Appendix B

Works Programme

A9000 9 Forth Road Bridge

Contents

1. Introduction

BEAR Scotland are responsible for maintenance and improvement schemes on the Forth Road Bridge as part of the South East (SE) Unit Network Management Contract (NMC) on behalf of Transport Scotland.

The A9000 9 Forth Road Bridge crosses the Firth of Forth between South Queensferry and North Queensferry as shown in Figure 1 (below).

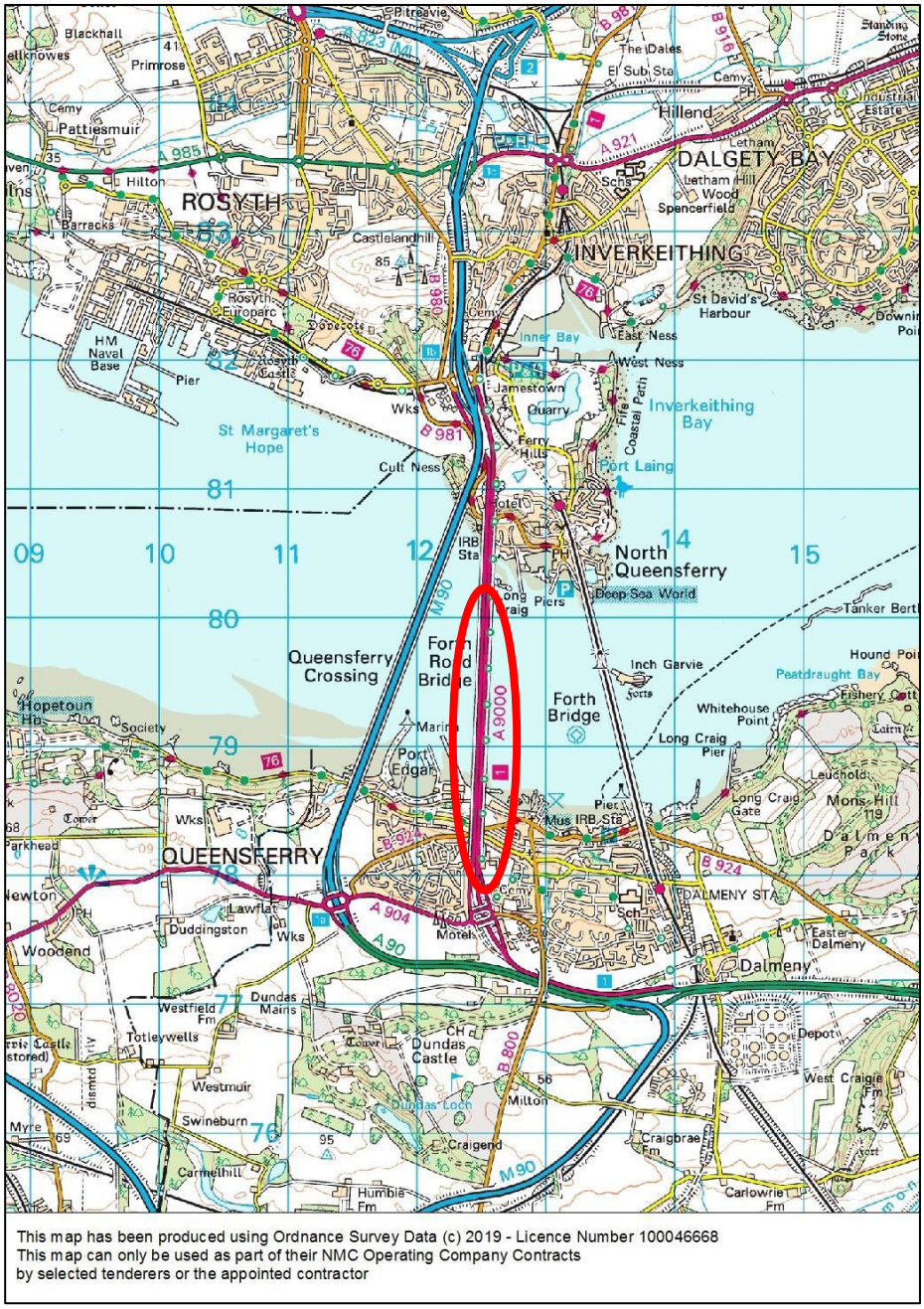

Figure 1. A9000 Forth Road Bridge Location

The Forth Road Bridge was designed by Mott, Hay and Anderson and, Freeman, Fox & Partners.

The main suspension bridge was constructed by the ACD Bridge Company, a consortium of Sir William Arrol and Co Limited, The Cleveland Bridge and Engineering Co Limited, and Dorman, Long (Bridge and Engineering) Limited. Other parts of the bridge were constructed by John Howard & Co Limited and Reed & Mallik.

Construction of the bridge commence in 1958 and was completed in 1964. The suspension bridge has a length of 2513 metres including the approach viaducts and carries four lanes of the A9000 over the Firth of Forth with a separate footway and cycle track on either side. The central span has a length of 1006m between its two main towers, the side spans each comprised of 408m, carry the deck to the side towers and are flanked by the approach viaducts.

Since the opening of the M90 Queensferry Crossing in 2017, the Forth Road Bridge has acted as a public transport corridor carrying buses, taxis, motorcycles under 125cc, agricultural vehicles, pedestrians and cyclists. Furthermore, the Forth Road Bridge continues to be utilised as a key resilience diversion route by Transport Scotland in the event when the Queensferry Crossing is required to be closed. Notably, the Forth Road Bridge is kept fully available for use as a diversion route over the winter season, due to the risk of ice accretion on the Queensferry Crossing resulting in the need for closures.

The main span consists twin steel orthotropic roadway decks and the side spans have twin reinforced concrete roadway decks. On the suspended spans, the roadway decks are supported on steel stringer beams that span between large steel cross girders spaced at 9,144mm centres. These cross girders are supported by two longitudinal stiffening trusses which, in turn, hang from the 610mm diameter main cables. Linking the stiffening trusses to the main cables are 192 sets of wire rope hangers at 18.29 metre centres varying in length from 2.5m at mid span to 90m adjacent to the main towers.

The main towers extend 156m above mean high water level and the sag of the cables between the towers is approximately 91m; which equates to 1/11th of the span. The clearance to navigation at mid span is approximately 50mabove mean high water springs without underdeck gantries. The passage of any vessels with a declared draught exceeding 40m is notified by Forth Ports plc to allow clearances to be checked in accordance with agreed procedures.

As well as services required for the operation of the bridge, i.e. electricity and communications cables there are a number of commercial communications cables which cross the bridge in steel ducts.

For general arrangement details of Forth Road Bridge refer to Appendix 1 of this document.

2. Programme of Works

Below are details of the engineering works to be included in the Marine Licence submission. The proposed works are classified as a Scheme (one off engineering works) or Routine works (regular maintenance) and are currently identified in the 10-year programme of works for the A9000 Forth Road Bridge. All schemes detailed below include; the estimated construction period/duration, estimated construction value, location, works description, an outline method statement and a summary of proposed mitigation measures related to the protection of the Marine Environment.

All the information detailed below is indicative based on the current understanding of required works and anticipated budgets over the coming 10-year period. As such, changes to the anticipated construction periods are likely to vary slightly year-on-year pending available budget, ongoing assessments on priorities, etc. In addition, construction methodologies and values are budget estimates, however this is likely to vary year-on-year as designs progress and industry prices fluctuate. Changes are not anticipated to be significant in nature or affect the pertinent details to the Marine Licence.

The works methodologies described below are designed to prevent any material or equipment entering the marine environment. It should be noted that additional measures may be required, and these will be confirmed with the contractor prior to works commencing and included within each schemes' individual Site Environmental Management Plan.

Any significant deviations from the below scheme and routine works information will be fully communicated to the Marine Directorate to determine if licensing amendments would be required.

3. Standard Mitigation Measures

Standard best practice working methods will be implemented during each of the schemes and routine maintenance activities. These will include the following measures:

- Encapsulation of working activities where there is a risk of loss of material i.e. during painting, grit blasting, hydro-demolition, intrusive investigation etc. This may be full or local encapsulation as appropriate.
- Temporary works including boarding and debris netting will be in place over extent of work area and site access when required to ensure no loss of material from the site during planing works.
- Use of tool tethers when working from suspended areas.
- Fuel and other substances potentially hazardous to health will be stored securely and safely on site to prevent spillage or loss from the work site.
- Plant nappies and spill kits will be utilised on site to prevent potential fuel leaks from entering the watercourse.
- Access platforms will be boarded and debris netting installed to prevent loss of materials during the removal and installation of platforms.
- Adherence to SEPA's Guidelines for Pollution Prevention, in particular GPP 5: Works and Maintenance Near Water.
- The contractor will be required to produce a contingency plan for dealing with spills or environmental incidents on site. Spill kits will be present on site, quickly accessible, and all staff trained in their use.
- All spills will be logged and reported. In the event of any spills into the water environment, all works will stop and the incident be reported to the project manager and the BEAR Scotland Environmental Team. Marine Directorate and SEPA will be informed of any such incident as soon as possible, and within 24 hours at the latest. The local District Salmon Fisheries Board will also be informed of any incidents as soon as possible.
- Any waste generated will be removed from site and either recycled or disposed of in compliance with Waste Management Regulations.
- Plant, machinery and equipment fitted with effective silencers where available will be utilised for the works. Where fitted, and where permitted under Health and Safety requirements, white noise reversing alarms should be utilised during construction.
- Where possible, inherently quiet plant should be selected for construction works. Where appropriate, pumps and generators will be sound-reduced models with fitted, lined, and sealed acoustic covers.
- All plant will be operated in such a way that minimises noise emissions and be switched off when not in use.
- All ancillary plant such as generators will be positioned so as to cause minimum noise disturbance. Where deemed necessary, acoustic screens will be utilised.
- Where possible, works will be programmed for daylight hours. If artificial lighting is required, it should be used for as short a duration as possible and directed on the immediate area of works. Artificial lighting (including lights from the site compound and other infrastructure) should avoid being directed onto the aquatic environment or habitats nearby as far as is safe and reasonably practicable.

Additional scheme specific mitigation is detailed, where necessary, in each of the scheme tables.

4. Scheme Programme of Works

Below is a breakdown of the schemes currently identified in the 10-year programme of works for A9000 9 Forth Road Bridge.

Suspended Span Painting Works	
Background Information:	• Contained within previous marine licence. • Partially within 50m/300m of Long Craig Island.
Construction Period:	2026 - 2036. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total cost across all schemes £20 million
Location on Structure:	All suspended span
Description of the Works:	The paint system on the suspended span is coming to the end of its working life. A full painting contract is now planned to replace the existing paint system – this is likely to be undertaken over several summer seasons.
Plant and Equipment:	Scaffolding, grit blasting equipment, painting equipment, hand tools, site vehicles
Outline Method Statement:	1. Provision of temporary suspended work platform, to provide full encapsulation to the work area 2. Removal of existing paint system. The majority is likely to be by grit blasting but other methods may be required, for example chemical. 3. Surface preparation of exposed steel members 4. Application of new paint system as per manufacturers guidelines 5. Removal of encapsulation and suspended platform
Materials/Waste	Waste materials removed from the bridge as part of this project will primarily consist of the removed paint and spent grit used in the blasting process. New paint will be added to the structure as part of the works.
Restrictions	Traffic management not permitted on FRB between 01 November to 31 March each year, limiting access for undertaking works. Painting works typically undertaken during spring to autumn. Additional encapsulation and heating required during winter months.
Scheme Specific Mitigation:	• Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Suspended Span Truss Strengthening Works	
Background Information:	• Contained within previous marine licence. • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times:	2026-2036. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total cost across all schemes £20 million
Location on Structure:	All suspended span
Description of the Works:	Through recent inspections/assessments it has been noted that strengthening works are required to the suspended span truss arrangement. It is likely that these works will be undertaken in conjunction with the Suspended Span Painting Contract.
Plant and Equipment:	Scaffolding, grit blasting equipment, welding equipment, painting equipment, hand-held grinders, impact wrenches, hand tools, site vehicles
Outline Method Statement:	1. Identification of area requiring strengthening and provision of temporary suspended platform, with full encapsulation 2. Removal of existing paint system, locally to the area to be strengthened, likely by grit blasting but other methods may be required, for example chemical. 3. Installation of strengthening steelwork by either bolting and/or welding new steelwork 4. Application of protective paint system 5. Removal of encapsulation and suspended platform
Materials/Waste	Removed paint and spent grit from the blasting process will be the primary waste materials. Removed steelwork based on condition / strengthening requirements. Additional steelwork will be added to the bridge as part of the strengthening process as well as new paint.
Restrictions	Traffic management not permitted on FRB between 01 November to 31 March each year, limiting access for undertaking works. Nature of strengthening works will require load restrictions (traffic / pedestrian / wind) which will require works to be undertaken out with traffic management embargo period and during spring to autumn out with higher wind periods. Painting works typically undertaken during spring to autumn. Additional encapsulation and heating required during winter months.
Scheme Specific Mitigation	• Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Suspended Span Resurfacing	
Background Information:	• Contained within previous marine licence. • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times:	2030-2034. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total across all schemes £5 million
Location on Structure:	All suspended span. Side spans could be resurfaced using conventional surfacing; main span will be resurfaced using hand laid mastic asphalt.
Description of the Works:	The existing surfacing system on the Forth Road Bridge is coming to the end of its working life. The existing surfacing system on the suspended span is comprised of a thin layer of mastic asphalt system, approximately 37mm thick. These works will require the alternate full closure of either the northbound or southbound carriageway.
Construction Plant and Equipment:	Road planer, road paver, floor scraper / scabbler, delivery wagons, site vehicles.
Outline Method Statement:	1. Removal of existing surfacing system by mechanical means, i.e. road planer etc. 2. Surface preparation of exposed steel deck plate and edge trimmer repairs / strengthening. 3. Application of proprietary spray applied waterproofing system. 4. Laying new mastic asphalt surfacing.
Materials/ Waste:	The existing mastic asphalt surfacing and waterproofing membrane will be removed from the bridge. A new waterproofing layer will be allied to the bridge deck as well as new mastic asphalt surfacing.
Restrictions	Replacement of existing surfacing requires works to be undertaken between 01 April to 31 October out with traffic management embargo period.
Scheme Specific Mitigation	• Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Footpath Resurfacing	
Background Information:	• Contained within previous marine licence. • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2027-2032. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total across all schemes £2 million
Location on Structure:	All spans
Description of the Works:	The existing waterproofing/surfacing system on the Forth Road Bridge footpaths is coming to the end of its working life. These works will require the alternate full closure of either the east or west footpaths.
Construction Plant and Equipment:	Floor scraper, spray-applied waterproofing equipment, welding equipment, site vehicles
Outline Method Statement:	1. Removal of existing surfacing system by mechanical means, i.e. floor scraper. 2. Surface preparation of exposed concrete deck and undertake necessary concrete repairs using rapid repair mortar. 3. Surface preparation of exposed steel deck plate and weld repairs as necessary. 4. Application of proprietary spray applied waterproofing/surfacing system.
Materials/ Waste	The existing surfacing on the footpaths will be removed. A combined waterproofing and surfacing system will be applied to the deck.
Restrictions	Only a single footway can be shut at one time to allow pedestrian access over the Forth Estuary. Nature of the waterproofing and thin surfacing material requires good weather, requiring works to be undertaken during summer months.
Scheme Specific Mitigation	• Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Suspended Span Under Deck Access (SSUDA)	
Background Information:	• Contained within previous marine licence. • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2026-2028. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total across all schemes £6 million
Location on Structure:	Main Span & South Side Span
Description of the Works:	Suspended Span Under Deck Access (SSUDA) system comprises five primary longitudinal walkways, each travel the full length of the bridge. The walkways comprise of aluminium mesh flooring supported on steel angle sections which are suspended from the main bridge structure. The under-deck access platforms and temporary staging boards have come to the end of their theoretical design life and will be replaced in phases over several years.
Construction Plant and Equipment:	Impact wrench, hand tools
Outline Method Statement:	1. Installation of scaffolding/temporary access platforms. 2. Remove existing walkways and dispose of in a suitably licenced facility. 3. Install refurbished walkways in individual components from the temporary access platform. 4. Remove access platforms.
Materials/ Waste	The existing walkways will be removed from the bridge and components will be reused where possible however, the existing steel flooring mesh will be removed and disposed of along with some of the original structural fixings. New steel components and fixings will be added to the bridge along with GRP flooring mesh.
Restrictions	Works can typically be undertaken year round with refurbishment works accessed and undertaken from a closed footway.
Scheme Specific Mitigation	• Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Footpath Elastomeric Bearing Replacement	
Background Information:	• Contained within previous marine licence. • Partially within 50m/300m of Long Craig Island
Construction Period and Working Times.	2026-2036. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total across all schemes £5 million
Location on Structure:	Suspended spans both footpaths
Description of the Works:	Inspection of the elastomeric bearing pads supporting the footpath deck panels has identified that the pads have become cracked and distorted and require replacement. This scheme will involve the repetitive jacking of each footpath panel, removal of the existing pad and installation of the new elastomeric bearings before returning the deck panel to its original position. A programme of bearing pad replacements will be determined each financial year.
Construction Plant and Equipment:	Hydraulic jacking equipment, impact wrenches, hand tools, site vehicles
Outline Method Statement:	1. Install temporary access (scaffolding / MEWP and bespoke underdeck FRB staging boards), install 2 no. temporary jacks per footway panel immediately below footway deck plate level. 2. Jack up footpath panels. 3. Remove worn elastomeric pads and dispose of to a suitably licenced facility. 4. Install new elastomeric pads. 5. Lower footpath panel back into position. 6. Remove jacks and temporary access. 7. Repeat as necessary along the length of the footpath.
Materials/ Waste	The existing elastomeric bearings will be removed and disposed of. These will be replaced with new bearings.
Restrictions	Works can typically be undertaken year-round with refurbishment works accessed and undertaken from a closed footway.
Scheme Specific Mitigation	• Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area. • Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Main Tower Lateral Thrust Bearing Replacement	
Background Information:	• Contained within previous marine licence. • North Tower within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2026-2028
Construction Value:	£1 million
Location on Structure:	North and south main towers (north within 50m/300m of Long Craig Island)
Description of the Works:	The existing main tower lateral thrust bearings are thought to be part of the original bridge construction. They are heavily worn and have been identified by the FRB critical element programme (CEP) posing very high risk: they are to be replaced with new preloaded bearings.
Construction Plant and Equipment:	Hiab/crane, hydraulic jacking equipment, impact wrenches, magnetic drills, hand-held grinders, welding equipment, diesel generator, site vehicles
Outline Method Statement:	1. Installation of temporary access. 2. Modification to truss cross girder existing steelwork and strengthening where necessary. 3. Install temporary bearing corbel, accumulator and hydraulic pipework 4. Energise jacks to temporary bearing corbel. 5. Remove existing bearing and install new bearing, preload device and sliding surface. 6. Energise the hydraulic system. 7. Remove the jacks to temporary bearing corbel.
Materials/ Waste	Existing steel components will be removed from the bridge and replaced with new components and paintwork.
Restrictions	Replacement of the lateral thrust bearings (resists wind loads) requires works to be undertaken to the side and main spans of both main towers during summer. This restriction is due to temporary propping of the deck required during replacement of the life expired bearings and significant strengthening to the cross-girders. These works must be undertaken during period of low winds to prevent damage to the longitudinal truss and main towers. Works can typically be done without carriageway or footway closures, however, lane closures may be required to provide greater / safer access.
Scheme Specific Mitigation	• Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area. • Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Side Tower Rocker Replacement	
Background Information:	• New to marine licence. • North side tower within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2026-2028
Construction Value:	£4.5 million
Location on Structure:	North and south side towers
Description of the Works:	The longitudinal trusses of the side spans is supported on rocker bearings at both side sides. These have been assessed as substandard and require replacement. Replacement shall consist of temporary support of the suspended span to allow removal of existing rocker bearings and corbel supports. Significant temporary and permanent modification to longitudinal truss steelwork will be undertaken with provision of new bearings and supporting structure.
Construction Plant and Equipment:	Hiab/crane, hydraulic jacking equipment, impact wrenches, magnetic drills, hand-held grinders, welding equipment, diesel generator, site vehicles, hydro-demolition
Outline Method Statement:	1. Installation of temporary access and encapsulation. 2. Modification and strengthening of existing longitudinal truss steelwork. 3. Installation of temporary hanger supports. 4. Removal of existing rocker bearings and steelwork. 5. Hydrodemolition of existing substandard concrete corbels. 6. Construction of replacement corbel supports. Installation of post tensioning. 7. Significant steelwork modification and strengthening. 8. Installation of replacement bearings. 9. Grit blast and painting of steelwork elements.
Materials/ Waste	Existing steel components will be removed from the bridge and replaced with new components and paintwork.
Restrictions	Replacement of the rocker bearings requires works to be undertaken to the side towers under traffic restrictions out with the TM embargo. This restriction is due to temporary support of the deck required during replacement of the life expired bearings and significant strengthening to the cross-girders and truss members. These works must be undertaken during period of good weather and low traffic to prevent overloading temporary supports.
Scheme Specific Mitigation	• Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area. • Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process. • Hydro-demolition works will be fully encapsulated to ensure no concrete wash / waste-water enters the marine environment. • Hydro-demolition waste / wash water will either be removed off site or disposed on site as trade effluent under an appropriate authorisation from SEPA. Where disposed on site all conditions of the authorisation will be adhered to.

Main Cable Intrusive Investigation	
Background Information:	• Contained within previous marine licence. • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2031-2032
Construction Value:	£3 million
Location on Structure:	Both main cables. Exact locations to be determined.
Description of the Works:	The main cables of the Forth Road Bridge are the primary load carrying members and are regularly inspected externally and have also been subject to internal intrusive inspection to determine the condition of the individual wires. The first internal inspection was carried out in 2004, prior to a dehumidification system being implemented to arrest the development of corrosion. Further internal inspections have been undertaken in 2008, 2012, 2018 and 2025, with further inspections planned in future.
Construction Plant and Equipment:	Cable access gantry, scaffolding, MEWP, hand tools
Outline Method Statement:	1. Installation of cable access gantry or scaffolding depending on the location, using temporary traffic management closure and hoisting of platform on to the main cable 2. Removal of localised area of cable wrapping material and driving of wedges between strands to inspect internal locations of cable 3. Removal of test sections of cable strand and installation of replacement sections 4. Application of protective paint system and installation of cable wrapping 5. Removal of platform from main cable, either to next inspection location or to storage if works are completed.
Materials/ Waste	The existing wrapping and will be removed from the main cables at the location inspections. In some locations this may include red lead paste which will be disposed of in accordance with the appropriate regulations. On completion of the investigation, the exposed sections of the main cables will be re-wrapped with zinc paste being used in place of the original red lead paste.
Restrictions	Works will need to be undertaken between 01 April to 31 October out with traffic management embargo period as traffic management required to install high level platforms to the main cable. Works to the main cable are wind susceptible and required to be undertaken out with high wind periods in winter.
Scheme Specific Mitigation:	• Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Pedestrian Balustrade Strengthening	
Background Information:	• Contained within previous marine licence. • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2028-2033. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total across all schemes £5 million
Location on Structure:	All
Description of the Works:	The pedestrian balustrades have been identified as being sub-standard and require additional strengthening / modification to increase the height and containment. Investigation and designs are on-going and therefore the outline method statement provided below is indicative at this stage.
Construction Plant and Equipment:	Magnetic drills, hand-held grinders, welding equipment, hand tools
Outline Method Statement:	1. Close the footpath to the public. 2. Install temporary works / fall prevention barriers. 3. Prepare the existing balustrade for modification (may require grinding out welds and / or drilling for bolted connections). 4. Install new modifications / strengthening works. 5. Paint the steelwork. 6. Remove temporary works and open the footpath.
Materials/ Waste	Existing paint will be stripped via grit blasting or mechanical removal from the work areas and this will be replaced on completion of the works. Existing steel components may be replaced with new steel components as part of the works.
Restrictions	Works can only be undertaken to a single footway at any one time due to requirement to keep a footway open to pedestrians. Modification of the existing balustrades will require significant strengthening of the footway deck panels and the supporting structure. Depending on the extent of strengthening this may require works to be undertaken under traffic load and wind load restrictions during spring to autumn. Removal & reinstatement of footway deck panels for strengthening / refurbishment / replacement must be undertaken 01 April to 31 October due to requirement for traffic management for lifting operations.
Scheme Specific Mitigation:	• Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area. • Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Runway Beam Bracket Replacement and New Suspended Span Underdeck Access Gantry	
Background Information:	• Contained within previous marine licence • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2026-2030. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total across all schemes £3 million
Location on Structure:	Suspended spans
Description of the Works:	New runway beams were installed on the suspended spans of the bridge in 2020. However, subsequent investigations have determined that the brackets which support these beams are deficient and require to be replaced. Two maintenance gantries were previously used across the three suspended spans. A third gantry was procured a few years ago with the intention that this would be installed on the bridge along with the 2 No existing gantries which were removed from the bridge in 2020 to be refurbished. Subsequently, it was determined that the 2 no original gantries were beyond economical repair and they were subsequently scrapped. At this stage it is proposed to install the one remaining gantry on one of the suspended spans once the runway beam brackets have been replaced in that location. Additional gantries may be provided later.
Construction Plant and Equipment:	Cranes, barge, hand tools
Outline Method Statement:	1. Install new runway beam support brackets. 2. Remove existing runway beam brackets. 3. Take delivery of new gantries and transfer to barge. 4. Barge the gantries into position below the bridge. 5. Raise the gantries to the underside of the bridge using 2no 200t cranes at road level. 6. Connect the gantries to the runway beams and secure the roller guides. 7. Lower the gantries to transfer load into the runway beams. 8. Inspect, test and commission the gantries for use.
Materials/ Waste	The existing steel runway beam brackets will be removed and disposed of with new brackets being installed on the bridge. New suspended span gantries will be installed on the bridge.
Restrictions	Works will need to be undertaken 01 April to 31 October due to requirement for traffic management for lifting operations.
Scheme Specific Mitigation:	• Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area. • Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Vehicle Restraint Barrier/Grillage Refurbishment	
Background Information:	• Contained within previous marine licence, under the name 'Suspended Span Painting Contract'. • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2026-2036. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total across all schemes £7.5 million
Location on Structure:	Suspended Spans
Description of the Works:	The Forth Road Bridge Vehicle Restraint System (VRS) consists of over 16km of barriers and parapets on the viaducts and suspended spans. The suspended span grillages conform to the geometrical and strength requirements of the containment level appropriate for the bridge carriageways for speeds up to 50mph. A trial panel of the suspended span grillages configurations was fabricated and tested under FETA. The suspended span VRS are known as 'grillages' and have been in place since opening in 1964. On the suspended spans there are two types of grillages. The nearside grillages- lane 1- are made up of a steel box section top rail supported from a 6" box section mid rail which supports individual 25x25mm grillage bars. These bars are welded to a shaped kerb plate which is welded or cast into the suspended span deck. The central grillage covers over the 3m gap between carriageways on the suspended span and is complete structure. It is similar makeup to the nearside VRS without the top rail. The central area is covered over with horizontal grillage bars welded to the 6" box section rail. Over the previous contracts, several localised schemes have been carried out to repair for vehicle impact damage, paint deterioration and modification for signage. The entire length of VRS has deteriorated with significant paint and structural defects identified throughout the length of the VRS. This scheme involves the structural repair and painting of the VRS.
Construction Plant and Equipment:	Grinders, welding equipment, blasting equipment and painting equipment
Outline Method Statement:	1. Install debris netting and temporary works access / encapsulation to above and below deck level. 2. Removal of defective steelwork. 3. Site welding of replacement steelwork. 4. Grit blast and painting.
Materials/ Waste	Removed paint, spent grit and corrode steelwork will be removed from the bridge. New steelwork will be installed and paint.
Restrictions	Planned refurbishment and repair of vehicle restraint systems requires works to be undertaken between 01 April March to 31 October out with traffic management embargo period.

Scheme Specific Mitigation:	• Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area during the erection of scaffolding. • Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Suspended Span Half Joint Replacement	
Background Information:	• Not included within previous marine licence. • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2026-2032. This will be undertaken under series of smaller schemes over multiple years with works phased across the structure.
Construction Value:	Total across all schemes £6 million
Location on Structure:	Suspended Spans
Description of the Works:	The bridge carriageway is divided into deck panels which span over the transverse cross girders of the stiffening truss. The stiffening truss below the carriageway is supported throughout its length by the spiral cable hangers and the bridge main cables. The carriageway is divided into panel sections which are each supported by 4 No. cable hangers. The deck panels are connected to adjacent panels via half joints. These joints roughly align with the locations of the cable hangers. The half joints themselves are spaced transversely across the carriageway and were originally designed to permit expansion and contraction of the panels. The joints are formed of cast steel bearing blocks which are welded to the ends of the stiffening truss stringers. These blocks were originally bolted together via a threaded stud which was screwed into the upper bearing block. The threaded stud was connected to the lower bearing block via a slotted hole which allowed longitudinal movement whilst preventing vertical displacement. Previous investigations into the condition of these bearings found that there have been instances where the threaded stud has failed. As a result, the vertical movement has not been restrained and there has been differential movement between the panels. In addition, the original polycast rubber joint sealant has failed which has allowed water to ingress between the joint. These defects have caused wear and corrosion of the bearing blocks which have ultimately led to the requirement for joint replacement. The joints have continually been a significant maintenance requirement over the lifespan of the bridge. A “jack and pack” method has frequently been used to realign worn joints. This involved using various jacks to lift the deck panels back into the correct position before filling the gap between the joints with Hardox packers. It is proposed to replace existing defective half joints with investigation ongoing to review potential of removing every 2nd half joint and replacing with a continuous member. An outline construction methodology is shown below. Alternative methods including removal of deck panels for offsite refurbishment is also being reviewed.
Construction Plant and Equipment:	Grinders, welding equipment, blasting equipment and painting equipment

Outline Method Statement:	1. Install debris netting and temporary works access / encapsulation to above and below deck level. 1. Removal of defective steelwork. 2. Site welding of replacement steelwork. 3. Grit blast and painting. Resurfacing local to half joints
Materials/ Waste	Removed paint, spent grit and corrode steelwork will be removed from the bridge. New steelwork will be installed and paint.
Restrictions	Full carriageway closures will be required. Works required to be undertaken between 01 April March to 31 October out with traffic management embargo period.
Scheme Specific Mitigation:	• Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area during the erection of scaffolding • Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process.

Suspended Span Carriageway Concrete Deck	
Background Information:	• Not included within previous marine licence. • Partially within 50m/300m of Long Craig Island.
Construction Period and Working Times.	2026-2027
Construction Value:	£1 million
Location on Structure:	Suspended Spans
Description of the Works:	The side suspended span road decks are made up of reinforced concrete deck connected to 4 no. roadway steel stringer beams (8no in total for both carriageways). The deck and stringers are composite. The concrete deck has been noted to have a number of defects along its length. The extent of any repairs will be influenced by the results of testing which has been carried out on the existing concrete.
Construction Plant and Equipment:	Hand tools, hydrodemolition, compressors, generators
Outline Method Statement:	1. Installation of suitable temporary works platforms and containment. 2. Removal of defective concrete. Method of removal subject to extent / findings of concrete condition investigations. Removal either by hand breakers or localised use of hydrodemolition. 3. Concrete and existing reinforcement preparation. Replacement of defective reinforcement. 4. Concrete repairs by use of Class R4 repair mortar and/or spray concrete. 5. Removal of temporary works and encapsulation upon completion.
Materials/ Waste	Removed concrete / corroded reinforcement. New reinforcement & concrete repair materials shall be installed.
Restrictions	Concrete repair works typically undertaken out with winter period. Depending on size & depth of concrete breakout, works may require traffic management therefore works required to be undertaken between 01 April March to 31 October out with traffic management embargo period.
Scheme Specific Mitigations:	• Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area during the erection of scaffolding • Mitigation will be in line with the above detailed standard mitigation measures. • Any additional required mitigation will be developed during the HRA process. • Hydro-demolition works will be fully encapsulated to ensure to concrete wash / waste-water enters the marine environment. • Hydro-demolition waste / wash water will either be removed off site or disposed on site as trade effluent under an appropriate authorisation from SEPA. Where disposed on site all conditions of the authorisation will be adhered to.

4. Routine Works Programme

In addition to the one-off schemes listed above, there are several routine works (maintenance activities) that are completed on a regular basis. Some of these routine works may also be encompassed within the one-off schemes.

Below is a breakdown of the routine works that may be carried out throughout the duration of the proposed licence period along with a description of the proposed works. The works can be both routine and reactive and vary in nature, therefore it is not possible to provide an estimated construction value. These works may also be required at any location of the structure. Environmental mitigation measures appropriate to the task and outlined in the method statements will be employed at all times.

This list is not exhaustive and there may be other low-risk routine maintenance activities carried out on the structure on a like-for-like basis. Any unidentified routine maintenance activities will be subject to the terms and conditions of the Forth Road Bridge Marine Licence.

Bridge Access Systems	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Due to the nature of the bridge construction, various access systems have been developed throughout the years in order to provide full access to the bridge. These include: • Hanger Access Cradles. • Tower Access Platforms. • Fixed underdeck access gantries (suspended span). • Top Chord Access Platform. • Main cable access gantries. • Upper front access staging. These systems can be deployed at any time for use during periodic inspection, routine maintenance or for emergency works. All of these systems involve rigging from the bridge itself with the use of electrically powered drive motors for hoisting the platforms into place. All platform systems are fitted with the necessary toe-boards and handrails to prevent the dropping of tools and materials during works. Platforms, underdeck walkways, staircases and ladders will require structural repairs, partial / full replacement, bolt / weld repairs and re-application of corrosion protection throughout lifespan of the structure. Improvement works will also be undertaken as need is identified to add additional underdeck access / staircases / ladders / platforms to aid access of the structure for inspection, maintenance, monitoring, repairs and strengthening.
Plant and Equipment:	N/A

Outline Method Statement:	1. Transport of access platform on to bridge, either under temporary carriageway closure or by use of footway/cycle track areas. 2. Installation of rigging components and access platform in appropriate work location. 3. Completion of inspection/work activity using access platform. 4. Removal and movement of access cradle to next work location of back to storage.

Hanger Painting	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	The main span hanger cables are spiral strand and made up of 7 cables, each consisting of 19 wires. The steel hanger cables require to be painted periodically to protect them from corrosion and deterioration. A continuous system of maintenance work is ongoing to undertake this. This comprises washing the hanger cables with white spirit to prepare them and then applying the new paint system.
Plant and Equipment:	Hanger cradle, MEWP, painting equipment
Outline Method Statement:	1. Access the hangers using suspended cradle system secured by the riggers to the main cable and top chord. 2. Cradle to be sheeted with drip screens in place. 3. Wires to be washed / degreased prior to paint application using white spirit. 4. Hangers painted from top to bottom by hand. 5. Remove cradle from hanger and secure upon completion.

Hanger Replacement	
Construction Period:	Routine Maintenance / Emergency Replacement
Construction Value:	£ unknown
Description of the Works:	The main span hanger cables are spiral strand and made up of 7 cables, each consisting of 19 wires. The steel hanger cables were previously replaced. Procedures have been developed to allow installation of temporary hangers should hanger failure occur, or condition require replacement. Replacement of hangers is not routinely undertaken, however, routine trials may be undertaken to verify existing procedures and equipment.
Plant and Equipment:	Hanger cradle, MEWP, hanger replacement equipment
Outline Method Statement:	1. Access the hangers using suspended cradle system secured by the riggers to the main cable and top chord. 2. Temporary cable bands to be installed. Temporary hangers installed and tensioned to release existing hangers. 3. Existing hangers replaced as required. Tensioning of existing hangers. Painting of replacement hanger bolts / cradle bolts. 4. Detensioning of temporary hangers and removal. 5. Remove cradle from hanger and secure upon completion.

Weld Repairs	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	The main elements in the construction of the Forth Road Bridge are steel. Throughout the duration of the contract, the bridge is subject to inspections of each element, which in turn produces a programme of defects which would require repair, including defective welds. Weld repairs will involve a number of different processes including paint removal, weld testing, weld removal and re- welding.
Plant and Equipment:	Handheld grinder, welding equipment, painting equipment
Outline Method Statement:	1. Provision of access to area of defective weld to be repaired. 2. Removal of paint system surrounding the defective weld, using chemical removal or grinding. 3. Non-destructive testing of existing weld to mark out the extent of defective area to be removed. 4. Cutting out of existing weld material and preparation of steel substrate before reinstatement of the weld. 5. NDT testing of new weld to ensure no defects are present. 6. Re-application of paint system over new welded area. 7. Removal of access system.

Bolt Replacement	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	As well as welded connections, as noted above, there are a similar number of bolted connections on the Forth Road Bridge which regularly require replacement due to corrosion or damage which is affecting the adequacy of the connection.
Plant and Equipment:	Impact wrench, hand tools, paint equipment
Outline Method Statement:	1. Provision of access to area of bolt replacement. 2. Removal of damaged bolt and preparation of painted area locally around the existing bolt. 3. Installation of new bolt and tightened to manufacturers specification. 4. Re-application of protective paint system over the new bolt. 5. Removal of access system.

Kingpost Replacement (Bottom Lateral Supports)	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	The main suspended span of the Forth Road Bridge is of truss construction. On the underside of the truss arrangement, large cross members are linked to the cross girder by a single slender steel section, known as the kingpost. Due to the vibrations on the bridge, the connections between the kingpost and cross members fail and this leads to a replacement of the kingpost. Kingposts are replaced using either rope access techniques or by use of the bridge's underdeck access gantries.
Plant and Equipment:	Impact wrench, hand tools
Outline Method Statement:	1. Riggers access the location of the failed kingpost using rope access techniques or via bridge underdeck access gantries. 2. The failed kingpost is removed using rope access methods. 3. Slings / chain blocks are slung round the cross girder and used to raise the cross bracing into position. 4. The new kingpost is lowered into position using rope access techniques, and secured in place via bolted connections.

Pier Defences Repairs	
Construction Period:	Routine Maintenance. Can be planned outwith the tern breeding season for the North Main Tower.
Construction Value:	£ unknown
Description of the Works:	The existing paint system is coming to the end of its working life. Regular routine maintenance painting is carried out on localised areas based on the findings of bridge inspections. A full painting replacement of exposed sections of the sheet pile defences may be required. Regular repairs to the concrete capping slab to the pier defences may be required. Monthly inspection and monitoring to the cathodic protection system installed to the sheet pile defences is undertaken. This may require repairs / replacement depending on operational condition.
Plant and Equipment:	Grit blasting equipment, painting equipment, hand tools, replacement of cathodic protection elements (diving operation), safety boat to support installation of temporary platform.
Outline Method Statement:	1. Provision of temporary suspended work platform, to provide full encapsulation to the work area. 2. Removal of existing paint system, likely by grit blasting but other methods may be required, for example chemical. 3. Surface preparation of exposed steel members. 4. Application of new paint system as per manufacturers guidelines. 5. Removal of encapsulation and suspended platform when works are completed.

Billet Repair (Half Joint Repairs)	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	The works involve all permanent and temporary construction associated with the trial replacement of the existing steel deck half joints including the levelling of the deck panels on the Forth Road Bridge. Which will consist of the removal of the existing joints and the installation of two replacement assemblies at defined locations on the suspended structure. The works also include the replacement of the drainage boxes and the associated pipes installed at the outer stringers, alterations to the existing access walkways and installation of the expansion joints between the deck panels at the level of the running surface.
Plant and Equipment	Hand-held grinders, welding equipment, painting equipment
Outline Method Statement:	1. Removal and replacement of existing under deck walkways. 2. Installation of supporting frames. 3. Removal of existing half joints. 4. Levelling of deck panels. 5. Installation of replacement joints assembly.

End Trimmer Replacement / Strengthening (Suspended Span)	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Due to failures of the existing edge trimmer to the suspended span, weld repairs are regularly undertaken under temporary carriageway closures. Depending on the condition of the defect, more intrusive repairs may be required from top of deck with local removal of surfacing & waterproofing to allow for replacement of full end trimmer. These works would involve reinstatement of waterproofing and carriageway surfacing.
Plant and Equipment:	Stihl saw, kango hammer, hand-held drill, welding equipment
Outline Method Statement:	1. Installation of temporary working platform. 2. Removal of defective welds / defective steelwork. 3. Site welding of replacement welds / steelwork. 4. Surface preparation & paint repair.

Upper Front Staging Installation (Underdeck Access Staging)	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	The walkways and access system to the underside of the suspended span decks and steelwork are located just below deck level. This system allowed effective safe access for inspection and maintenance, especially painting. The access system is made up of aluminium boards which span across and are supported by the main structural members of the walkways. These boards are moved from one location to another on the bridge by a combination of manual handling and lifting equipment.
Plant and Equipment:	N/A
Outline Method Statement:	1. Staging boards transported on to the bridge using a pickup van via the footway/cycle track area. 2. Rope access riggers install hangers to the permanent line walkways on the bridge below deck level. 3. Staging boards lowered below deck level using manual handling methods with board tethered to prevent objects falling beneath the bridge. 4. Staging boards fitted into position supported on temporary hangers and fixed line walkways. 5. Handrails and toe boards secured around the perimeter of the temporary staging. 6. Once works are completed, staging boards are removed in reverse to the installation procedure outlined above.

Removal of Lead Based Paint	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	At the time of construction of the bridge, all steelwork would have been painted with a protective paint system. Due to the period this was undertaken it is likely that much of the original paint system is lead based. This means that during periods of paint removal for current maintenance activities, further precautions and safety measures have to be put in place to minimise the risk of exposure to operatives and also contamination of surrounding areas.
Plant and Equipment:	Grit blasting equipment
Outline Method Statement:	1. Method for removal of paint system to be agreed (i.e. chemical removal / grit blasting etc.). 2. Access to be provided to works area and full encapsulation of the work area to be provided. 3. Paint removed (either from grit blasting or chemical removal) to be placed in reinforced bags and marked for disposal as special waste. 4. Upon completion of paint removal encapsulated area to be cleaned thoroughly of all contaminated material and disposed of as special waste. 5. Encapsulation to be removed.

Maintenance Painting	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Maintenance painting to be carried out as and when required. The existing paint system is coming to the end of its working life. Regular routine maintenance painting is carried out on localised areas based on the findings of bridge inspections. A full painting contract is now scheduled to replace the existing paint system.
Plant and Equipment:	Painting equipment
Outline Method Statement:	1. Provision of temporary suspended work platform, to provide full encapsulation to the work area as required. 2. Removal of existing paint system, by a method to be chosen through further investigation (chemical, grit blasting for example). 3. Surface preparation of exposed steel members. 4. Application of new paint system as per manufacturers guidelines. 5. Removal of encapsulation and temporary access system.

Repair of Cathodic Protection Systems	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Cathodic protection is used on some of the reinforced concrete elements of the structure to protect the steel reinforcement from corrosion. Routine maintenance of the CP systems may be required and may involve replacement of faulty electrical equipment, replacement of sacrificial anodes, replacement of cabling and replacement of faulty cathodes or installation of new cathodes. Diving may be needed at any time as part of the bridge inspection requirements or if issues with the CP system occur.
Plant and Equipment:	Electrical and testing equipment. Hand / mechanical breakers and generators. Hand tools. Safety boat to support diving operation.
Outline Method Statement:	1. Install access systems and debris netting if required. 2. Remove and replace faulty electrical equipment and cabling if applicable 3. Minor breakout of concrete or drilling of concrete using hand tools to access faulty components. 4. Remove and replace faulty components. 5. Install new cabling if required. 6. Repairs using cementitious repair mortar. 7. Remove access systems.

Replacement & installation of SHM Sensors	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	There are a number of sensors attached to various elements of the bridge as part of the ongoing structural health monitoring. Occasionally, these sensors will require maintenance or replacement due to a fault. Additional sensors may be required to any bridge structural component to monitor behaviour / to inform ongoing bridge assessments.
Plant and Equipment:	Electrical and testing equipment. Hand tools.
Outline Method Statement:	1. Identify faulty sensors. 2. Install access systems if required. 3. Remove faulty sensor. 4. Replace repaired sensor or install new sensor. 5. Install new cabling if required. 6. Remove access systems.

Electrical Infrastructure	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	There are various electrical, data communication and SOS phone systems across the bridge, including to footways and ducting / service trays to underside of suspended span. Routine maintenance / repair / replacement / removal of existing infrastructure may be required at times. Additional electrical infrastructure may also be required to suit operation of the structure. This will likely encompass installation of new ducting, cable trays, wiring and infrastructure.
Plant and Equipment:	Electrical and testing equipment. Generators. Hand tools. Impact wrenches. Grinders. Painting equipment.
Outline Method Statement:	1. Install temporary access as required 2. Test / repair / replace / remove existing infrastructure 3. Install new infrastructure and draw cabling 4. Remove temporary access as required.

Lighting Infrastructure	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	There are lighting columns between both carriageway and footways secured to top face of bridge cross-girders. These lighting columns require routine maintenance to test / repair / replace / remove bolt fixings, columns, electrical wiring and lanterns. Replacement of lighting columns, lanterns and components will be undertaken as identified as being required. Temporary removal of lighting columns is also undertaken as required, for example to permit temporary scaffold access. Lighting is also present within the internal cells of the main towers. Routine maintenance / repair / replacement of internal lighting and wiring is undertaken from within the main towers. Air navigation lights are present to sides and tops of both main towers. Navigation lights are also present to the bottom chord of the main span demarking the shipping channel. Routine testing and maintenance works are undertaken. Repair / replacement of navigation lights, cabling and supports is undertaken as required.
Plant and Equipment:	Electrical and testing equipment. Generators. Hand tools. Impact wrenches. Grinders. Painting equipment. MWEP.
Outline Method Statement:	1. Works to bridge lighting is typically undertaken from the carriageway or footway by MWEP. 2. Works to main tower internal lighting is undertaken from within the main towers. 3. Works to navigation lights to the main towers is access via main towers and requires working at height controls. 4. Works to navigation lights to the bottom chord is access by underdeck staircases and utilizing working at height controls.

CCTV Infrastructure	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	There are multiple CCTV cameras and infrastructure across the bridge of bridge security and welfare. CCTV infrastructure requires routine maintenance to test / repair / replace / remove bolt fixings, columns, electrical wiring and cameras. Replacement of columns, CCTV cameras and components will be undertaken as identified as being required. Temporary removal of CCTV infrastructure is also undertaken as required, for example to permit temporary scaffold access.
Plant and Equipment:	Electrical and testing equipment. Generators. Hand tools. Impact wrenches. Grinders. Painting equipment. MWEP.
Outline Method Statement:	1. Install temporary access as required 2. Test / repair / replace / remove existing infrastructure 3. Install new infrastructure and draw cabling 4. Remove temporary access as required.

Bridge Signage	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Permanent signage is present at various locations across to both footways and road carriageways. Routine maintenance is carried out to clean / repair / replace / remove signage and associated fixings and supports. Additional signage may be installed across the structure as deemed necessary.
Plant and Equipment:	Generators. Hand tools. Impact wrenches. Grinders. Painting equipment. MWEP.
Outline Method Statement:	1. Install temporary access as required 2. Clean / repair / replace / remove existing signage & supports. Install new signage as required. 3. Remove temporary access as required.

Surfacing Repairs	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Surfacing repairs will be required to the suspended span where defects identified as part of inspection process. This can involve partial or full depth surfacing repairs or sealing / overbanding of cracks.
Plant and Equipment:	Road planer. Hand / mechanical breakers. Generators. Hand tools. Waterproofing equipment. Surfacing equipment.
Outline Method Statement:	1. Removal of existing surfacing system by mechanical means, i.e. road planer / hand brakers etc. 2. Surface preparation of exposed concrete or steel deck. 3. Application of proprietary spray applied waterproofing system (where required). 4. Laying new surfacing. 5. Overbanding of joints / cracks with bitumen sealant.

Road Markings and Studs	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Renewal of road marking and studs may be undertaken as part of routine maintenance or following surfacing repairs. Temporary road markings and / or road studs may be required as part of routine bridge traffic management.
Plant and Equipment:	Generators. Hand tools. Road marking equipment.
Outline Method Statement:	1. Implement traffic management / road closures. 2. Removal of existing road studs (where required). 3. Replacement of road studs. Renewal of road markings with thermoplastic markings.

Vehicle Restraint Repairs (Grillage)	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	The Forth Road Bridge Vehicle Restraint System (VRS) consists of over 16km of barriers and parapets on the viaducts and suspended spans. The suspended span grillages conform to the geometrical and strength requirements of the containment level appropriate for the bridge carriageways for speeds up to 50mph. A trial panel of the suspended span grillages configurations was fabricated and tested under FETA. The suspended span VRS are known as 'grillages' and have been in place since opening in 1964. On the suspended spans there are two types of grillages. The nearside grillages- lane 1- are made up of a steel box section top rail supported from a 6" box section mid rail which supports individual 25x25mm grillage bars. These bars are welded to a shaped kerb plate which is welded or cast into the suspended span deck. The central grillage covers over the 3m gap between carriageways on the suspended span and is complete structure. It is similar makeup to the nearside VRS without the top rail. The central area is covered over with horizontal grillage bars welded to the 6" box section rail. In addition to planned scheme refurbishments, localised repairs may be undertaken due to condition identified by inspections or damage to crown property by third parties. This would require replacement of structural steelwork with offsite fabrication and site welding and subsequent paint repairs.
Plant and Equipment:	Generators. Hand tools. Impact wrenches. Grinders. Welding equipment. Painting equipment.
Outline Method Statement:	1. Install FRB underdeck staging boards. 2. Removal of defective steelwork. 3. Site welding of replacement steelwork. 4. Steelwork preparation & painting.

Main Cable Dehumidification	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Both main cables have dehumidification system installed. This dry air is pumped from three plant rooms located on the suspended span. Routine maintenance is undertaken to the plant rooms, cabling, air pipes, sensors, inlet / exhaust sleeves to the main cable, elastomeric wrap and high grip coating to main cable. Routine maintenance may include servicing, repair and replacement for dehumidification components, plant rooms and main cable wrap & coating.
Plant and Equipment:	Electrical and testing equipment. Generators. Hand tools. Impact wrenches. Grinders. Painting equipment.
Outline Method Statement:	1. Servicing and repair of plant room components will typically be undertaken on the bridge accessed from the west footway. Significant repairs may require removal of plant rooms by crane for offsite refurbishment. 2. Servicing / repair / replacement of cabling, ducting and sensors will typically be undertaken by roped access to underdeck and main cable / hangers. 3. Repairs / replacement of main cable elastomeric wrap and high grip coating will be undertaken from the main cable. Larger repair areas may require use of temporary platforms including encapsulation.

Suspended Span Drainage	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Drainage hoppers are located to the carriageway of the suspended span. Routine maintenance to clear the hoppers and downpipes is undertaken. Additional maintenance works are required periodically to undertake repair and replacement of components.
Plant and Equipment:	Power washer. Generators. Hand tools. Impact wrenches. Grinders. Painting equipment.
Outline Method Statement:	1. Clearing of hopper and downpipes undertaken from carriageway utilising water jetting as required. 2. Repair and replacement of steelwork components undertaken from underdeck access utilising FRB upper front staging boards and roped access controls as required.

Expansion Joints	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Expansion joints are located to both main towers and ends of the suspended span. Routine maintenance is carried out to clear debris from expansion joints. Repair / replacement of wear components is undertaken as required with additional repairs undertaken as identified, which can consist of, but not limited to, bolts, welds, replacement of components and painting.
Plant and Equipment:	Power washer. Road sweeper. Generators. Hand tools. Impact wrenches. Grinders. Painting equipment.
Outline Method Statement:	1. Clearing of debris is undertaken at carriageway level by hand and road sweeper. Some joints require clearing of debris to underside and drainage membranes. This is typically access via underdeck maintenance platforms. 2. Repair and replacement of components will be undertaken at deck level and underdeck. Extent will depend on defects identified.

Bearings	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Bearings are located to both main towers and ends of the suspended span. Routine maintenance is carried out to clear debris from bearings, grease, replace and retention components. Repair / replacement of wearable components will be undertaken in accordance with O&M manuals and as identified by inspections. Replacement can consist of wearable components. More significant would only be undertaken where bearings at end of service life or significant defects identified through bridge inspections.
Plant and Equipment:	Generators. Hand tools. Impact wrenches. Grinders. Painting equipment.
Outline Method Statement:	1. Clearing of debris is undertaken at underdeck typically by hand. 2. Repair and replacement of components will be undertaken at underdeck level utilising underdeck platforms. More significant maintenance works / replacement will require bespoke temporary works access.

Routine Cleaning	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Routine cleaning of bridge components is undertaken throughout the structure. This includes but not limited to: carriageways, footways, underdeck walkways, upper front staging, temporary and permanent platforms, removal of bird guano,
Plant and Equipment:	Power washer. Hand tools. Road sweeper.
Outline Method Statement:	1. Cleaning of debris will be undertaken by hand, mechanical means (i.e. road sweeper) and power washer depending on location on the structure.

Concrete Repairs	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Localised concrete repairs can be undertaken to the side span decks and side towers.
Plant and Equipment:	Hand tools, hydrodemolition, hand breaker, compressors, generators
Outline Method Statement:	1. Installation of suitable temporary works platforms and containment. 2. Removal of defective concrete. Method of removal subject to extent / findings of concrete condition. Removal either by hand breakers or localised use of hydrodemolition. 3. Concrete and existing reinforcement preparation. Replacement of defective reinforcement. 4. Concrete repairs by use of Class R4 repair mortar and/or spray concrete. 5. Removal of temporary works and encapsulation upon completion.

Offsite Repairs / Refurbishment	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Existing bridge components / access systems / infrastructure may require temporary removal by dismantling or cranage for offsite refurbishment.
Plant and Equipment:	Cranage. Hand tools. Impact wrenches. Grinders. Compressors. Generators. Welding equipment. Painting equipment.
Outline Method Statement:	1. Installation of suitable temporary works platforms and containment as required. 2. Dismantling of components or removal by cranage. 3. Offsite refurbishment. 4. Preparation, repair, painting of supporting structure as required. 5. Reinstallation of components.

Investigation Works	
Construction Period:	Routine
Construction Value:	£ unknown
Description of the Works:	Investigation works may be required to existing bridge components to inform condition and as-built configuration. This information will be used to inform bridge assessments and repair schemes. This may include, but not limited to, non-destructive testing or intrusive investigation of concrete, reinforcement, steelwork, welds, bolts, paintwork, wires, hangers, post tensioning, bearings, expansion joints, surfacing, waterproofing. In addition, there is a requirement for dive inspections to be undertaken every six years to inform the condition of the underwater elements.
Plant and Equipment:	Hand tools. Hand / mechanical breakers. Impact wrenches. Grinders. Compressors. Generators. Welding equipment. Painting equipment. Diving equipment.
Outline Method Statement:	1. Installation of suitable temporary works platforms and containment as required. 2. Non-destructive testing or intrusive investigation. Reinstatement of existing elements utilising replacement components. 3. Where dive inspections are required access will be gained to the relevant sections of the bridge via a boat.

Annex 1 – FRB General Arrangement Drawing