

## 4 Design Development

### 4.1 Introduction

4.1.1 This chapter outlines the iterative DMRB Stage 3 design and environmental review processes that have informed the development of the Proposed Scheme since DMRB Stage 2 selection of the preferred mainline and junction options. The principal aim of the iterative approach was to ensure that a range of potential environmental impacts could, in the first instance, be addressed or avoided by embedding mitigation through revisions to the design.

### 4.2 Design Iterations

4.2.1 **Table 4-1** summarises the iterative design/ review processes during DMRB Stage 3, with further explanation provided below.

Table 4-1: DMRB Stage 3 Iterative Design Process

Stage 3 design iteration	Engineering design elements considered	Environmental inputs/ reviews
First Design iteration (May 2016)	<ul style="list-style-type: none"> <li>Horizontal and vertical alignment of mainline and junction</li> <li>Location of principal structures</li> <li>Initial earthworks (cuttings and embankments)</li> <li>Initial slope designs</li> <li>Initial development of permanent SuDS feature locations</li> </ul>	<ul style="list-style-type: none"> <li>Watercourse Crossings Workshop               <ul style="list-style-type: none"> <li>– mammal permeability</li> <li>– geomorphology and flood risk</li> </ul> </li> <li>Local landform review of earthworks (landscaped slopes)</li> <li>Environmental desk-top review</li> </ul>
Second Design iteration (August 2016)	Changes to above following First design review, plus: <ul style="list-style-type: none"> <li>Raising of the mainline through Drumochter Pass</li> <li>Retaining wall detail between the mainline and the cycleway through Drumochter Pass</li> <li>Consideration of access options for Balsporran Cottage and Drumochter Lodge</li> <li>Locations of underpasses/ underbridges</li> <li>Design inclusion of underpass at chainage 3,020</li> <li>Consideration of Balsporran Telecoms mast access options</li> <li>Development of access track options (Dalnacardoch, Drumochter, accesses to SuDS features)</li> <li>Revision and refinement of permanent SuDS feature locations</li> <li>Revised earthworks slopes</li> <li>Development of lay-by locations and layouts</li> </ul>	<ul style="list-style-type: none"> <li>Updated environmental desk-top review</li> <li>Landscape review of earthworks</li> <li>Landscape review of SuDS feature designs</li> <li>Cross-discipline review workshops, identifying potential conflicts with:               <ul style="list-style-type: none"> <li>– designated sites</li> <li>– areas of peat</li> <li>– notable habitats</li> <li>– areas displaying active fluvial morphology</li> <li>– 1:200 flood plain extent constraints</li> </ul> </li> </ul>

Stage 3 design iteration	Engineering design elements considered	Environmental inputs/ reviews
<p>Third Design iteration – Design Freeze for initial Environmental Assessment (EA) (October 2016)</p>	<p>Issue of design, fixed for EA purposes, with changes following Second design iteration, plus:</p> <ul style="list-style-type: none"> <li>• Amendments to slopes and earthworks associated with Dalnaspidal Junction</li> <li>• Amended location for Balsporran/ Drumochter Lodge access</li> <li>• General arrangement design of underpasses/ underbridges</li> <li>• Watercourse diversions</li> <li>• Pre-earthworks drainage channels</li> <li>• Remainder of permanent SuDS feature locations updated</li> <li>• NMU route realignment</li> <li>• Localised amendments to landscape slopes</li> <li>• Permanent works boundary identified</li> <li>• Temporary construction works boundary identified</li> <li>• Initial flood compensatory storage area locations identified</li> </ul>	<ul style="list-style-type: none"> <li>• Each technical specialist conducted a review to identify further opportunity for embedded mitigation, and to outline preliminary requirements for additional land for impact mitigation/ restoration/ compensation purposes</li> <li>• Draft ES chapter production, updating baseline information and preliminary assessment of scheme for identification of any additional land required</li> <li>• Design review record compiled of any further mitigation required</li> </ul>
<p>Fourth Design iteration (March 2017)</p>	<p>Changes made to design following preliminary EA review:</p> <ul style="list-style-type: none"> <li>• Amended location for Drumochter Lodge access (east side)</li> <li>• Modified layout for Balsporran Cottage/ Drumochter Lodge access</li> <li>• Removal of access options to Balsporran telecoms mast, on west side of HML, in favour of shared use of NCN7</li> <li>• Reduction in mainline vertical alignment at northern crossing of Allt Coire Bhotie due to split watercourse crossing</li> <li>• Further design mitigation incorporated where possible</li> <li>• Identification of additional land required for impact mitigation purposes</li> <li>• Adjustment of mainline horizontal alignment at ch. 2,600-2,800 to eliminate split carriageway</li> <li>• Adjustment of mainline horizontal alignment at ch. 2,800-4,000 to avoid complete removal of existing Drumochter Pass lay-bys</li> <li>• NMU track moved offline from ch. 3,100-4,100 to reduce potential for excavations in deeper peat areas</li> <li>• Introduction of landscaping/ visual screening bund at ch. 7,250-7,400 for Drumochter Lodge</li> <li>• Introduction of emergency lay-by on northbound carriageway at ch. 5,800</li> <li>• Further development of retaining wall at ch. 5,400 to prevent earthwork encroachment on BDL pylon base</li> </ul>	<ul style="list-style-type: none"> <li>• Development of required mitigation proposals, including cross-discipline environmental workshops in April 2017</li> </ul>
<p>Fifth Design iteration (April 2017)</p>	<ul style="list-style-type: none"> <li>• Detailed drainage network</li> <li>• Mainline vertical alignment raised at ch. 7,550 to increase clearance for underpass</li> <li>• Refinement of horizontal alignment at ch. 3,200-4,000 to the east for larger lay-by</li> <li>• Verge widening for watercourse diversions</li> <li>• NCN7 modification to ch. 9,400 after removal of SuDs basin 102</li> <li>• Increased vertical gradient and reduced length of field access at ch. 3,100 to avoid impact on watercourse and reduce earthworks</li> <li>• Removal of rock cut/ rock trap at ch. 4,950-5,200 due to shallow and fragmented rock (informed by updated Ground Investigation data)</li> <li>• Introduction of retaining walls to limit earthwork encroachment on SAC and BDL exclusion zone to the east</li> </ul>	<ul style="list-style-type: none"> <li>• Review and rationalisation of proposed Environmental Mitigation land requirements</li> </ul>

Stage 3 design iteration	Engineering design elements considered	Environmental inputs/ reviews
Sixth Design iteration - Proposed Scheme for Environmental Impact Assessment (May 2017)	<ul style="list-style-type: none"> <li>• Steepened earthworks to limit encroachment on floodplain</li> <li>• Amended SuDs basin access due to revisions to basin layouts</li> <li>• Revisions to compensatory storage locations</li> <li>• Amended access to Drumochter Lodge and connection to the BDL track after consultation with stakeholders</li> <li>• Raised NCN7 vertical alignment at ch. 0,200 to provide clearance for a culvert sufficient for a 1:50 flood event.</li> </ul>	<ul style="list-style-type: none"> <li>• EIA chapter revision assessing the sixth iteration</li> <li>• Development of required mitigation proposals</li> <li>• Draft Environmental Statement produced</li> </ul>
Seventh Design iteration – Final Scheme for Environmental Impact Assessment (October 2017)	<ul style="list-style-type: none"> <li>• Addition of erosion protection measures following EIA hydromorphological risk assessment</li> <li>• Adjustments (additions/ removals) to Compensatory Storage Areas in response to Flood Risk Assessment</li> <li>• Drainage amendments and refinement of culverts, watercourse diversions, and addition of drainage storage tank at north end</li> <li>• Refinement to SuDS features and NCN7 re-routing</li> <li>• Updated Drumochter and Dalnaspidal lay-by designs including earthworks/ drainage/ watercourse diversion</li> <li>• Relaxation of lane widths in Drumochter Pass, resulting in <ul style="list-style-type: none"> <li>– mainline alignment moving east</li> <li>– increase in earthwork cuttings</li> <li>– amendments to retaining walls, increasing maximum height</li> <li>– amendments to drainage and watercourse diversions</li> </ul> </li> <li>• Addition of field accesses and track link from Drumochter Lodge to former BDL track</li> <li>• Inclusion of passing places on former BDL access track</li> <li>• Localised extensions to temporary works boundary to secure space for earthworks excavation due to presence of peat</li> <li>• Extension of LMA for above changes and geotechnical requirements for construction stage slope stability risk assessment</li> </ul>	<ul style="list-style-type: none"> <li>• EIA chapter finalisation assessing Final Proposed Scheme</li> <li>• Environmental Mitigation Plans and Schedules finalised</li> <li>• Environmental Statement finalised</li> </ul>

### First Iteration of DMRB Stage 3 Design

- 4.2.2 At the outset of DMRB Stage 3, the horizontal and vertical alignment (i.e. the route of the road) including earthworks (engineered embankments and cutting slopes) were developed. The main features driving the vertical alignment were crossing structures, road drainage and culvert levels. At this stage, the various structural features were also further developed.
- 4.2.3 A Watercourse Crossing Workshop was held in March 2016 to consider potential constraints and opportunities associated with watercourse crossings. The workshop considered ecological, geomorphological and hydrological issues which could potentially affect the vertical alignment, including culverts and potential requirements for mammal ledges, cascades and regrading.
- 4.2.4 A landscape and visual review was conducted in May 2016 to consider the aesthetic appearance of earthworks slopes. As the Project 7 extent is wholly situated within the Cairngorms National Park (CNP), the CNP special landscape qualities were paramount in developing landscaped earthworks for the Proposed Scheme. Landscape specialists reviewed design cross-sections to develop a more naturalistic landform which aimed to better integrate the scheme into the surrounding landscape context. **Figure 4-1** shows an example cross-section with slopes that have been through a landscape/ visual review.

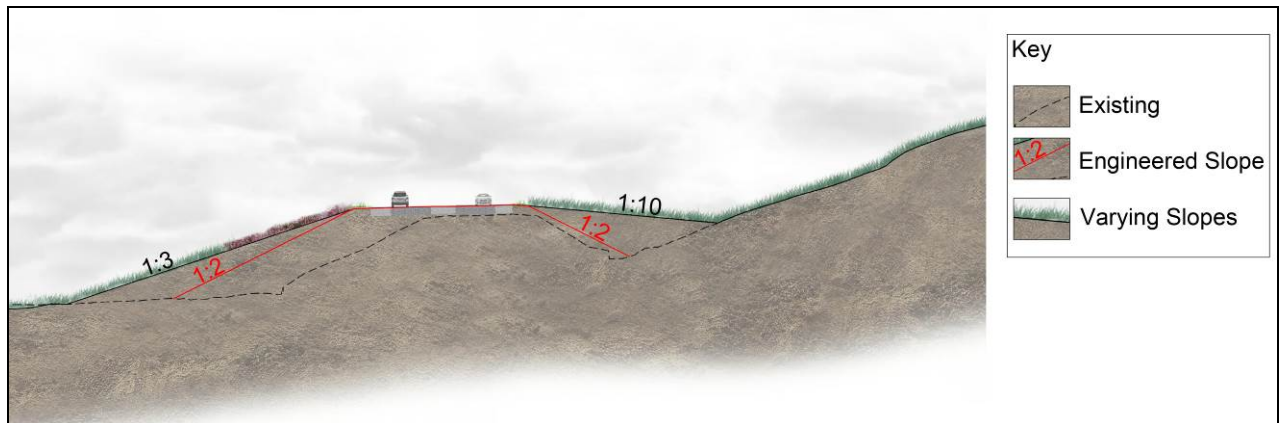


Figure 4-1: Illustrative cross-section showing typical landscaped earthworks slopes

- 4.2.5 The first iteration was reviewed against a range of environmental baseline constraints, including known areas of peat, SAC/ SPA/ SSSI designation boundaries, and 1:200 year floodplain extents to determine where softened landscape slopes resulted in conflicts that could be avoided by tightening up the slopes to a more suitable gradient.
- 4.2.6 It should be noted that in relation to SAC and SPA designations, the Drumochter Hills SPA and SAC boundaries were considered as defined by the SNH Geographical Information Systems (GIS) shapefiles for each designation. Because the site boundary varies slightly between SPA and SAC shapefiles, each site boundary was considered accordingly.
- 4.2.7 With respect to the River Spey SAC (River Truim), it was noted that A9 Dualling topographic survey and aerial imagery showed that the river had migrated in parts and did not match the SNH sourced SAC GIS shapefile. In some cases, the river had migrated closer to, or further away from the existing A9. CH2M HILL Fairhurst Joint Venture (CFJV) highlighted and discussed the river migration issue with SNH.
- 4.2.8 SNH agreed that as it is the watercourse qualifying species, and supporting habitats, that are protected, and not the fixed area in a static shapefile, CFJV should take account of river migration in design and any related assessments. As such, minimum design offsets were applied from either the latest topographic survey information on the river bank position, or the GIS shapefile boundary, whichever was closest to the A9. Offsets varied from 10m to 5m to 2m, depending on proximity to the watercourse through the scheme extent.

#### Second Iteration of DMRB Stage 3 Design

- 4.2.9 Online widening to the east combined with the steep side-long nature of the existing topography to the east of the A9 and the slopes required for stable earthworks results in the earthworks on east extending into the BDL exclusion zone and impacting on the pylon foundations. Raising the road alignment reduces the earthwork cuttings into the hillside and avoids the BDL exclusion. By raising the alignment the earthworks to the west then spill into the HML railway. The introduction of retaining walls reduced the extent of earthwork spread. Work to optimise the height of the retaining walls with raising the alignment has been undertaken to minimise the earthwork spread and retaining wall height.
- 4.2.10 The second iteration included consideration of SuDS feature locations and layouts, the general arrangement of crossing structures, the extents of watercourse diversions required to tie in with culvert locations, crossings and required slopes. This stage also included detailed consideration

of SuDS feature maintenance access tracks, as well as access options for Balsporran Cottage and Drumochter Lodge, and to the Balsporran telecoms mast.

- 4.2.11 This iteration was again reviewed against environmental baseline constraints, including known areas of peat, Natura site boundaries, wet/ dry heath habitats, 1:200 year floodplain extents and existing NMU routes. This determined where potential conflicts could be avoided by alignment amendments or tightening up earthwork slopes to a more suitable gradient.

#### Third Iteration – DMRB Stage 3 ‘Design Freeze’

- 4.2.12 This iteration included detailed landscaping input to inform the shape of SuDS features, input from geotechnical specialists to avoid and minimise likely requirements for peat excavations where possible, including refinements to earthworks boundaries to avoid areas of flood risk and areas of deep peat identified through ongoing peat surveys and ground investigations.
- 4.2.13 This iteration included detailed consideration of earthworks associated with Dalnaspidal Junction and local access to Dalnacardoch Estate; local access requirements for Balsporran Cottage and Drumochter Lodge, local amendments to NMU routes, as well as general arrangement designs for underpasses/ underbridges. This resulted in revisions to affected areas of National Cycle Route 7 (NCN7) to re-route around SuDS feature locations, and to include passing places in sections that will require shared use for SuDS maintenance.
- 4.2.14 It should be noted that access provisions were informed by earlier work, including the A9 Dualling Programme NMU Access Strategy, and a Project 7 specific access study, which considered a range of potential local access options and was subject to consultation with local landowners and the A9 Dualling NMU Forum.
- 4.2.15 This stage also included a ‘Buildability Review’ which aimed to identify any additional land required around the designed infrastructure extents, to enable the construction of the scheme and to limit risks to construction staff and the travelling public. For example, during the DMRB Stage 3 process, SEPA raised concerns about securing sufficient land for temporary watercourse diversions and to mitigate construction works runoff risks (i.e. to enable the inclusion of construction stage SuDS features for sediment control). Other factors considered included:
- space required and potential sequencing for watercourse diversions, culverts and dualling parallel to existing carriageways with live traffic
  - temporary haul routes and crossings for earthworks (cut/ fill) material transport to minimise construction traffic on live carriageways
  - space required for temporary laydown/ stockpiling of construction materials, structural plant (e.g. cranes for structures), temporary storage of topsoil/ peat and construction stage sediment controls
  - clearance (headroom) provided under structures and potential construction sequencing to enable material transfer between northbound/ southbound sides of the route
  - winter resilience, i.e. potential losses to existing snow belt trees and replacement required
  - access for landowners and future maintenance of A9 infrastructure once completed
- 4.2.16 Following the definition of permanent infrastructure and temporary (construction stage) works boundaries, the Design Freeze iteration was then subject to preliminary environmental assessment. Environmental Impact Assessment (EIA) topic specialists considered the works boundaries to identify whether any further mitigation could be embedded into the design, and whether any additional land would be required to enable environmental mitigation and/ or

compensation measures. The overarching intention was to inform the area of land likely to be required for the Proposed Scheme, i.e. to identify sufficient land to be made available to enable the construction and operation of the scheme and any required environmental mitigation.

- 4.2.17 This preliminary environmental assessment considered potential additional land requirements; for example, in terms peat management and restoration, ecological habitat restoration, species fencing and mammal crossing provisions, fluvial morphology issues associated with watercourse crossings and diversions, landscape/ visual/ cultural heritage/ noise screening requirements and any potential conflicts between disciplines. Results were recorded and fed back to the design team.
- 4.2.18 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.

#### Fourth Design Iteration – March 2017

- 4.2.19 This iteration captured changes to the design following the preliminary environmental assessment. It also included adjustments to the mainline horizontal alignment in two sections in order to reduce a split carriageway and to retain areas of existing Drumochter Pass lay-bys. In addition, access to the Balsporran telecoms mast via a route in the Drumochter Hills SAC was removed from further consideration due to potential impacts on good quality blanket bog habitats. Dual use, and therefore widening, of the NCN7 for vehicular access to SuDS and the existing telecoms mast access path was introduced instead.
- 4.2.20 Access to Balsporran Cottage and Drumochter Lodge was further modified to adjust the locations of left-in/ left-out accesses from the north and southbound carriageways, connected via a local underpass. A landscaping bund was introduced to screen Drumochter Lodge from the locally raised A9, and the Drumochter Lodge access link to the former BDL track was adjusted.
- 4.2.21 The vertical alignment in the northern extent was altered due to amending the crossing of the Allt Coire Bhotie from a single culvert crossing to two separate crossing features. Further refinements included introduction of mammal ledges to certain structures, further development of structure details, watercourse diversions and SuDS feature outfalls to minimise scour potential and identified geomorphological (erosion) risks.

#### Local Design Development Variations Considered

- 4.2.22 During this design iteration, five specific local design development issues were considered in some detail in order to select the most appropriate solution for the DMRB Stage 3 design. Each included a range of local design variants and the selection process was supported by assessment papers which considered the relative advantages/ disadvantages of each variant, in terms of engineering, environmental and economic issues.
- 4.2.23 These ‘mini-assessments’ ensured that an informed decision could be made before incorporation into the design fix. **Table 4-2** below summarises the local variation studies undertaken.

#### Fifth Design Iteration – April 2017

- 4.2.24 This iteration completed the detailed drainage network (including SuDS and pre-earthworks drainage ditches) as well as watercourse diversions, culvert crossings, and localised verge widening included for some diversions. The vertical alignment was adjusted to accommodate improved clearance for an underpass at ch. 7,550. Horizontal alignment refinements increased



space to the east for a proposed enlarged lay-by at ch. 3,200-4,000, and small areas of retaining walls were introduced to limit earthworks encroachment into the SAC designation and BDL exclusion zone to the east.

#### Sixth Iteration – Proposed Scheme for Environmental Impact Assessment – May 2017

- 4.2.25 The sixth iteration included amendments informed by the Flood Risk Assessment for the Proposed Scheme. A small number of earthworks were steepened to further limit encroachment into the floodplain and the location and scale of flood compensatory storage areas were refined. Access arrangements were adjusted based on revision to one SuDS basin layout. Amendments made to the access connection between Drumochter Lodge and the former BDL track following consultation with the landowner.
- 4.2.26 This iteration was subject to EIA, undertaken in full cognisance of the various embedded mitigation measures including:
- alignment informed by consideration of proximity to local sensitive receptors (both residential properties and ecological designated sites)
  - avoidance and minimisation of earthworks encroachment into property boundaries
  - continued and improved NMU access by, for example, inclusion of underpasses
  - locating SuDS outside flood extents and upsizing culverts for watercourse crossings to a minimum of 900mm, reducing the risk of blockage
  - mammal ledges in a number of culverts and additional bankside space provided in watercourse crossing structures, where achievable, to provide for mammal permeability
  - earthwork slopes (mainline, junction, SuDS and access tracks) developed to blend into surrounding landform, and to avoid sensitive habitats, deeper peat deposits and the 1:200 year flood zone where achievable
  - SuDS basins designed by Drainage Engineers and Landscape Architects to ensure they reflect local landscape characteristics where possible
  - sensitive design of embankments in the context of cultural heritage assets including Drumochter Lodge and its designed landscape
  - combination of culverts and a bridge to be constructed at Allt Bhotie allowing a lowering of the design finished road level, providing a reduction of fill material required

#### Seventh Iteration – Final Scheme for EIA – October 2017

- 4.2.27 The final design iteration contained a number of design amendments including relaxation of lane widths through Drumochter Pass; inclusion of erosion protection measures recommended by the EIA hydromorphology assessment; adjustments to works extents following confirmation of Network Rail land ownership boundary; inclusion of passing places on the former Beaully-Denny access track; refinement of earthworks extents in proximity to sensitive peat areas; and updates to lay-by designs at Drumochter and Dalnaspidal.
- 4.2.28 Updates were also made to accesses in response to landowner meetings; including the addition of field access points and modification to the access track link between the former Beaully-Denny track and Drumochter Lodge.
- 4.2.29 These design changes were reviewed by drainage engineers, who subsequently updated and amended drainage layouts (culverts, watercourse diversions and drainage ditches); finalised the

SuDS basin designs for assessment; and confirmed compensatory storage requirements. This resulted in the removal of some compensatory storage areas and replacements in other areas.

- 4.2.30 Finally, modifications were made to the temporary works boundary to reflect the above design changes; to include additional land between ch. -0,020 to ch. +0,100 to ensure sufficient space should construction stage stability assessments identify further slope grading is required, and to reduce land-take north of Drumochter Lodge to exclude parts of the existing shelter belt.
- 4.2.31 Following this, the LMA and CPO boundary was fixed, encompassing all of the above changes to the Proposed Scheme.
- 4.2.32 This ES presents the final assessment, based on the 7<sup>th</sup> iteration design and LMA boundary.

## 4.3 References

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



Table 4-2: Variation studies undertaken at DMRB Stage 3

Title	Variations considered	Consultation undertaken	Outcome	Benefit of selected solution
Dalnaspidal Junction	<ul style="list-style-type: none"> <li>Extend the new A9 underbridge to the north to accommodate the side road and the existing watercourse together in one underbridge/ underpass</li> <li>Relocate the new underbridge to the north and have two separate underbridges</li> <li>Review Dalnacardoch Estate access track options to avoid/ minimise SAC habitat effects</li> </ul>	<ul style="list-style-type: none"> <li>Meeting held with SNH in November 2016 to discuss the variations</li> <li>Meeting held with Cairngorms National Park Authority (CNPA) in February 2017 to discuss the variations</li> </ul>	<ul style="list-style-type: none"> <li>Relocate the new underbridge to the north to avoid the telecoms mast at Dalnaspidal and the Allt Coire Mhic-sith flood plain</li> <li>Dalnacardoch Estate access track realigned from telecoms mast location to route up and across the local hill slope gradient, rather than route via alongside the Allt Coire Mhic-sith watercourse to avoid and minimise Annex 1 habitat effects</li> </ul>	<ul style="list-style-type: none"> <li>Least impact on Allt Coire Mhic-sith watercourse and avoids unnecessary watercourse crossings</li> <li>No requirement to relocate existing telecommunications mast</li> <li>Minimised impact on important habitats</li> </ul>
Balsporran Cottage/ Drumochter Lodge Access	<ul style="list-style-type: none"> <li>Balsporran/ Drumochter Lodge access further to the south. Rejected on environmental grounds</li> <li>Move northbound left-in/ left-out access 200m north from its original position</li> <li>Move northbound left-in/ left-out access a further 500m to the north from the original design position, shortening the link road to the underpass but lengthening the access track to Balsporran Cottages</li> <li>Move northbound left-in/ left-out access a further 500m to the north from the original design position, shortening the link road to the underpass but lengthening the access track to Balsporran Cottages and designing this access track parallel to the mainline</li> <li>Retaining the Balsporran and Drumochter Lodge existing access locations were considered and rejected due to;                             <ul style="list-style-type: none"> <li>Balsporran - proximity to the River Truim watercourse</li> <li>Drumochter Lodge - proximity to property, connector road would require clearance of woodland and peat excavation</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Meeting held with landowners</li> </ul>	<ul style="list-style-type: none"> <li>Move northbound left-in/ left-out access a further 500m to the north from the original design position, shortening the link road to the underpass but lengthening the access track to Balsporran Cottages and designing this access track parallel to the mainline</li> </ul>	<ul style="list-style-type: none"> <li>Preferable in terms of landscape and visual impacts</li> <li>Least impact on an area of deep peat</li> <li>Fewer impacts on water features</li> <li>Lowest ecological impact</li> <li>Would require the least compensation storage provision</li> <li>Preferred engineering option as it only requires an extension to the Allt Dubhaig Underbridge rather than provide a new structure at a different location</li> </ul>
Balsporran Phone Mast Access	<ul style="list-style-type: none"> <li>Various alignments considered to the west of the Highland Main Line (HML) railway for a new access track from Balsporran Cottages to the Balsporran Phone Mast. However, all options considered passed through an area designated as SAC</li> <li>Use the cycle way (NCN7) to be combined as access to the existing crossing point on the HML railway to connect with an existing hill track to the mast. NCN7 already being realigned and shared use for SuDS maintenance access</li> </ul>	<ul style="list-style-type: none"> <li>Meeting held with SNH in November 2016 to discuss the variations</li> <li>Meeting held with CNPA in February 2017 to discuss the variations</li> </ul>	<ul style="list-style-type: none"> <li>The combined use of NCN7 was the preferred option as it prevented any direct impact on SAC habitat</li> </ul>	<ul style="list-style-type: none"> <li>Prevented any impact on SAC/ SPA designated areas</li> <li>Preferred engineering option as it only required widening of NCN7, rather than a new track and associated bridges</li> </ul>

Title	Variations considered	Consultation undertaken	Outcome	Benefit of selected solution
<p>Drumochter Estate Access Track (east side of A9)</p>	<ul style="list-style-type: none"> <li>• Direct accesses to A9 are being closed, alternative provisions required for estate access</li> <li>• Considered re-use of the former BDL temporary access track, against introduction of a new access track through tree belt to the east and closer to the A9</li> <li>• New access track would be former SSE wayleave which is within SSSI</li> </ul>	<ul style="list-style-type: none"> <li>• Meeting held with SNH in November 2016 to discuss the variations</li> <li>• Meeting held with CNPA in February 2017 to discuss the variations</li> <li>• Meeting held with landowner</li> </ul>	<ul style="list-style-type: none"> <li>• Principle of re-use of BDL established in favour of a new permanent track through relatively undisturbed SSSI habitat</li> <li>• BDL track between Project 7 extent and access point 15 to be made permanent and included within A9 Dualling proposals (to be delivered across Project 7 and adjacent Project 8 proposals)</li> <li>• BDL track proposals to include upgraded drainage and associated works to make permanent</li> </ul>	<ul style="list-style-type: none"> <li>• Minimises loss of SSSI habitat as uses existing track</li> <li>• Preferred engineering option as it involves the least construction works</li> </ul>
<p>Drumochter Estate Access Track – short length in SAC/ SPA with crossing over Allt Coire Chuirn</p>	<ul style="list-style-type: none"> <li>• Realignment of approximately 160m of the existing BDL access track and Allt Coire Chuirn crossing to remove from within the SAC/ SPA (move to SSSI area)</li> <li>• Retain BDL track online and replace existing Allt Coire Chuirn crossing within SAC/ SPA</li> </ul>		<ul style="list-style-type: none"> <li>• Retain the current BDL access track alignment as downstream morphology of Allt Coire Chuirn is more mobile and could outflank a new crossing, which would have to be approximately three times longer than existing</li> <li>• Track realignment would create fresh disturbance in SSSI habitats, whereas online replacement of existing crossing minimises additional habitat impact risk</li> </ul>	<ul style="list-style-type: none"> <li>• Is located in a more stable location for river crossing</li> <li>• Minimises loss of SSSI habitat</li> <li>• Preferred engineering option as the (replacement) bridge would have the least span</li> </ul>
<p>Drumochter Pass mainline design</p>	<ul style="list-style-type: none"> <li>• Stage 2 options – at-grade carriageway, split carriageway with natural slope, split carriageway with retaining wall</li> <li>• Stage 3 – Split carriageway with natural slope</li> <li>• Variations to horizontal and vertical geometry to minimize impact on HML railway, BDL and SAC/SPA</li> <li>• Vary split carriageway slopes to reduce cross section width</li> <li>• Departure from standards on cross section to minimize impact on HML railway, BDL, SAC/SPA</li> <li>• Introduce retaining walls on southbound verge to limit earthwork extent into SAC/SPA</li> </ul>	<ul style="list-style-type: none"> <li>• Meeting held with the landowner linked to a public consultation event</li> </ul>	<ul style="list-style-type: none"> <li>• Departure from standards submitted for reduced northbound verge width (2.5m to 2.0m) to reduce total cross section width and associated impact on constraints</li> <li>• Horizontal and vertical alignment to achieve 1:1 slope between carriageways minimizing cross section</li> <li>• Retaining walls introduced on southbound verge at multiple locations</li> </ul>	<ul style="list-style-type: none"> <li>• Minimises impact on SAC/SPA/SSSI</li> <li>• Avoids impact on BDL pylons bases</li> <li>• Avoids HML railway</li> </ul>