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Forth Replacement Crossing
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58 Port Dundas Road
Glasgow G4 0HF

The closing date for feedback is Friday 7th September 2007.
**Introduction**

The Forth Bridges are one of the most famous images of Scotland's industrial past and are a symbol of our commitment to bridging the gaps of the past, presenting the Forth to the world and creating a legacy for future generations. The Forth Road Bridge is a vital link connecting the east coast economic corridor and is a key component of the Scottish road network. It is anticipated that the Forth Road Bridge would be replaced by a new crossing due to the increasing weight and number of vehicles but also due to weather and climate.

The Forth Road Bridge

Where the Forth Road Bridge opened in 1964 it was one of the world's most impressive feats of engineering and the longest continuous-span suspension bridge in the world. At the time, a 4,000-car vehicle used the crossing to travel north over the Firth of Forth every year. In 2006, this figure was closer to 12 million - growing more than five-fold in 30 years - for higher than the national average traffic growth. With 85,000 vehicles per day, the Forth Road Bridge carries 20% of the traffic crossing the Forth.

Despite constant maintenance and investment throughout its lifetime, the bridge shows signs of deterioration in need of repair to maintain its safety and functionality. As a result of the increasing weight and number of vehicles but also due to weather and climate.

The Forth Road Bridge is maintained and managed by the Forth Bridge Trust (FBT) which has now decided to start work by carrying out a four-year programme of repairs and maintenance work which will begin in the near future. The Forth Bridges is one of the most famous images of Scotland's industrial past and is a symbol of our commitment to bridging the gaps of the past, presenting the Forth to the world and creating a legacy for future generations.

Carrying out these works while the bridge remains open to traffic would result in a partial closure for 56 weeks and partial closures for 48 weeks over a further year. It is anticipated that these works would be completed by 2021. For the future of the Forth Road Bridge, the obvious question is: how will we cross the Forth?

**Developing the new crossing**

Is 2014 and 2015 Transport Scotland and a group of leading transport consultants have been exploring options for a new Forth crossing. The process has worked down from an original list of 170 options to the final short-list of two - a bridge or a tunnel.

**Option 1: Bridge**

The first of the new bridge options from the study is a new bridge in corridor D. The option is to build alongside the existing bridge. It is anticipated that a new bridge would be completed by 2027.

**Key facts:**
- £20 billion to cost ratio 3.83
- 6 years to construct
- Key benefits:
  - Highest benefit to cost ratio
  - Can include more lanes than a tunnel and therefore feature
  - Has the highest benefit to cost ratio
  - Can be built quicker – around two years less than tunnel
  - Is the cheapest of all the options
  - Does not directly affect the special protected environmental season
  - Would incur some loss of woodland

**Option 2: Tunnel**

The second option under consideration is a tunnel, again to the west of the existing Forth Road Bridge. The precise line of the tunnel has not been fixed, as it would be influenced by the detailed ground investigations that were carried out in 2006.

**Key facts – Corridor C Tunnel:**
- 8.1 km long
- Northern entrance linking with M93 at Junction 2
- Southern entrance linking with M99 near Grangemouth
- 7 years to construct
- Cost estimate £2.3 billion at 2006 prices
- Benefits to cost ratio 2.23
- Immersed Tube Tunnel:
  - 7.3 km long
  - Twin bore tunnel (one tunnel in each direction)
  - Benefit to cost ratio of 2.44
  - Cost estimate £2.2 billion at 2006 prices
  - Southern entrance linking with M99 near Grangemouth

**Key facts – Corridor D Tunnel:**
- Twin bored tunnel (one tunnel in each direction)
- 9.1 km long
- Southern entrance linking with A909
- Northern entrance linking with A919
- Cost estimate £1.85 billion at 2006 prices
- Benefits to cost ratio 2.1

**Key facts – Immersed Tube Tunnel:**
- Twin bored immersed tube
- 6.8 km long
- Twin bore immersed tube (one tunnel in each direction)
- Cost estimate £2.5 billion at 2006 prices
- Benefits to cost ratio 2.44
- Southern entrance linking with M99 near Grangemouth
- Northern entrance linking with M99 near Grangemouth
- Cost estimate £2.3 billion at 2006 prices
- Benefits to cost ratio 2.23
- Immersed Tube Tunnel allows more flexible use of
- twin bore immersed tube (one tunnel in each direction)
- Construction and breaks in trench excavation (Immersed Tunnel only)
- Immersed Tube Tunnel would take a similar time to construct as bridge but would take around 2 years more

**Option 2: Tunnel**

The second option under consideration is a tunnel, again to the west of the existing Forth Road Bridge. The precise line of the tunnel has not been fixed, as it would be influenced by the detailed ground investigations that were carried out in 2006. It is anticipated that the tunnel would be faster (Corridors D and C) and could cost more than £2 billion. The precise line of the tunnel would be used to assess the tunnel boring machine needed to construct it, although immersed tube tunnel techniques are also possible.

### Table: Comparison of options

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Introduction

The Forth Bridges are one of the most famous icons of Scotland’s industrial heritage and have played a prominent role in the economic development of Scotland. The bridges are a testament to the ingenuity and dedication of the engineer Thomas Telford, designed to facilitate transport across the Forth Estuary, connecting the economic centers of Fife and Edinburgh. Today, the bridges continue to be vital for the flow of goods and services and are a symbol of Scotland’s industrial past.

The Forth Road Bridge

When the Forth Road Bridge opened in 1964, it was one of the world’s most impressive feats of engineering and the longest suspension bridge in the world. It was an engineering marvel that transformed the region’s connectivity and economic landscape. However, over time, the bridge has shown signs of wear and tear, requiring regular maintenance and investment to ensure its continued functionality.

Developing the new crossing

In 2006 and 2007, Transport Scotland and a group of leading transport consultants have been exploring options for a new Forth crossing. The process has been driven by a need to address the increasing weight and number of vehicles using the bridge. The investigation aims to select the most appropriate option for a new Forth crossing, which is scheduled to be completed by 2020.

Over time the options have been sifted as follows:

- Reduced to three corridors: (A to E)
- Bridge in corridor D
- Tunnel in corridor E rejected
- Northern entrance linking with M90 North of Halkirk
- Southern entrance linking with M90 North of Halkirk
- Southern entrance linking with M99/RyrieBurn
- Cost estimate £2.1 billion at 2006 prices
- Benefit to cost ratio 4.31

Option 1: Bridge

The first of the new final options from the study is a new bridge in corridor D. A new bridge in corridor D is the most likely option. Engineering homes and new safety measures in order to build a new 2014 bridge will not have been completed.

Key facts:

- 2.2 km long
- Southern access linking with M99 approximately 1 km west of Grangemouth
- Southern access linking with A90/M90 in the vicinity of Bathgate

Cable Stay options:

- 97 to 108 m. to span
- Cost estimate £1.5 billion at 2006 prices
- Benefit to cost ratio 4.21

Option 2: Tunnel

The second option under consideration is a tunnel, again to the west of the existing Forth Road Bridge.

Key facts – Corridor C Tunnel:

- 8.5 km long
- Northern access linking with M99 at Junction 2
- Southern access linking with M99 near Craigmillar
- Cost estimate £2.2 billion at 2006 prices
- Benefit to cost ratio 4.11

Option 3: Immerged Tube Tunnel

- 6.4 km long of which 2.2 to 3.3 km is immersed tube
- Northern entrance links with M90 at Junction 2 via A823 (M)
- Southern entrance linking with M99 near Craigmillar
- Cost estimate £2.3 billion at 2006 prices
- Benefit to cost ratio 4.41

Bridge design has advanced significantly since the Forth Road Bridge was designed and a new bridge would need to be designed with modern technology, such as built-in dehumidification system, to ensure a good service life.

Key benefits:

- Minimal visual impact on the landscape except for the portals, ventilation shafts and road connections
- Fewer risks during construction
- Fewer risks during construction
- Lower environmental impact
- Greater potential for light rapid transit (LRT) transport

Key drawbacks:

- High initial cost
- Limited accessibility
- Lower capacity
- Limited future development

The Forth Road Bridge is the main route across the Forth Estuary, connecting Fife and Edinburgh and vital for thousands of businesses and commuters. As an economic lifeline for the region, it essential for maintaining the flow of goods and services. The decision on the future is underway.

Introduction

Despite constant maintenance and investment throughout its service life, the bridge has shown signs of wear and tear, requiring regular maintenance and investment to ensure its continued functionality. The Forth Road Bridge carries 50% of the traffic that crosses the Forth Estuary, with 600,000 vehicles per day. The Forth Road Bridge carries 40% of the traffic that crosses the Forth Estuary. Despite constant maintenance and investment throughout its service life, the bridge has shown signs of wear and tear, requiring regular maintenance and investment to ensure its continued functionality.

Carrying out these works while the bridge remains open will pose a significant challenge, so it is planned to close the bridge for 50 weekends and partial closures for four weeks over a four-year period. It could mean the bridge would be closed completely for 52 weekends.
Introduction

The Forth Bridges are one of the most famous images of Scotland. They are the principal route to Edinburgh, opening the forth of Firth and connecting the few cities. The Forth Road Bridge is the third bridge across the road to the wealth of Scotland as a whole. It is 21 years old and now over 20 years old and it is becoming more common in the future. In particular the bridge’s design was selected to accommodate a longer life as a result of the special protection area that was found when more detailed surveys were carried out. It is anticipated that the bridge would be a crossing point for the future. It is 70% of the traffic that crosses the Forth and it is an economic lifeline for Fife, Edinburgh and the east coast of Scotland and vital for thousands of businesses and commuters. The road traffic crossing the bridge is estimated to be 12 million cars a year, growing more than five-fold in the next 40 years - far higher than the national average traffic growth. The bridge is also due to weather and climate.

Developing the new crossing

In 2004 and 2005 Transport Scotland and a group of leading transport consultants have been exploring options for a new Forth crossing. The bridge has been described as an original part of the list of 65 options in the final report of a new bridge and a tunnel to the West of the existing Forth Road Bridge.

Option 1: Bridge

The first of the two final options from the study has a new bridge in corridor D to the west of the existing Forth Road Bridge. Engineers have recommended a cable stayed bridge, although a new bridge to the existing Forth Road Bridge has not been ruled out.

Key facts:
- 2 km long
- Southern access linking with M90 approximately 1 km west of North Queensferry
- Northern access linking with A90/A92 in the vicinity of Edinburgh

Cost estimate £1.6 billion at 2006 prices

6 years to construct

Benefit to cost ratio 3.83

Option 2: Tunnel

The second option under consideration is a tunnel, again to the west of the existing Forth Road Bridge. The precise line of the tunnel has not been fixed, and it is influenced by the guided public consultation that started when more detailed surveys were carried out. It is anticipated that the tunnel would be 2 to 3 km long north to south and 3 to 4 km long east to west.

Key facts – Corridor C Tunnel:
- 5.1 km long
- Northern entrance linking with A90/A92 in the vicinity of Edinburgh
- Southern entrance linking with M90 North of Harthill Regional

Cost estimate £2.3 billion at 2006 prices

5½ years to construct

Benefit to cost ratio of 2.44

Key facts – Corridor D Tunnel:
- 6.2 km long
- Northern entrance linking with A90/A92 in the vicinity of Edinburgh
- Southern entrance linking with M90 South of Harthill Regional

Cost estimate £2.3 billion at 2006 prices

5½ years to construct

Benefit to cost ratio of 2.68

Key facts – Immersed Tube Tunnel:
- 5.2 km long
- Northern entrance linking with M90 East of North Queensferry
- Southern entrance linking with M90 West of Harthill Regional

Cost estimate £2.3 billion at 2006 prices

5½ years to construct

Benefit to cost ratio of 3.3

Carrying out these works while the bridge remains open to traffic would probably take between 3 and 7 years and could create considerable traffic for 5 weeks and partial closures for 40 weeks during the year. It is also possible that the new bridge would be closed completely for 52 weekends.

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The Forth Road Bridge

When the Forth Road Bridge opened in 1964 it was one of the most impressive feats of engineering and the largest European road bridge at the time at 2 miles long. At that time a new 2 cylinder vehicles used in the crossing to travel the forth of Firth and the bridge was 21 years old. The figure was closed to 12 million – growing more than five-fold in 40 years - far higher than the national average traffic growth. With 360,000 vehicles per day, the Forth Road Bridge carries 200,000 of the traffic crossing the Forth. Despite current maintenance and improvements throughout its lifetime, the bridge has shown signs of deterioration, mostly as a result of the increasing weight and number of vehicles but also due to weather and climate.

The Forth Road Bridge is maintained and managed by the Scottish Transport Alliance (STA) which has been described as a small group of experienced experts on road maintenance. It will not be the first for traffic crossing the bridge and it is a new bridge and a tunnel to the West of the existing Forth Road Bridge.

Option 1: Bridge

This process is explained in more detail in the exhibition and in the detailed report which can be found on the project website. Forth REPLACEMENT CROSSING INNOVATION.
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Protecting the environment
As well as being an area of great beauty, the Firth of Forth is home to a number of very significant environmental features, protected for all time. These include:
- SPAs – Special Protection Areas which are important habitats for rare and migratory birds
- Ramsar sites – wetlands of international importance
- SACs – Special Areas of Conservation
- SCMs – Sites of Community Importance
- SPA – Special Areas of Protected Land
- SSIs – Sites of Special Scientific Interest
- SNMs – Sites of National Importance
- LBI – Local Biodiversity Inventory
- Special Protection Areas which are important habitats for rare and migratory birds
- Ramsar sites – wetlands of international importance
- SACs – Special Areas of Conservation
- SCMs – Sites of Community Importance
- SAMs – Scheduled Ancient Monuments
- GDLs – Gardens and Designed Landscapes
- Country parks, local nature reserves and significant areas of woodland
- Listed buildings, archaeological sites and heritage conservation areas
- Various woodlands and specially protected trees
- Areas of Landscape Value
- Greenspace areas
- Rights of way and other public access

The need to protect the environment of the Firth of Forth has been an important part of the study. One of the key considerations which all the options have been assessed against is:
‘Minimise the impact on people, the natural environment and the cultural heritage of the Firth area.’

These environmental features, many of which are protected under regulations, will be carefully considered during the design of the crossing, working closely with organisations such as Scottish Natural Heritage, Scottish Environment Protection Agency and Historic Scotland.
A n  i n t r o d u c t i o n  t o  t h e Forth Replacement Crossing

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Protecting the environment
As well as being an area of great beauty, the Firth of Forth is home to a number of very significant environmental features, protected under various Acts and orders. These features include:
- SPAs – Special Protection Areas which are important habitats for rare and migratory birds
- Ramsar sites – wetlands of international importance
- SACs – Special Areas of Conservation with listed species
- SSSIs – Sites of Special Scientific Interest

These environmental features, many of which are protected under regulations, will be carefully considered during the design of the crossing, working closely with organisations such as Scottish Natural Heritage, Scottish Environment Protection Agency and Historic Scotland.

An introduction to the Forth Replacement Crossing

www.forthreplacementcrossing.info