5 The Proposed Scheme

5.1 Introduction

5.1.1 This chapter provides an overview of the Proposed Scheme for assessment. It includes screenshots from the Project 8, Dalwhinnie to Crubenmore, visualisation tool used to inform public exhibitions. These images are presented for illustration purposes, and readers should refer to the Proposed Scheme **Drawings 5.1** to **5.18**, provided in **Volume 3** of this report, which include any design refinements since the public exhibitions.

5.2 Proposed Scheme Overview

5.2.1 A high quality dual carriageway will be constructed along approximately 11km of the A9 between Dalwhinnie and Crubenmore, replacing the existing single carriageway road. There will be no gaps in the central reservation, to prevent right-turn manoeuvres across carriageways.

5.2.2 **Table 5-1** outlines the cross-section requirements for a rural all-purpose dual carriageway in accordance with the DMRB.

Table 5.1: Rural all-purpose dual carriageway cross section width requirements

Verge (m)	Nearside Hard Strip (m)	Carriageway (m)	Offside Hard Strip (m)	Central Reserve (m)	Offside Hard Strip (m)	Carriageway (m)	Nearside Hard Strip (m)	Verge (m)
2.5	1.0	7.3 (2x 3.65m lanes)	1.0	2.5	1.0	7.3 (2x 3.65m lanes)	1.0	2.5

Note - Verge and central reserve dimensions noted are minimum values; these may be increased to suit particular circumstances, e.g. forward visibility.

5.2.3 Cuttings and earthworks are required along the route and the size of these varies depending on local topography, slope stability requirements and landscape design to blend with local landform. Note that earthworks slopes in the images below show straight line gradients from top to bottom and whilst these demonstrate the footprint/ extent of slopes, they do not incorporate any landform contouring which is proposed.

5.2.4 The vertical alignment has been raised where necessary to accommodate the road drainage system. Drainage layouts have been developed, including consideration of Sustainable Drainage Systems (SuDS) features, swales, watercourse crossings and diversions, ditches, and outfalls.

5.2.5 Where watercourse crossing structures are required (i.e. bridges), the level of detail assumes a main span sufficient to avoid permanent in-channel works. With respect to culverts, the principal design assumption is that existing culverts that are currently undersized (with respect to the Flood Estimation Handbook (FEH) estimation methods) will be upsized to accommodate a 1:200 year flow plus freeboard, unless other constraints dictate retention at smaller sizes.

5.2.6 The Proposed Scheme has been developed on the basis that existing 'cascades' (i.e. hillside watercourses diverted or engineered to flow into existing culverts) could be further engineered to meet the required vertical alignment of the dualled route. In addition, vertical alignment changes require the introduction of new cascades on the upstream (east) side of the mainline.

5.3 Permanent Works – Mainline and Junction Infrastructure (Operational Phase)

Mainline Alignment – Chainage 20,000 to 21,800

5.3.2 **Figure 5-1** shows that the horizontal alignment of the Proposed Scheme mainline starts with a tie-in to the existing single carriageway to the south, incorporating dualling to the east (southbound) side of the existing A9. It shows the reuse of the former BDL temporary access track, a length of which will be made permanent to provide alternative access to the Drumochter Estate.

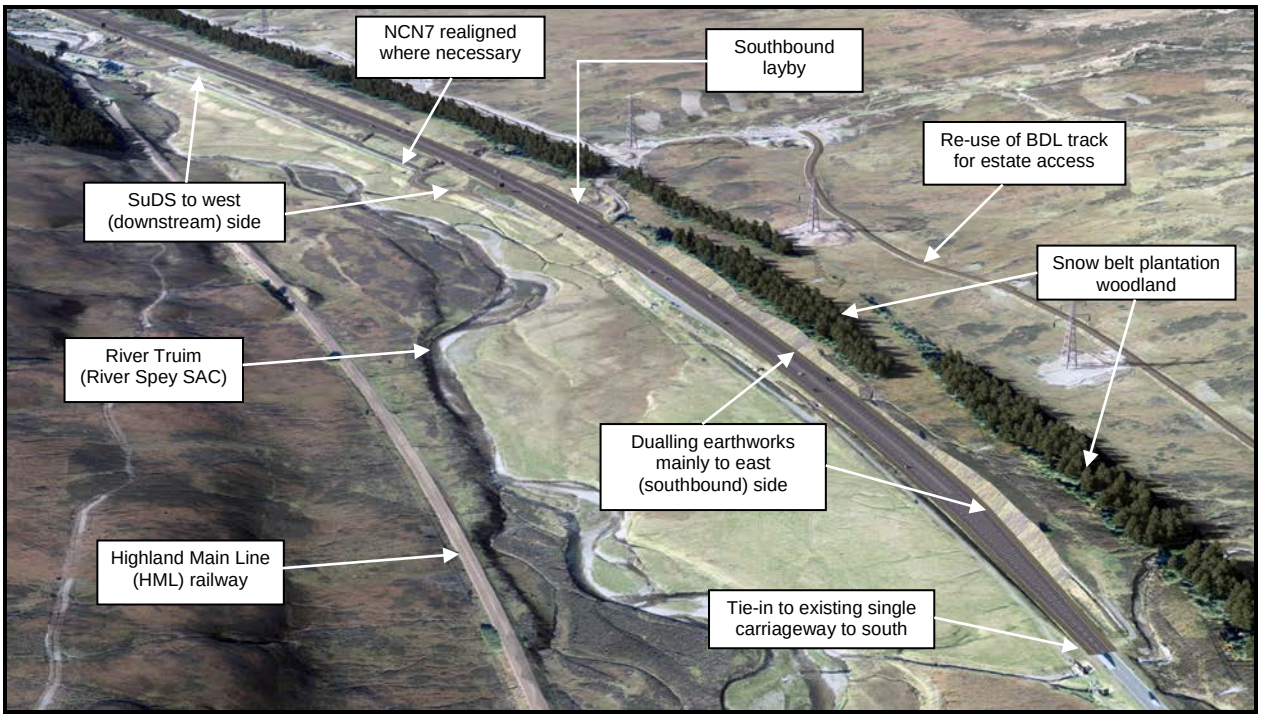

Figure 5-1: Ch. 20,000-21,800 – Dualling to southbound (east) side of existing A9

5.3.3 Sustainable drainage system (SuDS) basins are shown on the west (downstream) side of the A9, between the carriageway and the River Truim, and National Cycle Network route 7 (NCN7) is realigned around the SuDS features where necessary. Where required, the NCN7 will be upgraded with passing places to provide for SuDS maintenance access.

5.3.4 Note that the tie-in at the southern extent is shown to connect to the existing single carriageway. This depends on whether Project 8 is constructed before the adjacent Project 7, Glen Garry to Dalwhinnie scheme.

5.3.5 Should Project 7 be constructed first, then Project 8 will tie into the dual carriageway delivered by Project 7, and Project 7 will tie into the existing single carriageway. Both projects therefore include for an overlapping length of tie-in to ensure the area is fully considered in both project assessments.

Dalwhinnie Junction – Chainage 21,800 to 23,200

5.3.6 **Figure 5-2** shows the Dalwhinnie Junction (compact grade separated) layout, where the A9 mainline vertical alignment is elevated above the junction link road (link road underbridge). The link road is shown with a T-junction connecting to the existing A889 via a crossing over the River Truim. SuDS features are shown at natural drainage low points on either side of the A9 and maintenance access tracks are also shown.

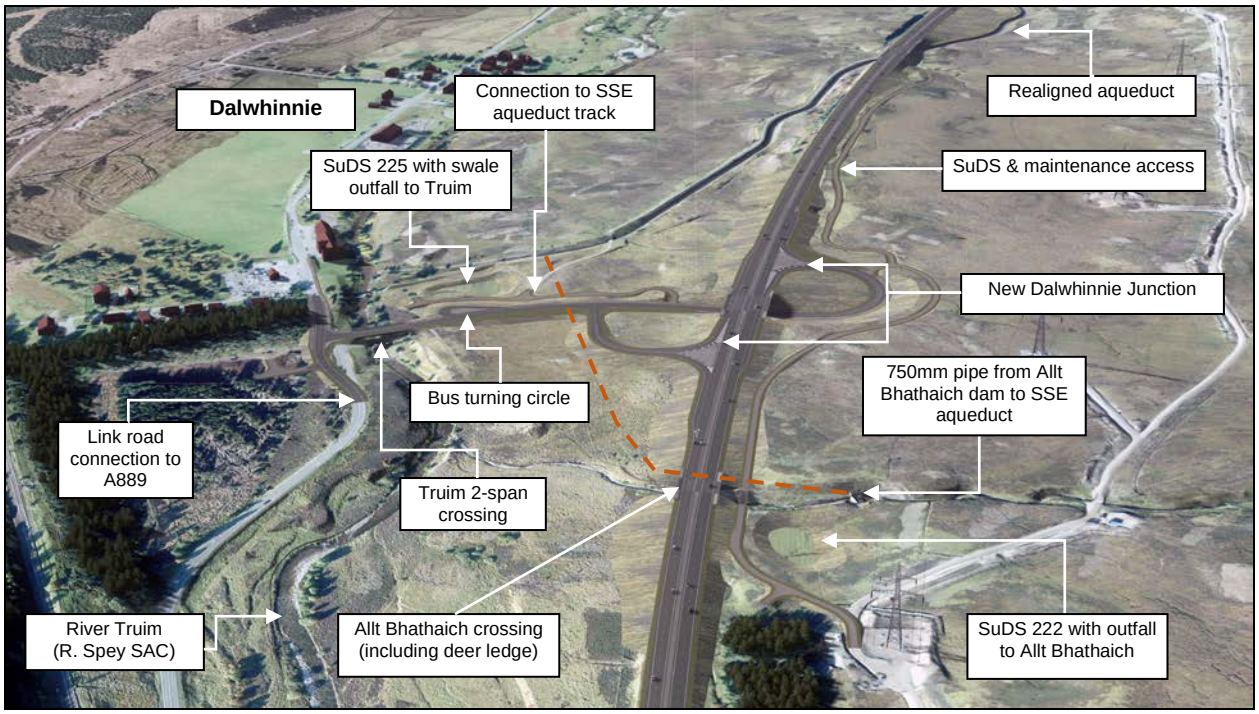

Figure 5-2: Ch. 21,800-23,200 – Dalwhinnie Junction, SuDS, A889 link road and Truim crossing

5.3.7 A bus turning circle is provided on the A889 link road with associated footways returning to Dalwhinnie. The link road footpath also connects to the existing SSE Aqueduct track. The NCN7 in this area is located along the existing A889, and the new link road T-junction connects to the A889; however, the NCN7 will not be directly affected by the A9 Dalwhinnie Junction itself. No additional lighting is proposed.

5.3.8 To the south, the mainline dualling requires a replacement structure over the Allt Coire Bhathaich. This structure includes a ledge located above the 1:30 flood level, provided for deer and non-motorised users (NMUs) to cross safely under the A9.

Mainline Alignment – Chainage 23,200 to 25,200

5.3.9 Immediately north past the junction, dualling continues on the east (southbound) side; however, given the close proximity of the SSE Aqueduct to the widened dual carriageway, local realignment of the SSE Aqueduct and access track is required for approximately 300m, see **Figure 5-3**.

5.3.10 North of the aqueduct crossing, the topography results in large cut slopes on the east (southbound) side. North and southbound 'Type A' lay-bys, typically 100m long, are located between the aqueduct crossing and Cuaich, in an area which offers good views towards Dalwhinnie. (Note, the lay-by locations shown below have been amended since the introduction of the compact form junction, please refer to **Drawings 5.1** to **5.18** (**Volume 3**).

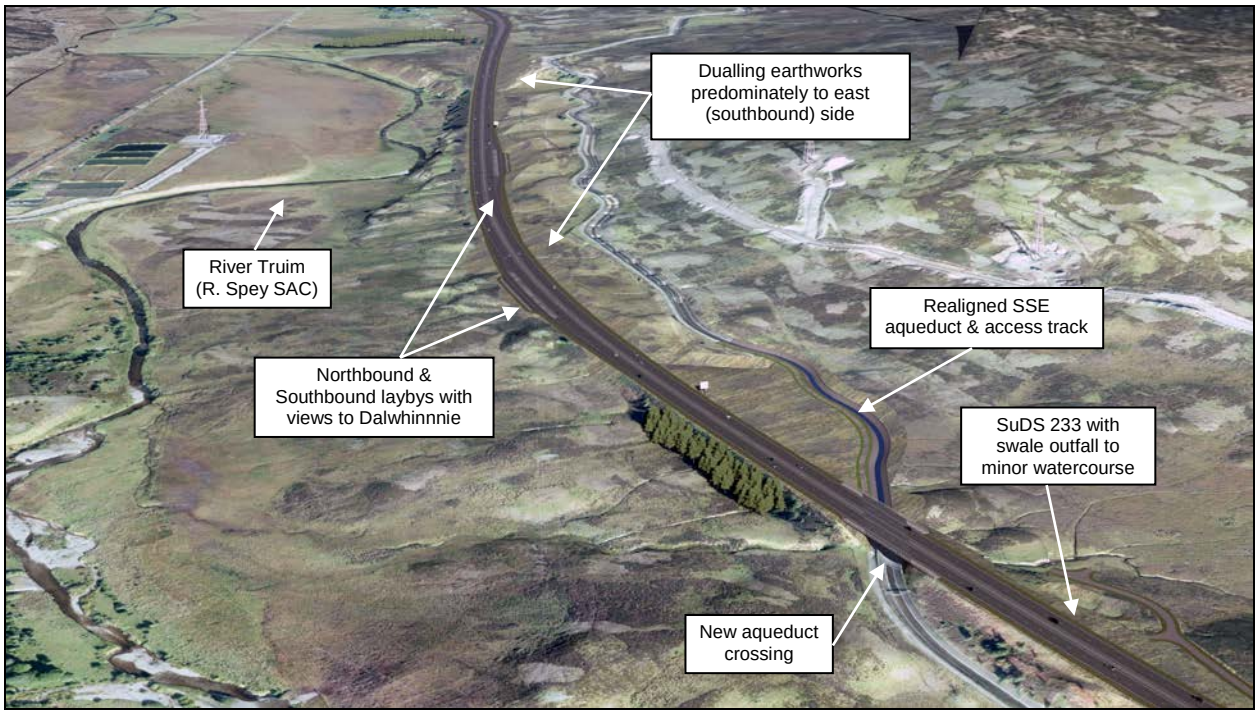

Figure 5-3: Ch. 23,200-25,200 – Southbound dualling, with SSE Aqueduct realignment

Mainline Alignment – Chainage 25,200 to 26,400

5.3.11 **Figure 5-4** shows dualling continues to the southbound side. SuDS and accesses provided around Cuaich and Lechden Wood are shown, as well as a new crossing over the Allt Cuaich.

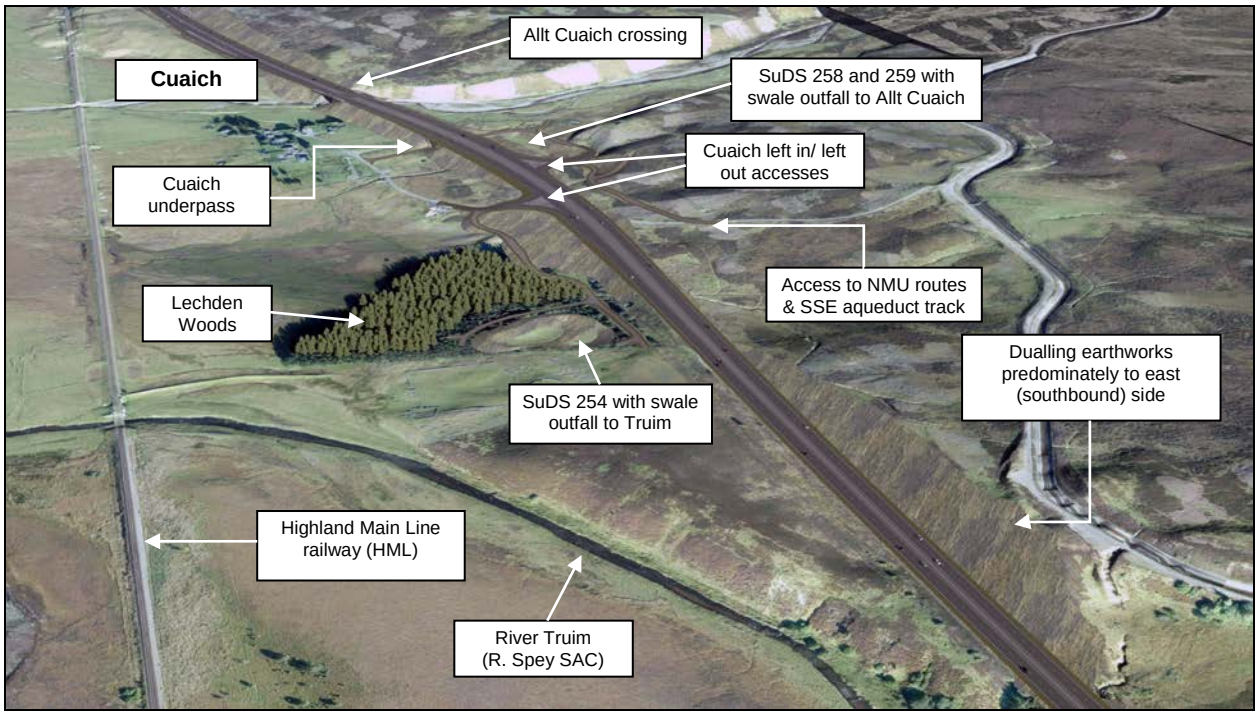

Figure 5-4: Southbound dualling, SuDS at Lechden, Cuaich access and Allt Cuaich crossing

Mainline Alignment – Chainage 26,400 to 28,800

5.3.12 **Figure 5-5** shows the proposed dualling continues to the eastern (southbound) side of the existing A9. Just north of Cuaich, the HML railway restricts works to the west, resulting in the need for rock cuts on the southbound side. North and southbound lay-bys are shown, with SuDS and maintenance access tracks on the west (downstream) side. (Note, later design iterations adjusted the SuDS access track layouts which now run between the SuDS basins and the mainline, please refer to **Drawings 5.1** to **5.18** in **Volume 3**).

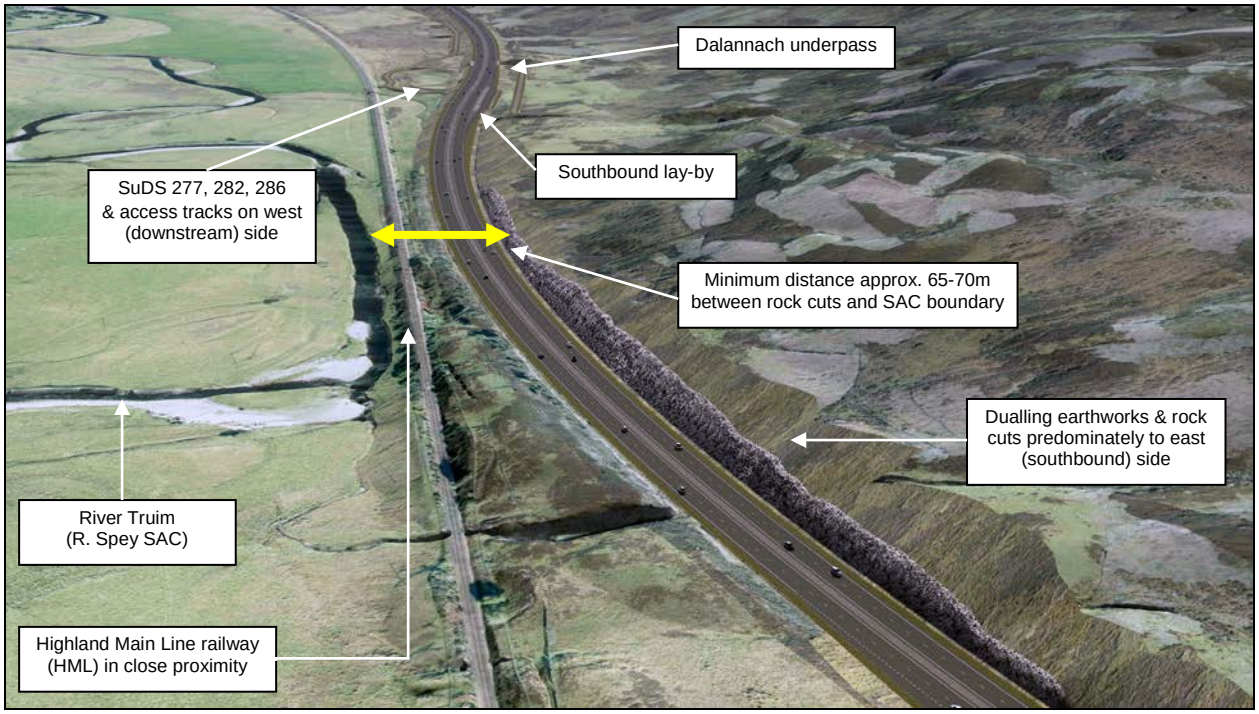

Figure 5-5: Ch. 26,400 to 28,800 Southbound dualling, rock cuts, lay-bys, SuDS to west side

Mainline Alignment – Chainage 28,800 to 30,200

5.3.13 **Figure 5-6** shows that dualling transitions to the northbound (west) side due to steep hill slopes to the east. SuDS and maintenance access tracks are shown to the west (downstream) side, with a left in/ left out access from the northbound carriageway providing access to the SuDS shown in the previous image (Fig. 5-5).

5.3.14 A southbound lay-by is shown with cuttings on both sides of the A9 in this location; on the southbound side this is because of the lay-by, whilst on the northbound side it is as a result of dualling to that side.

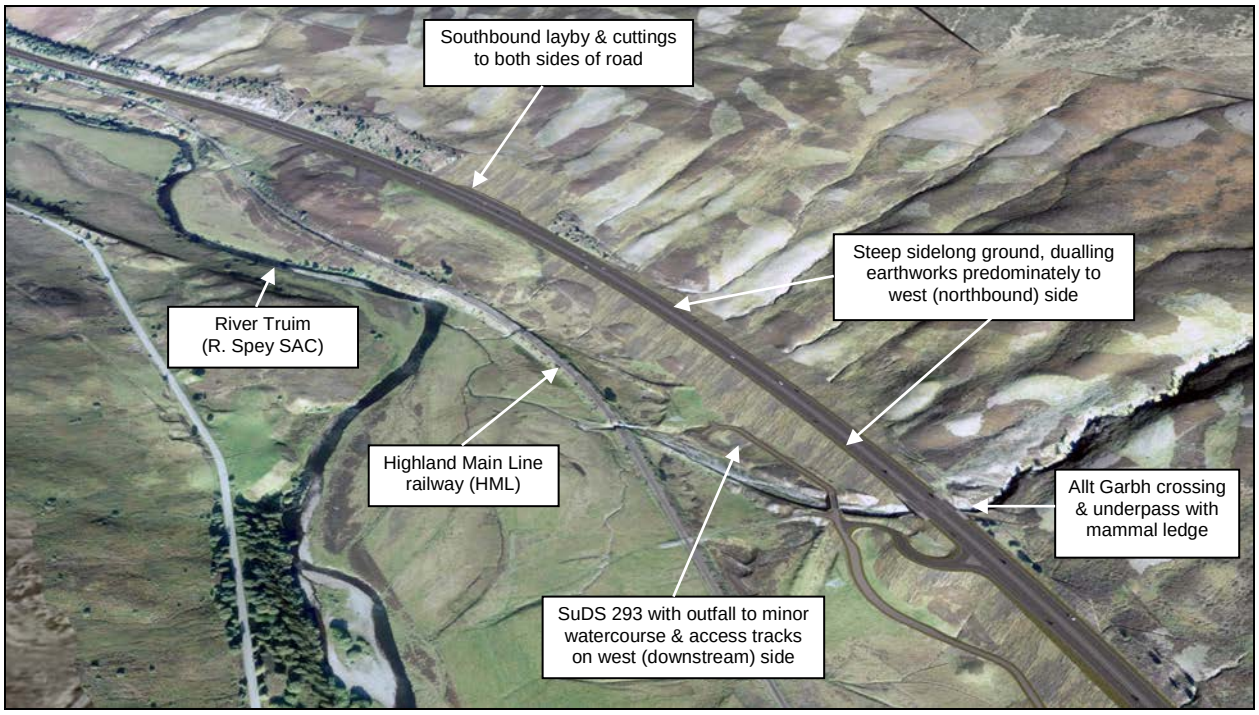

Figure 5-6: Ch. 28,800-30,200 – Dualling to northbound (west) side, steep hill slopes to east

Mainline Alignment – Chainage 30,200 to 31,050

5.3.15 **Figure 5-7** shows that dualling continues to the northbound (west) side due to steep hill slopes to the east. A northbound lay-by is shown with earthworks slopes graded to integrate with the surrounding landform.

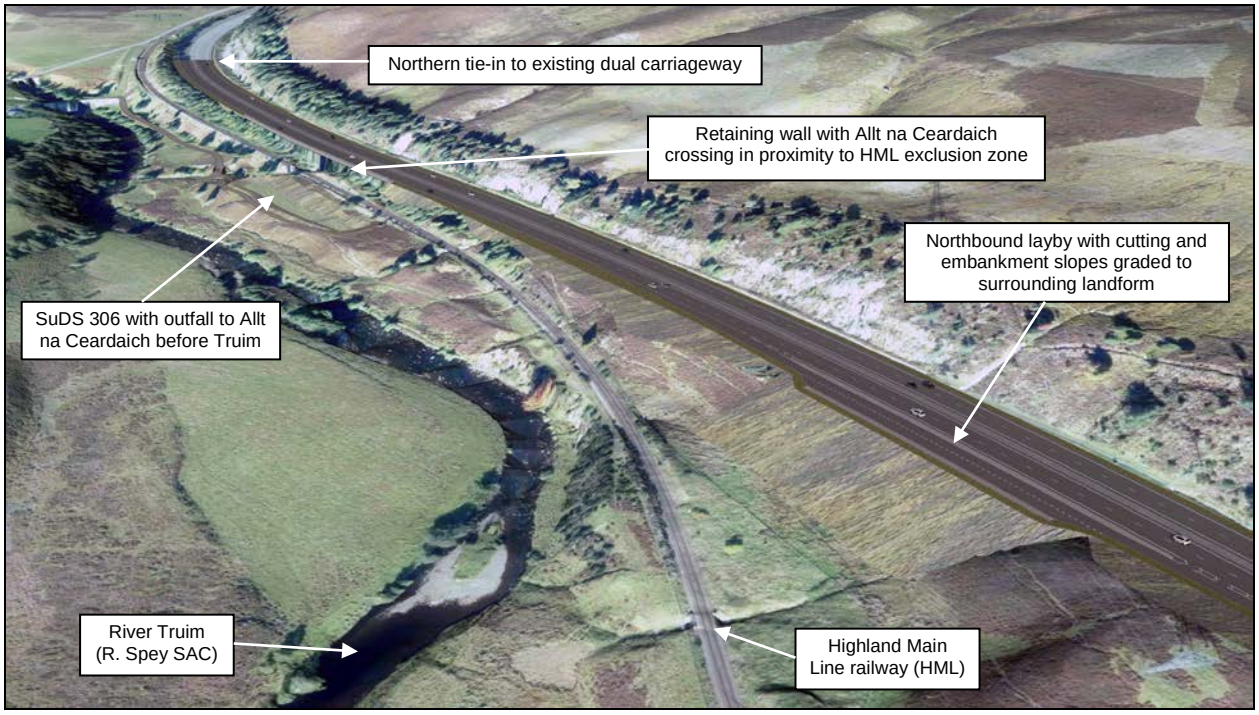

Figure 5-7: Ch. 30,200-31,050 – Northbound dualling, SuDS between HML railway and River Truim

5.3.16 At the end of this stretch, the Proposed Scheme ties into the existing Crubenmore dual carriageway; however, due to restricted space between the hill slopes to the east and the HML railway to the west, the Proposed Scheme includes a significant length of retaining wall. A safety barrier is incorporated along the length of the retaining wall due to its proximity to the HML railway boundary.

5.3.17 The SuDS basin in this area is located to the opposite side of the HML railway, on a raised plateau between the HML railway and the River Truim. Access to this SuDS location is via existing access to Crubenmore.

Proposed Scheme – Earthworks

5.3.18 The Proposed Scheme includes some rock cuttings, predominately situated on the eastern side of the A9 between ch. 26,600 and 27,200, with some additional rock likely at the Dalwhinnie Junction location. The chainage location of cuttings and embankments are shown on **Drawings 5.1 to 5.18** (see **Volume 3**). In general, the proposed engineering slope angles range between gradients of 1:2 to 1:3 to ensure slope stability; however, a number of steeper or shallower slopes are required in some locations to deliver local landscape requirements. Slacker slopes range from 1:2.5 to 1:8 for embankment fill and from 1:3 to 1:5 for cut slopes.

5.3.19 Best practice design aims to deliver an earthworks balance to minimise material import to, and export from, the Proposed Scheme extent. A summary of bulk earthworks quantities is provided in **Table 5-2** below:

Table 5.2: Summary of earthworks volumes/ quantities at DMRB Stage 3

Quantity/details	DMRB Stage 3 (Final Iteration)			
	Mainline	Dalwhinnie Junction	Access Tracks/ SUDS/ Aqueduct Diversion/ Other	Total
1. Cut (Acceptable)	386,000m^3	32,000m^3	66,000m^3	484,000m^3
2. Cut (Unacceptable)	15,000m^3	11,000m^3	33,000m^3	59,000m^3
3. Cut (Rock excluding bulking factor)	67,000m^3	8,000m^3	0m^3	75,000m^3
4. 60% rock re-processed for use as capping)	40,000 m^3	5,000m^3	0m^3	45,000m^3
5. Cut (Peaty soil/ topsoil)	56,000m^3	11,000m^3	26,000m^3	93,000m^3
6. Cut (Shallow peat (0.50m to 1.00m))	22,000m^3	13,000m^3	13,000m^3	48,000m^3
7. Cut (Deep peat (>1.00m))	3,500m^3	7,500m^3	3,000m^3	14,000m^3
8. Engineered Fill (Based on 1 in 2 slope)	326,000m^3	83,000m^3	41,000m^3	450,000m^3
9. Landscape Fill (Based on varied slope)	111,000m^3	N/A	N/A	111,000m^3
Approx. Surplus/ Deficit Volume (Engineered Fill) (1+((3-4) *1.15)) – (8) -ve Deficit/ +ve Surplus	+91,000m^3 Surplus	-48,000m^3 Deficit	25,000m^3 Surplus	+69,000m^3 Surplus
Approx. Surplus/ Deficit Volume (Landscape Fill) (2) - (9) -ve Deficit/ +ve Surplus	-96,000m^3 Deficit	+11,000m^3 Surplus	+33,000m^3 Surplus	-52,000m^3 Deficit
Surplus Engineering Fill used to balance Landscape Fill Deficit:				**+17,000m^3 Surplus Engineering Fill**
Notes: 1. Cut and engineering fill volumes include adjustments for peat excavation. 2. Engineering fill surplus/ deficit calculation assumes rock bulking factor of 15% is applied to the rock cut volumes. Also, assumes 60% of rock re-processed for use as capping. 3. Assumes peaty soil/ topsoil re-used as topsoil. Also, no allowance has been made for re-using shallow and deep peat as landscape fill.				

5.3.20 The volumes noted in **Table 5-2** are based on the latest Proposed Scheme design. Following the 4th iteration design it was apparent that there was a surplus of engineering fill of approximately 105,000m^3. To avoid this surplus material going off site, later design iterations included measures to enable suitable material to be used as landscaping fill, including:

- southbound mainline ch. 23,450-23,700 – slacken (grade out) embankment between mainline and realigned aqueduct
- northbound mainline ch. 25,500-25,600 – slacken (grade out) embankment between mainline and parallel access track
- northbound mainline ch. 27,800-29,100 – slacken (grade out) embankment between mainline and parallel access track
- southbound mainline ch. 29,250-29,700 – slacken (grade out) embankment to 1:11 slope

5.3.21 In addition, the final design incorporated the compact grade separated junction at Dalwhinnie which reduced the overall cut volume by approximately 50,000m^3.

5.3.22 The total surplus engineering fill for the final design is approximately 69,000m^3. This is used to balance the landscape fill deficit of approximately 52,000m^3. This leaves a total engineering fill surplus of approximately 17,000m^3, which is considered acceptable in terms of further earthworks balancing refinements likely to be realised at the construction stage.

5.3.23 Note that **Chapter 10, Geology, Soils and Groundwater**, includes an Outline Peat Management Plan, which addresses potential peat arisings, mitigation and management measures.

Structures

5.3.24 Following a value for money assessment that considered each structure within the Proposed Scheme, full replacement of the majority of existing structures is required.

5.3.25 Note that watercourse crossings (bridges and culverts) are typically designed to accommodate the 1:200 year design flood level, plus a 20% allowance for climate change, plus suitable freeboard. Exceptions are applied where culverts are retained at smaller sizes to avoid increasing downstream flood risks (detailed in **Chapter 11, Road Drainage and the Water Environment**).

Changes to Existing Structures

5.3.26 **Table 5-3** provides an overview of proposed changes to existing structures. Note that it is anticipated that structures will be replaced by building one new half whilst traffic is maintained on the existing, before transfer of traffic to the new half, dismantling and removing the existing, then construction of the second half to complete the new structure.

Table 5.3: Proposals for Existing Structures

Name of structure and chainage	Existing structure	Proposed structure
S1 - Allt Coire nan Cisteachan Underbridge – ch. 20,765	5m span reinforced concrete portal structure on strutted abutments	The existing structure will be replaced with a new widened structure which extends the A9 to the east (southbound side). The new structure span will be increased to 8m, principally to clear span the water channel, reduce morphological pressures, and improve bankside clearance for mammal passage.
S2 - Allt Coire Uilleim Underbridge – ch. 21,450	5m span reinforced concrete portal structure on strutted abutments	The existing structure will be replaced with a new widened structure which extends the A9 to the east (southbound side). The new structure span will be increased to 11m, principally to clear span the water channel, reduce morphological pressures, and improve bankside clearance for mammal passage.
S3 - Allt Coire Bhathaich Underbridge – ch. 22,240	5m span reinforced concrete portal structure on strutted abutments	The existing structure will be replaced with a new extended structure which extends the A9 to the east (southbound side). The span will be increased to approximately 13.8m, principally to clear span the water channel, reduce morphological pressures, and improve bankside clearance for mammal and NMU passage. A ledge is included on the north bank for deer, sheep and pedestrians.
S5 - Sheep Creep – Ch. 22,800	1.8m span (1.7m headroom) reinforced concrete headwall structure with post and rail boundary fence	A new sheep creep, provided via a dry culvert, to replace an existing sheep creep to the north of Dalwhinnie Junction The existing sheep creep is a corrugated steel pipe with an internal diameter of 1.7m The proposed sheep creep increases the internal dimensions to a span of 2.8m and a headroom of 1.8m
S6 - SSE Aqueduct Underbridge – ch. 23,375	The SSE Aqueduct crossing is currently a steel composite portal structure on strutted abutments The existing bridge has a clear skew span of approximately 35m between abutment faces	The existing structure will be replaced with a new widened structure which extends the A9 to the east The proposed span will remain as the existing at approximately 35m The structure will continue to accommodate access tracks which run parallel to the aqueduct The aqueduct and access track will be diverted on the eastern side of the A9 in order to maintain the existing skew
S7 - Cuaich Underpass - ch. 25,880	3.7m span multi-plate corrugated steel Armco pipe	The existing corrugated arch structure will be replaced with a new underpass structure Proposed dimensions are 5.3m min span and 3.3m min vertical clearance The new single span structure is located just to the north of the existing structure and approximately 150m south of the Allt Cuaich Underbridge and will be founded on spread footings The structure location has been informed by flood modelling to avoid creating a preferential flow path
S8 - Allt Cuaich Underbridge – ch. 26,030	A pre-stressed concrete portal structure on strutted abutments The existing clear skew span is approximately 19.4m	The existing structure will be replaced with a new widened structure which extends the A9 to the east The new structure will have the same skew span as the existing of 19.4m, principally to retain the same general arrangement as this currently provides some flood protection for properties at Cuaich
S10 - Allt Garbh Underbridge – ch. 29,170	5m square span reinforced concrete portal structure on strutted abutments	The existing structure will be replaced with a new widened structure which extends the A9 to the west (northbound side) The span will be increased to approximately 14m skew span (13m square span); principally to clearspan the watercourse and to provide additional space beneath for mammal and NMU passage
S11 - Allt nan Ceardaich Underbridge – ch. 30,665	5m span reinforced concrete box culvert	The existing structure will be retained and extended with a similar box culvert in order to extend the A9 to the west The culvert will continue along the same grade as the existing to follow the watercourse

Proposed New Structures

5.3.27 **Table 5-4** provides an overview of proposed new structures.

Table 5.4: Proposed new structures

Name of structure and chainage	Proposed structure
S4 - Dalwhinnie Junction Underpass - ch. 22,550	A new junction underpass structure will carry the A9 mainline over the Dalwhinnie link road w The new structure will be a fully integral, single span pre-stressed concrete structure with sloped embankments and bankseat abutments on spread footings The link road cross section includes a 9.3m wide carriageway with 2.5m wide verges to either side
S3a - River Truim Overbridge – ch. 22,550	The River Truim overbridge is designed as a 2-span steel composite structure with a varying soffit The structure is off-line from the mainline dual carriageway; however, it forms part of the new A889 link road directly from the A9 junction into Dalwhinnie The spans have been designed to accommodate 1:200 year flows in the River Truim and to provide a dry area for mammal passage above the 1:50 flood level on the east side
S9 - Dallanach Underpass - ch. 27,830	A new underpass structure is required to provide access to both sides of the A9 for estate operations Proposed dimensions are 4m min span and 3.3m min vertical clearance The new single span structure, located approximately 2km north of Cuaich, will be a reinforced concrete box structure with internal dimensions large enough to accommodate estate traffic
RW1 - Retaining wall around Allt na Ceardaich Underbridge – ch. 30,600–800	At the north end of the scheme, a vertical retaining wall is required, which will also incorporate the extension to the Allt Na Ceardaich culvert noted in **Table 5-3** above Space between the A9 and the HML railway is limited in this area, preventing the introduction of earthwork embankments, resulting in the need for a retaining wall solution The retaining wall is approx. 200m long, with height varying between 2m to 7m due to local topography

5.3.28 **Table 5-5** includes a list of the proposed offline structures within the Proposed Scheme.

Table 5.5: Proposed offline structures

Name of structure and chainage	Proposed structure
MS1 – Cycleway Structure – Ch. 20,150	New steel and timber structure to accommodate the realigned NCN7 over an unnamed watercourse The bridge spans approximately 8.0m and is 3.0m wide The beams themselves are spaced at 1.5m centres with transverse timber decking 300mm x 150mm thick The structure sits on full height abutments with spread footings.
MS2 – Allt Coire Bhathaich Access Structure	A new access structure is required to serve a SuDS/ estate link road from the Dalwhinnie Junction, to the east of the mainline at approx. ch. 22,250 Integral portal with 15m clear square span between abutment faces to clear the watercourse The access track itself is 3.3m wide, with 0.5m rubbing strips; including parapet edge beams of 0.5m gives a total structure width requirement of 5.3m.
MS3 – Allt Garbh Access Crossing	A new access structure is required to cross the Allt Garbh watercourse, at approx. ch. 29,170 to the west of the mainline structure Integral portal with 9.7m clear square span (10.4m skew span) between abutment faces The access track itself is 3.3m wide, with 0.5m rubbing strips; including parapet edge beams of 0.5m gives a total structure width requirement of 5.3m.
MS4 – Allt na Ceardaich Access Crossing	Replacement of existing small structure crossing the Allt na Ceardaich on an existing track, to the east of the A9 at approx. ch. 30,710 The proposed structure is a single span fully integral pre-stressed concrete structure with a clear square span of 6.0m between abutment faces to allow construction to be clear of the watercourse The access track itself is 3.3m wide with 0.5m rubbing strips; including parapet edge beams of 0.5m gives a total structure width requirement of 5.3m.

Watercourse Crossings

5.3.29 Watercourse crossings within the Proposed Scheme extents include:

- 6 bridge crossings (structures) on major watercourses
- 51 mainline culverted watercourse crossings including:
  - 4 box culverts on “major” watercourses
  - 1 piped culvert on “major” watercourse
  - 14 box culverts on “minor” watercourses
  - 31 piped culverts on “minor” watercourses

5.3.30 There are 41 watercourse crossings under access tracks comprising:

- 12 bridge crossings (structures)
- 29 culverted crossings

5.3.31 Additional crossings and culverts are required for associated access tracks, land drains and the SSE Aqueduct crossing. In general, structures and culverts are sized to pass the 1:200 year flow, with freeboard, unless flood modelling identified loss of upstream flood storage which increased downstream risk. In such cases, culverts are sized to maintain the upstream storage.

5.3.32 **Figure 5-8** shows that each watercourse has been assigned a reference number, with prefix ‘MW’ for a major watercourse (shown on Ordnance Survey (OS) 1:50k maps), and prefix ‘W’ for a minor watercourse (not visible on OS 1:50k maps). In addition, each watercourse crossing has been assigned a unique reference number (referred to as a Hydro ID) and in **Figure 5-8** colour coding is used to distinguish between major and minor watercourse crossings.

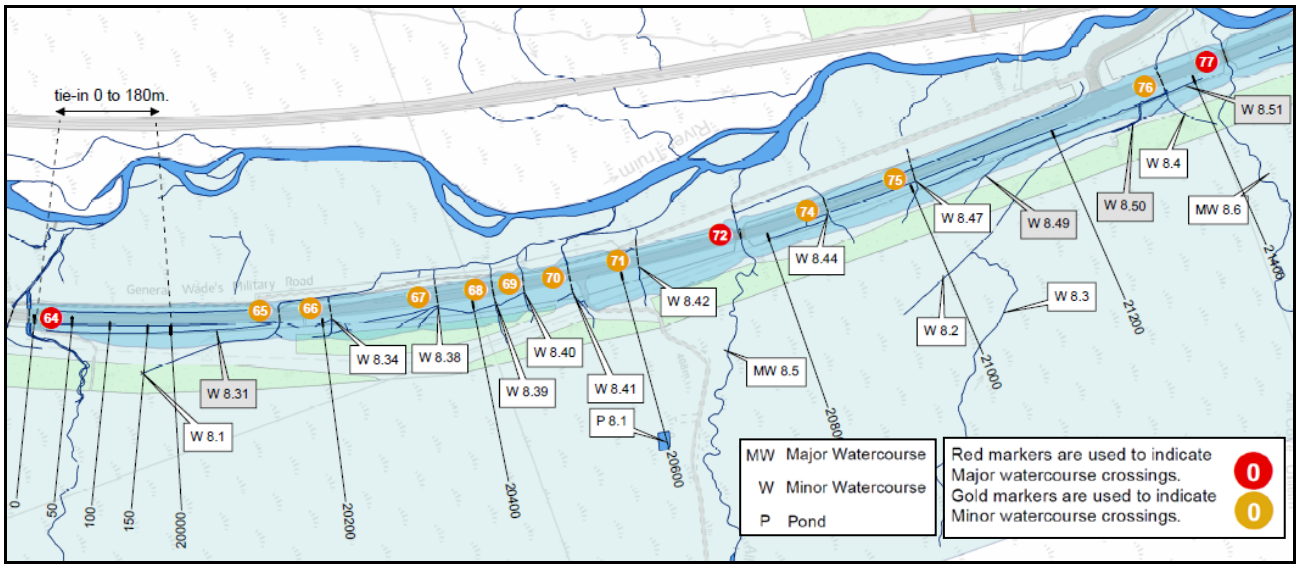

Figure 5-8: Major/ minor watercourse and watercourse crossings reference system (Hydro IDs)

5.3.33 During the design development process, ecological input identified a number of watercourse crossing locations where species permeability could potentially be improved via the inclusion of buried box culverts that incorporate natural bed material and mammal ledges.

5.3.34 **Figure 5-9** shows typical cross-section details of such culverts, and the relevant Hydro IDs are noted below each image. Ledges are sized according to SNH advice, to sit above the 1:50 flood level where possible, be at least 450mm wide and include at least 450mm headroom.

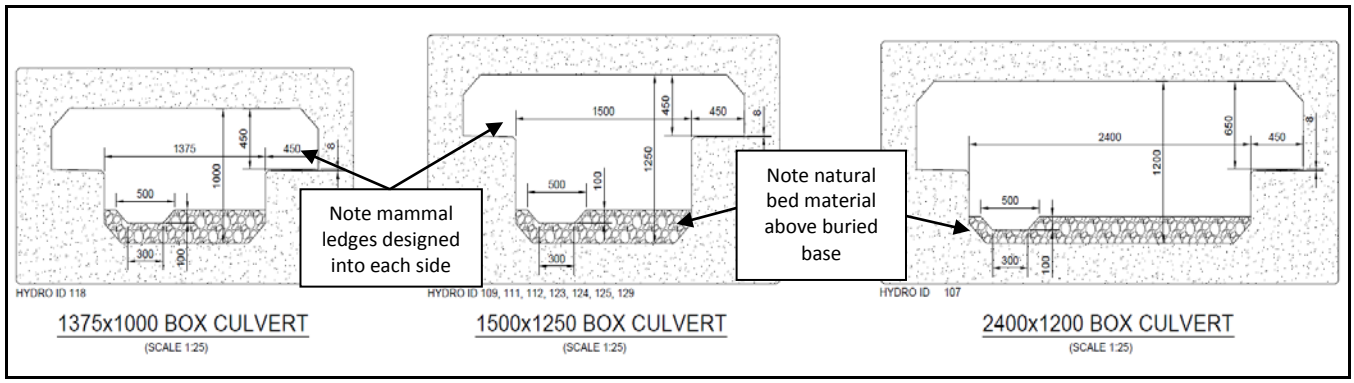

Figure 5-9: Typical cross-sections of buried box culverts with bed material and mammal ledges

5.3.35 Given the steep hill slopes along much of the Proposed Scheme extent, it is recognised that several watercourses will be intercepted and diverted on the upstream side, to direct flows into new, or replaced, culverts. Some of these watercourses will require steps, or cascades, to account for steep level changes. **Figure 5-10** shows an extract of a typical design detail for cascade features, where space available allows the introduction of pools which help to reduce flow velocities and deliver additional ecological opportunity. It should be recognised however, that such extended cascade features may not be possible in all cases due to other constraints.

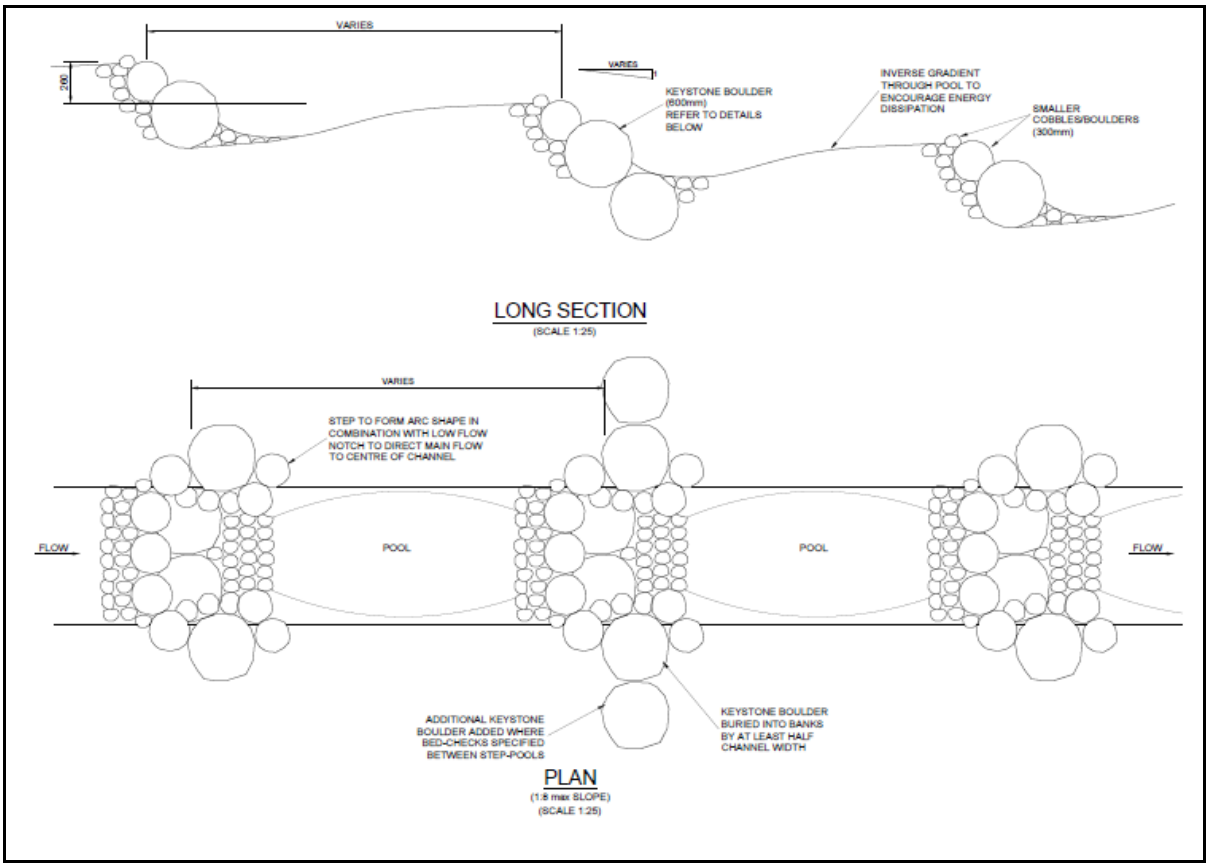

Figure 5-10: Schematic overview of proposed typical cascade detail

Drainage Network Design

5.3.36 Road surface drainage network design for the Proposed Scheme has been developed in accordance with Sustainable Drainage System (SuDS) design guidance and through consultation with SEPA, SNH and the relevant local authorities. This includes a minimum of two levels of SuDS treatment across the mainline and junction infrastructure, with enhanced treatment provided where water quality assessments identified a need.

5.3.37 Typically, the drainage network includes for roadside filter drains as a first level, passing to a detention basin as the second level. Where required, enhanced treatment is provided by a micro-pool (permanently wet feature) and/ or a swale (open, grassed channel) to the discharge outfall.

5.3.38 SuDS basins have been sized to provide surface runoff attenuation in heavy rainfall events, in accordance with local authority requirements. SuDS basins are located at natural drainage (low) points on the network, to enable gravity flows; however, positioning has also been informed by constraints analyses, including avoidance of 1:200 year floodplain encroachment, deeper peat deposits and sensitive habitats, where possible.

5.3.39 Similarly, points upstream of larger watercourse crossings, where it would be difficult to continue road drainage across a decked bridge structure, have been identified. Locations have also been identified at intermediate points on long road drainage catchments, to sub-divide the catchment area, ultimately aiming to keep associated SuDS feature areas to a reasonable size.

5.3.40 Due to the sensitive nature of local receiving waters (i.e. the River Truim (River Spey SAC)), drainage discharge from each SuDS basin has been assessed to ensure it meets environmental quality standards. In some locations, SuDS outfall direct to the Truim; however, in these cases low velocity outfalls have been incorporated to minimise risk of scour to SAC habitats.

5.3.41 In addition, each SuDS basin is sized assuming that it will be lined to prevent infiltration and to include shut off (e.g. a gate valve or similar) to provide spillage containment, further minimising risks to the SAC.

5.3.42 Access track drainage has been considered and, due to low levels of anticipated use, one level of drainage treatment is provided in line with SEPA and SNH guidance for design and drainage of upland tracks, and as agreed with SEPA via the A9 Dualling Environmental Steering Group. In addition, pre-earthworks drainage systems, to intercept hillside, cutting and embankment runoff are included. These are provided as cut off drains to intercept water that is not affected by road surface runoff, does not therefore require treatment and can be directed to a local watercourse within the natural catchment.

Compensatory Floodplain Storage

5.3.43 At each development iteration, infrastructure designs were tested against the 1:200 year flood model to identify floodplain encroachments and to reduce these through design refinement where possible. However, given the close proximity of the River Truim and numerous watercourse crossings, full floodplain avoidance is not possible. Compensatory flood storage is therefore required to offset floodplain displacement due to encroachments.

5.3.44 The Proposed Scheme includes a number of areas, which will include some limited excavation to lower the ground to provide level-for-level storage. These areas are therefore defined as permanent works, to provide compensatory flood plain storage for up to the 1:200 year event where achievable.

Road Surface

5.3.45 The Proposed Scheme design assumes that a low noise road surface will be laid in accordance with relevant specifications.

Lay-bys

5.3.46 The Proposed Scheme removes all previous roadside bays and introduces four new southbound and three new northbound lay-bys. New lay-bys will be extended 'Type A' lay-bys which include a separation island and merge tapers to/ from the mainline carriageway.

5.3.47 There are safety standards guiding lay-by placement that restrict how close lay-bys can be from significant bends and junctions, in order to maintain good visibility; however, where possible within these safety standards, lay-bys have been located in areas that also provide good views out to the surrounding landscapes.

Non-Motorised User (NMU) Provision

5.3.48 At the southern extent of the Proposed Scheme, the old General Wade's Military Road runs parallel to the A9 northbound carriageway, and forms part of the National Cycle Network Route 7 (NCN7), before it joins the existing A889 road into Dalwhinnie. The NCN7 is also identified as a Core Path. It continues through Dalwhinnie and reconnects with General Wade's Military Road past the Dalwhinnie Distillery, from where it continues north towards Etteridge/ Falls of Truim.

5.3.49 The Proposed Scheme includes for local realignment of the NCN7 at various points between ch. 20,100 and ch. 21,275. A9 dualling is to the southbound (opposite) side of the road in these areas; however, the NCN7 requires short local diversions around SuDS features on the downstream (northbound) side. Due to SuDS feature maintenance requirements, the NCN7 will also be locally widened to provide passing places. All related NCN7 works will be completed to provide an equal or better standard of provision than existing.

5.3.50 NMU links to other local tracks have been maintained, as noted under 'Access to Land and Properties' below. These include a southern link to the existing SSE Aqueduct track at ch. 22,550 and a northern link to the SSE Aqueduct track and recognised Munro routes at ch. 25,750. In terms of structures that may/ may not provide opportunities for NMU passage under the A9, **Table 5-6** summarises the clearances provided by structures in the Proposed Scheme.

Table 5.6: Clearance provided in Proposed Scheme structures

Chainage	Structure	Clearance (m)
20,765	Allt Coire nan Cisteachan Underbridge	<1
21,450	Allt Coire Uilleim Underbridge	>1
22,240	Allt Coire Bhathaich Underbridge	~3
22,800	Dry Culvert (Sheep Creep)	<2
25,880	Cuaich Underpass	>3
26,030	Allt Cuaich Underbridge	>4
27,830	Dalannach Underpass	~ 3
29,170	Allt Garbh Underbridge	>2
Note it is considered that structures with less than 2m clearance may be less likely to be used by NMUs, and those with approx. 1m clearance are not considered suitable for NMU access		

5.3.51 Note that **Table 5-6** excludes the River Truim A9/ A889 link road overbridge, which includes a footpath, the Dalwhinnie Junction underbridge, which includes clearance for high vehicles and the SSE Aqueduct underbridge, which also includes clearance for vehicles.

5.3.52 Bus stops are now provided via a bus turning loop on the Dalwhinnie Junction link road. This enables buses to pull off the A9 mainline and then re-join without having to divert fully into Dalwhinnie. It also reduces walking distance for local users and visitors, and removes the need to cross the mainline carriageway as in the current situation to get to/ from the bus stop on the southbound side. The location of the new bus turning loop is approximately 1km closer to Dalwhinnie than the existing provision. The benefits of new bus stop provisions are considered further in **Chapter 9, Effects on All Travellers**.

Access to Land and Properties

5.3.53 Proposed accesses to private land are provided as described in **Table 5-7** below.

Table 5.7: Proposed accesses

Location/ chainage	Proposed access
Drumochter Estate Access from Ch. 20,550 south into Project 7 extent Approx. 1,800m length	The former BDL construction track, on the southbound side of the A9, will be made permanent to provide for Drumochter Estate access, due to the closure of existing direct accesses from the A9 The Proposed Scheme includes for making the BDL track permanent from the Allt Coire nan Cisteachan south to the Allt Coire Chuirn
Phoines Estate Ch. 22,100	Access to Phoines Estate is provided, on the southbound side, via maintenance access tracks, which connect the Dalwhinnie Junction to SuDS features 222 and 233 Access to the northbound side is provided via the Allt Coire Bhathaich underbridge, which includes a track ledge on the north side of the watercourse
Drumochter and Phoines Estates Ch. 22,550	Access to both Estates on the northbound side of the dual carriageway is provided via the Dalwhinnie Junction A9/ A889 link road Once past the new Truim crossing, the A889 to the south side (i.e. away from Dalwhinnie) will be available for Estate access as it continues to link into the NCN7 route
SSE Aqueduct Ch. 22,550	Access to the SSE Aqueduct is via the Dalwhinnie Junction A9/ A889 link road The SuDS 225 access track includes a spur which connects into the existing SSE track (as shown in **Drawings 5.3**)
Dalwhinnie properties Ch. 22,550	Access to Dalwhinnie properties will be via the new Dalwhinnie Junction and A9/ A889 link road This brings the link road closer to Dalwhinnie and provides a bus turning circle on the A889 link, reducing the walking distance for bus users
Cuaich Northbound ch. 25,650 Southbound ch. 25,750	Left in/ left out accesses are proposed on the north and southbound carriageways, in conjunction with an underpass at ch. 25,850 This arrangement provides full access to/ from both carriageways at Cuaich It also provides for access to SuDS features, a northern connection to the SSE Aqueduct track and links to Munro routes on the southbound side
Phoines Estate Ch. 29,125	A left in/ left out access is proposed on the northbound carriageway This access will connect to SuDS feature maintenance tracks, an underbridge on the Allt Garbh (enabling access to the southbound side), and another underbridge at ch. 27,825 (Dallanach underpass) which also enables access to the southbound side of the A9
Access to SuDS feature 306	Due to space constraints, SuDS feature 306 is located on the opposite side of the HML railway on a plateau between the HML and the River Truim Access to this location will be via the existing Crubenmore Junction on the northbound side of the Crubenmore dual carriageway at Etteridge/ Falls of Truim General Wade's Military Road routes south to Crubenmore Bridge, and an existing track runs alongside the HML railway to Crubenmore Old Bridge; the Proposed Scheme extends this track to SuDS 306

Lighting and Signage

5.3.54 The Proposed Scheme does not include lighting for the mainline carriageway or the Dalwhinnie Junction, which accords with the Cairngorms National Park 'dark skies' Special Landscape Quality (SLQ). However, where necessary, road traffic signs and underpasses may be lit in accordance with applicable safety standards.

5.3.55 Signage has been developed in accordance with Transport Scotland's guidance on *Road Furniture in the Countryside*, 2006. Signs are required to have high visibility for road users. However, the exact siting for signage will be considered during the detailed design and construction stages to minimise skylining and visual clutter.

Fencing

5.3.56 Permanent post and wire fencing may be erected along the Proposed Scheme boundaries, depending on landowner requirements. Ecological fencing (e.g. otter/ badger fencing) will be introduced, where necessary, to guide smaller mammals to safe crossings under the road. Existing deer fencing will be replaced where affected by the Proposed Scheme, and some additional deer fencing may be introduced in certain locations to route larger mammals to suitable safe crossings under the road. It should be noted that it is not intended to introduce permanent deer fencing along the entire length of the Proposed Scheme.

5.4 Temporary Works (Construction Phase)

5.4.1 Construction activities, required to build the Proposed Scheme, are considered to be temporary works and will typically include:

- Site clearance, including vegetation clearance
- Stock proof fencing
- Pre-earthworks drainage and temporary SuDS
- Earthworks general (cut/ fill)
- Material transfer via haul routes and temporary watercourse crossings
- Rock cuts and rock breaking
- Stockpiling and temporary lay-down
- Watercourse diversions and culverts
- Drainage networks, including SuDS basin and outfall installation
- Earthworks rolling and compaction
- Road sub-layer formation
- Central reserve works
- Road pavement laying
- Structures demolition
- Bridge abutment construction
- Bridge structure and deck construction
- Road marking
- Signage installation
- Site restoration (ecological and landscape mitigation works)
- Active traffic management

5.4.2 It is therefore necessary to ensure that sufficient land is made available to enable construction activities around the perimeter of the permanent works extents, whilst at the same time limiting the amount of additional land likely to be affected.

5.4.3 Temporary works areas have been identified as being necessary to enable construction; however, it is considered that such areas will not be permanently lost to the Proposed Scheme, and would be suitable for restoration to conditions that enable recovery post-completion or, where shown on **Environmental Mitigation Drawings 6.1 – 6.14 (Volume 3)**, to provide areas for mitigation to address the impacts of the Proposed Scheme.

5.4.4 It should be noted that although the approach adopted identifies 'permanent' works areas, 'temporary' works areas and additional land areas for mitigation, for the purposes of clarity, all land identified as '*necessary for the safe construction and operation of the scheme*' would be considered for permanent land take and purchase under the Roads (Scotland) Act 1984.

5.4.5 It should also be noted that, whilst consideration of typical construction works activities has informed a temporary works boundary for assessment, in order to enable the Principal Contractor flexibility of use at construction stage, no specific temporary land uses are defined.

Indicative Construction Programme

5.4.6 The EIA of the Proposed Scheme has been undertaken based on an anticipated construction programme of approximately 3 years. It is considered that the following approximate timescales (which may overlap during the overall construction phase) will apply:

- Formation of earthworks – 8 months
- Bridge works – 1.5 years
- Pavement works – 2 years

5.4.7 A detailed construction programme will be developed by the Principal Contractor; however, further information on possible construction sequencing is provided in **Appendix 5.1 (Volume 2).**

Access to Property and Non-Motorised User Routes

5.4.8 During construction, suitable access to property and NMU routes shall be maintained by the Contractor; however, during certain construction operations, temporary closures or diversions may be required.

Works Compounds

5.4.9 At DMRB Stage 3 it is not possible to determine where a Contractor would prefer to locate works compounds (i.e. site accommodation, offices, welfare facilities, and parking for staff and storage areas for materials and plant); this is generally left to the Contractor to agree with local landowners and secure any relevant permissions/ consents from environmental regulators and planning authorities. Works compounds are not therefore considered within the Proposed Scheme under assessment.

Borrow Pits

5.4.10 At DMRB Stage 3 it is not possible to determine where a Contractor would seek to gain any additional material from borrow pits, potentially in proximity to the Proposed Scheme extents. This is generally left to the Contractor to agree with local landowners and secure any relevant permissions/ consents from environmental regulators and planning authorities. Borrow pits are not therefore considered within the Proposed Scheme under assessment.

Structures and Culverts

5.4.11 Structures and culverts will generally be constructed in two halves, to enable A9 traffic to continue running over existing structures until the first half of the new structure is complete, and traffic can be transferred. The second half will then be completed in conjunction with any required removal of the existing, redundant structure.

5.4.12 It should be noted that the contractor will need to assess the load capacity of structures for construction use and temporary alternatives, or suitable replacement, structures may be required. As this EIA does not specify haul routes or other construction elements, an assessment of such structures has not been undertaken at this stage.

Watercourse Diversions

5.4.13 The Proposed Scheme will result in a number of watercourse diversions. These will take place in stages depending on the road construction arrangement and in some cases, a temporary watercourse diversion will be required to enable completion of permanent diversion works. Land required for such diversion works has been considered within the assessment boundaries.

Temporary SuDS and Access Tracks

5.4.14 A principal concern raised by SEPA through the ESG was ensuring the provision of sufficient land for construction stage sediment controls, i.e. temporary SuDS such as settlement lagoons. Land required for such features has been considered within the assessment boundaries, typically in proximity to watercourses on the downstream side of the A9.

5.4.15 Various temporary access tracks may be required throughout the construction stage, for example, to enable access to install permanent drainage networks and outfalls, as well as to temporary construction SuDS and other areas. Land required for such temporary access has been considered within the assessment boundaries.

Temporary Works Fencing

5.4.16 Temporary stock proof fencing will be erected, prior to construction works, where considered appropriate by the contractor. Typically, the aim is to delineate the works site and minimise risk of larger mammals (e.g. deer, sheep, horses or cattle) and people wandering into an active works area. Temporary works fencing does not present a significant barrier for smaller mammals.

Piling

5.4.17 There are no proposals to use piling for structural foundations within the Project 8 extent. However, it is possible that piling may be considered in areas of deep peat, in favour of full excavation to rockhead. It is also possible that sheet piling techniques may be used during construction to enable formation of concrete, or to create temporary barriers at watercourses or in waterlogged areas. Recommendations are included within **Chapter 10 (Geology, Soils and Groundwater)** for the Contractor to adhere to appropriate guidance should piling techniques be used.

Traffic Management Phasing

5.4.18 The Proposed Scheme requires dualling to both the east (southbound) side and west (northbound) side. Buildability has informed considerations on landtake required for the Proposed Scheme, principally with a view to keeping A9 traffic flowing on the existing carriageway during the primary phases of construction.

5.4.19 Generally, new underbridges will be prioritised in each phase, such that they can then be used in haul routes for construction traffic. The majority of construction works will require a reduction in lane width to maintain 2-way traffic, while the new carriageway is constructed adjacent.

5.4.20 There will be some sections of temporary carriageway required to facilitate construction of crossovers and tie-ins, and where level differences between the existing and proposed mainline present construction complexities. Where an elevated carriageway is required, reinforced slopes or soil nailing may be used to enable construction. Appropriate temporary barriers will be installed prior to construction, where required.

5.4.21 The exception to the above will be at tie-ins when single-lane working is anticipated, although it is considered that such works may be undertaken overnight to minimise disruption to traffic flows. Construction of tie-ins will be carried out during off-peak times, potentially with temporary traffic light arrangements. Other temporary traffic management measures may be required in various locations, including:

- Temporary works access/ egress points throughout the site
- Temporary deceleration lanes
- Potential need for temporary roundabouts, or plant crossing points to facilitate movement of plant for earthwork haulage operations
- Access to general fill and landscape fill stockpiles
- Temporary traffic management diversion areas (around structures and tie-ins)

Construction Stage Lighting

5.4.22 Temporary lighting may be required across the Proposed Scheme where night time working is necessary, to minimise traffic disruption/ diversions/ lane closures, and also along temporary access roads or other locations where temporary traffic management measures require lighting for safety reasons. Temporary lighting may also be required for security and safety reasons at the Contractor's compounds during morning and evening working hours in winter.

5.4.23 The Contractor will develop a detailed construction lighting plan and method statement, to ensure that lighting in sensitive ecological areas is managed appropriately, in consultation with SNH.

Waste Management

5.4.24 The construction of the Proposed Scheme is likely to produce a range of waste types and it is envisaged that the majority of waste arising from the Proposed Scheme will be re-used on-site, or at an appropriately licensed or registered exempt site elsewhere, or segregated and sent for recycling or recovery at a materials recovery facility. Construction site-works activities will therefore include waste management activities, such as transport, processing, and final disposal. **Chapter 18, Materials** provides more details.

5.5 References

5.5.1 Relevant references for introductory Chapters 1 to 7 of this ES are compiled and listed at the end of Chapter 7.