FORTH REPLACEMENT CROSSING

M9 Junction 1a

SUSTAINABILITY APPRAISAL REPORT

TRANSPORT SCOTLAND

January 2015

FORTH REPLACEMENT CROSSING M9 Junction A1
SUSTAINABILITY APPRAISAL REPORT

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SUSTAINABILITY APPRAISAL REPORT

Executive Summary

In 2009, during the initial planning and design of the Forth Replacement Crossing (FRC) scheme, the Employer developed the Forth Replacement Crossing: Sustainability Appraisal and Carbon Management Report (SACMR) (Jacobs Arup, 2009a). The SACMR should be read in conjunction with this report, which focuses on sustainability associated with the M9 Junction 1a project (the Project). The purpose of the SACMR was to:

- summarise the sustainability appraisal process as developed and applied to the proposed scheme throughout its development since January 2008;
- appraise the sustainability performance of the proposed scheme against defined sustainability objectives, including the measurement and management of carbon; and
- identify design measures (ideas and innovations) that could deliver a more sustainable outcome.

Within Section 3.3 of the SACMR (Jacobs Arup, 2009a), 17 sustainability objectives were developed for the FRC scheme and assessed for compatibility with the overall scheme objectives. For each sustainability objective, a number of targets were identified, and performance/progress towards achieving these targets has been measured by indicators at the appropriate stage of the scheme. Some of the targets/indicators were only applicable to the operational phase or other parts of the overall scheme and therefore were not applicable to the Project. Eleven of the 17 sustainability objectives were applicable to the construction phase of the Project and are listed in the table below.

During the construction phase, SRB Civil Engineering Ltd. (SRB) was required to develop a number of related sustainability policies, plans and initiatives in order to monitor progress towards achieving or bettering the objectives and targets of the Project. Examples of these included:

- producing a Responsible Sourcing Code of Practice;
- registering with the Zero Waste Scotland programme;
- producing a Materials Transportation Strategy and Materials Register;
- contributing to the CEEQUAL Assessment for the Scheme;
- development of a Geology, Land Contamination Groundwater and Site Waste Management Plan;
- carrying out a Carbon footprint calculation for the construction phase; and
- developing an Energy Management Plan.

The purpose of this Sustainability Appraisal Report is to detail the indicators and targets that were relevant to the scope of the Project and provide evidence and case studies to demonstrate the attainment of the sustainability objectives throughout the detailed design and construction phases of the Project.

The main findings of this Sustainability Appraisal Report indicate that of the eleven objectives applicable to the construction phase, the majority were achieved or bettered through the efforts of the whole Project Team (including SRB, designers, client Transport Scotland and the Employer's Delivery Team (EDT)). A summary is provided below:

Key Objectives of the Sustainability Appraisal Plan
Objective 4: To minimise the Scheme Footprint and Severance of Land Topsoil was sealed and stored as close as possible to point of origin and final reinstatement, with improvements to profile and level to promote surface water flow and reduce waterlogging. Where possible, the extent of Lands Made Available (LMA) was reduced to maintain local access, such as in the case of the Kirkliston leisure centre football pitch. Areas of woodland to be retained were identified and protective fencing erected to prevent disturbance/damage.
Objective 5: Adopt Sustainable Resource Management in Design and Construction Specific key plans were developed, implemented and monitored during construction to ensure that consideration of sustainability was built-in to the management process during key design and construction decision-making. Where possible, waste arisings were reused rather than being disposed off-site and a local source of reusable waste material was used for construction import fill. The initial import fill requirement was substantially reduced through several iterations of the mass-haul for the project, while the use of pre-cast and pre-fabricated elements greatly reduced the energy use in manufacture and material wastage.
Objective 6: To ensure that community engagement takes place at all the Key stages in the FRC Project process A robust communications procedure, detailed in a Community Liaisons and Communications Procedure Plan (CLCPP), was initiated during the scheme, including the provision of: a dedicated Communications Liaison Officer (CLO); project website; letter drops; a 24 hour free-phone Hotline number; and target response times. Regular meetings and Working Groups were held with key industry, community and statutory stakeholders to keep them informed of the works progress, any issues encountered and anticipated forward schedule. This included Community Forum, Noise Liaison Group (NLG), Environmental Liaison Group (ELG) and Traffic Management Working Group (TMWG) meetings.
Objective 7: To improve local accessibility and reduce community severance A TMWG was established to discuss planned roadworks and traffic management (TM) provisions with key stakeholders such as the police, BEAR Scotland, local authorities and the ambulance service. TM layouts and management options were designed for least disruption including night-time and weekend closures, rolling blocks and use of contraflows. Future maintenance requirements have been minimised through design choices and contract requirements including designing out bearings from the M9 structure and the use of echelon paving to provide a more durable surface course.
Objective 8: To provide a scheme that accommodates the needs of disabled people The FRC Access Panel was consulted in order to inform the design regarding access and provision for the needs of disabled people during construction and operation. Additionally, existing routes were maintained to allow continued use of wheelchair and other disabled access.
Objective 9: To contribute to the promotion of healthy lifestyle opportunities and social inclusion SRB partnered with a local community group to assist in the refurbishment of a water amenity adjacent to the works. SRB also provided personnel to carry out maintenance works on the local primary school. Environmental procedures were put in place to protect the local green areas from damage during construction. SRB also provided a number of work

placements for young persons and long-term unemployed persons which included SVQ Level 2 training.

Objective 11: To Reduce, Reuse and Recycle Materials and Products where practicable

Sustainability and reduction of materials was a central theme running throughout the Project. Design development led to the retention of elements, material minimisation and a resulting reduction in waste, where practicable.

Material storage procedures minimised the amount of wastage and damage to materials. A WRAP site waste management plan allowed a high level of recycling, including reuse of over 16,000 tonnes of planings and reuse of materials. This minimised the amount of material sent to landfill. In total, 83% of all non-hazardous waste material was segregated and diverted from landfill and the vast majority of all other waste targets were achieved.

Objective 12: Seek to minimise embodied energy and carbon associated with key materials and their transport to site

During construction, energy use and carbon emissions of key activities, such as site compound power and water usage, fuel usage and plant selection were monitored and a carbon footprint for the project was prepared.

Where possible, elements were prefabricated off-site, thereby reducing energy consumption and transport movements.

Objective 14: To protect and enhance the natural heritage including local biodiversity

A Construction Environmental Management Plan (CEMP), including a number of subsidiary plans, was developed for the various environmental aspects of the project. The CEMP provided the necessary framework to ensure that natural heritage and local biodiversity were protected during construction of the Project.

Woodlands were retained and protected where required and the Swine Burn was realigned to provide an enhanced morphological and ecological habitat. Future species fragmentation and mortality was minimised by provision of mammal fencing, ledges and tunnels, such as mammal ledges within the Niddry Burn culvert.

Objective 16: To Reduce Noise and Air Emissions

A rigorous noise and vibration management regime was put in place that involved assessment of potential noise and vibration levels prior to works commencing; this informed plant selection and the approach to construction and is directly related to Objectives 6 and 7. During construction, noise, vibration and air quality were continually monitored at key sensitive receptors adjacent to the Works. Speed restrictions and use of average speed cameras also led to a steadier flow of traffic through the Works, leading to reduced noise from braking and general vehicle noise. Where possible, the works were reprogrammed around sensitive receptors and for off-peak periods.

Objective 17: To protect water quality, geomorphology and maximise the use of sustainable drainage systems for environmental and hydrological benefit

Surface water runoff was carefully controlled and mitigation measures put in place. A 20% climate change allowance was included in the overall drainage design and all site runoff was designed to pass through a number of SUDS drainage systems. Regular inspection and monitoring was carried out to verify that sediment/pollution control measures were working effectively.

1.0 Introduction to the M9J1a Project

The M9 Junction 1a project (the Project) forms part of the larger Forth Replacement Crossing (FRC) scheme. The Contract value was in the region of £26.5 million.

The design for the Project comprised a grade separated junction arrangement, capable of facilitating all movement access between the M9 and the M9 Spur. Located on the site of the existing junction, the new arrangement made best use of existing infrastructure whilst minimising the amount of new land-take required in its implementation. The functionality provided by the existing junction was enhanced through revisions to both the existing loop arrangement, from the M9 westbound to the M9 Spur, and the slip road from the M9 Spur to the M9 eastbound. Each of these links provided two general traffic lanes, which assisted traffic flow through the junction area.

To better serve West Lothian traffic, the re-design of M9 Junction 1a incorporated west facing slip roads, a feature not included within the existing junction design. The provision of these slip roads removed the current requirement for traffic to navigate Newbridge Roundabout when heading westbound and also gave the facility to remove traffic from the A904 local road.

The Project included a number of new and modified structures, which were required to carry new sections of road and realigned watercourses, as shown in Tables 1 and 2. Where possible, existing structures were utilised or widened.

Table 1 – New structures

Structure Reference	Structure Name
M901	M9 Overbridge
M904	New Swine Burn Culvert

Table 2 - Modified structures

Structure Reference	Structure Name
M905E	Overton Road Bridge
M906E	Existing Kirkliston Overbridge
M907E	Existing Swine Burn Culvert
M908E	Newmains Bridge
M912E	Niddry Burn Culvert
-	Niddry Burn Tributary Culvert

The interaction of traffic between M9 Junction 1 and Junction 1a was a known constraint on the operation of the strategic network, with lane weaving being a particular issue. The southbound widening of the M9, in conjunction with the provision of two-lane merge and diverge slip roads at Newbridge Roundabout and M9 Junction 1a, improved the connectivity and operational performance of the network through this section. An aerial view of the recently completed Project is shown on Figures 1 to 3. Two Scheme Layout Drawings as well as additional photographs of the Project are provided in **Appendix A.**

Figure 1 – Aerial view of newly completed M9J1a Junction looking eastward towards the new junction arrangement

Figure 2 – Project Opening Ceremony held on 1st February 2013

Figure 3 – Typical Completed Gantry

2.0 What is Sustainability?

One of the most widely quoted and succinct definitions of sustainability, in the context of '*Sustainable Development*', is that of the Brundtland Commission of the United Nations on March 20, 1987:

> *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."*

At the 2005 World Summit on Social Development it was noted that this required the reconciliation of environmental, social equity and economic demands - the "three pillars" of sustainability (the 3 "E's"). This is also known as the "Triple Bottom Line".

Venn diagram of sustainable development: at the confluence of three constituent parts

As per Section 2 of the FRC Sustainability Appraisal and Carbon Management Report (SACMR) (Jacobs Arup, 2009a), the approach to sustainability on the whole FRC Scheme (including the Project) is in line with the following UK, Scottish and FRC Sustainability Objectives:

- UK Framework (5 Key Principles);
- Scottish Sustainable Development Strategy (4 Key Target Areas);
- Scottish Government (5 Key Strategic Objectives and 15 National Outcomes);
- FRC Sustainable Development Policy (13 Objectives based on UK Framework Principles and supports 8 of the 15 National Outcomes of the Scottish Government); and
- FRC Sustainability Appraisal (17 Sustainability Objectives, of which eleven were applicable to the construction phase of the Project).

Within the SACMR (Jacobs Arup, 2009a), a fourth "pillar" was identified; that of Resources. The SACMR states that environmental impacts of consumption and production remain severe and inefficient use of resources is a "drag on the UK economy and businesses". The SACMR also stated that the key themes that form the basis of the Sustainable Resource Management Framework (SRMF) were:

- management of natural resources: which includes the re-use or recycling of materials;
- responsible sourcing: which includes sustainable sourcing, local sourcing, reducing transportation and efficient logistics;
- supply chain management: including waste minimisation, management systems and site stewardship; and
- climate change and energy: including energy efficiency, fossil fuel consumption and renewable sources of energy.

The issue of Resources was well documented in the Scheme objectives as a critical part of the requirement for sustainability.

3.0 Sustainability Appraisal and Carbon Management Report (SACMR)

The FRC SACMR (Jacobs Arup, 2009a) covered the three FRC contracts:

- Principal Contract (Main crossing and associated network connections);
- Fife Intelligent Transport System (FITS) to the north; and
- M9J1a to the south.

The purpose of the SACMR (Jacobs Arup, 2009a) was to:

- summarise the sustainability appraisal process as developed and applied to the Scheme throughout its development since January 2008;
- appraise the sustainability performance of the proposed scheme against defined sustainability objectives, including the measurement and management of carbon; and
- identify design measures (ideas and innovations) that could deliver a more sustainable outcome.

4.0 Benefits of the SACMR

The benefits of undertaking this sustainability appraisal and carbon management process were that it:

- drew together all the information on sustainability and carbon management relevant to the Scheme;
- ensured that the ethos of sustainable design and development was embedded within the Scheme throughout its project life-cycle;
- encouraged a more efficiently designed and effectively delivered scheme; and
- demonstrated how the Scheme contributes towards the delivery of Scottish Government and Transport Scotland policies on sustainable development and climate change.

In conjunction with the Environmental Impact Assessment (EIA), undertaken by a joint venture between Jacobs and Arup (JAJV) in 2008-2009, the sustainability appraisal also provided a framework for including environmental, social and economic factors in decision-making throughout the life-cycle of the project, thus supporting a sustainable approach. The sustainability appraisal also supported and built on the environmental commitments presented in the FRC Environmental Statement (ES) (Jacobs Arup, 2009b) and Reports to Inform Appropriate Assessments (RIAAs) (Jacobs Arup, 2009c).

5.0 Scope of M9J1a Sustainability Appraisal Report (M9J1a SAR)

As stated in Section 2, the FRC Sustainability Appraisal included 17 sustainability objectives. Of these, eleven were applicable to the construction phase of the Project. The purpose of this M9J1a Sustainability Appraisal Report is to evaluate the performance of the Project against the eleven sustainability objectives and associated targets of the Project. Evidence and case studies are provided, where necessary, to demonstrate the attainment of the sustainability objectives throughout the detailed design and construction phases of the Project.

6.0 Sustainability Appraisal – Methodology and Roles

Roland Tarrant (SRB) was appointed the Sustainability Manager for the Project on the 28th November 2011 (REF: FRC-M9J1A-EMP-COR00204) in accordance with Section 3.1.1 of Part A1 of the Employer's Requirements.

He was assisted in the preparation of this report by the following personnel:

- Management personnel within the SRB Quality and Environmental Office for the M9J1a Project.

- Peter Byrne (SRB Company Environmental Manager).
- David Bunyan (Ramboll Environmental Co-ordinator).
- Members of the Employers Delivery Team (EDT).
- These works were overseen by the EDT Sustainability Manager, Steven Brown.

During the Project, regular meetings were held to discuss the gathering of evidence by the Team and measurement of the sustainability objectives. Sustainability was driven through the design stage by the relevant contractor and designer team leaders, CEEQUAL assessors and the SRB Sustainability manager. Regular formal and informal contact was maintained to interrogate design and construction decisions to ensure that the sustainability objectives were considered at the most appropriate stage of the project and that the final design, through an iterative process, aligned with the sustainability objectives of the project.

During the construction phase, regular Project Team meetings and Sustainability meetings were held and attended by the Contractor, designer and EDT personnel to discuss progress towards achieving the sustainability objectives and to discuss new initiatives that could prove useful.

7.0 Sustainability Appraisal Plan Objectives

Within each of the eleven sustainability objectives identified for the Project, a number of Targets (Indicators) were used to measure and monitor performance and progress towards achieving each of the identified Objectives, identified within the SACMR (Jacobs Arup, 2009a).

The majority of the indicators were quantitative but in a few cases qualitative indicators were considered to be more relevant. The key Objectives and Targets applicable to the design and construction phases of the Project are listed in Table 3.

Table 3 – Sustainability Objectives and associated targets applicable to the Project

Key Objectives of the Sustainability Appraisal Plan
Objective 4: To minimise the Scheme Footprint and Severance of land • Target 1 Minimise land-take for the scheme. • Target 2 Minimise the negative impacts of land severance (during construction).
Objective 5: To adopt Sustainable Resource Management in Design and Construction • Target 1 Develop a Sustainable Resource Management Framework (SRMF). • Target 2 Minimise material use through careful design and adopting material reduction measures.
Objective 6: To ensure that community engagement takes place at all the Key stages in the FRC Project process • Target 1 To make sure that all groups whose interests are affected by the proposed scheme are identified and have access to information and opportunity to engage. • Target 2 To select appropriate methods of engagement for target audiences and to make sure information is made available at appropriate stages in the Project. • Target 3 To provide opportunity for two-way dialogue and ensure stakeholder feedback is considered during the design development process.
Objective 7: To improve local accessibility and reduce community severance • Target 1 Reduce community severance by reducing traffic on local roads within 400m of the main carriageway centre line. • Target 2 Improve walking and cycling provision and integration within the scheme

catchment. • Target 3 Contribute to the improvement of access to public transport.
Objective 8: To provide a scheme that accommodates the needs of disabled people • Target 1 Ensure all non-motorised user routes impacted by the scheme are designed in accordance with Transport Scotland's "Disability Discrimination Act Good Practice for Roads". • Target 2 Ensure the needs of disabled people are given due consideration in the design of all aspects of the scheme.
Objective 9: To contribute to the promotion of healthy lifestyle opportunities and social inclusion • Target 1 Maintain the quality and accessibility of open or green space. • Target 2 Seek to create training and employment opportunities. • Target 3 Contribute to the improvement in public transport access to economic opportunities for communities where this is a factor in deprivation. • Target 4 Avoid increasing health inequalities during the construction process.
Objective 11: To Reduce, Reuse and Recycle Materials and Products where practicable • Target 1 Minimise absolute volumes and difference between cut and fill earthworks quantities. • Target 2 Maximise percentage of earthworks materials sourced locally. • Target 3 Maximise use of reused/recycled products. • Target 4 Promote the restoration and development of brownfield/contaminated sites within areas affected by the scheme.
Objective 12: Seek to minimise embodied energy and carbon associated with key materials and their transport to site • Target 1 Seek to minimise the embodied energy and carbon associated with key materials and their transport to site. • Target 2 Minimise energy use and all carbon emissions during construction.
Objective 14: To protect and enhance the natural heritage including local biodiversity • Target 1 To minimise the number of sites designated for natural heritage conservation and protected species affected and significance of any adverse impacts. • Target 2 To protect and enhance biodiversity.
Objective 16: To Reduce Noise and Air Emissions • Target 1 Manage effectively construction noise impacts and reduce and mitigate significant operational noise impacts where practicable. • Target 2 Air quality limit values not to be exceeded at selected residential properties and other sensitive receptors. • Target 3 Dust deposition to be contained within deposition threshold.
Objective 17: To protect water quality, geomorphology and maximise the use of sustainable drainage systems (SUDS) for environmental and hydrological benefit • Target 1 Limit impacts and significance of residual effects on water quality and pass majority of runoff through SUDS.

- Target 2 Limit watercourse re-alignments and limit number of watercourse crossings.

8.0 Sustainability Policy and Sustainability Targets and Indicators

A Sustainability Policy was prepared specifically for the M9J1a Project. This was aligned with both the main FRC objectives and the SRB and Parent joint-venture Companies sustainability objectives and targets (refer to **Appendix B**).

A number of indicators and targets (real and aspirational) were established in the SACMR (Appendix 5: SRMF) (Jacobs Arup, 2009a) in order to track progress in terms of sustainability across the whole sustainability spectrum. The indicators, targets and realised results are included in **Appendix C.** The aim of these Project specific indicators and targets were to support progress towards achieving the Sustainability Objectives identified in the SACMR.

Actual performance against targets was reviewed monthly by the Sustainability Manager and areas for improvement were identified and actioned with the appropriate departmental manager.

Progress towards achieving sustainability targets was regularly reported in the Progress Report and regular presentations to the main FRC Sustainability Working Group.

9.0 Sustainability Management Tools

The various contract documents, including the Code of Construction Practice (CoCP), were written into the M9J1a Project. These detailed all of the sustainability related objectives and requirements with which SRB were required to comply. A number of management plans and initiatives were employed on the Project to assist in managing and steering the Project to achieve these objectives. These provided the procedures, processes, tools and techniques required and included:

- The overall Construction Environmental Management Plan (CEMP) included the following management plans:
  - Sustainable Resource Management Framework (SRMF);
  - Green Travel Plan;
  - Materials Transportation Strategy;
  - Energy Management Plan;
  - Operational Energy Plan; and
  - Responsible Sourcing Code of Practice.
- The sustainability assessment, rating and awards scheme for Civil Engineering (CEEQUAL).
- The Considerate Constructors Scheme (CCS).

9.1 Sustainability and CEEQUAL

CEEQUAL is an assessment and award scheme that measures and seeks to improve the environmental performance of civil engineering projects through a series of questions and evidence gathering. It applies across the life-cycle of the project to cover design as well as construction and delivery. Recent updates of the CEEQUAL scheme have increasingly embraced the sustainable development agenda and there are detailed sections that now cover resource and materials use, carbon management, stakeholder engagement and relations with local communities.

Transport Scotland decided that CEEQUAL could provide a useful tool for assessing the environmental and sustainability performance of the FRC Project as it is based on a management systems approach that includes:

- evidence gathering;

- auditing; and
- certification.

The undertaking of a CEEQUAL audit on the M9J1a project was used to provide a systematic and coherent approach to tracking the management activities and associated sustainability effects of the FRC Project, within the overall framework of best sustainability practice. It also helped to cover areas not routinely covered by the EIA process such as energy and carbon assessment.

A CEEQUAL award publicly recognises the achievement of high environmental and sustainability performance. Awards are presented to projects in which the clients, designers and contractors go beyond the legal and environmental minimum to achieve distinctive environmental and sustainability standards of performance.

An Interim CEEQUAL assessment was undertaken on the FRC scheme at the Design Phase and a score of 92.7% was awarded, placing it within the category of 'Excellent.' It was a requirement of the Construction Phase of this project that this category scoring of 'Excellent' was maintained.

The Project CEEQUAL assessment, under Version 4.1, has been ratified as of July 2013 and the Project has been awarded a final score of 86.5%. This places the Project in the "Excellent Award" category (Score of higher than 75%). Furthermore, scores above 85% are seen as Projects that represent the pinnacle of best practice within the construction industry.

Although the Whole Project Award score was lower than the FRC scheme Interim award score of 92.7%, this was mainly due to the relatively small scale of the M9J1a Project in terms of the overall FRC Scheme (M9J1a represents approximately 1.6% of the overall FRC Project cost). Many of the initiatives that are available to the Project team on the main FRC would neither be appropriate nor cost effective to implement.

An example would be Q7.3.6:
"Has energy from renewable and/or low- or zero-carbon resources been used during construction?"

The reality is that in the current market such supplies, while well established for static stand-alone permanent developments, are still not readily available for temporary compound setups. For example the use of renewables such as wind power or solar power as a site compound energy supply requires a very high capital cost, with potential for damage during repeated erection and demobilisation and high servicing costs, all with a relatively low energy yield in terms of the overall energy supply required on-site. In this case, it was not practicable in terms of cost and expertise required to source such a supply and so the seven marks available could not be scored.

The CEEQUAL scoring is often a limiting factor. Nevertheless, the score achieved demonstrates that the M9J1a Project was designed and delivered with sustainability as a central theme running throughout the Project.

9.2 Considerate Constructors Scheme

The Project was registered with the Considerate Constructors Scheme (CCS). There were three monitoring visits during the course of the construction phase. Scoring is out of a maximum of 40 marks and marks are awarded in the following eight categories:

- Considerate
- Environment
- Appearance
- Good Neighbour
- Respectful
- Safety
- Responsible
- Accountable

While there is no specific "sustainability" category, all of the above are related to social and environmental aspects i.e. two of the four pillars of sustainability.

The dates and scores achieved are listed below:

- December 2011 36.5/40
- June 2012 36.5/40
- November 2012 36/40

With an average score of 36.3, the Project was deemed to be within the top 10% of construction sites in the UK in terms of performance within the scheme. This led to SRB receiving a Bronze award at a ceremony in Edinburgh for achievements on the M9J1a Project. This further demonstrates that the Project was managed and carried out with the highest regard for workforce welfare, the community and the environment.

9.3 Reviews, audits and surveys

The project team undertook a number of reviews and surveys, which led to improvements in terms of sustainability on the Project. Participation in a number of industry schemes means that the M9J1a was benchmarked against standards both within the construction industry and wider manufacturing and service industries. Some of these are detailed below.

9.3.1 Zero Waste Scotland Review

Zero Waste Scotland is a programme managed by Waste & Resources Action Programme (WRAP) on behalf of the Scottish Government. The programme delivers a range of support programmes, campaigns and other interventions to help people and organisations on the journey to Zero Waste material being sent to landfill. These include:

- Services to business.
- Local and national campaigns.
- Voluntary waste reduction agreements, like "Courtauld" and "Halving Waste to Landfill".
- Expert support to local authorities, resource management businesses and the third sector.
- Capital investment.
- Research, training and identifying best practice.

Zero Waste Scotland's priorities include:

- Preventing waste and minimising resource use, saving money to householders and businesses.

- Creating a closed loop economy in Scotland to divert materials from landfill and maximise their economic value.
- Forging partnerships at local and national level to support behavioural change.

In February 2012, SRB personnel met with the Zero Waste Scotland team to carry out a review of the Site Waste Management Plan (SWMP) and existing measures to appoint sub-contractors with regard to their environmental credentials. Items reviewed included:

- Environmental Policy.
- Sub-contractor Pre-appointment Meeting.
- FM-PU-35 SRB Subcontract Checking Procedures.
- SWMP – this was revised and included in the Project CEMP.
- Standard Subcontract Conditions – Waste Management Requirements.

SRB also signed up to the "Halving Waste to Landfill Initiative" (Figure 4).

Figure 4 – Signed "Halving Waste to Landfill" commitment

9.3.2 Green Travel Plan

A Green Travel Plan was prepared and an initial survey carried out in December 2011. A second survey was carried out in March 2012, to gauge whether there had been any improvement in personnel using more sustainable modes of transport for commuting and carrying out work. Refer to SRB's Green Travel Plan (http://www.transportscotland.gov.uk/system/files/documents/tsc-basic-pages/Forth_Replacement_Crossing_FRC_M9_Junction_1a_Appendix_E_Green_Travel_Plan.pdf)

9.3.3 Achilles (Category B2)

Achilles' online procurement services encompasses everything from finding and selecting potential suppliers through to; pre-qualifying, evaluating, auditing and monitoring to provide

buyers with the highest quality searchable data about suppliers and contractors. More information is available on the Achilles website:

http://www.achilles.com/en/

As part of the SRB certification to Achilles Scheme, the M9J1a Project was inspected in 2012 with the scores achieved on our site management systems summarised in Table 4.

Table 4 – Achilles Scheme audit scores

Management System	Achilles Category B2 (Audit Score)
Health and Safety	97.9%
Environment	95.8%
Quality	98.2%

As with the Considerate Constructors Scheme, the Achilles Scheme is not primarily a sustainability-related scheme. However, our management systems enable delivery of the project sustainability objectives. Consistent, high scoring within Achilles demonstrates that the Project operated at the highest levels with appropriate and proportionate, well developed systems and procedures in place, all backed up by good site practice. This assisted and steered the delivery of the Project sustainability objectives.

9.3.4 Inspections and Audits

Inspections and Audits were carried out during the course of the Project to ensure that the management systems and site activities were in line with the various requirements of the Contract and the various Sustainability targets and objectives of the Project were being monitored and reported (Table 5).

Table 5 – Inspections and audits undertaken on the Project

Audit	Frequency
Internal Safety Audit	Weekly
External Safety Audit	Monthly
Temporary Works Co-Ordinator Audits	Monthly
CDM Co-ordinator Audits	3 monthly
Legislative Compliance Audits	Monthly
Internal Quality Audits (on various parts of the system)	Weekly
Supply Chain Audits	3 Monthly
Head Office Environmental Audits	Bi-monthly
External Consultant Environmental Audits	Bi-monthly
Client Audits	6 monthly
ISO and OHSAS Certification Audits by external body	6 Monthly
Daily site environmental inspections	Daily
Weekly site environmental inspections	Weekly
Reporting	**Frequency**
EDT Site Meeting	Weekly
Progress Report and Progress Meeting	Monthly

Environmental Liaison Group Meetings	Monthly
Noise Liaison Group Meetings	Monthly
Community Liaison Group Meetings	Monthly
Traffic Management Working Group Meetings	Monthly

10.0 Key Performance Indicators (Targets)

To assist in delivery of the sustainability targets and objectives, a number of Key Performance Indicators (KPI's) were identified and targets were developed by the Contractor and agreed with the EDT. These KPI's were chosen to closely align with the sustainability framework set out in the SACMR (Jacobs Arup, 2009a) for the whole scheme.

Performance against the KPI's was continually monitored, tracked and reported to the EDT at progress meetings and at the Sustainability Working Group meetings. The full list as well as performance against targets is included in **Appendix C**.

Analysis of the KPI target versus actual performance demonstrated that the majority of the targets were met or bettered. This verifies that sustainability was at the central core of the Project Team's decision-making throughout the Project lifecycle and that the overall sustainability objectives defined by Transport Scotland were successfully delivered.

Targets exceeded

In some areas, KPI targets were exceeded; these are outlined below with an explanation of how this was the case:

Target 7 50% of steel material recovered, re-used and recycled (Actual 100%)

All existing redundant steelwork on the Project (including gantry, safety restraint system and reinforcement from demolition) was recovered and sent for recycling. All waste steel from steel fixing and general material excess was also sent for recycling or sent to other sites for use, rather than being sent for disposal.

Targets not met

In some areas, KPI targets were not achievable; these are outlined below with an explanation of how this was the case:

Target 10 100% of timber based products that are certified as sustainable (Actual 70%)

All fencing timber came from a UK supplier (based in Shropshire) and was processed from UK grown forestry stock. FSC certificate for this material certified that 70% of the material was from sustainable sources. However, 100% of the supply came from managed forestry and complies with the spirit of the FSC certification in that the forestry is replanted and not at risk from deforestation as is the case in other parts of the world. It is a cost and paperwork issue that means smaller suppliers of timber do not get specific FSC certification. It is considered that 100% of the fencing materials used on the Project came from a sustainable supply.

Target 12 60% of workforce using car sharing scheme (Actual 45%)

On the M9J1a project there was a large geographical spread among the workforce and this meant that many of the personnel on-site were coming from Edinburgh, the Central belt of Scotland and beyond. There were not many opportunities for personnel to car share to work.

Car sharing among personnel that stayed in lodgings was high, with over 90% of them adopting car sharing or walking. Unfortunately, many of the remainder would have required making significant diversions to collect passengers, which would not have been feasible.

Staggered finish times for many of the operatives on the structures and roads elements and the need for night shift working at various stages meant that this KPI target was extremely difficult to attain.

For future contracts, other possible transport options could be considered along with a lower KPI.

Of the 17 Indicators included in Appendix C, fifteen were met, one was exceeded (car sharing) and one was not met but an equivalent target was achieved (Target 10 – Fencing).

11.0 Examples and evidence of meeting Sustainability Objectives

This section provides a summary of the evidence gathered of actions carried out during the project with regards to the eleven project sustainability objectives, and associated targets, identified in Section 7. A brief analysis of the benefits gained is also provided.

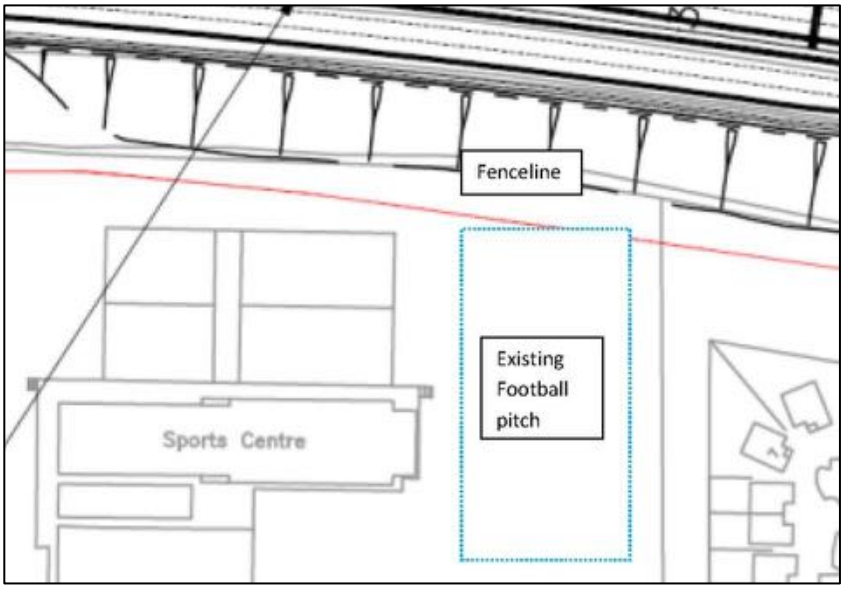
Key Objectives of the Sustainability Appraisal Plan
Objective 4: To minimise the Scheme Footprint and Severance for Scheme • Target 1 Minimise land-take for the scheme. • Target 2 Minimise the negative impacts of land severance.

Evidence SO4.01	
Potential to meet evidence of Target No's:	**OBJ 04 Target 1 and 2**
Action During the construction phase, a total of 4.5 acres of land was identified with potential for handing back to landowners, once the permanent works had been completed. This had been managed through the installation of temporary fencing and relocation of site haul routes close to batters. Locations where this was enabled were localised around gantries at CH 600-1150 LHS, CH950-1070 RHS and CH150-300 on the southbound spur (refer to Appendix A for scheme layout drawings). While this option was not ultimately successful, it does demonstrate that sustainability opportunities were explored during the Project and were a central theme during management decision-making.	
Benefits Opportunities to reduce the land take required for the Project were sought, although the benefit was not achieved in this instance.	

Evidence SO4.02	
Meets evidence of Target No's:	**OBJ 04 Target 1 and 2**

Action

During the setting out of the fence line for the boundary at Kirkliston Leisure Centre, it became evident that the fence would encroach on the north-western corner of the existing football pitch. The decision was taken to move the fence line back approximately 10m from the edge of the pitch.



Red line indicates the original position of the fence line - this would have encroached on the existing football pitch (blue line)

Benefits

- Negated the need to reline the football pitch and relocate goalposts, minimising the impact of the works on the local community.
- Created a level of goodwill to the Project from the operators of the leisure facility and indirectly with the community who use the facility. This was particularly important in the initial phase of fencing and securing the site, where public perception of the Project was paramount for undertaking future works.

Evidence SO4.03	
Meets evidence of Target No's:	**OBJ 04 Target 1 and 2**

Action

Topsoil stripped from lands was stored for the minimum period possible adjacent to the Works and returned to the same location for reinstatement, as far as practicable. SRB aimed to return temporary lands to the same or better condition to landowners adjacent to the Project.

Topsoil stripped from and stored as near as possible to the point of final placement within the permanent works

Benefits

The quality of reinstated lands was as close as possible to the existing lands with the result that the need for fertiliser or spraying was largely negated, reducing the amount of time that the land required to recover. This meant that the land could be sown immediately for crops where required, reducing the impact of land severance. Fortnightly inspections of the topsoil storage and LMA areas was carried out by the Landscape Clerk of Works and his team (51 visits over the course of the Project) to monitor storage arrangements and ensure that the topsoil did not become anaerobic or otherwise degrade. Topsoil stockpiles were managed in accordance with BS6031:1981 Code of Practice for Earthworks and Code of Construction Practice for the Sustainable Use of Soils on Construction Sites – DEFRA 2009". Any soils requiring temporary storage were sealed immediately, by tracking with bulldozer, to prevent water ingress.

LMA lands returned adjacent to M908E Newmains Overbridge – ploughed and ready for crops

In two areas of the works where lands were temporarily taken for the construction of the works, SRB carried out localised filling adjacent to the fence line. This resulted in a better profile for the lands handed back and a subsequent improvement in drainage and profile of the lands for agricultural use.

Localised filling of land being returned to improve agricultural use and surface water drainage (CH1300 Area 10 – see **Appendix B**)

Evidence SO4.04	
Meets evidence of Target No's:	**OBJ 04 Target 2**

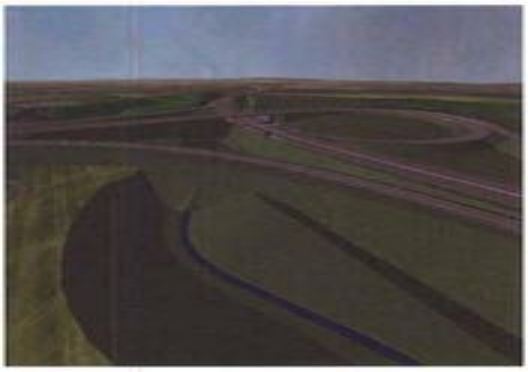
Action

SRB's Aesthetics Basis Document was submitted during the design phase to give broad detail to the designs and specification that would be provided by SRB, including the Designer Ramboll, and how the completed design and landscaping elements would blend into the local landscape character. This report covered the following elements:

- Noise barrier;
- Mammal Fencing;
- Changes to indicative landscape planting;
- Landscape cross sections;
- Rock cutting proposals;
- Highway embankment widening and soil cutting proposals;
- Hard landscaping between all bridge structures;
- Water environmental and SUDS proposals including earthworks design and security fencing; and
- Gantries.

Benefits

This document detailed the design strategy for the scheme in terms of fitting in with the local landscape. The specimen design was reviewed and further developed by SRB and Ramboll prior to construction, with improvements in end land use incorporated (see example below regarding Swine Burn). This ensured that land severance considerations and habitat connectivity were highlighted and mitigations integrated into the design. Client review of the design methodology also enabled EDT comments to be incorporated into the final design.



Specimen Landscape Design for Swine Burn

SRB landscaping at Swine Burn with enhanced geomorphology and planting

During the tender and design phases, SRB developed the Swine Burn design to include:

- An increase in the flood capacity of the burn at this location.
- Provision of a steepened cutting slope and a sinuous channel which are considered a better habitat than an engineered channel and slopes.

Evidence SO4.05	
Meets evidence of Target No's:	**OBJ 04 Target 2**

Action

During construction, areas of existing woodland were identified where trees were to be retained as part of the works. Prior to works commencing, these woodland areas were inspected by SRB's Arboricultural expert. Areas to be retained were agreed on-site and demarked and protective fencing applied. These were regularly inspected during the works; weekly by the construction team and bi-weekly/monthly, as required by the Landscape Clerk of Works.

The absolute minimum area of mature trees was taken for the construction of the Project

Mature trees retained at perimeter of the works

In addition, existing access routes and farm access points were extensively used where possible as site access for haul routes and site deliveries. This was through a combination of the relevant access roads being included in the Lands Made Available for the Project and through local agreement with landowners to share access routes adjacent to the site.

Existing farm access route used for deliveries and as haul route

Existing watercourse crossing of Niddry Burn was utilised for works traffic

Haul road located as close as possible to the works to minimise the amount of lands taken for project construction

Haul road located as close as possible to the works to minimise the amount of mature woodland required to be felled to construct the works

Example of protective fencing applied to protect existing woodland

Benefits

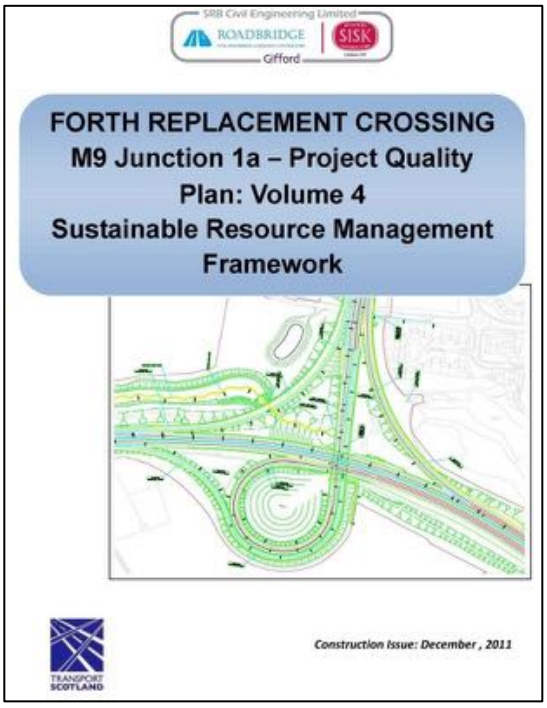
- The retention of as much of the existing landscape as possible retains much of the local character and reduces the impact of the Project on the surrounding landscape. Particularly in the early years while the landscape planting is establishing, the presence of mature planting can mitigate the “new” look of the scheme.
- The use of existing farm access tracks for haulage and deliveries removed the need to access the works from live carriageways. This would have required multiple traffic management layouts, increasing restrictions and delays to motorists and reducing local access to side roads, particularly at Overton Road and Kirkliston village. It also improved the safety of the works.

Key Objectives of the Sustainability Appraisal Plan
Objective 5: Adopt Sustainable Resource Management in Design and Construction • Target 1 Develop a Sustainable Resource Management Framework (SRMF). • Target 2 Minimise material use through careful design and adopting material reduction measures.

Evidence SO5.01	
Meets evidence of Target No's:	**OBJ 5 Target 1**

Action

A SRMF was developed from the SACMR (Jacobs Arup, 2009a) and implemented specifically for the M9J1a Project.



M9J1a SRMF Document

Benefits

The SRMF Plan addressed the key issues around the supply, management and use of the resources and materials in the M9J1a Project, reflecting the wider drive by Transport Scotland to adopt best sustainability practice within the FRC scheme.

Evidence SO5.02	
Meets evidence of Target No's:	**OBJ 5 Target 1**
Action There was a large emphasis on the principles of Sustainable Development on the M9J1a project from planning and design through to construction of the project. The joint construction team of Ramboll and SRB produced a number of sustainability plans to assist them in the delivery of the Sustainability Objectives outlined in the original SACMR (Jacobs Arup, 2009a). These plans included: • Sustainability Appraisal Plan; • SRMF; • Responsible Sourcing Code of Practice; • Green Travel Plan; and • Energy Management Plan.	
Benefits These wider plans facilitated the application of sustainability at all levels and across several aspects of the project. These management plans acted as enablers. By detailing commitment to processes, resources and champions, these plans provided the means by which the team could deliver the sustainability objectives of the SACMR (Jacobs Arup, 2009a).	

Evidence SO5.03	
Meets evidence of Target No's:	**OBJ 5 Target 2**
Action Materials and arisings from the works were reused within the works as much as possible. This included the reuse of the following: • Arisings from the hydro-demolition of the Swine Burn and Niddry Burn headwalls was incorporated into the works as Class 1 Material fill to embankments. • Settled concrete washout from deliveries was also incorporated into the earthworks as Class 1 material. • Demolition arisings from the wing walls of M905E Overton Road Bridge and M906E Existing Kirkliston Bridge were reused within the general earthworks as Class 1 fill material, once the reinforcement was removed and the material crushed.	
Benefits Reuse of materials in this manner resulted in a saving of approximately 390m^3 that would otherwise have required to be sent to landfill as C+D waste. This resulted in a reduction of 42 traffic movements otherwise required to remove the waste to landfill and in landfill tax charges payable (based on an average 12 cubic yard waste skip).	

Evidence SO5.04	
Meets evidence of Target No's:	**OBJ 5 Target 2**

Action

Design development meant that a ground improvement layer option was utilised as part of the earthworks strategy. This consisted of material from Niddry Bing (a local source of reusable waste, less than one mile from the site) and site-won rock being processed on-site to replace a traditional 6F1 or 6F2 capping layer. The design also maximised the use of site-won rock in starter layers and on top of embankments. This allowed site won material to reduce the import for capping material from 8,320m^3 to 5,708m^3, i.e. a reduction of 2,612m^3.

March 2012 quarry (Area 5 CH1450-1600 LHS)

2,612m^3 granular material won from Area 5

Site won granular material being graded on the Eastbound merge to the M90 Link

Niddry Bing (operated by Hunter Demolition) – a source of reusable waste from previous oil shale extraction industry

Benefits

Reduction in imported quarried non-renewable materials

Reduction in aggregates levy (£2 per tonne)

Reduction in traffic movements and associated carbon footprint:

- Reduction of 241 return load lorries on the Winchburgh road to the site (based on typical 17 tonne lorry load).
- Reduction of 474 kgCO_2e (tailpipe) emissions for transport alone from nearest supplier (Niddry Bing - 2km round trip to site) (Source: Defra/DECC (2010), Annex 7 Table 7d figures).

Eliminated the requirement to source alternative import supplier.

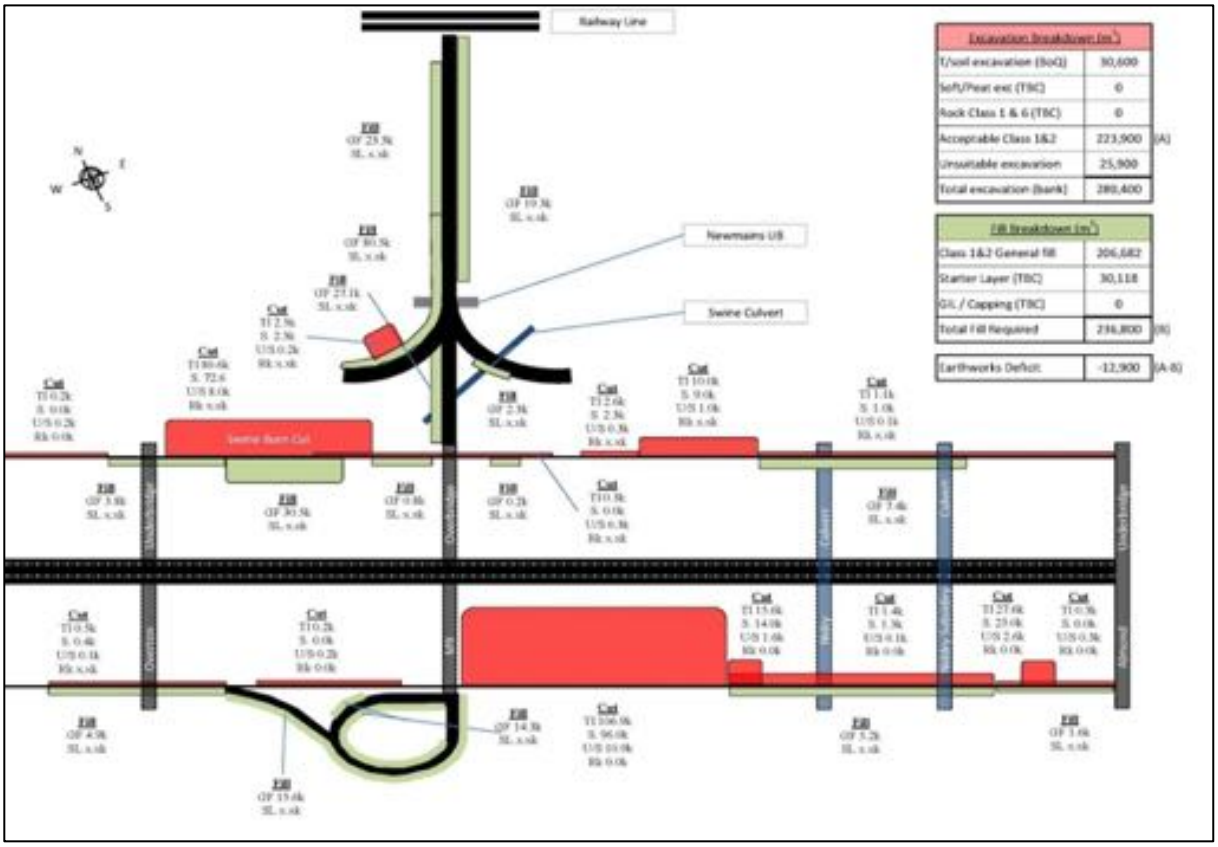
Reduction in embodied energy of: 261,200 MJ *(Source ICE Version a.6a).*

Reduction in embodied carbon of: 13,060 KgCO_2 *(Source ICE Version a.6a).*

Evidence SO5.05	
Meets evidence of Target No's:	**OBJ 5 Target 2**

Action

Several iterations of the design by the Project Team, during the tender period and through to construction meant that the site had a balanced cut and fill. The Stage 3 design (original specimen design) required 180,000m^3 material as import, out of a total earthwork quantity of 300,000m^3.



One of several iterations of mass haul diagram prior to construction commencing, showing an overall mass haul balance

This was achieved by reducing the fill requirements and increasing the rock cut and Swine Burn channel excavation. This eliminated the need for importation of materials and disposal of unsuitable materials off-site and improved the Swine Burn valley.

Benefits

Reduction in aggregate levy payments (£2 per tonne).

Reduction in traffic movements and associated carbon footprint:

- Reduction of 16,623 No. 17t return load lorries on the Winchburgh road to the site.
- Reduction of 33,000 kgCO_2e (tailpipe) emissions for transport alone from nearest supplier (Niddry Bing - 2km round trip to site) (Source: Defra/DECC (2010), Annex 7 Table 7d figures).

The Niddry Bing material is itself a recycled by-product of the historic oil shale extraction industry and for the purposes of this report it is assumed there is no carbon footprint other than for transport (although there is a carbon footprint associated with its initial production there is no valid data available for this product to provide an analysis).

Evidence SO5.06	
Meets evidence of Target No's:	**OBJ 5 Target 2**

Action

In certain areas the design required to over-widen the highway verges to provide adequate sight distance. In these areas marginal and otherwise unsuitable material was used in the widened verge allowing beneficial use of material.

In the layout for the M9 Eastbound Diverge, 18,313m^3 of marginal material was allowed to be used in this verge. Without this special design consideration, the material would have needed to be either imported or engineered (using lime or cement stabilisation) in order to construct the embankment.

Eastbound Diverge Embankment Fill

Benefits

Reduction in traffic movements and associated carbon footprint from supplying material from the nearest supplier:

- Reduction of 1,691 17t return load lorries on the Winchburgh road to the site.
- Reduction of 3,382 kgCO_2e (tailpipe) emissions for transport alone from nearest supplier (Niddry Bing - 2km round trip to site) (Source: Defra/DECC (2010), Annex 7 Table 7d figures).

Evidence SO5.07	
Meets evidence of Target Nos:	**OBJ 5 Target 2**

Action

Using pre-cast concrete units for the M912E Niddry Burn, M904 Swine Burn and Niddry Burn Tributary, and pre-cast beams for M905E Overton Road Bridge and M906E Existing Kirkliston Bridge, had significant benefits for the Project in terms of sustainability and minimising material use.

Extension onto existing Niddry Culvert M912E North Side using pre-cast culvert units

Extension onto existing Swine Burn culvert (M907E) using pre-cast arced culvert units

Benefits

Pre-cast construction of these key elements resulted in the following reductions:

- Quick erection times – reduced programme (the Project opened six weeks ahead of schedule) leading to less risk of incidents, near misses and accidents.
- Reduced need for plant on-site as works are shorter duration and less working room/shoring is required.
- Easier management of construction site (less trades, less management time required).
- Waterproofing can be applied in factory prior to shipping, reducing the amount required on-site – less waste and risk of environmental pollution.
- Better overall construction quality due to factory controlled conditions and finishes.
- A saving of between 20% and 50% in terms of the waste that would have been generated on-site using traditional construction approaches and reduced energy use (source: WRAP WAS003-003).
- 75% less formwork, 75%-90% less scaffolding, 90% less wet concrete (source: Irish Concrete Federation).
- Increased production of follow on activities such as backfilling and earthworks.

- Savings on delivery (typically in-situ solution would require multiple deliveries of ready-mix concrete), overheads, static plant (e.g. lighting towers and welfare units) and security. This increases waste from washout and part load deliveries to site.

Evidence SO5.08	
Meets evidence of Target No's:	**OBJ 5 Target 2**

Action

All of the gantries and the beams for M901 Overbridge structure were pre-fabricated off-site

Prefabricated gantry delivery to site 16th February 2012

Gantry staging area

Typical completed gantry

Benefits

- Similar to S05.07, there is a considerable saving in waste generated by having the elements constructed in a factory controlled setting. This is in terms of steel, welding consumables and paint materials.
- Quality of the finished product is superior, particularly given the sensitivities of welding

operations to temperature and weather conditions

- Pre-fabrication facilitates the use of automated cutting and welding systems and subsequent reduction in errors, wastage and energy use.
- Painting coating is applied in the factory prior to shipping. This reduces the amount of painting required on-site and subsequent risk of pollution and wastage of material
- Reduces the amount of temporary works required on-site for construction in stages
- Reduction in the requirement for traffic management to construct M901 M9 Overbridge structure than if constructed in-situ using reinforced concrete for the beams
- Reduces risk of accidents as variables are better controlled in a factory setting than on construction site with temporary supports.

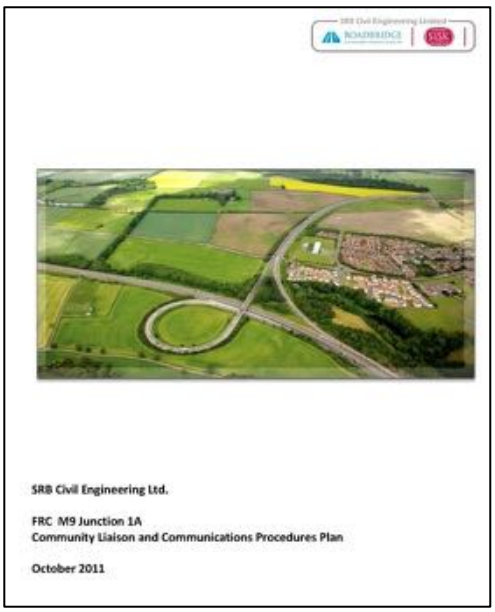
Key Objectives of the Sustainability Appraisal Plan
Objective 6: To ensure that community engagement takes place at all the Key stages in the FRC Project process • Target 1 To make sure that all groups whose interests are affected by the proposed scheme are identified and have access to information and opportunity to engage. • Target 2 To select appropriate methods of engagement for target audiences and to make sure information is made available at appropriate stages in the Project. • Target 3 To provide opportunity for two-way dialogue and ensure stakeholder feedback is considered during the design development process.

Evidence SO6.01	
Meets evidence of Target No's:	**OBJ 6 Target 1**

Action

SRB developed a Community Liaison and Communications Procedure Plan (CLCPP) as part of the Project Quality Plan, as per the Contract Requirements. The Plan set out how SRB was to fulfil the Employers Requirements, as outlined in the Code of Construction Practice (CoCP) and detail how the project was to engage with local communities.

A Consultation Matrix was prepared for the Project and was included in the Employers Requirements Part A1: General and Scheme Specific Requirements: Appendix B Consultation Matrix.



M9J1a Community Liaison and Communications Procedures Plan (CLCPP)

Benefits

Provided a structured approach with defined processes, including a mission statement, for the Project with top management commitment.

All groups which were required to be consulted with were recorded in a specific register developed from the contract documents.

A dedicated Community Liaison Officer (CLO) was appointed to work on the Contractor's behalf to identify relevant parties and ensure that proper consultations and liaisons took place when/as required.

Consultations were recorded using the consultation certificate system as part of the overall Project Quality Plan. This ensured that regular inspection and auditing was carried out on the consultation certificate records and the CLCPP.

Evidence SO6.02	
Meets evidence of Target No's:	**OBJ 6 Target 2**

Action

Methods of engagement were determined as appropriate and proportionate to the element or works for which engagement was taking place. For example, over twenty letter drops were carried out in targeted estates to ensure that the local community were kept directly informed of upcoming works. This was in addition to other indirect methods of communications such as community council meetings and website information.

The M9J1a Project has been very focused on engaging with the local community throughout all stages of the project. Some of the other methods of engaging with the community include the following:

- Project website: The website for the Forth Replacement Crossing contained a specific section for the M9J1a project and this part of the website included all Project Update Newsletters to date, along with a 'Latest News' link. Visitors to the website could also sign up to receive the Newsletter by email.
- Project Update Newsletters: These were prepared quarterly and placed on the website. Copies of these newsletters were also left in the Kirkliston Library for members of the public that may not have access to a computer (refer to extract from Newsletter below).
- Community Forum Meetings were also held quarterly with interested groups and minutes of these meetings available to the public. The forums were attended by standing members from local community councils, other organisations and members of the public were welcome to attend as observers.
- As described above, letter drops were distributed to the neighbouring housing estates and properties to give advanced notice of upcoming construction activities, as required.

FRC Newsletter with M9J1a Section

These measures supplemented higher level meetings with community leaders, local councils and statutory bodies. Methods employed included:

- Letter drops in specific works locations
- Holding of regular drop-in centres at Kirkliston Library
- Dedicated Community Liaison Officer (CLO)
- Emails to specific residents and meeting with resident groups
- 24 hour Freephone hotline and CLO email
- FRC Project Website email
- Considerate Constructors telephone line
- Community Council Liaison Meetings
- Scheme noticeboards at two locations on the site perimeter and use of the King Edwards Way Community Noticeboard
- Meetings with local schools
- Environmental Liaison Group (ELG) and Noise Liaison Group (NLG) meetings with local councils and statutory bodies (including City of Edinburgh Council, West Lothian Council, Historic Scotland and SNH).
- Wallet cards distributed to personnel and locals with key contact numbers.

Wallet Card with 24 hour contact numbers

Benefits

A significant number of tools and techniques were available to the Project Team and the most appropriate ones were utilised to ensure that stakeholders were kept informed. This ensured that our approach was flexible and most suited to the needs of the particular stakeholder.

Modern media methods of communications were combined with more traditional forms for the overall communication strategy, in order to ensure that all age groups affected by the works had the most suitable and readily available access to information at all times.

From community feedback received by the Project Team, there was a general appreciation from the community that the Project Team was trying to communicate effectively with them, leading to a greater level of understanding of the works. This was very important to the progression of the Project as much of the works took place immediately adjacent to the community and along local access routes, therefore presenting a high risk of disturbance, which was, overall, effectively mitigated.

Evidence SO6.03	
Meets evidence of Target No's:	**OBJ 6 Target 2**
Actions Project display boards were placed at Newmains Structure and B800 beside the River Almond Site Access. SRB also used the existing community noticeboard within King Edwards Way.	
Benefits Effective in terms of using a communication tool (i.e. use of existing community noticeboards) that the local community would already be familiar with.	

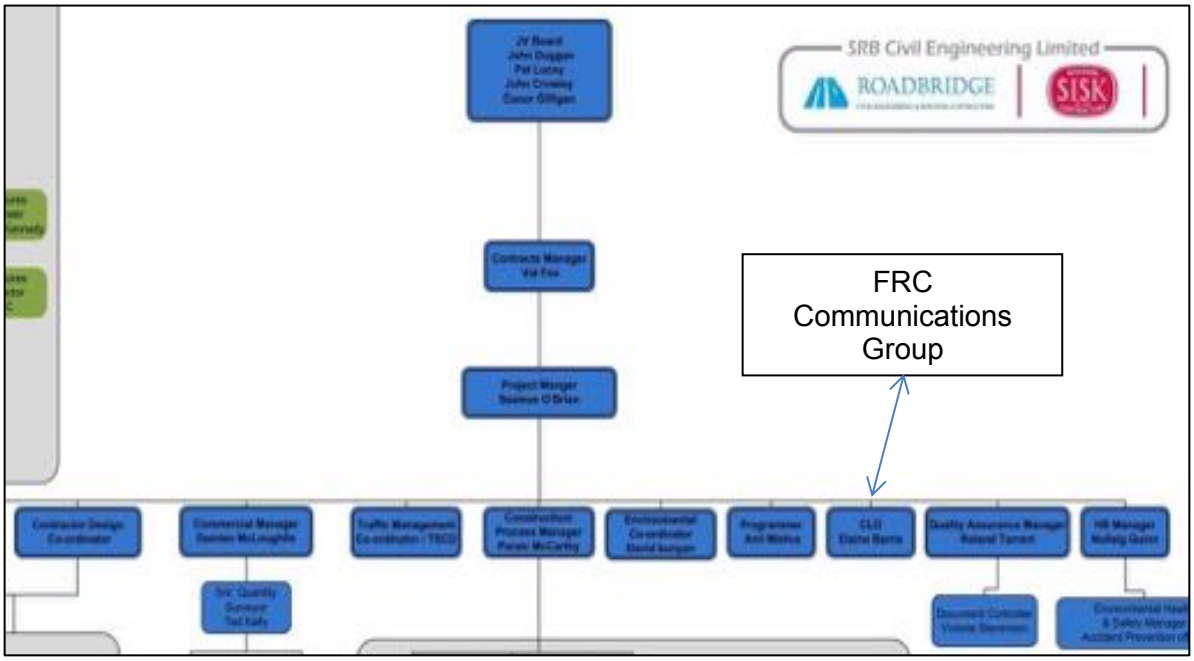
Evidence SO6.04	
Meets evidence of Target No's:	**OBJ 6 Target 3**

Action

Regular meetings were held with appropriate stakeholders during the planning and construction phase of the works. Community consultation was very much to the fore during the construction phase of this project, with an appointed Community Liaison Officer (CLO) (refer to attached Organisation Chart for the Contractor's Team). Regular meetings were held with the Community Councils and a local disability group and these were also given opportunity to review the CEMP. Comments were accepted from all these organisations and considered by the Project Team.

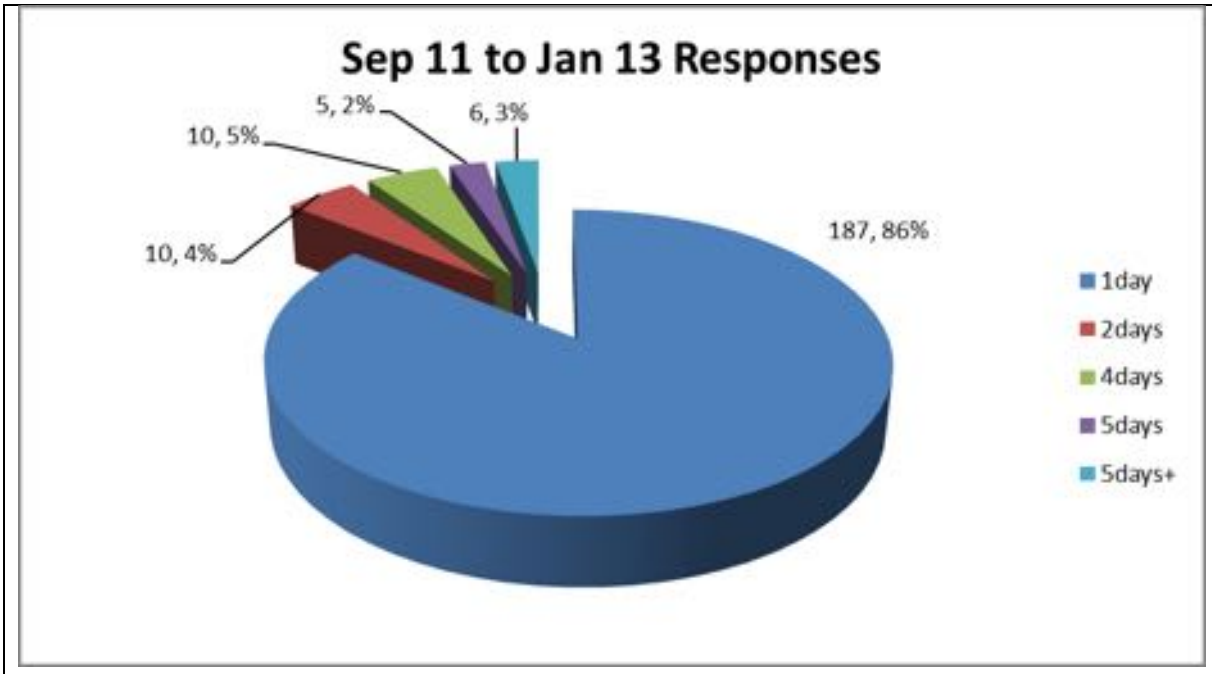
As required, ad-hoc consultations were also held with local groups within the community and to allay their concerns (SRB operated an open door policy with regard to communications with the general public).

A free-phone number was provided for members of the public to contact the project on a 24 hour basis and this was displayed on the project website. Each worker on the project was issued with an emergency contacts card during the project induction, and this included the CLO contact number (refer to attached example). When the CLO number was contacted, calls were always returned to keep the caller informed that the issue was being addressed.



Extract of M9J1a Organisational Structure showing CLO Role

Prior to and during construction, the client (Transport Scotland) displayed the community contact phone number on their website for the project. The FRC Communications Group (including the client and EDT representatives) led liaisons with political groups, and various operational, environmental and industrial stakeholders. The CLO was responsible for liaising with the FRC Communications Group with regards to dealings with these groups.



In general, response times to the vast majority of contacts received were less than one day (86%) (refer to graph above).

One example of the level of community engagement is in the case of the Cramond Angling Club. This organisation was consulted concerning the Fisheries Paper, developed by Ramboll, prior to works commencing in the Swine Burn area. This ensured that the angling club were consulted over the proposed works to the Swine Burn.

During construction, SRB maintained constant contact from residents at public interfaces with the scheme. Where possible and practical, works were programmed for daytime periods and periods of least disruption for local residents. In one instance, SRB reprogrammed works around a nearby resident's property to avoid disrupting their wedding preparations.

A contacts and complaints register was maintained and KPI's set for contact and complaints response times.

Benefits

Dialogue and feedback were encouraged from the earliest stage, resulting in productive and effective two way communication that involved listening to stakeholder concerns and dealing with them. Inputs from this continuous dialogue and mitigation were included in the design and construction strategies for the works.

Some very positive comments were received from the local community regarding commitment and consideration for the community by individual Project team members.

Based on comments and communications received by the Project Team during the works, these arrangements appeared to create a positive disposition to SRB and its activities from the local community.

Evidence SO6.05	
Meets evidence of Target No's:	**OBJ 6 Target 3**
Action SRB personnel attended ELG and NLG meetings which were multi-agency meetings attended by local councils, statutory bodies and the Employer. Briefings of on-going works were given, programmes and arrangements for upcoming works were developed and feedback from these stakeholders was included in the final programme and method statements. SRB personnel and our CLO also attended regular Community Council meetings to brief the local community leaders on the Project and to discuss any relevant issues and concerns. Feedback from these meetings was then communicated to the Project Team and actions taken where required. A Traffic Management Working Group (TMWG) was also set up by the Employer to minimise disruption to the travelling community and resulted in excellent two-way communication regarding upcoming works.	
Benefits This represented stakeholder and community engagement at a high level, which was then communicated down through the relevant community and stakeholder organisations. Useful contacts and relationships were developed through these forums, leading to formal and informal contacts that were useful in developing appropriate strategies and programmes that were likely to receive quicker acceptance and/or approval from the stakeholder groups.	

Evidence SO6.06	
Meets evidence of Target No's:	**OBJ 6 Target 3**
Action SRB held direct meetings with local residents in King Edwards Way prior to works commencing in this particular area. Also SRB personnel made personal contact with residents of Buie Rigg concerning works in close proximity to local properties, e.g. Gantry 11 and Newmains Road Works.	
Benefits This informal direct approach enabled a direct line of communication to be opened with local residents whereby they could deal directly with one of the Project Team responsible for the works. This removed some cynicism that complaints would not be taken seriously or fears of a big faceless organisation.	

Key Objectives of the Sustainability Appraisal Plan
Objective 7: To improve local accessibility and reduce community severance • Target 1 Reduce community severance by reducing traffic on local roads within 400m of the main carriageway centre line. • Target 2 Improve walking and cycling provision and integration within the scheme catchment. • Target 3 Contribute to the improvement of access to public transport.

Evidence SO7.01	
Meets evidence of Target No's:	**OBJ 7 Target 1**

Action

SRB attended regular TMWG meetings, chaired by Transport Scotland, along with the following Stakeholders:

- City of Edinburgh Council;
- Fife Council;
- Fife Constabulary;
- Lothian and Borders Police;
- West Lothian Council;
- Trunk Road Operating Company North East and South East Units (BEAR);
- Transport Scotland;
- Forth Estuary Transport Authority;
- Stagecoach East;
- Lothian and Borders Fire and Rescue Service; and
- Scottish Ambulance Service.

At these meetings, discussions were held with regards planning works and traffic management in order to minimise the impact on the surrounding community and road network. Various measures were discussed regarding proposed works and extensive stakeholder consultations took place with the relevant agencies and highway operators. The key goal of these engagements was to reduce the impact on the surrounding road network by choosing the most effective and efficient solutions and to carry out works at appropriate times to minimise disruption. Some of the various measures utilised for traffic management included:

Beam lifts

- A Police rolling block was used on all three M901 Overbridge beam lift operations – all took place at night and weekends. This reduced the need for long closures and diversions.

Painting of the existing M9 structure (Contractual Requirement)

- It was required that two lanes were left open in both directions at all times.

Pavement works (Contractual Requirement)

- M9 surfacing required possession of the entire carriageway and contraflows were utilised as a result.

Some works required closure of a complete carriageway and diversions and times were

agreed with the TWMG before works could proceed.
Benefits Overnight possessions were generally carried out during a time window from 8pm to 6am. Given the volumes of traffic using the M9 and M90, should overnight works have carried over past 6am, there may have been considerable disruption to the entire network and surrounding local route. This window was never breached on the Project, ensuring that disruption from the works was minimised as far as practicable. One of the key benefits was that all of the relevant stakeholders brought a vast array of experience of both the local network and of carrying out live carriageway works to the meeting. This ensured that the most appropriate and proven solutions were chosen for each particular scenario. Considering that over 130 different traffic management (TM) layouts were carried out on the M9J1a project, it is a considerable achievement of the Project that major delays were minimised.

Evidence SO7.02	
Meets evidence of Target No's:	**OBJ 7 Target 1**
Action Design of bridges to minimise joints and bearings will reduce the maintenance cycle and subsequent disruption to road users and local neighbours that occurs during future maintenance work.	
Benefits The immediate effects of this measure are not evident but with bearings generally requiring replacement at 20 year intervals, the elimination of these from the design of many of the structures eliminates the need for traffic management and diversions in the longer term to carry out inspections and maintenance of these elements. This will reduce the amount of traffic diverted onto alternative local routes.	

Evidence SO7.03	
Meets evidence of Target No's:	**OBJ 7 Target 1**
Action Over 200 TM drawings were prepared and over 130 traffic laydowns were carried out in a 13 month period with no significant disruptions to the network. The first elements of TM were installed on the 3rd Nov 2011 and most TM removed by Christmas 2012. At the busiest stage of the works, there was over 12km of varioguard barrier installed on live carriageway to allow works behind them.	
Benefits The Project was delivered on 1st Feb 2013 – six weeks ahead of schedule (16th March 2013 was the original completion date). Part of this delivery was a result of the planning of the TM on the Project and the reduction of disruption. Effective and appropriate methods of TM ensured that works were carried out on or ahead of	

programme and that traffic flows could be maintained through main routes, minimising disruption to networks users and the use of local routes as “rat-runs”.

Evidence SO7.04	
Meets evidence of Target No’s:	**OBJ 7 Target 1**

Action

Access to the central reserve was via scaffolding from the existing M9 Overbridge – this method of access was unique to the SRB bid for the Project.

Without this provision, the works would have required one lane possession in each direction (rotated so that only one carriageway is affected at a time) on the M9 from mid July 2012 to the start of October 2012.

Access from existing overbridge onto M9 Central Reserve

Access from existing overbridge onto M9 Central Reserve via scaffolding

Benefits

This innovative strategy resulted in a major reduction in the level of traffic management that was required to carry out the works and significantly reduced the level of disruption on and around the M9 route and surrounding local road network as traffic may have used Kirkliston and Winchburgh as alternative routes to avoid heavy traffic.

Evidence SO7.05	
Meets evidence of Target No's:	**OBJ 7 Target 1**

Action

Echelon paving was used on the surface course material, as per the Contract Requirements. The FRC project is the first time echelon paving has been used on such major works. This is where the surface course is constructed using multiple pavers working in tandem, laying pavement rips concurrently, to eliminate joints in the surface course. Joints in pavement construction are noted as being of specific risk in pavement deterioration and reduction in the life of the pavement.

Successful construction of the surface course in this manner was a primary objective of Transport Scotland.

Use of new Transport Scotland TS2010 road surface specification, required echelon paving

Benefits

The main benefits in terms of this sustainability objective is that it is expected to be a more durable pavement leading to a decrease in maintenance interventions and subsequent TM possessions/diversions and disruptions to travellers for long periods.

It is important that these design decisions are recognised as having wider long-term implications for local communities in terms of regular "clogging" up of local networks to maintain the trunk route network.

Evidence SO7.06	
Meets evidence of Target No's:	**OBJ 7 Target 1**
Action During road works at Overton Road, SRB facilitated local access, as far as possible, despite an approved road closure. This involved escorting some residents and reconfiguration of locked gates to allow horses through as there was an equine business operating in the area.	
Benefits This provision helped to mitigate the effect on some of the local residents who were displeased with the road closure in general, and reduced community severance as a result of the works.	

Evidence SO7.07	
Meets evidence of Target No's:	**OBJ 7 Target 1**

Action

Traffic management was managed under the Traffic Management Plan for the Project. A range of TM options were utilised to minimise disruption to residents and users of the network. These included (similar to S07.01):

- Rolling road blocks and lane closures to facilitate gantry erection, removal and installation of mid-span beams on the M901 M9 Overbridge.
- Contraflows and laydown of varioguard to maintain two lane traffic flow in both directions on the M9 at all times.
- Programming of pavement works to not coincide with school holidays, festivals, air shows and events.
- Programming of construction activities to avoid other traffic management layouts on the BEAR network and facilitate winter maintenance activities.
- 40mph speed limit and average speed cameras installed on parts of the network within the site to improve safety for all.
- Co-ordination with City of Edinburgh Council to alter signals timing on diversion routes to minimise disruption to commuters (this was facilitated through TMWG Meetings).
- Pre-signage erection in advance of works to warn commuters of upcoming works.
- Full closures of M9 Spur carried out at night. Works and deliveries were programmed accordingly.

Bridge beam erections carried out at night using closures and rolling blocks

Benefits

Similar to the benefits from S07.01

Evidence SO7.08	
Meets evidence of Target No's:	**OBJ 7 Target 1**

Action

SRB were able to co-ordinate works with the trunk road maintenance operator, BEAR Scotland, to co-ordinate construction activities with essential and routine maintenance using shared closures. This system worked quite well, being used on ten occasions. This reduced the number of closures required and disruption to road users.

SRB and BEAR shared some of the road closures to maximise the works carried out for both parties

Benefits

Inconvenience was minimised as far as possible as works that would otherwise have to be programmed under separate TM arrangements, were carried out at the same time under one TM layout. This reduced the diversion of traffic onto local routes during these periods.

Evidence SO7.09	
Meets evidence of Target No's:	**OBJ 7 Target 1**

Action

Pedestrian access was maintained at all bridge locations and site access points. Regular inspections were carried out and repairs made to footways where required.

Pedestrian access maintained through Newmains Structure

Benefits

This reduced community severance by maintaining connectivity across the Works.

Key Objectives of the Sustainability Appraisal Plan
Objective 8: To provide a scheme that accommodates the needs of disabled people • Target 1 Ensure all non-motorised user routes impacted by the scheme are designed in accordance with "Transport Scotland's Disability Discrimination Act Good Practice for Roads". • Target 2 Ensure the needs of disabled people are given due consideration in the design of all aspects of the scheme.

Evidence SO8.01	
Meets evidence of Target No's:	**OBJ 8 Target 1 and 2**

Action

During the design stages, SRB met with FRC Access Panel to discuss access for persons with disabilities within the design and construction of the works.

During construction, SRB maintained wheelchair and disabled access across site access points. These crossing points were regularly inspected and cleaned as necessary.

Pedestrian, bicycle and wheelchair access maintained through Newmains Structure

Benefits

This ensured that the needs of people of all abilities and needs were accommodated within the Project.

Evidence SO8.02	
Meets evidence of Target No's:	**OBJ 8 Target 1 and 2**

Action

Emergency Roadside Telephones (ERT's) were co-located with gantry pull-in areas where possible, where tactile paving provisions were installed as part of the works.

Tactile paving installed at all Gantry locations

Emergency Roadside Telephones were co-located with gantries where possible

Benefits

These measures ensured that the needs of disabled persons were taken into account, as far as practicable, within the project and that there was a significant level of awareness, amongst the Project Team, of provisions that would assist disabled persons using the network.

Key Objectives of the Sustainability Appraisal Plan
Objective 9: To contribute to the promotion of healthy lifestyle opportunities and social inclusion • Target 1 Maintain the quality and accessibility of open or green space. • Target 2 Seek to create training and employment opportunities. • Target 3 Contribute to the improvement in public transport access to economic opportunities where this is a factor in deprivation. • Target 4 Avoid increasing health inequalities during the construction process.

Evidence SO9.01	
Meets evidence of Target No's:	**OBJ 9 Target 1 and 4**

Action

SRB arranged assistance for an initiative with a local organisation called "Friends of Pike's Pool" to rejuvenate perimeter footpaths and create wildflower meadows, and drainage of a green space located adjacent to the site at King Edwards Way. This assistance included engineering advice and donation of over 100 tonnes of aggregates and access to plant and machinery (SRB provided the loan of a mini-digger to a local group to tidy up the area around a local amenity, Pike's Pool). A letter of appreciation was subsequently received from the group.

SRB Personnel with Pike's Pool Group Members

SRB also provided the expertise of an Ecological Clerk of Works (ECoW), from Direct Ecology, to visit with the group on the 19th March 2012 to carry out the following:

- Observe the habitat and species present in the pond.
- Offer advice on improving the site for wildlife.
- Offer advice on planting options.
- Encouraging new species of birds, animals and insects.
- Funding options and training available to enable the group to carry out some of the above.

Benefits

Enabled the group to maintain and develop this important local amenity that was falling into disrepair.

This improvement of the open green space may have a longer-term positive effect on promoting active lifestyle among the local community by promoting a pleasant local area for

relaxation and exercise.

As a by-product, this initiative also provided useful two-way points of contact between SRB and the Gateside community to engage in relation to other construction issues.

Evidence SO9.02	
Meets evidence of Target No's:	**OBJ 9 Target 1**

Action

Regular inspections and audits were carried out to protect the adjacent green areas from the impact of construction activities. These included:

- Daily environmental site walkovers;
- Weekly environmental site walkovers;
- Monthly environmental physical site audits and management systems audits;
- Arboricultural surveys and tree protection;
- 24 visits by the ECoW; and
- 51 visits by the Landscape Clerk of Works.

In addition there was monthly attendance and reporting to the ELG, NLG and Progress Meetings.

Prior to any activities taking place, comprehensive method statements and environmental risk assessments were required to be carried out to ensure that there would be no detrimental impact on the environment as a result of the works.

Benefits

As a result of these measures, the accessibility and quality of open and green spaces in the vicinity of the site was maintained and, in the case of Pike's Pool, was improved.

Evidence SO9.03	
Meets evidence of Target No's:	**OBJ 9 Target 2**

Action

Ten training and employment placements were offered by SRB on the Project to young persons who were identified as long-term unemployed. Five persons commenced working on-site and training to SVQ Level 2, through Edinburgh's Telford College.

Benefits

Five young lives were positively affected by the Project with valuable training and work experience provided.

Valuable knowledge was gained by SRB staff in managing young workers and persons from disadvantaged backgrounds that will be used on future contracts.

Evidence SO9.04	
Meets evidence of Target No's:	**OBJ 9 Target 1 and 4**

Action

Six operatives were provided for two days to Kirkliston Primary School to weed plant beds and paint fencing and garden furniture (refer to photos below).

Weeding of plant beds

Painting of Furniture

Fence Painting

Weeding of Plant Beds

Benefits

This provided at least some improvement in the surroundings and outdoor facilities in the local primary school that may encourage pupils to take advantage of the open space available to them at break times.

Evidence SO9.05	
Meets evidence of Target No's:	**OBJ 9 Target 4**
Action Early in the Project, SRB liaised with organisers of the "Dualathlon" to ensure that planned road races could go ahead during January, February and March through the works under Newmains bridge and outside the site compound access.	
Benefits Although there was relatively little scope for impacting on health inequalities during the construction phases, by facilitating local groups in this manner SRB supported exercise and well-being in the community.	

Key Objectives of the Sustainability Appraisal Plan
Objective 11: To Reduce, Reuse and Recycle Materials and Products where practicable • Target 1 Minimise absolute volumes and difference between cut and fill earthworks quantities. • Target 2 Maximise percentage of earthworks materials sourced locally. • Target 3 Maximise use of reused/recycled products. • Target 4 Promote the restoration and development of brownfield/contaminated sites within areas affected by the scheme.

Evidence SO11.01	
Meets evidence of Target No's:	**OBJ 11 Target Overall**
Action The SACMR (Jacobs Arup, 2009a) prepared for the overall scheme stated that the key themes forming the basis of the SRMF were: • Supply chain management: including waste minimisation, management systems and site stewardship. • Development of a specific materials plan. • Percentage reduction in specific materials as compared with Stage 3 design. An ISO14001 certified management system was in operation on the Project and a CEMP, that incorporated a Waste Management Plan, formed part of this. A Materials Plan was included in the SRMF specifically for the M9J1a Project. It set out targets that were developed based on the Stage 3 design (Specimen design), including materials recovery, re-use and recycling, and the use of locally sourced materials. Minimisation and reduction of materials is also covered as part of the section of this report on **Objective 5: Adopt Sustainable Resource Management in design and construction**. One further example of this is in the Structures Design Statement for the gantry elements. This states that: *"In choosing the material for the superstructure, steel is considered to be more sustainable than other alternatives as it can be readily recycled after demolition. For reasons of durability and the fact that it can also be readily recycled after demolition concrete has been selected as the primary material for the foundations. The design is to be optimised to use as little material as possible within the limits of approved codes of practice and sound engineering practice."*	
Benefits Sustainability and reduction of materials was a central theme running throughout the M9J1a Project. It was considered at all stages and formed an important part of the team decision making process in terms of material use, earthworks strategy, waste minimisation and materials handling.	

Evidence SO11.02	
Meets evidence of Target No's:	**OBJ 11 Target Overall**
Action M908 Newmains Bridge – maximise use of reused materials. The initial Specimen design given to SRB involved removing an area of the existing M908E Newmains under bridge deck approximately 12m wide. This would have involved the removal, disposal and reconstruction of approximately 120m^3 of reinforced concrete to reconstruct the beam and deck to proposed pavement levels. Through several iterations of the design, SRB and Ramboll were able to retain the existing deck in this section.	
Benefits This design innovation included the following positive results: • 120m^3 saved from landfill or recycling. • 120m^3 or 20 loads of ready-mix concrete saved from being brought to site to replace the slab demolished (approximately 40 return journeys). • Savings on energy and machinery required to demolish the deck and load the arisings. • Savings on requiring traffic management measures to maintain adequate traffic flows while the deck was being demolished and re-constructed and resultant knock-on effect on traffic flows.	

Evidence SO11.03	
Meets evidence of Target No's:	**OBJ 11 Target Overall**
Action In general industry, it has been reported that some 15% of materials delivered to construction sites is wasted, according to CIRIA Publications, and statistics compiled by WRAP. The cost of material wastage on a project not only relates to the material cost but also productivity losses associated with multiple handling of materials and inefficient construction practices that arise from poor logistics. (Source: SACMR, Appendix 5: SRMF). As detailed in Objective S05.07 and S05.08, extensive use of pre-cast and pre-fabricated elements was undertaken on the Project.	
Benefits The extensive use of pre-casting and pre-fabrication of elements has resulted in a considerable saving on wastage and reduced the environmental impact of site construction (savings were achieved in the following areas: application of spray, concrete additives all in a controlled environment and risk of environmental damage (see also Objectives S05.07 and S05.08)).	

Evidence SO11.04	
Meets evidence of Target No's:	**OBJ 11 Target Overall**

Action

Materials Storage

Materials Storage procedures were put in place to ensure that materials were appropriately stored. A 24 hour security was provided to reduce incidents of materials theft and vandalism.

The concept of "Just in Time" (JIT) delivery of materials was used as much as possible, reducing the amount of material that was kept in stock. Also, many of the materials were delivered straight to the point of installation or placement to reduce the amount of double handling and risk of damage. Refer to below examples of material storage on-site.

Storage of pre-fabricated bases

Storage of GRC Panels for structure M901

Materials Handling

Specific method statements were developed for the earthwork construction activities. These ensured that all measures necessary were taken to minimise the amount of unsuitable material on-site. This was enabled through effective storage and placement methodology and taking the following factors into consideration:

- Forecast weather conditions.
- Sealing of material stockpiles.
- Appropriate plant and machinery use (i.e. the appropriate machine for the task).
- Advance dewatering and drainage provision to protect the material.
- Timely covering of placed earthworks to provide protection from the elements.
- Excavating through layers of varying material quality and mixing at source to maximise the amount of material that could be used.

Benefits

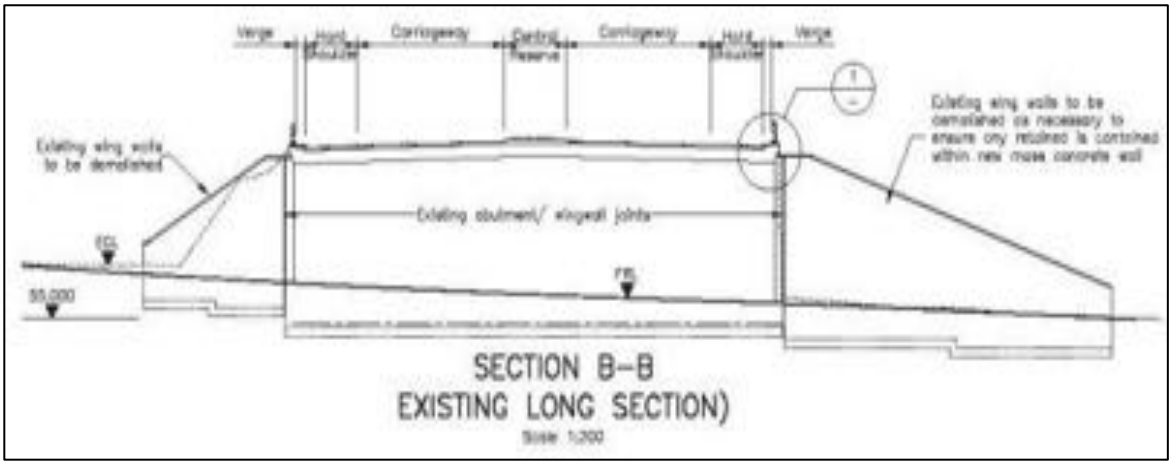
The amount of material required to complete the construction works was minimised and use of site-won material was maximised.

Evidence SO11.05	
Meets evidence of Target No's:	**OBJ 11 Target Overall**

Action

Retain part of existing wing walls at M905E Overton Bridge

Design iterations led to the retention of 25% of the south side retaining walls. This reduced the amount to be demolished and sent to the waste stream.



Structure M905E Overton Road – Demolition of Wing walls

Part of Overton existing structure retained in permanent works

Parts of Overton existing structure retained in permanent works

Benefits

- Significantly reduced the amount of material sent for recovery or landfill.
- Reduced noise and air emissions from demolition.

Evidence SO11.06	
Meets evidence of Target No's:	**OBJ 11 Target Overall**

Action

The WRAP based Site Waste Management Plan for the Project demonstrates that all materials were placed in their appropriate waste streams and sent off-site for recycling and processing rather than direct to landfill. A major part of this Plan was to identify and minimise materials used.

Benefits

Analysis of the Site Waste Management Plan Tracker on completion of the Project shows that the following was achieved:

- 100% of all oil waste was sent for recycling.
- 100% of all earthworks material was reused on-site. No earthworks material was sent off-site.
- 100% of all batteries were collected in the site offices (domestic) and sent for recycling
- 100% of dry recyclable waste was sent for recycling. Dedicated bins were provided for this purpose.
- 100% of timber was reused on-site or sent for recycling (10% reused on-site, 90% sent for recycling).
- 100% of inert waste material was diverted from landfill by nature of the balanced cut and fill.
- 83% of all non-hazardous waste material was segregated and diverted from landfill.
- 80 tonnes of reinforcement sent for recycling.
- 156 tonnes of steel diverted from landfill.
- 390m^3 of concrete reused within the works was diverted from landfill.

Evidence SO11.07	
Meets evidence of Target No's:	**OBJ 11 Target 1**

Action

The original SACMR Appendix 6: Energy and Carbon Report, Table 22 (Jacobs Arup, 2009a) gave an estimated 20,000m^3 of earthworks material to be exported from site and assumes an average 35km removal distance. From the Highways Agency Accounting Tool (HA 2008: HA 2009) calculations indicate that the removal of this requirement through design iterations has resulted in an emissions saving of 444tCO_2.

Category	Material	Mass (tonnes)	Average waste removal distance (km)	Road Transport (tCO_2/t.km)	Carbon (tCO_2)
Waste Removal	Inert Waste	40,000*	35.0	0.0003174	444

*Assumed 2.0 tonnes per m^3

(NOTE: Table adapted from SACMR, Appendix 6, Table 24)

Benefits

Saving of over 440 tCO_2 in terms of transportation emissions.

Additional savings in terms of loading and unloading emissions.

Evidence SO11.08	
Meets evidence of Target No's:	**OBJ 11 Target 1**

Action

As detailed in Objective S05.05, through numerous design iterations the Project had a balanced cut and fill (saving of 135,000m^3 of import earthworks in the Stage 3 Design).

The design development successfully reused all materials excavated on-site either as engineering fill or in landscaping and noise or headlight glare attenuation measures.

All general earthworks material was site-won and re-used on-site, with the exception of the Niddry Bing, which was sourced locally to the Project (within 3km). No disposal off-site was required.

Rock excavated from area and used as granular improvement layer on carriageway

Benefits

Reduced the need to import or dispose of materials off-site.

Reduced the number of loads to site by 3,757 loads (7,514 round trips) and 22,542km in freight mile terms.

Evidence SO11.09	
Meets evidence of Target No's:	**OBJ 11 Target 1 and 2**

Action
Use of oil shale extraction by-product from Niddry Bing

Where enabling material was required for construction of haul routes and access ramps (prior to the site quarry area being accessible), this was brought in from the nearby Niddry Bing (1 km from site). 5,000m^3 of this material was transported in to be used in temporary ramps and Ground Improvement Layer.

The close proximity of this by-product material helped SRB to maximise the amount of material that was sourced locally. Where granular material was required to specification, much of this was also sourced locally from Ravelrig (7km away).

Benefits

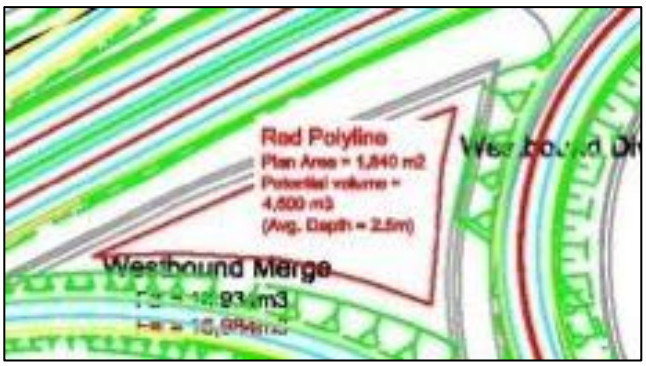
The use of the Niddry Bing material reduced the average haul distance by 12km from the next nearest supplier at Ravelrig (total reduction of 1,500km in haul distance – substantial reduction in transport carbon footprint).

Use of the Niddry Bing supply source reduced the amount of non-renewable quarried and processed aggregate that would otherwise be imported from Ravelrig by at least 5,000m^3.

Evidence SO11.10	
Meets evidence of Target No's:	**OBJ 11 Target 1 and 2**

Action

Some material was placed in landscaped areas with approval of the Landscape Clerk of Works. This allowed SRB to maximise the amount of material used on-site and reduced the amount of material that was required to be disposed off-site to zero, while still ensuring that all environmental commitments in the FRC ES (Jacobs Arup, 2009b) were delivered.



4,600m^3 placed between the Westbound Diverge and Westbound Merge area as part of the earthworks strategy

Benefits

If this material (surplus soil) could not have been incorporated into the works, under legislation it would have required to be sent for disposal to appropriate landfill. By using this material on-site, the following benefits included:

- Saved valuable landfill space.
- Saved cost of landfill charges.
- Reduced transport on local roads (91km round trip to nearest appropriate site at Linwood), leading to a reduced transport carbon footprint.

Evidence SO11.11	
Meets evidence of Target No's:	**OBJ 11 Target 1 and 2**

Action

As stated in **Objective 5** – there was a requirement for 8,320m^3 of capping in the earthworks design (200mm depth). By using site won material as ground improvement layer SRB successfully reduced this import quantity to 5,708m^3.

- Saving of 2,612m^3 of import.

Benefits

This measure led to the following benefits:

- Reduced the need for importing processed, non-renewable materials and cost of aggregate levy.
- Reduced haulage carbon footprint (8.7 miles return trip to the nearest supplier), reducing the overall transport carbon footprint.

Evidence SO11.12	
Meets evidence of Target No's:	**OBJ 11 Target 3**

Action

Site Clearance – reuse and retain

A site specific method statement for Site Clearance was developed for the management of existing vegetation and removal of vegetation within the footprint of the works. A Tree Survey was carried out by Alan Motion Tree Consulting Ltd. which assessed the condition of the tree stock and which ones could be reused and which could be cleared.

Materials from site clearance were all reused as energy sources including biomass and firewood.

Benefits

In the first instance, the minimum area of lands and vegetation was cleared. Of what was required to be cleared, the maximum benefit was obtained from this renewable resource:

- 100t of spruce and larch went into the timber processing streams for biomass.
- 250t of hardwood was sent for processing as firewood.

Evidence SO11.13	
Meets evidence of Target No's:	**OBJ 11 Target 3**

Action

Site clearance of poor grade material and wind-throw

Poor grade timber from the Site Clearance operations and wind-throw were used to create natural habitats for smaller species of flora and fauna on the woodland floors.

Habitat Creation – Wood Stack

Benefit

This scenario reduced the amount of material transported, leading to reduced emissions, transportation requirements and maximised the reuse of material, while contributing to a positive initiative to enhance the woodland habitat.

Evidence SO11.14	
Meets evidence of Target No's:	**OBJ 11 Target 3**

Action

All material planed from the existing pavement within the site was sent to the sub-contractors facility to be incorporated into pavement mixes (refer to statement from Lafarge Tarmac below). This meant that no waste was generated from pavement construction or remediation works.

LAFARGE TARMAC

JD/ES

11th April 2013

Forth Replacement Crossing
M9 Junction 1A Site Offices
101, Stirling Road
Kirkliston
Edinburgh
EH29 9GA

F.A.O Paraic McCarthy

Dear Paraic

Re: Planings on M9 Jct 1A

In reply to your e-mail dated the 26th March regarding the planings on the M9 Jct 1A

The total amount of planings taken off site was 16,412 tonnes and this material was taken to Hillwood Recycling where it will be processed and re used in asphalt.

Any problems please do not hesitate to contact me.

Yours sincerely

Evelyn Scott

p.p John Doyle
Area Recycling Manager

Declaration from Lafarge Tarmac that 16,412tonnes of planings were recycled from site and reused in asphalt mixes

Planing material being loaded onto tipper lorries for transportation back to Tarmac Paving plant for reuse within pavement mixes

Benefits

A saving of over 16,400 tonnes in material that would otherwise have been sent to landfill for disposal as waste.

A saving in over 6,750m^3 of bitumen and aggregate material that would otherwise have had to be processed from non-renewable sources (quarry in the case of the aggregate and other disposal site in the case of bitumen contents).

Evidence SO11.15	
Meets evidence of Target No's:	**OBJ 11 Target 3**

Action

A total of 7km (over 80 tonnes) of the existing road restraint system was placed in the metal waste stream and sent off-site for recycling to Dalton Metal Recycling.

200m^3 of safety barrier post concrete was reused as Class 6 fill material.

Benefits

All of the existing road restraint system was reused or recycled.

Evidence SO11.16	
Meets evidence of Target No's:	**OBJ 11 Target 3**

Action

Concrete arisings from demolition works and concrete washout were incorporated into the works. The concrete from the wing walls of Newmains and Overton Bridges was broken up and placed within the embankment fill; therefore all concrete arisings were recovered on-site without the need to go to landfill.

Demolition Wing walls at Newmains Structure M908E

Metal from reinforced concrete arisings was removed and sent for recycling.

Demolition Wing walls at existing Swine Burn Culvert M907E

Benefits

All concrete arisings from the Project were reused within the works.

All steel arisings were sent for recycling.

Evidence SO11.17	
Meets evidence of Target No's:	**OBJ 11 Target 3**

Action

Any surplus or excess materials were sent to other SRB projects. These included:

- timber/plywood;
- concrete blocks;
- scaffolding, sign posts;
- traffic cones;
- drainage pipes; and
- Heras fence panels.

Site offices loaded and awaiting transport to another Project

Site offices were sent for storage in depots and will be used on future SRB schemes.

Benefits

SRB have maximised the amount of materials that could be reused from the Project.

Evidence SO11.18	
Meets evidence of Target No's:	**OBJ 11 Target 4**
Action Area S11, within the site boundary, was identified during the EIA as being potentially contaminated with waste materials. A Contaminated Land Risk Assessment was carried out, which included testing of the in-situ material. Consultations with SEPA and additional testing proved that there was no risk to public health or from soil leachate, thereby allowing the material excavated from the area (340m³) to be placed within works embankments and the initial suspect area to be in-filled and incorporated into the road footprint.	
Benefits Pro-active management of this issue enabled this area to be successfully managed and incorporated into the works with no material having to go off-site for disposal.	

Key Objectives of the Sustainability Appraisal Plan
Objective 12: Seek to minimise energy and carbon associated with key materials and their transport to site • Target 1 Seek to minimise the embodied energy and carbon associated with key materials and their transport to site. • Target 2 Minimise energy use and all carbon emissions during construction.

Evidence SO12.01	
Meets evidence of Target No's:	**OBJ 12 Target Overall**

Action

Gantries used on the scheme were all pre-fabricated enabling fast assembly and disassembly.

In the case of the New Swine Burn culvert, a corrugated structure was used and this could be readily assembled and disassembled.

In the case of Niddry Burn and Swine Burn culvert extensions, these were constructed using pre-cast units and these could be disassembled in their original sections.

In the case of Newmains bridge, the wing walls were pre-cast reinforced earth retaining and could be readily disassembled.

These structures were designed with a 120 year lifespan, as per DMRB guidance.

Gantry G16

M904 New Swine Burn Culvert

M904 New Swine Burn Culvert – corrugated structure

Benefits

By using pre-fabricated and pre-cast units the consumption of energy during production and transportation was minimised due to superior construction methods in a controlled working environment.

This approach also had the benefit of reducing the emissions during construction as the elements took less time to assemble and complete and there was a substantial reduction in rework required and material wastage.

Evidence SO12.02	
Meets evidence of Target No's:	**OBJ 12 Target 1**

Action

Through successful design consideration, a number of structures were successfully retained within the Project.

All of the existing culverts and structures have been retained within the Project. Minor hydro demolition works were required where the existing culvert was "stitched" on but this would have been in the order of 5% of the overall structures (95% retained).

The existing Steel bridge structure on the M9 was retained and refurbished allowing it to be retained (100% retained).

On M905E Overton and M908E Newmains structures, the existing beams and decks were retained while the wing walls were removed on both sides of Overton (30% retained) and one side of Newmains (75% retained).

Benefits

By reducing the number of structures to be demolished to construct the Project, SRB and Ramboll succeeded in minimising the quantity and volumes of key materials that needed to be used.

Evidence SO12.03	
Meets evidence of Target No's:	**OBJ 12 Target 1**
Action Over 70% of the timber used on the Project was FSC certified and 100% came from UK managed forestry sources.	
Benefits By utilising British forestry sources, SRB managed to minimise the transportation emissions associated with its transfer to site. By selecting 100% managed sources of timber products, SRB also succeeded in ensuring that replanting took place to replenish the carbon storage afforded by the felled trees used in the timber supply chain.	

Evidence SO12.04	
Meets evidence of Target No's:	**OBJ 12 Target 1**
Action While some pavement was overlaid and/or resurfaced/reconstructed, the main depth of material was retained. Where material had been planed out, it was reused in the batching plant to produce new mixes. Overall 60% of the existing pavement has been retained and where it had been removed, it was reused in the production of fresh asphaltic mixes. Maximising use of reused/recycled materials is covered in Objective 11 (Target 3).	
Benefits Considerable site investigation, analysis and detailed design has minimised the use of new bituminous mixes and enabled a recycled content to be incorporated into the mixes that were required to be produced. Pavement construction is traditionally one of the largest emission producing activities (see Objective SO12.7 below - at 5,658 tCO_2, pavement construction generated the largest amount of emissions on the Project); this is a major achievement in terms of minimising the embodied energy and carbon footprint of this activity and in reducing the fossil fuels and non-renewable aggregate required.	

Evidence SO12.05	
Meets evidence of Target No's:	**OBJ 12 Target 1**

Action

Consideration was given to the public lighting installed under M908E Newmains bridge to ensure they were dimmable, were controlled by photocell and were of a low pollution and low maintenance category.

In addition, the number of lighting units required was reduced in the design, thus reducing the carbon and energy usage of the lights in operation.

Benefits

Reduction in carbon and energy usage in operation through choice of equipment and controls and reduction in number of units through design.

Evidence SO12.06	
Meets evidence of Target No's:	**OBJ 12 Target 2**

Action

As stated throughout this report, all of the existing culverts were retained where possible and stitched in pre-cast culverts were installed to extend the existing culverts. This considerably reduced the amount of in-situ works that were required and reduced the programme for these works elements. This led to a corresponding reduction in energy consumables such as pumps (reduced pumping times), need for generators, power tools, task lighting and diesel driven welfare units.

Reuse of existing culverts where possible by "stitching" in

Benefits

By utilising existing elements as far as possible, the amount of new construction was minimised leading to an overall reduction in the embodied carbon and associated energy.

Evidence SO12.07

Meets evidence of Target No's:	**OBJ 12 Target Overall**

Action

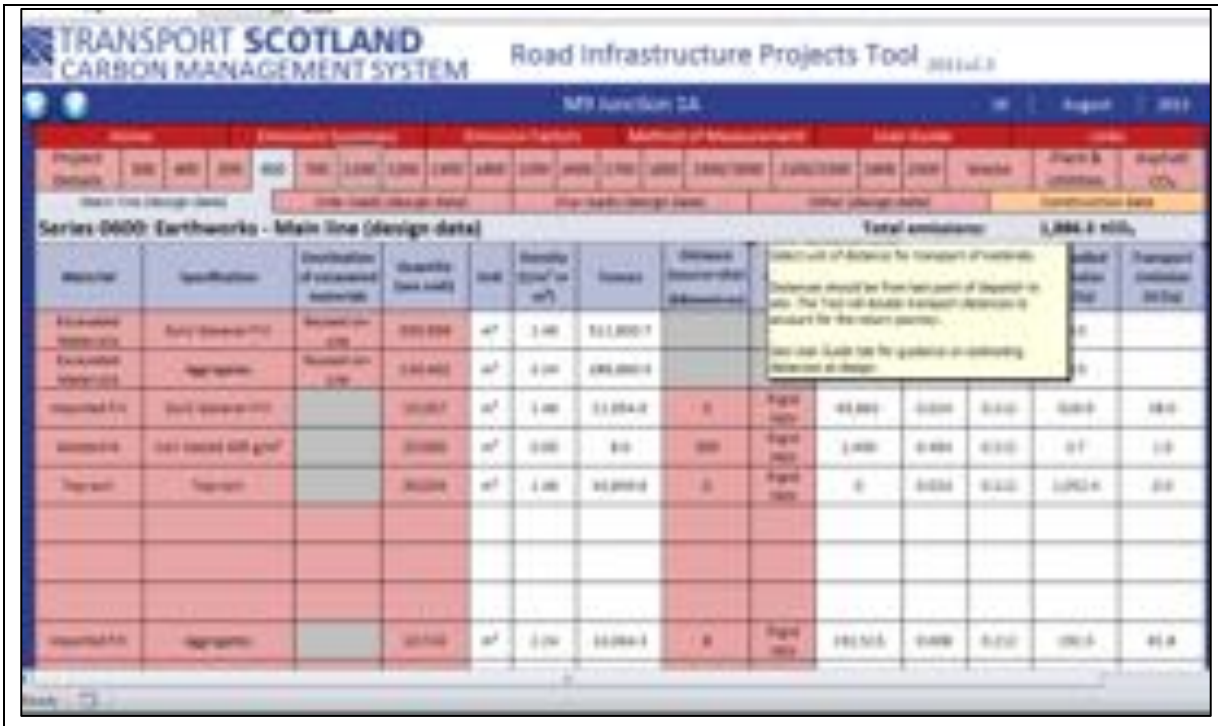
Carbon emissions from the Project were monitored and calculated using a Carbon Management System Project Tool supplied by Transport Scotland. A summary sheet is included below and a graph of emissions per Specification for Highways Works (SHW) Series is included in Appendix D.

SRB Civil Engineering Limited
ROADBRIDGE CIVIL ENGINEERING & BUILDING CONTRACTORS
SISK BUILDERS CONTRACTORS

Forth Replacement Crossing
M9 Junction 1A
Carbons Emissions Summary

The figures below have been generated using Transport Scotland's Carbon Management System Project Tool
The various elements of the works are broken down using the Specification for Highway Works (SHW) Series

Series	Carbon Emissions (tCO_2)
300 - Fencing	65.5
400 - Road Restraint Systems	1713.5
500 - Drainage	130.5
600 - Earthworks	1886.3
700 - Pavements	5658.1
1100 - Kerbs, Footways & Paved Areas	341.9
1200 - Traffic signs & Road Markings	375.8
1300 - Road Lighting Columns & Brackets, CCTV Masts & Cantilever Masts	0.1
1400 - Electrical Work for Road Lighting & Traffic Signs	12.3
1500 - Motorway Communications	-
1600 - Piling & Embedded Retaining Walls	2422.4
1700 - Structural Concrete	1593.6
1800 - Steelwork for Structures	3095.8
1900/2000 - Protection of Steelwork & Waterproofing	57.1
2100/2300 - Bridge Bearings & Expansion Joints & sealing of Gaps	0
2400 - Brickwork, Blockwork & Stonework	0
Plant & Utilities	1514.1
Total Carbon Emissions (tCO_2)	**18867**



TS CMS Roads Infrastructure Projects Tool

Benefits

Through periodic monitoring of the carbon footprint of the various elements, broken down by SHW Series, SRB were able to analyse the structures, pavements and earthworks elements in isolation. Structures could also be further broken down (including piling and embedded retaining walls) and roadworks could be broken down (including pavement and road restraint systems).

This method provided valuable information to the Project Team in a format that could be easily understood by Project Team members.

Evidence SO12.08	
Meets evidence of Target No's:	**OBJ 12 Target 2**

Action

Materials Handling

Efficient earthworks planning and an accurate mass-haul programme, helped minimise the amount of material that was required to be double-handled or re-worked on-site.

Plant selection was also important as it ensured that the correct type and quantity of plant was used to carry out the works.

Local material

As stated in Objective S011, material from local sources was used where available/suitable and site-won material was used as a granular improvement and starter layer within the works.

Benefits

These measures ensured that the works were carried out efficiently and made the best use of local and site-won material, minimising the embodied carbon and energy for the earthworks and also the emissions during construction.

Reducing the need to double-handle materials would alone have reduced the fuel usage by up to 50%.

Evidence SO12.09	
Meets evidence of Target No's:	**OBJ 12 Target 2**

Action

Water Usage

A water meter was installed at the mains connection into site and readings taken weekly. Usage was monitored by the environmental manager and assessed in relation to on-site activities.

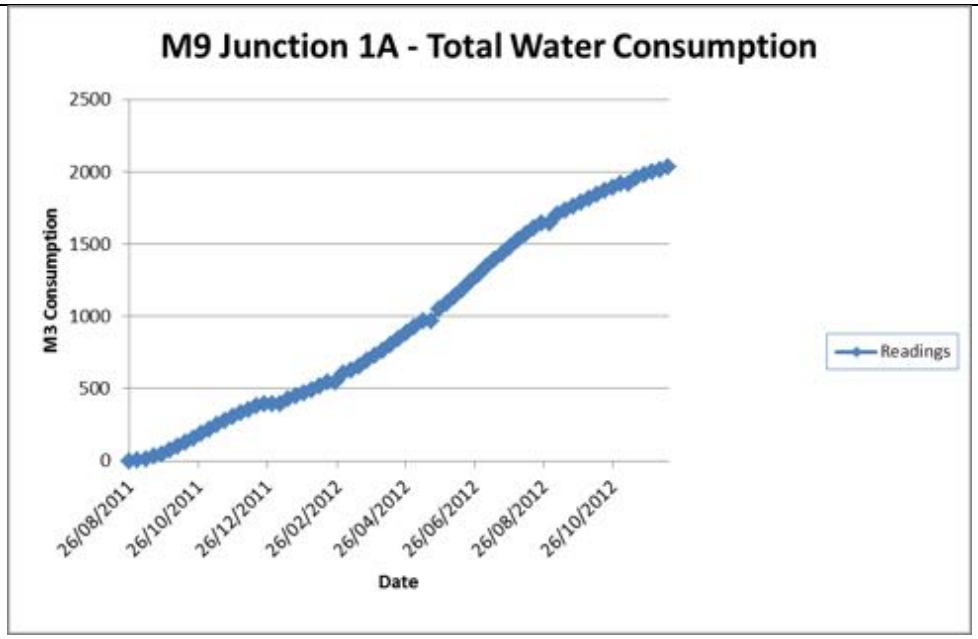
In order to promote the strategy of minimising water usage on-site, guttering was installed on the compound roof and the water collected into Intermediate Bulk Container (IBC) units. This water was then used as grey water for welfare units and for small scale use such as road saws and concrete saws. 58m^3 of water was used in this manner, saving the need to extract from the mains supply.

Surface water runoff was also collected in a 25,000 litre reservoir on-site and this water was used for dampening down site access roads during dry conditions.

Both of these measures minimised the amount of water that was required to be abstracted from mains.

25,000 litre reservoir for dust suppression

IBC container for Grey water recovery



M9J1a Total Water Consumption 'S' Curve

Benefits

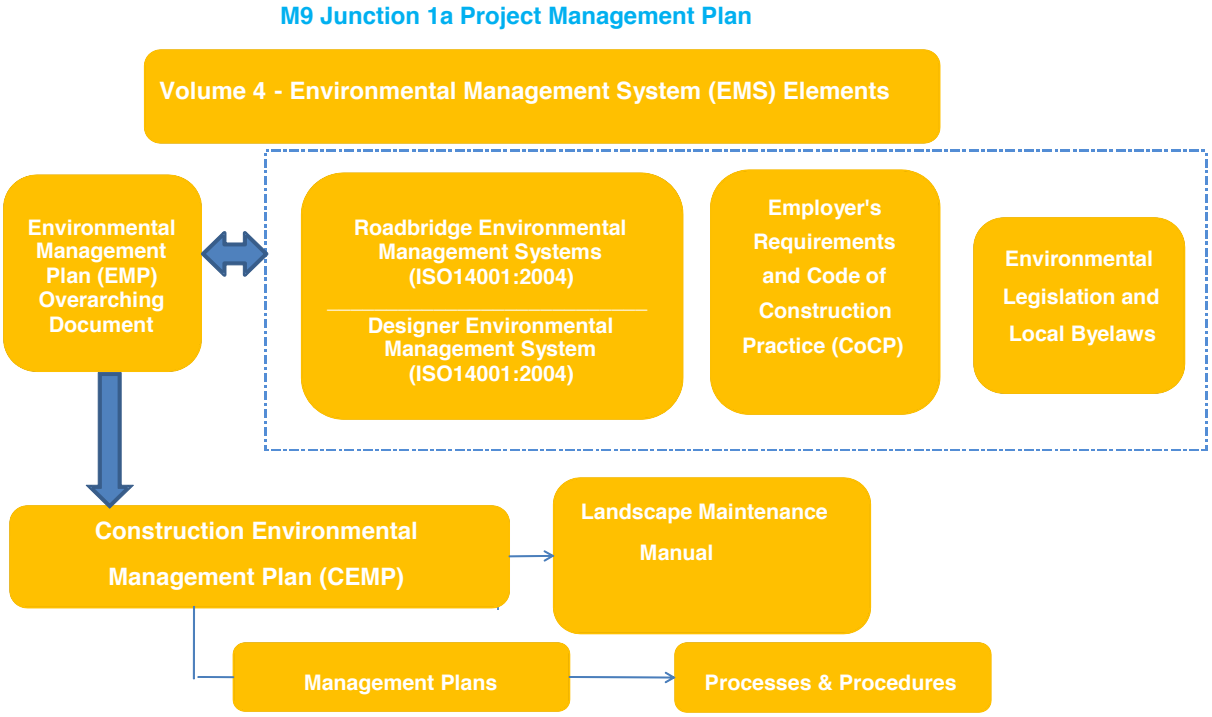
Water reduction and reuse, and strict monitoring, helped to minimise the requirement for drawing mains water for site activities.

Key Objectives of the Sustainability Appraisal Plan
Objective 14: To protect and enhance the natural heritage including local biodiversity • Target 1 To minimise the number of sites designated for natural heritage conservation and protected species affected and significance of any adverse impacts. • Target 2 To protect and enhance biodiversity.

Evidence SO14.01	
Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

As can be seen from the flowchart below, the M9J1a Project brought the relevant ISO14001 systems from SRB and the designer together into the overarching CEMP along with relevant information from the FRC ES (Jacobs Arup, 2009b), ES Schedule of Environmental Commitments, Employers Requirements, Environmental Legislation and Local byelaws. This ensured that all relevant contract information was specifically detailed and addressed within the CEMP and the follow-on maintenance management plans.



Benefits

This ensured that natural heritage and local biodiversity considerations and requirements were built into the construction methodology and decision making process and that a regimented management system, which was fully traceable, was used to ensure that appropriate assessments and other checks and balances were in place.

Evidence SO14.02

Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

Environmental and Sustainability Management Plans and Environmental Master Plans/Constraints drawings were developed to record and address specific environmental aspects and impacts for the Project. These are listed below.

Surface Water Management Plan	Geology, Contamination, Groundwater and Site Waste Management Plan
Landscape Management Plan	Incident Control and Response Management Plan
Traffic Management Plan	Agriculture Management Plan
Dust and Air Pollution Management Plan	Environmental Masterplan Constraint Drawings
Noise and Vibration Management Plan	Sustainable Resource Management Framework
Cultural Heritage Management Plan	Green Travel Plan
Ecological Management Plan	Area Management Plan
Invasive Species Management Plan	Materials Transportation Strategy
Energy Management Plan and Operational Energy Management Plan	Site Waste Management Plan (SWMP)
Responsible Sourcing Code of Practice	

Each Management Plan contained the following minimum information:

- Aspects, potential impacts and specific Environmental Control Measures (ECM's).
- Specific Environmental Commitments and mitigation measures.
- Roles and Responsibilities in relation to the specific Management Plan (including delegations where appropriate).
- Procedures and processes relating to implementation of the management plan.
- Licences, consents and guidance required (e.g. Environmental Permits and CIRIA best practice guidance notes).

Benefits

These management plans provided the necessary framework to ensure that natural heritage and local biodiversity were protected during the Project and were partly responsible for the Project being completed without environmental incident or prosecution.

Evidence SO14.03	
Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

Freshwater Watercourse Protection:

A salmonid survey and Redd count were carried out prior to works commencing and fish rescue operations (electrofishing) were carried out by Eco-Fish Consultants Ltd. on the Niddry Burn and Swine Burn prior to works commencing in order to preserve the populations. This was carried out under permission from the Aquaculture, Freshwater Fisheries and Licensing Policy Department from within the Scottish Government.

Where crossings were carried out, additional mitigation was provided to ensure that there was minimal environmental impact.

Protection at Swine Burn watercourse to prevent surface water and mud ingress

Benefits

Works were completed without incident and helped to maintain the quality and integrity of watercourses during construction, as well as protect existing fish populations and channel habitat.

Evidence SO14.04	
Meets evidence of Target No's:	**OBJ 14 Target Overall**
Action Method statements were developed for all activities on the Project and environmental risk assessments carried out and mitigation measures communicated to the workforce. These identified the relevant environmental risks of the activity and rated the impact magnitude and significance before and after the implementation of mitigation measures.	
Benefits The works were completed without any adverse impacts on natural heritage or biodiversity. The process ensured that all risks were identified, assessed and mitigated to reasonable levels, where required.	

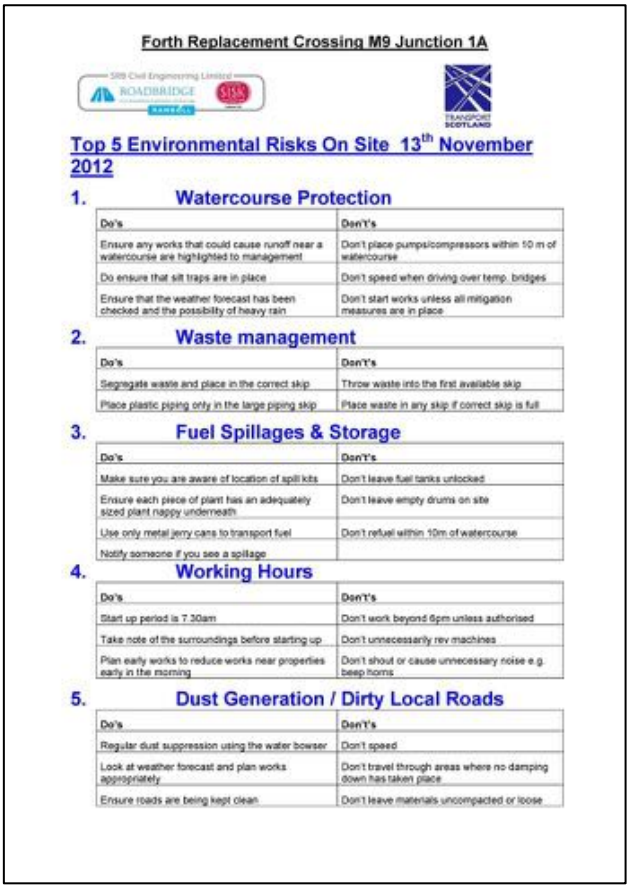
Evidence SO14.05	
Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

The Project Team continually incorporated the environmental impacts into the design. This occurred at all design stages of the Project. One example was where design drawings prepared took into account levels referenced in the CAR Licence application in order to ensure that the designed works matched the environmental commitments and the conditions of the various licenses issued by SEPA. Re-checks were carried out where the design was fundamentally changed, as in the case of M904 (New Swine Burn Culvert) where flow characteristics were rechecked for the corrugated structure and found to be better than the original box culvert design.

Regular SRB internal management meetings were held where updates and environmental issues were highlighted to the Project Team.

Regular Toolbox talks were undertaken with site personnel covering relevant topics including 'Nesting birds' and 'Working around trees and hedgerows'.



Forth Replacement Crossing M9 Junction 1A

Top 5 Environmental Risks On Site 13th November 2012

1. Watercourse Protection

Do's	Don'T's
Ensure any works that could cause runoff near a watercourse are highlighted to management	Don't place pumps/compressors within 10 m of watercourse
Do ensure that silt traps are in place	Don't speed when driving over temp. bridges
Ensure that the weather forecast has been checked and the possibility of heavy rain	Don't start works unless all mitigation measures are in place

2. Waste management

Do's	Don'T's
Segregate waste and place in the correct skip	Throw waste into the first available skip
Place plastic piping only in the large piping skip	Place waste in any skip if correct skip is full

3. Fuel Spillages & Storage

Do's	Don'T's
Make sure you are aware of location of spill kits	Don't leave fuel tanks unlocked
Ensure each piece of plant has an adequately sized plant nappy underneath	Don't leave empty drums on site
Use only metal jerry cans to transport fuel	Don't refuel within 10m of watercourse
Notify someone if you see a spillage	

4. Working Hours

Do's	Don'T's
Start up period is 7.30am	Don't work beyond 6pm unless authorised
Take note of the surroundings before starting up	Don't unnecessarily rev machines
Plan early works to reduce works near properties early in the morning	Don't shout or cause unnecessary noise e.g. beep horns

5. Dust Generation / Dirty Local Roads

Do's	Don'T's
Regular dust suppression using the water bowser	Don't speed
Look at weather forecast and plan works appropriately	Don't travel through areas where no damping down has taken place
Ensure roads are being kept clean	Don't leave materials uncompacted or loose

'Typical Top 5 Environmental Risks On Site' poster

'Protected Animals that may be on-site' poster

Benefits

Works were completed without incident and with no record of adverse environmental impact.

Evidence SO14.6	
Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

Habitat creation for the Project included riparian habitat planting and detention basin enhancement to ensure that these habitats were retained in the long term (mitigation item TE24 within the FRC ES, Jacobs Arup 2009b).

The new culvert and culvert extensions were designed to prevent habitat fragmentation and reduce habitat loss. To maintain in-stream habitat diversity, the base of the culvert was set below bed level and lined with natural substrate.

Benefits

This measure ensured that the impact of the new/existing culverts were minimised and maintained connectivity and retention of the existing habitat by maintaining a natural link between the upstream and downstream habitat.

Evidence SO14.7	
Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

Landscaping of local provenance:

A contract was set up by Transport Scotland with a Nursery (Johnsons of Whixley), who were required to prepare, supply and deliver specified plant material for use in the landscape and ecological mitigation planting for the FRC scheme, including the M9J1A project. All plants were specified as UK native origin and local provenance, which is region 203.

Benefits

Plants of local provenance tend to establish better in these situations as they are more tolerant of local climates than those from outside the broader area. Also, local provenance plants are generally more adaptable to local soils than imported planting and the initial bedding period tends to be more successful.

Evidence SO14.8	
Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

Biodiversity Enhancement:

Chapter 10 of the FRC ES (Jacobs Arup, 2009b) states – Positive significant residual impacts are predicted due to the provision of river habitat along the Swine Burn where the proposed realignment would create improved morphological and habitat biodiversity.

Section 10.5.46 of the FRC ES (Jacobs Arup, 2009b) states) – The realignment of the Swine Burn will be designed to improve morphological diversity and habitat complexity, thereby improving the habitat quality in the burn. Realignments in low gradient areas will be designed to minimise sedimentation and in high gradient areas to minimise erosion. The opportunity to create and enhance habitat will be incorporated through the inclusion of meander bends, secondary channels and riparian zones, where appropriate (FRC ES mitigation item TE34).

Realignment of Swine Burn improves freshwater fish habitat and is a striking landscape feature

Benefits

This design solution provided a number of improvements over the specimen design. The landscaping of the sinuous channel is visually/aesthetically improved compared to the original situation and aligned with sensitive planting, creating a very impressive natural landscape for users of the M9. This sinuosity also enhances the local biodiversity as it is the opposite of a stereotypical engineered setting and more in keeping with a naturally formed valley. It is anticipated that local fauna and flora will flourish in this environment.

Evidence SO14.9	
Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

A new mammal ledge was installed in the Niddry Burn Culvert over its entire length

Mammal ledge Niddry Burn

Benefits

This is an enhancement to the habitat in the general area of Niddry Burn as there was no mammal ledge in the existing culvert. This will ensure connectivity in a well-used mammal area during high flow periods leading to further biodiversity enhancement.

Evidence SO14.10	
Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

Species Rich Grassland (SRG):

Opportunities were scarce for wildlife improvement due to the restrictions imposed by British Airport Authority (BAA) due to the close vicinity of the airport. SRG had been specified to make it attractive to reptiles and provide habitat for them. This was seen as an improvement in biodiversity compared to the previous land use of agricultural fields that were there previously.

Benefits

The total area of SRG is 133,000m^2 and the four types of other landscaping mixes, including woodland, totals an area of 98,550m^2.

Therefore, with a total of 231,550m^2, SRG in the completed works accounted for 57.4% of the total landscaping area. This is considered to lead to a net increase in wildlife habitat and biodiversity potential compared to the existing agricultural use.

Evidence SO14.11	
Meets evidence of Target No's:	**OBJ 14 Target Overall**

Action

SRB actively sought to retain trees in addition to those identified in the landscape drawings, through management and mitigation on-site.

Approximately 1.5 acres of trees were successfully retained through mitigation on-site.

Line of trees retained at Kirkliston Road

Line of trees retained at Overton Bridge

Examples of Tree Protection – Environmental Exclusion Zones

Benefits

Mature trees that were retained within the works assisted in tying-in to the existing landform and local character. This has the effect of softening the "new look" of the Project, particularly in the area around Kirkland's Park Grove, where a substantial land bank of trees has been retained to maintain screening from the completed works.

Evidence SO14.12	
Meets evidence of Target No's:	**OBJ 4 Target Overall**

Action

During the construction of the works, SRB were able to translocate approximately 200m of the existing boundary hedgerows at G15 and G16 Northbound (N/B) carriageway.

Translocation Hedge between G15 and G16 N/B

Benefits

Visual impact of the works was lessened as the existing hedgerow is mature.

Reduced the need to transport these plants from nursery to site.

Lessened the impact of the works on the surrounding landscape and habitat.

Key Objectives of the Sustainability Appraisal Plan
Objective 16: To Reduce Noise and Air Emissions • Target 1 Manage effectively construction noise impacts and reduce and mitigate significant operational noise impacts where practicable. • Target 2 Air quality limit values not to be exceeded at selected residential properties and other sensitive receptors. • Target 3 Dust deposition to be contained within deposition values.

Evidence SO16.01	
Meets evidence of Target No's:	**OBJ 16 Target 1**
Action Monthly Noise Liaison Group (NLG) Meetings were attended by SRB, EDT and the Local Authority Representatives where presentations were made concerning works carried out and three-monthly lookahead programmes were provided. The NLG reviewed Plans for the Control of Noise and Vibration (PCNV); these ensured that proposed activities used Best Practicable Means (BPM) to limit noise and vibration coming from the works. Monthly records were submitted to the EDT and the NLG. Throughout the construction phase, three 24/7 noise and vibration monitors were maintained at sensitive receptors on the Project. The noise levels gathered were submitted at monthly intervals to the EDT for review, placed on the project website and reported to the local authorities and other stakeholders at the monthly NLG Meetings.	
Benefits Noise emissions relating to the construction works were carefully controlled through a hierarchy of avoidance, reduction and mitigation. This ensured that noise considerations were a central part of the activity planning process. No abatement notices were received during the construction works.	

Evidence SO16.02	
Meets evidence of Target No's:	**OBJ 16 Target Overall**
Action A 40mph speed limit was introduced through the live public highway within the site during the main construction phase. This was policed using mobile and average speed cameras.	
Benefits More consistent traffic speeds and constant flows based on anecdotal reports from both the local community and from the Project Team, of a reduction in the morning peak queues at Newbridge junction. There were positive comments received from the local community that the lower traffic speed and reduction in braking had a beneficial side effect of reducing the audible peak noise in	

adjoining residential areas.

Evidence SO16.03	
Meets evidence of Target No's:	**OBJ 16 Target Overall**

Action

A noise fence, as required by the Forth Replacement Crossing Environmental Statement, was installed along the M9 to act as an acoustic barrier for the nearby housing (refer to photos).

King Edwards Way noise barrier

King Edwards Way noise barrier

Benefits

Reduction in noise pollution from both the construction and operational phases of the Project.

Evidence SO16.04	
Meets evidence of Target No's:	**OBJ 16 Target Overall**
Action Reprogrammed activities around sensitive receptors/periods, e.g. reprogrammed works at gantry G11 to accommodate a local wedding of one of the property owners.	
Benefits Generally, the Project team found that the reprogramming of activities created a certain level of appreciation and goodwill from those affected and also relayed by word of mouth. Higher tolerance of other less intensive but more constant activities such as road sweeper, which were employed in order to meet the contract requirement to eliminate debris from public roads. Direct contact between site staff and residents lead to greater transparency and less chance of miscommunication.	

Evidence SO16.05	
Meets evidence of Target No's:	**OBJ 6 Target 2 and 3**
Action A Dust and Air Pollution Management Plan was developed specifically for the Project. This identified sensitive receptors regarding possible air pollution and a monitoring regime was developed to ensure SRB's mitigation measures were successfully implemented from the management plan. Dust minimisation measures were detailed within the management plan and communicated to the workforce via toolbox talks and briefings. Regular inspections were carried out to ensure that dust emissions were minimised as far as practicable.	
Benefits There were no instances where dust emissions breached the agreed limits for the works. There were no warnings or abatement notices received for the works from the local authority.	

Evidence SO16.06	
Meets evidence of Target No's:	**OBJ 16 Target Overall**
Action The construction compound was laid out so that potential dust-creating activities were kept as remote from the public as possible. Office units were used as a barrier between the site work areas and the road/public interface. In addition, it was identified in the design that the stripped soil could be placed in a bund around the compound to create a further barrier against dust emissions coming onto the public highway.	

Screening Bund at Site Compound

Benefits

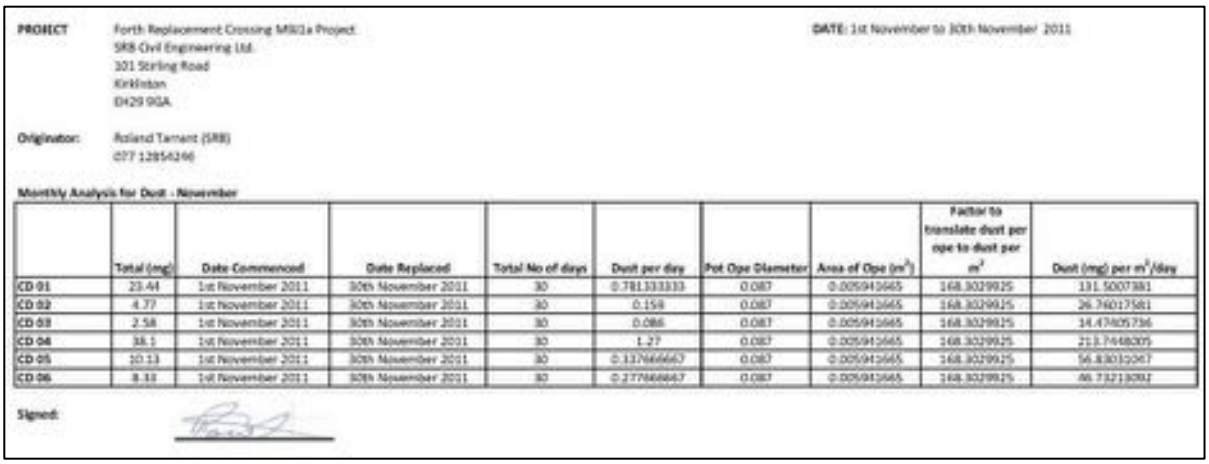
Reduced the potential for dust emissions from the site for the duration of the construction phase**.**

Evidence SO16.07

Meets evidence of Target No's:	**OBJ 16 Target 2 and 3**

Action

During the works, after discussion with City of Edinburgh Council (CEC), SRB agreed to increase monitoring to bi-weekly.



PROJECT: Forth Replacement Crossing M9/1a Project
SRB Civil Engineering Ltd.
101 Stirling Road
Kirkliston
EH29 9GA

DATE: 1st November to 30th November 2011

Originator: Roland Tarrant (SRB)
077 12854246

Monthly Analysis for Dust - November

	Total (mg)	Date Commenced	Date Replaced	Total No of days	Dust per day	Pot Ope Diameter	Area of Ope (m^2)	Factor to translate dust per ope to dust per m^2	Dust (mg) per m^2/day
CD 01	23.44	1st November 2011	30th November 2011	30	0.781333333	0.087	0.005941665	168.3029925	131.5007381
CD 02	4.77	1st November 2011	30th November 2011	30	0.159	0.087	0.005941665	168.3029925	26.76017581
CD 03	2.58	1st November 2011	30th November 2011	30	0.086	0.087	0.005941665	168.3029925	14.47405736
CD 04	38.1	1st November 2011	30th November 2011	30	1.27	0.087	0.005941665	168.3029925	213.7448005
CD 05	10.13	1st November 2011	30th November 2011	30	0.337666667	0.087	0.005941665	168.3029925	56.83032067
CD 06	8.33	1st November 2011	30th November 2011	30	0.277666667	0.087	0.005941665	168.3029925	46.73213092

Signed:

Typical monthly Dust Deposition Values

Benefits

Provided confidence to the community, CEC and the EDT that action was being taken to minimise emissions from the works and that emissions were being closely monitored and action taken as appropriate.

Key Objectives of the Sustainability Appraisal Plan
Objective 17: To protect water quality, geomorphology and maximise the use of sustainable drainage systems for environmental and hydrological benefit • Target 1 Limit impacts and significance of residual effects on water quality and pass majority of runoff through SUDS. • Target 2 Limit watercourse re-alignments and limit number of watercourse crossings.

Evidence SO17.01	
Meets evidence of Target No's:	**OBJ 17 Target 1**
Action A 20% climate change allowance was incorporated into the design strategy and resultant Attenuation Pond Drawings, as a Contractual Requirement on this project.	
Benefits This measure ensured that works were designed for additional flows expected as a result of the effects of climate change and complied with SEPA guidance. This demonstrates that the works were future-proofed.	

Evidence SO17.02	
Meets evidence of Target No's:	**OBJ 17 Target 1**
Action Road Drainage and Outfalls: The pre-existing drainage of the surface water runoff from the existing road network discharged into watercourses via a highway drainage system. Within the baseline assessment, information available on the existing drainage system indicated that a proportion of existing drainage either outfalls directly to a watercourse with no treatment or undergoes partial treatment before discharge (Table 9.6).	

Table 9.6: Existing Road Drainage Network

Road Name	New Drainage Watercourse	New Drainage Run Number	Existing Road Drainage Length (m)	Approximate Existing Road Drainage Area (m^2)	Existing Drainage/Level of Treatment
Existing M9 (ch2500 -2200)	Swine Burn	Run A	300	3,850	Gullies and perforated pipes prior to direct outfall.
Existing M9 Spur		Run E	1,230	27,675	Combination of filter drains, and gullies and perforated pipes prior to outfall into ditches.
Existing M9 (ch2500 – 2180)	Tributary of Swine Burn	Run B	320	3,835	Gullies draining to ditch prior to direct outfall.
Existing M9 (ch1290 – 2200) & M9 to M9 spur links	Niddry Burn	Run C	1,910	38,442	Gullies and perforated pipes draining to ditches prior to direct outfall.
Existing M9 (ch610 – 1290)	River Almond	Run D	680	21,100	Gullies and perforated pipes draining to ditches prior to direct outfall.

All road drainage in the completed works, including those sections connecting with the Project are now transferred through SUDS detention basins prior to outfall. See photos in Appendix A showing SUDS basins throughout the scheme.

Benefits

This additional treatment of all road drainage is an improvement on the pre-existing condition and should lead to improvements in local watercourse quality and flow attenuation, particularly in high flow conditions.

Evidence SO17.03	
Meets evidence of Target No's:	**OBJ 17 Target 1**

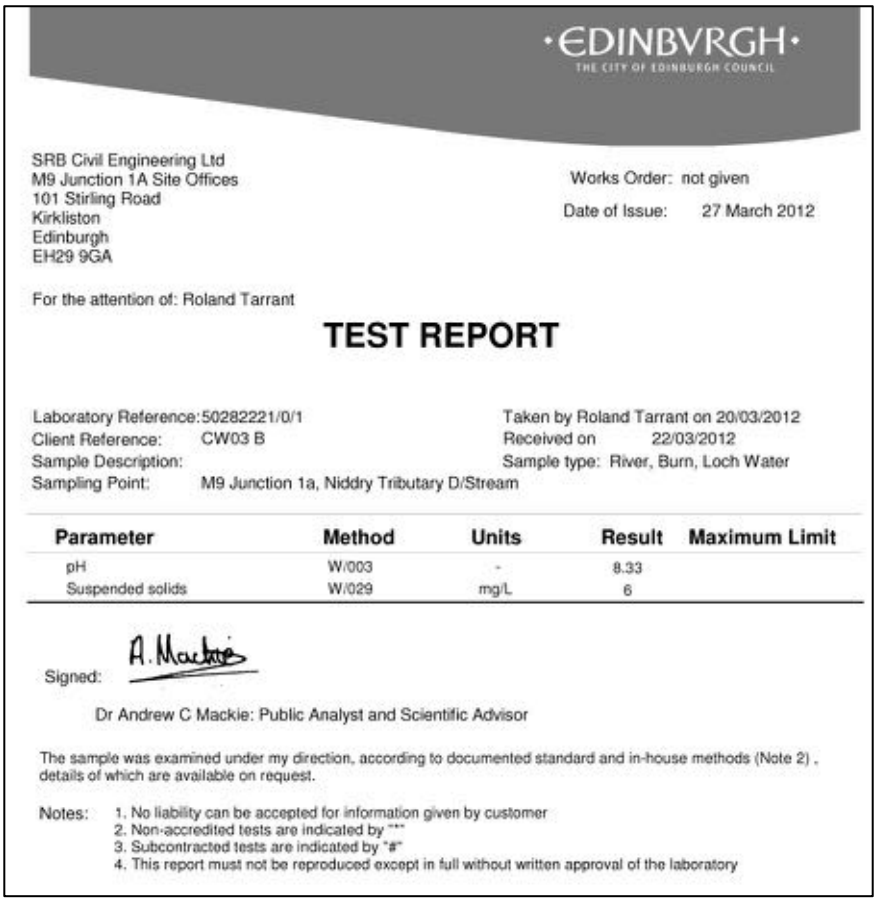
Action

The FRC ES (Jacobs Arup, 2009b) describes that the drainage to existing systems would replicate the existing drainage or include additional SUDS treatment as agreed with SEPA and pipe storage would be included to restrict discharge to pre-development flows, where required.

A programme of water quality sampling and inspection was implemented throughout the project, beginning with a baseline sample undertaken upstream and downstream of all watercourses on the project. This was carried out monthly for the duration of the project.

Daily and Weekly Environmental Walkovers also ensured that water quality was visually monitored throughout the Project.

The example test result below shows the monthly suspended solids concentration (6mg/l) was well within the acceptable threshold of 25 mg/l, which was not breached as a result of the works throughout the construction period.



·EDINBVRGH·
THE CITY OF EDINBURGH COUNCIL

SRB Civil Engineering Ltd
M9 Junction 1A Site Offices
101 Stirling Road
Kirkliston
Edinburgh
EH29 9GA

Works Order: not given
Date of Issue: 27 March 2012

For the attention of: Roland Tarrant

TEST REPORT

Laboratory Reference: 50282221/0/1
Client Reference: CW03 B
Sample Description:
Sampling Point: M9 Junction 1a, Niddry Tributary D/Stream

Taken by Roland Tarrant on 20/03/2012
Received on 22/03/2012
Sample type: River, Burn, Loch Water

Parameter	Method	Units	Result	Maximum Limit
pH	W/003	-	8.33	
Suspended solids	W/029	mg/L	6	

Signed: A. Mackie

Dr Andrew C Mackie: Public Analyst and Scientific Advisor

The sample was examined under my direction, according to documented standard and in-house methods (Note 2), details of which are available on request.

Notes:
1. No liability can be accepted for information given by customer
2. Non-accredited tests are indicated by "*"
3. Subcontracted tests are indicated by "#"
4. This report must not be reproduced except in full without written approval of the laboratory

Typical Surface water monitoring result

Benefits

Throughout the construction phase of this project, no adverse effects as a result of construction activities were reported.

Evidence SO17.04	
Meets evidence of Target No's:	**OBJ 17 Target 1**

Action

During consultation with SEPA in the design phase it was agreed to make changes to the outline of the existing Swine Burn Culvert Extension to facilitate an additional arc into the line of the structure.

Benefits

- A more sinuous and natural two-stage channel resulting in geomorphological and hydrological benefits. See also information in SO14.8 regarding the Swine Burn realignment.
- Change to tie-in point at western end of Swine Burn Stream diversion.
- Retention of a number of mature trees and habitat.
- Reduction in the amount of interference with the natural river bank.

Evidence SO17.05	
Meets evidence of Target No's:	**OBJ 17 Target 2**

Action

The project scope of works also included the realignment of two minor tributaries of the Niddry Burn and Swine Burn, and these works were planned in such a way as to avoid any damage to the natural environment.

A range of measures were implemented during construction to minimise the potential impact from construction activities on the adjacent water features. These included:

- Using existing watercourse crossings as much as possible.
- No fording of watercourses allowed.
- Daily site walkover with inspection of watercourses.
- More proactive approach to surface water management than testing alone.
- Regular daily site inspections reduced the risk of possible pollution events that may have been missed by weekly inspections, e.g. storage of fuels and overtopping of silt fences.
- No refuelling within 10m of watercourses.
- Protective screening and temporary structures to cross watercourses.
- Locating spill kits adjacent to watercourses.

Protective screening at Niddry Burn tributary

Spill Kits placed at key locations along watercourses

Outlet at CH600 Almond River Mainline South

Benefits

There were no prosecutions or warnings received during the works. There were no detrimental effects on the watercourses in the area of the works as a result of construction activities.

12.0 References

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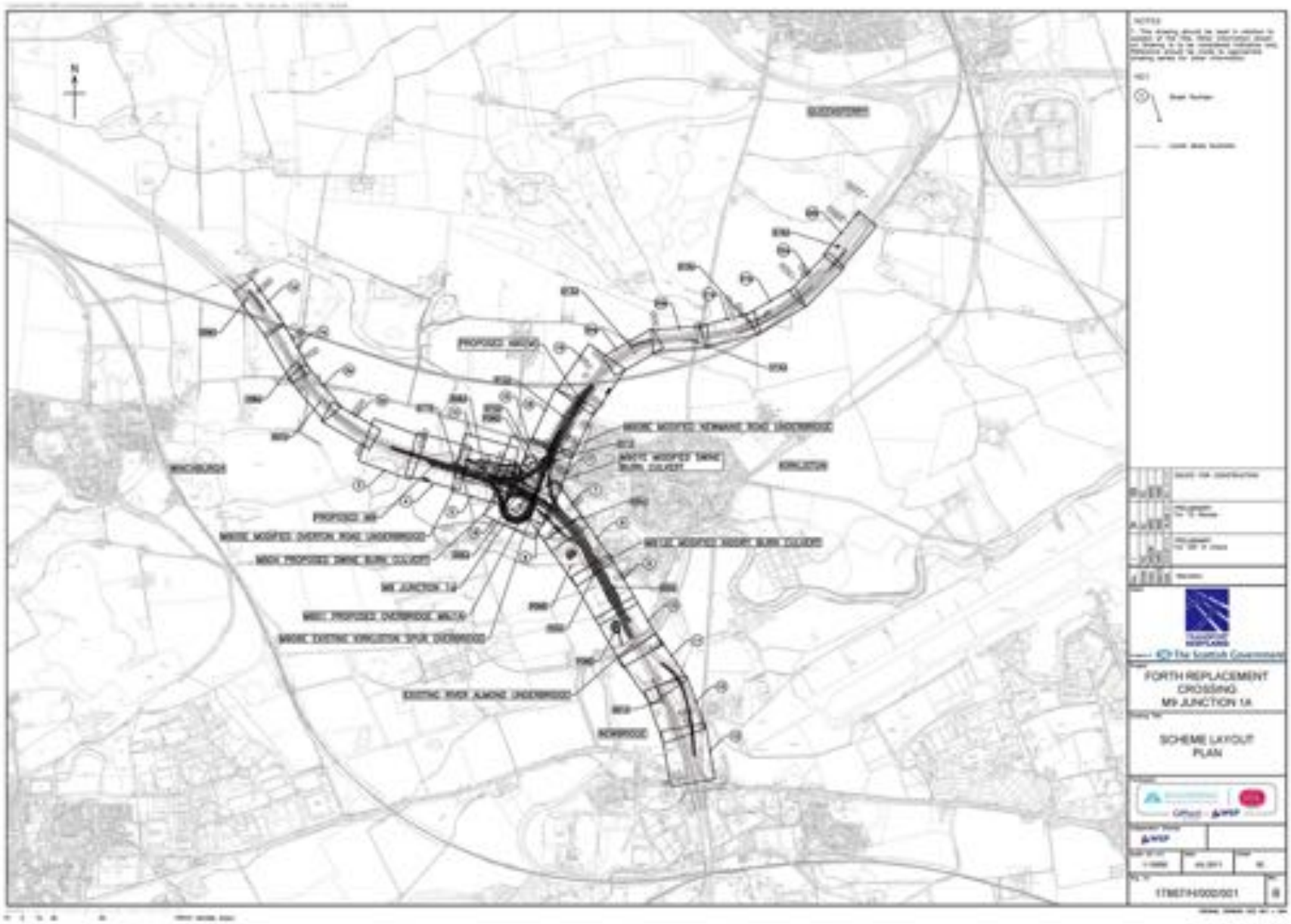
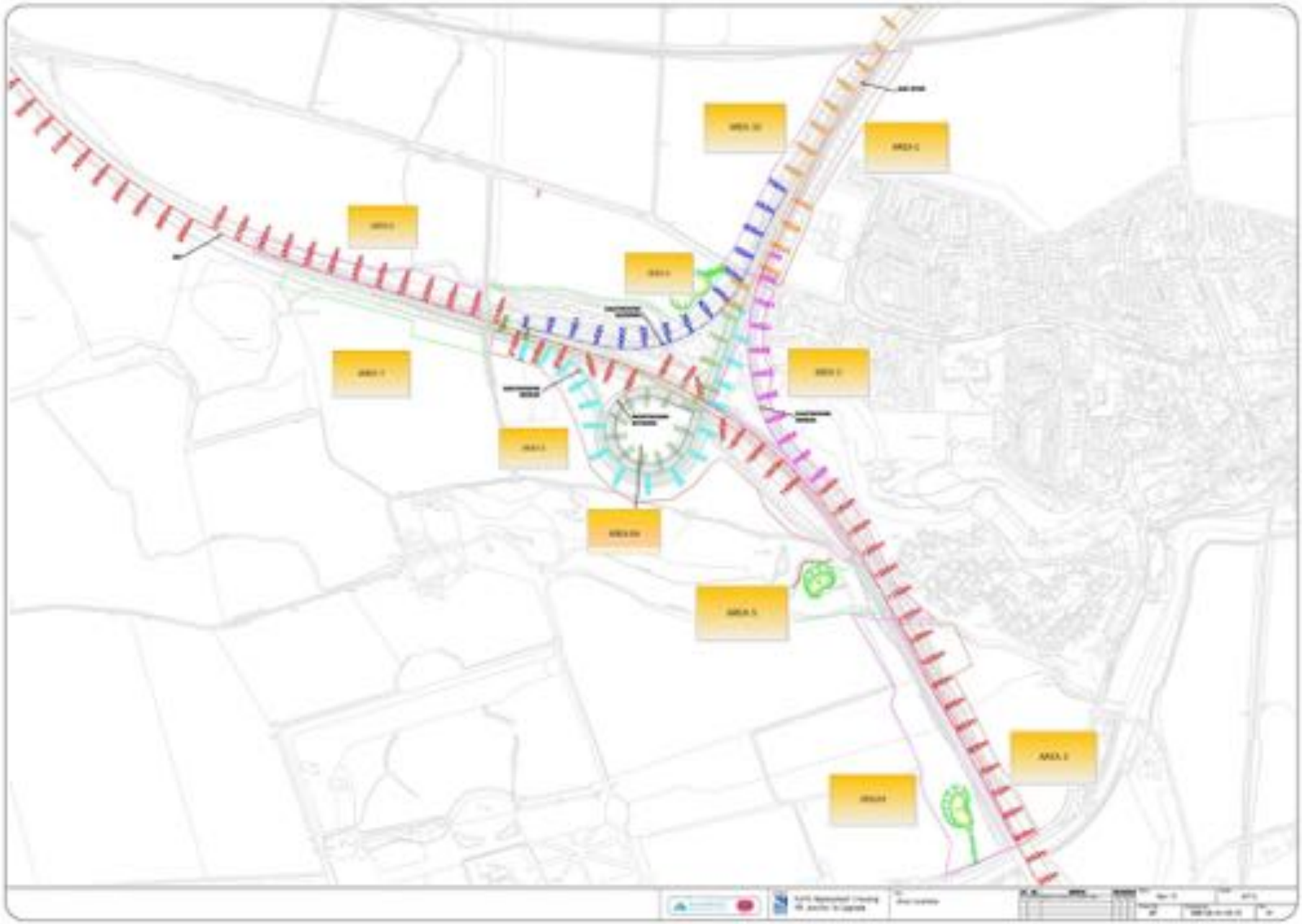
Appendix A – Site Location Drawings and Photographs


FORTH REPLACEMENT CROSSING
M9 JUNCTION 1A
SCHEME LAYOUT PLAN



M901 M9 Overbridge

M908E Newmains Overbridge

M907E Existing Swine Burn Culvert

Swine Burn realignment

M9J1a Junction

Appendix B – Sustainability Policy

SRB Integrated Management System Policy

SRB is committed to managing environmental, health & safety and quality matters as an integral part of our business. In particular, it is our policy to ensure the integrity of our processes and facilities at all times and at all places. We will do so by adhering to the following principles:

We will comply with all applicable laws, regulations and other requirements and will implement programs and procedures to assure compliance. Strict compliance with standards will be a key ingredient in the training, performance reviews and incentives of all employees.

We will employ management systems and procedures specifically designed to prevent activities and/or conditions that pose a threat to human health, safety or the environment.

We strive to reduce the impact of our works on the environment by avoiding the removal of natural resources where possible, or translocation for the duration of the works, where unavoidable.

We will strive to prevent harmful releases to the atmosphere, land or water. We will minimise the amount and toxicity of waste generated and will ensure the safe treatment and disposal of waste. We will recycle where we can and actively pursue means of reducing waste through use of alternative materials.

We source local suppliers and labour force in order to reduce the impact on the environment from vehicle emissions and unnecessary journey times. We employ maintenance teams across our projects to ensure the efficient operation of our plant and equipment at all times.

We will communicate our commitment to quality and sustainability to our employees, vendors and customers. We will solicit their input in meeting our objectives and targets and will in turn offer assistance to meet their goals. We believe that Sustainability is the process of ensuring the wise use of all resources within a framework in which economic, environmental and social factors are integrated and balanced.

We will continuously seek opportunities to improve our adherence procedures and principles, and will periodically report progress to our sites.

RH Livingstone

Project Director

Date: 31st July 2011

Appendix C – Sustainability Indicators and Targets

Key Performance Indicators (KPI's) contained within the M9J1a Sustainable Appraisal Plan

Material	Target Percentage to be sourced locally on the M9J1a Project	Actual Percentage sourced locally on the M9J1a Project
Earthworks – cut and fill: soils	100%	100% - Balanced cut and fill 0% import
Earthworks – cut and fill: imported materials	100%	100% - sourced from Edinburgh area
Concrete	100%	100% sourced from Edinburgh area
Asphalt – Bituminous Pavement	100%	100% sourced from Edinburgh area
Timber (excluding fencing timber)	100%	100% sourced from local suppliers
Fencing Timber Fencing timber not available locally	100%	100% sourced from UK processor (Shropshire)

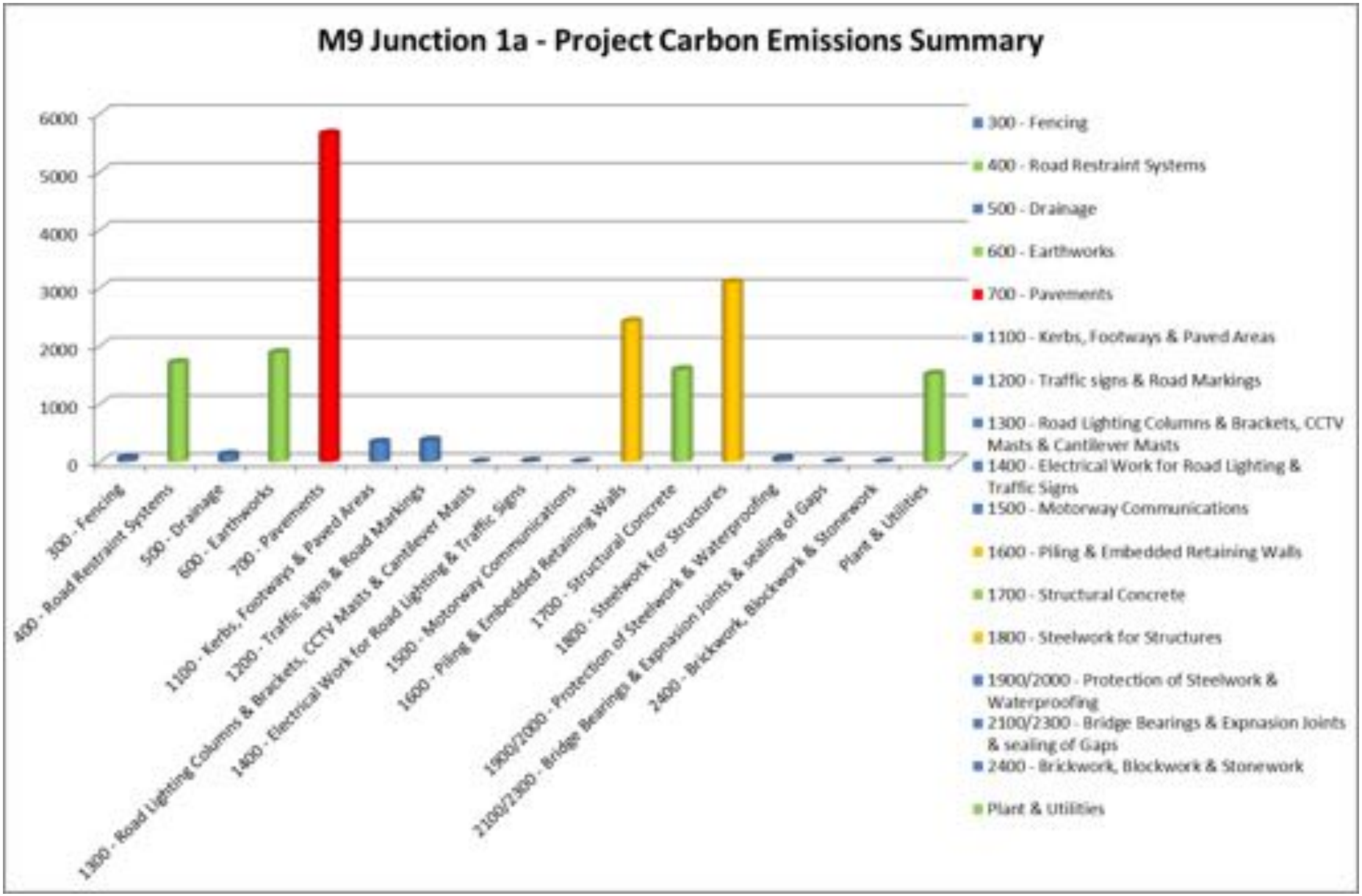
Key Performance Indicators (KPI's) contained within the M9J1a Sustainable Appraisal Plan (continued)

Indicators			
Materials Specification	**Material**	**Target**	**Actual**
% of materials recovered, re-used and recycled	Earthworks- Cut and Fill: Soils Earthworks-Cut and Fill: Imported Material Concrete Steel Asphalt Timber	100% 100% 100% 50% 95-100% 100%	100% 100% 100% 100% 95-100% 100%
% of all coatings and treatments for permanent work materials that have been factory applied (except for cut ends)	Paints and Coatings Timber Treatments	90% 100%	99.9% 100%
% of materials locally sourced	Earthworks- Cut and Fill: Soils Earthworks-Cut and Fill Import Steel Concrete Asphalt	100% 100% 100% 100% 100%	100% 100% 100% 100% 100%
% of timber-based products that are certified as sustainable	Timber	Timber 100%	Fencing Timber 70% (100% is from managed UK sources) Shuttering Timber 100%

Key Performance Indicators (KPI's) contained within the M9J1a Sustainable Appraisal Plan (continued)

Indicators	Materials	Target	Actual
% of materials transported by road, rail or boat	Earthworks – cut and fill: imported materials Earthworks – rock and aggregate Steel Concrete Asphalt Polymer membrane Timber Paints and coatings	100% (road) 100% (road) 100% (road) 100% (road) 100% (road) 100%(road) 100% (road) 100%(road)	100% (road) 100% (road) 100% (road) 100% (road) 100% (road) 100%(road) 100% (road) 100%(road)
% of workforce using car sharing scheme	Workforce	60%	45%
% topsoil and subsoil stored correctly for re-use after construction All material storage sites sited with minimum risk to the environment	Earthworks – cut and fill: soils Earthworks – cut and fill: imported materials Soils Imported fill materials Construction materials	100% 100% 100% 100% 100%	100% 100% 100% 100% 100%
% of excavated material re-used on-site	Earthworks – cut and fill: soils	100%	100%
% of previously used material as bulk fill or sub-base material	Earthworks – cut and fill: imported materials Earthworks – rock and aggregate	100% 100%	100% 100%
% of waste diverted from landfill	Earthworks – cut and fill: soils Earthwork`s – cut and fill: imported materials Earthworks – rock and aggregate	100% 100% 100%	100% 100% 100%
% of waste re-used	Earthworks – cut and fill: soils Earthworks – cut and fill: imported materials Earthworks – rock and aggregate	100% 100% 100%	100% 100% 100%

Appendix D – Project Carbon Emissions Summary



SRB Civil Engineering Limited
ROADBRIDGE
SISK

Forth Replacement Crossing
M9 Junction 1A
Carbons Emissions Summary

The figures below have been generated using Transport Scotlands Carbon Management System Project Tool
The various elements of the works are broken down using the Specification for Highway Works (SHW) Series

Series	Carbon Emissions (tCO_2)
300 - Fencing	65.5
400 - Road Restraint Systems	1713.5
500 - Drainage	130.5
600 - Earthworks	1886.3
700 - Pavements	5658.1
1100 - Kerbs, Footways & Paved Areas	341.9
1200 - Traffic signs & Road Markings	375.8
1300 - Road Lighting Columns & Brackets, CCTV Masts & Cantilever Masts	0.1
1400 - Electrical Work for Road Lighting & Traffic Signs	12.3
1500 - Motorway Communications	-
1600 - Piling & Embedded Retaining Walls	2422.4
1700 - Structural Concrete	1593.6
1800 - Steelwork for Structures	3095.8
1900/2000 - Protection of Steelwork & Waterproofing	57.1
2100/2300 - Bridge Bearings & Expnasion Joints & sealing of Gaps	0
2400 - Brickwork, Blockwork & Stonework	0
Plant & Utilities	1514.1
Total Carbon Missions (tCO_2)	**18867**