

2 The Scheme and Alternatives Considered

2.1 Introduction

2.1.1 The EIA Regulations state that alternatives for a scheme should be considered in the environmental assessment process, be it alternative location, design or technology. By looking at alternative options, the aim is for the scheme to evolve sustainably by taking into account all constraints throughout the lifetime of the project.

2.2 No Development Alternative

2.2.1 A “do nothing” scenario was not considered, as the junctions at Laurencekirk have had issues relating to safety and delay. The junctions have already been subject to a range of measures aimed at reducing accident frequency and severity. However, a long running campaign, led by the local community, resulted in a petition to the Scottish Government being lodged in February 2009 seeking the construction of a grade separated junction at the A90/A937 southern junction.

2.3 Alternatives Considered at Stage 2 assessments

2.3.1 The following is a summary description of the proposals for all options that were considered during Stage 2 (shown in **Figure 2.1 – Figure 2.4**).

Option 1A

2.3.2 This scheme option was a grade-separated junction (GSJ) positioned at the location of the existing junction of the A937 single carriageway with the A90 dual-carriageway to the south-west of Laurencekirk.

2.3.3 The GSJ was a full-diamond layout with dumb-bell roundabouts. The layout comprised the local realignment of the A937 carriageway over a bridge over the A90 with four slip-roads to the A90 from two roundabouts on either side of the overbridge.

2.3.4 The overbridge would span the A90 dual-carriageway and verges between concrete abutments positioned on either side of the A90. The realigned A937 carriageway would be approximately 7.8m above the A90 carriageways and up to 7m above the general level of surrounding fields.

2.3.5 The A937 realignment would tie into the existing road near Mains of Newton Farm on the southbound side of the A90 and tie into the existing road at the Laurencekirk 30mph limit on the northbound side of the A90. A shared-use footpath/cycle track will run along one side of the A937 from tie-in to tie-in including over the bridge.

- 2.3.6 Street lighting would be provided at the dumb-bell roundabouts with the potential to be extended over a longer length of the realigned A937. Speed limits other than national speed limit for the grade-separated junction roads would be considered.

Option 1B

- 2.3.7 Option 1B was the GSJ as Option 1A but with the central reserve gap closed at the north A937 junction, as shown in **Figure 2.1**.

Option 1C

- 2.3.8 Option 1C was the GSJ as Option 1A but with the addition of a link road from the roundabout on the southbound side of the A90 to the B9120 (Laurencekirk centre junction with the A90), as shown in **Figure 2.2**.

- 2.3.9 The B9120 link road was aligned parallel to the A90 on the southbound side and connects with the B9120 via a roundabout. The existing B9120 junction with the A90 would be closed. The link road was generally at-grade other than where it elevates to meet the roundabout on the southbound side of the grade-separated junction.

- 2.3.10 The link road carriageway was 6m wide with 0.6m hardstrips and 2m wide verges. A 3m wide shared-use footpath/cycletrack runs along one side of the link road.

- 2.3.11 Drainage for the link road would be conventional filter and carrier drains leading to Sustainable Drainage Systems (SuDS) attenuation facilities and ultimately to discharge to the Gaugers Burn that flows to the Luther Water north-west of Laurencekirk then into the River North Esk near North Water Bridge, approximately 6.4km south-west of Laurencekirk.

Option 1D

- 2.3.12 Option 1D is the GSJ as Option 1C but with the central reserve gap closed at the north A937 junction, as shown in **Figure 2.2**.

Option 2A

- 2.3.13 Option 2A is similar to Option 1 except that the grade-separated junction is a half-cloverleaf layout with dumb-bell roundabouts. The layout comprised the local realignment of the A937 carriageway on a bridge over the A90 with slip-roads that loop down to/from the bridge to the A90 in the south-west and north-east quadrants from two roundabouts on either side of the overbridge.

- 2.3.14 The overbridge would span the A90 dual-carriageway and verges between concrete abutments positioned on either side of the A90. The realigned A937 carriageway would be approximately 7.8m above the A90 carriageways and up to 7m above the general level of surrounding fields.

2.3.15 The A937 realignment would tie into the existing road near Mains of Newton Farm on the southbound side of the A90 and tie into the existing road at the Laurencekirk 30mph limit on the northbound side of the A90. A shared-use footpath/cycle track would run along one side of the A937 from tie-in to tie-in including over the bridge. A smaller local access road will connect to the A937 via a T-junction on the southbound side of the A90 and extend to the existing access road for the Johnston Lodge property.

2.3.16 Street lighting would be provided at the dumb-bell roundabouts with the potential to be extended over a longer length of the realigned A937. Speed limits other than national speed limit for the grade-separated junction roads would be considered.

Option 2B

2.3.17 Option 2B was as Option 2A but with the central reserve gap closed at the north A937 junction.

Option 2C

2.3.18 Option 2C was as Option 2A but with the addition of a link road from the roundabout on the southbound side of the A90 to the B9120 (Laurencekirk centre junction with the A90).

2.3.19 The B9120 link road was aligned parallel to the A90 on the southbound side and connects with the B9120 via a roundabout. The existing B9120 junction with the A90 would be closed. The link road was generally at-grade other than where it elevates to meet the roundabout on the southbound side of the grade-separated junction.

2.3.20 The link road carriageway was 6m wide with 0.6m hardstrips and 2m wide verges. A 3m wide shared-use footpath/cycletrack runs along one side of the link road.

2.3.21 Drainage for the link road would be conventional filter and carrier drains leading to SuDS attenuation facilities and ultimately to discharge to the Gaugers Burn that flows to the Luther Water north-west of Laurencekirk then into the River North Esk near North Water Bridge, approximately 6.4km south-west of Laurencekirk.

Option 2D

2.3.22 Option 2D is as Option 2C but with the central reserve gap closed at the north A937 junction.

2.3.23 **Figure 2.3** shows all the sub-options (Option 2A, 2B & 2C) combined as Option 2D.

Option 3

2.3.24 This option was a realignment of the A937 from a tie-in to the existing road near Mains of Newton Farm at the location of the existing junction of the A937 single carriageway (Laurencekirk-Montrose local authority road) with the A90 dual-carriageway (Dundee-Aberdeen trunk road) to the south-west of Laurencekirk. The realigned A937 ran parallel to the southbound side of the

A90 and connected to a grade-separated junction positioned south of the location of the existing junction of the A937 single carriageway (local authority road through Laurencekirk) with the A90 dual-carriageway (Dundee-Aberdeen trunk road) to the north of Laurencekirk, as shown in **Figure 2.4**.

- 2.3.25 The GSJ layout incorporated a new A90 southbound off-slip road but utilised the existing junction of the A937 with the A90 for on and off access with the northbound side of the A90. The layout comprised continuation of the realignment of the A937 carriageway to a roundabout on the southbound side of the A90 then on a bridge over the A90 to tie back into the existing A937 at a new roundabout just north of Laurencekirk. The on-slip road to the southbound carriageway of the A90 was located at the southern end of the A937 realignment near the location of the existing junction of the A937 single carriageway with the A90 dual-carriageway to the south-west of Laurencekirk.
- 2.3.26 The overbridge would span the A90 dual-carriageway and verges between concrete abutments positioned on either side of the A90. The realigned A937 carriageway would be approximately 7.8m above the A90 carriageways and up to 8.5m above the general level of surrounding fields where they are lower lying on the northbound side of the A90.
- 2.3.27 A shared-use footpath/cycle track would run along one side of the A937 from tie-in to tie-in including over the bridge. A smaller local access road would connect to the roundabout on the southbound side of the A90 and extend to the existing access road for Keilburn Farm and cottages.
- 2.3.28 The B9120 and access roads on the southbound side of the A90 would connect to the A937 realignment via a T-junction and all direct connections to the A90 dual-carriageway, over the extents of the A937 realignment, would be closed.
- 2.3.29 Street lighting would be provided at the roundabouts with the potential to be extended over a longer length of the realigned A937. Speed limits other than national speed limit for the grade-separated junction roads would be considered.

Two Grade-Separated Junction Option

- 2.3.30 This option was two GSJs as follows:
 - o positioned at the location of the existing junction of the A937 single carriageway (Laurencekirk-Montrose local authority road) with the A90 dual-carriageway (Dundee-Aberdeen trunk road) to the south-west of Laurencekirk, and;
 - o positioned south of the location of the existing junction of the A937 single carriageway (local authority road through Laurencekirk) with the A90 dual-carriageway (Dundee-Aberdeen trunk road) to the north of Laurencekirk.

- 2.3.31 The south GSJ sub-options were:
- A and B, a full-diamond layout with dumb-bell roundabouts. The layout comprised local realignment of the A937 carriageway on a bridge over the A90 with four slip-roads to the A90 from two roundabouts on either side of the overbridge. The B sub-option is to also amend the B9120 junction to left-in and left-out only with the A90 southbound carriageway, and;
 - C and D, a half-cloverleaf layout with dumb-bell roundabouts. The layout comprised local realignment of the A937 carriageway on a bridge over the A90 with slip-roads that loop down from the bridge to the A90 in the south-west and north-east quadrants (forming the half-cloverleaf shape) from two roundabouts on either side of the overbridge. The D sub-option would also amend the B9120 junction to left-in and left-out only with the A90 southbound carriageway.
- 2.3.32 The north GSJ incorporated new off-slip and on-slip roads that loop from the bridge to/from the A90 on the southbound side. Access to the A90 on the northbound side utilised the existing junction of the A937 with the A90 for on and off access. The layout comprised a roundabout on the southbound side of the A90 with a link road on a bridge over the A90 to tie back into the existing A937 at a new roundabout just north of Laurencekirk.
- 2.3.33 The overbridges at both GSJs would span the A90 dual-carriageway and verges between concrete abutments positioned on either side of the A90. The carriageways on the bridges would be approximately 7.8m above the A90 carriageways and up to 7m above the general level of surrounding fields at the south junction and up to 8.5m above the general level of surrounding fields at the north junction where they are lower lying on the northbound side of the A90.
- 2.3.34 The A937 realignment for the south GSJ would tie into the existing road near Mains of Newton Farm on the southbound side of the A90 and tie into the existing road at the Laurencekirk 30mph limit on the northbound side of the A90. A shared-use footpath/cycletrack would run along one side of both roads from tie-in to tie-in including over the bridge. A smaller local access road would connect to the roundabout on the southbound side of the A90 at both GSJs, with the one at the south GSJ extending to the existing access road for the Johnston Lodge property and the one at the north GSJ extending to the existing access road for Keilburn Farm and cottages. An access road would also connect Burnside Cottage to the roundabout on the southbound side of the A90 at the north GSJ.
- 2.3.35 Street lighting would be provided at the roundabouts with the potential to be extended over a longer length of the realigned A937 and/or link. Speed limits other than national speed limit for the grade-separated junction roads would be considered.

Preferred Option

- 2.3.36 Each option was ranked for each environmental topic. The results of option ranking showed that Option 1A was the preferred environmental option being ranked first by five out of the nine environmental topics and second by four out of the nine topics. The second preferred option was Option 1B being ranked first by five out of the nine topics and second by three out of the nine topics. Plate 2-1 details the environmental options ranking that was completed at Stage 2.

- 2.3.37 The environmental assessment of the 13 options under consideration for the A90/A937 Laurencekirk Junction Improvements was undertaken in accordance with DMRB and concluded that Option 1A was the Preferred Option. This option was taken forward for further assessment and design refinement at Stage 3.

2.4 Stage 3 Design Development

Overview – General Description

- 2.4.1 The scheme will provide a GSJ positioned at the location of the existing junction of the A937 single carriageway (Laurencekirk-Montrose local authority road) with the A90 dual-carriageway (Dundee-Aberdeen trunk road) to the south-west of Laurencekirk.
- 2.4.2 The GSJ is a full-diamond layout with dumb-bell roundabouts. The layout comprises local realignment of the A937 carriageway over a bridge over the A90 with four slip-roads to the A90 from two roundabouts on either side of the overbridge.
- 2.4.3 The A937 realignment will tie into the existing road near Mains of Newton Farm on the southbound side of the A90 and tie into the existing road at the Laurencekirk 30mph limit on the northbound side of the A90. The A937 carriageway will be 7.3m wide with 2.5m wide verges.
- 2.4.4 A 3m wide shared-use footpath/cycletrack will run along one side of the A937 (separated from it by a 2m separation verge) from tie-in to tie-in including over the bridge. The slip road carriageways will be circa 7.7m or 9.3m wide depending on whether they are one or two lanes with 0.5m verges. A smaller local access road will connect to the roundabout on the southbound side of the A90 to the existing access road for the Johnston Lodge property.
- 2.4.5 The scheme design is shown in **Figure 1.2** and **1.3**.

Construction

- 2.4.6 Construction has been assumed to last approximately 12 - 15 months, this will allow the construction of the structure, traffic management and phasing for the embankment plus all road related construction.
- 2.4.7 The construction programme is outlined below;
- Phase 1.1 (duration 18 weeks):
 - All offline works excluding the old A90, the south roundabout and the A937 south;
 - The A90 overbridge foundations and abutments to the north of the A90;

- Construction of temporary access road to the east of the existing A937; and
 - Construction of temporary access road to existing Denlethen Woods access.
 - Phase 1.2 (duration 2 weeks): Construction of access to Denlethen woods access; and
 - Phase 1.3 (duration 2 weeks): Construction of tie in of Denlethen Woods access to existing carriageway.
 - Phase 1.4 (duration 8 weeks):
 - Construction of south roundabout including south side of A90 overbridge and abutments and
 - Construction of A937 south and Johnston Lodge access tie-in.
 - Phase 2.1 (4 nights):
 - Complete construction of A90 northbound and southbound off-slip tie in; and
 - Construction of A90 overbridge beams, permanent deck formwork and temporary falsework to over three night-time closures.
 - Phase 2.2 (duration 8 weeks):
 - Construction of A927 tie-in to be constructed; and
 - Construction of A90 overbridge.
 - Phase 2.3 (duration 2 weeks):
 - Completion of A90 NB on-slip gap and A90 NB-on slip tie in; and
 - Permanent closure of existing A90/A937 nearside gap.
 - Phase 2.4 (duration 1 week): Construction of A90 southbound off-slip tie in and proposed temporary link road from A90 southbound off-slip to Johnstone Lodge access
 - Phase 2.5 (duration 2 weeks): Construction of A90 off-slip gap.
 - Phase 2.6 (duration 1 week): Closure of central reserve gaps.
- 2.4.8 A Construction Environmental Management Plan (CEMP) will be developed by the contractor to provide the management framework needed for the planning and implementation of construction activities in accordance with environmental commitments identified in the EIAR, and in accordance with legislation requirements.

Site Compound

- 2.4.9 At time of writing the location of the temporary compound was not known. The contractor will determine the exact location prior to works commencing.

Traffic Management

- 2.4.10 The final traffic management sequencing will be the responsibility of the appointed contractor. During the development of the design a proposed construction phasing was created, this resulted in specific sequencing with the following combination of traffic management layouts identified;
- A90 - Full overnight closures using strategic diversion routes. Lane 1 and 2 closures depending on work element.
 - A937 South - Full closure. Depending on phase access will be provided by either a temporary road or traffic will be diverted along strategic diversion routes. Single lane closures will be provided for other work elements.
 - A937 North - Full closures with traffic being directed along agreed diversion routes, mainly through centre and north junctions. Single lane closures will also be in place to allow certain elements of work.
 - Old trunk road - Full closure, residents will gain access through Oatyhill Junction.
 - Denlethen Woods - Full closure, access by temporary road.

Earthworks and quantities

- 2.4.11 The proposed scheme requires a total land take of 208,873.2m² (20.8ha). Some minor road cuttings will be required; total volume of cut is estimated to be 16,249m³ with the maximum depth of cuttings of 3.5mbgl (metres below ground level). The total volume of fill required will be 300,472m³ with maximum embankment heights of 10.1m.
- 2.4.12 Overall, 284, 223m³ of imported fill material is estimated to be required. Currently there is limited information on how much of the cuttings will be suitable for reuse onsite (estimated to be approximately between 60-70%).
- 2.4.13 Earthworks will be required during construction phases 1.1 to 2.1 as described in section 2.4.7.

Overbridge

- 2.4.14 The overbridge structure is expected to be a steel-concrete composite construction (concrete deck on steel beams) that will span the A90 dual-carriageway and verges between concrete abutments positioned on either side of the A90. There will be no central support within the bounds of the A90 dual-carriageway. The bridge will have a minimum clearance of 5.7m above

the A90 carriageway and the realigned A937 carriageway will therefore be approximately 7.8m above the A90 carriageways and up to 7m above the general level of surrounding fields.

Drainage design

- 2.4.15 The proposed drainage design for the scheme will comprise a number of new and independent gravity drainage networks designed to collect and convey surface water runoff from impermeable surfaces. The road drainage network consists of 3 main elements, pre-earthworks, networks (conveyance pipework) and outfalls.
- 2.4.16 Pre-earthwork drainage is a series of open ditches or filter drains positioned at the bottom of earthworks embankments to intercept runoff flowing towards the embankments from the existing land due to the topography.
- 2.4.17 On trunk roads, the network drainage will consist of over the edge filter drains which are positioned at the side of the carriageway. On local authority roads, the network drainage will take the form of carrier pipes conveying runoff by removing surface water from the carriageway by a kerbside gully system.
- 2.4.18 Network drainage systems will convey surface water runoff to outfalls. These outfalls consist of detention basins which will have a dual use, to attenuate runoff and control discharge, and to act as treatment in the SuDS system.
- 2.4.19 A culvert will be constructed to allow the alignment of the Johnston Lodge access road and cycle path to cross the Gaugers Burn. The specimen design will propose a precast concrete portal which will be constructed without disturbing the bed of the burn. The culvert is designed to span the outside of the footprint of the water course and be founded on spread footings located on the banks of the burn.

Lighting Design

- 2.4.20 The lighting design is based on the recommendations within BS5489-1:2013, Code of practice for the design of road lighting (Ref. 2.1). Based on this guidance, lighting is being provided at both roundabouts, on the A937 from approach to south roundabout to the 30mph section on the north side.

Project/Design mitigation

- 2.4.21 In terms of the design of the scheme, design mitigation includes:
- The incorporation of SuDS to prevent road runoff pollutants affecting water quality and oil interceptors in gullies; and
 - Landscape design to minimise visual impacts on local receptors.

Post-Construction

- 2.4.22 On the basis that the scheme is procured as a Design and Build contract, the scheme will have a 5-year maintenance period where the contractor will be responsible for the rectification of any defects. Following the construction maintenance period, the maintenance responsibility of the structure, slip roads and remote cycle path will pass across to Transport Scotland.
- 2.4.23 The structure will undergo principal inspections every 6 years, general inspections every 2 years and reactive and special inspections when required. Other aspects of the scheme, including the A937, A937 surface course over the structure, access to the old trunk road and Denlethen Woods will pass across to Aberdeenshire Council. They will be responsible for the reactive and routine maintenance thereafter.