5. The Proposed Scheme

5.1 Introduction

5.1.1 This Chapter provides a description of the Proposed Scheme as assessed in this Environmental Statement (ES), including a summary of the likely methods and programme of its construction.

5.1.2 The Proposed Scheme is to be progressed under the Roads (Scotland) Act 1984 (Scottish Parliament, 1984). Draft Roads Orders will be accompanied by a Compulsory Purchase Order (CPO) which will detail land to be acquired to enable construction and maintenance of the Scheme.

5.1.3 Background is also provided on the anticipated procurement process, and on existing and projected traffic conditions.

5.1.4 The Proposed Scheme is shown on Figure 5.1 'Proposed Scheme Layout' and includes details on the Chainage (Ch.) locations which are discussed in this chapter.

5.2 Background

Scheme Procurement

5.2.1 It is likely that the Proposed Scheme will be procured by means of a Design and Build (D&B) type contract. Under the terms of this contract type, the Contractor will undertake both the detailed design and construction of the Proposed Scheme. Responsibility for operating and maintaining side roads would remain with Midlothian Council on completion of the Proposed Scheme. Both the Scottish Government and Midlothian Council may appoint agents to operate and maintain the respective road networks on their behalf.

5.2.2 Under a D&B type contract, a specimen (outline) design is prepared for the Proposed Scheme, which the appointed Contractor(s) can optimise as the detailed design is developed. Any optimisation must be within the constraints imposed by the ES including Chapter 20 - Schedule of Environmental Commitments which contains the mitigation measures identified through the Environmental Impact Assessment (EIA) process); the Statutory Orders (such as land acquisition) and any specific limits set within the contract documents. This will ensure that the detailed design will be implemented in compliance with this ES.

5.2.3 Optimisation of the scheme design will be deemed to comply with this ES provided that any design changes have been subject to environmental review to ensure that the residual impacts would not be greater (or significantly different) than those reported in this ES, and subject to Transport Scotland (TS) accepting the design changes and the findings of any such review.

5.3 Description of the Proposed Scheme

5.3.1 As described in Chapter 3 – Alternatives Considered, four layouts were developed at Design Manual for Roads and Bridges (DMRB) Stage 2, three of which underwent a formal DMRB Stage 2 scheme assessment which ultimately identified the preferred junction layout described in this section.

5.3.2 The Proposed Scheme provides a grade separated roundabout at Sheriffhall, requiring vertical and horizontal realignment of the A720 Edinburgh City Bypass ('the A720') over an approximate length of 1600m. The A720 will be carried across the Sheriffhall Roundabout by two new bridges. The Sheriffhall Roundabout will be enlarged and become an 8-arm roundabout but will be retained at its existing location and reduced to three lanes. The roundabout will connect the A7 North, the A6106 North (Millerhill Road), the A6106 South (Old Dalkeith Road), A7

South and all four A720 east and west facing slip roads. The Proposed Scheme also includes non-motorised user (NMU) facilities including five dedicated subways under the new roundabout providing an off carriageway NMU route. A more detailed description of the Proposed Scheme is provided in the following sections.

5.3.3 The Scheme design has been developed in accordance with current design standards and industry best practice as noted in the sections below. The DMRB is undergoing a full review and some of the documents listed above have recently been superseded by updated guidance. However, the scheme has been assessed against the design guidance that was current at the time the design was undertaken.

5.3.4 A 3D conceptual model has been prepared and two stills from the model are provided below to illustrate the Proposed Scheme. It should be noted that the visualisation is an artist's impression of what the Proposed Scheme may look like 15 years after opening. The video and imagery in the visualisation are conceptual and based upon design data available at the time of production in November 2019. Two views are shown in Plate 5-1 'View of the Proposed Scheme looking East along the A720 Edinburgh City Bypass towards Old Craighall' and Plate 5.2 'Plate 5-2 View of the Proposed Scheme looking South along the A7 North towards Dalkeith'

Plate 5-3 View of the Proposed Scheme looking East along the A720 Edinburgh City Bypass towards Old Craighall

Plate 5-4 View of the Proposed Scheme looking South along the A7 North towards Dalkeith

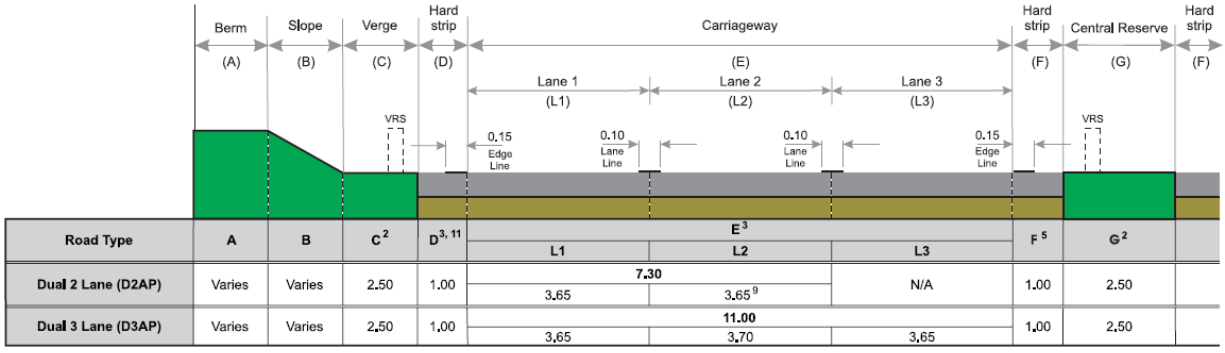
A720 Mainline

5.3.5 The proposed grade separated junction requires the vertical and horizontal realignment of the A720 carriageway over an approximate length of 1600m. The realignment has been designed in accordance with the minimum geometric standards as laid out in DMRB Volume 6, Section 1, Part 1 'Highway Link Design' (TD9/93) (Highways Agency, et al., 1993), for a design speed of 120kph. The proposed horizontal alignment generally follows the existing.

5.3.6 The A720 will be vertically realigned over the roundabout, raising up on approach to the bridge crossings, with embankments up to approximately 10m in height and a vertical carriageway gradient never exceeding 4%.

5.3.7 The proposed A720 cross-section is as set out in Figure 4-3a of DMRB, Volume 6, Section 1, Part 2 'Cross-Sections and Headrooms' (TD27/05) (Highways Agency, et al., 2005) for a Rural Dual 2 Lane All-Purpose Road (D2AP), as shown below in Figure 5.2 'Dimensions of Cross-Section Components for Rural All-Purpose Roads Mainline – Dual Carriageway'

Figure 5.2 Dimensions of Cross-Section Components for Rural All-Purpose Roads Mainline – Dual Carriageway



Road Type	A	B	C [2]	D [3, 11]	E [3] L1	E [3] L2	E [3] L3	F [5]	G [2]
Dual 2 Lane (D2AP)	Varies	Varies	2.50	1.00	7.30 3.65	7.30 3.65 [9]	N/A	1.00	2.50
Dual 3 Lane (D3AP)	Varies	Varies	2.50	1.00	11.00 3.65	11.00 3.70	11.00 3.65	1.00	2.50

Source: DMRB, Volume 6, Section 1, Part 2 (TD 27/05), Figure 4-3a (Highways Agency, et al., 2005)

Slip Roads

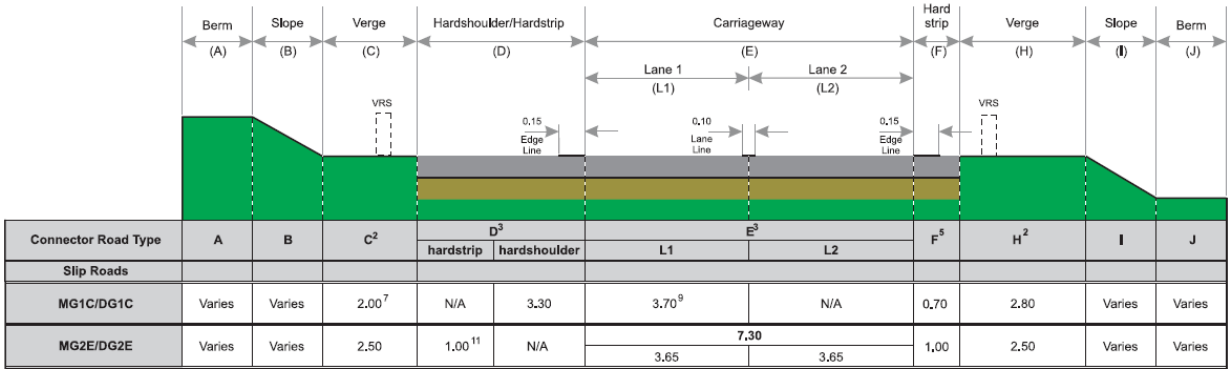
5.3.8 The A720 Mainline would be connected to the enlarged Sheriffhall Roundabout by four slip roads designed in accordance with the minimum geometric parameters required by DMRB TD 9/93 for a design speed of 70kph. The length of each slip road is shown in Table 5-1 'Slip Road Lengths'. All merge and diverge tapers will be 150m in length with nose lengths of 85m and 70m respectively.

Table 5-1 Slip Road Lengths

Direction	Slip Road	Length (m)
Eastbound	Merge	370
	Diverge	423
Westbound	Merge	455
	Diverge	412

5.3.9 The proposed cross section for the slip roads is as set out in Figure 4-3c of TD 27/05 for a Rural 2-Lane All-Purpose Connector Road (DG2E), as shown below in Figure 5.3 'Dimensions of Cross-Section Components for Rural All-Purpose Connector Roads'.

Figure 5.3 Dimensions of Cross-Section Components for Rural All-Purpose Connector Roads



Connector Road Type	A	B	C[2]	D[3]		E[3]		F[5]	H[2]	I	J
				hardstrip	hardshoulder	L1	L2				
Slip Roads											
MG1C/DG1C	Varies	Varies	2.00[7]	N/A	3.30	3.70[9]	N/A	0.70	2.80	Varies	Varies
MG2E/DG2E	Varies	Varies	2.50	1.00[11]	N/A	7.30 (3.65	3.65)	1.00	2.50	Varies	Varies

Source: DMRB, Volume 6, Section 1, Part 2 (TD 27/05), Figure 4-3c (Highways Agency, et al., 2005)

Roundabout Design

5.3.10 The Sheriffhall Roundabout will be retained at its existing location, but enlarged to 150m diameter, and will become an 8-arm roundabout, connecting the A7 North, the A6106 North, the A6106 South, A7 South and all A720 east and west facing slip roads.

5.3.11 The circulatory carriageway will consist of three lanes, with a total width of 10.95m. Two lane exits are provided on all roundabout arms, tapering down to a single lane width downstream where necessary. Two lane entries are provided for the slip roads and three lane entries are provided for the side roads. Traffic signals would be provided at the eastbound and westbound diverge slip road junctions with the roundabout.

Side Roads

5.3.12 Side roads will be realigned to connect to the enlarged roundabout. Horizontal and vertical realignment will be minimal for the A7 North, the A6106 South and A7 South, which will mostly retain their existing layout and only

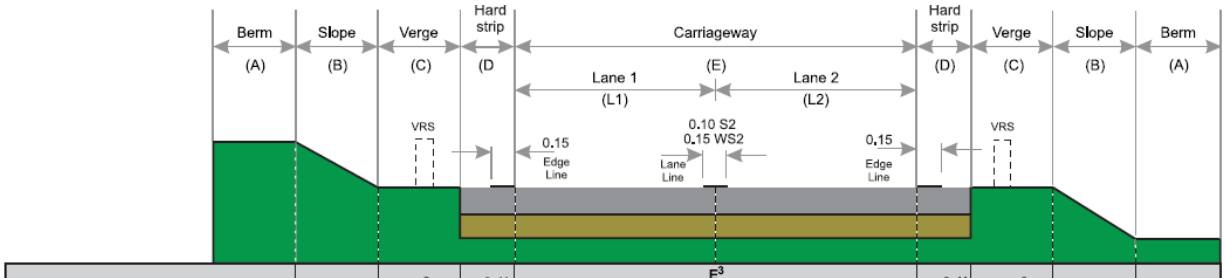
require minor alterations to tie into the new roundabout, with a longer realignment of the A6106 North. The length of each side road is shown in Table 5-2 'Side Road Lengths'.

Table 5-2 Side Road Lengths

Side Road	Length (m)
A7 North	286
A6106 North	526
A7 South	270
A6106 South	133

5.3.13 The proposed typical cross section for the realigned side roads is as set out in Figure 4-3a of DMRB TD27/05 for a Rural All-Purpose Single Carriageway Road, as shown below in Figure 5.4 'Dimensions of Cross-Section Components for Rural All-Purpose Roads Mainline – Single Carriageway'.

Figure 5.4 Dimensions of Cross-Section Components for Rural All-Purpose Roads Mainline – Single Carriageway



Road Type	A	B	C[2]	D[3, 11]	E[3] L1	E[3] L2	D[3, 11]	C[2]	B	A
Single (S2)	Varies	Varies	2.50	1.00	7.30 / 3.65	7.30 / 3.65	1.00	2.50	Varies	Varies
Wide Single (WS2)	Varies	Varies	2.50	1.00	10.00 / 5.00	10.00 / 5.00	1.00	2.50	Varies	Varies

Source: DMRB, Volume 6, Section 1, Part 2 (TD 27/05), Figure 4-3a (Highways Agency, et al., 2005)

5.3.14 The above typical cross section applies to all side roads except the A6106 South, which does not include hard strips and widens to include two northbound lanes, matching the existing provision. All side roads provide a 3-lane entry onto the roundabout.

Access to Land and Properties

5.3.15 A number of residential and rural properties are located in the area of the Proposed Scheme. Following consultation with landowners and tenants, proposals for relocated/realigned accesses have been developed as summarised below.

5.3.16 The existing accesses to Summerside residential properties, directly impacted by the realignment of the A7 North, will be combined into one access relocated approximately 160m north of the roundabout. A new side road running parallel to the A7 from the new access will then provide access to the individual properties and will extend further south to provide access to the proposed sustainable drainage systems (SuDS) pond.

5.3.17 The existing access to Sheriffhall House and Old Sheriffhall Farmhouse, impacted by the realignment of the A6106 South, will be relocated approximately 20m south of its existing location and the relevant access road realigned.

5.3.18 A number of field accesses will be upgraded and/or relocated to tie into the Proposed Scheme. These include:

- A field access provided off the A7 North at approximately Ch. 255;

- Three field accesses provided off the A6106 North at Ch. 280, 320 and 440. The access at Ch.320 serves both a rural property located east of the existing A6106 and, partly using the existing road, the SuDS pond located further south;
- Two new accesses provided to serve the SuDS ponds either side of the A6106 South. These accesses will be located beyond the point where the proposed realigned A6106 ties into the existing, approximately 195m from the roundabout. The western access will form a junction directly with the existing A6106, whereas the eastern one will be provided off an existing access road; and,
- A new access on the east side of the A7 South serving both the field located east of the A7 and the SuDS pond further north.

5.3.19 It is proposed that all field accesses will be 3.5m wide.

Non-Motorised User (NMU) Provision

5.3.20 The NMU Provision will provide a low-level grade-separated NMU link across the Sheriffhall Roundabout centre island with five subways connecting to off-carriageway, 3m wide shared pedestrian/cycle routes on the A7 North, A7 South, A6106 North and A6106 South. Where NMU routes run adjacent to the carriageway, shared facilities will be provided within the road verge and offset from the running edge of the carriageway, appropriate to the speed limit of the adjacent carriageway. Subways will provide a minimum 2.8m headroom and an open-aspect cross section of 9m, accommodating the 5m width of the NMU facilities and adjacent verges.

Underbridge Structures

5.3.21 Two road underbridge structures will span over the new enlarged Sheriffhall Roundabout and the existing rail underbridge structure will be extended where the A720 crosses the Borders Railway, approximately 250m to the east of the roundabout.

5.3.22 The underbridge structures crossing the roundabout will be three-span beam and slab construction, comprising composite steel beam/in-situ concrete deck or composite precast concrete beam/in-situ concrete deck. Bankseat abutments will be supported on piled foundations. Intermediate supports will be in-situ concrete columns on piled foundations.

5.3.23 The crossing of the Borders Railway will make use of an existing structure, which will be retained. The existing structure was originally constructed to allow for an increase in the level of the A720, in anticipation of future works to grade-separate the Sheriffhall Roundabout. This structure will require to be extended at each end to allow for the construction of new slip roads. The extension of the existing structure will be approximately 25m in length to the north and approximately 36m to the south. In order to comply with Network Rail requirements for construction in the railway environment, the extensions to the existing structure are expected to be formed from precast concrete beams with in situ concrete infill, supported on in-situ concrete walls on piled foundations.

5.3.24 In order to make allowance for the NMU provision, discussed earlier, five subways/underpasses will be required. These will be located under the new roundabout. These will be provided with a wide span to promote an open aspect within the underpasses. As the NMU routes will be at a lower level than the roundabout generally, a number of wing walls and retaining walls will also be necessary.

Earthworks

5.3.25 The Proposed Scheme involves widening and realigning, horizontally and vertically, the existing road infrastructure. Significant earthworks are required, both cutting and embankment, to achieve this. Additionally, as the scheme is in

an area of historic mining activity, treatment of shallow mine workings and existing mine entries is also required to ensure ground stability throughout the design life.

Embankments

5.3.26 Embankments are generally proposed to be formed at a 1 vertical in 2 horizontal profile. Embankment heights vary: the A720 approach embankments to the two bridges over the roundabout are the greatest height of new fill, at approximately 10m high. Site won fill will be used to form embankments where possible, although the cut-fill balance is such that imported fill will also be required.

5.3.27 The fill between the two bridges, Ch. 1770m to Ch. 1830m, is also up to 10m high and is proposed to be a strengthened earthwork, using reinforced soil to reduce the footprint of the new fill whilst at the same time permitting options for a green and vegetated slope face. Parallel to the road a green-faced slope with a profile in the order of 45 degrees is proposed while under the east bridge abutment a steeper slope, up to 70 degrees, is proposed due to space constraints. This slope will have a 'hard faced' finish.

5.3.28 Local areas of steepened embankments, up to 1 vertical in 1 horizontal, are also required along the A720 between the slip roads and the mainline.

5.3.29 Widening of existing embankments is required from Ch. 1900m to Ch. 2500m, with up to 7m of new fill being placed on the existing embankment, which itself varies in height from approximately 4m to 6m. Finished embankment slope profiles of 1 vertical in 2 horizontal are proposed. Associated with the widening works are measures to improve the existing ground at the toe of the new embankment fill to minimise differential settlements between new and existing.

5.3.30 In two locations, A7 South (northbound) Ch. 150m to Ch. 200m and A720 Ch. 2500m to Ch. 2600m, the Proposed Scheme alignment can be accommodated within the extents of the existing earthwork. As such no new earthworks are proposed and the existing earthwork (embankment in both cases) will be adopted into the scheme.

Cuttings

5.3.31 Cutting slopes in the scheme, both new excavations and widening of existing cuttings, are generally proposed to be formed at a profile of 1 vertical in 3 horizontal. Steeper slopes or toe walls are proposed locally where space is constrained.

5.3.32 Towards the roundabout there is substantial excavation work to form the cuttings required for the NMU routes. Excavations of up to 5m below existing ground level are proposed with a side slope profile of 1 vertical in 3 horizontal but approaching the NMU underpasses the cut slopes are retained by wing walls associated with the underpass structures.

5.3.33 Available groundwater monitoring data suggests that groundwater level is high at the roundabout, approximately 1m below ground level, and groundwater may be encountered in the cut slope faces, necessitating permanent slope face drainage.

Works related to Historic Mining

5.3.34 The scheme is in an area of historic mining. Potential shallow mine workings and mine entries underlie the Proposed Scheme.

5.3.35 Mine workings treatment is proposed to ensure the long-term stability of the new earthworks. Shallow workings under the scheme will be infilled by consolidation grouting as follows: A720 Ch. 1300m to Ch. 1900m; A7 South Ch. 0m to Ch. 170m; A6106 South Ch. 0m to Ch. 110m; and A7 North Ch. 120m to Ch. 286m.

5.3.36 Mine entries which are below or within influencing distance of the scheme will either be capped at rockhead, infilled by grouting or will be both capped and grouted.

Earthworks related to SuDS

5.3.37 There are five SuDS basins which are formed in a mix of cut and fill depending on the base and crest level relative to existing ground level. Where in cutting the slopes for the SuDS ponds are no steeper than 1 vertical in 4 horizontal and where formed of fill the slopes are no steeper than 1 vertical in 2 horizontal. All slopes will be top soiled to allow a vegetated finish.

Earthworks Balance

5.3.38 A summary of the estimated earthworks quantities for the construction of the Proposed Scheme is provided in Table 5-3 'Estimated Earthworks Volumes'. Further details relating to materials use and management of waste during construction are provided in Chapter 17 – Material Assets and Waste.

Table 5-3 Estimated Earthworks Volumes

Import/Export	Volume (m^3)
Total Acceptable Cut Available (excl. topsoil)	108,600
Total Fill Required (excl. Topsoil)	413,200
Total Imported Fill Required	339,400
Topsoil Won from General Excavations	3,000
Total Topsoil Required	35,000
Total Acceptable Topsoil to be Reclaimed from Existing Topsoil within the footprint	32,000

5.3.39 Ground investigation results indicate up to 80% of excavated material will be acceptable for re-use or could be rendered acceptable by use of improvement such as lime/cement stabilisation or air drying. In-situ ground improvement (e.g. by in-situ mixing with cement or lime) is proposed where it could reduce quantities of excavated unsuitable soils and/or reduce the volume of imported aggregate.

5.3.40 Contaminated land is not a significant concern. The majority of test results from the made ground samples would likely fall into the non-hazardous waste category. However, the possible classification of hazardous waste may be associated with a small number of soil samples and Coal Tars in the older road pavement, due to elevated hydrocarbons, including Polycyclic Aromatic Hydrocarbons (PAHs), and metals. Leachate test results indicate potential water environment exceedances which may impact fill placement with respect to surface water and groundwater receptors. Chapter 16 – Geology and Soils provides further detail on contaminated land.

Fencing/Environmental Barriers

5.3.41 Temporary fencing will be installed to secure the acquired land prior to commencing works on site. At completion of construction permanent post and wire fencing will generally be erected along the property boundaries, except where a different type of fence has been identified as required. In addition:

- hedgerows will be planted along field boundaries at SuDS ponds where possible, to provide greater biodiversity benefits; and,
- existing natural stone boundary walls within the scheme extents will be retained as key landscape features wherever possible or rebuilt elsewhere where directly impacted by the works.

5.3.42 No environmental mitigation barriers are proposed as part of the scheme.

Drainage Design and Watercourses

5.3.43 The Water Environment (Controlled Activities) Regulations 2011 (CAR) (Scottish Parliament, 2011) require licences to be sought for design and construction activities affecting watercourses, including engineering works (culverts and bridges) and discharges (outfalls, attenuation and treatment). It is intended that the appointed Contractor(s) will be responsible for submitting applications and securing CAR authorisation based on their detailed design. TS will provide the Contractor(s) with draft CAR licence applications based on the DMRB Stage 3 design.

5.3.44 The design of the drainage system for the scheme has been undertaken taking into consideration the CAR Regulations mentioned above, in accordance with the mandatory requirements set out in Volume 4 Section 2 of the DMRB and SuDS guidance and in consultation with Scottish Environment Protection Agency (SEPA).

5.3.45 The Proposed Scheme will require approximately 3.5km of new carriageway with road drainage, and the extension of two cross-carriageway culverts. The culverts will be required to pass a 1 in 200 year storm plus climate change flow. The drainage will have three separate outfalls into the Dean Burn.

5.3.46 The proposed surface water drainage solution varies depending on the relevant road cross section, particularly considering whether it is kerbed, or if in cut or on embankment. Where the road is kerbed (e.g. Sheriffhall Roundabout and side roads), gullies or combined kerb drainage units will be used. If the road is kerbed and on embankment, gullies or kerb drains are proposed with adjacent carrier drain and separate sub-surface drainage. If in cut, it is proposed to connect the gullies directly to the combined surface and sub-surface drains. Where the road is not kerbed (e.g. A720 Mainline and slip roads), combined surface and sub-surface drains will be used.

5.3.47 Sub-surface drainage will convey any water from the sub-base or capping pavement layers to join the surface runoff in the surface water pipe network. This will be achieved through the use of a combined drain or a separate system via carrier drain in conjunction with a narrow filter drain or fin drain.

5.3.48 In accordance with GBR10 CAR – A Practical Guide (SEPA, 2019) and SuDS for Roads (SuDS Working Party & SCOTS, 2009) two levels of treatment will be provided for the road drainage before discharge into watercourse. The proposed treatment methods will be a combination of carriageway filter drains and SuDS ponds.

5.3.49 Earthworks drainage will be installed to convey land runoff/intercept existing land drainage. This will preferably take the form of ditches wherever possible. However, due to the wider land take ditches require, filter drains may be used in constrained areas.

5.3.50 Due to the proximity of the road embankment to the Dean Burn, a section of the burn will be diverted upstream of the A7, to a location approximately 40m south of its original alignment. This diversion is approximately 230m in length and will be installed as a restored two stage meandering channel to improve watercourse function and habitat. The sharp right-angle bend in the channel between the A7 and A6106 acts as a channel constriction and it is proposed that this be smoothed to improve river function and facilitate creation of the adjacent SuDS pond.

5.3.51 Compensatory flood storage is required as part of the design as functional floodplain storage will be lost as a result of SuDS allocation and encroachment of road embankments. Land reprofiling to create this required storage will be provided in three separate locations: inside the meander of the realigned channel, an area to the north of the channel upstream of the A7 and along the right-hand bank between the A7 and A6106.

Traffic Signs

5.3.52 The detailed design of traffic signage for the Proposed Scheme will be part of the appointed Contractor(s) responsibilities and undertaken in accordance with the Traffic Sign Manual and the contract documents, and in consultation with TS and the local roads authorities.

Lighting

5.3.53 The A720 mainline will remain unlit but the slip roads will be partially lit on their approach to the conflict area of the grade separated roundabout.

5.3.54 The roundabout is classed as a conflict area and will be lit across the full extents. Lighting columns with LED lanterns will be installed around the junction.

5.3.55 Lighting will be installed along each side road on its approach to the roundabout. Lighting will cover no less than currently lit extents of the existing roads. Lighting columns with LED lanterns will be installed.

5.3.56 Lighting will be installed along NMU routes where running next to a lit carriageway and will also extend to cover the entire extents of the NMU routes where they form their own separate network through the roundabout. Lighting columns with LED lanterns will be used. All subways will also include lighting and will be kept lit day and night.

5.4 Traffic Conditions

Introduction

5.4.1 A detailed Paramics traffic simulation model has been developed and calibrated to represent conditions observed during the 14-Hour traffic surveys undertaken in May 2017.

5.4.2 The computer model has been further developed to represent the 24-Hour annual average daily traffic flows and to incorporate the forecasted growth in traffic volumes after the 2017 Base Year.

5.4.3 Details of the adopted annualisation and forecasting procedures are described below.

Traffic Annualisation

5.4.4 TS maintains a database of traffic flow information for the Scottish trunk road network through a series of permanent Automatic Traffic Counters (ATCs).

5.4.5 The ATCs located on the A720 to the west of Sheriffhall Roundabout provide the most complete set of traffic data and have therefore been used as a basis for annualising the traffic volumes recorded on day of survey.

5.4.6 The traffic data described above has been used to estimate the volumes of traffic on the road network by factoring the 14-Hour day of survey information to derive the overnight and annual average weekday traffic flows.

Traffic Growth – Do-Minimum Network

Growth to 2024 Opening Year

5.4.7 Although the 2017 traffic surveys provided detailed information to assist in the development of the Paramics Do-Minimum model, further information was required to define future traffic demand after the 2017 Base Year.

5.4.8 The SEStran Regional Model (SRM12), which was developed separately by TS and covers the South East Scotland area, was used to derive an estimate of future growth based on the traffic related effects of proposed changes in land use over both the local and the wider regional area.

5.4.9 The traffic data from SRM12 consists of AM Peak Hour, Inter-Peak Hour and PM Peak Hour traffic turning flows, split by cars, large goods vehicles (LGVs), heavy good vehicles (HGVs) and public service vehicles (PSVs). This data was extracted from the SRM12 models for the 2012 Baseline Year and the 2024 Reference Case Year which included future developments.

5.4.10 The traffic data was then converted to a 4-Hour AM Period, 5-Hour Inter-Peak Period and 5-Hour PM Period using pre-defined factors, with further factors derived from the observed demand profile being applied to convert the AM Period and PM Period to individual hourly periods to match the format of data required in the Paramics model.

5.4.11 To maintain the integrity of the observed data collected during the May 2017 traffic surveys, the SRM12 data was only to define the additional traffic between 2017 and 2024.

5.4.12 The estimated traffic growth from the 2017 Base Year to the 2024 Scheme Opening Year was derived by comparing the 2012 and 2024 SRM12 matrices and adopting a linear growth profile for the 12-year period.

Growth beyond 2024 Opening Year

5.4.13 To assess the effects of traffic growth beyond the proposed 2024 Scheme Opening Year, the Transport Model for Scotland (TMfS14) growth rates were used to derive an overall growth factor of 17.5% between 2024 and 2039, which was applied to the SRM12 Reference Case model to develop a new SRM12 2039 Design Year model.

5.4.14 The resulting trip matrices for the Sheriffhall Roundabout study area derived from the SRM12 2039 model were then compared with the equivalent matrices derived from the SRM12 2024 model to estimate the traffic growth for each zone to zone movement on the network. A linear growth profile for the 15 years of traffic growth was adopted, and the additional traffic was added to the 2024 Paramics matrices in yearly increments to establish the level of growth that the Paramics model network could accommodate considering the AM, Inter-Peak and PM periods separately.

5.4.15 The demand that could be accommodated on the network under the Do-Minimum scenario included AM and PM Period traffic at the estimated 2024 demand level and Inter-Peak and Overnight traffic at the estimated 2026 demand level.

Traffic Growth – Do-Something Network

5.4.16 In order to provide a consistent basis for assessing the effects of the Proposed Scheme, a Do-Something model was developed to incorporate additional trips that SRM12 predicts could be attracted to the Sheriffhall Roundabout following grade-separation, due to the provision of increased capacity at this location.

5.4.17 The results from the Paramics model indicate that the network cannot accommodate 100% of the additional trips estimated by the SRM12 model with the proposed Sheriffhall Roundabout during the AM and PM Periods. Therefore, the Inter-Peak and Overnight traffic was increased by the full 100% of predicted additional demand whilst traffic demands in the AM and PM Periods were increased in increments of 10% of the predicted additional demand in increments of the predicted additional demand up to the operational capacity of the network.

5.4.18 As a result, the trip matrices defined for the heavily congested AM and PM Periods have been limited to an increase of 25% of the predicted additional demand defined by SRM12. The trip matrices defined for the more lightly trafficked Inter-Peak and Overnight Periods include the full 100% predicted additional demand defined by the SRM12 model with the proposed Sheriffhall Roundabout.

5.5 Construction Methods and Programme

5.5.1 This section provides a brief overview of the envisaged construction programme and typical construction activities. It is probable that the scheme will be constructed in a number of phases and a description of each likely construction phase is given below. Overall the construction period is expected to last approximately 28 months.

5.5.2 The existing operational capacity of the junction will be maintained throughout the full construction period. As a result, traffic conditions should not be significantly worse, thereby removing the need for traffic to re-route on to alternative unsuitable roads.

5.5.3 With regards to construction working hours the City of Edinburgh Council (CEC) have advised that their maximum standard construction working hours are 7am-7pm Monday-Saturday. Midlothian Council (MLC) have advised that their maximum standard construction working hours are 8am-7pm Monday-Friday and 8am-1pm Saturday. It was agreed that some works will be required out of these hours, for example, due to the need to close roads to install new bridge decks and it would be the responsibility of the Contractor to engage with each of the Councils to agree any construction periods out with standard hours.

Phase 0

5.5.4 Any advanced Ground Investigation (GI) works would be undertaken prior to starting construction of the Proposed Scheme. Any potential advanced utility diversions would be identified/confirmed and undertaken during this phase. It is also assumed that mining works will be carried out in Phase 0, before the main construction phasing begins, but this will be dependent on their interface with other phases.

Phase 1

5.5.5 The Borders Railway underbridge would be extended to accommodate the new slip roads. Temporary works would be required to allow NMU subways 1, 2 and 5 to be constructed.

Phase 2

5.5.6 Offline works would be undertaken in this phase, including large sections of the new roundabout, the A6106 South, A6106 North, A7 North and A7 South. The slip roads would be partially constructed, tying in at-grade to the A720 mainline at the extents of the scheme. Traffic management on the A720 mainline, A7 North and A7 South would be required to construct the tie-ins, however traffic would continue to occupy the existing carriageway with no vehicle movement restrictions. Temporary works would be required to allow NMU subway 3 to be constructed.

Phase 3

5.5.7 Traffic would be diverted off the existing A720 mainline onto the partially constructed slip roads, with temporary carriageway linking back into the existing Sheriffhall Roundabout to maintain all vehicle movements. Construction of the raised A720 on embankment would commence. Traffic management would be required on the slip roads to maintain safe clearance between the construction activity and the live traffic. Temporary works would be required to allow NMU subway 4 to be installed. The at-grade tie-ins at the extents of the side roads and the remaining sections of the new circulatory carriageway would also be completed during this phase.

Phase 4

5.5.8 The A7 North and South traffic would be moved onto the newly constructed roads allowing the final areas of their verge and earthworks to be completed. The earthworks in the centre island of the new roundabout would be formed. Traffic management would be required to provide access to the work area and maintain safe clearance between the works and the live traffic.

Phase 5

5.5.9 Works would be completed within the central island of the new roundabout, including the remaining sections of the NMU routes. The underbridges (including abutments) would be constructed and the new A720 carriageway

completed. A partial overnight closure of the roundabout, including restrictions in north-south vehicle movements, would be required for the completion of the under-structures.

Phase 6

5.5.10 Work would be carried out to complete all outstanding areas of work such as areas of pavement, street furniture and road markings.

Summary

5.5.11 The envisaged construction activities and an estimation of possible durations are summarised in Table 5-4 'Construction Phases, Activities and Durations 'below.

Table 5-4 Construction Phases, Activities and Durations

Phase	Main Construction Activities	Approx. Duration
Phase 1a Phase 1b	Temporary works – install subways Extend Borders Railway structure	3 months
Phase 2a Phase 2b	Temporary works – temporary pavement /install subways Offline works, construction slip roads	5 months
Phase 3a Phase 3b	Temporary works – temporary pavement /install subways Construct mainline embankments	6 months
Phase 4	Construct central embankment	3 months
Phase 5	Construct central NMU route, construct A720 bridges	9 months
Phase 6	Conclude construction, pavement, street furniture etc	2 months

5.6 Operation and Long-Term Maintenance

5.6.1 Once the scheme is opened, the mainline carriageway would form part of the A720 Trunk Road, with the roundabout, A7 and A6106 being adopted as side roads by the Local Authority which is Midlothian Council. Maintenance of the strategic road network is undertaken by TS's operating companies, whose remit includes, trunk road maintenance, bridge maintenance, incident support, and undertaking annual road condition surveys. Ongoing maintenance work maintains the structural integrity of the road network. The scheme includes appropriate access, i.e., maintenance hardstandings on the mainline co-located with CCTV masts, access tracks provided for SUDs ponds, to allow for routine inspections and maintenance.

5.7 Construction Traffic

5.7.1 During construction, it is anticipated that the peak period for construction traffic will be during phase 3 where the main A720 embankments are being formed. It is considered that, up to 200 lorries a day could be delivering materials to and from the site during this phase.

5.7.2 The project will employ a large number of resources throughout the construction period with numbers fluctuating depending on the activities underway during different phases. Nevertheless, there will be a core resource based on site throughout. For the purposes of assessments, it is assumed that there will be up to 100 resources travelling to and from site throughout the construction phase, concentrated early in the morning and in the late evening.

5.8 Land Acquisition

5.8.1 It is expected that the construction work would take place within the Scheme Extents as shown on Figure 1.2 'The Proposed Scheme'. The Scheme Extents have informed the land take calculations undertaken for assessment purposes in this ES. The land within the Scheme Extents will be purchased under a CPO.

5.8.2 It is possible that the Contractor may require construction compounds to be located out with land identified in the CPO. In this case this will be done in negotiation with landowners and separate planning applications may be required. This would also be the case for any other land required beyond the CPO, for temporary access routes for example.

Loss of Designated Areas

5.8.3 The majority of the land required is agricultural land. Small areas of private property are required mostly to realign accesses. Areas of Ancient Woodland will be lost, and this is addressed in more detail in Chapter 9 – Nature Conservation, including proposals to compensate for the loss.

Loss of LDP Areas

5.8.4 The Proposed Scheme is situated in land designated as Green Belt by the Edinburgh City Council Local Development Plan (LDP) (adopted November 2016) and the Midlothian LDP (adopted November 2017). Land is also required from areas identified in the Midlothian LDP as Economic Business and Industry Areas; Shawfair Park Extension Site (Ec1) and Sheriffhall South (E32). Details of land take impacts are included in Chapter 15 - People and Communities – Community and Private Assets, and Human Health.

5.9 References

City of Edinburgh Council (2016) Edinburgh Local Development Plan (Adopted November 2016)

The Highways Agency, et al. (1993) Design Manual for Roads and Bridges, Volume 6, Section 1, Part 1 'Highway Link Design' (TD9/93)

The Highways Agency, et al. (2005) Design Manual for Roads and Bridges, Volume 6, Section 1, Part 2 'Cross-Sections and Headrooms' (TD27/05)

Midlothian Council (2017) Midlothian Local Development Plan (Adopted November 2017)

Scottish Environmental Protection Agency (SEPA) (2019) The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) - A Practical Guide (GBR10) (February 2019)

Scottish Parliament (1984) Roads (Scotland) Act 1984 (as amended by the Environmental Impact Assessment (Scotland) Regulations 1999 and 2006)

SuDS Working Party & SCOTS (2009) SuDS for Roads