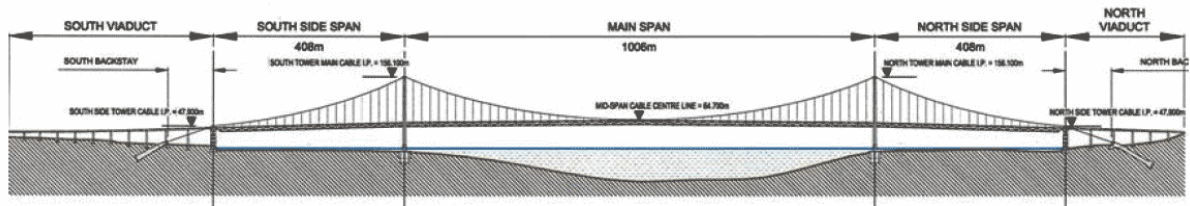


4. FRB 5 Year Programme of Works

4.1. Scheme Works Programme

Below is a breakdown of the schemes currently identified in the 5-year programme for the Forth Road Bridge. All schemes have been provided with an estimate of the construction period, the value and location of the works to be carried out along with a brief outline description of the works, an outline method statement and proposed mitigation measures related to the protection of the Marine Environment.



Main Bridge Expansion Joint Replacement	
Construction Period:	2021
Construction Value:	£0.25 million
Location on Structure:	Northbound Carriageway – South Side Tower, South Main Tower, North Main Tower, North Side Tower
Description of the Works:	There are currently 8 no sets of joint units, 4 no sets in each carriageway. Previous inspections have noted several condition issues, which highlighted the need for replacement of the existing roller shutter joints. These works were procured as a works contract. It is hoped that these works will be completed before the end of September 2021 but the northbound joints may still be ongoing in October 2021.
Plant and Equipment:	Crane, Hiab, impact wrench, handheld drills, handheld grinder, welding equipment, concrete jaeger, generator, site vans and cars
Outline Method Statement:	<ol style="list-style-type: none"> 1. Full traffic management closure of Northbound carriageway 2. Crane out existing steel roller joints and remove for disposal 3. Removal of existing bridge expansion joint steelwork 4. Installation of new bridge expansion joint steelwork 5. Crane in new steel roller joints and installation of new anti-slip surfacing
Proposed Mitigations:	<ul style="list-style-type: none"> • ECoW to periodically monitor the site and working practices – works to be halted if breaches of approved method statements or best practice occur • Observation of noise monitoring equipment installed at the base of the north main and side towers – activities to be halted if noise limits are reached • Access platforms shall be boarded, sheeted and netting installed as necessary to prevent loss of material • Tool tethers to be used where there is potential of dropping from the works area or access platform

Suspended Span Painting Contract	
Construction Period:	2021 - 2026
Construction Value:	£15 million
Location on Structure:	All suspended span (partially within 400m of Long Craig Island)
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 3 to 4 summer seasons.
Plant and Equipment:	Scaffolding, grit blasting equipment, painting equipment, hand tools, site vans and cars
Outline Method Statement:	<ol style="list-style-type: none"> 1. Provision of temporary suspended work platform, to provide full encapsulation to the work area 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 suspended platform
Proposed Mitigations:	<ul style="list-style-type: none"> • The work site will be fully encapsulated prior to surface preparation and painting to prevent any loss of material or tools from the work site • Potentially noisy and disruptive works within 400m of Long Craig Island will not be undertaken during the tern breeding season
Suspended Span Strengthening Contract	
Construction Period:	2021 - 2026
Construction Value:	£1.0 million
Location on Structure:	All suspended span (partially within 400m of Long Craig Island)
Description of the Works:	Through recent inspections / investigations 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 vans and cars
Outline Method Statement:	<ol style="list-style-type: none"> 1. Identification 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 by means to be determined through further investigation (chemical removal, grit blasting for example) 3. Installation of strengthening steelwork by either bolting or welding new steelwork 4. Application of protective paint system 5. Removal of encapsulation and suspended platform
Proposed Mitigations:	<ul style="list-style-type: none"> • The work site will be fully encapsulated prior to surface preparation and painting to prevent any loss of material or tools from the work site

	<ul style="list-style-type: none"> Potentially noisy and disruptive works within 400m of Long Craig Island will not be undertaken during the tern breeding season
Viaduct Span Painting Contract	
Construction Period:	2021 - 2026
Construction Value:	£3.75 million
Location on Structure:	North and south approach viaducts
Description of the Works:	The existing paint system on the viaduct spans of the Forth Road Bridge 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. These works are likely to be undertaken over 3 painting seasons.
Plant and Equipment:	Scaffolding, grit blasting equipment, painting equipment, hand tools, site vans and cars
Outline Method Statement:	<ol style="list-style-type: none"> Provision of temporary suspended work platform, to provide full encapsulation to the work area Removal of existing paint system, by a method to be chosen through further investigation (chemical, grit blasting for example) Application of new paint system as per manufacturers guidelines Once paint system fully applied, full encapsulation and suspended platform to be removed / moved for further painting works
Proposed Mitigations:	<ul style="list-style-type: none"> The work site will be fully encapsulated prior to surface preparation and painting to prevent any loss of material or tools from the work site Potentially noisy and disruptive works within 400m of Long Craig Island will not be undertaken during the tern breeding season
Viaduct and North Approach Resurfacing	
Construction Period:	2021 - 2022
Construction Value:	£3.5 million
Location on Structure:	North and south approach viaducts
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 a thin layer epoxy asphalt system, approximately 40mm thick. These works will require the alternate full closure of either the northbound or southbound carriageway.
Plant and Equipment	Road planer, road paver, vibrating rollers, floor scraper / scabblers, delivery wagons, site vans and cars
Outline Method Statement:	<ol style="list-style-type: none"> Removal of existing surfacing system by mechanical means, i.e. road planer etc. Surface preparation of exposed concrete deck and undertake necessary concrete repairs using rapid repair mortar Application of proprietary spray applied waterproofing system Laying new epoxy asphalt system

Proposed Mitigations:	<ul style="list-style-type: none"> • All work undertaken from deck level with minimal risk of loss of material • 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 available on site to prevent potential fuel leaks from entering the watercourse
Suspended Span Resurfacing	
Construction Period:	2021 - 2022
Construction Value:	£4.0 million
Location on Structure:	All suspended span (partially within 400m of Long Craig Island)
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 a thin layer epoxy asphalt system, approximately 40mm thick. These works will require the alternate full closure of either the northbound or southbound carriageway.
Plant and Equipment	Road planer, road paver, vibrating rollers, floor scraper / scabblers, delivery wagons, site vans and cars
Outline Method Statement:	<ol style="list-style-type: none"> 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 epoxy asphalt system
Proposed Mitigations:	<ul style="list-style-type: none"> • All work undertaken from deck level with minimal risk of loss of material • 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 available on site to prevent potential fuel leaks from entering the watercourse
Footpath Resurfacing	
Construction Period:	2021 - 2023
Construction Value:	£3.0 million
Location on Structure:	All (partially within 400m of Long Craig Island)
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.
Plant and Equipment	floor scraper, spray-applied waterproofing equipment, welding equipment, site vans and cars
Outline Method Statement:	<ol style="list-style-type: none"> 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

Proposed Mitigations:	<ul style="list-style-type: none"> • All work undertaken from deck level with minimal risk of loss of material • Temporary works including boarding and netting will be in place at the edges of the footpath to ensure no loss of material from the site during planing works. • 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 available on site to prevent potential fuel leaks from entering the watercourse
Suspended Span Under Deck Access (SSUDA)	
Construction Period:	2021 – 2026
Construction Value:	£7.5 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.
Plant and Equipment:	Impact wrench, hand tools
Outline Method Statement:	<ol style="list-style-type: none"> 1. Installation of temporary access platforms 2. Remove existing walkways and dispose of in a suitably licensed facility 3. Install new walkways from temporary access platform 4. Remove access platforms
Proposed Mitigations:	<ul style="list-style-type: none"> • Tool tethers to be used during installation of temporary access platforms and permanent walkways • Access platforms to be boarded and debris netting installed to prevent loss of materials during the removal and installation of platforms • Notice to Mariners & consultation with ports to prevent private vessels from sailing beneath the works area
Footpath Elastomeric Pads Replacement	
Construction Period:	2021 – 2026
Construction Value:	£0.75 million
Location on Structure:	West Footpath
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 elastomerics before returning the deck panel to its original position. A programme of bearing pad replacements will be determined each financial year.
Plant and Equipment:	Hydraulic jacking equipment, impact wrenches, hand tools, site vans and cars

Outline Method Statement:	<ol style="list-style-type: none"> 1. Install temporary access and jacking systems beneath the footpath 2. Jack up footpath panels 3. Remove worn elastomeric pads and dispose of to a suitably licensed 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
Proposed Mitigations:	<ul style="list-style-type: none"> • Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area • Tool tethers to be used during installation of the access platforms and installation of elastomeric pads to prevent loss of equipment or materials from the work site • No replacement works will be undertaken within 400m of Long Craig Island during the tern breeding season
Side Tower Lateral Thrust Bearing Strengthening	
Construction Period:	2022 - 2023
Construction Value:	£0.75 million
Location on Structure:	North and south side towers (north within 400m of Long Craig Island)
Description of the Works:	Strengthening works to improve the transverse load path for the lateral thrust bearings at the north and south side towers of the Forth Road Bridge. Replacement of the preloaded bars, a key component of the lateral thrust bearing, will also be carried out as part of this work and an additional bearing plate installed on the inside face of the Side Tower.
Plant and Equipment:	Hiab / crane, hydraulic jacking equipment, impact wrenches, magnetic drills, hand-held grinders, welding equipment, diesel generator, site vans and cars
Outline Method Statement:	<p>Replacement of existing prestressed bars:</p> <ol style="list-style-type: none"> 1. Install temporary jacking frame 2. Insert additional bearing plate behind existing internal bearing plate 3. Stress bars against bearing plates, on at a time 4. Remove temporary jacking frame <p>Steel Reaction Block:</p> <ol style="list-style-type: none"> 1. Prepare external tower face to receive reaction block 2. Erect temporary structure to support internal spreader plates 3. Prepare internal tower face to receive internal spreader plate 4. Raise internal bearing plates to correct position 5. Lower external reaction blocks from roadway level 6. Install Macalloy bars and stress to installation loads 7. Install new bearing element 8. Remove temporary support structures
Proposed Mitigations:	<ul style="list-style-type: none"> • Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area • Tool tethers to be used during installation of the access platforms • Appropriate containment measures will be installed on access platforms to prevent against dropping of tools or materials during replacement works • No potentially disruptive or noisy works will be undertaken within 400m of Long Craig Island during the tern breeding season

Main Tower Lateral Thrust Bearing Replacement	
Construction Period:	2022 - 2023
Construction Value:	£0.80 million
Location on Structure:	North and south main towers (north within 400m 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.
Plant and Equipment:	Hiab / crane, hydraulic jacking equipment, impact wrenches, magnetic drills, hand-held grinders, welding equipment, diesel generator, site vans and cars
Outline Method Statement:	<ol style="list-style-type: none"> 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
Proposed Mitigations:	<ul style="list-style-type: none"> • Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area • Tool tethers to be used during installation of the access platforms • Appropriate containment measures will be installed on access platforms to prevent against dropping of tools or materials during replacement works • No potentially disruptive or noisy works will be undertaken within 400m of Long Craig Island during the tern breeding season
Side Tower Elastomeric Bearings Replacement	
Construction Period:	2022 - 2023
Construction Value:	£0.82 million
Location on Structure:	North and south side towers (north within 400m of Long Craig Island)
Description of the Works:	<p>Forth Road Bridge's Side Tower elastomeric bearings are part of the original 1960s bridgeworks. They are visibly degrading and in poor condition. Defects outlined in the recent PI report include rust stained cracking to bearings' visible faces and water ingress between the bearings and their plinths.</p> <p>Despite their degrading condition, the bearings have performed well. As such, like-for-like replacement using contemporary elastomeric bearings is proposed. The existing holding down arrangement, consisting of the holding down bolts, base plates and bearing plinths, shall be replaced. Bearing top plates will also be replaced. Replacement bearing plinths may be constructed of either steel or reinforced concrete.</p>
Plant and Equipment:	Hydraulic jacking equipment, hydro-demolition equipment, impact wrenches, magnetic drills, hand-held grinders, welding equipment, diesel generator, site vans and cars

Outline Method Statement:	<ol style="list-style-type: none"> 1. Installation of new permanent jacking corbels / jacking frames 2. Closure of overhead carriageway / footway 3. Energise jacks to lift the deck segment at the Side Tower 4. Remove bearings, dowels and top and bottom bearing plates 5. Undertake hydro demolition of bearing plinths down to Side Tower bearing shelf level 6. Cut and remove protruding length of holding down bolts above bearing shelf level 7. Cast new concrete bearing plinths or install steel bearing plates 8. Install new bearing plates and anchors and install bearings 9. Energise hydraulic system, lowering deck onto new bearings 10. Remove jacks and remove traffic management
Proposed Mitigations:	<ul style="list-style-type: none"> • Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area • Tool tethers to be used during installation of the access platforms • Full encapsulation of the area will be provided prior to hydro-demolition of the concrete bearing plinths • No potentially disruptive or noisy works will be undertaken within 400m of Long Craig Island during the tern breeding season
Main Cable Intrusive Investigation	
Construction Period:	2025/2026
Construction Value:	£3.0 million
Location on Structure:	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 and 2012, with further inspections planned in future.
Plant and Equipment:	Cable access gantry, MEWP, hand tools
Outline Method Statement:	<ol style="list-style-type: none"> 1. Installation of cable access gantry, 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.
Proposed Mitigations:	<ul style="list-style-type: none"> • Cable access gantry will be suitably encapsulated to prevent loss of tools or materials during the investigation works

Pedestrian Balustrade Strengthening	
Construction Period:	2022 - 2024
Construction Value:	£1.5 million
Location on Structure:	All (partially within 400m of Long Craig Island)
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.
Plant and Equipment:	Magnetic drills, hand-held grinders, welding equipment, hand tools
Outline Method Statement:	<ol style="list-style-type: none"> 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
Proposed Mitigations:	<ul style="list-style-type: none"> • Footpaths will be closed to the public during the strengthening works • Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area • Strengthening / replacement works will not be carried out within 400m of Long Craig Island during the tern breeding season. • Tool tethers / temporary works will be in place to prevent loss of tools and materials from the work site
New Suspended Span Underdeck Access Gantry	
Construction Period:	2021 - 2022
Construction Value:	£3.0 million
Location on Structure:	Suspended span
Description of the Works:	<p>New runway beams were installed on the bridge under a previous contract, leaving only the installation of the gantries to be undertaken. The new gantry for the main span will be installed in April 2021. The gantry will be delivered, by road, to a yard on the River Forth, from where it will be barged to the FRB. 2 no. 200T cranes will be located on the bridge deck and will perform a tandem lift to lift the gantry from the barge to position at the runway beams. The roller guides will then be positioned around the runway beam and the load transferred from the cranes to the beams in incremental stages. Finally, the gantry will be inspected, tested and commissioned prior to use.</p> <p>A further two gantries for the side spans will be fabricated throughout the summer of 2021 and installed in a similar manner to the main span gantry. It is anticipated that this installation will be carried out in late 2021 or early 2022.</p>
Plant and Equipment:	Cranes, barge, hand tools

Outline Method Statement:	<ol style="list-style-type: none">1. Take delivery of new gantries and transfer to barge2. Barge the gantries into position below the bridge3. Raise the gantries to the underside of the bridge using 2no 200t cranes at road level4. Connect the gantries to the runway beams and secure the roller guides5. Lower the gantries to transfer load into the runway beams6. Inspect, test and commission the gantries for use
Proposed Mitigations:	<ul style="list-style-type: none">• Notice to Mariners & consultation with Forth Ports and Coastguard to prevent private vessels from sailing below the works area• Tool tethers to be used during installation of the access gantries• Barges will not be permitted within 400m of Long Craig Island and installation works will also be carried out well away from the island

4.2 Routine Maintenance Activities

In addition to the maintenance schemes to be taken forward on the Forth Road Bridge, there are a number of smaller routine maintenance activities which can be carried out on a regular basis. In addition, some of these routine maintenance activities may also be encompassed within the overall schemes as outlined in Section 4.1.

Below is a breakdown of some examples of the routine maintenance activities which may be carried out throughout the duration of the proposed license period along with a description of the proposed works. These works are typically reactive and vary in nature therefore it is not possible to provide an estimate construction value. These works may be required at any location on the structure and as such may by necessity need to take place within 400m of Long Craig Island at any time. However, environmental mitigation measures appropriate to the task, as 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 License.

Use of Bridge Access Systems	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	<p>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:</p> <ul style="list-style-type: none"> • Hanger Access Cradles • Tower Access Platforms • Fixed underdeck access gantries (suspended span and viaducts) • Top Chord Access Platform • Main cable access gantries • Upper front access staging <p>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.</p>
Plant and Equipment:	N/A
Outline Method Statement:	<ol style="list-style-type: none"> 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 and a continuous system of maintenance work is ongoing. This comprises of washing the hanger cables with white spirit to prepare them and then applying the new paint system.
Plant and Equipment:	Hanger cradle, MEWP
Outline Method Statement:	<ol style="list-style-type: none"> 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
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
Outline Method Statement:	<ol style="list-style-type: none"> 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. NDT 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 at some times may require

	replacement due to corrosion or damage which is affecting the adequacy of the connection.
Plant and Equipment:	Impact wrench, hand tools
Outline Method Statement:	<ol style="list-style-type: none"> 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:	<ol style="list-style-type: none"> 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 Painting	
Construction Period:	Routine Maintenance
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 contract is now scheduled to replace the existing paint system.
Plant and Equipment:	Grit blasting equipment, painting equipment
Outline Method Statement:	<ol style="list-style-type: none"> 1. Provision of temporary suspended work platform, to provide full encapsulation to the work area 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

	<ol style="list-style-type: none"> 4. Application of new paint system as per manufacturers guidelines 5. Removal of encapsulation and suspended platform when painting 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. The works 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. During the Works the Forth Road Bridge will remain open to vehicular and pedestrian traffic.
Plant and Equipment	Hand-held grinders, welding equipment, painting equipment
Outline Method Statement:	<ol style="list-style-type: none"> 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
Edge Trimmer Replacement / Strengthening (Viaduct Spans)	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Due to a possible failure of the edge trimmer or concrete finish, at the North Side Tower (South West edge detail at carriageway level) it is proposed that an investigation is carried out to determine the extent of the problem and possibly carry out repairs at the same time. This will involve breaking out of existing road surface and concrete, installing new support brackets, reinstating concrete using Deck Repair Rapid by Nuffins and applying temporary road surface (Note road surface will be permanently repaired by Tarmac during viaduct resurfacing). All work will be carried out overnight utilising carriageway closures for resurfacing of the viaducts, the work is programmed whilst Tarmac are working at the South viaduct so access to both Northbound lanes should be available.
Plant and Equipment:	Stihl saw, kango hammer, hand-held drill, welding equipment
Outline Method Statement:	<p>Ensure work area is clearly defined and lit and that Tarmac supervisors are aware of FRB area of work.</p> <p>Mark the affected area for repair and cut the edges using a Stihl saw to a depth of 100mm minimum, (depth of the repair will be determined by the state of the existing concrete) break out material within the cut edges using Kango hammers or similar.</p> <p>Mark position of 2 No new support L 75 x 75 x 10 x 305 lg, place the angle in position and drill 2 No 16 diameter x 90 deep holes in the concrete.</p>

	<p>Install 2 No M12 x 130 lg Hilti rods using Hilti hit resin, fix angles onto the rods and weld onto the existing trimmer.</p> <p>Mix the required quantity of deck repair rapid with water, 3 litres of water per 25 kg bag, water should be placed in the mixer with the deck repair rapid being added as required.</p> <p>Ensure the affected area is clean and free from loose material, thoroughly moisten the surface but ensure no free water remains.</p> <p>Once the deck repair rapid has been mixed immediately place in the area as required.</p> <p>Finish the road surface with cold applied bituminous road repair.</p>
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Edge Trimmer Replacement / Strengthening (Suspended Span)

Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	<p>Due to a possible failure of the edge trimmer or concrete finish, at the North Side Tower (South West edge detail at carriageway level) it is proposed that an investigation is carried out to determine the extent of the problem and possibly carry out repairs at the same time. This will involve breaking out of existing road surface and concrete, installing new support brackets, reinstating concrete using Deck Repair Rapid by Nuffins and applying temporary road surface (Note road surface will be permanently repaired by Tarmac during viaduct resurfacing). All work will be carried out overnight utilising carriageway closures for resurfacing of the viaducts, the work is programmed whilst Tarmac are working at the South viaduct so access to both Northbound lanes should be available.</p>
Plant and Equipment:	Stihl saw, kango hammer, hand-held drill, welding equipment
Outline Method Statement:	<ol style="list-style-type: none"> 1. Ensure work area is clearly defined and lit and that Tarmac supervisors are aware of FRB area of work. 2. Mark the affected area for repair and cut the edges using a Stihl saw to a depth of 100mm minimum, (depth of the repair will be determined by the state of the existing concrete) break out material within the cut edges using Kango hammers or similar. 3. Mark position of 2 No new support L 75 x 75 x 10 x 305 lg, place the angle in position and drill 2 No 16 diameter x 90 deep holes in the concrete. 4. Install 2 No M12 x 130 lg Hilti rods using Hilti hit resin, fix angles onto the rods and weld onto the existing trimmer. 5. Mix the required quantity of deck repair rapid with water, 3 litres of water per 25 kg bag, water should be placed in the mixer with the deck repair rapid being added as required. 6. Ensure the affected area is clean and free from loose material, thoroughly moisten the surface but ensure no free water remains. 7. Once the deck repair rapid has been mixed immediately place in the area as required. 8. Finish the road surface with cold applied bituminous road 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:	<ol style="list-style-type: none"> 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:	<ol style="list-style-type: none"> 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:	<ol style="list-style-type: none"> 1. Provision of temporary suspended work platform, to provide full encapsulation to the work area 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
Grit Blasting	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	As outlined previously, for the purposes of paint removal or steelwork preparation, it may be necessary to undertake grit blasting. This involves blasting the steelwork area to be cleaned with shot material at using high pressure compressed air. Due to the pressure and nature of the works, encapsulation of each works area is important in order to eliminate contamination of surrounding areas.
Plant and Equipment:	Grit blasting equipment, water pump,
Outline Method Statement:	<ol style="list-style-type: none"> 1. Installation of temporary access system and full encapsulation of the works area 2. Encapsulation surrounding the work area, to be checked to ensure no excessive gaps are present which would allow grit blasting material to spread into surrounding areas. 3. Area of steelwork to be cleaned using grit blasting, with good housekeeping maintained at regular intervals by cleaning spent shot material and placing in reinforced bags 4. Upon completion of the blasting operation, full area within encapsulation to be fully cleaned to ensure that all grit blasting material has been collected 5. Removal of encapsulation and temporary access system
Chemical Removal of Paint System	
Construction Period:	Routine Maintenance
Construction Value:	£ unknown
Description of the Works:	Another method of paint removal is to apply a chemical solution which acts to strip of the existing paint system. This is often a cleaner and more manageable form of paint removal as compared to that of grit blasting etc. The use of chemical methods currently on the bridge involves application of a paste along with a paper backing which is left to set and when removed takes of layers of previous paint. These can then be bagged and removed from the bridge for disposal.

Plant and Equipment:	N/A
Outline Method Statement:	<ol style="list-style-type: none"> 1. Access system to be provided to works area 2. Application of paste system and paper backing to area of paint to be removed. 3. Paste to be left to cure as per manufacturers guidelines 4. Once cured, remove paste by peeling backing paper, removing layers of existing paint system 5. Steps to be repeated until sufficient paint layers have been removed. 6. All materials to be placed in reinforced bags and disposed of as appropriate
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.
Outline Method Statement:	<ol style="list-style-type: none"> 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 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
Outline Method Statement:	<ol style="list-style-type: none"> 1. Identify faulty sensors 2. Install access systems if required 3. Remove faulty sensor 4. Replace repaired sensor or install new sensor if required 5. Install new cabling if required 6. Remove access systems