge of Kirkliston and the south bound carriageway is visible on street view imagery dated Mar 2019.	Mixed woodland planting on northwest edge of Kirkliston and the south bound carriageway is visible on street view imagery dated Mar 2019. However, notably, the vegetation is in its infancy and may require a future site visit to further evaluate the performance of L54.	No	No
L55	M9 ch1250-1480 s/b	Mixed woodland will be provided to integrate cutting into existing woodland pattern.	Mixed woodland planting on the embankment is visible on street view imagery dated Mar 2019, however notably the vegetation is in its infancy. Future site visit required to evaluate the performance of mitigation item L55, looking at the coverage and density of planting.	Mixed woodland planting on the embankment is visible on street view imagery dated Mar 2019, however notably the vegetation is in its infancy. Although this is satisfactory for this 1YA evaluation, it is recommended that a site visit should be undertaken to evaluate the performance of mitigation item L55, looking at the coverage and density of planting.	No	Yes

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
L56	M9 ch980-1150 s/b	Scrub woodland planting will be provided to screen embankment and noise barrier.	Scrub woodland has been planted on the east side of the noise barrier to provide screening for the Kirkliston residents. This is visible on street view imagery dated Mar 2019.	Scrub woodland has been planted on the east side of the noise barrier to provide screening for the Kirkliston residents. This is visible on street view imagery dated Mar 2019.	No	No
L57	M9 Spur s/b to M9 ch1100 e/b	Species rich grassland will be provided in disturbed soft areas outwith planting.	The noise barrier in this location blocks the view of any planting behind it.	The noise barrier in this location blocks the view of any planting of species rich grassland. As-built drawings are not available for this area therefore a site visit is required and deferred to the 3YA evaluation.	Yes	No
L58	M9 ch1014-1290 s/b	Noise barrier will be provided as per mitigation items N12 and N13 (Note from Stantec - I think this should say N9 and N10 (which is the Kirkliston Barrier according to the ES) and not N12 and N13).	A noise barrier is visible on aerial imagery dated 24/06/2018 and street view imagery dated Mar 2018. The barrier is timber-built and appears to be approximately 2.5m in height and 284m in length (as measured by aerial tools). The barrier has been constructed in the location shown on Figure 12.4m.	A noise barrier is visible on aerial imagery dated 24/06/2018 and street view imagery dated Mar 2018. The barrier is timber-built and appears to be approximately 2.5m in height and 284m in length (as measured by aerial tools). The barrier has been constructed in the location shown on Figure 12.4m.	No	No
L59	M9 ch2500-2600 w/b, northeast of Ross's Plantation	Scrub planting around SUDS detention basin will provide screening and integration.	Mature trees line the M9 in the location of the detention basin adjacent to the Tributary of Swine Burn therefore the presence of scrub planting in this location cannot be confirmed or evaluated. Future site visit required.	No detention basin is visible on aerial imagery dated 14/12/18 in the area by the Tributary of Swine Burn. Transport Scotland has confirmed that this detention basin was not constructed due to the presence of a high pressure gas main. Further details in mitigation measure W35 above.	No	No

L60	M9 ch2180-2600 w/b	Species rich grassland will be provided on embankment and SUDS area outwith planting.	Species rich grassland has been provided on embankment in location shown on Fig 12.4I according to street view imagery dated Jul 2017. Mature trees line the M9 in the location of the detention basin adjacent to the Tributary of Swine Burn therefore the presence of species rich grassland in this location cannot be confirmed or evaluated. Future site visits required.	Species rich grassland has been provided on embankment in location shown on Fig 12.4I according to street view imagery dated Jul 2017. Mature trees line the M9 in the location of the detention basin adjacent to the Tributary of Swine Burn therefore the presence of species rich grassland in this location cannot be confirmed or evaluated. Landscape as-built drawings are not available for this area. A site visit is required and has been deferred to the 3YA evaluation.	Yes	No
L61	M9 ch1300-1600 w/b	Mixed woodland planting will integrate cutting into existing woodland pattern.	North/west boundary carriageway - some woodland planting starting to establish at the base of the cutting however woodland planting does not appear to fully cover the cutting according to street view imagery dated May 2018. Southbound carriageway - some saplings are visible on the top of the cutting only. Future site visit required.	North/west boundary carriageway - some woodland planting starting to establish at the base of the cutting however woodland planting does not appear to fully cover the cutting according to street view imagery dated May 2018. Southbound carriageway - some saplings are visible on the top of the cutting only. A future site visit deferred to the 3YA evaluation	Yes	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
L62	M9 westbound to M9 Spur northbound link.	Scrub woodland will integrate junction.	Scrub woodland planting in the approximate areas shown on Figure 12.41 is visible in the most recent aerial imagery dated 26/05/2017 and street view imagery dated Mar 2019. However, some of the scrub woodland on the embankment to the north of the Swine Burn either has not become established yet or has not planted. Future site visits required.	Scrub woodland planting in the approximate areas shown on Figure 12.41 is visible in the most recent aerial imagery dated 26/05/2017 and street view imagery dated Mar 2019. However, some of the scrub woodland on the embankment to the north of the Swine Burn either has not become established yet or has not planted. Future site visit deferred to the 3YA evaluation.	Yes	No
L63	M9 Spur southbound to M9 westbound link, south of M9 ch1680- 2180-2150	Hedgerow will be provided to tie boundary of new slip road into existing field boundaries and reinforce edge of existing woodland on slip road embankment.	Signs of a hedgerow starting to become established along the field boundary according to street view dated May 2018 taken from the M9 looking south east towards the hedgerow at the approximate chainage 2200.	Signs of a hedgerow starting to become established along the field boundary according to street view dated May 2018 taken from the M9 looking south east towards the hedgerow at the approximate chainage 2200.	No	No
L64	M9 ch1300-2180 w/b	Species rich grassland will be provided in disturbed soft areas outwith planting.	Species rich grassland has become established and is visible on street view imagery dated May 2018 taken from the M9.	Species rich grassland has become established and is visible on street view imagery dated May 2018 taken from the M9.	No	No

L65	M9 ch1200-1300 n/b, east end Lindsay's Craigs woodland.	Mixed woodland planting at northern SUDS detention basin will be provided to replace lost woodland, provide screening and integrate with Lindsay's Craigs woodland.	Aerial imagery dated 03/09/2010 show that dense mature woodland surrounds the area where the Niddry detention basin is located today. Aerial imagery dated 20/05/2012 then shows that trees closest to the M9 have been felled to allow for the widening of the M9 northbound carriageway. Most recent aerial imagery dated 24/06/2018 shows that mixed woodland has been replanted, albeit not to the same extent as the woodland previously situated there.	Aerial imagery dated 03/09/2010 show that dense mature woodland surrounds the area where the Niddry detention basin is located today. Aerial imagery dated 20/05/2012 then shows that trees closest to the M9 have been felled to allow for the widening of the M9 northbound carriageway. Most recent aerial imagery dated 24/06/2018 shows that mixed woodland has been replanted, albeit not to the same extent as the woodland previously situated there. A site visit may be required at the 5YA evaluation assess the coverage of mixed woodland in this area.	No	Yes
L66	M9 ch600-780 M9 ch1100-1150	Scrub planting on regraded embankments and at southern SUDS detention basin will provide screening and integration.	Scrub woodland planting has established itself in all locations shown in Figure 12.4m except for the north west corner of the basin.	Scrub woodland planting around the SUDS basin has established itself in all locations shown in ES Figure 12.4m except for the north west corner of the basin where woodland planting has either not been planted or has not become established. This is further visible on more recent aerial imagery dated June 2018. To be confirmed at the 3YA evaluation stage. Scrub woodland at the embankment near the SUDS at ch1100-1150 is visible on street view imagery dated May 2018.	Yes	No
L67	M9 ch600-1300 n/b	Species rich grassland will be provided in SUDS basins and disturbed soft areas outwith planting.	Species rich planting is visible at the SUDS pond near the River Almond. Street view imagery dated May 2017 taken from the B800 looking northwards was reviewed.	Species rich planting is visible in River Almond SUDS basin and in the soft ground areas outside of the basin . Street view imagery dated May 2017 taken from the B800 looking northwards was reviewed.	No	No
L68	M9 ch600-980 s/b	Species rich grassland will integrate regraded embankment.	Species rich planting is visible on street view imagery dated	Species rich planting is visible on street view imagery dated May 2017 on the southbound carriageway embankment.	No	No

			May 2017 on the southbound carriageway embankment.			
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ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
L69	M9 ch300-550 n/b	Scrub woodland will replace lost woodland on embankment.	Planting doesn't look like its changed between street view imagery dated Jun 2012 and May 2019.	Planting doesn't look like its changed between street view imagery dated Jun 2012 and May 2019. Mitigation item L69 required that scrub woodland will replace lost woodland on embankment. Evaluation to be deferred to the 3YA evaluation.	Yes	No
L70	M9 ch0-600 n/b	Species rich grassland will be provided on regraded embankments outwith planting.	Street view imagery taken from the M9 looking dated Jul 2012 and Jul 2014 indicate that the embankments formed are covered by species-rich grassland.	Regarding planting around northbound chainage ch0-600 (M9 at Newbridge), Street view imagery taken from the M9 looking dated Jul 2012 and Jul 2014 indicate that the embankments formed are covered by species-rich grassland.	No	No
Visual						
V1	Throughout scheme	All landscape mitigation in Table 23.6 will be provided.	No	See landscape mitigation measures. The evaluation of some of the landscape mitigation measures has been deferred to the more detailed 3YA after opening evaluation.	Yes	No
V2	Throughout scheme	Where lighting is essential, all reasonable precautions will be undertaken to reduce energy consumption and avoid/reduce the amount of light pollution of the night sky and rural landscape where this can be achieved safely and effectively.	No	Transport Scotland confirmed in an email on 04/05/20 that an intelligent Lighting Control System (ILCS) is incorporated in the crossing and supporting infrastructure. Depending on traffic flow and ambient lighting conditions, this controls the artificial lighting which in turn reduces energy consumption. Lighting dims when not required (e.g. under very low traffic conditions). LEDs used throughout which reduces energy compared to sodium lamps.	No	No
Cultural Heritage						
CH1	St. Margaret's Marsh	Evaluation and recording of identified site (St. Margaret's Wharf upstanding remains) will be undertaken to record the extent of known remains that may be affected and to assess areas of unknown archaeological potential prior to construction.	No	The Headland Archaeological Report Results of Land Based Invasive Archaeological Survey and Evaluation Volumes 1 to 5 confirms that archaeological trial trenching was carried out in the design and pre-construction phases of the project.	No	No

				Programme of Archaeological Post-Excavation Assessment Report confirms assessment was carried out in the construction phase of the project		
CH2	Inchgarvie House Port Edgar Barracks Complex St. Margaret's Hope (Admiralty House)	Historic Building recording (to appropriate level) will be undertaken prior to the start of construction.	No	FRC Historic Building Record (contractor for the Principal Contract) confirms the Historic Building recording was undertaken prior to the start of construction.	No	No
CH3	Inchgarvie House Port Edgar Barracks Complex St. Margaret's Hope (Admiralty House)	Vibration monitoring will be carried out on a weekly basis during works that may create a risk of vibration damage to protect buildings from risk of physical damage.	No	Transport Scotland confirmed in email sent on 05/05/20 that air quality and noise and vibration monitoring was undertaken across the site during the construction phase in accordance with the requirements of the CoCP.	No	No
CH4	St. Margaret's Hope Arch	Historic Building recording will be undertaken prior to relocation or dismantling to record the features and setting of the arch.	No	FRC St. Margaret's Hope Archway Standing Building Survey Report confirms the evaluation and recording of identified site was undertaken.	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
CH6	Beamer Rock Beacon (Site 426, Figure 14.2a).	A topographic survey and recording, building recording, dismantling and storage in a suitable location will be undertaken, leaving open the possibility to re-erect the beacon at a suitable site later if appropriate.	No	FRC Beamer Rock Beacon: NT 65 120 800 Survey and Recording confirms the topographic survey and recordings were undertaken.	No	No
CH7	Beamer Rock, ship wrecks (Sites 410-17, 419-20, 424, on Figure 14.2d).	Detailed underwater survey will be undertaken prior to construction within 50m of the low tide mark in the vicinity of Beamer Rock to check for the presence of historic wrecks or debris that may exist on and around Beamer Rock. The known vessels shipwrecked on or within the vicinity of Beamer Rock will be included within the programme of archaeological evaluation works.	No	As per emails received by Transport Scotland on 25/03/20: Historic Scotland has advised that marine archaeological surveys are not necessary.	No	No
CH8	Inchgarvie House, Springfield graves (Site 453). Linn Mill Burn, Dalmeny, cropmark (Site 561). Inchgarvie House, Linear cropmark (Site 811). South Queensferry, Linear cropmark (Site 1118). Refer to Figure 14.2e-h.	Geophysical survey followed by trial trenching will be included as part of the programme of archaeological evaluation works.	No	The Headland Archaeological Report Results of Land Based Invasive Archaeological Survey and Evaluation Volumes 1 to 5 confirms that archaeological trial trenching was carried out in the design and pre-construction phases of the project. Programme of Archaeological Post-Excavation Assessment Report confirms assessment was carried out in the construction phase of the project	No	No
CH9	Echline Strip Clearance Cairn (Site 1147, Figure 14.2g). Newbigging Clearance Cairns (Site 1148, Figure 14.2g). Newbigging tank/spring (Site 1149, Figure 14.2g). Dundas Castle Designed Landscape (Site 1111, Figure 14.2e-h).	Trial trenching followed by excavation (if required) will be included as part of the programme of archaeological evaluation works.	No	As per email received from Transport Scotland on 25/03/20: "an archaeological watching brief carried out of the proposed dredging's around South Queensferry and would advise of the value of having in place a protocol for handling any discoveries and recoveries of archaeological material of interest". Headland's Results of Land based Invasive Archaeological Survey and Evaluation Volumes 1 to 5 confirms trial trenching followed by excavation (if required) was part of the programme of archaeological evaluation works.	No	No

CH10	Throughout scheme	Planting proposed as part of the landscape/ecology mitigation measures (refer to Table 23.6 and Figure 12.4) and noise barriers (refer to Table 23.10) will be provided to reduce impacts on setting.	Yes	<p>As per email received from Transport Scotland on 13/03/20: "CH10 is a general item to cover impacts on setting and can be covered with a cross-ref to the landscape and noise sections".</p> <p>Relevant evidence has been provided to confirm proposed planting and noise barriers have been put in place (cross ref. Landscape / Ecology and Noise mitigation items).</p>	No	No
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ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
Noise and Vibration						
N1	South Queensferry (ch4310 - 4515)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 2.8m x 180m barrier on viaduct and a 2.8m x~25m barrier on road will be provided.	Yes	<p>The noise barriers referred to in Chapter 16 are visible on street view imagery dated 14/12/18 and comprise a timber fence in combination with a wind barrier. Transport Scotland confirmed on a phone call on 21/05/20 that the bridge designers designed the wind barrier to form part of the noise barrier. The wind barrier typically has gaps in-between slats to allow wind to pass through, however, in this case the gaps have been closed to form one impermeable barrier which effectively creates a barrier to noise.</p> <p>A post-opening operational noise assessment (year 1) was undertaken in by KSG Acoustics. Noise measurements were taken at 14 monitoring locations agreed by Transport Scotland in 2018. Locations included areas around Inverkeithing, South Queensferry, Linn Mill and Dundas Home Farm. The report concluded that, subject to the limitations of the assessment, the assessment indicates good correlation between the predicted levels in the 2017 Environmental Statement 3D digital noise model and the levels of road traffic noise measured in the 2018 post-opening survey. The results therefore also confirm that the significance of effects in 2018 is no worse than predicted in the ES for the year of opening of the Queensferry Crossing.</p>	No	No
N2	South Queensferry (ch4260 - 4310)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 4m x ~50m barrier will be provided.	Yes	<p>A noise barrier is present at chainage ch4260 - 4310 (southbound), shown on street view imagery dated April 2018.</p> <p>As above - post-opening operational noise assessment concluded that the results confirm that the significance of effects in 2018 is no worse than predicted in the ES for the year of</p>	No	No

				opening of the Queensferry Crossing.		
N3	South Queensferry (ch4110 - 4260)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 3m x ~150m barrier will be provided.	Yes	<p>A noise barrier is present at chainage ch4110 - 4260 (southbound), shown on street view imagery dated April 2018.</p> <p>As above - post-opening operational noise assessment concluded that the results confirm that the significance of effects in 2018 is no worse than predicted in the ES for the year of opening of the Queensferry Crossing.</p>	No	No
N4	South Queensferry (ch4030 - 4110)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 3m x ~80m bund will be provided.	Yes	<p>A noise barrier is present at chainage ch4030 - 4110 (southbound), shown on street view imagery dated April 2018.</p> <p>As above - post-opening operational noise assessment concluded that the results confirm that the significance of effects in 2018 is no worse than predicted in the ES for the year of opening of the Queensferry Crossing.</p>	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
N5	Linn Mill (ch4310 - 4450)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 2.8m x ~115m barrier on viaduct and a 2.8m x ~25m barrier on road will be provided.	No - noise barriers are not present at this location according to street view imagery.	The noise barriers referred to in Chapter 16 are visible on street view imagery dated 14/12/18 and comprise a timber fence in combination with a wind barrier. Transport Scotland confirmed on a phone call on 21/05/20 that the bridge designers designed the wind barrier to form part of the noise barrier. The wind barrier typically has gaps inbetween slats to allow wind to pass through, however, in this case the gaps have been closed to form one impermeable barrier which effectively creates a barrier to noise. As above - post-opening operational noise assessment concluded that the results confirm that the significance of effects in 2018 is no worse than predicted in the ES for the year of opening of the Queensferry Crossing.	No	No
N6	Linn Mill (ch4000 - 4310)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 4m x ~310m barrier will be provided.	No - location has not been established	A noise barrier is present at chainage ch4000 - 4310 (northbound), shown on street view imagery dated April 2018. As above - post-opening operational noise assessment concluded that the results confirm that the significance of effects in 2018 is no worse than predicted in the ES for the year of opening of the Queensferry Crossing.	No	No
N7	West Dundas (ch2550 - 3095)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 4m x ~545m barrier will be provided.	Yes	A noise barrier is present at chainage ch2550 - 3095 (northbound), shown on street view imagery dated April 2018. As above - post-opening operational noise assessment concluded that the results confirm that the significance of effects in 2018 is no worse than predicted in the ES for the year of opening of the Queensferry Crossing.	No	No

N8	East Dundas (ch1860 - 2365)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 4m x ~505m barrier will be provided.	Yes	<p>The noise barriers referred to in Chapter 16 are visible on street view dated 14/12/18. A fence is in place on one side of the A90, which is located in East Dundas.</p> <p>As above - post-opening operational noise assessment concluded that the results confirm that the significance of effects in 2018 is no worse than predicted in the ES for the year of opening of the Queensferry Crossing.</p>	No	No
N9	Kirkliston M9 (ch1015 - 1260)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 2.5m x ~245m barrier will be provided.	Yes	<p>The noise barrier (fence) referred to in Chapter 16 is visible on aerial imagery street view dated 12/3/2018. A fence is in place on the M9 highway close to Kirkliston.</p> <p>Operational noise report for the M9 Junction 1A was provided by Transport Scotland for review on 04/05/20. A noise assessment was carried out by an independent company. It was completed over two days on the 29 and 30 August 2013. The post-construction assessment concludes that there is a reduction in L10(18 hour) sound pressure levels when compared to the pre-construction surveys, which was anticipated due to the introduction of noise barriers at the M9 Junction 1A. It is understood that these noise results have been accepted by Transport Scotland.</p>	No	No

ES Mitigation Item	Approximate Location/Chainage	Description	Review of Aerial and Street View Imagery	Evaluation Comments	Further Action Required (see comments)	
					Evaluation Deferred to 3YA	More Detailed Assessment Recommended at 3YA
N10	Kirkliston M9 (ch1260-1290)	Noise barrier to achieve residual impact identified in Chapter 16 (Noise and Vibration). It is envisaged that a 2m x ~30m barrier will be provided.	Yes	The noise barrier (fence) referred to in Chapter 16 is visible on aerial imagery street view dated 12/3/2018. A fence is in place on the M9 highway close to Kirkliston. Operational noise report for the M9 Junction 1A was provided by Transport Scotland for review on 04/05/20. A noise assessment was carried out by an independent company. It was completed over two days on the 29 and 30 August 2013. The post-construction assessment concludes that there is a reduction in L10(18 hour) sound pressure levels when compared to the pre-construction surveys, which was anticipated due to the introduction of noise barriers at the M9 Junction 1A. It is understood that these noise results have been accepted by Transport Scotland.	No	No
Pedestrians, Cyclists, Equestrians and Community Effects						
P9	NCR1/Local Path (path 6) NCR 76 (path 10) Right of way (path 16) Local paths (21) Core path (23) Core path (38) Local paths (46) Local paths (78) Recreational areas - Ferry Hills and Echline fields	Planting proposed as part of the landscape/ecology mitigation measures (refer to Table 23.6 and Figure 12.4) will be provided to reduce impact on amenity value.	Yes	The aerial imagery dated 14/12/2018 shows evidence that landscape / mitigation measures have been implemented, including scrub woodland planting.	No	No
Vehicle Travellers						
VT1	Throughout scheme	All landscape mitigation in Table 23.6 will be provided.	See landscape mitigation items above (L4-L52 and L54-L70)	See landscape mitigation measures	Yes	No

Disruption Due to Construction						
DC1	Agricultural land throughout scheme	Appropriate measures will be undertaken to reduce damage or disturbance to field and forestry drainage systems and to the agricultural capability of soils in accordance with mitigation measures LU3 and LU9 in Table 23.1.	No	It has been confirmed that measures were undertaken to protect topsoil and subsoil during construction and reinstatement, as described in the contractors Agricultural Management Plan Rev04. These measures included undertaking surveys of topsoil/subsoil before and after construction, removal and appropriate storage of topsoil and subsoil (separately). Transport Scotland confirmed that topsoil storage was inspected by Employer's Delivery Team and it is understood that no issues were raised.	No	No
DC3	Throughout scheme	Existing access will be maintained or alternative access provided for all properties during construction in accordance with the requirements of the Bill.	No	<p>This mitigation item relates to the construction phase which was largely been scoped out of the 1YA environmental evaluation, however it relates specifically to the requirements of the Bill and therefore has been included in the evaluation.</p> <p>See LU2 above. Transport Scotland is content that access to this land has been maintained and continues to be maintained. It is recommended that site visits to a small selection of agricultural land parcels should be conducted during the 3YA evaluation to confirm this.</p>	No	Yes



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