

12 Ecology & 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 ecological features that could potentially be impacted by the proposed scheme, including two statutory designated sites (the River Tay Special Area of Conservation and the Pass of Killiecrankie Site of Special Scientific Interest). Aquatic and terrestrial species and habitats that could potentially be impacted included, amongst others, Ancient Woodland Inventory (AWI) sites, otter, red squirrel, badger, bats, freshwater pearl mussel and the notable plant species northern marsh-orchid.

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 development and 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. For example, a roundabout on the southbound merge/diverge at the Pitlochry North Junction has been incorporated during the design development to substantially reduce the land-take and associated loss of habitat listed on the AWI in this area, compared with initial proposals, which required significant earthworks. 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 measures to reduce significant adverse impacts have been identified. Such measures include implementation of commitments and best working practices during the construction phase. During operation, compensatory planting, habitat creation, mammal fencing and provision of crossing structures has been proposed to mitigate potential impacts.

No significant residual impacts are anticipated from construction of the proposed scheme. A significant residual impact from the operation phase is anticipated from the permanent loss of habitat designated as part of the AWI. Compensation planting is proposed, however this cannot mitigate for the permanent loss of the biodiversity and intrinsic importance of ancient woodland habitats. As the habitat matures, however, 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 (EclA) 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 publicly available. However, these data will be submitted to SNH, Transport Scotland, and Perth & Kinross Council (PKC).
- 12.1.4 The assessment is derived from a review of available information, including:
- the DMRB Stage 2 assessment (Transport Scotland, 2016a);

- targeted 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 (Highways Agency et al., 1993);
- CIEEM's 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' (Highways Agency et al., 2010) (hereafter referred to as IAN 130/10).

12.2.2 In addition to DMRB 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, 2013a);
- 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 by 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 extents of the proposed scheme, which includes all aspects of the design, as shown on Figure 12.1. This excludes proposed signage locations which lie up to 1km beyond the northern and southern extents of the section to be dualled, as these will require only minor works and are associated with the ongoing works required by the trunk road operating company.

12.2.6 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.

12.2.7 Following consultation with consultees listed in paragraph 12.2.21 and, where relevant, in line with standard survey guidance for protected species, variations were made to the study area. Such variations were ecology feature-specific, according to their sensitivity, mobility and habitat, as described in Table 12.1.

12.2.8 National Biodiversity Network (NBN) desk-based searches extended beyond the study area. Searches were undertaken up to 10km from the existing A9 in order to take into account the highly mobile nature of some species and the level at which some data are available (10km grid square).

Baseline Conditions

Desk-based Assessment

- 12.2.9 The desk-based assessment consisted of a review of existing relevant literature, 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 Environmental Report Addendum (Transport Scotland, 2014a);
 - A9 Dualling Programme, SEA Post Adoption SEA Statement (Transport Scotland 2014b);
 - A9 Dualling Programme, Habitats Regulations Appraisal (HRA), Programme Level Appropriate Assessment (AA) (Transport Scotland, 2015c);
 - survey data from Scottish Badgers (received 2015, 2016 and 2017) (Appendix A12.3: Confidential Ecology Features);
 - data provided by Heritage Environmental Ltd. (HEL) as part of surveys prior to ground investigation works¹ (HEL, 2016); and
 - protected species information from SNH (received 2015) (Appendix A12.3: Confidential Ecology Features).
- 12.2.10 Information for the desk-based assessment was obtained from the following online resources:
- Joint Nature Conservation Committee (JNCC) website (JNCC, 2016a);
 - 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).
- 12.2.11 Data responses from the following also formed part of the desk-based assessment:
- British Trust for Ornithology (BTO);
 - 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 Wildlife Trust;
 - Tayside Bat Group;
 - Tayside Biodiversity Partnership;
 - Tay District Salmon Fisheries Board (TDSFB); and
 - Tayside Raptor Study Group.

¹ Ground Investigation works were undertaken for the A9 dualling programme. Ecology surveys included those for bats and otter (September – October 2016).

Wildcat Assessment Methods

- 12.2.12 A habitat network approach was agreed through consultation with SNH and the Cairngorms National Park Authority (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).
- 12.2.13 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 dry mammal underpasses. 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).
- 12.2.14 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 via dualling works. 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.
- 12.2.15 The above information was used to inform this assessment and identify mitigation required to reduce habitat fragmentation.

Site Surveys

- 12.2.16 Ecology surveys were undertaken as described in Table 12.1 and in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
- 12.2.17 All surveys were undertaken in accordance 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).
- 12.2.18 All surveys were undertaken in 2015 and 2016 (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 undertaken 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	January – October 2015, to cover peaks in badger territorial activity	<p>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 $\geq 50\text{m}$ wide) constrained the survey extent. The grounds of residential properties (gardens of houses) were not surveyed.</p> <p>Field signs indicative of badger presence were recorded and could include:</p> <ul style="list-style-type: none"> • 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, were also recorded (SNH, 2014); and • hairs, prints, mammal paths and dung.
Bat roost surveys	Hundt, 2012 Collins, 2016	June – September 2015 July – October 2016 January – February 2016 (hibernation)	<p>To determine the potential impacts on roosting bats, all buildings, structures (bridges and culverts) and trees within 50m of the proposed scheme were subject to initial ground-based assessment 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 DMRB Stage 3.</p> <p>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 during the optimal period (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. In 2016, following design changes at DMRB Stage 3, new buildings were identified under the footprint where seasonal constraints meant the full complement of surveys (one, two or three) was not always possible.</p> <p>No trees were recorded as having potential for significant roosts (maternity or rare species roosts) within the footprint of the proposed scheme and therefore no trees were subject to further survey.</p> <p>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.</p> <p>In 2016, following design changes at DMRB Stage 3, a small number of new areas were identified within the footprint of the proposed scheme. These were subject to ground-based assessment for roost potential, and limited further roost survey where seasonal constraints allowed. Due to the iterative nature of the design fix process, a small number of additional areas within disturbance distance of the proposed scheme were not subject to survey. Where this was the case, pre-construction surveys (which will be undertaken throughout the proposed scheme) will identify any roosts or other notable features, such that any required mitigation can be implemented to minimise potential adverse impacts.</p> <p>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).</p>

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
Bat activity surveys	Hundt, 2012 Wray et al., 2010 Boonman, 2011 Jacobs, 2014 Adams, 2013	April – October 2015 July – September 2016	<p>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 for their potential to be used as a commuting route for bats at DMRB Stage 2. This 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. Where possible, deployments were spread 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.</p> <p>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).</p> <p>Analysed data produced an index of bat activity (bat passes per night) and the number of species recorded (species richness) at each location. Species which were treated as rare (Wray et al., 2010) were also identified. These results were transformed into an overall activity 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:</p> <ul style="list-style-type: none"> • 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 diversity of bats would be deemed most valuable; and • presence of rare species (as defined in Wray et al., 2010). <p>The overall activity value was calculated by assigning points to each of these three variables and summing the total. Assigning an overall activity 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 activity value was based on approaches used in previous Ecological Impact Assessments (A14 Cambridge to Huntingdon Improvement Scheme, Jacobs, 2014) and adapted from Adams (2013).</p> <p>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.</p> <p>Three 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).</p> <p>In the absence of published industry guidance on criteria for allocating relative activity levels, the same method of assigning activity value as described above was used for the transect data. See Appendix A12.2 (Baseline Data and Detailed Survey Methods) for full details.</p> <p>Where data search, survey or habitat assessment had shown the presence or potential presence of rare and/or cryptic species within 350m of the proposed scheme (Wray et al., 2010) static detectors were deployed for a minimum of four 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 were used to determine the likely presence of a roost for these species, and to determine the importance of these areas for these species.</p> <p>Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).</p>

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
Breeding birds: modified Common Bird Census	Bibby et al., 2000 Highways Agency et al., 2001	July 2015; dawn to noon BST	<p>The Breeding Bird Survey (BBS) methodology was adapted to comprise a single visit in July, in order to cover the large area and gain an indication of the species assemblage present across all habitat types. The survey extended up to 150m from the mainline of the proposed scheme.</p> <p>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.</p> <p>Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).</p>
Otter	Chanin, 2003	February – November 2015 February – March 2016	<p>Otter presence/likely absence, and use of habitats affected by the proposed scheme were surveyed. Surveys were conducted along watercourses considered, by suitably experienced surveyors, to be valuable in terms of potential to support foraging and resting otter, from a minimum of 100m and to a maximum of 250m from the proposed scheme. Surveys extended to 50m from water's edge.</p> <p>Thirteen suitable watercourses (as identified at DMRB Stage 2) were surveyed for otter shelters, which were categorised and photographed. In addition, field signs indicative of otter presence were recorded and could include:</p> <ul style="list-style-type: none"> • spraints, prints, slides or other well-used access points to watercourses; • feeding remains; and • sightings (including wildlife vehicle incidents (WVIs)). <p>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.</p> <p>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.</p>
Water vole	Strachan et al., 2011 Dean et al., 2016	June – November 2015	<p>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. Surveys extended to 2m from water's edge.</p> <p>Ten suitable watercourses were surveyed (as identified at DMRB Stage 2), where habitats were considered valuable, in terms of potential to support water vole populations, by suitably experienced surveyors.</p> <p>Field signs indicative of water vole presence were recorded and could include:</p> <ul style="list-style-type: none"> • droppings and latrines; • a network of bankside burrows (categorised and photographed as appropriate); • feeding signs of neat vegetation piles; and • covered runs through vegetation.
Pine marten, red squirrel and wildcat	Croose et al., 2013 Gurnell et al., 2009 SNH, undated-a	January 2015 – August 2016	<p>Evidence was recorded as incidental sightings/signs found during other habitat and species surveys.</p> <p>Desk-based data, for example data obtained from the assessment for wildcat as detailed in paragraphs 12.2.12 to 12.2.15, were used in combination with the above to assess the potential presence of these species.</p>

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
Reptiles	Edgar et al., 2010 Sewell et al., 2013 Froglife, 1999 Highways Agency et al., 2005	July – September 2015 Eight survey visits with times focused between 08:30-11:00 and 16:00-18:30	Suitable habitats for reptiles located under the footprint of the proposed scheme and within 50m of 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 habitat suitable for reptiles and suitable for undertaking the 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 Reptile Site Status of each site surveyed for reptiles using criteria listed in Table 12.2 and Table 12.3.
Phase 1 habitat surveys	JNCC, 2010	July 2015	Aerial photography provided by Blom (2013) was examined and, in conjunction with professional judgement and knowledge of qualified botanists/habitat specialists of the relevant areas, was used to extend the A9 Dualling Programme route-wide Phase 1 habitat data (Transport Scotland, 2015b) in areas not previously surveyed, to cover areas up to 150m from the proposed scheme. Such gaps arose during the iterative design process from minor alterations to the proposed scheme, and features such as side roads and Sustainable Drainage Systems (SuDS) basins. The Blom data was used in conjunction with professional judgement and knowledge of the relevant areas, and also provided a wider context of habitats up to 500m from the proposed scheme. The need for further field survey was considered, but based on the nature and extent of the data gaps and likely impacts, was deemed not necessary and is not considered a limitation to the assessment.
Phase 2 habitat surveys	Rodwell, 1991-2000 Rodwell, 2006 Averis et al., 2014 Elkington et al., 2001	July 2015	Key areas, likely to be of greater botanical importance, were identified from the A9 Dualling Programme route-wide Phase 1 habitat survey data (Transport Scotland, 2015b). Those key areas, for which an effect pathway was identified, were surveyed with Phase 2 techniques, which included National Vegetation Classification (NVC) assessment where necessary. NVC assessments were carried out in line with the methodology and classification set out in Rodwell's <i>British Plant Communities</i> (Rodwell, 1991-2000) and associated user handbook (Rodwell, 2006), and with reference also to <i>An Illustrated Guide to British Upland Vegetation</i> (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 currently wooded AWI sites within the anticipated Land Made Available (LMA) to the Contractor, areas of permanent loss of terrestrial habitat within the SAC boundary, and the source site proposed for mitigation in relation to the translocation of northern marsh-orchid.
Aquatic Features			
Aquatic Habitat Visual Assessment (including fish habitat suitability)	n/a	March and September 2015	Assessments were undertaken to include water features 150m either side of the existing A9 and additional areas affected by the proposed scheme. Nineteen sites on 16 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: <ul style="list-style-type: none"> • no impact pathway was present; • 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.

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
Macroinvertebrates (aquatic)	Environment Agency, 2012 BS EN ISO 10870:2012	April and November 2015	<p>Surveys were undertaken at three point locations on two representative watercourses (River Tummel/Loch Faskally and one unnamed watercourse(WF64)) within 150m of the existing A9 and affected by the proposed scheme. Sites were chosen for presence of suitable sampling habitat, safe access and for being characteristic of several other watercourses. Standard survey methods (3-minute kick sampling and 1-minute manual searching) were used 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.</p> <p>Metrics calculated from the results of the macroinvertebrate samples were used to give an indication of:</p> <ul style="list-style-type: none"> • Water Framework Directive (WFD) compliant macroinvertebrate classification; • species of conservation importance (CCI Score); • impacts from organic pollution and general degradation; • flow; and • sedimentation. <p>Detailed metrics calculated from the samples are given in Appendix 12.2 (Baseline Data and Detailed Survey Methods).</p> <p>A limitation to the assessment was that two sites, one on the River Tummel and one on Loch Faskally, could not be re-surveyed in autumn due to high water levels. Consequently, the results and classifications for these sites are representative of a single point in time only, which may explain differences between baseline classifications and SEPA classifications.</p>
Freshwater Pearl Mussel (FWPM)	Cosgrove et al., 2007 SNH, undated-b	March – October 2016	<p>A minimum of 600m (100m upstream and 500m downstream), where accessible, was surveyed for FWPM at sites directly affected by the proposed scheme; namely the River Tummel crossing and three of the proposed scheme's indicative outfall locations; as identified through consultation with design teams.</p> <p>Under the crossing point footprint, 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.</p> <p>Where a live FWPM or a dead FWPM shell was found, a 50m x 1m transect was surveyed and all visible FWPM within the transect were counted.</p> <p>Surveys were carried out under SNH licence (number: 18806 and 102467).</p>

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

Table 12.2: Reptile habitat importance criteria

Category	Criteria
Unsuitable *	<ul style="list-style-type: none"> no confirmed reptile presence; and no desirable features in the habitat (Edgar et al., 2010).
Potential	<ul style="list-style-type: none"> no confirmed reptile presence in the target habitat, but reptile presence confirmed in adjacent suitable habitat; or suitable habitat with desirable features.
Presence	<ul style="list-style-type: none"> reptile presence confirmed with a minimum of one individual.
Key Reptile Site (KRS)	<p>To qualify as a KRS, the site must meet at least one of the following criteria (Froglife, 1999) (population scores in Table 12.3):</p> <ul style="list-style-type: none"> support three reptile species; support an exceptional population of one species; or support an assemblage of species scoring at least four. <p>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.</p>

* Unsuitable habitat was screened out during habitat assessment.

Table 12.3: Reptile population densities (numbers refer to maximum number of adults seen in one survey in one hectare with a minimum of ten artificial cover objects (ACO/ha)) (Froglife, 1999)

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

12.2.20 Fish habitat criteria are presented in Table 12.4 (based on Hendry & 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	Optimal 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.
Eel	Adults/elvers (juveniles)	Occurs in all types of freshwaters that are accessible from the sea.

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

12.2.21 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).

12.2.22 The ESG was also consulted on various aspects of the ongoing ecological work and on key potential impacts such as watercourse crossings, including River Tummel and Loch Faskally, and the loss of ancient woodland. Through the ESG, including specialist input from SNH, issues such as the specification for badger- and otter-resistant fencing were agreed. Options for the Tummel Crossing bridge design were presented to the ESG at the December 2016 ESG meeting. Feedback was provided by the consultees.

12.2.23 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 12.2.21 in addition to the following consultees:

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

Public Exhibitions

12.2.24 Through the public exhibition process and associated drop-in sessions, a request was made by local SWT members and PKC that an attempt be made to translocate a population of orchids under the

footprint of the proposed scheme in advance of construction. These orchids had been identified during site surveys as northern marsh-orchid.

Impact Assessment

12.2.25 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.

12.2.26 The importance of a feature was defined using criteria set out in Table 12.6 and paragraphs 12.2.27-12.2.30. Impact characterisation criteria are defined in Table 12.7, and in paragraphs 12.2.32-12.2.33.

Importance

12.2.27 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’ (Highways Agency et al., 2010).

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

12.2.29 The rarity, ability to resist or recover from environmental change, and uniqueness of an ecological feature, functioning/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.

12.2.30 Only important ecological features are subject to impact assessment. Therefore, features that have been identified during the collection of the baseline 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	<p>Ecosystems and Habitats <i>Ecosystems or habitats essential for the maintenance of:</i></p> <ul style="list-style-type: none"> internationally designated areas or undesignated areas that meet the criteria for designation; and/or viable populations of species of international conservation concern. <p>Species <i>Species whose presence contributes to:</i></p> <ul style="list-style-type: none"> 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	<p>Ecosystems and Habitats <i>Ecosystems or habitats essential for the maintenance of:</i></p> <ul style="list-style-type: none"> 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. <p>Species <i>Species whose presence contributes to:</i></p> <ul style="list-style-type: none"> 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	<p>Ecosystems and Habitats <i>Ecosystems or habitats essential for the maintenance of:</i></p> <ul style="list-style-type: none"> communities and assemblages that occur within regionally important sites or localities listed as being of conservation importance in the Tayside Biodiversity Action Plan (BAP) 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. <p>Species</p>

Importance	Criteria
	<p><i>Species whose presence contributes to:</i></p> <ul style="list-style-type: none"> the maintenance and restoration of biodiversity and ecosystems at a regional level, as defined in the Tayside BAP or CNAP.
Authority Area	<p>Ecosystems and Habitats</p> <p><i>Ecosystems or habitats essential for the maintenance of:</i></p> <ul style="list-style-type: none"> populations of species of conservation concern within the authority area. <p>Species</p> <p><i>Species whose presence contributes to:</i></p> <ul style="list-style-type: none"> the maintenance and restoration of biodiversity and ecosystems within a relevant area such as Perth and Kinross within the Tayside BAP, or Aviemore in the CNAP.
Local	<p>Ecosystems and Habitats</p> <p><i>Ecosystems or habitats essential for the maintenance of:</i></p> <ul style="list-style-type: none"> populations of species of conservation concern within the local area (for example a Local Nature Reserve (LNR)). <p>Species</p> <p><i>Species whose presence contributes to:</i></p> <ul style="list-style-type: none"> the maintenance and restoration of biodiversity and ecosystems at a local level.
Less than Local	<p>Ecosystems and Habitats</p> <ul style="list-style-type: none"> Ecosystems or habitats that do not meet the above criteria. <p>Species</p> <ul style="list-style-type: none"> Species that do not meet the above criteria.

12.2.31 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. 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. The impact of transfer of INNS has therefore been assessed in this chapter (Table 12.12). 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) and have also been assessed in Table 12.12.

Impact Characterisation

12.2.32 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).

12.2.33 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

- 12.2.34 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 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, as the assessment only includes features of local importance or above. However, any impact on a SSSI would progress through the assessment process as such sites are designated as nationally important.

- 12.2.35 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 status² of important ecological features. Knowledge and assessment of construction methods and operational activities, together with professional judgement by experienced ecologists with experience of similar large-scale infrastructure projects, has been used to identify the potential impacts of the project on ecological features.

- 12.2.36 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.

- 12.2.37 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.

- 12.2.38 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.

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

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 (CIEEM, 2016).

- 12.2.40 The mitigation measures described within the EclA 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.
- 12.2.41 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 and features as described in this assessment.
- 12.2.42 Mitigation is also designed to produce a net gain for biodiversity where practicable, in line with policy and guidelines (CIEEM, 2016). Further details of relevant policies are provided in Chapter 19: Policy and Plans.

12.3 Baseline Conditions

Desk-based Assessment

Designated Sites

- 12.3.1 Two 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); and
 - Pass of Killiecrankie SSSI (SNH, 2016c) (SNH site code 1274).
- 12.3.2 The Pitlochry to Killiecrankie section of the existing A9 crosses the River Tay SAC site twice: at the southern end of the section where the A9 crosses the River Tummel, and at the Clunie Underbridge where the A9 crosses Loch Faskally. An area of the Pass of Killiecrankie SSSI falls within the study area at the northern end of this section of the existing A9, at a distance of 200m at the closest point.
- 12.3.3 A detailed consideration of the potential effects on the River Tay SAC, a European site, in the context of The Conservation (Natural Habitats, & c.) Regulations 1994 (referred to as the Habitat Regulations), has been undertaken in a Habitat 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 Thirty-nine sites listed on the Ancient Woodland Inventory (AWI) (categories 1a, 2a, 2b and 3) equalling 289ha (SNH, 2008a; undated-c) were identified in the 500m desk-based assessment study area (Figure 12.1). Approximately 64% of the habitat listed on the AWI is Category 2b woodland (long-established woodlands of plantation origin) but there are also smaller areas of Category 1a, 2a (both ancient woodland) and 3 (other woodland on 'Roy' maps³) present. In addition, 89 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 sites are coincident or overlapping with AWI sites.
- 12.3.6 The AWI includes some areas which were previously wooded, but which have since been modified for other uses such as intensive agriculture, or have been developed. Some non-wooded AWI sites could potentially retain remnants of ancient woodland habitats, for example in the soil bank and ground flora.

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/> (accessed January 2017).

Biodiversity Action Plans

12.3.7 The study area is located within the areas covered by the Tayside Local BAP (Tayside Biodiversity Partnership, 2016). The Tayside Local BAP identifies objectives and targets for the conservation of six ecosystems, including the habitats and species present within them, which are:

- Water and Wetland;
- Coastal and Marine;
- Urban;
- Upland;
- Farmland; and
- Woodland.

Terrestrial Habitats

12.3.8 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.

12.3.9 The most widespread habitat type by area was woodland, accounting for nearly half the area, followed by agricultural and amenity grassland. Habitats found in lesser extents included arable, scrub, ruderal habitats, and bare ground.

12.3.10 Woodland habitats include coniferous, broadleaved and mixed woodlands. An example of plantation conifer woodland, with an area of felled trees, is shown in Photograph 12.1.

Photograph 12.1: Plantation conifer woodland north of Craiglunie, with areas of thinning and windthrow evident



12.3.11 Parcels of habitats that have the potential to 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 The River Tummel is the main watercourse in the area and runs parallel to the existing A9 throughout the length of the proposed scheme, transitioning into Loch Faskally at Pitlochry Dam. It is also joined by the River Garry at the upstream end. There are a further 14 smaller watercourses within the study area 150m either side of the existing A9: Allt an Aghastair and 13 unnamed, which are crossed by or beside the existing A9. The watercourses considered for aquatic ecology do not include minor ephemeral drains, which are discussed in Chapter 11 (Road Drainage and the Water Environment). Loch Dunmore and two unnamed ponds were also identified within the ecology and nature conservation study area. One of the unnamed ponds, located at Overton of Fonab, was scoped out for survey due to being artificial.
- 12.3.13 Loch Faskally and the sections of the River Tummel and River Garry within the proposed scheme have been classified by SEPA as part of the River Basin Management Plan (RBMP) and all are classified as having Good Ecological Potential (SEPA, 2016). Whilst the RBMP was published in 2016, the most recent classifications are from the 2015 monitoring cycle.
- 12.3.14 The River Tummel, including Loch Faskally, and the River Garry, up to the confluence with Errochty Water, form part of the River Tay SAC, which has been designated for otter, Atlantic salmon, and three species of lamprey, in addition to clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels (SNH, 2016b).
- 12.3.15 Consultation with SSE confirmed that Loch Faskally is deep (20m) with steeply sloping sides and large amounts of silt (A. Stephen, pers. comm., 26 April 2016).
- 12.3.16 Many of the smaller unnamed watercourses in the study area are of limited value to aquatic species due to their small size and impassable culverts.

Protected Species

- 12.3.17 Data obtained during the desk-based assessment, as described in paragraphs 12.2.9 to 12.2.15, and the results of field work carried out for the DMRB Stage 2 assessment (Transport Scotland, 2016a), identified the potential presence of the following protected species within the study area:
- badger: Scottish Badgers provided records in 2015, 2016 and 2017 of badger presence in the study area and setts were recorded during DMRB Stage 2 assessment (Transport Scotland, 2016a);
 - bats: six trees and 19 buildings with high roost potential were identified during DMRB Stage 2 Assessment (Transport Scotland, 2016a). Locations of four roosts in trees within 50m of the proposed scheme were identified during surveys undertaken by HEL prior to ground investigation works (HEL, 2016);
 - beaver: records from NBN from 2012 onwards, and potential beaver woodland, including some potential core beaver woodland, has been identified within the study area (SNH, 2015). Potential beaver woodland has certain characteristics in terms of habitat, location and gradient of water, whilst potential core woodland has additional characteristics and are those areas predicted as most likely to be utilised as part of a territory due to their size and connectivity;
 - bird species on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended): records of Schedule 1 species within the study area were provided by the TRSG, RSPB and BTO (received 2015 and 2016);
 - breeding birds: suitable habitat was recorded during DMRB Stage 2 assessment, notably in woodland, agricultural grassland and scrub (Transport Scotland, 2016a). RSPB consultation data (received 2015 and 2016) included records within 2km of the proposed scheme;
 - breeding and wintering birds: species recorded during the BTO Atlas 2007-2011 in two 10km² grid squares which cover the study area (received 2016);
 - black grouse: a review of RSPB data (received 2016) from the past ten years identified no records of black grouse within 2km of the proposed scheme;

- otter: evidence recorded during DMRB Stage 2 assessment (Transport Scotland, 2016a). Holt monitoring undertaken by HEL prior to ground investigation works identified seven holts (HEL, 2016);
- pine marten: NBN (2016) records of pine marten within the study area. In a recent study, the species was considered to be expanding its range in Tayside (Croose et al., 2014);
- red squirrel: records noted within the study area (Transport Scotland, 2015b). During DMRB Stage 2 assessment six sightings, a drey and an anecdotal record of the species were noted (Transport Scotland, 2016a);
- reptiles: common lizard was recorded during DMRB Stage 2 site surveys (Transport Scotland, 2016a). Adder and slow worm have been recorded within 10km of the existing A9 (NBN, 2016). DMRB Stage 2 assessment walkover surveys in 2015 indicated some suitable habitat for all three species (Transport Scotland, 2016a);
- water vole: the species is undergoing widespread decline (SNH, 2016d) and NBN (2016) indicates no records within 10km radius of the existing A9 from within the past 30 years. No field signs recorded during DMRB Stage 2 assessment, although suitable habitat was identified (Transport Scotland, 2016a);
- Atlantic salmon: TDSFB (A9 ESG, 2015) advise that the species is found throughout the River Tay catchment, and suitable habitat was identified in the River Tay catchment during site surveys (Transport Scotland, 2016a). The River Tay SAC has favourable conservation status for Atlantic salmon (Rivers and Fisheries Trusts of Scotland, 2014). Approximately 600,000 hatchery-reared ova and fry are stocked at various locations throughout the Tay catchment each year (TDSFB, 2016). Although none of the stocking locations are currently within the study area it is possible that stocked fish make a contribution to the Atlantic salmon population within the study area;
- freshwater pearl mussel: data provided by SNH (received January 2016, June 2016) indicated that FWPM have been recorded in the study area;
- river, brook and sea lamprey: records of lamprey species including sea lamprey within the study area and considered as having favourable conservation status within the River Tay SAC (Watt et al., 2008). Suitable habitat identified in River Tay catchment during DMRB Stage 2 assessment (Transport Scotland, 2016a). D. Summers, at TSDFB, confirmed sea and river lamprey cannot pass Pitlochry Dam (D. Summers, meeting with Jacobs, 25 November 2015);
- trout (brown/sea): TDSFB (TDSFB, 2009) state that trout are present throughout the study area, and suitable habitat was identified in the River Tay catchment during DMRB Stage 2 assessment (Transport Scotland, 2016a); and
- European eel: suitable habitat was identified in the River Tay catchment during DMRB Stage 2 assessment (Transport Scotland, 2016a). SSE confirmed that eel cannot pass the Pitlochry Dam (A. Stephen, pers. comm., 26 April 2016).

Wildcat

- 12.3.18 As shown on Figure 12.3, the Wildcat Habitat Suitability Model (Bryce and Mattisson, 2012) shows extensive areas around the proposed scheme which are suitable as: cover habitat for wildcats; moorland and grassland prey habitats; and habitats through which wildcat can move. Large areas of cover habitat are found north of Loch Faskally on either side of the existing A9. Prey habitat and habitats suitable for wildcat to move through are distributed throughout the proposed scheme, particularly around Pitlochry, between Dunfallandy and Middleton/Overton of Fonab, and at Dalshian. Current permeability across the existing A9 is classified as 'good' or 'possible' at regular intervals of at least approximately 1.2km along the road.
- 12.3.19 Movement of wildcat east and west is likely restricted, but not prevented entirely, by the natural barrier presented by the River Tummel and Loch Faskally, which run parallel to the existing A9 along much of the length of the proposed scheme. The close proximity of the road, river and railway line result in mostly relatively small strips of suitable habitat in the study area.
- 12.3.20 CNPA's records (Hetherington and Campbell, 2012) indicate confirmed wildcat to the north of Blair Atholl, the closest record being 7.5km to the north of the proposed scheme.

Other Species of Interest

CNPA Priority Non-protected Species

- 12.3.21 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).
- 12.3.22 The A9 dualling programme route-wide Phase 1 habitat survey data (Transport Scotland, 2015b) was used to highlight areas where key and draft 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.
- 12.3.23 One habitat with confirmed records of key species and priority non-protected species was identified; a pond northwest of the existing Clunie Underbridge had records of northern damselfly and amphibians.

Deer

- 12.3.24 Deer have been recorded in the study area and were sighted incidentally during DMRB Stage 2 assessment (Transport Scotland, 2016a). They are not legally protected for nature conservation reasons; although roe deer are listed on the Tayside BAP protected species list (Tayside Biodiversity Partnership, 2016). They are of concern to the project due to vehicle collisions and their protection under animal welfare legislation.

Invasive Non-Native species (INNS)

- 12.3.25 INNS present a threat to biodiversity (Department for Environment, Food & Rural Affairs (DEFRA), 2015). Japanese knotweed was recorded in the study area during the A9 Dualling Programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b). Rhododendron and cotoneaster were also identified within the study area during site surveys. Further details are provided in Table 16 of Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Grayling

- 12.3.26 Grayling have been recorded in the River Tummel and in Loch Faskally (The Grayling Society, 2015). Grayling are listed on Annex V of Council Directive 92/43/EEC but are not considered native to Scotland and therefore are not considered further in this assessment. Other than being licensed for angling, they are not subject to any conservation measures. Their habitat requirements and life cycle are broadly similar to other salmonids, thus mitigation for Atlantic salmon and trout would mitigate potential impacts on grayling.

Site Surveys

Terrestrial Features

Badger

- 12.3.27 Four outlier setts were recorded within the study area, as well as dung pits (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 Ecological Features).

Bat Roost Surveys

- 12.3.28 Four buildings and one structure within 50m of the proposed scheme were found to contain a combination of possible maternity roosts, summer roosts and transitional roosts. A suspected feeding perch was also identified at one of the buildings. All five roosts are shown on Figure 12.5. No confirmed roosts in trees were identified within 50m of the proposed scheme. Please see Appendix A12.2 (Baseline Data and Detailed Survey Methods) for full survey results.

- 12.3.29 Hibernation surveys were undertaken at two structures (BS 4.4 and BS 4.7). No evidence of bats was found during ground-based inspections, and these surveys did not identify the presence of bats within the structures. Please see Appendix A12.2 (Baseline Data and Detailed Survey Methods) for further information.

Bat Activity Surveys

- 12.3.30 Four structures (BS 4.1, BS 4.7, BS 4.11 and BS 4.20) were identified to have an overall value of high (Collins, 2016). Two had 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).
- 12.3.31 Two transects had an overall activity value of moderate, and one of low (Table 8 in Appendix A12.2: Baseline Data and Detailed Survey Methods), as shown on Figure 12.6.
- 12.3.32 As described in Table 12.1, cryptic species are those with similarities in echolocation to other bat species, and species with echolocation calls which are more difficult to detect. Of the two sites for which cryptic species overall activity was assessed, Loch Dunmore had an activity value of high and no cryptic species were recorded at Loch Faskally (Table 10 in Appendix A12.2: Baseline Data and Detailed Survey Methods) and as shown on Figure 12.6.

Breeding Birds

- 12.3.33 In total, 389 records of birds were logged during site surveys. Of these, 244 represented breeding records (birds recorded nesting, singing, acting territorially and in family groups). A total of 43 species were recorded during the site surveys, of which 29 species were confirmed to have bred. A complete list of species recorded as breeding is shown in Table 11 in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
- 12.3.34 Of the 29 breeding species identified during site surveys, eight were listed as birds of conservation concern, either red-listed or amber-listed (Eaton et al., 2015), as shown on Figure 12.7. Six species were listed on the Scottish Biodiversity List (SBL) (Scottish Government, 2013), 11 on the Tayside Local BAP (Tayside Biodiversity Partnership, 2016) and one species, common crossbill, is on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). Further information is provided in Table 11 of Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Incidental Bird Records

- 12.3.35 Incidental evidence of barn owl (a Schedule 1 species) was recorded in April 2015 during surveys for other species, as detailed in Table 8 in Appendix A12.3 (Confidential Ecological Features).

Otter

- 12.3.36 Seven holts 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 provided in a confidential appendix to the authorities listed in paragraph 12.1.3 (Appendix A12.3: Confidential Ecological Features).

Water vole

- 12.3.37 During DMRB Stage 3 site surveys no field signs of water vole were recorded. Suitable habitat was identified along two watercourses (WF61 and WF69, at Middlehaugh of Dalshian, and Clunie-Foss underbridge, respectively) (Table 12, Appendix A12.2: Baseline Data and Detailed Survey Methods).

Pine Marten, Red Squirrel and Wildcat

- 12.3.38 Incidental recordings of evidence of red squirrel are detailed in Table 13 in Appendix A12.2 (Baseline Data and Detailed Survey Methods). There were 12 sightings of red squirrel, one on an infra-red camera recording, as well as one drey and two possible dreys (Figure 12.9). No incidental recordings of pine marten or wildcat were made.

Reptiles

- 12.3.39 Following assessments of habitat suitability, two sites were identified as potentially suitable for reptiles and were selected for artificial cover object (ACO) and walkover surveys, as shown in Figure 12.10.
- 12.3.40 Reptile presence was confirmed at both sites; one adult common lizard at Site 1 and eleven juvenile common lizards at Site 2. However, neither site was categorised as a Key Reptile Site (KRS) or Local KRS (whereby a small area or individual habitat within a large reptile survey area is identified as a KRS, as described in Table 12.2). Results of the reptile surveys conducted are presented in Table 14 in Appendix A12.2 (Baseline Data and Detailed Survey Methods). Photograph 12.2 shows a juvenile common lizard found in the study area (see Table 14, Appendix A12.2: Baseline Data and Detailed Survey Methods).
- 12.3.41 In addition, incidental sightings along the proposed scheme confirmed reptile presence in locations not included in surveys (Table 15, Appendix A12.2: Baseline Data and Detailed Survey Methods). Incidental and ACO survey results were used to establish the Reptile Site Status (Figure 12.10). Three areas were identified as Presence habitat.

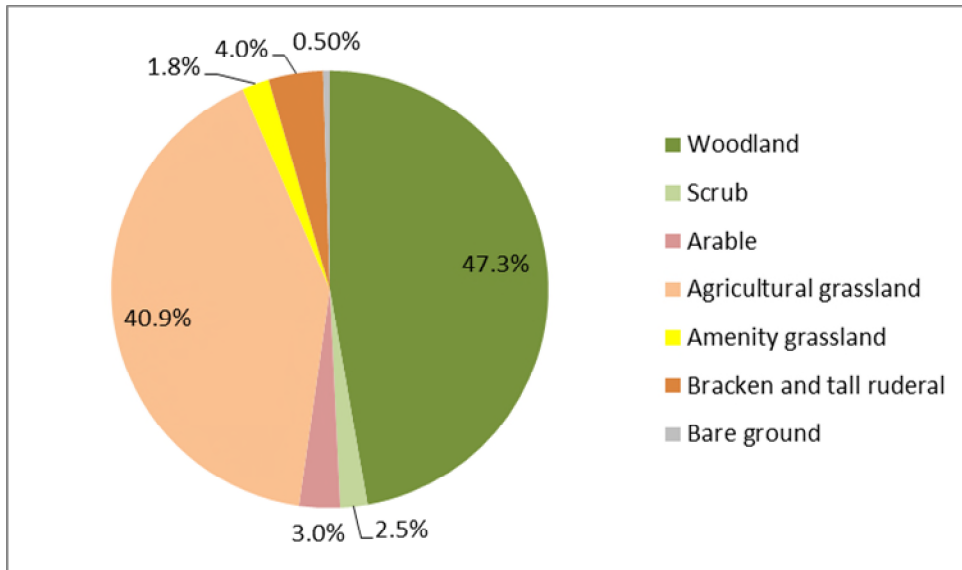
Photograph 12.2: Juvenile common lizard found in Site 2



Phase 1 Habitat Surveys

- 12.3.42 Diagram 12.1 summarises all habitats identified within 150m of the existing A9, and considers data recorded during Phase 1 habitat surveys (Transport Scotland, 2015b) and complemented with Blom (2013) data (Figure 12.11). 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



12.3.43 Grassland and woodland together accounted for approximately 90% of the area. The remaining 10% comprised arable, scrub, ruderal habitats and bare ground.

12.3.44 Northern marsh-orchid (Photograph 12.3) was recorded in a number of locations within the study area. Although not an exhaustive list, incidental records of the species were made south of Tummel Crossing, north and northeast of Middleton of Fonab, behind the Festival Theatre carpark in Pitlochry, and at Pitlochry North junction.

Photograph 12.3: Northern marsh-orchid recorded within the study area, on the road verge, north of Middleton of Fonab.



12.3.45 Relevant target notes (Transport Scotland, 2015b) are provided in Table 16 in Appendix A12.2 (Baseline Data and Detailed Survey Methods), and shown on Figure 12.2.

Phase 2 Habitat Survey

12.3.46 Phase 2 habitat surveys were undertaken at: AWI sites that had the potential to be impacted by the proposed scheme; terrestrial areas within the River Tay SAC boundary to be permanently lost; and the source sites identified for mitigation in relation to the translocation of northern marsh-orchid. Habitat descriptions are provided in Table 17 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and are shown on Figure 12.11. Target notes from the survey of the translocation source site and incidental records of northern marsh-orchid, are provided in Table 18 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and are shown on Figure 12.11.

Aquatic Features

Aquatic Habitats Visual Assessment

- 12.3.47 Walkover surveys were undertaken in March 2015 with an additional site surveyed in September 2015 (WF77). An artificial pond, WF66A was assessed from information gathered during other surveys and it was determined to require no further ecological assessment. Water features are characterised in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
- 12.3.48 Habitat assessments were undertaken on Loch Dunmore and one unnamed pond (WF72) (Figure 12.12). Both ponds are within the Faskally Forest and the unnamed pond was heavily shaded and shallow, with a silt and organic matter substrate. Loch Dunmore is heavily managed for local anglers and is largely ornamental. Neither pond was considered suitable for further survey due to poor quality habitat (WF72) and being a managed system (Loch Dunmore).
- 12.3.49 The results of the walkover surveys were used to generate an overall ecological value for each watercourse, illustrated in Figure 12.12.

Fish

- 12.3.50 Habitat suitable for all life stages of salmon and trout was present throughout the main stem of the River Tummel. Habitat suitable for adult and spawning lamprey was present throughout the Tummel but areas of silt suitable for juveniles was limited between the Tummel Crossing and the Pitlochry Dam; juveniles have been found in sub-optimal areas in this section of the River Tummel (Watt et al., 2008). Salmonid fry, parr and adults were seen in the River Tummel during FWPM surveys and an incidental sighting of a juvenile lamprey was recorded downstream of the Tummel Crossing, outside the survey area. Areas of habitat for European eel were present throughout.

Macroinvertebrates

- 12.3.51 Detailed results of the macroinvertebrate surveys are given in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and WFD classifications calculated from the samples are displayed on Figure 12.12.
- 12.3.52 The results from the macroinvertebrate surveys indicated that the unnamed tributary (WF64) was in very good condition, and no impacts from organic pollution, flow or fine sediments were evident.
- 12.3.53 The composition of the macroinvertebrate community observed in the River Tummel site indicated that the river was impacted by environmental stress, but despite a reduction in diversity some pollution-intolerant families were still present.
- 12.3.54 The results for Loch Faskally indicated that it is impacted by slow flows and is heavily sedimented. These results are expected due to the impoundment created by the Pitlochry Dam.

Freshwater Pearl Mussel

- 12.3.55 Results of the FWPM surveys are provided in a confidential appendix to the authorities listed in paragraph 12.1.3 (Appendix A12.3: Confidential Ecological Features).

Evaluation

- 12.3.56 The legal status and conservation status of ecological features within the study area is provided in Table 12.8, along with a short justification for the assigned conservation importance of each feature. The evaluations take into account baseline conditions and utilise 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.
- 12.3.57 Deer and INNS were scoped out from ecological evaluation as explained in paragraph 12.2.31.
- 12.3.58 No locally important features were noted in the desk-assessment or field surveys.

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

- Pass of Killiecrankie SSSI at NN 917 624 (SNH, 2016c), although nationally important no effects pathway was identified from the proposed scheme. Designated under the Nature Conservation (Scotland) Act 2004, it lies predominantly to the north and uphill of this section of the proposed scheme and is also on the far side of the B8079 and railway.
- Scottish wildcat, internationally important, in decline and protected under the Conservation (Natural Habitats &c.) Regulations 1994 (as amended), however there is no data to indicate presence in the study area. The Wildcat Habitat Suitability Model shows extensive wildcat cover habitat to the south and the north east of the proposed scheme, however natural barriers to movement (the River Tummel and Loch Faskally), and the urban area of Pitlochry, reduce the likelihood of wildcat presence close to the proposed scheme. Current permeability across the A9 into Faskally Wood is only facilitated by the span underneath the existing Clunie Underbridge. Due to the high level of human activity throughout Faskally Wood, it is considered unlikely that wildcat would be present due to the disturbance created.
- Water vole, regionally important and protected under the WCA. Suitable habitat was present along two watercourses based on DMRB Stage 2 assessment, but no evidence of the species was identified in the study area during the DMRB Stage 3 field surveys.
- Slow worm and adder, regionally important and protected under the WCA. Desk study data reported presence within 10km of the existing A9, and DMRB Stage 2 assessment indicated some suitable habitat in the study area, however DMRB Stage 3 field surveys did not report presence in the study area.
- Black grouse, red-listed Species of Conservation Concern (Eaton et al., 2015), and listed on the SBL and Tayside BAP protected species list. Data received through the consultation process identified no records of black grouse from the past ten years within 2km of the proposed scheme (RSPB, received 2016).
- CNPA priority non-protected species, pond with northern damselfly and amphibians. Northern damselfly is also listed on the SBL and is a protected species on the Tayside LBAP, and has been identified as undergoing decline due to loss of suitable habitat and climatic pressures. The pond will not be impacted by the proposed scheme and no effects pathway was identified.

Table 12.8: 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). WFD watercourse. Listed as a key site in the Tayside BAP (Water and Wetland Ecosystems).	Statutory designated site within the study area likely to be affected by the proposed scheme. All life stages of salmonids and lamprey present.	Designated for its clear-water lakes, Atlantic salmon, river lamprey, brook lamprey, sea lamprey and otter.	International
Ancient woodland Categories: ancient of semi-natural origin (1a and 2a); long established of plantation origin (2b) and other (3; on Roy map)	SBL priority habitat (including a variety of semi-natural broadleaved woodland types). Some areas fit the criteria for designation as Tayside BAP priority habitats.	Approximately 289ha of woodland listed on the AWI falls within the study area, of which 47% is category 1a or 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 which may retain biodiversity value. SNH has asked that all AWI sites, whether they currently support ancient woodland or not, be treated as protected (Transport Scotland, 2015b).	National
Habitats and Ecosystems				
Broadleaved, mixed or coniferous semi-natural woodland (not AWI)	Lowland mixed deciduous woodland, native pine woodlands, upland birchwoods, upland mixed ashwoods and upland oakwoods are listed in the SBL. Lowland mixed broadleaved woodland and wet woodland are listed as priority habitats in the Tayside BAP (Woodland Ecosystems).	Areas of non-AWI semi-natural woodland, including NWSS sites, occur across the study area (Diagram 12.1 and paragraphs 12.3.8 to 12.3.11).	This habitat can provide important habitat for species such as pine marten and red squirrel.	Regional
Broadleaved, mixed or coniferous plantation woodland (not AWI)	Lowland mixed deciduous woodland, upland birchwoods, upland mixed ashwoods and upland oakwoods are listed in the SBL. Planted coniferous woodlands and lowland mixed broadleaved woodland are listed as priority habitats in the Tayside BAP (Woodland Ecosystems).	Areas of non-AWI plantation woodland, including NWSS sites, occur across the study area (Diagram 12.1 and paragraphs 12.3.8 to 12.3.11).	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.	Regional
Allt an Aghastair and unnamed watercourses	Listed as priority habitat in the Tayside BAP (Water and Wetland Ecosystems).	Up to 1m wide and 5-10cm deep with mixed sand, gravel and pebble substrate, flowing through woodland and into the main river. Regionally notable macroinvertebrate species present in the sampled watercourse.	Flow into River Tay SAC but provide no suitable fish habitat.	Authority area

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Species				
Atlantic salmon	Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Schedule 3 species under the Conservation (Natural Habitats &c.) Regulations 1994 (as amended). Listed under Annex II and V of Council Directive 92/43/EEC. A qualifying feature of the River Tay SAC. Listed on the SBL and as a key species in the Tayside BAP.	Suitable habitat for all life stages available. Present throughout the River Tummel.	Species of conservation importance found in the River Tummel. Host species for FWPM. Favourable conservation status for both adults and juveniles in River Tay SAC (Rivers and Fisheries Trusts of Scotland, 2014).	International
Lamprey species	Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Listed under Annex II and V of Council Directive 92/43/EEC. A qualifying feature of the River Tay SAC. Listed as protected species under the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) Schedule 3 (river lamprey only). Listed on the SBL and on the Tayside BAP protected species list.	All species present in the River Tummel below Pitlochry Dam, brook lamprey also present above Pitlochry Dam. Adult and spawning habitat available, juvenile habitat limited with sub-optimal areas being used by juveniles (Watt et al., 2008).	Species of conservation importance found in the River Tummel. Favourable conservation status for River Tay SAC (Watt et al., 2008).	International
Brown trout/sea trout	Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Brown trout listed on the Tayside BAP protected species list and sea trout listed on the SBL.	Found throughout the River Tummel.	Species of conservation importance found in the River Tummel. Host species for FWPM.	International
European eel	Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. European Commission (2007) Council Regulation (1100/2007/EC) Establishing measures for the recovery of the stock of European eel. Listed on the SBL.	Suitable habitat present below the Pitlochry Dam.	Widespread in Tay catchment below dam at Pitlochry. Has undergone major decline in numbers. Listed Critically Endangered on International Union for Conservation of Nature (IUCN, 2016) Red List.	International

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Freshwater pearl mussel	Schedule 5 of the WCA. Listed on the SBL and as a key species in the Tayside BAP. Listed under Annex II and V of Council Directive 92/43/EEC. Critically Endangered based on the International Union for Conservation of Nature 2001 guidelines (JNCC, 2016b).	Full survey results are detailed in Appendix A12.3 (Confidential Ecological Features).	Critically Endangered species known to be present in the Tay catchment.	International
Otter	European Protected Species (EPS) under the Conservation (Natural Habitats &c.) Regulations 1994 (as amended). A qualifying feature of the River Tay SAC. Listed on the SBL and as a key species in the Tayside BAP.	Fourteen lying-up sites (holts and couches) were identified in the study area. Otter spraint and prints were also recorded (Figure 12.8). Full survey results are detailed in Appendix A12.3 (Confidential Ecological Features). No resting sites were situated directly under the proposed scheme.	The study area is a key stronghold for this species which is known to be at carrying capacity (i.e. maximum population size of the species that the environment can sustain indefinitely taking account of food, habitat availability, etc.) in the study area.	International
Badger	Protection of Badgers Act 1992 (as amended). Listed on the Tayside BAP protected species list.	Four outlier setts were recorded within the study area, as well as field signs (dung pits) (Figure 12.4). Full survey results are detailed in Appendix A12.3 (Confidential Ecological Features). No setts were situated directly under the proposed scheme.	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
Bats (all species)	All UK bat species are EPS under the Conservation (Natural Habitats &c.) Regulations 1994 (as amended). All nine species that occur in Scotland are listed on the SBL and as key species in the Tayside BAP.	Four confirmed roosts are under the footprint of the proposed scheme; one in a structure, and three in buildings. One further confirmed roost is within 50m of the proposed scheme, within a building. Four structures had an overall activity value of high, two a value of moderate, and two an overall activity value of low. Two transects had an overall activity value of moderate, and one low. One site had a cryptic species overall activity value of high, and the other had none. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	The majority of the species recorded within the study area and 10km from the existing A9 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 to 100,000.	Regional
Beaver	At present the species is not legally protected. However, legal protection is expected to be in place by 2018 (SNH, 2017).	Records from NBN from 2012 onwards, 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 BAP 'Water and Wetlands Actions Schedule' includes an Action to explore the implications of the species in river catchments.	Regional

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
Breeding birds	Species of Conservation Concern (Eaton et al., 2015). Species listed on the SBL and on the Tayside BAP protected species list. Linnet, house sparrow and swallow listed as key species in Tayside BAP. Schedule 1 of the WCA.	A total of 43 species were recorded during the site surveys, of which 29 species were confirmed to have bred. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods). A further 45 species were recorded during the BTO Atlas 2007-2011 surveys, including breeding and wintering records. RSPB (2015, 2016) data indicated breeding records of a further two species of conservation concern. Records of the Schedule 1 species common crossbill recorded during surveys are detailed in Confidential Appendix A12.3 (Confidential Ecological Features).	Of the 29 breeding species identified during site surveys, eight are listed as species of conservation concern, either red-listed or amber-listed, six are listed on the SBL, 11 are listed on the Tayside BAP protected species list, and one species on Schedule 1 of the WCA. Of the 45 additional species not recorded during site surveys, 27 are listed as species of conservation concern, either red-listed or amber-listed. RSPB data included one red-listed and one amber-listed species, both of which are listed on the SBL and on the Tayside BAP.	Regional
Pine marten	Schedule 5 of the WCA. Listed on the SBL and as a key species in the Tayside BAP.	Desk study records within the study area and the species is expanding its range in Tayside (Croose et al., 2014).	Pine marten have been recorded within the study area. 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 BAP.	There were twelve incidental sightings of red squirrel, as well as one drey and two possible dreys. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	Red squirrel is widespread within most parts of Scotland, although there has been widespread decline in population and range. The species has been recorded within the study area. Priority woodland has been identified at Faskally (NN 932 552).	Regional
Common lizard	Schedule 5 of the WCA. Listed on the SBL and a key species in the Tayside BAP.	Reptile presence was confirmed at two sites, though neither was categorised as a Key Reptile Site. Three further sightings were made as incidental surveys. 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.	Authority area
Northern marsh-orchid	Listed as a key species in the Tayside BAP.	Species recorded incidentally in a number of locations within the proposed scheme. Records are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	Listed in the Vascular Plant Red Data List for Great Britain (Cheffings and Farrell, 2005) as of Least Concern but with 25% of the European and world populations in the UK. Relatively widespread in Scotland.	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 12.12 (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 nitrogen deposition is unlikely to give rise to significant effects on the SAC. Effects associated with changes in air quality and nitrogen deposition on the River Tay SAC are therefore not considered further in this assessment.
- 12.4.5 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.
- 12.4.6 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

- 12.4.7 Impacts may be incurred as a result of the construction of two major structures that cross watercourses as part of the proposed scheme, namely the Tummel Crossing and new Clunie Underbridge over Loch Faskally.
- 12.4.8 The detailed construction methods and programme for both structures are necessarily still under detailed development. For the purposes of this impact assessment, a precautionary approach has been taken, with timescales and land take areas quoted as the largest expected. A summary of the construction methods expected to be used for each structure is provided within Appendix A5.1 (Construction Information).

Tummel Crossing

- 12.4.9 A new crossing will be constructed adjacent to the existing crossing at the River Tummel for the northbound carriageway. The existing structure will be retained as the southbound carriageway. The new structure will be a 'bowstring' design, and will be clear-span across the River Tay SAC. During construction, temporary piers will be required, which will be within the SAC on the south side.
- 12.4.10 Two options were considered for the construction of the Tummel Underbridge:
- Option 1: slide the bridge into place on a temporary launching system; and
 - Option 2: lift the bridge in pieces onto temporary supports.
- 12.4.11 Both options require the temporary support systems. In both cases no structures would be located within the main channel of the River Tummel, but would be positioned within the terrestrial (high-flow) area of the River Tummel within the River Tay SAC boundary. The footprint(s) of the temporary supports would be of a similar magnitude.

- 12.4.12 The temporary supports would comprise a large concrete foundation with a steel supporting system for the arch. The foundation blocks would be constructed *in situ* prior to the construction of the supporting system and would be removed once construction was complete. The existing shingle would be removed to create a firm footing for the supports. To limit the risk to these temporary structures, their construction and use would most likely take place during the period of lower flows in the River Tummel i.e. the summer months. It is likely that some form of bunding would be required to protect the foundations during their construction from inundation during high water events. However, this would be removed once works are completed.
- 12.4.13 The construction of the new 'bowstring' arch structure is anticipated to last approximately 21 months, with approximately a further three months for the refurbishment of the existing bridge, following transfer of traffic to the new structure.
- 12.4.14 The temporary support pier on the south side will be sited within an area of 0.33ha of the SAC, and not in the water at normal flows. The actual footprint of the temporary support is likely to be less than this but the worst case scenario has been assumed for the assessment. Indicative designs for the temporary supports show an area within the River Tay SAC of approximately 100-200m² (0.01-0.02ha).
- 12.4.15 All works will be undertaken outwith the watercourse at normal flows. The temporary support structure may require sheet piling for scour protection due to its location in the SAC.

Clunie Underbridge

- 12.4.16 At Clunie Underbridge, where the proposed scheme crosses Loch Faskally, the existing crossing will be retained as the northbound carriageway, and a new crossing constructed adjacent to it to accommodate the southbound carriageway. The piers will align with those of the existing structure, and will be within the terrestrial part of the River Tay SAC on the northern side.
- 12.4.17 The size of the pier foundations for the new structure cannot be finalised at this stage of the project, however the structure is expected to be similar in nature to the existing structure's pier foundations, but wider to accommodate the wider deck, the dimensions would be of the order of 60m² (north abutment, within the SAC) and 90m² (south abutment, outwith the SAC).
- 12.4.18 The duration of work in the area of the pier foundations is likely to be of the order of four months.
- 12.4.19 Potential impacts associated with the construction of the two major structures above are detailed within Table 12.12. The impact assessment and mitigation are provided in line with the information available at present.
- 12.4.20 Other potential construction impacts throughout the proposed scheme 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, 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

- 12.4.21 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 the footprint of the proposed scheme;

- fragmentation and severance of habitats;
- pollution from road run-off; and
- hydrological changes from run-off and structures.

12.5 Mitigation

Introduction

- 12.5.1 Mitigation will follow a hierarchical approach, in the following order (CIEEM, 2016; SNH, 2013a):
- 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 European, UK, Scottish and local government environmental impact, planning and sustainability policies. Where these impacts can be fully mitigated they would not be considered to be 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 and best working practice (e.g. mitigation of potential pollution impacts through adherence to standard best practice and guidelines, such as SEPA Guidance for Pollution Prevention (GPP) (SEPA, 2017)) (Table 12.12).
- 12.5.5 Potential significant ecological impacts as shown in Table 12.12 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 ('P04' 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; reduce impacts on aquatic environments; and avoid 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 two levels of treatment via sustainable drainage systems (SuDS). Tier 3 accesses (private and/or agricultural accesses) will be treated via 'over the edge' drainage that will be dispersed over vegetation with subsequent infiltration into groundwater.
- 12.5.9 The water quality and geomorphological design of SuDS features are discussed in Chapter 11 (Road Drainage and the Water Environment). Table 11.19 of Chapter 11 sets out the treatment levels that are proposed and have been agreed with SEPA.

Ecological Clerk of Works

- 12.5.10 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 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 safe-guarding and ecological mitigation requirements (**Mitigation Item SMC-E2**).

Construction

- 12.5.11 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, e.g. pre-construction surveys and monitoring, are not mitigation in isolation, but their implementation will be required for licencing and for compliance with legislation. 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 12.10 and in Table 21.6 in Chapter 21 (Schedule of Environmental Commitments).
- 12.5.12 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**).
- 12.5.13 Certain activities during construction will trigger the need for a 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 in Table 12.9, and the need for a derogation licence for work taking place within this distance will be assessed by an ecologist.

Table 12.9: Protection zones for protected species⁴

Species	Non-breeding Protection Zone	Protection Zone of a Proven Breeding Location	Suggested Protection Zone for Specific Activities***
Otter	30m	200m	100m
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.

*** Specific activities include high noise/vibration activities such as pile driving or blasting.

- 12.5.14 Based on the current baseline the following derogation licences will be required:
 - otter: disturbance licences for seven holts and six couches;
 - badger: disturbance licences for two outlier setts; and
 - bats: disturbance licences for seven known roosts and destruction licences for four known roosts.
- 12.5.15 In accordance with **Mitigation Item SMC-S1** the CEMP will include an Ecological Management Plan which will contain Species and Habitat Management Plans. These will be prepared and developed by the Contractor from the mitigation and environmental commitments identified in this assessment (Table 12.10), for example:

⁴ Indicative distances provided by SNH, with the exception of bats and beaver, for which notes are provided.

- 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.
- 12.5.16 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.
- 12.5.17 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.
- 12.5.18 As part of the Species Protection Plan for FWPM a Silt Control Management Plan (SCMP) will be produced, taking into consideration the following recommended mitigation:
- controls for site runoff and sedimentation (**Mitigation Item SMC-W3**), appropriate storage of oils and fuels and spill response (**Mitigation Item SMC-W7**) and regular inspection and monitoring of receiving water features;
 - the use of silt curtains around FWPM which have the potential to be impacted by sediment release;
 - regular monitoring and sampling for suspended solids concentrations during construction (in conjunction with **Mitigation Item P04-W20**). Samples will be taken from fixed locations up and downstream of the works and analysed by a UK Accreditation Service accredited laboratory. Where sediments exceed safe thresholds for FWPM an emergency action plan detailing how mussels will be protected, rapid installation of temporary barriers or temporary removal of FWPM (under licence) for example, will be enacted; and
 - monitoring of weather and river levels and postponement of works during heavy rainfall or when high flows or spate conditions are expected. If works cannot be avoided, sediment levels will be monitored by the ECoW on a daily basis.
- 12.5.19 Adherence to Species Management Plans will avoid potential breaches of conservation legislation arising from mortality or disturbance. Adherence to the Ecological Management Plan will also mitigate for potential animal welfare issues during construction.
- 12.5.20 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.
- 12.5.21 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 12.12.

Table 12.10: Standard Mitigation Items for Ecology and Nature Conservation (E) and General (S)

Mitigation Item	Description
SMC-S1	<p>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.</p> <p>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.</p>
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	<p>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:</p> <ul style="list-style-type: none"> • 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	<p>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 to be proposed e.g. leaving an exclusion zone around the nest to avoid disturbance.</p> <p>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.</p>
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, 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, 2012). This includes the following: <ul style="list-style-type: none"> • 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.
<i>n/a (note)</i>	<i>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-W2, 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.</i>

Operation

Mitigation for Ancient Woodland

- 12.5.22 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, other woodland and important habitats for protected species) has not been achievable through the iterative design process, mechanisms for landscape-scale mitigation have been designed to compensate for this loss.
- 12.5.23 The full extent of habitats listed on the AWI under the footprint of the proposed scheme is calculated as 23.3ha. 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, 2016b) as 16.8ha (Figure 12.14). This document sets out the agreed approach to compensation for the loss of sites listed on the AWI, which is consistent across the A9 programme. The approach taken mapped 2014/2015 Forestry Commission Scotland National Forest Inventory (Forestry Commission Scotland, 2015), NWSS (Patterson et al., 2014) and currently wooded sites listed on the AWI, and overlaid the design information for the proposed scheme to identify affected areas of woodland. This was also used as the basis from which to explore opportunities for areas of compensatory planting, utilising non-wooded AWI sites in proximity to those areas affected.
- 12.5.24 Candidate sites for compensatory woodland planting (**Mitigation Item P04-E37**) have been identified to maximise the biodiversity benefit of planting, maintain connectivity of existing AWI sites, and maximise opportunities to maintain functionality of local ancient woodland communities throughout the route corridor. Soils will be re-used to maintain fungal and invertebrate biodiversity and provide a seed bank, and will be taken from an identified large, contiguous area of AWI to be lost (Table 12.11a). Within this area, soils of low quality will not be re-used, for example from areas within the existing highway boundary, under non-native plantation woodland and areas dominated by bracken.
- 12.5.25 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 12.5.16, 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 metabarcoding) 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 Compulsory Purchase Order (CPO) area 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.
- 12.5.26 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 achieve the desired connectivity, 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 18.55ha. 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 12.11b.

Table 12.11a: Details of currently wooded AWI loss

Chainage	Area (ha)	AWI category (as detailed in paragraph 12.3.5)
ch1980-ch2140	0.24	2a
ch1990-ch2400	0.49	1a
ch2140-ch2400	0.11	1a, 3
ch2500-ch2530	0.01	3
ch2530-ch2570	<0.01	3
ch2710-ch2760	<0.01	3
ch2860-ch2880	0.01	3
ch3210-ch3240	0.04	2b
ch3210-ch3270	0.01	2b
ch3370-ch3600	0.29	2b
ch3480-ch3510	0.01	2b
ch3540-ch3560	<0.01	2b
ch3600-ch3620	0.02	2b
ch3670-ch3770	0.09	2b
ch3670-ch3780	<0.01	2b
ch3760-ch3980	0.19	2b
ch3960-ch3980	<0.01	2b
ch3980-ch4220	0.14	2b
ch4200-ch4240	0.07	2b
ch4550-ch4700	0.46	2b
ch4590-ch4650	0.29	2b
ch4690-ch5400	3.37	2b
ch4930-ch5020	0.12	2b
ch5090-ch5120	<0.01	2b
ch5100-ch5400	0.12	2b
ch5190-ch6050 *	9.53	2b
ch5220-ch5470	0.94	2b
ch5480-ch5500	<0.01	2b
ch6080-ch6300	0.17	2b
ch6900-ch7000	<0.01	1a
Total Loss	16.8	

*Soil from this large, contiguous area will be re-used in compensation areas where applicable.

Table 12.11b: Details of locations of AWI compensation

Chainage	Area (ha)	Figure reference
ch1870-ch1970	0.57	12.14a
ch1870-ch2210	0.87	12.14a
ch2350-ch2580	1.30	12.14a
ch5990-ch6160	1.07	12.14c
ch6190-6280	0.27	12.14c
ch6080-ch6650	9.86	12.14c
ch6650-ch7000	4.61	12.14c
Total	18.55	

Mitigation for Other Habitats

12.5.27 All new native planting should be nursery grown from local native seeds collected from within appropriate provenance zones and designed using outputs from the Woodland Connectivity – Ancient Woodland Compensation Strategy (Transport Scotland, 2016b) 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).

- 12.5.28 The areas around SuDS will be seeded with native grasses and wildflowers, as appropriate, to provide added wildlife habitat. The margins of SuDS retention ponds will be planted with native aquatic, emergent and marginal plant species (**Mitigation Item P04-LV9**), and species-rich grassland mixes will consist of native, non-invasive grasses and wildflower species (**Mitigation Item P04-LV18**), to enhance biodiversity for example by planting species that are favoured by invertebrates as food.
- 12.5.29 As noted in Section 12.3 (Baseline Conditions), an HRA has been undertaken for potentially affected European sites, to meet requirements of the Habitat Regulations. Through this process the assessments have informed the construction programme and methods for provision of the new Tummel and Clunie Underbridges. Whilst the HRA provides more detailed information, this ES contains mitigation measures that are consistent with the HRA requirements.

Mitigation for Protected Species

- 12.5.30 Species permeability is an overarching design theme for the A9 dualling programme and the provision of suitable crossing structures (**Mitigation Item P04-E40**) 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 dry mammal underpasses, are shown on Figure 13.5. The structures offer multi-species benefits and will provide passage for otter, badger and bats, amongst others.
- 12.5.31 Otter and badger fencing will be provided to prevent access onto the A9 carriageway and will be positioned to direct animals to safe crossing points. Otter fencing has been proposed along watercourses 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 and tie into crossing structures where possible. In locations where engineering constraints are such that a means of mammal passage is desirable but cannot be incorporated within the structures' design, fencing is 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

- 12.5.32 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.
- 12.5.33 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 P04-E40**).
- 12.5.34 As noted in paragraph 12.3.23, northern damselfly is a CNPA priority non-protected species, and a pond was identified through desk study data as having records of the species. The pond will not be impacted by the proposed scheme; however, as part of the A9 dualling programme it was proposed to create a network of wet SuDS spanning the scheme in order to provide 'stepping stone' habitats for the species. These would connect isolated populations and facilitate movement longitudinally, and thus provide some resilience from the effects of climate change. The design of SuDS and surrounding planting has therefore been designed with northern damselfly in mind.
- 12.5.35 Mitigation for potential impacts on specific ecological features during operation is described in Table 12.12 in Section 12.6, for example the translocation of northern marsh-orchid and creation of a purpose-built bat building.

Monitoring

- 12.5.36 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 Management Plans, Habitat Management Plans and the standard mitigation commitments. Compliance will be monitored by the employer's ecologist.
- 12.5.37 Post-construction monitoring will be undertaken in accordance with Table 12.12, the Species 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 12.12.

Table 12.12: Summary impact assessment for ecological features

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
Construction						
River Tay SAC (<i>International</i>) (Figure 12.1)	Run-off and release of sediment from construction works including chemical and hydrocarbon loads from accidental spillage.	<ul style="list-style-type: none"> ch500 (drainage outfall) ch930 (SuDS outfall) ch900-ch1050 (Tummel Underbridge) ch4200-ch4350 (Clunie Underbridge) ch4220 (drainage outfall) ch4350 (SuDS outfalls) 	Pollution of SAC aquatic and terrestrial 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. The effect could be negative and permanent.	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 construction of outfalls.	<ul style="list-style-type: none"> ch500 (drainage outfall) ch930 (SuDS outfall) ch4220 (drainage outfall) ch4350 (SuDS outfalls) 	Alteration of riverbed habitat. This effect would be negative, short-term and reversible.	low (Significant)	Existing bed material will be stored and kept clean. Bed material will be reinstated where appropriate to ensure that the habitat is returned to a similar state (Mitigation Item P04-E16). In addition, Mitigation Item SMC-W1 and Mitigation Item SMC-W4 will be adhered to.	No significant residual impacts predicted.
	Temporary loss of 0.95ha terrestrial habitat within the SAC boundary to accommodate construction, including, for example, laydown areas and the siting of cranes, temporary piers, and plant. Aquatic SAC habitat has been avoided where possible. Under a worst case scenario, temporary loss of an estimated 0.01ha of aquatic habitat to facilitate construction works.	<ul style="list-style-type: none"> ch400-ch600 ch850 ch950 ch850-ch930 ch930 ch930-ch1050ch4240 ch4240-ch4340 ch4320-ch4340 ch4330 	Temporary reduction in extent of terrestrial habitat within the SAC boundary in this internationally important site. This effect would be negative, reversible and short-term. Potential temporary reduction in extent of aquatic habitat within the SAC boundary in this internationally important site. However, there is no functionally important habitat present at this location. This effect would be negative, reversible and short-term.	low (Significant)	Areas of terrestrial non-qualifying habitat within the River Tay SAC boundary required temporarily for construction activities will be returned to their former habitat type (largely riparian grass vegetation and areas of woodland), by the Contractor. This will be done 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 P04-E17). Where the habitat forms part of the river bed at high flows, existing bed material will be stored and kept clean. Bed material will be reinstated where appropriate to ensure that the habitat is returned to a similar state (Mitigation Item P04-E16). In addition, Mitigation Item SMC-E9 will be adhered to.	No significant residual impacts predicted.
Ancient Woodland (<i>National</i>) (Figure 12.1)	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, short-term and reversible.	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 semi-natural woodland or plantation woodland (not AWI) (<i>Regional</i>) (Figure 12.2)	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, short-term and reversible.	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
Watercourses (<i>Authority area</i>) (Allt an Aghastair and unnamed watercourses) (Figure 12.12)	Run off and release of sediment from construction works including chemical and hydrocarbon loads from accidental spillage.	<ul style="list-style-type: none"> Unnamed watercourses (13 locations) Allt an Aghastair ch5550 	Pollution of aquatic habitat leading to reduced water quality and increased deposition, and resulting in modified submerged habitat. This effect would be negative, long-term (recovery could take several seasons) and reversible.	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.	<ul style="list-style-type: none"> Unnamed watercourses (nine locations) Allt an Aghastair ch5550 	Temporary changes in hydrology; change in functional habitat for species. This effect would be negative, short-term and reversible.	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
Atlantic salmon Brown/sea trout Brook, river and sea lamprey European eel (<i>International</i>) (Figure 12.12)	Run-off and release of sediment from construction works throughout the proposed scheme including 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. Reduced availability of suitable habitat. Depending on the magnitude of the pollution event the effect could be negative, long-term and reversible.	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	medium (Significant)	Mitigated through compliance with Mitigation Item SMC-E3 , Mitigation Item SMC-E10 , P04-E29 and Mitigation Item SMC-LV4 . In addition, the following measure will be adhered to: <ul style="list-style-type: none"> in-stream works will be undertaken between July and mid-October inclusive to avoid the most sensitive period for fish at these locations. In-stream works will comply with 	No significant residual impacts predicted.

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
			negative, short-term and reversible, however physical damage would be negative and permanent.		SEPA Good Practice Guidance – Temporary Construction Methods (WAT-SG-29) (SEPA, 2009) (Mitigation Item P04-E18).	
	De-watering of watercourse sections and in-stream works with construction of structures that form the footprint of the proposed scheme.	<ul style="list-style-type: none"> ch500 (drainage outfall) ch930 (SuDS outfall) ch4220 (drainage outfall) ch4350 (SuDS outfalls) 	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.	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, the following measure will be adhered to: <ul style="list-style-type: none"> in-stream works will be undertaken between July and mid-October inclusive to avoid the most sensitive period for fish at these locations. In-stream works will comply with SEPA Good Practice Guidance – Temporary Construction Methods (WAT-SG-29) (SEPA, 2009) (Mitigation Item P04-E18). 	No significant residual impacts predicted.
Freshwater pearl mussel <i>(International)</i> (Figure 12.13)	Run-off and release of sediment from construction works including chemical and hydrocarbon loads from accidental spillage.	For locations see Appendix A12.3 (Confidential Ecological Features)	Reduced water quality potentially causing physiological stress or mortality. Smothering of individuals in interstitial habitats potentially leading to mortality. Depending on the magnitude of the pollution event the effect could be negative and permanent.	high (Significant)	Mitigated through compliance with Mitigation Item SMC-W2, Mitigation Item SMC-W3 and Mitigation Item SMC-W7 . In addition, the following measures will be adhered to: <ul style="list-style-type: none"> an ECoW will be present on site prior to and during potentially sensitive works (e.g. installation/removal of in-channel structures) to continually monitor conditions (Mitigation Item P04-E19); toolbox talks with contractors on environmental sensitivities and implementation of mitigation will be conducted (Mitigation Item P04-E19); an agreed working area will be established prior to the start of works which will avoid FWPM (Mitigation Item P04-E19); a Silt Control Management Plan (SCMP) will be developed and implemented which will include the following measures (Mitigation Item P04-E20, Mitigation Item P04-E21 and Mitigation Item P04-E22): <ul style="list-style-type: none"> appropriate controls for construction site runoff and sedimentation (Mitigation Item SMC-W3); regular inspection and monitoring of receiving water features; oils and fuels will be stored appropriately and spill response will follow best practice (Mitigation Item SMC-W7); if flocculants are considered necessary to aid in settlement of fine suspended solids, such as clay particles, the chemicals used must first be approved by SEPA (Mitigation Item P04-W18); and any other appropriate measures required following consultation or licencing discussions with SEPA. In the event of an accidental sediment release due to construction activities, all works will immediately cease. Works will remain suspended until the ECoW confirms that the integrity of the silt barrier is functioning, a water quality sample has been taken and a visual check of FWPM and supporting habitat has been completed (Mitigation Item P04-E23); and where sediments exceed safe thresholds for FWPM an emergency action plan detailing how mussels will be protected, rapid installation of temporary barriers or temporary removal of FWPM (under licence) for example, will be enacted. Where fine sediment has infiltrated the substrate or sediment loading is persistent, temporary translocation of FWPM may be required and will follow guidelines for translocation as outlined in Killeen and Moorkens (2016) (Mitigation Item P04-E23). 	No significant residual impacts predicted.
	Noise and vibrations associated with construction related activities.		Vibration may lead to physiological stress and reduced fitness of the species. Disturbance of the host species due to noise and vibration may result in a reduction in reproductive success of the species. This effect would be negative, long-term and reversible.	medium (Significant)	Mitigated through compliance with Mitigation Item SMC-E3, Mitigation Item SMC-E10 and Mitigation Item SMC-LV4 . In addition, the following measure will be adhered to: <ul style="list-style-type: none"> in-stream works will be undertaken between July and mid-October inclusive to avoid the most sensitive period for FWPM spawning and fish at these locations. If in channel works are required outwith this period, the working method will be agreed with SNH. In-stream works will comply with SEPA Good Practice Guidance – Temporary Construction Methods (WAT-SG-29) (SEPA, 2009). (Mitigation Item P04-E18). 	No significant residual impacts predicted.
	In-stream works and de-watering of watercourse sections with construction of structures that form the footprint of the proposed scheme.		In-stream works and de-watering may cause mortality of individuals and cause an indirect reduction in reproductive success due to prevention of movement of host species. This effect would be negative and permanent.	high (Significant)	Mitigated through compliance with Mitigation Item SMC-W1 and Mitigation Item SMC-W4 . In addition, the following measures will be adhered to: <ul style="list-style-type: none"> a Mitigation Strategy (including Emergency Action Plan (EAP)) for FWPM will be developed prior to works commencing. As a part of this plan, all suitable habitat in the area around in-stream works and bankside vegetation clearance will be re-surveyed, which will include a photographic record, prior to works commencing to confirm the presence of FWPM. Upon discovery of any FWPM, all works that could affect the FWPM will immediately cease and mitigation measures detailed in the Mitigation Strategy will be implemented. Works will not begin until the measures have been implemented and SNH has been consulted (Mitigation Item P04-E24); and in-stream works will be undertaken between July and mid-October inclusive to avoid 	No significant residual impacts predicted.

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
					the most sensitive periods for FWPM spawning and fish. If in channel works are required outwith this period, the working method will be agreed with SNH. In-stream works will comply with SEPA Good Practice Guidance – Temporary Construction Methods (WAT-SG-29) (SEPA, 2009) (Mitigation Item P04-E18).	
	Removal of bankside vegetation (trees) to accommodate construction of structures that form the footprint of the proposed scheme.		Removal of bankside vegetation (trees) may result in reduced stability of habitat (bank and temperature stability) suitable for FWPM. This effect would be negative, long-term and reversible.	high (Significant)	The following measures will be adhered to: <ul style="list-style-type: none"> bankside vegetation to be retained in confirmed FWPM locations. Where removal is essential, trees are to be pollarded, retaining as much height and as many overhanging branches as possible. Where this is not possible, removal will be by cutting trees down rather than extraction (Mitigation Item P04-E25); FWPM will be protected during any pollarding or cutting of trees, for example through careful placing of robust mesh cages over the mussels (Mitigation Item P04-E25); the ECoW will be present on site during any pollarding or cutting of trees (Mitigation Item P04-E25); a Mitigation Strategy (including Emergency Action Plan (EAP)) for FWPM will be developed prior to works commencing. As a part of this plan, all suitable habitat in the area around in-stream works and bankside vegetation clearance will be re-surveyed, which will include a photographic record, prior to works commencing to confirm the presence of FWPM. Upon discovery of any FWPM, all works that could affect the FWPM will immediately cease and mitigation measures detailed in the Mitigation Strategy will be implemented. Works will not begin until the measures have been implemented and SNH has been consulted (Mitigation Item P04-E24); and bankside vegetation to be reinstated as soon as possible upon completion of construction. (Mitigation Item P04-E26). 	No significant residual impacts predicted.
Otter <i>(International)</i> (Figure 12.8)	Construction-related activities including vehicle movement, culvert and watercourse crossing construction, bridge demolition and construction, and creation of excavations including those for SuDS.	For locations see Appendix A12.3 (Confidential Ecological 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 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-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 P04-E27).	No significant residual impacts predicted.
			Severance and fragmentation through temporary loss of habitat. This effect would be negative and short-term.	low (Significant)	Severance and fragmentation of habitat will be reduced during construction by retention of commuting routes, for example constructing dry mammal underpasses early in the construction process. To the west of Clunie Underbridge a temporary diversion of the footpath may be required during construction. If the diversion is required, a mandatory setback of a minimum 5m of vegetation protection from the shoreline to the location of any footway diversion will be implemented. In addition, beyond the 5m setback, removal of vegetation will be minimised, and any trees removed will be replanted (Mitigation Item P04-E28).	No significant residual impacts predicted.
	Noise, vibrations and light spill associated with construction-related operations including bridge, embankment and drainage works.		Disturbance, including seven holt (one a likely breeding holt) and six couches, leading to avoidance of key places of shelter and rest. The disturbance will not be at a level that would cause declines in the otter population as resting sites are not limited within the study area, and otter are 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 the measures of which will also benefit ecological features. In addition, the following measures will be adhered to (Mitigation Item P04-E29): <ul style="list-style-type: none"> where practicable, piling/drilling will not be undertaken within 100m of a resting site; directional and/or cowed lighting will be used to prevent light-spill and light angled away from all lying-up sites and areas of otter activity; provision of temporary screening to create dark areas around lying-up sites where construction lighting would result in light spillage on the sites that cannot be controlled through the use of directional lights; and lighting for night-time works at the Tummel and Clunie Underbridges will ensure that dark areas along at least one bank of the River Tummel and Loch Faskally are maintained, using angled or shielded lighting, together with under-bridge screening as necessary. 	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.
Badger <i>(Regional)</i> (Figure 12.4)	Construction-related activities including vehicle movement.	For locations see Appendix A12.3 (Confidential Ecological 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 Items SMC-E13 and Mitigation Item SMC-E14 .	No significant residual impacts predicted.
	Temporary loss of badger		Fragmentation through temporary loss of habitat.	low	No mitigation is required for this non-significant impact.	n/a

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
	habitat to accommodate construction.		This effect would be short-term, reversible and negative.	(Not significant)		
	Noise, vibration and light spill associated with construction-related operations throughout the proposed scheme.		Temporary disturbance of badgers and their setts (two outlier setts), leading to a change in the distribution of local population(s). This effect would be negative and short-term.	low (Not significant)	Although impacts are not significant, compliance with Mitigation Item SMC-E6 , Mitigation Item SMC-E10 and adherence to the following mitigation measure will ensure compliance with species protection legislation and best practice guidance: <ul style="list-style-type: none"> severance and fragmentation of habitat will be minimised during construction by retention of commuting routes, for example constructing dry mammal underpasses early in the construction process (Mitigation Item P04-E28). 	n/a
Bats (all species) (Regional) (Figure 12.5, Figure 12.6)	Construction-related activities, including vegetation clearance.	<ul style="list-style-type: none"> ch920 ch1550 ch1820 ch2020 ch2850 ch3480 ch3700 ch4200 ch4500 ch5050 ch5170 ch5520 All woodland, riparian and scrub 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: <ul style="list-style-type: none"> 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 P04-E30). 	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, reversible 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 the measures of which will also benefit ecological features, would reduce the effect of this impact.	n/a
Beaver (Regional)	Construction-related activities including vehicle movement.	Watercourses and adjacent woodlands throughout the proposed scheme.	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 operations.		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 the measures in which would 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: <ul style="list-style-type: none"> severance and fragmentation of habitat will be reduced during construction by retention of commuting routes, for example constructing dry mammal underpasses early in the construction process (Mitigation Item P04-E28). 	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
Pine marten Red squirrel (Regional) (Figure 12.9)	Construction-related activities including vehicle movement.	<ul style="list-style-type: none"> ch3200 ch3350 ch3850-ch3950 ch4300-ch6600 	Direct mortality of individuals from vehicle collisions and destruction, during vegetation clearance, of any dens/dreys identified during pre-works checks (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: <ul style="list-style-type: none"> no more than three weeks prior to the commencement of site clearance, and again at least two days prior to clearance, pre-works checks will be undertaken to identify active dens/dreys. (Mitigation Item P04-E31); exclusion zones will be marked around dens/dreys (Mitigation Item P04-E32). Exclusion zones will be to the following distances: <ul style="list-style-type: none"> pine marten: 100m for breeding dens and 30m for non-breeding dens; and red squirrel: 30m for breeding dreys and 5m for non-breeding dreys; site clearance affecting pine marten and red squirrel habitat should be timed to avoid 	No significant residual impacts predicted.

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
					breeding seasons (March to June inclusive for pine marten and February to September inclusive for red squirrel) (Mitigation Item P04-E33); and <ul style="list-style-type: none"> 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). 	
			Severance and fragmentation through temporary loss of habitat. This effect would be short-term and negative.	low (Not significant)	No mitigation is required for this non-significant impact; however, adherence to the following mitigation measure will ensure compliance with proposed species protection legislation and best practice guidance: <ul style="list-style-type: none"> severance and fragmentation of habitat will be reduced during construction by retention of commuting routes, for example constructing dry mammal underpasses early in the construction process (Mitigation Item P04-E28). 	n/a
	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 the measures of which would also benefit ecological features - would reduce the effect of this impact.	n/a
Common lizard (Regional) (Figure 12.10)	Construction activity including vehicle movement and vegetation clearance.	<ul style="list-style-type: none"> ch1600 ch3150-ch3200 ch4500 ch6050-ch6160 	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 prior to vegetation clearance of reptile habitat (Mitigation Item P04-E34): <ul style="list-style-type: none"> 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 operations throughout the proposed scheme.		Disturbance of individuals resulting in some displacement. 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-NV2 , which is primarily aimed at human receptors, but the measures of which will also benefit ecological features, would reduce the effect of this impact.	n/a
	Temporary loss of reptile 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
Northern marsh-orchid (Authority area) (Figure 12.11)	Operational impacts only.					
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.
Operation						
River Tay SAC (International) (Figure 12.1)	Loss of terrestrial (0.022ha) and aquatic (0.0005ha) habitats within the SAC boundary to accommodate footprint of construction, including bridges, embankments, outfalls and SuDS basins.	<ul style="list-style-type: none"> ch400-ch600 (flood channel WF61) ch850 (Pitlochry South Junction field access) ch950 (Outfall C) ch850-930 Tummel Underbridge ch4240 (Outfall E) ch4320-4340 (Clunie Underbridge) ch4330 (Outfall F/G) 	Permanent reduction in extent of habitat within SAC boundary 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 habitat available is a <i>de minimis</i> effect and 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 P04-E35): <ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> ch930 (SuDS outfall) ch900-ch1050 (Tummel Underbridge) ch4200-ch4350 (Clunie Underbridge) ch4220 (drainage outfall) ch4330 (SuDS outfalls) 	Increased run-off volumes and contaminants leading to decreased water quality in 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 Pollution Prevention Guidelines (PPG) / GPP 1, 5, 6, 21, 22 and 26 (SEPA, 2003; 2017) will be abided by (Mitigation Item P04-E36). Road surface run-off will be subject to treatment via SuDS. See Mitigation Item SMC-W17 for more details. Likely locations of SuDS are indicated on Figure 13.5.	No significant residual impacts predicted.

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
	Shading of stream or river bed under footprint of the proposed scheme.	River Tummel <ul style="list-style-type: none"> ch900-ch1050 (Tummel Crossing) ch4200-ch4350 (Clunie Underbridge) 	Change in habitat composition under proposed scheme footprint through increased shading of the stream/river bed. This effect would be permanent and negative however the area of habitat affected by shading will not be significant given the amount of habitat available and 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 and extended structures including any necessary bank protection measures.	<ul style="list-style-type: none"> ch500 (drainage outfall) ch930 (SuDS outfall) ch4220 (drainage outfall) ch4330 (SuDS outfalls) 	Altered habitat due to changes in flow around outfalls. This effect would be permanent and negative, however the area of habitat affected by changes in hydrology will not be significant given the amount of habitat available and 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 P04-E35): <ul style="list-style-type: none"> 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
Ancient woodland (National) (Figure 12.1)	Removal of ancient woodland to accommodate structures that form the footprint of the proposed scheme. Loss by category of approximately: <ul style="list-style-type: none"> 2.82ha of 1a/2a (ancient of semi-natural origin) 20.23ha of 2b (long-established of plantation origin) 0.22ha of 3 (other on Roy map). Of the 23.3ha listed on the AWI, approximately 16.8ha is currently wooded.	Throughout the proposed scheme	Reduction in the area of ancient woodland and the biodiversity of these sites; and of areas which were previously wooded, but which 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 P04-E37). Compensation planting will include the following: <ul style="list-style-type: none"> 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 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 biodiversity and the intrinsic importance of AWI habitats, the effect of the habitat loss will be permanent. Compensation planting will not mitigate for the permanent loss of AWI. 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.
Broadleaved, mixed or coniferous semi-natural woodland (not AWI) (Regional) (Figure 12.2)	Loss of 3.88ha of this woodland under the footprint of the proposed scheme	Throughout the proposed scheme	Reduction in extent of this habitat and its availability for 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 P04-E38).	No significant residual impacts predicted
Broadleaved, mixed or coniferous plantation woodland (not AWI) (Regional) (Figure 12.2)	Loss of 3.50ha of this woodland under the footprint of the proposed scheme	Throughout the proposed scheme	Reduction in extent of this habitat and its availability for species that rely on it for food, shelter and breeding. This effect would be permanent and negative.	high (Significant)		No significant residual impacts predicted
Watercourses (Allt an Aghastair and unnamed watercourses) (Authority area) (Figure 12.12)	Pollution from road run-off.	<ul style="list-style-type: none"> Unnamed watercourses (13 locations) Allt an Aghastair ch5550 	Increased run-off volumes and contaminants leading to decreased water quality. This effect would be long-term, reversible and negative.	medium (Not 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 P04-E36). Road surface run-off will be subject to treatment via SuDS. See Mitigation Item SMC-W17 for more details. Likely locations of SuDS are indicated on Figure 13.5.	n/a.
	Changes in hydrology due to increase in impervious surfaces.	<ul style="list-style-type: none"> Unnamed watercourses (eight locations) 	Altered habitat due to changes in flows around extended culverts. This effect would be permanent and negative	low (Not significant)	No mitigation is required for this non-significant impact.	n/a

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
		<ul style="list-style-type: none"> Allt an Aghastair ch5550 	however the amount of habitat affected by changes in hydrology will be negligible given the amount of habitat available.			
	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 loss is negligible given the total amount of habitat available.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a
Atlantic salmon Brown/sea trout Brook, river and sea lamprey European eel (International) (Figure 12.12)	Pollution from road run-off	Throughout the proposed scheme	Increased run-off volumes and contaminants leading to decreased water quality and altered habitat (e.g. spawning, lying-up and foraging) resulting in reduced juvenile population size. 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 P04-E36). Road surface run-off will be subject to treatment via SuDS. See Mitigation Item SMC-W17 for more details. Likely locations of SuDS are indicated on Figure 13.5.	No significant residual impacts predicted.
	Changes in hydrology and shading around new structures that form the footprint of the proposed scheme (bridges, culverts and outfalls).		Altered habitat (e.g. spawning, lying-up and foraging) resulting in reduced juvenile population size. Potential for disturbance and habitat fragmentation through shading. This effect would be permanent and negative.	high (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 P04-E35): <ul style="list-style-type: none"> 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.
Freshwater pearl mussel (International) (Figure 12.13)	Pollution from road run-off throughout the proposed scheme.	For locations see Appendix 12.3 (Confidential Ecological Features).	Increased run-off volumes and contaminants leading to decreased water quality and altered habitat resulting in reduced population size. This effect would be long-term, reversible and negative.	high (Significant)	Road surface run-off will be subject to treatment via SuDS. See Mitigation Item SMC-W17 for more details. Likely locations of SuDS are indicated on Figure 13.5. 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 P04-E36).	No significant residual impacts predicted.
	Changes in hydrology around structures that form the footprint of the proposed scheme (outfalls).		Altered habitat leading to reduction in available suitable habitat and possible reduction in population size. This effect would be permanent and negative.	high (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 P04-E35): <ul style="list-style-type: none"> 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.
Otter (International) (Figure 12.8)	Loss of terrestrial habitat under the footprint of the proposed scheme	For locations see Appendix A12.3 (Confidential Ecological Features).	Reduction in availability of foraging habitat. Fragmentation of connecting habitats, leading to increased 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 small proportion of the overall catchment population.	medium (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 P04-E39). 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: <ul style="list-style-type: none"> fragmentation of habitat will be minimised during operation by retention of commuting routes or creation of suitable crossing points, including dry mammal underpasses, so movement between areas of habitat can be maintained (Mitigation Item P04-E40); 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 P04-E41); and the landscape and ecological mitigation planting design (Figure 13.5) will be followed to encourage use of crossing points (Mitigation Item P04-E42). 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 due to increased permeability of the proposed scheme through provision of crossing structures and mammal fencing. Post-construction monitoring to determine the effectiveness of the crossing structures will be undertaken.
	Pollution from road run-off.		Decreased water quality resulting in a reduction in prey resource, and thus reduced fitness of	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 P04-E36).	No significant residual impacts predicted.

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
			individuals feeding on them. 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.		Road surface run-off will be subject to treatment via SuDS. Likely locations of SuDS are indicated on Figure 13.5.	
Badger (Regional) (Figure 12.4)	Loss of foraging habitat from the footprint of the proposed scheme	For locations see Appendix A12.3 (Confidential Ecological Features).	Reduction in availability or fragmentation of foraging habitat. This effect would be long-term and negative as the species can readily 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 P04-E43) . Should any active sett be identified during pre-construction surveys, its destruction will be conducted under licence following consultation with SNH (Mitigation Item SMC-E6) .	No significant residual impacts 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: <ul style="list-style-type: none"> fragmentation of habitat will be minimised during operation by retention of commuting routes through creation of suitable crossing points, including dry mammal underpasses, so movement between areas of habitat can be maintained (Mitigation Item P04-E40); 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 P04-E41); and the landscape and ecological mitigation planting design (Figure 13.5) will be followed to encourage use of crossing points (Mitigation Item P04-E42). 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. Post-construction monitoring to determine the effectiveness of the crossing structures will be undertaken.
Bats (all species) (Regional) (Figure 12.5, Figure 12.6)	Loss of foraging and commuting habitat under the footprint of the proposed scheme	Woodland habitat lost throughout the proposed scheme.	Fragmentation of habitat for commuting and reduced availability of foraging resources. This effect would be long-term and negative, as species can readily use unaffected areas.	medium (Significant)	Fragmentation of habitat will be reduced during operation by retention of commuting routes and minimising operational lighting at crossing points used by bats so movement between areas of habitat can be maintained (Mitigation Item P04-E44) . 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 P04-E45) . This will include: <ul style="list-style-type: none"> planting around SuDS basins 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. 	During the growth phase of landscape planting, a negative residual impact is predicted due to loss and fragmentation of habitat. However, this impact would not be permanent 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.	<ul style="list-style-type: none"> ch3200 ch4300 (Clunie Bridge) ch4800 ch5050 ch5170 ch5520 Woodland habitat lost throughout the proposed scheme. 	Loss of three known building roosts and one known structure roost. Loss of two high potential trees and trees with potential for roosts in woodland, including potentially 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)	<p>The destruction of any confirmed roosts will be conducted under licence following consultation with SNH (Mitigation Item SMC-E6).</p> <p><i>Trees/habitat</i></p> <p>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 (Mitigation Item P04-E46).</p> <p>Three bat boxes, designed for trees, for example Schwegler 1FF and 2F boxes, will be provided as mitigation for each roost tree or high potential tree lost under the footprint of the proposed scheme.</p> <p>Bat boxes will be monitored post tree felling to determine uptake and success reported to SNH and Transport Scotland.</p> <p>The location of woodland habitat identified for erection of bat boxes and landscape planting is shown on Figure 13.5.</p> <p><i>Structures</i></p> <p>The loss of roosts within structures will be mitigated by the provision of bat boxes designed for external surfaces of structures (Mitigation Item P04-E47).</p> <p>Bat boxes, for example Schwegler 1FQ, 1WQ and 2FE bat boxes, will be mounted on the abutments/piers (depending on construction) of the new structure across Loch Faskally.</p> <p>During construction of the new structure across Loch Faskally, bat boxes will be erected in the surrounding habitat to replace the lost roost in the interim.</p> <p><i>Buildings</i></p> <p>The loss of roosts in buildings will be mitigated by the provision of compensation habitat which will incorporate bat boxes and a purpose-built bat building (Mitigation Item P04-E48).</p> <p>The replacement building will be located in close proximity to the roost building(s) lost and will contain like for like qualities suitable for the species of bats.</p> <p>Where possible, the replacement building should be in place prior to the destruction of the roosts in buildings.</p>	No significant residual impacts predicted.
Beaver (Regional)	Construction impacts only					

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
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. Mortality would be a permanent effect on individuals. However, this would affect a low number of individuals and is unlikely to affect the overall breeding bird assemblage. This effect would be short-term and negative.	low (Not significant)	No mitigation is required for this non-significant impact; however, planting proposed as mitigation for bats (Mitigation Item P04-E45) would further reduce the effect of this impact.	n/a
	Loss of habitat under the footprint of the proposed scheme		Loss of suitable breeding and foraging 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 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 P04-E49).	During the growth phase of landscape 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.
Pine marten Red squirrel (Regional) (Figure 12.9)	Loss of habitat under the footprint of the proposed scheme.	<ul style="list-style-type: none"> ch3200 ch3350 ch3850-ch3950 ch4300-ch6600 	Destruction of any dens/dreys identified during pre-works checks and permanent reduction in availability of this habitat to red squirrel and pine marten that rely on it for food, shelter and breeding. This effect would be long-term and negative as the species can readily use unaffected areas and re-colonise a habitat.	medium (Significant)	<p>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, as appropriate, and incorporated into Habitat Management Plans (Mitigation Item P04-E50).</p> <ul style="list-style-type: none"> 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 P04-E51). Each lost drey will be replaced by one red squirrel nest box (Mitigation Item P04-E52). <p>The replacement breeding and nest boxes will be:</p> <ul style="list-style-type: none"> 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 monitored post-tree-felling to determine uptake and success reported to SNH and Transport Scotland. <p>The location of woodland habitat identified for erection of replacement breeding and nest boxes is shown on Figure 13.5.</p>	During the growth phase of landscape 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.
Common lizard (Regional) (Figure 12.10)	Loss of 16.52ha of reptile habitat under the footprint of the proposed scheme.	<ul style="list-style-type: none"> ch1600 ch3150-ch3200 ch4500 ch6050-ch6160 	Reduction in extent of habitat. This effect would be permanent and negative.	high (Significant)	<p>No KRS were identified in the study area and thus no replacement habitat is required to mitigate impacts on the species. Nevertheless, where possible, areas of habitat suitable for reptiles have been included in the landscape and ecological planting design (Mitigation Item P04-E53).</p> <p>Planting suitable for reptiles may include features such as:</p> <ul style="list-style-type: none"> 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). <p>Landscape planting suitable for reptiles is shown on Figure 13.5.</p>	No significant residual impacts predicted.
Northern marsh-orchid (Authority area) (Figure 12.11)	Loss of habitat under the footprint of the proposed scheme.	<ul style="list-style-type: none"> ch1200 ch2100 ch2300-ch2500 ch2550 ch4500-ch4600 	Loss of approximately 3200 individual plants, leading to a long-term, negative effect (reduction) on the population until numbers become re-established.	high (Significant)	<p>To mitigate for the loss of habitat and northern marsh orchid, measures to protect the plants will be implemented and will be detailed in a Species Management Plan (Mitigation Item P04-E54). Areas identified for translocation are shown on Figure 13.5. The Species Management Plan could include details to:</p> <ul style="list-style-type: none"> translocate dormant tubers, and/or translocate turves; and monitor translocation area(s). <p>The construction timetable of the proposed scheme will dictate when the above will be undertaken. Temporary storage of turves will be near the translocation area at</p>	No significant residual impacts are predicted. Whilst any translocation carries a slight risk, with implementation of the Species Management Plan, no significant residual impacts are predicted on the authority area population.

Ecological Feature and Importance	Potential Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation Item	Summary of Residual Impact and Significance (post-mitigation)
INNS (n/a)	Construction impacts only				approximately ch6100.	

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 terms of 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 23.3ha of habitat designated as AWI, of which 16.8ha is currently wooded. Measures such as compensation planting of native species in candidate sites (Figure 12.14 and Figure 13.5) will be implemented to minimise the extent of the resulting significant residual impact. The AWI candidate planting sites will be prepared with appropriately stored soil from areas to be lost to maintain the microbial biodiversity and seedbank as described in Table 12.12.
- 12.7.3 The planting will not mitigate for the permanent loss of intrinsic biodiversity value as a result of the proposed scheme, and a significant adverse residual impact is predicted, but at a reduced extent to that prior to compensation. The planted habitat will mature and woodland corridors will grow to connect currently fragmented areas. Thus, in terms of habitat connectivity and the carrying capacity of the habitat for other species, no significant residual impacts are predicted in the longer-term.
- 12.7.4 It is considered certain that the identified activities and associated protected species scenarios are licensable. A 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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