

## 3 The Proposed Scheme

### 3.1 Introduction

3.1.1 This chapter provides a description of the proposed scheme as assessed and reported in this EIA Report. This includes a summary of the indicative methods and programme for its construction (subject to completion of the statutory processes), with background also provided on the anticipated procurement process.

3.1.2 This chapter is supported by Appendix A3.1 (Construction Information) and the following figures:

- Figure 3.1 (The Proposed Scheme);
- Figure 3.2 (Existing Piled Viaduct);
- Figure 3.3 (Proposed Piled Viaduct – General Arrangement (Sheet 1 of 3));
- Figure 3.4 (Proposed Piled Viaduct – General Arrangement (Sheet 2 of 3));
- Figure 3.5 (Proposed Piled Viaduct – General Arrangement (Sheet 3 of 3));
- Figure 3.6 (Temporary Diversion Structure – Indicative General Arrangement (Sheet 1 of 4));
- Figure 3.7 (Temporary Diversion Structure – Indicative General Arrangement (Sheet 2 of 4));
- Figure 3.8 (Temporary Diversion Structure – Indicative General Arrangement (Sheet 3 of 4));
- Figure 3.9 (Temporary Diversion Structure – Indicative General Arrangement (Sheet 4 of 4)); and
- Figure 3.10 (Proposed Scheme Land-take).

### 3.2 Scheme Procurement

3.2.1 It is anticipated that the proposed scheme would be procured by means of a Transport Scotland model document contract. Under the terms of this contract type, the design of the replacement piled viaduct structure is undertaken by Transport Scotland and the Contractor would undertake both the design of the temporary works and construction of the proposed scheme. Responsibility for operating and maintaining the Kincardine Bridge and the A985 Kincardine – Rosyth Trunk Road would remain with the Scottish Government.

3.2.2 The Contractor's design of the temporary works and construction of the proposed scheme must be within the constraints imposed by this EIA Report including the Schedule of Environmental Commitments (Chapter 17: Schedule of Environmental Commitments), which summarises the mitigation measures identified through the EIA process; Statutory Orders (such as land acquisition); and any specific limits set within the contract documents.

3.2.3 Design changes will be subject to environmental review to ensure that:

- there are no new residual significant adverse effects; and/or
- the significance levels of residual significant effects are not greater than those reported in this EIA Report.

3.2.4 If environmental review found that any future changes to the design resulted in either of the above, an addendum to the EIA Report, or a new EIA Report, would need to be published for public consultation and comment in order to comply with the Roads EIA Regulations (**Mitigation Item SM5**).

### 3.3 Outline of the Proposed Scheme

3.3.1 An overview of the proposed scheme is shown on Figure 3.1.

- 3.3.2 The proposed scheme would incorporate:
- the demolition of the existing piled viaduct at the southern end of the Kincardine Bridge;
  - replacement of the existing piled viaduct with a new five span structure of similar appearance to the adjacent spans of the Kincardine Bridge; and
  - temporary construction works.
- 3.3.3 In order to maintain traffic flow during construction works, a temporary bridge would be constructed adjacent to the north-west side of the existing piled viaduct. The temporary bridge would connect to the approach road to the southern end of the Kincardine Bridge. The connection of the temporary bridge to the Kincardine Bridge would be made to the north-east of the existing piled viaduct.
- 3.3.4 As noted in paragraph 3.2.1, it is anticipated that the Contractor would undertake the design of the temporary works and construction of the proposed scheme. An indicative temporary bridge design and indicative construction methodology have been assessed during the EIA process and reported in this EIA Report. The indicative construction methodology includes an indicative temporary raised working platform located on either side of the existing piled viaduct and construction site accesses from the A876 and from the existing access track to the existing Sustainable Drainage System (SuDS) pond at the south of the Higgins Neuk Roundabout.
- 3.3.5 It is proposed that two-way traffic would be maintained on the temporary bridge during construction with the exception of limited periods of single lane working or full closure of the bridge for specific short-term duration activities. Traffic would be diverted onto the replacement piled viaduct on its completion. All temporary access measures provided to facilitate construction of the piled viaduct replacement structure would be removed on completion of construction. The concrete footings of the temporary bridge would be removed, and the piles cut off 1m below the ground level. The working platform and the access from the A876 would be removed. Ground levels would be reinstated where possible to allow the long-term natural re-establishment of saltmarsh habitat.

#### **Existing Piled Viaduct**

- 3.3.6 The extent of the piled viaduct to be replaced is shown on Figure 3.2. The existing piled viaduct is a reinforced concrete structure which forms the southernmost approach to the existing Kincardine Bridge and which extends approximately 80m from the south bank across the intertidal area of the Firth of Forth. The main features of the existing piled viaduct are as follows:
- It consists of five sections, each spanning approximately 15m long, separated by expansion joints.
  - These sections are supported by a substructure consisting of transverse beams supported by reinforced concrete piles.
  - The piles extend approximately 15m through alluvial material to gain support from a layer of gravel and also extend upwards to support the transverse beams at approximately 4.5m above ground level.
  - The piled viaduct is currently supported on secondary propping supports.
  - The parapets on the existing piled viaduct comprise a series of panels spanning between vertical metal support posts. Reinforced concrete posts (pilasters) are situated at the pier positions. 'Varioguard' safety barriers are located between the carriageway and the footways.

#### **Piled Viaduct Replacement Structure**

- 3.3.7 The proposed scheme includes the construction of a new structure to replace the existing piled viaduct. The proposed general arrangement of the piled viaduct replacement structure is shown on Figures 3.3 to 3.5.
- 3.3.8 An artist's impression of the proposed piled viaduct replacement structure is shown in Image 3.1 below.



**Image 3.1: Artist's impression of the proposed piled viaduct replacement**

3.3.9 The piled viaduct replacement structure would comprise the following elements:

- A deck formed using in situ (cast on site) reinforced concrete beams with curved soffits. The deck would be supported at the north end by a new reinforced concrete pier on piled supports, independent from and adjacent to the existing pier at the adjacent 15m span of the Kincardine Bridge, and elsewhere by piled reinforced concrete piers of similar appearance to the existing piers of the adjacent 15m spans of the Kincardine Bridge.
- Large diameter bored cast in situ (cast on site) concrete piles bearing onto bedrock to support the structure.
- A new permanent barrier to replace the temporary 'Varioguard' safety barriers over the length of the piled viaduct replacement.
- The existing parapet panels would be re-erected on the new structure where possible. Where existing parapets panels are not suitable for re-erection, new replacement parapets which resemble the design and materials of the existing parapets would be provided. The existing parapet panels would be removed and then fully inspected to determine which panels would be refurbished and installed in the replacement structure and which panels would be recreated with new panels. Only parapet panels that are not in a suitable condition to be refurbished would be replaced with new replacements resembling the design and materials of originals. The remaining panels would be reinstated as part of the new piled viaduct, following refurbishment off-site. The refurbished / recreated panels would be installed as a pedestrian parapet on the piled viaduct replacement structure. The replacement reinforced concrete posts (pilasters) which are situated at the pier positions would match the design and materials of the originals.
- The existing lamp posts would be retained, refurbished and installed on the piled viaduct replacement structure.
- Pedestrian footways adjacent to the northbound and southbound carriageway.

#### **Temporary Bridge**

3.3.10 The temporary traffic diversion is proposed to be provided via a temporary bridge to be installed adjacent to the north-west side of the existing piled viaduct with a connection to the approach road to the south end of the Kincardine Bridge. The connection of the temporary structure to the Kincardine Bridge would be made to the north-east of the piled viaduct. The temporary bridge structure would contain a pedestrian footway adjacent to the northbound carriageway. The indicative general arrangement of the temporary bridge structure is shown on Figures 3.6 to 3.9.

#### **Temporary Raised Working Platform**

3.3.11 An indicative temporary raised working platform which would provide bearing capacity for the piling rig and to provide a dry working area for operatives and plant has been assessed and reported in the EIA Report. The indicative extent of the temporary raised working platform is shown on Figure 3.1.

3.3.12 To accommodate the proposed temporary raised working platform, the temporary realignment of the existing drainage channel that outfalls from the existing SuDS pond would be required. The indicative alignment of the temporary drainage channel is shown on Figure 3.1.

### 3.4 Embedded Mitigation

3.4.1 As the design of the project has developed, a range of measures have been incorporated into the project design in order to avoid or prevent adverse environmental effects. These measures are referred to as 'embedded mitigation' and are taken into account in this EIA Report before determining potential impacts in line with DMRB LA 104: 'Environmental assessment and monitoring' (Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure Northern Ireland 2019). Further details on the development of mitigation are provided in Chapter 4 (Overview of Assessment Process) and in the individual environmental topic chapters. Table 3.1 collates and summarises the embedded mitigation measures included in the design and where referenced in the environmental topic chapters.

**Table 3.1: Environmental Mitigation Embedded into the Proposed Scheme Design**

Section	Design Principles and Related Environmental Topic
Piled Viaduct Design	<p><u>Road Drainage and the Water Environment, Marine Ecology and Terrestrial Ecology</u></p> <ul style="list-style-type: none"> <li>The proposed piled viaduct replacement structure will comprise spans of a similar size and appearance to the existing 15m spans of the adjacent Kincardine Bridge structure. Approach will minimise the potential for local alterations to flow patterns, increased erosion and sedimentation, and flood storage losses.</li> </ul> <p><u>Cultural Heritage</u></p> <ul style="list-style-type: none"> <li>Only parapet panels that are not in a suitable condition to be refurbished will be replaced. The replacements will resemble the design and materials of originals. The remaining parapet panels will be reinstated as part of the new piled viaduct, following refurbishment off-site.</li> <li>Replacement reinforced concrete posts (pilasters), which are situated at the pier positions, will resemble the design and materials of originals. The four replacement concrete columns (pilasters) on the retained section of the bridge will also be reinstated to their original pier positions.</li> <li>The existing lamp posts will be retained, refurbished and installed on the piled viaduct replacement structure.</li> <li>The design of the new piers will match the spans of the adjacent part of the bridge, ensuring the special architectural and historic interest of the bridge is complemented by the architectural form and quality of the new construction. The proposed new structure will consist of a deck formed using <i>in situ</i> reinforced concrete beams with curved soffits. The deck will be supported at the north end by a new reinforced concrete pier on piled supports, independent from and adjacent to the existing pier at the southernmost 15m span, and elsewhere by piled reinforced concrete piers of similar appearance to the existing piers of the adjacent 15m spans.</li> </ul> <p><u>Material Assets and Waste and Climate</u></p> <ul style="list-style-type: none"> <li>The piled viaduct replacement structure has been designed using the latest analysis software to drive design efficiency and reduce the quantity of all materials used in construction. The concrete mix for the structural members has been specified as containing 40% ground-granulated blast-furnace slag (GGBS) addition. This addition of recycled material is more sustainable than Portland cement (CEM1) and will reduce peak temperatures during curing (hydration), which reduces the effect of Early Thermal Cracking, and hence reduces the volume of steel reinforcement required (larger bars or closer spacings).</li> <li>Piled viaduct structure made integral to remove the need for bearings and movement joints, reducing the maintenance liability and need to replace components over the lifetime of the structure. The use of stainless steel reinforcements in critical areas will also improve the durability of the structure and minimise future maintenance interventions.</li> </ul> <p><u>Non-Motorised Users</u></p> <ul style="list-style-type: none"> <li>A pedestrian footway will be instated adjacent to the northbound and southbound carriageway on the replacement piled viaduct structure to ensure continuity of the route during operation of the proposed scheme.</li> </ul>

Section	Design Principles and Related Environmental Topic
Temporary Bridge Structure	<p><u>Cultural Heritage</u></p> <ul style="list-style-type: none"> <li>The temporary bridge structure will be a stand-alone structure, abutting the bridge during construction. Bridge plates and a temporary road surface will be used to cover the abutment.</li> </ul> <p><u>Non-Motorised Users</u></p> <ul style="list-style-type: none"> <li>A pedestrian footway will be instated adjacent to the northbound carriageway on the temporary bridge structure to ensure continuity of the route during construction.</li> </ul>
Operational Drainage Design	<p><u>Road Drainage and the Water Environment and Climate</u></p> <ul style="list-style-type: none"> <li>The current drainage system for Kincardine Bridge discharges directly into the Forth Estuary with no treatment or attenuation. The new drainage associated with the proposed scheme will discharge to the existing SuDS basin at the Higgins Neuk Roundabout, prior to discharging to the Forth Estuary.</li> <li>The new drainage system has been designed to accommodate the 20% AEP (5-year) return period rainfall event, including a 35% allowance for climate change in line with the latest SEPA guidance (SEPA 2019b).</li> </ul>

### 3.5 Construction Methods and Programme

3.5.1 This section provides a brief outline of the envisaged construction programme and construction activities, and examples of essential mitigation to be implemented during construction (a full list is provided in Chapter 17 (Schedule of Environmental Commitments)). Phasing and methods for these construction activities and the assumptions made for the purposes of this EIA Report are provided in Appendix A3.1 (Construction Information).

3.5.2 It is anticipated that construction would not commence before Summer 2021 (subject to completion of statutory procedures) and the overall construction period is expected to be between 18 and 24 months. Habitat re-instatement and management commitments may continue after this timeframe.

#### Outline Construction Programme

3.5.3 To assist the EIA process, the approximate duration of construction activities has been estimated. An outline of the potential timing of the overall works (subject to completion of the statutory procedures) is provided in Table 3.2.

**Table 3.2: Outline Construction Works Duration**

Indicative Duration	Construction Activities
2 months	<ul style="list-style-type: none"> <li>Mobilisation / Site Establishment</li> <li>Advance Works – some environmental mitigation works may be required six months or more in advance of the mobilisation / site establishment.</li> </ul>
16 to 22 months	<ul style="list-style-type: none"> <li>Main Works</li> <li>Temporary Works</li> <li>Environmental Mitigation</li> </ul>

#### Indicative Construction Activities

3.5.4 The key indicative elements of the construction works have been broken down to facilitate the assessment of environmental effects. The indicative construction activities associated with the proposed scheme are outlined in Table 3.3.

**Table 3.3: Indicative Construction Activities**

Section	Indicative Construction Activities
Advance works	<ul style="list-style-type: none"> <li>Where required, environmental mitigation to be implemented in advance of the main construction contract i.e. construction of otter holt.</li> <li>Advance service diversions.</li> </ul>
Mobilisation/Site establishment	<ul style="list-style-type: none"> <li>Provision of temporary access to the construction site from the north (from the A876) (construction of temporary access junction and establishment of access track including installation of geotextile matting and crushed rock on the saltmarsh surface).</li> <li>Provision of temporary access to the construction site from the south (from the existing access track at the south of the Higgins Neuk Roundabout) and establishment of site access track (installation of geotextile matting and crushed rock on the saltmarsh surface).</li> <li>Establishment of the construction site compound and material storage area to the east of the SuDS pond at the Higgins Neuk Roundabout.</li> </ul>
Construction of temporary bridge structure	<ul style="list-style-type: none"> <li>Installation of trackway for plant for installation of sheet piles.</li> <li>Installation of sheet piling between temporary bridge and existing piled viaduct.</li> <li>Development of temporary construction drainage measures which will likely comprise use of a proprietary treatment system. This system will treat surface water and dewatering as appropriate during construction of the temporary bridge structure, demolition of the existing piled viaduct, construction of the piled viaduct replacement structure and removal of the temporary bridge structure.</li> <li>Construction of the raised working platform to the north of the existing piled viaduct (installation of geotextile matting and crushed rock on the saltmarsh surface).</li> <li>Installation of piles and footings for temporary bridge.</li> <li>Removal of reinforced concrete pilasters, parapet panels and the lamp posts at the tie-in (between the 2nd, 3rd, 4th and 5th spans of the adjacent section of the Kincardine Bridge).</li> <li>Erection of temporary bridge support structure and deck.</li> <li>Installation of bridging plates and temporary surfacing.</li> <li>Diversion of traffic onto temporary bridge structure.</li> </ul>
Demolition of existing piled viaduct	<ul style="list-style-type: none"> <li>Construction of the raised working platform to the south of the existing piled viaduct (installation of geotextile matting and crushed rock on the saltmarsh surface).</li> <li>Removal of the steel propping system</li> <li>Installation of netting / collection measures for the demolition debris.</li> <li>Removal of parapet panels and lamp posts.</li> <li>Demolition of the existing piled viaduct (deck, diaphragms and piles).</li> <li>Cut off piles to 1m below ground level.</li> </ul>
Construction of piled viaduct replacement	<ul style="list-style-type: none"> <li>Installation of piles for all piers, diaphragms and south abutment.</li> <li>Installation of sheet piling around each footing and south abutment to form caissons.</li> <li>Construction of pile caps.</li> <li>Construction of new piers and superstructure.</li> <li>Backfill over south abutment.</li> <li>Casting of parapet support slabs, waterproofing of bridge deck and installation of kerbing.</li> <li>Surfacing over bridge and south abutment.</li> <li>Installation of expansion joints.</li> <li>Installation of new safety barriers on deck.</li> <li>Installation of parapets panels and lamp posts.</li> <li>Removal of south working platform and temporary access track.</li> <li>Removal of geotextile matting.</li> </ul>
Removal of temporary bridge structure	<ul style="list-style-type: none"> <li>Diversion of traffic onto the piled viaduct replacement structure.</li> <li>Dismantling and removal of the temporary bridge.</li> <li>Removal of footings and cut off piles to 1m below ground level.</li> <li>Removal of north working platform and access track.</li> <li>Removal of geotextile matting.</li> </ul>

3.5.5 An assessment of the material asset consumption and waste generation as a result of the above construction activities is provided in Chapter 13 (Material Assets and Waste).



#### Construction Site Compound

- 3.5.6 The construction site compound is proposed to be located to the east of the SuDS pond at the Higgins Neuk Roundabout. The construction site compound would provide toilet facilities and mess facilities. In addition, a material storage area would be provided at the construction site compound for the construction phase.

#### Environmental Mitigation

- 3.5.7 The Contractor would be required to implement all relevant essential environmental mitigation measures outlined in this EIA Report. These would include a range of measures to avoid or reduce environmental effects.
- 3.5.8 Further information on environmental mitigation is provided within each assessment chapter and summarised in Chapter 17 (Schedule of Environmental Commitments).

#### Land Made Available

- 3.5.9 Construction work would take place within the limit of the land made available (LMA) to the appointed Contractor as defined within the contract documents (**Mitigation Item SM6**). An indicative LMA is shown on Figure 3.1 and relevant figures for each assessment chapter. In addition, it is anticipated that advanced works essential ecological mitigation measures, i.e. construction of replacement otter holt as specified in **Mitigation Item TE13**, would take place within land owned by the Scottish Ministers at the SuDS pond at Higgins Neuk Roundabout in advance of the main construction works.
- 3.5.10 The LMA would include land acquired under a compulsory purchase order (CPO) and land to which the Scottish Ministers already has ownership of or access to. Figure 3.10 (Proposed Scheme Land-take) shows the LMA boundary, Scottish Ministers land, and land to be temporarily occupied for construction by agreement.
- 3.5.11 The land to be acquired for the proposed scheme includes land necessary to construct the proposed scheme and to undertake essential environmental mitigation measures.
- 3.5.12 Should the appointed Contractor wish to utilise other areas of land outwith the LMA, the use of the land would have to be secured by agreement and through separate planning applications, where appropriate. As the requirement and potential location of such areas is currently unknown, it has not been possible to include an assessment of the effects of them within this EIA Report. As described in paragraph 3.2.3 and 3.2.4 and **Mitigation Item SM5**, design changes, including the requirement for additional areas of land outwith the LMA, will be subject to environmental review.

### **3.6 Designated Areas**

- 3.6.1 The LMA to the appointed Contractor for temporary works and construction is approximately 3.87ha. Within this area, the proposed scheme requires temporary loss of 3.24ha of habitat within the Firth of Forth Site of Special Scientific Interest (SSSI), Firth of Forth Special Protection Area (SPA), and Firth of Forth Ramsar sites during construction, of which up to 2.99ha comprises saltmarsh habitat. The saltmarsh temporarily lost during construction will be subject to mitigation measures to aid recovery, for example on completion of the works all access tracks and working platforms would be removed in their entirety from the saltmarsh (**Mitigation Item ME5**) to minimise damage to saltmarsh habitat and allow the existing National Vegetation Classification (NVC) community to re-establish in the long-term.
- 3.6.2 The footprint of the proposed scheme, once operational, requires approximately 0.012ha less land take from the Firth of Forth SSSI, SPA and Ramsar sites than the existing piled viaduct on the basis that the proposed piled viaduct replacement structure contains fewer supports that require land take.

### **3.7 References**

Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure Northern Ireland (2019). Design Manual for Roads and Bridges, LA 104 Environmental assessment and monitoring, Revision 1.