12 Ecology and Nature Conservation

This chapter considers the potential impacts of the proposed scheme on terrestrial and freshwater species, habitats and ecosystems. The approach to this assessment is based on DMRB guidance and draws on the Chartered Institute for Ecology and Environmental Management's (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland.

Baseline conditions for ecological features were established through desk-based assessment, consultation and site surveys. This process identified 32 ecological features that could potentially be impacted by the proposed scheme. These included Ancient Woodland Inventory (AWI) sites and four statutory designated sites: the River Tay Special Area of Conservation (SAC); Tulach Hill and Glen Fender Meadows SAC; Tulach Hill Site of Special Scientific Interest (SSSI); and Aldclune & Invervack Meadows SSSI. In addition, aquatic and terrestrial species and habitats that could potentially be impacted included Atlantic salmon and other fish species; mammals including otter, badger and red squirrel; bird species including barn owl, black grouse and hen harrier; reptiles; and the notable plant species field gentian.

Assessment of impacts and their significance took into account the nature and magnitude of potential impacts and their consequent effects on important ecological features. Prior to the application of mitigation, potential significant impacts on ecological features were identified for the construction and operation phases of the proposed scheme.

A hierarchical approach to mitigation was followed to address potential impacts. The primary approach has been to use the flexibility available within the early design stages to avoid significant impacts. An iterative design process has been undertaken and design principles have been discussed with SNH, SEPA, and other relevant stakeholders.

Where avoidance of impacts has not been possible, mitigation to reduce significant impacts has been identified. Measures include the implementation of commitments and best working practices during the construction phase of the proposed scheme. During operation, compensatory planting, habitat creation, mammal fencing and provision of crossing structures have been proposed to mitigate potential impacts.

No significant residual impacts are anticipated from the construction phase of the proposed scheme. A significant residual impact from the operational phase is anticipated from the permanent loss of habitat listed on the AWI. Compensation planting is proposed, however this cannot mitigate for the permanent loss of the biodiversity and intrinsic importance of ancient woodland habitats. However, as this habitat matures, woodland corridors will grow to connect currently fragmented areas and the planting will therefore mitigate for the functions and importance of the woodland in respect of habitat connectivity and carrying capacity for other species. In the long-term, significant residual impacts are therefore predicted to reduce.

A potential beneficial impact is anticipated as a result of the proposed scheme through increased permeability of the A9 for species compared with that of the existing A9. This is expected for species including badger and otter through provision of crossing structures.

12.1 Introduction

12.1.1 This chapter presents the DMRB Stage 3 Ecological Impact Assessment (EcIA) for the proposed scheme (Chapter 5: The Proposed Scheme), which considers the potential impacts on terrestrial and freshwater species, habitats and ecosystems.

12.1.2 The chapter is supported by the following appendices, which are cross-referenced where relevant:

- Appendix A12.1 (Scientific Names);
- Appendix A12.2 (Baseline Data and Detailed Survey Methods); and
- Appendix A12.3 (Confidential Ecology Features).

12.1.3 Appendix A12.3 (Confidential Ecology Features) is not published with the ES due to the potential risk to protected species from locational data being made publicly available. However, these data will be submitted to:

- SNH;
- Transport Scotland;
- Perth & Kinross Council (PKC); and

- Cairngorms National Park Authority (CNPA).

12.1.4 The assessment is derived from a review of available information including:

- the DMRB Stage 2 assessment and data (Transport Scotland, 2016a and 2016b);
- site surveys; and
- supplementary consultation to take into account design features of the preferred option selected during the DMRB Stage 2 assessment process.

12.1.5 This DMRB Stage 3 assessment is presented in the context of the A9 dualling programme. This means that many potential impacts on ecological features, associated with road operations, are already experienced by the species and habitats in the area of the existing A9.

12.2 Approach and Methods

12.2.1 The approach to this assessment is based on the guidance provided by:

- DMRB Volume 11, Section 3, Part 4: Ecology and Nature Conservation (The Highways Agency et al., 1993);
- the Chartered Institute for Ecology and Environmental Management's (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2016); and
- DMRB Interim Advice Note 130/10 'Ecology and Nature Conservation: Criteria for Impact Assessment' (The Highways Agency et al., 2010) (hereafter referred to as IAN 130/10).

12.2.2 In addition to the above guidance, other policy documents and published guidance taken into account in the preparation of this chapter include:

- Scottish Transport Appraisal Guidance (STAG) (Transport Scotland, 2015a);
- SNH, A handbook on environmental impact assessment (SNH, 2013);
- A9 Dualling Programme, Strategic Environmental Assessment (SEA) (Transport Scotland, 2013);
- A9 Dualling Programme, Strategic Environmental Assessment (SEA) Report Addendum (Transport Scotland, 2014a); and
- A9 Dualling Programme, Strategic Environmental Assessment (SEA), Post Adoption SEA Statement (Transport Scotland, 2014b).

12.2.3 The approach and methods employed have been informed by the recommendations made in the A9 Dualling Programme SEA (Transport Scotland, 2013) and from the DMRB Stage 2 assessment process. For ecology and nature conservation, recommendations related primarily to early engagement with SNH regarding key constraints identified in the SEA, specifically Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs) and ancient woodland.

12.2.4 Additional policy and guidance documents are discussed in Chapter 19 (Policies and Plans).

Study Area

12.2.5 The study area comprised an area up to 500m from the proposed scheme as shown on Figure 12.1. Following consultation with consultees listed in paragraph 12.2.20 below, and in line with standard survey guidance for ecological features, some variations were made to the study area. Such variations were ecology feature-specific, according to their sensitivity, mobility and habitat, and are described in Table 12.1.

12.2.6 National Biodiversity Network (NBN)[1] desk-based searches were undertaken up to 10km from the existing A9, to take into account the highly mobile nature of some species and the level at which some data are available (10km grid square).

12.2.7 Where reference is made to the footprint of the proposed scheme, this includes the design of the proposed scheme and the areas required for construction.

Baseline Conditions

Desk-based Assessment

12.2.8 The desk-based assessment consisted of a review of existing relevant literature and data, along with online searches for ecological information within the study area, including:

- A9 dualling programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b);
- A9 Dualling Programme SEA Report Addendum (Transport Scotland, 2014a);
- A9 Dualling Programme SEA Post Adoption Statement (Transport Scotland, 2014b);
- A9 Dualling Programme Habitats Regulations Appraisal (HRA), Programme Level Appropriate Assessment (AA), Updated Issue (Transport Scotland, 2015c);
- survey data from Scottish Badgers (received 2015 and 2016) (Appendix A12.3: Confidential Ecology Features); and
- protected species information from SNH (received 2015) (Appendix A12.3: Confidential Ecology Features).

12.2.9 Information for the desk-based assessment was obtained from the following online resources:

- Joint Nature Conservation Committee (JNCC) website (JNCC, 2016);
- NBN gateway website (NBN, 2016);
- Scotland's Environment website (Scotland's Environment Web Partnership, 2016);
- SEPA website (SEPA, 2016); and
- SNH Information Service (SNH, 2016a).

12.2.10 The following were consulted and received data responses also formed part of the desk-based assessment:

- British Trust for Ornithology (BTO);
- Cairngorms Nature;
- Deer Commission Scotland;
- Forestry Commission Scotland;
- Marine Scotland (at Pitlochry);
- Perth Museum Biological Records Centre;
- Royal Society for the Protection of Birds (RSPB);
- Saving Scotland's Red Squirrels (SSRS);
- SSE (trading as Scottish Hydro);
- Scottish Mink Initiative;
- Scottish Wildlife Trust (SWT);

1 See Appendix A12.2 for licensing details

- Tayside Bat Group;
- Tayside Biodiversity Partnership;
- Tay District Salmon Fisheries Board (TDSFB); and
- Tayside Raptor Study Group (TRSG).

Wildcat Assessment Methods

12.2.11 A habitat network approach was agreed through consultation with SNH and the CNPA and was adopted to identify wildcat potential habitat (Transport Scotland, 2015d). The approach utilised visual habitat analysis with geographic information system (GIS) mapping, based on three key datasets:

- SNH's Wildcat Habitat Suitability Model (Bryce and Mattisson, 2012), displaying wildcat cover and movement habitats, and moorland and grassland prey habitats;
- CNPA's wildcat observer sightings (Hetherington and Campbell, 2012); and
- current and proposed structures of suitable permeability for wildcat (Transport Scotland, 2015d).

12.2.12 The visual habitat analysis involved determining important areas of connectivity across the proposed scheme, accounting for natural barriers, such as large watercourses, and assessing current and proposed migration porosity via structures, such as bridges and ledge culverts. Smaller roads travelled by only a few hundred cars per day are a negligible barrier to wildcat movement and therefore side roads and access roads were not included in this analysis (Klar et al., 2009).

12.2.13 A traffic light scoring system was established to assign porosity values to the existing A9 structures to determine current permeability for wildcat (Transport Scotland, 2015d). The scoring system assigned a 'green' value to structures which currently provide good permeability for a range of species. An 'amber' score was assigned to those that could be used currently but which could potentially be improved. A 'red' score was assigned to crossing features that were not considered to provide good permeability, such as narrow diameter drainage pipes and culverts with catch pits or long drops.

12.2.14 The above information was used to inform this assessment and identify mitigation required to minimise habitat fragmentation for wildcats.

Site Surveys

12.2.15 Ecology surveys were undertaken as described in Table 12.1 below.

12.2.16 All surveys were carried out in line with the 'Outline approach to consistency in A9 ecology survey extents' (Transport Scotland, 2015e) as agreed by statutory consultees forming the A9 Environmental Steering Group (ESG).

12.2.17 All surveys were undertaken between 2015 and 2017 (Table 12.1) and baseline results represent conditions at that time. Any limitations experienced during site surveys are detailed in Table 12.1.

Table 12.1: Details of surveys used to inform the DMRB Stage 3 Assessment of Ecology and Nature Conservation

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
Terrestrial Features			
Badger	Harris et al., 1989 SNH, 2003	February – October 2015 to cover peaks in badger territorial activity	Badger presence/likely absence and use of habitats was recorded; from a minimum distance of 100m from the proposed scheme to a maximum of 250m, except where an impassable barrier (e.g. a river ≥50m wide) constrained the survey extent. Signs recorded were: · setts as defined by the Protection of Badgers Act 1992 (as amended by the Wildlife and Natural Environment (Scotland) Act 2011); · structures that were possible setts, but that had no immediate evident signs of current use by badgers (SNH, 2014); and · hairs, prints, mammal paths and dung. Infra-red trigger camera traps were deployed to evaluate use of pathways located within 30m of the existing A9 carriageway.
Bat roost surveys	Hundt, 2012 Collins, 2016	May – September 2015 November 2015 – March 2016 (hibernation) July – September 2016	To determine the potential impacts on roosting bats, all buildings, structures and trees within 50m of the proposed scheme were subject to initial ground-based assessments at DMRB Stage 2 for their potential to support bat roosts (only 1* category/high potential trees were recorded). This was used to inform the requirements for further survey work at Stage 3. Buildings and structures with low, moderate or high potential/confirmed roosts that were within the footprint of the proposed scheme were subject to one, two or three (respectively) dusk emergence or dawn re-entry surveys between May-September following the standard guidance in Hundt, 2012 and Collins, 2016. These roost surveys were undertaken to determine the presence and conservation status of any roosts present. Features that were not within the footprint of the proposed scheme, but had potential to be used by bats, were subject to a similar level of effort but seasonal constraints meant the full complement of surveys (one, two or three) was not always possible. All trees recorded as having potential for significant roosts (maternity or rare species roosts) within the footprint of the proposed scheme were subject to a single emergence survey, as agreed with SNH. Surveys and bat call analysis were carried out using standard call detection and recording equipment (see Appendix A12.2: Baseline Data and Detailed Survey Methods). Bat dropping samples collected during surveys were sent for DNA analysis for species level identification. In 2016, following iterative design changes at DMRB Stage 3, new areas were identified within the footprint of the proposed scheme. These were subject to ground-based assessments for roost potential only due to seasonal constraints. This poses a limitation, as the full importance of these new areas could not be fully determined. Where this was the case, pre-construction surveys (which will be undertaken throughout the proposed scheme) will be undertaken to identify any roosts or other notable features, such that any required mitigation can be implemented to minimise potential adverse impacts. As part of the initial ground-based assessments at DMRB Stage 2, the potential for buildings or structures to support hibernating bats was assessed. Hibernation roosts can support multiple species and be used by bats from a wide area, which means they are of high importance in consideration of potential impacts. Where there was moderate or high potential for hibernation roosts, static automatic bat recorders were deployed over winter to identify the status of the potential roosts. Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
Bat activity surveys	Hundt, 2012 Wray et al., 2010 Boonman, 2011 Jacobs, 2014 Adams, 2013	May – October 2015 July – September 2016	Surveys were designed, based on best practice guidance available at the time, to determine the impact of the proposed scheme on bat flight-lines and their ability to use multiple aspects of the landscape. All culverts and bridges beneath the existing A9 and within 50m of the proposed scheme were assessed at DMRB Stage 2 for their potential to be used as a commuting route for bats and this data was used to inform the requirements for further survey work at Stage 3. For those that were recorded as having moderate or high potential based on the physical characteristics of the structure (informed by Hundt, 2012 and Boonman, 2011), the quality of the habitat and the presence of existing linear features leading to the structure were surveyed using static detectors. Detectors were deployed for a minimum of three nights over spring, summer and autumn (adapted from Hundt, 2012). This spread across the seasons covers the periods when bats would be expected to be most active, dispersing from hibernation sites, during the maternity season and the dispersal to hibernation and mating sites. The detector was deployed to give the highest confidence possible of detecting only bat passes through the culvert or under the bridge, indicating bats crossing beneath the existing road. Surveys and bat call analysis were carried out using standard call detection and recording equipment (see Appendix A12.2: Baseline Data and Detailed Survey Methods).

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
			Analysed data produced an index of bat activity (bat passes per night) and the number of species recorded (species diversity) at each location. Species which were treated as rare (Wray et al., 2010) were also identified. These results were transformed into an overall value (high, moderate or low) for each location. This is described in detail in Appendix A12.2 (Baseline Data and Detailed Survey Methods). In summary this valuation was based on: · overall activity levels (for all species), as those areas supporting larger numbers of foraging or commuting bats would be deemed most valuable; · species richness, as those areas supporting a higher number of species of bats would be deemed most valuable; and · presence of rare species (as defined in Wray et al., 2010). The overall value was calculated by assigning points to each of these three variables and summing the total. Assigning an overall value to each recording location allows them to be compared and to identify those that are of higher value for the impact assessment. In the absence of published industry guidance on criteria for allocating relative activity levels and values to bat activity data, the method of calculating the value was based on approaches used in previous Ecological Impact Assessments (A14 Cambridge to Huntingdon Improvement Scheme, Jacobs, 2014) and adapted from Adams (2013). Walked transect routes were undertaken to obtain a measure of bat activity in habitats along the proposed scheme and to help identify those areas of higher value to bats. Five walked transects were surveyed for bat activity and species richness. The transect routes were designed to encompass a range of habitats at varying proximity to the existing A9 based on Bat Conservation Trust (BCT) guidelines (Hundt, 2012) but seasonal and survey weather constraints meant that this was not possible for all transects. Surveys and bat call analysis were undertaken using standard call detection and recording equipment (see Appendix A12.2: Baseline Data and Detailed Survey Methods). Surveys were carried out in spring, summer and autumn (as above) and were conducted at both dusk and dawn where possible (informed by Hundt, 2012). In the absence of published industry guidance on criteria for allocating relative activity levels, the same method of assigning value as described above was used for the transect data. See Appendix A12.2 (Baseline Data and Detailed Survey Methods) for full details. Where data search, survey or habitat assessment had shown the presence or potential presence of rare and/or cryptic species within 50m of the proposed scheme (Wray et al., 2010) static detectors were deployed for a minimum of ten nights over the summer to assess activity levels. Cryptic species are defined here as those with similarities in echolocation to other bat species, or those species with echolocation calls which are more difficult to detect. The acoustic sound files were analysed using standard software and techniques. The data was used to determine the likely presence of a roost for these species and to determine the importance of these areas for these species. Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
Breeding birds: Modified Common Bird Census	Bibby et al., 2000 The Highways Agency et al., 2001	April - July 2015; dawn to noon BST	Adapted Breeding Bird Survey (BBS) were undertaken up to 150m from the mainline of the proposed scheme between April and July (2015) to gain an indication of the species assemblage present across all habitat types. All farmland, woodland, upland, copse and scrub boundaries, hedgerows, ditches, rivers and streams were surveyed for location, species and activity of every individual bird observed (sight and/or sound) within or flying over the survey area using standard BTO conventions (Bibby et al., 2000). This approach also maximised the chances of seeing birds and so mitigated for reduction in ability to hear birds due to road noise. Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
Otter	Chanin, 2003	June – November 2015 January – September 2016	Otter presence/likely absence and use of habitats affected by the proposed scheme were surveyed. Surveys were conducted along watercourses from a minimum of 100m and to a maximum of 250m from the proposed scheme. Surveys extended to 50m from the water's edge. Fifty-two suitable watercourses were surveyed (as identified at DMRB Stage 2) where habitats were considered to be valuable, in terms of having potential to support foraging and resting otter, by suitably experienced surveyors. Surveyors recorded otter shelters, which were categorised and photographed, in addition to the below field signs: · spraints, prints, slides or other well-used access points to watercourses; · feeding remains; and · sightings (including Wildlife Vehicle Incidents (WVIs)).

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
			Where appropriate, infra-red camera traps were also deployed under licence from SNH (licence number: 54909) to monitor otter resting sites, for example to determine if any were natal holts. Short (up to 5m) stretches of steep, heavily vegetated or rocky banks could not be surveyed safely in some locations, but this did not preclude full assessment of otter use of the survey area.
Water vole	Strachan et al., 2011 Dean et al., 2016	June – November 2015	Water vole presence/likely absence and use of habitats affected by the proposed scheme were surveyed. Surveys were conducted along watercourses up to 100m from the proposed scheme and extended to 2m from the water's edge. Forty-five suitable watercourses were surveyed (as identified at DMRB Stage 2) where habitats were considered valuable, in terms of having potential to support foraging and resting water vole, by suitably experienced surveyors. Field signs indicative of water vole presence were recorded and included: · droppings and latrines; · a network of bankside burrows; · feeding signs of neat vegetation piles; and · covered runs through vegetation.
Pine marten, red squirrel and wildcat	Gurnell et al., 2009 Croose et al., 2013 SNH, undated-a	January 2015 – August 2016	Evidence was recorded as incidental sightings/signs found during other habitat and species surveys. Desk-based data, for example data obtained from the assessment for wildcat as detailed in paragraphs 12.2.11 to 12.2.14, were used in combination with the above to assess the potential presence of these species.
Reptiles	Edgar et al., 2010 Sewell et al., 2013 Froglife, 1999 The Highways Agency et al., 2005	May – September 2015 Eight survey visits with times focused between 08:30-11:00 and 16:00-18:30	Suitable habitats located under the footprint of the proposed scheme and within 50m from the mainline were identified through examination of the A9 dualling programme route-wide Phase 1 habitat survey data (Transport Scotland, 2015b) and walkover surveys. Surveys for the presence or likely absence of reptiles were undertaken in areas of suitable habitat by visual search walkovers, aided by the use of artificial cover objects (ACOs). ACOs were deployed at each site identified as having suitable habitat and consisted of 0.5m^2 roofing felt, basal-rubber carpet tiles, and corrugated sheet metal, and were deployed at a density of no fewer than ten ACOs per hectare. Survey results and incidental sightings were used to define the importance of each surveyed site for reptiles using criteria listed in Tables 12.2 and 12.3.
Phase 1 habitat survey	JNCC, 2010	September 2016	Habitat surveys undertaken to cover areas that were not previously surveyed (Transport Scotland, 2015b), such as side roads, up to 150m from the proposed scheme, except where the survey area included the opposite side of the River Garry. Additionally, aerial photography provided by Blom (2013) was examined to provide context on habitats up to 500m from the proposed scheme, and complement the A9 dualling programme route-wide Phase 1 habitat data (Transport Scotland, 2015b).
Phase 2 habitat surveys	Rodwell, 1991-2000 Rodwell, 2006 Averis et al., 2014 Elkington et al., 2001	September 2016 August 2017	Key areas, likely to be of greater botanical importance, were identified through the A9 dualling programme route-wide Phase 1 habitat survey data (Transport Scotland, 2015b) or past National Vegetation Classification (NVC) data (Scotland's Environment Web Partnership, 2016). Key areas, for which an effect pathway was identified, were surveyed with Phase 2 techniques, which included NVC assessment where necessary. NVC assessments were carried out in line with the methodology and classification set out in Rodwell's British Plant Communities (Rodwell, 1991-2000) and associated user handbook (Rodwell, 2006), and with reference also to *An Illustrated Guide to British Upland Vegetation* (Averis et al., 2014). Previous botanical experience was also used to classify plant communities. Sites that were identified as requiring Phase 2 habitat surveys transpired to be those that were considered to have the potential to be groundwater dependent, areas of permanent loss of terrestrial habitat within SSSI and SAC boundaries and wooded Ancient Woodland Inventory (AWI) sites within the footprint of the proposed scheme.
Groundwater Dependent Terrestrial	Rodwell, 1991-2000 Rodwell, 2006 Averis et al., 2014	September and November/December 2016	Potential GWDTEs were identified from: · Target Notes recorded during the A9 dualling programme route-wide Phase 1 habitat surveys (Transport Scotland, 2015b); · notes made during the DMRB Stage 2 assessment using the Sniffer wetland typology (Sniffer, 2009); and

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
Ecosystem (GWDTE)	Sniffer, 2009 Elkington et al., 2001 SEPA, 2014	March 2017	· the Phase 1 habitat - NVC equivalence table (JNCC, 2010). Potential groundwater dependant sites were revisited to assess their botanical composition and principal hydrological features, such as adjacency to watercourses. Surveys focused on areas within 100m of the existing A9, as agreed with SEPA, which could be directly or indirectly affected and took into account the predicted zones of de-watering determined in the groundwater flow impact assessment, see Chapter 10 (Geology, Soils, Contaminated Land and Groundwater). Sites assessed as being potentially groundwater-fed were then assigned an NVC category using the SEPA Guidance Note 4, Potential guidance on windfarm developments (SEPA, 2014), to develop a final list of areas with potentially groundwater dependant vegetation. Additional visits were undertaken jointly with a hydrogeologist to determine the likelihood of GWDTE presence. Coring surveys were undertaken at one site (CF01) within the Tulach Hill and Glen Fender Meadows SAC and Tulach Hill SSSI. The full assessment of GWDTEs is detailed in Appendix A10.2 of Chapter 10 (Geology, Soils, Contaminated Land and Groundwater).
Aquatic Features			
Aquatic habitat visual assessment (including fish habitat suitability)	n/a	February – March 2015 September 2015	Where a potential impact pathway was identified, assessments were undertaken to include water features within 150m either side of existing A9 and any additional areas affected by the proposed scheme. Seventy-five sites on 67 water features identified during the DMRB Stage 2 process were surveyed taking note of habitat conditions such as substrate, depth, flow type and suitability for species of conservation importance. Water features were scoped out for further survey where: · an impact pathway was ruled out during site visits; · they did not contain resources for sensitive ecological features and as such no potential negative impacts on sensitive ecological features could occur; or · where several water features were similar in character (e.g. forestry drains) and a typical subset could be used for impact assessment of low value features. Habitat for different species and life stages of fish was assessed against the criteria in Table 12.4. Each water feature was evaluated using the criteria in Table 12.5 and an ecological value assigned.
Macroinvertebrates (aquatic)	Environment Agency, 2012 British Standards Institution, 2012a	April and November 2015	Nineteen point locations on 17 representative watercourses within 150m of the existing A9 and affected by the proposed scheme were surveyed. These sites were chosen for presence of suitable sampling habitat, safe access and/or being characteristic of several other watercourses. Sites were surveyed using standard methods (3-minute kick sampling and 1-minute manual searching) and water chemistry parameters including water temperature, dissolved oxygen, pH, salinity and specific conductance were measured and recorded using a YSI 556 handheld multi-parameter instrument. Three sites could not be surveyed in autumn due to high water levels; two sites on the River Garry and one on Allt Eachainn. Metrics calculated from the results of the macroinvertebrate samples were used to give an indication of: · Water Framework Directive (WFD) compliant macroinvertebrate classification; · species of conservation importance (CCI Score); · impacts from organic pollution and general degradation; and · flow and sedimentation. Detailed metrics calculated from the samples are given in Appendix A12.2 (Baseline Data and Detailed Survey Methods). Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
Macrophytes	Water Framework Directive (WFD) UKTAG, 2014	September 2015	Representative 100m stretches of watercourses within 150m of the existing A9 and affected by the proposed scheme were surveyed. Two sites were identified during the aquatic walkover surveys as suitable for macrophytes. Percentage cover of each macrophyte species was recorded and a Taxon Cover Value (TCV) assigned. Physical characteristics of the sample site were also collected, including location, width, depth, substrate, habitats (for example pools and riffles), shading, water clarity and bed stability.

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
			Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
Predictive SYstem for Multimetrics (PSYM)	Environment Agency & Ponds Conservation Trust, 2002	September 2015	One pond within 150m of the existing A9 and potentially affected by the proposed scheme was surveyed (four other ponds were unsuitable for survey). A family level macroinvertebrate assessment and species level macrophyte assessment was undertaken on site. Physical data was recorded from the site including substrate, shading, and presence of inflows/outflow. All data were recorded on standard PSYM survey sheets, and photos were taken of the pond. Completed survey sheets were submitted to the Freshwater Habitats Trust for analysis. Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
Freshwater pearl mussel (FWPM)	Cosgrove et al., 2007 SNH, undated-b	March – October 2016	A minimum of 600m (100m upstream and 500m downstream), where accessible, was surveyed at all River Tay SAC crossings and the proposed scheme's indicative outfall locations. For crossing point sites, the entire river width was surveyed. At the indicative outfall locations, the bank on the side of the proposed outfall location was surveyed. If no FWPM were found on this bank, the search was extended to the entire river width, including the opposite bank. Surveys were carried out under SNH licence (number: 18806).

12.2.18 As detailed in Table 12.1, results obtained from the reptile surveys and incidental sightings were used to determine a Reptile Site Status, as outlined in Tables 12.2 and 12.3.

Table 12.2: Reptile habitat importance criteria

Reptile Site Status	Criteria
Unsuitable*	No confirmed reptile presence; and no desirable features in the habitat (Edgar et al., 2010).
Potential	No confirmed reptile presence in the target habitat, but reptile presence confirmed in adjacent suitable habitat; or suitable habitat with desirable features.
Presence	Reptile presence confirmed with a minimum of one individual.
Key Reptile Site (KRS)	To qualify as a KRS, the site must meet at least one of the following criteria (Froglife, 1999) (population scores in Table 12.3): · support three reptile species; · support an exceptional population of one species; or · support an assemblage of species scoring at least four. Where a small area, or individual habitat, within a large reptile survey site was identified as a KRS, the entire reptile survey site was given a Reptile Site Status of Local KRS.

* Unsuitable habitat was screened out during habitat assessment.

Table 12.3: Reptile populations density table (numbers refer to maximum number of adults seen in one survey in one hectare with a minimum of ten artificial cover objects ACO/ha)

Species	Low Population Score 1	Good Population Score 2	Exceptional Population Score 3
Adder	<5	5 – 10	>10
Slow worm	<5	5 – 20	>20
Common lizard	<5	5 – 20	>20

12.2.19 Fish habitat criteria are presented in Table 12.4 (based on Hendry and Cragg-Hine, 2003; Maitland, 2003, Maitland, 2007 and Scotland Fisheries Co-ordination Centre (SFCC), 2016) and water features were evaluated using the criteria in Table 12.5.

Table 12.4: Fish habitat criteria

Species	Life Stage	Habitat Requirements
Atlantic salmon	Spawning/egg	Channel width at least 3m, with 0.17-0.76m water depth. Glide or riffle flow at 0.35-0.80m/s. Golf ball - tennis ball sized substrate, 0.15-0.25m deep with less than 8% fine particles.
	Fry	Shallow (0.2m or less) fast flowing broken water. Golf ball - tennis ball sized substrate.
	Parr	Fast flowing broken water, 0.2-0.4m deep. Tennis ball – football sized substrate.
	Adult	Deep, at least 0.8m deep. Connectivity.
Lamprey	Adults/Spawning	Gravel with some sand (around 0.1m deep substrate). Water flow through substrate, generally at the tail end of pools. Water velocities around 0.3–0.5m/s but can be as high as 4.0m/s. Water depth generally less than 0.4m.
	Ammocoetes (juveniles)	Mud, silt, sand substrate up to 0.3m deep with high organic content. Slow flowing water (less than 0.1m/s). Stable stream bed. Water depth 0.1–1m.
Trout	Spawning/egg	Channel generally less than 3m wide. Glide or riffle flow at 0.15-0.75m/s. Pea – tennis ball sized substrate at least 0.15m deep with less than 12% fine particles.
	Fry	Shallow (0.2m or less) medium flowing water. Golf ball - tennis ball sized substrate. Marginal cover.
	Parr	Variety of substrates. Water depth 0.2-4m with slow-medium flows. Bankside cover (undercut banks/vegetation/tree roots).
	Adult	Deeper water (at least 0.4m) with slow sustained flow. Bankside/bed/canopy cover.

Table 12.5: Scoring system for watercourse ecological evaluation

Accessible to Migratory Species	FWPM Habitat	Salmonid Spawning	Juvenile Salmonid Habitat	Adult Salmonid Habitat	Lamprey Habitat	Resources Supporting SAC	Overall Score	Ecological Value
Yes-2 Partial-1 No-0	Yes-2 Some-1 No-0	Yes-2 Some-1 No-0	Yes-2 Some-1 No-0	Yes-2 Some-1 No-0	Yes-2 Some-1 No-0	Yes-2 Some-1 No-0	0 - 14	10-14 = Excellent 5-9 = Good 2-4 = Moderate 0-1 = Poor

Consultation

12.2.20 A summary of the consultation process is provided in Chapter 7 (Consultation and Scoping). Consultation via the A9 ESG included agreement on the survey scope, methods and study areas for the assessed features, with input from the following key statutory consultees:

- CNPA;
- SEPA;
- Historic Environment Scotland (HES);
- SNH;
- PKC; and
- The Highland Council (THC).

12.2.21 The ESG was also iteratively consulted on various aspects of the ongoing ecological work and on key potential impacts such as crossings over watercourses and loss of ancient woodland.

12.2.22 The Environmental Forum was also consulted; this forum is the mechanism for non-statutory consultees to provide inputs to the A9 dualling programme. The Environmental Forum included all members of the ESG, as stated in paragraph 12.2.20, in addition to the following consultees:

- RSPB;
- Badenoch and Strathspey Conservation Group;
- Scottish Badgers;
- British Deer Society;
- SWT;
- Buglife;
- Spey District Fisheries Board;
- Findhorn, Nairn and Lossie Fisheries Board;
- TDSFB;
- Forestry Commission Scotland; and
- The Woodland Trust.

Impact Assessment

12.2.23 Impact significance was assessed taking into account the nature and magnitude of potential impacts (including duration, extent and reversibility) and their consequent effects on important ecological features, using criteria as set out below.

12.2.24 The importance of a feature was defined using criteria set out in Table 12.6 and paragraphs 12.2.25 to 12.2.29. Impact characterisation criteria are defined in Table 12.7, and paragraphs 12.2.30 to 12.2.31.

Importance

12.2.25 The general approach to defining the importance of ecological features follows that of CIEEM (2016). The approach is also in line with advice given in DMRB Interim Advice Note 130/10 'Ecology and Nature Conservation: Criteria for Impact Assessment' (The Highways Agency et al., 2010).

12.2.26 Ecosystems, habitats and species are assigned levels of importance for nature conservation based on the criteria set out in Table 12.6.

12.2.27 The rarity, ability to resist or recover from environmental change, and uniqueness of an ecological feature, function/role within an ecosystem, and level of legal protection or designation afforded to a given ecological feature are all factors taken into account in determining its importance.

12.2.28 Only important ecological features are subject to impact assessment. Therefore, features that do not meet the criteria for at least local importance are not considered in detail in this assessment (see Table 12.6).

Table 12.6: Importance criteria for ecological features

Importance	Criteria
International	Ecosystems and Habitats *Ecosystems or habitats essential for the maintenance of:* internationally designated areas or undesignated areas that meet the criteria for designation; and/or viable populations of species of international conservation concern. Species *Species whose presence contributes to:* the maintenance of qualifying habitats, communities and assemblages that occur within internationally designated sites or within undesignated areas that meet the criteria for such designation.
National	Ecosystems and Habitats *Ecosystems or habitats essential for the maintenance of:* qualifying communities and assemblages that occur within nationally designated sites or within undesignated areas that meet the criteria for such designation; and/or viable populations of species of national conservation concern. Species *Species whose presence contributes to:* the maintenance of qualifying habitats, communities and assemblages that occur within nationally designated sites or within undesignated areas that meet the criteria for such designation; or the maintenance and restoration of biodiversity and ecosystems at a national level, as defined in the Scottish Biodiversity Strategy (SBS) (Scottish Government, 2013, 2015).
Regional	**Ecosystems and Habitats** *Ecosystems or habitats essential for the maintenance of:* communities and assemblages that occur within regionally important sites or localities listed as being of conservation importance in the Tayside Local Biodiversity Action Plan (LBAP) or Cairngorms Nature Action Plan (CNAP) (including Local Nature Reserves) or within undesignated areas that meet the criteria for such designation; and/or viable populations of species of regional conservation concern. **Species** *Species whose presence contributes to:* the maintenance and restoration of biodiversity and ecosystems at a regional level, as defined in the Tayside LBAP or CNAP.
Authority Area	**Ecosystems and Habitats** *Ecosystems or habitats essential for the maintenance of:* populations of species of conservation concern within the authority area. **Species** *Species whose presence contributes to:* the maintenance and restoration of biodiversity and ecosystems within a relevant area such as Perth and Kinross within the Tayside LBAP, or Aviemore in the CNAP.
Local	Ecosystems and Habitats

Importance	Criteria
	Ecosystems or habitats essential for the maintenance of: populations of species of conservation concern within the local area (for example a Local Nature Reserve (LNR)). **Species** *Species whose presence contributes to:* the maintenance and restoration of biodiversity and ecosystems at a local level.
Less than Local	Ecosystems and Habitats Ecosystems or habitats that do not meet the above criteria. Species Species that do not meet the above criteria.

12.2.29 In accordance with DMRB IAN 130/10, deer and invasive non-native species (INNS) were scoped out from ecological evaluation due to their lack of conservation status and so are not discussed further in that context. Deer are discussed in this chapter in the context of potential for vehicle collisions during the operational phase of the proposed scheme, which could have implications regarding human safety and animal welfare. INNS are discussed in the context of their potential as a risk to biodiversity and, under the Wildlife and Countryside Act 1981 (as amended) (WCA), legal responsibilities to prevent their transfer. Beaver are discussed where relevant in line with the recent Scottish Government decision to accord the species protection in line with the EU Habitats Directive (Scottish Government, 2016).

Impact Characterisation

12.2.30 For the purposes of this assessment, the impact descriptors in Table 12.7 are taken to summarise the overall characterisation of positive or negative impacts in accordance with CIEEM (2016), including:

- impact extent/scale (e.g. entire habitat loss, partial habitat loss or indication over specific area affected);
- direct or indirect impact (e.g. direct mortality of individuals from vehicle collisions, or indirect mortality of individuals from reduced prey resources due to pollution of watercourses);
- reversibility of impact (reversible or irreversible);
- frequency of impact (single event, recurring or constant);
- duration of impact (short-term, medium-term, long-term or permanent); and
- likelihood of occurrence (certain/near certain, probable, unlikely or extremely unlikely).

12.2.31 The character of impacts is defined using the criteria set out in Table 12.7. Impact character was identified as high, medium, low or negligible, following the above impact characterisation approach.

Table 12.7: Impact descriptors and characterisation for ecological features

Impact Descriptor	Impact Characterisation
High	An impact resulting in a permanent effect on the distribution and/or abundance of a habitat, species assemblage/community or population, in such a way as to alter the integrity of the feature and its conservation status. If negative, this type of effect would reduce the integrity of the feature and its conservation status. If positive, it would result in an improvement to the conservation status of the feature.
Medium	An impact resulting in a long-term but reversible effect on the distribution and/or abundance of a habitat, species assemblage/community or population. If negative, this type of effect would have neutral long-term implications for the integrity of the feature or its conservation status. If positive, it would not alter the long-term conservation status of the feature.
Low	An impact resulting in a short-term reversible effect on the distribution and/or abundance of a habitat, species assemblage/community or population.
Negligible	No discernible impact on the distribution and/or abundance of a habitat, species assemblage/community or population.

Impact Significance

12.2.32 Each feature's importance and the potential impacts upon it have been determined through the above described collection of data and consultation; and also from prior project experience, to provide a robust basis for making a professional decision on the appropriate focus of the impact assessment. The assessment is then focused on those impacts that result in potentially significant effects on local or above important ecological features. For example, an area of amenity grassland would not meet the criteria for local ecological importance and would not progress through the assessment process. However, any impact on a SSSI would progress through the assessment process as such sites are designated as nationally important.

12.2.33 CIEEM (2016) notes that impacts that are likely to be relevant in an assessment are those that are predicted to lead to significant effects (negative or positive) on important ecological features. Significant effects are those that are sufficiently important to support or undermine the conservation status[2] of important ecological features. Knowledge and assessment of construction methods and operational activities, together with the ecological knowledge of ecologists with experience of similar large-scale infrastructure projects, has been used to identify the potential impacts of the project on ecological features.

12.2.34 Following the above approach, the assessment aims to characterise ecological impacts rather than placing a reliance only on magnitude. The character of an impact is used to inform the determination of whether or not the impact on the feature in question is a significant one.

12.2.35 Where impacts on internationally, nationally or regionally important ecological features are characterised as 'medium' or 'high', they are considered to be potentially significant under the terms of the EIA Regulations.

12.2.36 Impacts on internationally important features characterised as 'low', and 'high' impacts on features of authority area importance, can also be potentially significant. In addition, there may be a number of impacts on a feature that, whilst not of a character to be significant in themselves, may cumulatively result in a significant effect on that feature.

12.2.37 Under the terms of the EIA Regulations, where significant impacts are identified, mitigation will be developed to reduce impacts where feasible.

12.2.38 The mitigation measures described within the EcIA have been incorporated into the design and operational phasing programme and taken into account in the assessment of the significance of effects. The mitigation aims to avoid or negate impacts on ecological features in accordance with best practice guidance and UK, Scottish and local government environmental impact, planning and sustainability policies.

12.2.39 Impacts that are not significant (including those where compliance with regulation is required) would be expected to be avoided or reduced through the application of the standard mitigation commitments and best working practice (e.g. mitigation of potential pollution impacts through adherence to standard best practice and guidelines). Significant ecological impacts are expected to be mitigated through a combination of best practice/typical mitigation methods and also mitigation targeted to specific locations as described in this assessment.

12.2.40 Mitigation is also designed to produce a net gain for biodiversity where practicable, in line with policy and guidelines (CIEEM, 2016).

2 Conservation status for habitats is determined by the sum of the influences acting on the habitat and its typical species that may affect its long-term distribution, structure and function, as well as the long-term distribution and abundance of its population within a given geographical area. Conservation status for species is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its population within a given geographical area.

12.3 Baseline Conditions

Desk-based Assessment

Designated Sites

12.3.1 Seven statutory designated sites (for their biological interest) lie within the study area and are shown on Figure 12.1:

- River Tay SAC (SNH, 2016b) (SNH site code 8366, EU site code UK0030312);
- Tulach Hill and Glen Fender Meadows SAC (SNH, 2016c) (SNH site code 8401; EU site code UK 0012891);
- Tulach Hill SSSI (SNH, 2016d) (SNH site code 1568);
- Aldclune & Invervack Meadows SSSI (SNH, 2016e) (SNH site code 30);
- Pass of Killiecrankie SSSI (SNH, 2016f) (SNH site code 1274);
- Struan Wood SSSI (SNH, 2016g) (SNH site code 1504); and
- Cairngorms Massif Special Protection Area (SPA) (SNH, 2016h) (SNH site code 10234; EU site code UK9020308).

12.3.2 The Glen Garry SSSI lies within the study area, but is designated for its geological importance rather than biological and is therefore discussed in detail in Chapter 10 (Geology, Soils and Groundwater).

12.3.3 A detailed consideration of the potential effects on European sites; the River Tay SAC and Tulach Hill and Glen Fender Meadows SAC, in the context of The Conservation (Natural Habitats, & c.) Regulations 1994 (referred to as the Habitat Regulations), has been undertaken in a Habitats Regulations Appraisal (HRA) for the proposed scheme.

12.3.4 There are no known locally designated sites of nature conservation interest (such as Local Nature Reserves) within the study area.

Ancient and Native Woodland

12.3.5 Forty-nine sites listed on the Ancient Woodland Inventory (AWI) (categories 1a, 1b, 2a, 2b and 3) equalling over 275ha (SNH, 2008a; undated-c) were identified in the 500m desk-based assessment study area (Figure 12.1). Approximately 51% of the habitat listed on the AWI is Category 2a woodland (ancient woodlands of semi-natural origin) but there are also smaller areas of Category 1a (ancient woodland), 1b and 2b (both long-established woodlands of plantation origin) and 3 (other woodland on 'Roy' maps[3]) present. In addition, 165 pockets of native woodland categorised as part of the Native Woodland Survey of Scotland (NWSS) (Patterson et al., 2014) were identified in the 500m desk-based assessment study area (Figure 12.1); some of these are coincident or overlapping with AWI sites.

12.3.6 The AWI includes some areas which were previously wooded. Many areas on the AWI could be identified as wood-pasture; a landscape of scattered trees in a grassland or heathland setting (SNH, 2004). Wood-pastures have been recognised as a distinct form of ancient woodland (Rackham, 1976; 1980; 2003 and Peterken, 1977) could retain remnants of ancient woodland habitats, for example in the soil bank and ground flora.

12.3.7 Other non-wooded AWI sites have since been modified for other uses, such as intensive agriculture, or have been developed, (for example under the existing A9).

[3] Roy maps (c.1750) from the Roy Military Survey of Scotland, 1747-1755, and the 1st edition Ordnance Survey map (c.1860) were used to derive the AWI. Available at http://www.nls.uk/ (Last accessed January 2017).

Biodiversity Action Plans

12.3.8 The study area is located within the areas covered by the Tayside LBAP (Tayside Biodiversity Partnership, 2016) and the Cairngorms Nature Action Plan (CNAP) for 2013 – 2018 (CNPA, 2013). The Tayside LBAP identifies objectives and targets for the conservation of six ecosystems, including the habitats and species present within them. The CNAP includes 26 key species and 19 habitats which have relevance to the study area.

Terrestrial Habitats

12.3.9 Habitats within 150m of the existing A9, as recorded during the A9 dualling programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b), are identified on Figure 12.2.

12.3.10 Grassland and woodland together accounted for the majority of the area, of which over half is agricultural grassland. Upland habitats (heath/grassland mosaics and fen, mire, flush and spring) made up most of the remaining area (Photograph 12.1).

Photograph 12.1: Upland Habitat looking southwest from Dalnamein Forest

12.3.11 Parcels of habitats that may contribute to foraging, nesting, breeding and/or commuting habitat for faunal species of conservation importance are included as part of the assessment for the relevant species.

Aquatic Habitats

12.3.12 In total there are 67 water features within the study area 150m either side of the existing A9. Of these, the River Garry is the main watercourse and runs parallel to the existing A9 along the length of the proposed scheme. Of the remaining water features, 11 smaller named watercourses and 55 minor unnamed watercourses which are crossed by or beside the existing A9 have been considered for aquatic ecology. Additional water features discussed in Chapter 11 (Road Drainage and the Water Environment) include those outwith the 150m ecology and nature conservation study area, and on the opposite side of the River Garry.

12.3.13 Watercourses classified by SEPA as part of the River Basin Management Plan (RBMP), in accordance with Annex V of the EU Water Framework Directive 2000/60/EC (WFD), are given in Table 12.8. It

should be noted that watercourses classified by SEPA as Highly Modified are given an Ecological Potential rather than an Ecological Status.

Table 12.8: WFD Classifications for watercourses

Watercourse	WFD Overall Status (2015)
River Garry (downstream of confluence with Errochty water)	Good Ecological Potential
River Garry (upstream of confluence with Errochty water)	Bad Ecological Potential
Lower Allt Girnaig	Moderate
Allt Bhaic	Good
Allt a'Chromaidh	Good
River Bruar[4]	Bad Ecological Potential
Allt Anndeir	Bad Ecological Potential

12.3.14 The lower sections of Allt Girnaig, River Bruar and Allt Bhaic along with the River Garry up to the confluence with Errochty Water, 1.75km upstream of the A9 Pitaldonach crossing, form part of the River Tay SAC which has been designated for protected species including Atlantic salmon, lamprey and otter. In addition, the SAC is designated for clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels (SNH, 2016b); however, no clear water lochs are present within the study area. Stretches of the River Garry also form part of the Aldclune & Invervack Meadows SSSI (SNH, 2016e), which is a series of small parcels of lowland grassland on the floodplain.

12.3.15 Five ponds were identified within the study area, three in wooded areas between Killiecrankie and Aldclune and two within Shierglas Quarry.

Protected Species

12.3.16 Data obtained during the desk-based assessment, as described in paragraphs 12.2.8 to 12.2.14, and the results of fieldwork carried out for the DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b), identified the potential presence of the following protected species within the study area:

- badger: Scottish Badgers provided records in 2015 and 2016 of badger presence in the study area and setts were recorded during DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b);
- bats: 74 trees, buildings or structures with high bat roost potential were identified during DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b);
- beaver: an incidental record of beaver foraging activity was identified during DMRB Stage 2 assessment (Transport Scotland, 2016a) and potential core beaver woodland has been identified within the study area (SNH, 2015);
- bird species on Schedule 1 of the WCA: incidental sightings recorded during DMRB Stage 2 assessment included barn owl (two WVIs) and kingfisher (Transport Scotland, 2016a and 2016b). Records of other Schedule 1 species within the study area were provided by the TRSG, RSPB and BTO (received 2015 and 2016);
- hen harrier: breeding records within the study area provided by the TRSG (received 2015);
- black grouse: lek sites have been recorded in proximity to the proposed scheme, between Blair Atholl and Glen Garry (RSPB, 2016);
- breeding birds: suitable habitat was recorded during DMRB Stage 2 assessment, notably in woodland, agricultural grassland and scrub (Transport Scotland, 2016a and 2016b);
- breeding and wintering birds: species recorded during the BTO Atlas 2007-11 in three 10km^2 grids associated to the study area (received 2016);

4 Note that this water feature is referred to as River Bruar throughout this chapter. SEPA refer to this water feature as River Bruar, however it is referred to as Bruar Water on Ordnance Survey maps.

- otter: evidence of otter was recorded during DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b);
- water vole: there are NBN (2016) records within 10km radius of the study area. The species has undergone widespread decline in Scotland, particularly in the lowlands (SNH, 2016i);
- pine marten: incidental sightings of pine marten and suitable habitat were recorded during DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b). In a recent study, the species was considered to be expanding its range in Tayside (Croose et al., 2014);
- red squirrel: incidental sightings of red squirrel and suitable habitat recorded during DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b);
- reptiles: adder, common lizard and slow worm all recorded in the study area during DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b);
- wood ant: the A9 dualling programme route-wide Phase 1 habitat survey data recorded a nest within the study area (Transport Scotland, 2015b);
- Atlantic salmon: TDSFB (A9 ESG, 2015) advise that the species is found throughout the River Tay catchment and that there is a large pool that is used by the species immediately upstream of the existing crossing of the River Garry at Essangal. Large numbers of adult fish are known to utilise this pool prior to moving upstream to spawn in both the River Tilt and the River Garry. The River Tay SAC has favourable conservation status for Atlantic salmon (Rivers and Fisheries Trusts of Scotland, 2014). Previously, Atlantic salmon were unable to pass the weir at Struan (TDSFB, 2016) however; in January 2017 this weir was breached and is now considered to be passable (SSE, 2017). TDSFB have stocked eyed ova/unfed fry throughout the River Garry both above and below the Struan Weir for several years (Appendix A12.212.2: Baseline Data and Detailed Survey Methods);
- FWPM: SNH provided a record of survey within the study area but no FWPM presence recorded;
- brook lamprey: records within study area (Watt et al., 2008) and suitable habitat identified in River Tay catchment during DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b). SSE confirmed that river lamprey cannot pass the Pitlochry Dam (Stephen, 2016, pers. comm., 26 April 2016). The TDSFB, confirmed sea and river lamprey cannot pass Pitlochry Dam (Summers, 2015, meeting with Jacobs, 25 November 2015);
- trout (brown/sea): TDSFB (2009) report brown trout throughout the River Tay catchment with sea trout in smaller numbers. Suitable habitat identified in River Tay catchment during DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b); and
- European eel: suitable habitat identified in River Tay catchment during DMRB Stage 2 assessment (Transport Scotland, 2016a and 2016b). A. Stephen and D. Summers confirmed that eel cannot pass the Pitlochry Dam (Stephen, 2016, pers. comm., 26 April 2016) (Summers, 2015, Meeting with Jacobs, 25 November 2015).

Wildcat

12.3.17 The Wildcat Habitat Suitability Model (Bryce and Mattisson, 2012) shows extensive cover, prey and movement habitat to the north and south of the proposed scheme as shown on Figure 12.3 and in Photograph 12.2. Movement north and south is likely restricted, but not prevented entirely, by the natural barrier presented by the River Garry which runs parallel to the existing A9 along the length of the proposed scheme.

Photograph 12.2: Potential wildcat cover habitat looking northwest from Tulach Hill

12.3.18 CNPA's wildcat records (Hetherington and Campbell, 2012) show that there is confirmed wildcat within the woodlands (Craig Urrard, Blairuachdar and Ruigh-loisgte Woods) to the north of Blair Atholl (Figure 12.3).

12.3.19 The Wildcat Habitat Suitability Model displays potential wildcat habitats along the length of the proposed scheme (Figure 12.3). Good cover habitat has been identified either side of the existing A9 at Killiecrankie, Blair Atholl, Woodend/Black Island, Pitagowan and Calvine/Clunes Wood. Current permeability across the existing A9 is possible at all of the above locations with the exception of Woodend/Black Island where the River Garry may act as a natural barrier to wildcat movement.

Other Species of Interest

CNPA Priority Non-protected Species

12.3.20 As well as the 26 key species identified in the CNAP (CNPA, 2015), the CNPA presented a draft list of 360 priority non-protected species, notably invertebrates, plants, fungi and lichens, which have been categorised into relevant broad habitat types. Inclusion on this list is based on the rarity of the species and is informed by specialists and/or interest groups (Transport Scotland, 2015f).

12.3.21 The A9 dualling programme route-wide Phase 1 habitat survey data (Transport Scotland, 2015b) was used to highlight areas where key and priority non-protected species are in relation to the proposed scheme. A habitat-based approach has been undertaken to assess potential impacts of the proposed scheme on habitats that support key species and priority non-protected species.

Deer

12.3.22 Deer have been recorded in the study area. They are not legally protected for nature conservation reasons; although roe deer are listed on the Tayside LBAP protected species list (Tayside Biodiversity Partnership, 2016). They are of concern to the project due to deer vehicle collisions (DVCs) and their protection under animal welfare legislation.

12.3.23 DVCs have been recorded within the study area and deer fencing was recorded in two locations (Transport Scotland, 2015b): the House of Urrard, where it is considered that the fencing was primarily concerned with protecting the gardens and not from preventing the movement of deer onto the highway; and around plantation woodland north of the existing A9 at Dalreoch.

Invasive Non-native Species

12.3.24 INNS present a threat to biodiversity (Department for Environment, Food & Rural Affairs (DEFRA), 2015). Four plant species; Japanese knotweed, rhododendron, monkeyflower and snowberry, were recorded in the study area during the A9 dualling programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b). American mink, an invasive non-native animal species, was recorded

within the study area on the River Garry during site surveys. Details of the location of these species can be found in Table 17 in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Site Surveys

Terrestrial Features

Badger

12.3.25 Three main setts, three subsidiary setts and 36 outlier setts were recorded within the study area, as well as field signs including dung pits, footprints and paths (Figure 12.4). Full survey results are provided in a confidential appendix to the authorities listed in paragraph 12.1.3 (Appendix A12.3: Confidential Ecology Features).

Bat Roost Surveys

12.3.26 Eight buildings, two structures and one tree were found to contain summer bat roosts. The roosts and all buildings, structures and trees identified with bat roost potential are shown on Figure 12.5. Please see Appendix A12.2 (Baseline Data and Detailed Survey Methods) for full survey results.

Bat Activity Surveys

12.3.27 Six structures were identified to have an overall value of high (Collins, 2016), nine with an overall value of moderate and two structures had an overall value of low as shown on Figure 12.6 (Table 6 in Appendix A12.2: Baseline Data and Detailed Survey Methods).

12.3.28 One transect route had an overall value of high and four had an overall value of moderate (Table 7 in Appendix A12.2: Baseline Data and Detailed Survey Methods). One woodland had a cryptic species (species with similarities in echolocation to other bat species or species with echolocation calls which are more difficult to detect, as described in Table 12.1) overall activity value of moderate (Table 8 in Appendix A12.2: Baseline Data and Detailed Survey Methods) as shown on Figure 12.6.

Breeding Birds

12.3.29 In total, 3,230 records of birds were logged during site surveys. Of these, 2,760 represented breeding records (birds recorded nesting, singing, acting territorially or in family groups). A total of 77 species were recorded during the site surveys, of which 67 species were confirmed to have bred.

12.3.30 Of the 67 breeding species, 33 were listed as species of conservation concern, either red-listed or amber-listed (Eaton et al., 2015) as detailed in Table 9 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and shown on Figure 12.7. The most frequently recorded breeding species were chaffinch, blue tit and willow warbler. Eighteen species were listed on the Scottish Biodiversity List (Scottish Government, 2013), 25 on the Tayside LBAP (Tayside Biodiversity Partnership, 2016) and one species on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (Table 9 in Appendix A12.2: Baseline Data and Detailed Survey Methods).

Otter

12.3.31 One holt and six couches were recorded within the study area, as well as field signs including spraints and footprints (Figure 12.8). Full survey results are provided in a confidential appendix to the authorities listed in paragraph 12.1.3 (Appendix A12.3: Confidential Ecology Features).

Water Vole

12.3.32 During DMRB Stage 3 site surveys, no field signs for water vole were recorded. Limited suitable habitat was identified along eight watercourses (Table 10 in Appendix A12.2: Baseline Data and Detailed Survey Methods).

Pine Marten, Red Squirrel and Wildcat

12.3.33 Incidental recordings of evidence of red squirrel and pine marten are detailed in Table 11 in Appendix A12.2 (Baseline Data and Detailed Survey Methods). There were two incidental sightings of pine marten and eight incidental sightings of red squirrel. Two dreys and one potential drey were recorded, and evidence of squirrel feeding was also found (Figure 12.9). Signs were all found within woodland areas. No field signs for wildcat were recorded.

Reptiles

12.3.34 Nine sites were identified as potentially suitable for reptiles and were selected for artificial cover object (ACO) surveys.

12.3.35 Reptile presence was confirmed at all nine sites, with one site categorised as a Key Reptile Site (KRS) and four as Local KRS (where a small area or individual habitat within a large reptile survey area was identified as a KRS) as described in Table 12.2. Results of the reptile surveys conducted are presented in Table 12 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and on Figure 12.10. Site 9, which was categorised as a Local KRS, is shown in Photograph 12.3. This site was 2ha in area and two reptile species were recorded (adder and common lizard). Habitats in KRS comprised sparse birch woodland, dry heath with low heather cover, and rough grassland, with rocks in some areas.

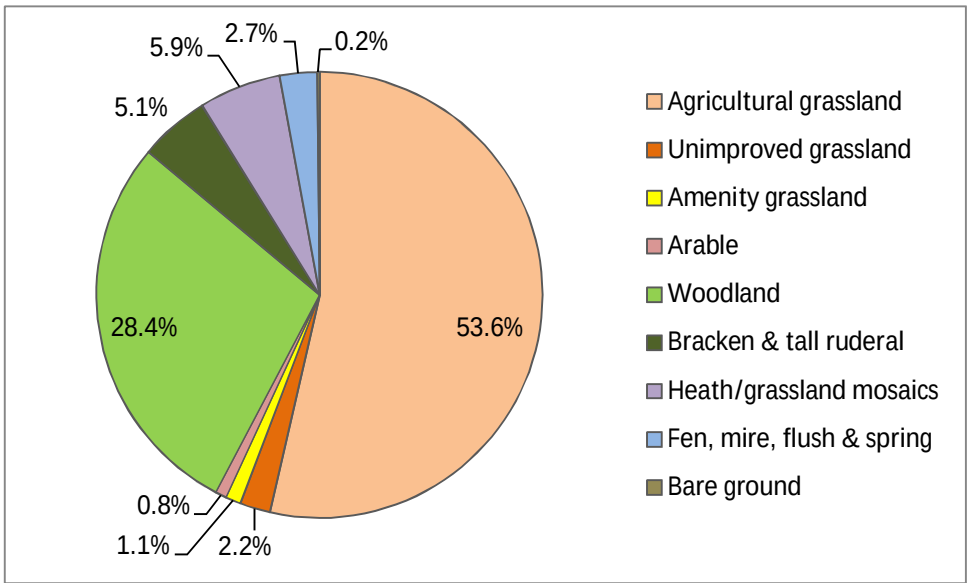
12.3.36 In addition, incidental sightings along the proposed scheme confirmed reptile presence in locations not included in surveys (Table 13 in Appendix A12.2: Baseline Data and Detailed Survey Methods). These results were also used to establish the Reptile Site Status (Figure 12.10).

Photograph 12.3: Site 9, the south-bound verge of the existing A9, categorised as a Local KRS

Phase 1 Habitat Survey

12.3.37 Phase 1 habitat surveys were undertaken to update previous surveys, as detailed in paragraph 12.3.9, and include areas that had not been surveyed. Diagram 12.1 summarises all habitats identified within 150m of the existing A9, and considers all Phase 1 habitat surveys undertaken. Aerial photography provided by Blom (2013) was examined to provide context on habitats up to 500m from the proposed scheme (Figure 12.11).

Diagram 12.1: Phase 1 habitats identified within 150m of the proposed scheme



12.3.38 Grassland and woodland together accounted for an estimated 85.3% of the area, of which agricultural grassland accounts for 53.6% and woodland for 28.4%. Upland habitats (heath/grassland mosaics and fen, mire, flush and spring) accounted for an estimated 8.6% and made up most of the remaining area.

12.3.39 Field gentian, a herbaceous flowering plant (Photograph 12.4), was recorded at NN 81605 65699, south of Pitagowan and the existing A9, and at NN 80799 65936, north of Calvine and the existing A9.

Photograph 12.4: Field gentian recorded within the study area south of Pitagowan

12.3.40 Relevant target notes from the A9 dualling programme route-wide Phase 1 habitat surveys (Transport Scotland, 2015b) are provided in Table 14 in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Phase 2 Habitat Survey

12.3.41 Phase 2 habitat surveys were undertaken at sites that were considered to have the potential to be groundwater dependent (see below); and at statutory designated and wooded AWI sites that had the potential to be impacted by the proposed scheme. Target notes from the surveys are provided in Table 15 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and are shown on Figure 12.11.

Groundwater Dependent Terrestrial Ecosystem (GWDTE) Survey

12.3.42 Potential GWDTE sites were identified during surveys. The impact assessment for these sites is detailed in Appendix A10.2 of Chapter 10 (Geology, Soils, Contaminated Land and Groundwater) and initial surveys indicated that four sites (CF01, TN160-162, ANF02 and TN190-193) could potentially be impacted by the proposed scheme. Details of these sites are provided in Table 16 in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

12.3.43 As a result of coring surveys, it was determined that site CF01 would not be impacted by the proposed scheme as a result of drawdown of the water table. Sites TN160-162 and ANF02 are areas of acid or neutral flush and site TN190-193 is an area of marshy grassland. The habitat at these three sites is not of high quality, being relatively species poor due to the effects of land drainage and road infrastructure.

Incidental Bird Records

12.3.44 A barn owl roost was recorded within the study area in November 2015 as an incidental record (Figure 12.12). The volume of owl pellets recorded within the roof of a disused farm building suggests this roost could be a potential breeding site (Table 5 in Appendix A12.3: Confidential Ecology Features)

12.3.45 Five incidental records of black grouse were recorded within the study area between September and December 2016. On four occasions between two and twelve male black grouse were recorded west of Invervack and one male was recorded north of Clunes Lodge. The locations of these records, as well as known lek locations (RSPB, 2016), are shown on Figure 12.12.

Aquatic Features

Aquatic Habitats

12.3.46 The main watercourse in the survey area is the River Garry which showed two distinct habitat types within the survey area. Between the confluence with the Errochty Water and Dalnamein, the River Garry flowed mainly over bedrock, often with steep high banks (Photograph 12.5). Above and below this section the river was much wider and shallower with a predominantly mobile cobble substrate (Photograph 12.6). The named watercourses generally all cascaded down steep bedrock gorges providing little habitat for aquatic species. Allt Bhaic was the exception, at around 4m wide and flowing through relatively flat pasture. Its cobble and gravel substrate and flat gradient made it suitable for many species. The majority of unnamed watercourses were small and shallow, with pebble and gravel substrate, and drained down from areas of wet woodland and pasture.

12.3.47 The results of the walkover surveys were used to generate an overall ecological value for each watercourse, illustrated in Figure 12.13. Of the five ponds identified in the study area, the two ponds within the active Shierglas Quarry were scoped out from requiring survey due to being artificial settlement ponds. Two of the three ponds surveyed were artificial (one ornamental and one in a pheasant enclosure) and were not considered further. The remaining pond was situated within broadleaved woodland and, as a result, was heavily shaded and had a silt and organic matter substrate.

12.3.48 Appendix A12.2 (Baseline Data and Detailed Survey Methods) provides additional supporting details of aquatic habitats.

Photograph 12.5: River Garry at the confluence with Allt Girnaig

Photograph 12.6: River Garry below the confluence with Errochty Water

Fish

12.3.49 Habitat suitable for all life stages of salmon and trout was present throughout the River Garry up to the confluence with the Errochty Water. Above the confluence, access was impeded by Struan Weir and therefore migratory species are unlikely to be present above this point (prior to the breach of Struan Weir in January 2017) (Figure 12.13).

12.3.50 Much of the River Garry between Struan Weir and Dalnamein was unsuitable for fish due to a predominantly bedrock substrate and a number of tumultuous fast-flowing areas. Above Dalnamein the habitat was assessed as suitable for juvenile salmonids, but it is expected that only residential trout and artificially stocked salmon are present in this section. The River Garry is subject to heavy water abstraction and as such can experience very low water levels in drier months, making much of the available habitat unsuitable.

12.3.51 Lamprey habitat was observed in sections of the River Garry, although areas of silt suitable for ammocoetes were limited. Silt beds were present in the lower reaches of Allt Bhaic and the lower reaches of the small tributary WF121. In the River Garry small silt beds were recorded approximately 375m upstream of the River Tilt confluence, 1300m downstream of the Allt Bhaic confluence and approximately 500m downstream of the Essangal Crossing.

12.3.52 In general, the other named watercourses provided suitable salmonid and lamprey habitat for short distances around their confluence with the River Garry before becoming steeper and inaccessible further upstream.

12.3.53 Fish species likely to be present are displayed on Figure 12.13.

Macroinvertebrates

12.3.54 The River Garry and 16 of its tributaries were surveyed for macroinvertebrates (Figure 12.13). Detailed results of the macroinvertebrate surveys are given in Appendix A12.2 (Baseline Data and Detailed Survey Methods). WFD classifications and Community Conservation Index (CCI) conservation value calculated from the samples, along with any species of conservation interest, are displayed on Figure 12.13.

12.3.55 The macroinvertebrate community in 12 of the tributaries was in good or excellent condition and showed minimal or no impacts from organic pollution, flow or fine sediments.

12.3.56 The macroinvertebrate community in the remaining four tributaries (WF116, WF121, Allt Crom Bhruthaich and Allt Anndeir) showed notable impacts from organic pollution and sediments.

12.3.57 Macroinvertebrate samples collected from three sites on the River Garry (Figure 12.13), had low species richness but contained species intolerant of organic pollution and indicated no impacts from sediments or flow.

Macrophytes

12.3.58 Two watercourses, Allt Bhaic and an unnamed watercourse (WF159), were surveyed for macrophytes (Figure 12.13, Appendix A12.2: Baseline Data and Detailed Survey Methods). In Allt Bhaic only one taxa, the algae, *Cladophora glomerata*, was observed and the site was classified under WFD as Bad. In WF159 three taxa (*Cladophora glomerata,* common water moss and broad-leaved pondweed) were observed, much fewer than would be expected in a stream of its typology. The community was indicative of nutrient enrichment and the site was classified as Moderate. No species of conservation importance were present.

PSYM Survey

12.3.59 A survey was undertaken at one pond (WF96A) in September 2015 (Figure 12.13). The results indicated an overall assessment of Very Poor due to the presence of a single macrophyte species, *Lemna minor*, and low invertebrate taxa richness. Detailed results are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Freshwater Pearl Mussel (FWPM)

12.3.60 No FWPM were recorded during DMRB Stage 3 site surveys. More information is provided in a confidential appendix to the authorities listed in paragraph 12.1.3 (Appendix A12.3: Confidential Ecology Features).

Evaluation

12.3.61 The legal status and conservation status of ecological features within the study area is provided in Table 12.9, along with a short justification for the assigned conservation importance of each feature. The evaluations take into account baseline conditions and utilises the criteria in Table 12.6 to develop an understanding of the implications for features that may be affected by the proposed scheme. Features are ordered by importance, with habitats followed by species.

12.3.62 The River Garry, upstream of Struan Weir has been assessed on the latest available information which indicates that the weir was breached in 2017 to facilitate migratory fish passage. Full flow restoration is anticipated to occur later in 2017 and as such this section of the River Garry has been assessed as supporting Atlantic salmon, brown / sea trout and brook lamprey.

12.3.63 Deer and INNS were scoped out from ecological evaluation as explained in paragraph 12.2.29.

12.3.64 No locally important features were noted in the desk-assessment or field surveys.

12.3.65 The following features are unlikely to be affected by the proposed scheme as, based on currently available desk-based assessment and/or site survey data, they are not known to be present within the study area, or no effects pathways were identified. These features will therefore not be discussed further.

- Pass of Killiecrankie SSSI at NN 917 624 (SNH, 2016f) is nationally important. Designated under the Nature Conservation (Scotland) Act 2004 but is uphill of the proposed scheme and separated from it by the B8079 (Figure 12.1a).
- Struan Wood SSSI at NN 791 659 (SNH, 2007, 2016g) is nationally important. Designated under the Nature Conservation (Scotland) Act 2004 but is uphill of the proposed scheme and separated from it by the River Garry (Figure 12.1e).
- Cairngorms Massif SPA at NN 999 899 (SNH, 2016h) is internationally important (Figure 12.1a). A Natura 2000 site under Conservation (Natural Habitats & c.) Regulations 1994 (as amended in Scotland) and designated for golden eagle. However, no golden eagle nests have been recorded within 2km of the proposed scheme.
- Capercaillie, common scoter, corncrake, golden eagle, goldeneye, goshawk, merlin, osprey, quail, peregrine, red kite and ring ouzel are on Schedule 1 of the WCA and are nationally important, except golden eagle which is internationally important. However, due to the distance of records from the proposed scheme or lack of suitable habitat affected, no impacts are predicted.
- Water vole are regionally important and protected under the WCA. Limited suitable habitat was present along eight watercourses, but no evidence of the species was identified in the study area during any field surveys.
- Wood ant are regionally important and protected under the Nature Conservation (Scotland) Act 2004, however the nest recorded during the A9 dualling programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b) was not found during field surveys at DMRB Stage 3.
- European eel, river lamprey and sea lamprey are internationally important but it was confirmed that these species cannot pass the fish pass on the dam at Pitlochry (Stephen, 2016, pers. comm., 26 April; Summers, 2015, Meeting with Jacobs, 25 November 2015) and so are unlikely to be within the study area.
- FWPM are considered to be internationally important but were not recorded in the study area.

Table 12.9: Legal status, baseline and evaluation of terrestrial and aquatic features

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Designated Sites				
River Tay SAC (UK0030312)	Natura 2000 site under Conservation (Natural Habitats & c.) Regulations 1994 (as amended in Scotland). WFD watercourse. Listed as a key site in the Tayside LBAP (Water and Wetland Ecosystems). Listed in CNAP.	Four statutory designated sites within the study area are likely to be affected by the proposed scheme.	Designated for its clear-water lakes, Atlantic salmon, river lamprey, brook lamprey, sea lamprey and otter. Lower Allt Girnaig, Allt Bhaic, the River Bruar and the River Garry up to the confluence with Errochty Water, 1.75km upstream of the A9 crossing, form part of the River Tay SAC. The River Garry supports the northern silver stiletto fly which is listed as a CNAP key species.	International
Tulach Hill and Glen Fender Meadows SAC (UK0012891) (including GWDTE site CF01)	Natura 2000 site under Conservation (Natural Habitats & c.) Regulations 1994 (as amended in Scotland).		Base-rich fens, dry heaths, limestone pavements, dry grasslands and scrublands on chalk or limestone, round-mouthed whorl snail and Geyer's whorl snail. SNH stated that none of the qualifying interests present in the Glen Fender Meadows part of the site would be affected by the A9 dualling programme (Transport Scotland, 2015c).	International
Tulach Hill SSSI	Designated under NCSA 2004.		Underlying limestone gives rise to a range of important plant communities including alkaline or calcareous fens, subalpine calcareous grassland, dry and wet heath and birch/oak woodland, as well as limestone pavement. These communities are species-rich with an assemblage of rare plants, including brown bog-rush, a species only found in the UK in a small area in Perthshire and marsh helleborine, a very rare species in Scotland (SNH, 2016d).	National
Aldclune & Invervack Meadows SSSI	Designated under Nature Conservation (Scotland) Act 2004 (NCSA 2004).		A 17.2ha composite site in three parts comprising riverine areas of alluvium flats and old abandoned river channels supporting lowland calcareous grassland.	National
Ancient woodland Categories 1a and 2a (ancient of semi-natural origin), 1b and 2b (long established of plantation origin) and 3 (other on Roy map)	SBL priority habitat (including a variety of semi-natural broadleaved woodland types). Some areas fit the criteria for designation as Tayside LBAP and CNAP priority habitats.	Over 275ha of habitat listed on the AWI falls within the study area, over half of which is Category 2a (ancient of semi-natural origin).	Ancient woodland and plantation woodland of ancient origin have intrinsic importance because of their age which means they are not readily replaceable if lost. In addition to their intrinsic importance, such habitats have importance for the species they support, and for habitat connectivity. There are some AWI areas which were previously wooded, but may retain biodiversity value e.g. wood-pasture. SNH has asked that all AWI sites, whether they currently support ancient woodland or not, be treated as protected (Transport Scotland, 2015b).	National

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Habitats and Ecosystems				
River Garry (upper) (WF100)	Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems). Listed in CNAP.	This section was previously inaccessible to migratory species but in January 2017 the Struan Weir was breached making the area accessible. Large sections of bedrock substrate and flatter sections with heterogeneous substrate and flow offering good habitat for all life stages of Atlantic salmon, brown/sea trout and brook lamprey.	Directly connected to River Tay SAC. Supporting habitat for Atlantic salmon. Currently SEPA WFD overall classification of Bad Ecological Potential, but this is expected to improve following flow restoration.	International
Allt Anndeir (WF158)	WFD watercourse. Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems). Listed in CNAP.	The downstream section (300m) provides suitable juvenile fish and spawning habitat. Upstream of existing A9 is inaccessible for migratory species due to bedrock cascades and torrents. Resident trout and brook lamprey are expected to be present. Atlantic salmon expected to re-colonise the lower section of this watercourse. Low richness in April sample and very low richness in November sample. Taxa composition indicated no notable negative impacts from organic pollution, flow or sediments.	Connected to the River Tay SAC via the River Garry and provides supporting habitat for Atlantic salmon. Currently SEPA WFD overall classification of Bad Ecological Potential but this is expected to improve following flow restoration.	International
Broadleaved, mixed or coniferous semi-natural woodland (not AWI)	Lowland mixed deciduous woodland, native pine woodlands, upland birchwoods, upland mixed ashwoods and upland oakwoods is listed in the SBL. Lowland mixed broadleaved woodland and wet woodland are listed as priority habitats in the Tayside LBAP (Woodland Ecosystems). Broadleaved woodland, birch woodland, upland oak woodland, upland mixed ash woodland and native pine woodland are listed in the CNAP.	Areas of non-AWI semi-natural woodland occur across the study area. Details relating to woodland habitats can be found in the Terrestrial Habitats section and in Diagram 12.1.	This woodland can provide important habitat for species such as pine marten and red squirrel. Potential to support fungi species listed as CNAP key and CNPA priority non-protected species.	Regional

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Broadleaved, mixed or coniferous plantation woodland (not AWI)	Lowland mixed deciduous woodland is listed in the SBL. Planted coniferous woodlands and lowland mixed broadleaved woodland are listed as priority habitats in the Tayside LBAP (Woodland Ecosystems). Planted conifer woodland is listed in the CNAP.	Areas of non-AWI plantation woodland occur across the study area. Details relating to woodland habitats can be found in the Terrestrial Habitats section and in Diagram 12.1.	Plantation woodland is generally of low diversity, with a poorly developed ground flora and shrub layer. It is widespread in the area but can also provide important habitat for species such as pine marten and red squirrel in the area. Areas of this habitat support helleborines and orchids and have potential to support lichen species listed as CNAP key and CNPA priority non-protected species.	Regional
Dry dwarf shrub heath/acid grassland mosaic	Dry heath is an Annex I habitat. Upland heathland is listed on the SBL, and in the CNAP.	Results from Phase 1 habitat surveys can be seen in Figure 12.2 with a summary in Diagram 12.1. A full list of Target Notes can be found in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	The vegetation is widespread and common but can be of high conservation interest, especially for birds, mammals, insects, bryophytes and lichens. The type of extensive landscape where this vegetation occurs is more common in Scotland than anywhere else in Europe. The areas identified as being at risk from the proposed scheme are of poor quality due to agricultural improvement and do not meet the criteria to be Annex 1 habitat. Potential to support the small dark yellow underwing moth listed as a CNAP key species.	Regional
Valley mire fen and fen not in wet heath mosaics	Upland flushes, fens and swamps are listed on the SBL. Fen, marsh, swamp, reedbed, blanket bog and upland heath are listed in the CNAP.		Upland fen habitats are widespread but local throughout the uplands and may be important as nesting habitat for wading birds. Fen tends to occur in small stands and high quality examples can support a rich flora of vascular plants with many rare species. Valley mire comprises a range of vegetation types which are also typical of blanket bog, wet heath and other upland habitats. The areas identified at risk from the proposed scheme are partly compromised by drainage, forestry and the existing A9.	Authority area
Acid or neutral flush (including GWDTE sites TN160-162 and ANF02)	Upland flushes, fens and swamps are listed on the SBL.		Upland flush habitats are widespread but local throughout the uplands and may be important as nesting habitat for wading birds. Flushes tend to occur in small stands and high quality examples can support a rich flora of vascular plants with many rare species. However, the flushes identified at risk from the proposed scheme are not of high quality, being relatively species poor due to the effects of land drainage and road infrastructure.	Authority area
Wet heath/acid grassland mosaic (including fen)	Wet heathland with cross-leaved heath is an Annex I habitat. Upland heathland, *Juncus squarrosus-Festuca ovina* grassland and *Nardus stricta-Galium saxatile* grassland are listed on the SBL. Upland heath, blanket bog and acid grassland are listed in the CNAP.		Wet heath comprises a patchy sward of dwarf shrubs and grass species on shallow peat. It is widespread and common but can be of high conservation interest, especially for birds, mammals, insects, bryophytes and lichens. The areas identified at risk from the proposed scheme are of poor quality due to agricultural improvement and do not meet the criteria to be Annex 1 habitat. See above for further information in fen and below for further information on acid grassland.	Authority area

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Acid grassland	*Festuca ovina* grassland and *Nardus stricta-Galium saxatile* grassland are listed on the SBL. Acid grassland is listed in the CNAP.		This habitat is widespread throughout Scotland on well-drained acid soils. In the uplands it can become the dominant habitat type as a result of conversion from heath due to heavy grazing, which is the case in the Cairngorms where acid grassland is becoming more common (CNPA, 2013). Action plan targets are to maintain and restore good quality sites and convert low quality sites to woodland or heather moorland. Areas of this habitat support field gentian and have potential to support Lepidoptera, Hymenoptera and waxcap species listed as CNAP key and CNPA priority non-protected species. The areas identified at risk from the proposed scheme are relatively species poor due to agricultural improvement.	Authority area
Improved grassland	Improved grassland is listed in the CNAP.		Improved grassland can be important habitat for ground-nesting birds. Potential to support lichen species listed as CNAP key and CNPA priority non-protected species.	Authority area
Marshy grassland (including GWDTE site TN190-193)	n/a		Within the study area, marshy grassland has been identified as occurring in discreet areas within agricultural fields and along modified watercourses and do not fit the criteria to be listed on the SBL. The areas identified at risk from the proposed scheme are species poor due to agricultural improvement including land drainage.	Less than local
Allt Eachainn (WF84) Allt nan Cuinneag (WF149)	Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems). Listed in CNAP.	Not accessible to migratory fish species due to steep gradient and/or a series of cascades, pools and torrents over bedrock substrate. Good quality macroinvertebrate community and no notable impacts from organic pollution, flow or sediments.	Directly connected to River Tay SAC, but do not provide suitable fish habitat.	Authority area
Allt Chluain (WF98) Allt Crom Bhruthaich (WF167)	Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems). Listed in CNAP.	Not accessible to migratory fish species due to steep gradient and high velocity cascades. Allt Crom Bhruthaich macroinvertebrate community composition indicated some negative impacts from flow and sediments. Taxa intolerant to organic pollution were present. Regionally Notable macroinvertebrate species present.	Directly connected to River Tay SAC, but do not provide suitable fish habitat.	Authority area
Allt a'Chrombaidh (WF142)	WFD watercourse. Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems). Listed in CNAP.	Not accessible to migratory fish species due to a series of cascades, pools, and torrents over bedrock substrate and a high waterfall. Resident trout may be present upstream of existing A9 and evidence of otter spraint containing fish scales found near to confluence with River Garry.	Flows directly into River Garry, but does not provide suitable fish habitat. SEPA WFD overall status of Good.	Authority area

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Allt Geallaidh (WF164)	Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems). Listed in CNAP.	Downstream section (150m) is accessible, but suboptimal for juvenile fish. Upstream of the existing A9 is inaccessible to migratory fish and provides limited suitable habitat. Good quality macroinvertebrate community observed. No notable impacts from organic pollution, flow or sediments.	Flows directly into River Garry and provides very little habitat for fish species.	Authority area
Unnamed watercourses	Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems). Listed in CNAP.	Small streams (<1m wide) generally with gravel, pebble or organic substrate, flowing down steep hillsides or through rough pasture. No suitable fish habitat. Most of the watercourses supported a good macroinvertebrate community with no notable impacts from organic pollution, flow or sediments. WF116 and WF121 supported communities that showed impacts from the aforementioned stressors. Regionally Notable macroinvertebrate species present in a number of watercourses.	Flow into River Tay SAC, but provide no suitable fish habitat.	Authority area
Unnamed pond (WF96A)	Listed on SBL. Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems). Listed in CNAP.	Very poor quality due to low abundance and richness of macrophytes and invertebrates.	Not connected to River Tay SAC.	Authority area
Species				
Atlantic salmon	Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Schedule 3 species under the Conservation (Natural Habitats & c.) Regulations1994 (as amended in Scotland). Listed under Annex II and V of Council Directive 92/43/EEC. A qualifying feature of the River Tay SAC. Listed on the SBL, as a key species in the Tayside LBAP, and as a priority species in the CNAP.	Present throughout the River Garry. Important holding pool present on the upstream side of the Essangal Crossing. Stocked by TDSFB throughout the River Garry, above and below Struan Weir (A9 ESG, 2015).	Species of conservation importance and a River Tay SAC qualifying species which is found throughout the River Garry. Not considered to be a host species for FWPM in this location as no FWPM are present.	International

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Brook lamprey	Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Listed under Annex II of Council Directive 92/43/EEC. A qualifying feature of the River Tay SAC. Listed on the SBL, and as a protected species in the Tayside LBAP.	Present in the River Garry.	Species of conservation importance and a River Tay SAC qualifying species which is found throughout the River Garry.	International
Otter	European Protected Species (EPS) under the Conservation (Natural Habitats & c.) Regulations1994 (as amended). A qualifying feature of the River Tay SAC. Listed on the SBL. Listed as a protected species in Tayside LBAP and as medium importance in the CNAP.	One holt and six couches were recorded within the study area, as well as field signs including spraints and prints (Figure 12.8). Full survey results are detailed in Appendix A12.3 (Confidential Ecology Features). No resting sites were situated directly under the proposed scheme.	The species is at carrying capacity (i.e. maximum population size of the species that the environment can sustain indefinitely taking account of food, habitat availability, etc.) within the River Tay SAC area and the wider catchment.	International
Wildcat	EPS under the Conservation (Natural Habitats & c.) Regulations1994 (as amended). Listed on the SBL. Listed as a protected species in the Tayside LBAP and as a key species in the CNAP.	No evidence was recorded during site surveys. However, observations provided by CNPA identify wildcat to the north of Blair Atholl, the closest record being approximately 2km from the existing A9. Potentially suitable wildcat habitat exists along the length of the proposed scheme.	Widespread, but uncommon across the Cairngorms. Despite deliberate persecution the species has benefited from the recent expansion in woodland cover across the area. Although listed by IUCN as 'Least Concern' it is possible that very few genetically pure Scottish wildcats remain. If so, this presumed subspecies would be Critically Endangered (Nowell et al., 2005).	International
Brown trout/sea trout	Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Brown trout is listed as a protected species in the Tayside LBAP and sea trout is listed on the SBL.	Found throughout the River Garry.	Species of conservation importance found in the River Garry. Not considered as host for FWPM in this location as no FWPM are present.	Regional
Badger	Protection of Badgers Act 1992 (as amended). Listed as a protected species in the Tayside LBAP.	Three main setts, three subsidiary setts and 36 outlier setts were recorded within the study area, as well as field signs including dung pits, prints and paths (Figure 12.4). Full survey results are detailed in Appendix A12.3 (Confidential Ecology Features).	The species is widespread throughout the UK and Scotland. Legal requirements to comply with animal welfare legislation would be the main driver for mitigation of impacts on this species.	Regional

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Bats (all species)	All UK bat species are EPS under the Conservation (Natural Habitats & c.) Regulations1994 (as amended). All nine species that occur in Scotland are listed on the SBL and as key species in the Tayside LBAP. Pipistrelle bats listed as medium importance in the CNAP.	One confirmed tree roost is under the footprint of the proposed scheme. Seven confirmed roosts; two structures and five buildings, are within 30m of the proposed scheme. Six structures had an overall value of high, nine a value of moderate and two structures had a value of low. One transect route had an overall value of high and four had an overall value of moderate. One woodland (Killiecrankie) had a cryptic species activity value of moderate. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	All of the species recorded within the study area and surrounding 10km are widespread and found throughout Scotland: common pipistrelle, soprano pipistrelle, Natterer's bat, Daubenton's bat and brown long-eared bat. Despite the widespread distribution of the latter three species, they are classed as rarer species in Scotland (Wray et al., 2010) with estimated populations between 10,000 and 100,000. Both pipistrelle species are classed as common.	Regional
Beaver	At present the species is not legally protected. The species will be accorded protection in line with the EU Habitats Directive (Scottish Government, 2016), which is expected to be in place 2018 (SNH, 2017).	Incidental record of beaver foraging activity (Transport Scotland, 2016a) and potential core beaver woodland has been identified within the study area (SNH, 2015).	The species occupies a restricted distribution across the UK, with disparate populations in southern England, Argyll, and Tayside. Range expansion and increase in density typically occur following reintroduction, and the Tayside beavers make up a sizeable proportion of the UK population of the species. The Tayside LBAP 'Water and Wetlands Actions Schedule' includes an Action to explore the implications of the species in river catchments.	Regional
Breeding birds	Species of Conservation Concern (Eaton et al., 2015) Schedule 1 of the WCA. Species listed on the SBL and on the Tayside LBAP protected species list. Lapwing, skylark, swallow, house martin and house sparrow are listed as key species in Tayside LBAP. Lapwing is listed as a key species on the CNAP.	A total of 77 species were recorded during the site surveys, of which 67 species were confirmed to have bred. An additional 13 species were recorded during the BTO Atlas 2007-11. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods). Records of Schedule 1 species recorded during surveys (common crossbill and barn owl) are detailed in Appendix A12.3 (Confidential Ecology Features).	Of the 67 breeding species, 33 were listed as species of conservation concern, either red-listed or amber-listed whilst 18 were listed on the SBL and one species (common crossbill) on Schedule 1 of the WCA.	Regional
Barn owl	Schedule 1 of the WCA. Listed on the SBL and as a key species in Tayside LBAP.	Three records of barn owl in the study area, two WVIs and one confirmed roost, which is a likely breeding site.	Barn owl distribution in Scotland has increased, possibly due to a run of mild winters and though previously amber listed through its loss of UK range, the species was moved to the UK green list in 2015 (Eaton et al., 2015).	Regional

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Black grouse	Red-listed Species of Conservation Concern (Eaton et al., 2015). Listed on the SBL and as a protected species in the Tayside LBAP.	Fifteen lek sites have been recorded in close proximity to the proposed scheme between Blair Atholl and Glen Garry (RSPB, 2016). Four records of black grouse, one of which indicated breeding, recorded during site surveys. Four incidental records of between two and twelve male birds west of Invervack and one incidental record of one male bird north of Clunes Lodge.	The UK population of black grouse has been declining in range and numbers (SNH, 2016j). The declines are due to a number of factors, including loss of important plant food sources, habitat fragmentation and human disturbance.	Regional
Hen harrier	Schedule 1 and 1A of the WCA. Listed under Annex I of Council Directive 2009/147/EC (European Union, 2009) Red-listed Species of Conservation Concern (Eaton et al., 2015). Listed on the SBL and as a protected species in the Tayside LBAP.	Confirmed breeding presence within the study area (data received RSPB, 2015 and 2016; TRSG, 2015; BTO, 2016). The most recent data suggests two breeding sites in similar locations either side of the existing A9 as detailed in Appendix A12.3 (Confidential Ecology Features).	The breeding hen harrier population in the UK is estimated at c.660 pairs (SNH, 2016k) and is primarily distributed across north and west Scotland (Hardey et al., 2013).	Regional
Pine marten	Schedule 5 of the WCA. Listed on the SBL and as a key species Tayside LBAP.	There were two incidental sightings of pine marten during site surveys north of Aldclune and in Clunes Wood. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	Pine marten has been recorded around Calvine, Pitagowan and Blair Atholl and to the south around Loch Tummel. The species is widespread throughout Scotland and has continued to expand its range throughout Perthshire and Tayside.	Regional
Red squirrel	Schedule 5 of the WCA. Listed on the SBL as a species for which conservation action is needed, and as a key species in the Tayside LBAP and the CNAP.	There were eight incidental sightings of red squirrel during site surveys. Two dreys, feedings signs and a possible drey were also recorded. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	Red squirrels are widespread within Scotland although there has been widespread decline in population and range. The species has been recorded within the study area along the route of the existing A9 with concentrations around Calvine, Pitagowan, Blair Atholl and Loch Tummel to the south. Priority woodland for red squirrel conservation has been identified at Atholl Estate (NN 841 667) and at Clunes (NN 780 668) (Poulsom et al., 2005).	Regional
Reptiles: adder, slow worm, common lizard	Schedule 5 of the WCA. Listed on the SBL. Adder listed as a priority species in the Tayside LBAP. Slow worm and common lizard listed as a key species in the Tayside LBAP.	All three species were recorded within the study area. Of the nine sites identified as having suitable habitat, one qualified as a KRS and four as Local KRS. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	Recorded within the study area and within the surrounding 10km.	Regional

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Field gentian	Listed on the SBL.	Species recorded incidentally at NN 81605 65699 south of Pitagowan and the existing A9 and at NN 80799 65936 north of Calvine and the existing A9.	Locally common in Scotland and a 'Vulnerable' species on the Vascular Plant Red Data List for Great Britain (Cheffings and Farrell, 2005) due to overgrazing in the uplands and the neglect of lowland pastures.	Authority area

12.4 Potential Impacts

Introduction

12.4.1 General potential impacts on ecological features for the proposed scheme are described below and specific potential impacts on ecological features are set out in Table 12.14 (Section 12.6: Residual Impacts).

12.4.2 Where a potential impact was assessed as not significant, it was not considered further, unless measures are required to comply with relevant legislation. Standard construction and design best practices would mitigate non-significant impacts.

12.4.3 Where an impact is initiated in construction, but also occurs throughout operation (e.g. permanent habitat removal), it is discussed only within operational impacts.

12.4.4 As stated in Chapter 16 (Air Quality), although the River Tay SAC may be nitrogen-sensitive, the contribution of nitrogen from road transport via N deposition is unlikely to give rise to significant effects on the SAC.

12.4.5 Chapter 16 (Air Quality) also notes that, for Struan Wood SSSI, Aldclune & Invervack Meadows SSSI and Tulach Hill SSSI, including the contiguous site Tulach Hill and Glen Fender Meadows SAC, predicted changes in N deposition will not be significant. It also predicts there will be no exceedance of critical loads (which are defined for specific habitats in Chapter 16 (Air Quality)).

12.4.6 Therefore, effects associated with changes in air quality and N deposition on the River Tay SAC, Aldclune & Invervack Meadows SSSI, Struan Wood SSSI, Tulach Hill SSSI and Tulach Hill and Glen Fender Meadows SAC are not considered further in this assessment.

12.4.7 The impacts of road salt on the water environment were highlighted as a concern by SNH and the Spey Fishery Board. The salt assessment detailed in Appendix A11.6 (Water Quality) indicates that salt levels are not expected to exceed the threshold for the most sensitive species within the River Tay SAC and other larger watercourses. Therefore, the impacts of salt on the water environment is not considered further.

12.4.8 Potential impacts detailed in this assessment are based on the current baseline. Due to the mobile nature of animals and changes in distribution of plant species, surveys to update the baseline will be undertaken prior to construction.

Construction

12.4.9 Potential construction impacts may include:

- injury or mortality of protected species due to in-stream works, vegetation removal, vehicle movements or becoming trapped in uncovered holes and pipes;
- disturbance to protected species from noise, vibration, lighting and movement of vehicles and increased human activity;
- temporary habitat fragmentation due to disturbance activities;
- sediment release and run-off from construction works; and
- generation of dust from use of haul routes, earth movement and soil storage.

Operation

12.4.10 Potential operational impacts may include:

- injury and mortality of protected species from vehicle collisions;

- permanent loss of habitats, such as woodland and other terrestrial habitats, and shading of aquatic habitats, under footprint of the proposed scheme;
- fragmentation and severance of habitats, especially watercourses including loss of fish passage;
- pollution from road run-off; and
- hydrological changes from run-off, structures and realignment of watercourses.

12.5 Mitigation

Introduction

12.5.1 Mitigation will follow a hierarchical approach in the following order (CIEEM, 2016; SNH, 2013):

- avoid adverse impacts in the first instance;
- where avoidance is not possible, reduce the adverse impacts through mitigation; and
- where significant adverse residual impacts remain, measures to offset the adverse impacts at a site-specific level may be required (compensation).

12.5.2 The proposed mitigation is designed to enhance and produce a net gain for biodiversity where practicable in line with policy and guidelines (CIEEM, 2016).

12.5.3 This section includes mitigation that aims to avoid or negate impacts on ecological features in accordance with best practice guidance and UK, Scottish and local government environmental impact, planning and sustainability policies. Where these impacts can be fully mitigated they would not be considered significant under the terms of the EIA Regulations.

12.5.4 It is expected that the majority of non-significant impacts would be mitigated through the application of standard mitigation commitments and best working practice (e.g. mitigation of potential pollution impacts through adherence to standard best practice and guidelines, such as the SEPA Guidance for Pollution Prevention (GPP) or Pollution Prevention Guidelines (PPGs) (SEPA, 2003; 2017)) (Table 12.14).

12.5.5 Significant ecological impacts as shown in Table 12.14 are expected to be mitigated through a combination of best practice/typical mitigation methods and mitigation targeted to specific locations.

12.5.6 This chapter makes reference to overarching standard measures applicable across all A9 dualling projects ('SMC' Mitigation Item references), and also to project-specific measures ('P05' Mitigation Item references). Those that specifically relate to ecology and nature conservation are assigned an 'E' reference.

Embedded Mitigation

12.5.7 Embedded mitigation has been developed through an iterative process and consultation with SNH, SEPA and other relevant stakeholders. This has included careful alignment of the proposed scheme to avoid or reduce loss of habitat, including a focus on avoiding woodland loss as far as practicable; reducing impacts on aquatic environments; and avoiding encroachment into designated and high value sites/areas. Further information is provided in Chapter 4 (Iterative Design Development).

12.5.8 Road surface run-off from the mainline carriageway and side road connections will be subject to a minimum of two levels of treatment via sustainable drainage systems (SuDS). A small number of Tier 3 accesses (private and/or agricultural accesses) will be treated via 'over the edge' runoff that will be dispersed over vegetation with subsequent infiltration into groundwater. Where drainage is required parallel to the Tier 3 accesses, run-off will be permitted to infiltrate within open ditches and residual flow will be spread diffusely over vegetated areas to allow for natural infiltration into groundwater. The water quality and geomorphological design of SuDS features are discussed in Chapter 11 (Road Drainage and the Water Environment).

Ecological Clerk of Works

12.5.9 A suitably qualified (or team of suitably qualified) Ecological Clerk of Works (ECoW) will be appointed by the Contractor to supervise the construction works, undertake pre-construction surveys for protected species in the areas identified as being potentially impacted by the proposed scheme and ensure mitigation measures are implemented to avoid and reduce impacts on ecological features. An employer's ecologist will observe that the Contractor ECoW are suitably qualified to undertake their role and will audit the contractual obligations with regards to the ecological safeguarding and ecological mitigation requirements (**Mitigation Item SMC-E2**).

Construction

12.5.10 Standard mitigation commitments have been produced which set out the actions the Contractor is required to take during the construction phase of the proposed scheme to avoid or reduce environmental impacts. Some measures detailed are not mitigation in isolation, but their implementation for regulatory/legal compliance purposes will inform the scope of further mitigation and licensing where required (e.g. pre-construction surveys and monitoring). These define the standard construction mitigation required to achieve the objectives of the mitigation and those relevant to Ecology and Nature Conservation are detailed in Table 12.11 below and in Table 21.6 in Chapter 21 (Schedule of Environmental Commitments).

12.5.11 The standard A9 mitigation commitments include the requirement for the Contractor to develop a management system to structure the implementation of the mitigation measures. This will include an Environmental Management System (EMS) and a Construction Environmental Management Plan (CEMP) (**Mitigation Item SMC-S1**).

12.5.12 Certain activities during construction will trigger the need for a protected species derogation licence under relevant legislation. Structures or places which a protected species uses for shelter that are under the footprint of the proposed scheme will be destroyed under licence following consultation with SNH. Works taking place within a certain distance may disturb protected species when occupying a structure or place of shelter and may require a derogation licence. Suggested protection zones for each species are detailed below in Table 12.10, and the need for a derogation licence for work taking place within this distance will be assessed by an ecologist.

Table 12.10: Protection zones for protected species[5]

Species	Non-breeding Protection Zone	Protection Zone of a Proven Breeding Location	Suggested Protection Zone for Specific Activities
Otter	30m	200m	100m from high noise/vibration activities such as pile driving or blasting
Badger	30m	30m	
Bats*	30m	30m	
Pine marten	30m	100m	
Red squirrel	5m	50m	
Wildcat	200m	200m	200m
Beaver**	30m	200m	

* In the absence of a published distance for bats, professional judgement has been used to determine an appropriate protection zone.

** At present the species is not legally protected, however they will be accorded protection in line with the EU Habitats Directive and therefore protection zones for otter, that are similarly protected, have been used.

12.5.13 Based on the current baseline the following derogation licences will be required:

- otter: disturbance licences for one holt, when used for breeding, and three couches;
- badger: disturbance licences for two main and six outlier setts, and destruction licences for 11 outlier setts; and

[5] Indicative distances provided by SNH, with the exception of bats and beaver, for which notes are provided.

- bats: disturbance licences for seven known roosts and a destruction licence for one known tree roost.

12.5.14 In accordance with **Mitigation Item SMC-S1**, the CEMP will include an Ecological Management Plan which will contain Species Protection Plans and Habitat Management Plans. These will be prepared and developed by the Contractor from the mitigation and environmental commitments identified in this assessment (Table 12.14), for example:

- details of proposed protection measures and exclusion zones to avoid any unnecessary encroachment into adjoining areas of nature conservation;
- a programme for undertaking pre-construction surveys prior to and during construction;
- restrictions on the timing of construction works, for example during site clearance and works within watercourses;
- appropriate watching briefs during construction; and
- relocation or translocation of species.

12.5.15 An AWI-specific Habitat Management Plan, which will be provided as part of the CEMP, will be prepared and implemented prior to construction, and will detail soil retrieval, storage and deployment methods. Monitoring and management strategies will also be detailed within the plan which will include maintenance and replacement of the planting, including missing and damaged trees, or those that are failing to make satisfactory growth during operation of the proposed scheme.

12.5.16 The Species Protection Plans and Habitat Management Plans will be prepared to ensure that essential mitigation strategies required for safeguarding protected species and habitats are implemented as part of the contract. These will be updated as appropriate if any additional licences and mitigation measures, or amendments to the agreed mitigation are identified through pre-construction surveys or watching briefs. The plans will be developed in consultation with relevant stakeholders including SNH.

12.5.17 Adherence to Species Protection Plans will avoid potential breaches of conservation legislation arising from mortality or disturbance. Adherence to the Ecological Management Plan will also mitigate for any potential animal welfare issues during construction.

12.5.18 It will be the contractual responsibility of the Contractor to ensure that mitigation is implemented during the works and that all relevant licences, should they be required, are in place prior to commencement of works.

12.5.19 It is expected that the majority of impacts during construction will be mitigated through the application of the standard mitigation commitments. Where required, additional mitigation for feature-specific impacts during construction are described in Table 12.14.

Table 12.11: Standard Mitigation for Ecology and Nature Conservation (E) and General (S)

Mitigation Item	Description
SMC-S1	A Construction Environmental Management Plan (CEMP) will be prepared by the Contractor. The CEMP will set out how the Contractor intends to operate the construction site, including construction-related mitigation measures identified in Tables 21.2 to 21.11 (Chapter 21: Schedule of Environmental Commitments). The relevant section(s) of the CEMP will be in place prior to the start of construction work. The CEMP will include, but not be limited to, subsidiary plans relating to: agricultural land (including a specific Soil Management Plan), geology and land contamination; surface water and groundwater (including a Flood Response and Pollution Incident Response Plan); ecology (Ecological Management Plan which will include specific Species Protection Plans and Habitat Management Plans); landscape, cultural heritage, air quality and noise and vibration.
SMC-E1	Pre-construction surveys will be undertaken to verify and, where required, update the baseline ecological conditions set out in the ES. The scope of the pre-construction surveys will be confirmed with SNH prior to them being undertaken.
SMC-E2	Prior to construction a suitably qualified (or team of suitably qualified) Ecological Clerk of Works (ECoW) will be appointed by the Contractor and will be responsible for implementation of the Ecological Management Plan. The ECoW will: · provide ecological advice over the entire construction programme; · undertake or oversee pre-construction surveys for protected species in the areas affected by the proposed scheme; and ensure mitigation measures are implemented to avoid and reduce impacts on ecological features; and · monitor the implementation of the mitigation measures during the construction phase to ensure compliance with protected species legislation and commitments within the ES. The ECoW will be a member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and will have previous experience in similar ECoW roles. All ECoWs will be approved by Transport Scotland to be appropriately qualified for the role and compliance will be monitored by the employer's ecologist. The ECoW will be appointed in advance of the main construction programme commencing to ensure pre-construction surveys are undertaken and any advance mitigation measures required are implemented.
SMC-E3	Noise and vibration will be reduced by working back from the river bank where possible or working within a dry area to avoid implications to fish, such as behavioural changes e.g. avoidance of areas or physical damage e.g. to hearing. In addition, soft-start techniques will be applied to piling work procedures to enable sensitive species to evacuate the area.
SMC-E4	Where areas are required to be temporarily de-watered to permit construction activities, fish will be removed by means of electrofishing and relocated prior to de-watering (SFCC, 2007).
SMC-E5	Water flow/passage will be sufficiently maintained to permit movement of all fish species past areas of de-watering and/or significant alteration of water movement during any construction works within the watercourses. Suitable temporary channels or gravity fed flumes/pipes may be implemented so that movement between areas of habitat can be maintained. Where any over pumping is required, screens will be used to prevent fish from entering pumps.
SMC-E6	The Contractor will obtain and comply with the requirements of any protected species derogation licences in respect of works necessary to construct the proposed scheme that are likely to breach applicable conservation legislation. Licensing may be for the UK and/or European protected species.
SMC-E7	Tree felling and vegetation clearance to be reduced as far as practicable and undertaken outside the core bird nesting season (01 March to 31 August) to avoid damage or destruction of occupied nests or harm to breeding birds. If this cannot be achieved, works within the core bird nesting season will require an inspection of vegetation to be cleared for nesting birds by a suitably qualified ecologist no more than 24 hours prior to any works being undertaken. If any nesting birds are identified during the survey, they will be left in situ for their entire nesting period until the young birds have fledged. Alternative approaches to the work will need be proposed e.g. leaving an exclusion zone around the nest to avoid disturbance. All cleared vegetation will be rendered unsuitable for nesting birds, for example, by covering or chipping depending on the end purpose of the vegetation, or will be removed from the works area.
SMC-E8	Any tree felling will be carried out by experienced contractors to reduce direct mortality of protected species according to agreed felling methods between contractors and the ECoW.
SMC-E9	Plant and personnel will be constrained to a prescribed working corridor through the use of, where practicable, temporary barriers to minimise the damage to habitats and potential direct mortality and disturbance to animals located within and adjacent to the proposed scheme working corridor.

Mitigation Item	Description
SMC-E10	A construction lighting plan and method statement will be developed by the Contractor. The plan, as part of the Species Protection Plans, will detail specific mitigation requirements taking into account guidance on lighting (e.g. Bat Conservation Trust (2009); Institution of Lighting Professionals (2011) and The Royal Commission on Environmental Pollution (2009)). The construction lighting design will take into account the need to avoid illuminating sensitive fish and mammal (e.g. for bats, otter and badger) habitats in locations such as: adjacent to watercourses; along woodland edges; and, where there is known activity identified through pre-construction ecological surveys (refer to **Mitigation Item SMC-E1**). Where this is not possible the Contractor will agree any exceptions with SNH.
SMC-E11	During construction trees will be protected in line with guidelines provided in 'BS 5837 Trees in relation to Construction' (British Standards Institution, 2012b). This includes the following: · establishment of Root Protection Areas (RPA); · protective fencing will be erected around the RPA to reduce risks associated with vehicles trafficking over roots system or beneath canopies; · selective removal of lower branches of trees to reduce risk of damage by construction plant and vehicles; · prevent soil compaction measures; and · maintain vegetation buffer strips (where practicable).
SMC-E12	Planting will be undertaken to replace any trees that were intended to be retained which are felled or die as a result of construction works. The size, species and location of replacement trees will be approved by Transport Scotland and other relevant stakeholders.
SMC-E13	Trenches, holes and pits will be kept covered at night or provide a means of escape for mammals that may become entrapped. Gates to compound areas will be designed to prevent mammals from gaining access and will be closed at night.
SMC-E14	Temporary mammal-resistant fencing will be provided around construction compounds following a specification agreed through consultation with Transport Scotland.
SMC-E15	The Contractor will describe within the CEMP (**Mitigation Item SMC-S1**) the biosecurity strategy to be implemented for the appropriate treatment of invasive, non-native species (INNS). The strategy will set out appropriate construction, handling, treatment and disposal procedures to prevent the spread of INNS in line with recognised best practice.
n/a (note)	*Further to the above, the following standard mitigation commitments detailed in Chapter 11: Road Drainage and the Water Environment (W), Chapter 13: Landscape (LV), Chapter 16: Air Quality (AQ) and Chapter 17: Noise and Vibration (NV) will be implemented to protect aquatic and terrestrial habitats and species:* ***SMC-W1, SMC-W3, SMC-W4, SMC-W7, SMC-W13, SMC-W14, SMC-W15, SMC-W17, SMC-LV4, SMC-LV5, SMC-AQ1, SMC-AQ2 and SMC-NV2****.*

Operation

Mitigation for Ancient Woodland

12.5.20 Avoiding and reducing woodland loss has been a key consideration during the design process, as explained in Chapter 4 (Iterative Design Development). Where avoidance of habitats (including AWI, woodland and important habitats for protected species) has not been achievable through the iterative design process, mechanisms for landscape scale mitigation has been designed to compensate for this loss.

12.5.21 The full extent of habitats listed on the AWI under the footprint of the proposed scheme is calculated as 27.08ha. The extent of those habitats which are currently wooded was determined based on the outputs from the 'Woodland Connectivity – Ancient Woodland Compensation Strategy' (Transport Scotland, 2016c) as 12.90ha (Figure 12.14). Candidate sites for compensatory woodland planting (**Mitigation Item P05-E39**) have been identified to maximise the biodiversity benefit of the planting; maintain connectivity or reconnect existing AWI sites; and maximise opportunities to maintain functionality of local ancient woodland communities within the route corridor (Figure 12.14). Soils from AWI sites that are of low quality will not be re-used, for example areas within the existing highway boundary, under non-native plantation woodland and areas dominated by bracken (Table 12.12a).

12.5.22 The AWI-specific Habitat Management Plan provided as part of the CEMP (**Mitigation Item SMC-S1**), which will be prepared and implemented prior to construction as noted in paragraph 12.5.15, will detail the following:

- the retrieval, storage and deployment methods of suitable ancient woodland soil that will be re-used to conserve fungal and invertebrate biodiversity and provide a seed bank to promote the re-establishment of ancient woodland ground flora;
- monitoring of re-used woodland soils (such as using invertebrate sampling and DNA meta-barcoding) to demonstrate the success of their use;
- species mixes that will reflect native woodland mixes to replace non-native plantations and maximise biodiversity benefit;
- monitoring and management strategies, which will include maintenance and replacement of the planting, including missing and damaged trees, or those that are failing to make satisfactory growth during operation of the proposed scheme (see **Mitigation Item SMC-LV5** for more details)., and
- management strategies that will be undertaken in AWI woodland that is to be retained within the CPO during the course of the construction contract and maintenance and establishment period. These will include the retention of dead and fallen wood and will be the responsibility of the Contractor and, in the longer term, of the trunk road operating company.

12.5.23 As stated above, compensatory planting is intended to maintain or reconnect existing AWI sites and locations have been determined based on current understanding of known forestry management plans. Therefore, in order to mitigate for the functions and importance of the woodland in respect of habitat connectivity and carrying capacity for other species the extent of sites identified for compensatory woodland planting is more than the extent of wooded AWI lost, with the final area of compensatory planting totalling 19.35ha. The locations proposed for compensatory planting are distributed along the proposed scheme in a range of sizes, as shown on Figure 12.14 and detailed in Table 12.12b.

Table 12.12a: Details of currently wooded AWI loss

Chainage	Area (ha)	AWI Category
ch700-710* and ch900-910*	0.02	2a
ch1100-1200	0.20	1a
ch1220-1270	0.04	1a
ch1420-1650	0.68	1a and 2b

Chainage	Area (ha)	AWI Category
ch2680-2770	0.14	1a
ch3550-3670*	0.10	3
ch3800-4040	2.49	1a
ch4090-4110*	0.01	1a
ch5480-5540* and ch5580*	0.02	2a
ch6750-6830	0.06	1b
ch7370	<0.01	1b
ch7400-7510*	0.15	1b
ch10410*	<0.01	2a
ch10420-10810	1.67	1a and 2a
ch13600-13610* and ch13700-13710*	0.01	2b
ch14890*	0.01	3
ch14890-14990*	0.20	3
ch14890-15110*	0.29	3
ch15260-15890*	2.62	2a
ch15290-15610*	0.50	2a
ch16040-16350	1.46	2a
ch16170-16220*	0.29	2a
ch16280*	<0.01	2a
ch16300-16500*	0.52	2a
ch16460-16620*	0.27	2a
ch16710-16990*	1.10	2a
ch16940*	<0.01	2a
ch17060-17100*	0.01	2a
Total	12.90	

*Soil from this low quality area will be not re-used in compensation areas.

Table 12.12b: Details of locations of AWI compensation

Chainage	Area (ha)	Figure Reference
ch810-1190	1.11	13.5a
ch1640-1740	0.51	13.5b
ch2520-2630	0.48	13.5b
ch3660-3800	0.75	13.5c
ch10160-10570	2.38	13.5g/h
ch10800-11000	0.99	13.5h
ch15240-15510	1.62	13.5k
ch15700-16850	11.51	13.5k/l
Total	19.35	

Mitigation for Other Habitats

12.5.24 All new native planting should be nursery grown from local native seeds and cuttings collected from within appropriate provenance zones and designed using outputs from the Woodland Connectivity – Ancient Woodland Compensation Strategy (Transport Scotland, 2016c) to help identify areas to plant in order to maintain ecological functionality. In addition, turves from areas of high botanical importance will be retained to relocate ground flora (Figure 13.5).

12.5.25 The areas around SuDS features will be seeded with native grasses and wildflowers or heathland vegetation, as appropriate, to provide added wildlife habitat. The margins of SuDS retention ponds will be planted with native emergent and marginal plant species (e.g. greater bird's-foot trefoil, yellow iris, white water-lily, purple-loosestrife and meadowsweet) (**Mitigation Item P05-LV9**), and species-rich

grassland mixes will consist of native, non-invasive grasses and wildflower species (**Mitigation Item P05-LV18**), to enhance biodiversity for example by planting species that are favoured by invertebrates as food.

12.5.26 As noted in Section 12.3 (Baseline Conditions), an HRA has been undertaken for potentially affected European sites; the River Tay SAC and Tulach Hill and Glen Fender Meadows SAC, to meet requirements of the Habitat Regulations. Through this process the assessments have informed the construction programme and methods for provision of the new Essangal Crossing. Whilst the HRA provides more detailed information, this ES contains mitigation measures that are consistent with the HRA requirements.

12.5.27 Areas of non-significant habitat loss, which are important in supporting CNPA priority non-protected species, are considered to be mitigated through the overall landscape and ecological planting design and through **Mitigation Items P05-E40 and P05-E41**. This includes areas of woodland, scrub, heath and grassland of various types as shown on Figure 13.5.

Mitigation for Protected Species

12.5.28 Species permeability is an overarching design theme for the A9 dualling programme and the provision of suitable crossing structures (**Mitigation Item P05-E43**) to reduce barrier effects and collision risk, and also maintain, and where possible enhance, habitat connectivity, are detailed in this assessment. The locations of these crossing structures, which include culverts with mammal provision and dry mammal underpasses, are shown on Figure 13.5. The structures offer multi-species benefits and will provide passage for otter and badger amongst others.

12.5.29 Wildcat are unlikely to use crossings less than 1.2m in diameter (Rodriquez et al., 1997). Crossings that are large enough for wildcat have been provided (**Mitigation Item P05-E46**), including six culverts with mammal provision, at locations with good wildcat habitat as detailed in paragraph 12.3.19. These crossings are detailed in Table 12.13 with a chainage showing their location.

Table 12.13: Proposed crossing structures suitable for wildcat

Location	Proposed Crossing Structure	Chainage of crossing	DMRB Stage 3 Dimensions
Killiecrankie	Old Faskally Underpass	ch1200	Width: 3.5m, Height: 4.7m
	Culvert with mammal provision	ch1260	Width: 3.96m, Height: 2.5m
	Allt Girnaig Underbridge	ch1500	Width: ~35m
Urrard	Culvert with mammal provision	ch2240	Width: 2.4m, Height:2.1m
Aldclune	Allt Chulain Underbridge	ch3360	Width: 26.3m
Essangal	Essangal Underbridge	ch4300	Width: 26.7m, Height: ≥8.3m
Blair Atholl	Tullach Hill Underpass	ch6450	Width: 30m, Height: 35m
Woodend/Black Island	Culvert with mammal provision	ch8410	Width: 2.1m, Height: 1.2m
	Culvert with mammal provision	ch8670	Width: 1.5m, Height: 1.2m
	Allt Bhaic Underbridge	ch9190	Width: 11m
Invervack	Culvert with mammal provision	ch10150	Width: 1.5m, Height: 1.35m
Pitagowan	River Garry Underbridge (at Bruar)	ch11300	Width: ≥41.7m, Height: ≥6.8m
	B847 Pitagowan Road Underbridge	ch12470	Width: 15.7m
Calvine	Calvine Underpass	ch13420	Width: 3m, Height: 2.7m
Clunes Wood	Allt a' Chrombaidh Underbridge	ch15090	Width: 10.6m
Clunes Lodge	Clunes Underbridge	ch16160	Width: 3.5m, Height: 5.3m
	Clunes Burn Underbridge	ch16500	Width: 5.8m, Height: 3.2m
Crom Bhruthach	Allt Crom Bhruthaich Underbridge	ch18240	Width: 15.6m
Dalreoch	Culvert with mammal provision	ch19210	Width: 2.4m, Height: 1.2m
Dalnamein	Dalnamein Underbridge	ch19830	Width: 47m
	Allt Geallaich Underbridge	ch22000	Width: 10.6m

12.5.30 Otter and badger fencing will be provided to prevent access onto the A9 mainline and will be positioned to direct animals to safe crossing points (**Mitigation Item P05-E44**). Otter fencing has been proposed at watercourse crossings with known otter presence and/or suitable habitat, and badger fencing has been proposed at key areas adjacent to known setts and locations of multiple wildlife vehicle incidents (WVIs). The fencing specifications will follow SNH guidance (SNH, 2001; SNH, 2008b) and will be designed to prevent animals being trapped on the road, tie into crossing structures where possible and where this is not possible, designed to direct animals away from the carriageway. The indicative location of mammal fencing is shown on Figure 13.5.

Mitigation for Other Species of Ecological Interest

12.5.31 To reduce the potential risk of deer vehicle collisions (DVCs), a suitable distance between the road and planting has been incorporated into the landscape and ecological mitigation planting design. Woodland will be set back 5m and shrub planting will be set back 3m from the carriageway. This will improve line of sight for drivers and limit the attraction of deer to verges.

12.5.32 In addition, although not designed specifically for deer passage, suitable crossing structures will be constructed as part of the proposed scheme that have a multi-species benefit approach, providing passage for mammals including deer (**Mitigation Item P05-E44**).

12.5.33 Mitigation for impacts to specific ecological features during operation is described in Table 12.14 in Section 12.6 below.

Monitoring

12.5.34 The Contractor's ECoW will be responsible for ensuring compliance with protected species legislation and commitments stated in this assessment during construction. This will include adherence to Species Protection Plans, Habitat Management Plans and the standard mitigation commitments. Compliance will be monitored by the employer's ecologist.

12.5.35 Post-construction monitoring will be undertaken in accordance with Table 12.14, the Species Protection Plans and Habitat Management Plans and any derogation licences required for the proposed scheme. This monitoring will determine the effectiveness of the mitigation employed and inform whether further mitigation, maintenance or changes in mitigation approach are required to maintain the conservation status of ecological features is maintained. Post construction monitoring will be the responsibility of the Contractor and, in the longer term, of the trunk road operating company.

12.6 Residual Impacts

12.6.1 Potential impacts on ecological features without mitigation, mitigation measures and a summary of residual impacts are set out in Table 12.14 below.

Table 12.14: Summary Impact assessment for ecological features

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
Construction						
River Tay SAC (*International*) (Figure 12.1)	Run-off and release of sediment from construction works including chemical and hydrocarbon loads from accidental spillage.	River Garry (WF100) · ch4200-4350 (Essangal Underbridge) · ch4850-5250 · ch6080-6300 (access road) · ch6400-6600 (access road) · ch6800 · ch7700-7800 · ch8700-8800 · ch9180 (access road) · ch9900-10200 · 10550-16650 · ch11250-11350 (River Garry Underbridge) · ch11600-11800 (access road) · ch12470 Allt Girnaig (WF89) ch1500-1550 Allt Bhaic (WF115) ch9160 River Bruar (WF123) ch11400-11600 (access road)	Pollution of SAC habitat leading to reduced water quality and increased deposition resulting in modified submerged habitat. Depending on the magnitude of the pollution event, there could be irreversible long-term effects on the SAC and on the viability of populations of its qualifying species and CNAP key species. The effect could be permanent and negative.	high (Significant)	Mitigated through compliance with **Mitigation Item SMC-W3** and **Mitigation Item SMC-W7.**	No significant residual impacts predicted.
	De-watering and in-stream works during bridge construction and scour protection works.	River Garry (WF100) · Essangal Underbridge ch4200-4350	Alteration of riverbed habitat. This effect would be negative, reversible and short-term.	low (Significant)	Existing bed material will be stored and kept clean. Bed material will be reinstated where appropriate (on top of bridge foundations and scour protection) to ensure that the habitat is returned to a similar state (**Mitigation Item P05-E16**). In addition, **Mitigation Item SMC-W1** and **Mitigation Item SMC-W4** will be adhered to.	No significant residual impacts predicted.
	De-watering and in-stream works during outfall construction.	River Garry (WF100) · ch10550 · ch11370 (outfalls) · ch12470				
	De-watering and in-stream works during bridge and outfall construction and bridge demolition.	Allt Bhaic (WF115) ch9160				
	Temporary loss of 2.15ha of SAC habitat to accommodate construction.	River Garry (WF100) · ch4100-4340 (Essangal Underbridge) · ch9000 · ch10500 · ch10560-10610 · ch11250-11350 (River Garry Underbridge)	Temporary reduction in extent of SAC habitat for use by qualifying species in this internationally important site. This effect would be negative, reversible and short-term.	low (Significant)	SAC areas temporarily required for construction will be returned to their former habitat type by the Contractor. Areas of terrestrial habitat within the SAC boundary used for construction activities will be returned using species appropriate to the local environment and of local provenance. Seeding and planting of bare ground areas will be undertaken as soon as possible after the completion of construction works. Appropriate measures, such as the use of geo-textile matting, will be put into place should vegetation establishment be delayed to prevent sediment entering watercourses. (**Mitigation Item P05-E17**). In addition, **Mitigation Item SMC-E9** will be adhered to.	No significant residual impacts predicted.
Tulach Hill and Glen Fender Meadows SAC (including GWDTE site CF01) (*International*) (Figure 12.1)	Generation of dust from construction activities.	ch5500-5800 ch6440-6500 ch7560-8590	Degradation of SAC habitat. This effect would be negative, reversible and short-term.	low (Significant)	Mitigated through compliance with **Mitigation Item SMC-AQ1** and **Mitigation Item SMC-AQ2**.	No significant residual impacts predicted.
Tulach Hill SSSI (*National*) (Figure 12.1)	Generation of dust from construction activities.	ch5500-5800 ch6440-6500 ch7560-8590	Degradation of SSSI habitat. This effect would be negative, reversible and short-term.	low (Significant)	Mitigated through compliance with **Mitigation Item SMC-AQ1** and **Mitigation Item SMC-AQ2**.	No significant residual impacts predicted.
Aldclune & Invervack Meadows SSSI (*National*)	Temporary loss of 1.39ha of terrestrial SSSI habitat to accommodate construction.	ch3800-4260 (Essangal Underbridge) ch10570-10710	Reduction in extent of this important habitat and the communities associated with it. The habitat lost is of poor quality, therefore the effect would be negative, reversible and short-term.	low (Significant)	The SSSI is designated for its grassland. Rather than reinstate the woodland lost as part of the proposed scheme, calcareous grassland will be created on the road embankment. Seed collection from appropriate parts of the SSSI within the CPO will	During the restoration period, a negative residual impact is predicted due to loss of habitat. However, this impact would be temporary in nature and once target habitat is

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
(Figure 12.1)					be sown in the temporary land-take area. A management strategy/habitat restoration plan will be adopted by the Contractor, and will be agreed in consultation with SNH and other relevant stakeholders, to start the process of improvement of the SSSI's condition and prevent further deterioration. Details of the management strategy will be included in Habitat Management Plans (**Mitigation Item SMC-S1**). Any seeding and planting of bare ground areas will be undertaken as soon as possible after the completion of construction works using plants of local provenance. Appropriate measures to prevent sedimentation of watercourses should vegetation establishment be delayed, such as the use of geo-textile matting, will be put into place. (**Mitigation Item P05-E18**). In addition, **Mitigation Item SMC-E9** will be adhered to.	established no significant residual impacts are predicted.
	Run-off from construction works including sediment and chemical and hydrocarbon loads from accidental spillage.	ch3500-4270 ch9410-9910 ch10560-11150	Degradation of SSSI habitat resulting in modified habitat. Dependent on the magnitude of the pollution event, there could be irreversible effects on the SSSI and on the viability of qualifying habitat. This effect could be permanent and negative.	high (Significant)	Mitigated through compliance with **Mitigation Item SMC-W3** and **Mitigation Item SMC-W7**.	No significant residual impacts predicted.
Ancient woodland (*National*) (Figure 12.14)	Generation of dust from construction activities.	Throughout the proposed scheme	Degradation of habitat within the first few metres of woodland, leading to changes in health of plants and community compositions. This effect would be negative, reversible and short-term.	low (Significant)	Mitigated through compliance with **Mitigation Item SMC-AQ1** and **Mitigation Item SMC-AQ2**.	No significant residual impacts predicted.
River Garry and Allt Anndeir (*International*)	Run-off and release of sediment from construction works including chemical and hydrocarbon loads from accidental spillage.	River Garry (upper) (WF100) · ch14800 · ch15350 · ch16300	Pollution of aquatic habitat such as reduced water quality and increased deposition resulting in modified submerged habitat. Depending on the magnitude of the pollution event, there could be irreversible long-term effects on the habitat and on the viability of populations of the qualifying species of the SAC. The effect would be permanent and negative.	high (Significant)	Mitigated through compliance with **Mitigation Item SMC-W3** and **Mitigation Item SMC-W7**.	No significant residual impacts predicted.
	De-watering and in-stream works during outfall construction.	River Garry (upper) (WF100) · ch14800 · ch15350 · ch16300	Alteration of riverbed habitat. This effect would be negative, reversible and short-term.	low (Not significant)	No mitigation is required for this non-significant impact; however, compliance with **Mitigation Item SMC-W1** and **Mitigation Item SMC-W4** would reduce the effect of this impact.	n/a
	De-watering and in-stream works during outfall and bridge construction and bridge demolition.	Allt Anndeir (WF158) ch19720-19850				
Broadleaved, mixed or coniferous semi-natural woodland (not AWI) (*Regional*)	Generation of dust from construction activities.	Throughout the proposed scheme	Degradation of habitat leading to changes in health of plants and community compositions. This effect would be negative, reversible and short-term.	low (Not significant)	No mitigation is required for this non-significant impact; however, compliance with **Mitigation Item SMC-AQ1** and **Mitigation Item SMC-AQ2** would reduce the effect of this impact.	n/a
Broadleaved, mixed or coniferous plantation woodland (not AWI) (*Regional*)						
Dry dwarf shrub heath/acid grassland mosaic (*Regional*)	Operational impacts only.				n/a	n/a
Valley mire fen and fen not in wet heath mosaics (*Authority area*)						
Acid or neutral flush (including GWDTE sites TN160-162 and ANF02) (*Authority area*)						

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
Wet heath/acid grassland mosaic (including fen) (*Authority area*)						
Acid grassland (*Authority area*)						
Improved grassland (*Authority area*)						
Other watercourses (*Authority area*)	Run-off and release of sediment from construction works including chemical and hydrocarbon loads from accidental spillage.	Allt Eachainn (WF84) ch800 Allt Girnaig (WF89) ch1520 (run-off only) Allt Chluain (WF98) ch3350 Essangal Burn (WF99) ch4310 Allt a'Chrombaidh (WF142) ch15090 Allt nan Cuinneag (WF149) ch16500 Allt Crom Bhruthaich (WF167) ch18240 Allt Geallaidh (WF164) ch22000 Unnamed watercourses 53 locations (51 locations for de-watering)	Pollution of aquatic habitat leading to reduced water quality and increased deposition resulting in modified submerged habitat. This effect would be negative, reversible, and long-term (recovery could take several seasons).	medium (Not significant)	No mitigation is required for this non-significant impact; however, compliance with **Mitigation Item SMC-W3** and **Mitigation Item SMC-W7** would reduce the effect of this impact.	n/a
	De-watering of watercourse.		Temporary changes in hydrology; change in functional habitat for species. This effect would be negative, reversible and short-term.	low (Not significant)	No mitigation is required for this non-significant impact; however, compliance with **Mitigation Item SMC-W1** and **SMC-W4**, would reduce the effect of this impact.	n/a
Unnamed pond (*Authority area*)	Run-off from construction works including sediment and chemical and hydrocarbon loads from accidental spillage.	WF96A ch2750	Pollution of aquatic habitat leading to reduced water quality and increased deposition resulting in modified submerged habitat. This effect would be negative, reversible and long-term.	medium (Not significant)	No mitigation is required for this non-significant impact; however, compliance with **Mitigation Item SMC-W3** and **Mitigation Item SMC-W7** would reduce the effect of this impact.	n/a
Atlantic salmon Brook lamprey (*International*)	Run-off from construction works including sediment and chemical and hydrocarbon loads from accidental spillage.	At watercourses throughout the proposed scheme	Reduced water quality potentially causing physiological changes and/or affecting fish gill structures. This effect would be negative and long-term.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-W3** and **Mitigation Item SMC-W7**.	No significant residual impacts predicted.
	Noise, vibrations and light spill associated with construction related activities.		Noise, vibration and lighting may lead to barrier effects to migrating fish, causing temporary fragmentation of habitat through a reduction in fish passage. Noise and vibration may also lead to physical damage in sensitive species. The effect of habitat fragmentation would be negative, reversible and short-term; however physical damage would be negative and permanent.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E3, Mitigation Item SMC-E10** and **Mitigation Item SMC-LV4.**	No significant residual impacts predicted.
	De-watering of watercourse sections and in-stream works, including scour protection, with construction of structures that form the footprint of the proposed scheme.	River Garry (WF100) · Essangal Underbridge ch4200-4350	Temporary de-watering may cause mortality of qualifying species. In-stream works may prevent movement of qualifying species along the watercourse resulting in habitat fragmentation. The effect of mortality would be permanent and negative. If habitat fragmentation occurs during a sensitive period, this may have long-term negative effects on the population.	high (Significant)	Mitigated through compliance with **Mitigation Item SMC-E4, Mitigation Item SMC-E5**, **Mitigation Item SMC-W1** and **Mitigation Item SMC-W4.** In addition, to mitigate impacts on Atlantic salmon and brook lamprey during the construction of the Essangal Underbridge the following measures will be adhered to (**Mitigation Item P05-E19**): · in-stream works and all drilling and piling operations carried out within 100m of the river will be undertaken between December and April inclusive to avoid the most sensitive period for fish at this location; · the de-watered working area will avoid the holding pool for Atlantic salmon (the area of deep water below the 115m contour); and · in-stream works will comply with SEPA Good Practice Guidance – Temporary Construction Methods (WAT-SG-29) (SEPA, 2009).	No significant residual impacts predicted.
	De-watering of watercourse sections and in-stream works with construction of structures that form the footprint of the proposed scheme and demolition of existing structures.	Allt Bhaic (WF115) ch9160 Allt Anndeir (WF158) ch19720-19850		medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E4, Mitigation Item SMC-E5, Mitigation Item SMC-W1** and **Mitigation Item SMC-W4.** In addition, in-stream works and all drilling and piling operations carried out within 100m of the watercourses will be undertaken between July and mid-October inclusive to avoid the most sensitive period for fish. In-stream works will comply with SEPA Good Practice Guidance – Temporary Construction Methods (WAT-SG-29) (SEPA, 2009) (**Mitigation Item P05-E20**).	
	De-watering of watercourse sections and in-stream works with construction of outfalls.	ch10550 ch11370 ch12470 ch14800 ch15350				

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
		ch16300				
Otter (*International*) (Figure 12.8)	Construction related activities including vehicle movement, culvert and watercourse crossing construction and creation of excavations including those for SuDS features.	For locations see Appendix A12.3 (Confidential Ecology Features).	Direct mortality of individuals moving across site from collisions or entrapment in uncovered holes, pipes or machinery. Permanent negative effect on an individual level, but is unlikely to occur in sufficient numbers to affect the wider population and would therefore be long-term, reversible and negative.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E9**, **Mitigation Item SMC-E13 and Mitigation Item SMC-E14.** In addition, construction compounds, storage areas, temporary access tracks etc. (except for culvert, bridge and outfall works) will be at least 10m from watercourse banks (**Mitigation Item P05-E21**).	No significant residual impacts predicted.
	Noise, vibrations and light spill associated with construction related activities including bridge, embankment and drainage works.		Disturbance of an EPS, including a holt when used for breeding and three couches, leading to its avoidance of key places of shelter and rest, and fragmentation through temporary loss of habitat; but not at a level that will cause declines in population as the species is widespread in the catchment. This effect would be negative and short-term.	low (Significant)	Mitigated through compliance with **Mitigation Item SMC-E6, Mitigation Item SMC-E10**, **Mitigation Item SMC-LV4** and **Mitigation Item SMC-NV2,** which is primarily aimed at human receptors, but measures detailed will also benefit ecological features. In addition, the following measures will be adhered to: · severance and fragmentation of habitat will be reduced during construction by retention of commuting routes, for example constructing culverts with mammal provision and dry mammal underpasses early in the construction process (**Mitigation Item P05-E22**); · piling/drilling will not be undertaken within 100m of a resting site or during the hours of darkness unless undertaken under a protected species derogation licence. (**Mitigation Item P05-E23**); and · installation of screening (e.g. chestnut paling) to segregate resting sites from construction areas for the duration of works and daily inspections of resting sites, as determined by the ECoW (**Mitigation Item P05-E24**).	No significant residual impacts predicted.
	Run-off from construction works including sediment and chemical and hydrocarbon loads from accidental spillage.		Pollution of watercourse resulting in reduced prey availability, leading to a decline in foraging habitat quality. This effect would be, negative, short-term and reversible.	low (Significant)	Mitigated through compliance with **Mitigation Item SMC-W3** and **Mitigation Item SMC-W7**.	No significant residual impacts predicted.
Wildcat (*International*)	Operational impacts only.				n/a	n/a
Brown/sea trout (*Regional*)	Run-off from construction works including sediment and chemical and hydrocarbon loads from accidental spillage.	At watercourses throughout the proposed scheme	Reduced water quality potentially causing physiological changes and/or affecting fish gill structures. This effect would be negative and short-term.	low (Not significant)	No mitigation is required for this non-significant impact; however, compliance with **Mitigation Item SMC-W3** and **Mitigation Item SMC-W7** would reduce the effect of this impact.	n/a
	Noise, vibrations and light spill associated with construction related activities.		Noise, vibration and lighting may lead to avoidance of the area causing temporary fragmentation of habitat through reduction in fish passage. Noise and vibration may also lead to physical damage in sensitive species. The effect of habitat fragmentation would be negative, reversible and short-term; however physical damage would be negative and permanent.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E3, Mitigation Item SMC-E10** and **Mitigation Item SMC-LV4**.	No significant residual impacts predicted.
	De-watering of watercourse sections and in-stream works with construction of structures that form the footprint of the proposed scheme.		Temporary de-watering may cause mortality of qualifying species. In-stream works may prevent movement of qualifying species along the watercourse resulting in habitat fragmentation. The effect of mortality would be permanent and negative. If habitat fragmentation occurs during a sensitive period, this may have long-term negative effects.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E4, Mitigation Item SMC-E5**, **Mitigation Item SMC-W1** and **SMC-W4.** In addition, in-stream works and all drilling and piling operations carried out within 100m of the watercourses will be undertaken between July and mid-October inclusive to avoid the most sensitive period for fish. In-stream works will comply with SEPA Good Practice Guidance – Temporary Construction Methods (WAT-SG-29) (SEPA, 2009) (**Mitigation Item P05-E20**).	No significant residual impacts predicted.
Badger (*Regional*) (Figure 12.4)	Construction related activities including vehicle movement.	For locations see Appendix A12.3 (Confidential Ecology Features).	Potential direct injury or mortality of individuals moving across site from collisions or entrapment in uncovered holes, pipes or machinery. This effect on the overall population would be long-term, reversible and negative.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E9**, **Mitigation Item SMC-E13 and Mitigation Item SMC-E14.**	No significant residual impacts predicted.
	Temporary loss of badger habitat to accommodate construction.		Fragmentation through temporary loss of habitat. This effect would be short-term, reversible and negative.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
	Noise, vibration and light spill associated with construction related activities.		Temporary disturbance of badgers and their setts, including two main setts and six outlier setts, leading to a change in the distribution of local population(s).	low (Not significant)	Although impacts are not significant, compliance with **Mitigation Item SMC-E6** and **Mitigation Item SMC-E10**, and adherence to	n/a

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
			This effect would be short-term and negative.		the following mitigation measure will ensure compliance with species protection legislation and best practice guidance: · severance and fragmentation of habitat will be reduced during construction by retention of commuting routes, for example constructing culverts with mammal provision and dry mammal underpasses early in the construction process (**Mitigation Item P05-E22**).	
Bats (all species) (*Regional*) (Figures 12.5 and 12.6)	Construction related activities including vegetation clearance.	ch1190 ch1500-1710 ch2490 ch2800 ch3360 ch4250 ch4980 ch7670 ch9170 ch10160 ch10280 ch10800 (access track) ch11260-11330 ch13280 ch13410 ch13520 ch16500 ch22000 All woodland habitat throughout the proposed scheme	Direct mortality of an EPS during removal of roosting habitat. This effect on overall populations would be long-term, reversible and negative.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E1**, **Mitigation Item SMC-E6, Mitigation Item SMC-E8** and **Mitigation Item SMC-E9.**	No significant residual impacts predicted.
	Temporary obstruction of culverts and underpasses.		Severance of habitat, and diversion of individuals away from existing commuting routes, potentially resulting in greater use of less suitable crossing points. This effect would be short-term, reversible and negative.	low (Not significant)	Although impacts are not significant, adherence to the following mitigation measure will ensure compliance with species protection legislation and best practice guidance: · severance of habitat will be reduced during construction by retention of commuting routes through culverts and underpasses, such that movement between areas of habitat is maintained (**Mitigation Item P05-E25**).	n/a
	Noise, vibration and light spill associated with construction related activities.		Disturbance of an EPS, including seven known roosts, which could lead to the abandonment of roost sites and increased energy expenditure during roosting periods. Could also cause avoidance of commuting routes and foraging areas. This effect would be short-term and negative.	low (Not significant)	No mitigation is required for this non-significant impact; however, compliance with **Mitigation Item SMC-E1**, **Mitigation Item SMC-E6, Mitigation Item SMC-E10**, **Mitigation Item SMC-LV4** and **Mitigation Item SMC-NV2;** which is primarily aimed at human receptors, but measures detailed will also benefit ecological features, would reduce the effect of this impact.	n/a
Beaver (*Regional*)	Construction related activities including vehicle movement.	ch6160	Potential direct injury or mortality of individuals moving across site from collisions or entrapment in uncovered holes, pipes or machinery. This effect on the overall population would be long-term, reversible and negative.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E9**, **Mitigation Item SMC-E13 and Mitigation Item SMC-E14.**	No significant residual impacts predicted.
	Noise, vibration and light spill associated with construction related activities.	Watercourses and adjacent woodlands throughout the proposed scheme.	Temporary disturbance of beavers, leading to a change in the distribution of local population(s), and fragmentation through temporary loss of habitat. This effect would be negative and short-term.	low (Not significant)	No mitigation is required for this non-significant impact. However, compliance with **Mitigation Item SMC-E10** and **Mitigation Item SMC-NV2,** which is primarily aimed at human receptors, but measures detailed will also benefit ecological features, would reduce the effect of this impact. In addition, adherence to the following mitigation measure will ensure compliance with proposed species protection legislation and best practice guidance: · severance and fragmentation of habitat will be reduced during construction by retention of commuting routes, for example constructing culverts with mammal provision and dry mammal underpasses early in the construction process (**Mitigation Item P05-E22**).	n/a
Breeding birds (*Regional*) (Figure 12.7)	Construction related activities, including vehicle movement and vegetation clearance.	Throughout the proposed scheme	Direct mortality and disturbance due to vegetation clearance during the breeding season. Mortality of individuals would be a permanent and disturbance would be long-term and negative due to implications from failure to reproduce. However, this effect is unlikely to occur in sufficient numbers to affect the wider population and would be long-term, reversible and negative.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E7**, **Mitigation Item SMC-E8** and **Mitigation Item SMC-E9.**	No significant residual impacts predicted.
	Temporary loss of habitat to accommodate construction.	Throughout the proposed scheme	Fragmentation and displacement through temporary loss of habitat. This effect would be short-term, reversible and negative.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
Barn owl (*Regional*)	Noise, vibration and light spill associated with construction related activities.	For locations see Appendix A12.3 (Confidential Ecology Features).	Disturbance of Schedule 1 species which could influence breeding success, feeding behaviour and if disturbance becomes continuing could lead to abandonment of nests during that season. This effect would be long-term and negative.	medium (Significant)	To avoid disturbance of barn owl, temporary measures will be undertaken to discourage nesting during construction (**Mitigation Item P05-E26**). These measures, as detailed by Shawyer (2011), must be undertaken prior to commencement of work and outside the breeding season (March to August inclusive).	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
					Measures will include: · securely covering openings into the building with plywood panels focussing on specific features of the building where barn owls have bred or might offer potential nest sites; and · provision of alternative nest sites to mitigate for the loss of this nest site. If barn owl are already nesting in the building prior to construction, or a new nest is identified, the following measures to reduce disturbance, as detailed by Shawyer (2011), will be adhered to: · a suitable protection zone will be placed around the nest. Construction work within the protection zone will not take place between the months of March to August inclusive (**Mitigation Item P05-E27**); · construction work near barn owl nests should avoid taking place during the hours of darkness when barn owls are largely active (**Mitigation Item P05-E28**); and · the nest will be visually screened, for example, by the use of high fine mesh netting which will prevent encroachment and shield birds visually from sudden changes in activity levels (**Mitigation Item P05-E29**).	
Black grouse (*Regional*)	Noise and vibrations associated with construction related activities.	ch6280-6750 ch13980-14910 ch16550-16900 ch22000-22100	Disturbance of black grouse during lekking which could lead to temporary abandonment of lek sites and result in increased energy expenditure during breeding. This effect would be short-term and negative.	low (Not significant)	Although impacts are not significant, adherence to the following mitigation measures will ensure compliance with species protection legislation and best practice guidance, and as detailed by the RSPB (2016). Black grouse-specific surveys to confirm location(s) and monitor activity at known lek sites (shown in Figure 12.12) within 500m (Ruddock & Whitfield, 2007) of the proposed scheme immediately prior to works undertaken March-May inclusive (**Mitigation Item P05-E30**). Upon completion of black grouse-specific surveys a Species Protection Plan will be implemented as required based upon survey results. As a minimum the plan will include: · suitable protection zones will be established around known leks between March and May (inclusive); · works will only take place within the protection zones during daylight hours, restricted to between two hours after sunrise and two hours before sunset; and · a year-round consideration of active lek sites and any potential impacts due to the programmed works. In addition, replacement habitat and tree planting will not be located at known lek sites (**Mitigation Item P05-E31**).	n/a
Hen harrier (*Regional*)	Noise and vibrations associated with construction related activities.	See Appendix A12.3 (Confidential Ecology Features).	Disturbance of Schedule 1 species which could influence breeding success, feeding behaviour and if disturbance becomes continuing could lead to abandonment of nests during that season. This effect would be long-term and negative.	medium (Significant)	In addition to the mitigation outlined for all breeding birds the following will be followed (**Mitigation Item P05-E32**): · hen harrier-specific surveys to identify any active breeding locations (typically March-August inclusive) (Hardey et al., 2013) within 500m (Ruddock & Whitfield, 2007) of the proposed scheme; and · if any active breeding locations are found a Species Protection Plan will be implemented. The plan will include suitable protection zones in consultation with SNH.	No significant residual impacts predicted.
Pine marten Red squirrel (*Regional*) (Figure 12.9)	Construction related activities, including vehicle movement and vegetation clearance.	Woodland along Allt Girnaig ch1400-1600 ch2240-2800 Woodland along Allt Chluain ch3300-3400 Aldclune ch3700-4020 Woodland along River Garry ch5000-5820 Calvine ch13300 Clunes Wood ch14750-15100 Other suitable woodland habitat lost throughout the proposed scheme	Direct mortality of individuals from vehicle collisions and destruction, during vegetation clearance, of any dens/dreys identified during pre-construction surveys (see Table 12.10). This effect on the overall population would be long-term, reversible and negative.	medium (Significant)	Mitigated through compliance with **Mitigation Item SMC-E6**, **Mitigation Item SMC-E8 and Mitigation Item SMC-E9**. In addition, the following measures will be adhered to: · no more than three weeks prior to the commencement of site clearance, and again at least two days prior to clearance, pre-construction surveys will be undertaken to identify active dens/dreys. (**Mitigation Item P05-E33**); · exclusion zones will be marked around dens/dreys (**Mitigation Item P05-E34**). Exclusion zones will be to the following distances: Ø pine marten: 100m for breeding dens and 30m for non-breeding dens; and Ø red squirrel: 30m for breeding dreys and 5m for non-breeding dreys;	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
					· site clearance affecting pine marten and red squirrel habitat should be timed to avoid breeding seasons (March to June inclusive for pine marten and February to September inclusive for red squirrel) (**Mitigation Item P05-E35**); · where site clearance is required to take place during breeding season and/or the destruction of dens/dreys is required, works will be conducted under licence following consultation with SNH (**Mitigation Item SMC-E6**).	
	Noise, vibration and light spill associated with construction related activities.		Disturbance leading to avoidance of key habitats for foraging and drey/denning sites leading to some displacement of population(s). This effect would be short-term and negative.	low (Not significant)	No mitigation is required for this non-significant impact; however, compliance with **Mitigation Item SMC-E6, Mitigation Item SMC-E10, Mitigation Item SMC-LV4** and **Mitigation Item SMC-NV2,** which is primarily aimed at human receptors, but measures detailed will also benefit ecological features, would reduce the effect of this impact. In addition, adherence to the following mitigation measure will ensure compliance with species protection legislation and best practice guidance: · severance and fragmentation of habitat will be reduced during construction by retention of commuting routes, for example constructing culverts with mammal provision and dry mammal underpasses early in the construction process (**Mitigation Item P05-E22**).	n/a
Adders Slow worm Common lizard (*Regional*) (Figure 12.10)	Construction activity including vehicle movement and vegetation clearance.	ch890-1190 ch6580-7390 ch10160-10450 ch10570-10620 ch11340-11690 ch12390-12800 ch13400-14980 ch15100-19840 ch20895-22020	Potential direct mortality of individuals. This effect on the overall population would be long-term, reversible and negative.	medium (Significant)	The following measures will be adhered to by the Contractor prior to vegetation clearance of reptile habitat **(Mitigation Item P05-E36)**: · pre-construction surveys to understand the population size and distribution of reptiles in KRS (Edgar et al., 2010); · translocation areas (Figure 13.5) will be created for KRS prior to site clearance; · exclusion fencing will be installed around KRS areas that are to be lost and individuals will be captured by hand with use of ACOs and pitfall traps; · captured individuals will then be translocated from KRS into created areas; · exclusion fencing will be installed between works and translocation areas; · phased strimming of favourable reptile habitat will take place during hibernation season (November to February inclusive) (Edgar et al., 2010) following fingertip searches when necessary and under the direction of an ECoW; and · soil stripping and removal of potential hibernacula, including, but not limited to, drystone walls, dense tussocks of grass and log piles, will take place outwith hibernation season.	No significant residual impacts predicted.
	Noise, vibration and light spill associated with construction related activities throughout the proposed scheme.		Disturbance of individuals resulting in some displacement. This effect would be negative, reversible and short-term.	low (Not significant)	No mitigation is required for this non-significant impact. However, compliance with **Mitigation Item SMC-NV2**, which is primarily aimed at human receptors, but measures detailed will also benefit ecological features, would reduce the effect of this impact.	n/a
	Temporary loss of reptile habitat to accommodate construction.	ch810-10060 ch12400 ch12600-12800 ch13800-15000 ch15500-16000 ch17100-18350	Fragmentation through temporary loss of habitat. This effect would be short-term, reversible and negative.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
Field gentian (*Authority area*)	Operational impacts only.				n/a	n/a
INNS (*n/a)*	Transfer of INNS during construction.	Throughout the proposed scheme	Reduction in biodiversity, through loss of habitat, reduction in species-richness and a loss of species which the habitat(s) support. Negative effect which could be permanent without management, with the potential for the effects to spread beyond the scope of the initial impact area.	high (Significant)	Mitigated through compliance with **Mitigation Item SMC-E15.**	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
Operation						
River Tay SAC (*International*) (Figure 12.1)	Loss and alteration of approximately 0.49ha of SAC habitat to accommodate footprint of construction, including, embankments, bridges, outfalls and SuDS features.	River Garry (WF100) · Essangal Underbridge ch4200-4350 · ch5000 · ch6210 · ch8040 · ch8410 · ch8710-8790 (embankment) · ch10160 · ch10280 · ch10550 (outfall) · ch11250-11350 River Garry Underbridge (including outfalls) · ch12480 (outfall) Allt Girnaig (WF89) ch1520 (outfall) Allt Bhaic (WF115) ch9160 (access track and outfalls)	Permanent reduction in extent of habitat which has the potential for fragmentation or reduction in fish passage and loss of otter foraging habitat, in this internationally important site. This effect would be permanent and negative however the area of habitat loss is negligible. The proposed scheme design avoids functionally important SAC habitat and given the amount of remaining SAC habitat available, there is a *de minimis* effect (of minimum importance) which will not affect the integrity of the SAC.	low (Not significant)	No mitigation is required for this non-significant impact; however new structures (and extended structures where possible) and outfalls will be designed to minimise changes to current flow rates and velocities and in accordance with the following guidance (**Mitigation Item P05-E37**): · SEPA Good Practice Guide for Bank Protection Rivers and Lochs (WAT-ST-23) (SEPA, 2008a); · SEPA Good Practice Guide for River Crossings (WAT-SG-25) (SEPA, 2010); · CIRIA Culvert Design and Operation Guide (C689) (CIRIA, 2010); and · SEPA Good Practice Guide for Intakes and Outfalls (WAT-SG-28) (SEPA, 2008b). See Mitigation Item **SMC-W13**, Mitigation Item **SMC-W14** and Mitigation Item **SMC-W17** for more details.	n/a
	Pollution from road run-off.	River Garry (WF100) · ch4200-4350 (Essangal Underbridge) · ch10550 · ch11250-11350 (River Garry Underbridge) · ch11600-11800 (access road) · ch12480 Allt Girnaig (WF89) ch1500-1550 Allt Bhaic (WF115) ch9160	Increased run-off volumes and contaminants leading to decreased water quality for the SAC. In the absence of mitigation being applied during design, this effect is predicted to be long-term, reversible and negative.	medium (Significant)	To prevent pollution of water features during operation, SEPA PPG / GPP 1, 5, 6, 21, 22 and 26 (SEPA, 2003; 2017) will be abided by (**Mitigation Item P05-E38**). Road surface run-off will be subject to treatment via SuDS. See **SMC-W17** for more details. Likely locations of SuDS features are indicated on Figure 13.5.	No significant residual impacts predicted.
	Shading of stream or river bed under footprint of the proposed scheme.	River Garry (WF100) · ch4200-4350 (Essangal Underbridge) · ch11250-11350 (River Garry Underbridge) Allt Bhaic (WF115) ch9160	Change in habitat composition under the footprint of the proposed scheme through increased shading of the stream/river bed. This effect would be permanent and negative however the area of habitat loss is negligible. The proposed scheme design avoids shading of functionally important SAC habitat and given the amount of remaining SAC habitat available, there is a *de minimis* effect (of minimum importance) which will not affect the integrity of the SAC.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
	Changes in hydrology due to new structures within the watercourse including any necessary bank protection.	River Garry (WF100) · Essangal Underbridge ch4200-4350	Alteration of spawning gravels and increased deposition in important lying-up pools, due to changes in flows and increasing water velocity around new structures, leading to a decrease in functional supporting habitat. This effect would be permanent and negative.	medium (Significant)	New structures (and extended structures where possible) and outfalls will be designed to minimise changes to current flow rates and velocities and in accordance with the following guidance (**Mitigation Item P05-E37**): · SEPA Good Practice Guide for Bank Protection Rivers and Lochs (WAT-ST-23) (SEPA, 2008a); · SEPA Good Practice Guide for River Crossings (WAT-SG-25) (SEPA, 2010); · CIRIA Culvert Design and Operation Guide (C689) (CIRIA, 2010); and · SEPA Good Practice Guide for Intakes and Outfalls (WAT-SG-28) (SEPA, 2008b). See **Mitigation Item SMC-W13**, **Mitigation Item SMC-W14** and **Mitigation Item SMC-W17** for more details.	No significant residual impacts predicted.
	Changes in hydrology due to construction of outfalls including any necessary bank protection.	River Garry (WF100) · ch10550 (outfall) · ch11350 (outfalls) · ch12480 (outfall) Allt Girnaig (WF89) ch1550 (outfall)	Altered habitat due to changes in flows around outfalls. This effect would be permanent and negative.	medium (Significant)		
	Changes in hydrology due to new crossing and outfalls, bank protection measures and removal of existing structure.	Allt Bhaic (WF155) ch9160 (underbridge and outfalls)	Altered habitat due to changes in flows around outfalls, extended crossing and removal of existing structures. This effect would be permanent and negative.	medium (Significant)		
Tulach Hill and Glen Fender Meadows SAC (including GWDTE site CF01) (*International*) (Figure 12.1)	Construction impacts only.				n/a	n/a
Tulach Hill SSSI (*National*) (Figure 12.1)	Construction impacts only.				n/a	n/a

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
Aldclune & Invervack Meadows SSSI (*National*) (Figure 12.1)	Removal of 0.03ha of terrestrial SSSI habitat to accommodate bridge supports for the Essangal Underbridge and SuDS access tracks.	Essangal Underbridge ch4200-4260 ch10590-10710	Reduction in extent of this important habitat and the communities associated with it. Although the habitat lost is of poor quality, the effect would be permanent and negative.	high (Significant)	The SSSI is designated for its grassland. Rather than reinstate the woodland lost as part of the proposed scheme, calcareous grassland will be created on the road embankment. Seed collection from appropriate parts of the SSSI within the CPO will be sown in the temporary land-take area. A management strategy/habitat restoration plan will be adopted by the Contractor, and will be agreed in consultation with SNH and other relevant stakeholders, to start the process of improvement of the SSSI's condition and prevent further deterioration. Details of the management strategy will be included in Habitat Management Plans (**Mitigation Item SMC-S1**). Any seeding and planting of bare ground areas will be undertaken as soon as possible after the completion of construction works using plants of local provenance. Appropriate measures to prevent sedimentation of watercourses should vegetation establishment be delayed, such as the use of geo-textile matting, will be put into place (**Mitigation Item P05-E18**).	Loss of approximately 0.03ha of SSSI habitat. However, the habitat lost is of poor quality and the amount of habitat loss is negligible (*de minimis*) given the amount of available habitat. Residual impact is not significant.
	Pollution from road run-off.	ch3500-4270 ch9410-9910 ch10560-11150	Increased run-off volumes and contaminants leading to decreased water quality and alteration in SSSI habitat. In the absence of mitigation being applied during design, this effect is predicted to be long-term, reversible and negative.	medium (Significant)	To prevent pollution of water features during operation, SEPA PPG / GPP 1, 5, 6, 21, 22 and 26 (SEPA, 2003; 2017) will be abided by (**Mitigation Item P05-E38**). Road surface run-off will be subject to treatment via SuDS. Likely locations of SuDS features can be seen on Figure 13.5.	No significant residual impacts predicted.
Ancient woodland (*National*) (Figure 12.14)	Removal of areas listed on the AWI from the footprint of the proposed scheme. Loss of approximately: · 25.87ha of ancient woodland (of semi-natural origin); · 0.30ha of long-established woodland (of plantation origin); and · 0.91ha of other woodland (on Roy map). Of the 27.08ha of habitat listed on the AWI, approximately 12.90ha is currently wooded.	Throughout the proposed scheme	Reduction in the area of ancient woodland and the biodiversity of these sites; and areas which were previously wooded, but may retain biodiversity value. There will also be a reduction in plant and animal communities associated with this habitat, which rely on it for food, shelter and breeding. This effect would be permanent and negative.	high (Significant)	Candidate sites for compensation planting have been identified. The sites identified are those which currently do not have tree cover but which, when planted with appropriate native woodland species, maximise the biodiversity benefit of the planting; maintain connectivity or reconnect existing AWI sites; and maximise opportunities to maintain functionality of local ancient woodland communities within the route corridor, thus reducing ancient woodland fragmentation in the landscape (**Mitigation Item P05-E39**). Compensation planting will include the following: · species mixes that will reflect native woodland mixes to replace non-native plantations and maximise biodiversity benefit; · the retrieval, storage and deployment methods of ancient woodland soil that will be re-used to maintain fungal and invertebrate biodiversity and provide a seed bank to promote the re-establishment of ancient woodland ground flora (see **Mitigation Item SMC-LV5** for more details); · monitoring and management strategies, which will include maintenance and replacement of the planting, including missing and damaged trees, or those that are failing to make satisfactory growth during operation of the proposed scheme; and · management strategies that will be undertaken in AWI woodland that is to be retained within the CPO during the course of the construction contract and maintenance and establishment period. These will include the retention of dead and fallen wood and will be the responsibility of the Contractor and, in the longer-term, of the trunk road operating company. The locations of candidate sites for woodland compensation can be seen on Figure 12.14.	Significant adverse residual impact. In terms of the biodiversity and the intrinsic importance of ancient woodland habitats, the effect of the habitat loss will be permanent. Compensation planting will not mitigate for the permanent loss of ancient woodland. However, the compensation planting is designed so that when it is mature, woodland corridors will grow to connect currently fragmented areas. The planting will therefore mitigate for the functions and importance of the woodland in respect of habitat connectivity and carrying capacity for other species. In terms of habitat connectivity and carrying capacity for other species, over the long-term significant residual impacts are predicted to reduce.
River Garry and Allt Anndeir (*International*)	Loss of 45m^2 aquatic habitats to accommodate footprint of construction, including outfalls.	River Garry (upper) (WF100) · ch14800 · ch15350 · ch16300 Allt Anndeir (WF158) ch19720-19850	Permanent reduction in extent of aquatic supporting habitat and potential for fragmentation or reduction in fish passage in the River Tay SAC. This effect would be permanent and negative however the area of habitat loss is negligible given the amount of habitat available.	low (Not significant)	No mitigation is required for this non-significant impact; however, new structures (and extended structures where possible) and outfalls will be designed to minimise changes to current flow rates and velocities and in accordance with the following guidance (**Mitigation Item P05-E37**): · SEPA Good Practice Guide for Bank Protection Rivers and Lochs (WAT-ST-23) (SEPA, 2008a);	n/a

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
					· SEPA Good Practice Guide for River Crossings (WAT-SG-25) (SEPA, 2010); · CIRIA Culvert Design and Operation Guide (C689) (CIRIA, 2010); and · SEPA Good Practice Guide for Intakes and Outfalls (WAT-SG-28) (SEPA, 2008b). See **Mitigation Item SMC-W13**, **Mitigation Item SMC-W14** and **Mitigation Item SMC-W17** for more details.	
	Pollution from road run-off.		Increased run-off volumes and contaminants leading to decreased water quality. In the absence of mitigation being applied during design, this effect is predicted to be long-term, reversible and negative.	medium (Significant)	To prevent pollution of water features during operation, SEPA PPG / GPP 1, 5, 6, 21, 22 and 26 (SEPA, 2003, 2017) will be abided by (**Mitigation Item P05-E38**). Road surface run-off will be subject to treatment via SuDS. See **Mitigation Item SMC-W17** for more details. Likely locations of SuDS features are indicated on Figure 13.5.	No significant residual impacts are predicted.
	Changes in hydrology due to new outfall structures including any necessary bank protection measures.		Altered habitat due to changes in flows around outfalls. This effect would be permanent and negative; however, the area of habitat affected by changes in hydrology will be negligible given the amount of habitat available.	medium (Significant)	New structures (and extended structures where possible) and outfalls will be designed to minimise changes to current flow rates and velocities and in accordance with the following guidance (**Mitigation Item P05-E37**): · SEPA Good Practice Guide for Bank Protection Rivers and Lochs (WAT-ST-23) (SEPA, 2008a); · SEPA Good Practice Guide for River Crossings (WAT-SG-25) (SEPA, 2010); · CIRIA Culvert Design and Operation Guide (C689) (CIRIA, 2010); and · SEPA Good Practice Guide for Intakes and Outfalls (WAT-SG-28) (SEPA, 2008b). See **Mitigation Item SMC-W13**, **Mitigation Item SMC-W14** and **Mitigation Item SMC-W17** for more details.	No significant residual impacts predicted.
	Shading of river bed under footprint of the proposed scheme.	Allt Anndeir (WF158) ch19720-19850	Change in habitat composition under the footprint of the proposed scheme through increased shading of the stream/river bed. This effect would be permanent and negative however the area of habitat affected by shading will be negligible given the amount of habitat available.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
Broadleaved, mixed or coniferous semi-natural woodland (not AWI) (*Regional*)	Loss of 18.3ha of this woodland from the footprint of the proposed scheme.	Throughout the proposed scheme	Reduction of this habitat and its availability for CNAP key and CNPA priority non-protected species and species that rely on it for food, shelter and breeding. This effect would be permanent and negative.	high (Significant)	The loss of woodland will be replaced through landscape and ecological planting, additional to compensation planting for ancient woodland loss, as shown on Figure 13.5 (**Mitigation Item P05-E40**).	No significant residual impacts are predicted.
Broadleaved, mixed or coniferous plantation woodland (not AWI) (*Regional*)	Loss of 11.6ha of this woodland from the footprint of the proposed scheme.					
Dry dwarf shrub heath/acid grassland mosaic (*Regional*)	Loss of 2.11ha of this habitat from the footprint of the proposed scheme.	ch1250-1350 ch18010-18210 ch18350-18470 ch18530-19100 ch19740-19860 ch21500-21700	Reduction in extent and distribution of this habitat and its availability for the small dark yellow underwing moth; a CNAP key species. This effect would be permanent and negative; however, the areas affected are of low quality.	medium (Significant)	In areas of more agriculturally improved habitat identified for woodland compensation and replacement reptile habitat, dwarf shrub heath and acid grassland vegetation will be encouraged to create upland habitat mosaics, which will provide added benefit of habitat for the small dark yellow underwing moth. Soil analysis will be undertaken to inform the requirement for additional management, such as soil stripping or cultivation to create suitable soil conditions (**Mitigation Item P05-E41**). The locations of candidate sites for woodland compensation and replacement reptile habitat can be seen on Figure 13.5.	No significant residual impacts are predicted.
Valley mire fen not in wet heath mosaics (*Authority area*)	Loss of 2.24ha of this habitat from the footprint of the proposed scheme.	ch17050-17130 ch18470-18540 ch19320-19420 ch19440-19850 ch20845-20940 ch21040-21280	Reduction in extent and distribution of this habitat. This effect would be permanent, however due to the low quality of habitat affected this loss is not of significant conservation importance.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
	Changes in water flows as a result of cuttings and embankments.		Changes in hydrology leading to alteration in fen habitat through changes in botanical composition. This effect is predicted to be long-term, reversible and negative on an area of low quality habitat.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
Acid or neutral flush (including GWDTE sites TN160-162 and ANF02) (*Authority area*)	Loss of 0.11ha of this habitat from the footprint of the proposed scheme.	ch20100-20140	Reduction in extent and distribution of this habitat. This effect would be permanent, however due to the low proportion of overall habitat affected this loss is not of significant conservation importance.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
	Changes in water flows as a result of cuttings and embankments.		Changes in hydrology leading to alteration in flush habitat through changes in botanical composition. This effect is predicted to be long-term, reversible and negative on an area of low quality habitat.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
	Pollution from road run-off.		Increased run-off volumes and contaminants leading to decreased water quality and alteration in flush habitat through changes in botanical composition. This effect is predicted to be long-term, reversible and negative on an area of low quality habitat.	low (Not significant)	No mitigation is required for this non-significant impact; however, road surface run-off will be subject to treatment via SuDS. Likely locations of SuDS features can be seen on Figure 13.5.	n/a
Wet heath/acid grassland mosaic (including fen) (*Authority area*)	Loss of 3.96ha of this habitat from the footprint of the proposed scheme	ch13680-14450 ch17100-17500 ch18190-18210 ch18480-18700	Reduction in extent and distribution of this habitat. This effect would be permanent, however due to the low quality of habitat affected this loss is not of significant conservation importance.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
	Changes in water flows as a result of cuttings and embankments.		Changes in hydrology leading to alteration in this habitat through changes in botanical composition. This effect is predicted to be long-term, reversible and negative on an area of low quality habitat.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
Acid grassland (*Authority area*)	Loss of 8.05ha of this habitat from the footprint of the proposed scheme	Throughout the proposed scheme	Reduction in extent and distribution of this habitat and its availability for CNAP key and CNPA priority non-protected species. This effect would be permanent, however due to the low proportion of overall habitat affected this loss is not of significant conservation importance.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
Improved grassland (*Authority area*)	Loss of 26.9ha of this habitat from the footprint of the proposed scheme	Throughout the proposed scheme	Permanent reduction in extent and distribution of this habitat and its availability for CNAP key and CNPA priority non-protected species. This effect would be permanent, however due to the low proportion of overall habitat affected this loss is not of significant conservation importance.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
Other watercourses (*Authority area*)	Pollution from road run-off.	Allt Eachainn (WF84) (ch800) Allt Girnaig (WF89) (ch1520) (run-off only) Allt Chluain (WF98) (ch3350) (run-off only) Allt a'Chrombaidh (WF142) (ch15090) Allt nan Cuinneag (WF149) (ch16500) Allt Crom Bhruthaich (WF167) (ch18240) Allt Geallaidh (WF164) (ch22000) Unnamed watercourses (51 locations)	Increased run-off volumes and contaminants leading to decreased water quality. This effect would be long-term, reversible and negative.	medium (Significant)	To prevent pollution of water features during operation, SEPA PPG / GPP 1, 5, 6, 21, 22 and 26 (SEPA, 2003, 2017) will be abided by (**Mitigation Item P05-E38**). Road surface run-off will be subject to treatment via SuDS. See **Mitigation Item SMC-W17** for more details. Likely locations of SuDS features can be seen on Figure 13.5.	No significant residual impacts predicted.
	Changes in hydrology due to increase in impervious surfaces.		Altered habitat due to changes in flows around new bridge supports and extended culverts. This effect would be permanent and negative. However, the amount of habitat affected by changes in hydrology will be negligible given the amount of habitat available.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
	Culvert extensions leading to permanent loss of habitat.		Reduced availability or fragmentation of habitat for aquatic flora and fauna. This effect would be permanent and negative. However, the amount of habitat lost will be negligible given the amount of habitat available.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
Unnamed pond (*Authority area*)	Construction impacts only.				n/a	n/a
Atlantic salmon Brook lamprey (*International*)	Loss of up to 12m^2 habitat from the footprint of the proposed scheme.	River Garry (WF100) Essangal Underbridge ch4200-4350	Permanent reduction in extent of habitat. This effect would be permanent and negative however the area of habitat loss avoids functionally important habitat and is negligible given the amount of habitat available.	low (Not significant)	No mitigation is required for this non-significant impact; however, new structures (and extended structures where possible) and outfalls will be designed to minimise changes to current flow rates and velocities and in accordance with the following guidance (**Mitigation Item P05-E37**): · SEPA Good Practice Guide for Bank Protection Rivers and Lochs (WAT-ST-23) (SEPA, 2008a); · SEPA Good Practice Guide for River Crossings (WAT-SG-25) (SEPA, 2010);	n/a

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
					· CIRIA Culvert Design and Operation Guide (C689) (CIRIA, 2010); and · SEPA Good Practice Guide for Intakes and Outfalls (WAT-SG-28) (SEPA, 2008b). See **Mitigation Item SMC-W13**, **Mitigation Item SMC-W14** and **Mitigation Item SMC-W17** for more details.	
	Pollution from road run-off.	At watercourses throughout the proposed scheme	Increased run-off volumes and contaminants leading to decreased water quality and altered habitat resulting in reduced juvenile population size. Predicted to be a long-term, reversible and negative effect, however the proportion of population affected likely to be low.	medium (Significant)	To prevent pollution of water features during operation, SEPA PPG / GPP 1, 5, 6, 21, 22 and 26 (SEPA, 2003; 2017) will be abided by (**Mitigation Item P05-E38**). Road surface run-off will be subject to treatment via SuDS. See **Mitigation Item SMC-W17** for more details. Likely locations of SuDS features can be seen on Figure 13.5.	No significant residual impacts predicted.
	Changes in hydrology and shading from new structures that form part of the proposed scheme (bridges, culverts and outfalls).		Altered habitat resulting in reduced juvenile population size. Potential for disturbance and habitat fragmentation through lighting. Predicted to be a long-term, reversible and negative effect, however the changes are predicted to be localised.	medium (Significant)	New structures (and extended structures where possible) and outfalls will be designed to minimise changes to current flow rates and velocities and in accordance with the following guidance (**Mitigation Item P05-E37**): · SEPA Good Practice Guide for Bank Protection Rivers and Lochs (WAT-ST-23) (SEPA, 2008a); · SEPA Good Practice Guide for River Crossings (WAT-SG-25) (SEPA, 2010); · CIRIA Culvert Design and Operation Guide (C689) (CIRIA, 2010); and · SEPA Good Practice Guide for Intakes and Outfalls (WAT-SG-28) (SEPA, 2008b). See **Mitigation Item SMC-W13**, **Mitigation Item SMC-W14** and **Mitigation Item SMC-W17** for more details.	No significant residual impacts are predicted.
Otter (*International*) (Figure 12.8)	Loss of terrestrial habitat from the footprint of the proposed scheme	For locations see Appendix A12.3 (Confidential Ecology Features).	Reduction in availability of foraging habitat. Fragmentation of connecting habitats leading to increase in barriers to movement and access to resources for the species within the catchment. Predicted to be a long-term and negative effect, however, current baseline indicates that no holts or couches will be lost and numbers of affected individuals likely to be a low proportion of overall catchment population.	low (Significant)	The loss of areas identified as otter habitat will be replaced through woodland and riparian planting as shown on Figure 13.5 (**Mitigation Item P05-E42**). Although current baseline indicates that no holts or couches will be lost under the proposed scheme; the destruction of any holts or couches identified during pre-construction surveys will be conducted under licence following consultation with SNH (**Mitigation Item SMC-E6**).	No significant residual impacts are predicted.
	Increased road width in conjunction with culvert installation.		Potential for increase in mortality of individuals due to fragmentation of connecting habitat. Permanent negative effect on an individual level, but unlikely to occur in sufficient numbers to affect the wider population and would be long-term, reversible and negative.	medium (Significant)	Mitigation measures will include: · fragmentation of habitat will be reduced during operation by retention of commuting routes through creation of suitable crossing points, including culverts with mammal provision and dry mammal underpasses, so movement between areas of habitat can be maintained. Post-construction monitoring to determine the effectiveness of the crossing structures will be undertaken. (**Mitigation Item P05-E43**); · mammal fencing will be provided to prevent access onto the road and will be positioned in such a way that mammals will be directed to safe crossing points. Fencing will follow SNH guidance, Otters and Development (SNH, 2008b) and Badgers and Development (SNH, 2001) (**Mitigation Item P05-E44**); and · the landscape and ecological mitigation planting design (Figure 13.5) will be followed to encourage use of crossing points (**Mitigation Item P05-E45**). Possible crossing points and associated mammal fencing are shown on Figure 13.5.	No significant residual impacts are predicted. However, there may be a positive impact due to increased permeability of the proposed scheme through provision of crossing structures and mammal fencing.
	Pollution from road run-off.		Decreased water quality resulting in reduced condition of individuals and a reduction in prey resource. Predicted to be a long-term and negative effect, but proportion of population affected likely to be low and the species can readily use unaffected areas.	low (Significant)	To prevent pollution of water features during operation, SEPA PPG / GPP 1, 5, 6, 21, 22 and 26 (SEPA, 2003, 2017) will be abided by (**Mitigation Item P05-E38**). Road surface run-off will be subject to treatment via SuDS. Likely locations of SuDS features are indicated on Figure 13.5.	No significant residual impacts predicted.
Wildcat (*International*)	Loss of potential suitable habitat from the footprint of the proposed scheme	Throughout the proposed scheme	Fragmentation of connecting habitats leading to barriers to movement and access to resources for the species. Reduction in availability of cover, prey and movement habitats. This effect would be permanent and negative.	high (Significant)	Mitigation measures will include: · fragmentation of habitat will be reduced during operation by retention of commuting routes through creation of crossing points suitable for wildcat, including culverts with mammal provision, so movement between areas of habitat can be maintained. Post-construction monitoring to determine the	No significant residual impacts are predicted. However, there may be a positive impact due to increased permeability of the proposed scheme through provision of crossing structures and mammal fencing.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
					effectiveness of the crossing structures will be undertaken. (**Mitigation Item P05-E46**); · mammal fencing will be provided to prevent access onto the road and will be positioned in such a way that mammals will be directed to safe crossing points. Fencing will follow SNH guidance, Otters and Development (SNH, 2008b) and Badgers and Development (SNH, 2001) (**Mitigation Item P05-E44**); and · the landscape and ecological mitigation planting design (Figure 13.5) will be followed to encourage use of crossing points (**Mitigation Item P05-E45**). Possible crossing points and associated mammal fencing are shown on Figure 13.5.	
Brown/sea trout (*Regional*)	Loss of up to 12m^2 aquatic habitat from the footprint of the proposed scheme.	River Garry (WF100) Essangal Underbridge ch4200-4350	Permanent reduction in extent of habitat. This effect would be permanent and negative; however, the area of habitat loss avoids functionally important habitat and is negligible given the amount of habitat available.	low (Not significant)	No mitigation is required for this non-significant impact; however, new structures (and extended structures where possible) and outfalls will be designed to minimise changes to current flow rates and velocities and in accordance with the following guidance (**Mitigation Item P05-E37**): · SEPA Good Practice Guide for Bank Protection Rivers and Lochs (WAT-ST-23) (SEPA, 2008a); · SEPA Good Practice Guide for River Crossings (WAT-SG-25) (SEPA, 2010); · CIRIA Culvert Design and Operation Guide (C689) (CIRIA, 2010); and · SEPA Good Practice Guide for Intakes and Outfalls (WAT-SG-28) (SEPA, 2008b). See **Mitigation Item SMC-W13**, **Mitigation Item SMC-W14** and **Mitigation Item SMC-W17** for more details.	n/a
	Pollution from road run-off.	At watercourses throughout the proposed scheme	Increased run-off volumes and contaminants leading to decreased water quality and altered habitat resulting in reduced juvenile population size. Predicted to be a long-term, reversible and negative effect, however the proportion of population affected is likely to be low.	low (Significant)	To prevent pollution of water features during operation, SEPA PPG / GPP 1, 5, 6, 21, 22 and 26 (SEPA, 2003; 2017) will be abided by (**Mitigation Item P05-E38**). Road surface run-off will be subject to treatment via SuDS. See **Mitigation Item SMC-W17** for more details. Likely locations of SuDS features are indicated on Figure 13.5.	No significant residual impacts are predicted.
	Changes in hydrology and shading from structures that form part of the proposed scheme (bridges, culverts and outfalls).		Altered habitat resulting in reduced juvenile population size. Potential for disturbance and habitat fragmentation through lighting. Predicted to be a long-term, reversible and negative effect, however the proportion of population affected is likely to be low.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
Badger (*Regional*) (Figure 12.4)	Loss of outlier setts and foraging habitat from the footprint of the proposed scheme	For locations see Appendix A12.3 (Confidential Ecology Features).	Loss of 11 outlier setts and reduction in availability or fragmentation of foraging habitat. This effect would be long-term and negative as the species can readily use unaffected setts and re-colonise an area.	medium (Significant)	The loss of areas identified as badger habitat will be replaced through the landscape and ecological mitigation planting design (Figure 13.5) (**Mitigation Item P05-E47**). The destruction of any active sett will be conducted under licence following consultation with SNH (**Mitigation Item SMC-E6**).	No significant residual impacts are predicted.
	Increased road width including new junctions and access tracks.		Potential for increase in mortality of individuals due to fragmentation of connecting habitat. Permanent negative effect on an individual level, but unlikely to occur in sufficient numbers to affect the wider population and would be long-term, reversible and negative.	medium (Significant)	Mitigation measures will include: · fragmentation of habitat will be reduced during operation by retention of commuting routes through creation of suitable crossing points, including culverts with mammal provision and dry mammal underpasses, so movement between areas of habitat can be maintained. Post-construction monitoring to determine the effectiveness of the crossing structures will be undertaken. (**Mitigation Item P05-E43**); · mammal fencing will be provided to prevent access onto the road and will be positioned in such a way that mammals will be directed to safe crossing points. Fencing will follow SNH guidance, Otters and Development (SNH, 2008b) and Badgers and Development (SNH, 2001) (**Mitigation Item P05-E44**); and · the landscape and ecological mitigation planting design (Figure 13.5) will be followed to encourage use of crossing points (**Mitigation Item P05-E45**). Possible crossing points and associated mammal fencing are shown on Figure 13.5.	No significant residual impacts are predicted. However, there may be a positive impact due to increased permeability of the proposed scheme through provision of crossing structures and mammal fencing.
Bats (all species)	Loss of foraging and commuting habitat under the	Woodland habitat lost throughout the proposed scheme	Fragmentation of habitat for commuting and reduced availability of foraging resources.	medium (Significant)	Fragmentation of habitat will be reduced during operation by retention of commuting routes and minimising operational lighting	During the growth phase of landscape and ecological planting, a negative residual

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
(*Regional*) (Figures 12.5 and 12.6)	footprint of the proposed scheme		This effect would be long-term and negative, as species can readily use unaffected areas.		at crossing points used by bats so movement between areas of habitat can be maintained (**Mitigation Item P05-E48**) In addition, habitat loss and fragmentation of existing habitat will be mitigated by woodland retention and landscape and ecological planting as shown on Figure 13.5 (**Mitigation Item P05-E49**). This will include: · planting around SuDS features to create suitable habitat for foraging bats which will encourage higher flight lines to prevent vehicle collisions; and · planting and woodland retention designed to encourage use of crossing points so movement between areas of habitat can be maintained.	impact is predicted due to loss and fragmentation of habitat. However, this impact would be temporary in nature and once cover is established no significant residual impacts are predicted.
	Loss of roosts and potential roost habitat under the footprint of the proposed scheme.	ch7670 Woodland habitat lost throughout the proposed scheme	Loss of one known tree roost and 34 high potential trees. Loss of trees with potential for roosts in woodland, including potential roosts of higher conservation value. Loss of roosts would be a permanent effect. However, depending on the nature of the roost, bats may be able to use alternative roost sites, and therefore, this effect would be long-term and negative	medium (Significant)	The destruction of any confirmed roosts will be conducted under licence following consultation with SNH (**Mitigation Item SMC-E6**). The loss of roost trees and individual trees identified as having high bat potential will be mitigated by the provision of bat boxes designed for trees, for example Schwegler 1FF and 2F boxes (**Mitigation Item P05-E50**). Three bat boxes will be provided as mitigation for each roost tree or high potential tree lost under the footprint of the proposed scheme. Bat boxes will be monitored post tree felling to determine uptake and success reported to SNH and Transport Scotland. The locations of retained woodland habitat identified for erection of bat boxes and landscape and ecological planting are shown on Figure 13.5.	No significant negative residual impacts predicted.
Beaver (*Regional*)	Construction impacts only.				n/a	n/a
Breeding birds (*Regional*) (Figure 12.7)	Increased road footprint.	Throughout the proposed scheme	Direct mortality of individuals throughout the proposed scheme through road-traffic related incidents. This effect would be long-term and negative to the low number of individuals affected, and is unlikely to affect the overall breeding bird assemblage.	low (Not significant)	No mitigation is required for this non-significant impact; however, planting proposed as mitigation for bats (**Mitigation Item P05-E49**) would further reduce the effect of this impact.	n/a
	Loss of habitat from the footprint of the proposed scheme		Loss of suitable breeding habitat which could result in reduced breeding success. This effect would be long-term and negative as species can re-colonise an area.	medium (Significant)	The loss of breeding bird habitat will be replaced through the landscape and ecological mitigation planting design (Figure 13.5). The landscape and ecological mitigation planting design has incorporated a variety of breeding bird habitats including the planting of woodland, scrub, hedgerow and species rich grassland, as shown on Figure 13.5 (**Mitigation Item P05-E51**).	During the growth phase of landscape and ecological planting, a significant negative residual impact is predicted due to loss and fragmentation of habitat. However, this impact would be temporary in nature and once cover is established no significant residual impacts are predicted.
Barn owl Black grouse Hen harrier (*Regional*)	Construction impacts only.				n/a	n/a
Pine marten Red squirrel (*Regional*) (Figure 12.9)	Loss of habitat from the footprint of the proposed scheme	Woodland along Allt Girnaig ch1400-1600 ch2240-2800 Woodland along Allt Chluain ch3300-3400 Aldclune ch3700-4020 Woodland along River Garry ch5000-5820 Calvine ch13300 Clunes Wood ch14750-15100 Other suitable woodland habitat lost throughout the proposed scheme	Destruction of any dens/dreys identified during pre-works checks and permanent reduction in availability of this habitat to pine marten and red squirrel that rely on it for food, shelter and breeding, and fragmentation of habitat. This effect would be long-term and negative as the species can readily use unaffected areas and re-colonise a habitat.	medium (Significant)	The loss of areas identified as pine marten and red squirrel habitat will be replaced through the landscape and ecological mitigation planting design (Figure 13.5). Trees of different age and species composition will be planted, for example Scots pine, birch and alder, and as incorporated into Habitat Management Plans **(Mitigation Item P05-E52**). · The destruction of pine marten dens and red squirrel dreys will be conducted under licence following consultation with SNH (**Mitigation Item SMC-E6**). · Each lost pine marten den will be replaced by a breeding box (**Mitigation Item P05-E53**). · Each lost drey will be replaced by a red squirrel nest box (**Mitigation Item P05-E54**). The replacement breeding and nest boxes will be: · erected and positioned under direction of an ECoW prior to tree felling; · erected in suitable areas of pine marten and red squirrel woodland habitat; and	During the growth phase of landscape and ecological planting, a negative residual impact is predicted due to loss and fragmentation of habitat. However, this impact would be temporary in nature and once cover is established no significant residual impacts are predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor & Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
					· monitored post tree felling to determine uptake and success reported to SNH and Transport Scotland. The location of woodland habitat identified for erection of replacement breeding and nest boxes is shown on Figure 13.5.	
Adders Slow worm Common lizard (*Regional*) (Figure 12.10)	Loss of habitat from the footprint of the proposed scheme.	ch890-1190 ch6580-7390 ch10160-10450 ch10570-10620 ch11340-11690 ch12390-12800 ch13400-14980 ch15100-19840 ch20895-22020	Reduction in reptile habitat including 11.99ha of KRS. This effect would be permanent and negative.	high (Significant)	The loss of areas identified as KRS will be replaced through landscape and ecological planting and habitat creation, including appropriately located hibernacula (hibernation sites), which will be detailed in a Species Protection Plan (**Mitigation Item P05-E55**). The Species Protection Plan will include details of: · areas of insolation (sun exposure) with varied topography; · areas sheltered from the elements, such as wind breaks consisting of woodland edges, wet and dry habitats, gullies and ditches; · hibernation sites such as gorse/birch root systems, rocky crevices and purple moor-grass tussocks; · habitats that support prey species for reptiles, for example insects, soft bodied invertebrates and small mammals; · areas sheltered from predators; · breeding habitat that is structurally diverse; · areas that support habitat connectivity; and · ecotones (interfaces between habitats and transitional zones). Landscape and ecological planting suitable for reptiles is shown on Figure 13.5.	Replacement habitat, which has been created as translocation areas, will be established prior to site clearance. Therefore, no significant residual impacts are predicted.
Field gentian (*Authority area*)	Loss of habitat from the footprint of the proposed scheme.	ch12240	Losses of individual plants leading to a long-term, negative effect (reduction) on the population until numbers become re-established.	high (Significant)	To mitigate for the loss of habitat and field gentian, measures to protect the plants will be undertaken and will be detailed in a Species Protection Plan (**Mitigation Item P05-E56**). The Species Protection Plan could include details to: · monitor plants to understand their ecology and population to identify a suitable translocation area(s); · remove turves to translocation area(s); · collect and grow seeds prior to planting in translocation area(s); and · monitor translocation area(s). The construction timetable of the proposed scheme will dictate when the above will be undertaken.	No significant residual impacts are predicted.
INNS (*n/a*)	Construction impacts only.				n/a	n/a

12.7 Statement of Significance

12.7.1 No residual impacts during the construction phase of the proposed scheme are considered to be significant in accordance with the EIA Regulations.

12.7.2 During operation, the proposed scheme is predicted to result in a significant adverse residual impact from the loss of 27.08ha of habitat listed on the AWI, of which 12.90ha is currently wooded. Compensation planting of native species will be undertaken in candidate sites (Figure 12.14) which will be prepared with appropriately stored soil from areas to be lost to maintain the fungal and invertebrate biodiversity and seedbank as described in Table 12.14.

12.7.3 The compensation planting will not mitigate for the permanent loss of the biodiversity and intrinsic importance of ancient woodland habitats as a result of the proposed scheme, and a significant adverse residual impact is predicted. However, the planted habitat will mature and woodland corridors will grow to connect currently fragmented areas of ancient woodland. The planting will therefore mitigate for the functions and importance of the woodland in respect of habitat connectivity and carrying capacity for other species, and over the long-term, significant residual impacts are predicted to reduce.

12.7.4 A potential beneficial impact is anticipated resulting from increased permeability of the A9 following dualling for species, including badger and otter, through provision of suitably designed crossing structures and mammal fencing at appropriate locations as shown on Figure 13.5. Post-construction monitoring to determine the effectiveness of the crossing structures will be undertaken and it is predicted that barrier effects and vehicle collision risks for wildlife will be reduced.

12.8 References

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