

12 Ecology and Nature Conservation

This chapter considers the potential impacts of the proposed scheme on terrestrial and freshwater species, habitats and ecosystems. The approach to this assessment is based on DMRB guidance and draws on the Chartered Institute for Ecology and Environmental Management's (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland (2016).

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 three statutory designated sites, Ancient Woodland Inventory (AWI) sites, and aquatic and terrestrial species and habitats. The three statutory designated sites are the River Tay Special Area of Conservation (SAC) and the Shingle Islands SAC and Site of Special Scientific Interest (SSSI). Habitats and species of particular interest included woodland, badger, bats and freshwater pearl mussel (FWPM).

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

A hierarchical approach to mitigation was followed to address potential significant impacts. The primary approach has been to use the flexibility available within the early design stages to avoid significant impacts. For example, retaining walls have been incorporated into the design to substantially reduce land-take and associated loss of AWI woodland compared to initial proposals. 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 potential significant impacts have been identified. Such measures include implementation of commitments and best working practices during the construction phase. During operation, compensatory planting, habitat creation, provision of artificial nest/roost structures, crossing structures and mammal fencing, has been proposed to mitigate potential impacts.

No significant residual impacts are anticipated from the construction phase of the proposed scheme, with mitigation in place. A significant residual impact from the operation phase is anticipated from the permanent loss of habitat listed on the AWI. Compensation planting is proposed, however this cannot fully mitigate for the permanent loss of the biodiversity and intrinsic importance of ancient woodland. As the habitat matures, however, woodland corridors will grow to connect currently fragmented areas and the planting will therefore mitigate for the loss of functions, and importance of the woodland, in respect of habitat connectivity and carrying capacity for other species. In the long-term, significant residual impacts on AWI are therefore predicted to reduce. The micro-siting of outfalls away from ecologically sensitive areas and the incorporation of robust silt and pollution controls ensures that there will be no significant residual impacts on the internationally important River Tay SAC or the critically endangered FWPM.

The A9 dualling is expected to increase the permeability of the A9 for species including badger and otter through provision of safe crossing structures included in the design of the proposed scheme. The increased barrier effect of a widened carriageway may counteract some of the benefits of this increased permeability, however a potential beneficial impact with regards to permeability is considered likely overall. Furthermore, the provision of Sustainable Drainage Systems (SuDS) features can result in potentially beneficial effects through providing potential habitat and climate resilience for wetland species, including northern damselfly.

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). The assessment 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 assessment of available information, including:
- the DMRB Stage 2 Assessment Report (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 (The Highways Agency et al., 1993);
 - the Chartered Institute for Ecology and Environmental Management's (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2016); and
 - DMRB Interim Advice Note 130/10 'Ecology and Nature Conservation: Criteria for Impact Assessment' (The Highways Agency et al., 2010) (hereafter referred to as IAN 130/10).
- 12.2.2 In addition to the above guidance, other policy documents and published guidance taken into account in the preparation of this chapter include:
- Scottish Transport Appraisal Guidance (STAG) (Transport Scotland, 2015a);
 - SNH, A handbook on environmental impact assessment (SNH, 2013);
 - A9 Dualling Programme, Strategic Environmental Assessment (SEA) (Transport Scotland, 2013);
 - A9 Dualling Programme, Strategic Environmental Assessment (SEA) Environmental 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 (SSSI), Special Areas of Conservation (SAC) 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.
- 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 the consultees listed in paragraph 12.2.24, 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 and are described in Table 12.1.

- 12.2.8 National Biodiversity Network (NBN)¹ desk-based searches extended beyond the 500m study area. Searches were undertaken up to 10km from the existing A9, to take into account the highly mobile nature of some species and the level at which some data are available (10km grid square).

Baseline Conditions

Desk-based Assessment

- 12.2.9 The desk-based assessment consisted of a review of existing relevant literature and data, along with online searches for ecological information within the study area, including:
- A9 Dualling Programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b);
 - A9 Dualling Programme, Strategic Environmental Assessment (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), Updated Issue (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 works (HEL, 2017); 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)²;
 - Scotland's Environment website (Scotland's Environment Web Partnership, 2016);
 - Scottish Environment Protection Agency website (SEPA, 2017); and
 - SNH Information Service (SNH, 2016a).
- 12.2.11 Data responses from the following organisations also formed part of the desk-based assessment:
- British Trust for Ornithology (BTO);
 - Forestry Commission Scotland;
 - Marine Scotland (at Pitlochry);
 - Perth and Kinross Red Squirrel Project;
 - 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 (SWT);

¹ See Appendix A12.2 for licensing details

² NBN Atlas replaced NBN Gateway in April 2017. Data searches were undertaken using NBN in 2016.

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

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). Although the project lies outwith the CNPA area, a consistent approach to wildcat assessment was required across the A9 Dualling Programme, and CNPA are a key consultee in this regard. The approach utilised visual habitat analysis with geographic information system (GIS) mapping, rather than field surveys, 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 assessed current and proposed migration porosity via structures, such as bridges and ledge culverts. Smaller roads travelled by only a few hundred cars per day are a negligible barrier to wildcat movement and therefore side roads and access roads were not included in this analysis (Klar et al., 2009).
- 12.2.14 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. Where structures could not be accessed the permeability was not assessed and are assigned 'unknown'. These data are presented on Figure 12.3.
- 12.2.15 The above information was used to inform this assessment and identify mitigation required to minimise habitat fragmentation for wildcats.
- 12.2.16 Furthermore, any priority wildcat areas (as defined by Littlewood et al., 2014) within the study area were identified.

Groundwater Dependent Terrestrial Ecosystem (GWDTE)

- 12.2.17 Potential GWDTEs were identified from:
- Target Notes recorded during the A9 dualling programme route-wide Phase 1 habitat surveys (Transport Scotland, 2015b);
 - notes made during the DMRB Stage 2 assessment using the Sniffer wetland typology (Sniffer, 2009); and
 - the Phase 1 habitat – NVC equivalence table (JNCC, 2010).
- 12.2.18 No specific GWDTE site surveys were undertaken, as review of the data identified no GWDTEs present within the study area. Please refer to 12.3.12 and Chapter 10 (Geology, Soils, Contaminated Land and Groundwater) for further details.

Site Surveys

- 12.2.19 Ecology surveys were undertaken as described in Table 12.1 and in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
- 12.2.20 All surveys were carried out in line with the *Outline approach to consistency in A9 ecology survey extents* (Transport Scotland, 2015e) as agreed by statutory consultees forming the A9 Environmental Steering Group (ESG).
- 12.2.21 All surveys were undertaken between 2015 and 2018 inclusive (Table 12.1), and baseline results represent conditions at that time. Any limitations experienced during site surveys are detailed in Table 12.1.

Table 12.1 Details of surveys used to inform the DMRB Stage 3 assessment of ecology and nature conservation

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
Terrestrial Features			
Badger	Harris et al., 1989 SNH, 2003 SNH, 2014 Delahay et al., 2000	January – October 2015 to cover peaks in badger territorial activity April – May 2017 Bait marking surveys at specific locations.	<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 directly, however survey of all relevant properties was undertaken from adjacent ground where possible.</p> <p>Signs recorded were:</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. <p>Infra-red trigger camera traps were deployed to evaluate use of pathways located within 30m of the existing A9 carriageway.</p> <p>Bait marking surveys were undertaken at locations where high levels of badger activity were evident adjacent to the proposed scheme, following Delahay et al. (2000). Surveys were undertaken to confirm which setts could be classified as main setts and to identify territory boundaries between badger social groups. This involved feeding badgers at focal setts a peanut and syrup mixture containing coloured pellets (unique to a particular sett). Bait was deposited at the focal sett(s), two to three times a week for three working weeks. The pellets, once consumed, are subsequently deposited into latrines across the badger's territory. Repeated walkovers were undertaken during the baiting period and into a subsequent week(s), in order to find and map as many latrines as possible.</p> <p>Detailed methods for bait marking surveys are presented in Appendix A12.3 (Confidential Ecology Features) and results are presented on Figure 12.13.</p>
Bat Roost Surveys	Hundt, 2012 Collins, 2016	May – September 2015 July – September 2016 November 2015 – March 2016 (hibernation) June – August 2017 December – March 2018	<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 assessments at DMRB Stage 2 for their potential to support bat roosts (only high potential³ 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 under the footprint of the proposed scheme. Features that were not under the footprint, but had potential to be used by bats, or were used by bats (information provided by landowners), were subject to a similar level of effort where access was granted by landowners. Time restrictions meant the full complement of surveys (one, two or three) was not always possible.</p> <p>Trees with previous evidence of bat roosts were subject to a single emergence survey.</p> <p>Surveys and bat call analysis were carried out using standard call detection and recording equipment as described further in 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, new areas were identified under the footprint of the proposed scheme. These were subject to ground-based assessments for roost potential only as, due to the time of year, it was not possible to complete roost surveys in the correct bat survey season. This poses a limitation, as the full importance of these new areas could not be fully determined. Where this is the case, pre-construction surveys (which will be undertaken throughout the proposed scheme) will be undertaken, following standard guidance in Collins (2016), to 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 medium or high potential to be used by hibernating bats, static automatic bat recorders were deployed over winter to record calls and thereby give an indication of bat presence.</p>

³ High potential trees are equivalent to 1* category trees as stated in Hundt, 2012.

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
			<p>In 2017, mist netting was employed at one confirmed roost within the proposed scheme to ascertain the status of the roost, species present and inform the design and impact assessment.</p> <p>Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).</p>
Bat Activity Surveys	<p>Hundt, 2012 Wray et al., 2010 Boonman, 2011 Adams, 2013 Jacobs, 2014</p>	<p>May – October 2015 July – September 2016 May - August 2017</p>	<p><u>Passive Monitoring and Cryptic Species Monitoring</u></p> <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. This was used to inform the requirements for further survey work at DMRB Stage 3.</p> <p>Structures under the footprint of the scheme 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 fourteen nights over spring, summer and autumn (adapted from Hundt, 2012). This spread across the seasons covers the periods when bats would be expected to be most active; dispersing from hibernation sites, during the maternity season and the dispersal to hibernation and mating sites. Where possible the detector was deployed to give high confidence of detecting only bat passes through the culvert or under the bridge indicating bats crossing beneath the existing road. Due to equipment failure and time constraints, not all structures received the same level of survey effort. Four structures were surveyed, and of these, all received at least two deployments, however this was not a limitation to the analysis.</p> <p>Surveys and bat call analysis were carried out using standard call detection and recording equipment as described in Appendix A12.2 (Baseline Data and Detailed Survey Methods).</p> <p>Analysed data for each structure 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 and an index of rarity was assigned. 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 number of species of bats would be deemed most valuable; and • presence of rare species (as defined in Wray et al., 2010). <p>The overall value of each location for bat activity was calculated by assigning points to each of these three variables and summing the total. Assigning an overall value to each recording location allows them to be compared and to identify those that are of higher value for the impact assessment. In the absence of published industry guidance on criteria for allocating relative activity levels and values to bat activity data, the method of calculating the value was based on approaches used in a previous Ecological Impact Assessment (A14 Cambridge to Huntingdon Improvement Scheme, Jacobs, 2014) and adapted from Adams (2013).</p> <p>Where data search, survey or habitat assessment had shown the presence or potential presence of rare and or/cryptic species within 50m of the proposed scheme (Wray et al., 2010) static detectors were deployed for a minimum of four nights over the summer to assess activity levels. At Guay Farmhouse, further information was required to identify foraging and commuting areas of the bats using the farm. Therefore, for this site the passive monitoring was extended to 300m from the mainline of the proposed scheme. 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 (Analog W v4.1 software) and techniques. The data was used to determine the likely presence of a roost for these species and to determine the importance of these areas for these species.</p> <p>Passive monitoring was undertaken at one confirmed roost in 2017 to confirm species presence and to assist in the classification/status of the roost.</p> <p><u>Transect Surveys</u></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 to allow mitigation to be designed if needed.</p> <p>Five manually 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). 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</p>

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
			<p>carried out in spring, summer and autumn (as above) and were conducted at both dusk and dawn where possible (informed by Hundt, 2012), but time constraints meant that this was not possible for all transects. Of the five transects surveyed, three received the full complement of effort in each season and another received surveys in two seasons. One transect was surveyed only in autumn. Therefore, it is possible that activity levels on the transect may have been different in other seasons. However, for the majority of transects sufficient data was collected to give confidence in the results and enable a robust impact assessment to be made.</p> <p>In the absence of guidance on criteria for allocating relative activity levels, the same method of assigning value as described above was used for the transect data. See Appendix A12.2 (Baseline Data and Detailed Survey Methods) for full details.</p> <p>Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).</p>
Breeding Birds: Modified Common Bird Census	Bibby et al., 2000 The Highways Agency et al., 2001	July 2015 dawn to noon BST	<p>Adapted Breeding Bird Surveys (BBS) were undertaken up to 150m from the mainline of the proposed scheme to gain an indication of the species assemblage present across all habitat types.</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. Detailed methods are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).</p>
Otter	Chanin, 2003	June – November 2015 February – September 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>Twenty-one suitable watercourses were surveyed (as identified at DMRB Stage 2) for otter shelters which were categorised and photographed. In addition, the following signs were recorded:</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 trigger 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 and extended to 2m from water's edge.</p> <p>Five suitable watercourses were surveyed (as identified at DMRB Stage 2) where habitats were considered, by suitably experienced surveyors, to be valuable in terms of potential to support water vole populations.</p> <p>Field signs indicative of water vole presence were recorded and included:</p> <ul style="list-style-type: none"> • droppings and latrines; • a network of bankside burrows; • feeding signs of neat vegetation piles; and • covered runs through vegetation.
Pine marten, red squirrel, wildcat and beaver	Croose et al., 2013 Gurnell et al., 2009 Klar et al., 2009	January 2015 – August 2017	<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
	SNH, undated-a		
Reptiles	Edgar et al., 2010 Sewell et al., 2013 Froglife, 1999 The Highways Agency et al., 2005	May – September 2015 Maximum of 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. Eight sites were identified as having potentially suitable habitat for reptiles and were subject to surveys for presence or likely absence of reptiles using artificial cover objects (ACOs). However, due to health and safety risks related to access, one site of the eight selected could not be surveyed. ACOs were deployed at each of the seven sites 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. Of the seven sites taken through to ACO surveys (see Figure 12.10), sites 1, 3 and 4 were not subject to the full eight surveys as stated in the guidance; with two visits, one visit and four visits, respectively. This reduced survey effort at sites 1, 3 and 4 was due to identification of increased safety risks following dynamic risk assessment of the terrain on each site at the start of each survey visit. The site peak counts obtained for these sites were included in the Key Reptile Site (KRS) assessment as the survey standard ACO deployment and survey methodology was implemented. Survey results and incidental sightings were used to define the importance of each surveyed site for reptiles using criteria listed in Tables 12.2 and 12.3.
Phase 1 surveys	JNCC, 2010	July – September 2016	Habitat surveys undertaken to cover areas up to 150m from the proposed scheme that were not previously surveyed (Transport Scotland, 2015b). Additionally, aerial photography provided by Blom (2014) was examined to provide context on habitats up to 500m from the proposed scheme, and complement the Phase 1 habitat data (Transport Scotland, 2015b). Following development of the proposed scheme design at DMRB Stage 3, a desk-based study was undertaken to provide an assessment of the habitats present at locations in which the proposed scheme overlapped with designated sites. This desk-based study involved the review of Blom (2014) aerial imagery, photographic data and field notes, collected during Stage 3 surveys. Detailed methodology and results are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
Phase 2 habitat surveys	Rodwell, 1991-2000 Rodwell, 2006 Averis et al., 2014 Elkington et al., 2001	July – September 2016 March 2018	Key areas, likely to be of greater botanical importance, were identified through the A9 Dualling Programme route-wide Phase 1 habitat survey data (Transport Scotland, 2015b). 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. Detailed methodology and results are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).
Aquatic Features			
Aquatic Habitat Visual Assessment (including fish habitat suitability)	n/a	February 2015 and September 2015	Where a potential impact pathway was identified, assessments were undertaken to include water features within 150m either side of existing A9 and additional areas affected by the proposed scheme. Watercourses to the west of the River Tay were not surveyed as no potential impact pathway was identified for these features. Thirty-six sites 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"> • 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. Habitat for different species and life stages of fish was assessed against the criteria in Table 12.4. Following the visual assessment each water feature was evaluated using the criteria in Table 12.5 and an ecological value assigned.
Macro-invertebrates (aquatic)	Environment Agency, 2012	April and November 2015	Seven point locations on representative watercourses within 150m of the existing A9 and affected by the proposed scheme were surveyed. These sites were chosen for presence of suitable sampling habitat, safe access and/or being characteristic of several other watercourses. Sites were surveyed using standard methods (three-minute kick sampling and one-minute manual searching) and water chemistry parameters including water temperature,

Survey Type	Guidance	Date Ranges	Survey Area Covered and Signs Recorded
	British Standards Institution, 2012		<p>dissolved oxygen, pH, salinity and conductivity were measured and recorded using a YSI 556 handheld multi-parameter instrument. Points on the River Tay were limited to the edge of the watercourse due to safety.</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 A12.2 (Baseline Data and Detailed Survey Methods).</p> <p>A limitation to the assessment was that two sites on the River Tay 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>
Macrophytes	Water Framework Directive (WFD) UKTAG, 2014	September 2015	<p>Representative 100m stretches of watercourses within 150m of the existing A9 and affected by the proposed scheme were surveyed.</p> <p>Three sites were identified during the aquatic walkover surveys as suitable for macrophytes.</p> <p>Percentage cover of each macrophyte species was recorded and a Taxon Cover Value (TCV) assigned.</p> <p>Physical characteristics of the sample site were also collected, including location, width, depth, substrate, habitats (for example pools and riffles), shading, water clarity and bed stability.</p> <p>Detailed results are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).</p>
Predictive System for Multimetrics (PSYM)	Environment Agency & Ponds Conservation Trust, 2002	September 2015	<p>Two ponds within 150m of the existing A9 and affected by the proposed scheme were surveyed.</p> <p>A family level macroinvertebrate assessment and species level macrophyte assessment was undertaken on site.</p> <p>Physical data were recorded from the site including substrate, shading, and presence of inflows/outflow.</p> <p>All data were recorded on standard PSYM survey sheets, and photos were taken of the pond.</p> <p>Completed survey sheets were submitted to the Freshwater Habitats Trust for analysis.</p> <p>Detailed methods and results are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).</p>
Freshwater Pearl Mussel (FWPM)	Cosgrove et al., 2007 SNH, undated-b	April – October 2016 June & August 2017	<p>A minimum of 600m (100m upstream and 500m downstream), where accessible, was surveyed at all named watercourse crossings and indicative outfall locations (11 sites in total), and one area of the River Tay identified as having high erosion risk, as identified through consultation with design teams.</p> <p>For crossing point sites, the entire river width was surveyed. At the indicative outfall locations, the bank on the side of the proposed outfall location was surveyed. If no FWPM were found on this bank, the opposite bank was surveyed and the mid-channel where possible to give greater confidence in a negative survey result.</p> <p>Shallow areas were surveyed using a bathyscope. 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 counted.</p> <p>In June 2017, following the identification of an area of high erosion risk along the River Tay, a shallow water survey was undertaken along the left (east) bank between NO 00433 44802 and NO 00418 45483, and then in August 2017, 37 spot checks were undertaken using a Spyball underwater camera in deeper water (at NO 00419 45518 and NO 00370 45872). Due to high flows, the deep water survey methodology in Cosgrove et al. (2007) was amended such that the area covered by the spot checks was smaller than the 5m² recommended by that guidance. For the area of high erosion risk, the left bank only was surveyed.</p> <p>Surveys were carried out under SNH licence (numbers: 18806 and 102467).</p>

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

Table 12.2: Reptile habitat importance criteria

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

* Unsuitable habitat was screened out during habitat assessment.

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

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

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

Table 12.4: Fish habitat criteria

Species	Life Stage	Habitat Requirements
Atlantic salmon	Spawning/egg	Channel width at least 3m, with 0.17-0.76m water depth. Glide or riffle flow at 0.35-0.80m/s. Golf ball - tennis ball sized substrate, 0.15-0.25m deep with less than 8% fine particles.
	Fry	Shallow (0.2m or less) fast flowing broken water. Golf ball – tennis ball sized substrate.
	Parr	Fast flowing broken water, 0.2-0.4m deep. Tennis ball – football sized substrate.
	Adult	Deep, at least 0.8m deep. Connectivity.
Lamprey	Adults/spawning	Gravel with some sand (around 0.1m deep substrate). Water flow through substrate, generally at the tail end of pools. Water velocities around 0.3–0.5m/s but can be as high as 4.0m/s. Water depth generally less than 0.4m.
	Ammocoetes (juveniles)	Mud, silt, sand substrate up to 0.3m deep with high organic content. Slow flowing water (less than 0.1m/s). Stable stream bed. Water depth 0.1–1m.
Trout	Spawning/egg	Channel generally less than 3m wide. Glide or riffle flow at 0.15-0.75m/s. Pea – tennis ball sized substrate at least 0.15m deep with less than 12% fine particles.
	Fry	Shallow (0.2m or less) medium flowing water. Golf ball - tennis ball sized substrate. Marginal cover.
	Parr	Variety of substrates. Water depth 0.2–4m with slow-medium flows. Bankside cover (undercut banks/vegetation/tree roots).
	Adult	Deeper water (at least 0.4m) with slow sustained flow. Bankside/bed/canopy cover.
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	10-14 = Excellent 5-9 = Good 2-4 = Moderate 0-1 = Poor

Consultation

- 12.2.24 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).
- 12.2.25 The ESG was also consulted on various aspects of the ongoing ecological work and on key potential impacts such as watercourse crossings, loss of ancient woodland and loss of bat roosts. Through the ESG, including specialist input from SNH, issues such as the specification for badger- and otter-resistant fencing were agreed. Further consultation with SNH was undertaken in October 2017 specifically with regards to loss of bat roosts due to side road construction at Guay Farmhouse. This consultation directed the progression of the side road design, as well as informing the construction and operation mitigation at this location.
- 12.2.26 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 12.2.24, in addition to the following consultees:
- Badenoch and Strathspey Conservation Group;
 - British Deer Society;
 - Buglife;
 - Findhorn, Nairn and Lossie Fisheries Board;
 - Forestry Commission Scotland,
 - RSPB;
 - Scottish Badgers;
 - SWT;
 - Spey District Fisheries Board;
 - TDSFB; and
 - The Woodland Trust.

Public Exhibitions

- 12.2.27 Through the public exhibition process and associated drop-in sessions, presence of northern damselfly and flowering rush in/around ponds near Kindallachan was raised. Subsequent consultation, including a site meeting, was undertaken in June 2017 to identify northern damselflies at Kindallachan and to

develop appropriate mitigation for loss of habitat as a result of the proposed scheme (refer to paragraph 12.3.17).

Impact Assessment

12.2.28 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.

12.2.29 The importance of a feature was defined using criteria set out in Table 12.6 and paragraphs 12.2.30 to 12.2.33. Impact characterisation criteria are defined in Table 12.7, and paragraphs 12.2.35 to 12.2.36.

Importance

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

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

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

12.2.33 Only important ecological features are subject to impact assessment. Therefore, features that do not meet the criteria for at least local importance are not considered in detail in this assessment.

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 Local Biodiversity Action Plan (LBAP) (Tayside Biodiversity Partnership, 2016) or Cairngorms Nature Action Plan (CNAP) (CNPA, 2013) (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.

Importance	Criteria
	<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 regional level, as defined in the Tayside LBAP 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 LBAP, 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>Ecosystems or habitats essential for the maintenance of:</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 are considered to be absent or do not meet any of the above criteria.

12.2.34 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 in Section 12.6: Residual Impacts). Beaver are discussed where relevant in line with the 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

12.2.35 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).

12.2.36 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

- 12.2.37 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.
- 12.2.38 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 status⁴ of important ecological features. Knowledge and assessment of construction methods and operational activities, together with the ecological knowledge of ecologists with experience of similar large-scale infrastructure projects, has been used to identify the potential impacts of the project on ecological features.
- 12.2.39 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.
- 12.2.40 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.
- 12.2.41 Impacts on internationally important features characterised as ‘low’, and ‘high’ impacts on features of authority area importance, can also be potentially significant. There may in addition 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.
- 12.2.42 Under the terms of the EIA Regulations, where significant impacts are identified, mitigation will be developed to reduce impacts where feasible.
- 12.2.43 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

⁴ 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).

guidance and UK, Scottish and local government environmental impact, planning and sustainability policies.

- 12.2.44 Impacts that are not significant (including those where compliance with regulation is required) would be expected to be avoided or reduced through the application of the standard mitigation commitments and best working practice (e.g. mitigation of potential pollution impacts through adherence to standard best practice and guidelines). Significant ecological impacts are expected to be mitigated through a combination of best practice/typical mitigation methods and also mitigation targeted to specific locations as described in the assessment.
- 12.2.45 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).

Limitations to Assessment

- 12.2.46 Any limitations to surveys have been detailed in Table 12.1 under the relevant survey type. Although limitations to the surveys were noted for bats and reptiles, the data collected provides robust baseline for the purposes of an EclA and as such there are no limitations to the assessment.

12.3 Baseline Conditions

Desk-based Assessment

Designated Sites

- 12.3.1 Three statutory designated sites, designated for their biological interest, lie within the 500m study area and are shown on Figure 12.1:
- River Tay SAC (SNH, 2016b) (SNH site code 8366, EU site code UK0030312);
 - Shingle Islands SAC (SNH, 2016c) (SNH site code 8375, EU site code UK0030274); and
 - Shingle Islands SSSI (SNH, 2016d) (SNH site code 1427).
- 12.3.2 A detailed consideration of the implications on European sites, River Tay SAC and Shingle Islands SAC, in the context of the Conservation (Natural Habitats, & c.) Regulations 1994 (referred to as the Habitat Regulations) has been undertaken in a Habitats Regulations Appraisal (HRA) for the proposed scheme.
- 12.3.3 There are no locally designated sites of nature conservation interest (such as Local Nature Reserves) within the study area.

Ancient and Native Woodland

- 12.3.4 Twenty-six sites listed on the Ancient Woodland Inventory (AWI) (categories 1a, 2a, 2b and 3) (SNH, 2008a; undated-c) and 69 pockets of native woodland categorised as part of the Native Woodland Survey of Scotland (NWSS) sites (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. Of the AWI sites located within 500m of the proposed scheme, approximately a quarter of the area is category 1a and 2a (both ancient woodland), approximately half is category 2b (long-established woodlands of plantation origin) and the remaining area is category 3 (other woodland on 'Roy' maps⁵).
- 12.3.5 The AWI includes some areas which were previously wooded, but have since been modified to other uses, such as agriculture; or are now areas of hardstanding, for example under the existing A9. Some non-wooded AWI sites could potentially retain remnants of ancient woodland habitats, for example in the soil bank and ground flora. Within the study area, non-wooded AWI sites predominately comprise areas of continuous bracken, grassland and scrub.

⁵ Roy maps (c.1750) from the Roy Military Survey of Scotland, 1747-1755, and the 1st edition Ordnance Survey map (c.1860) were used to derive the AWI. Available at <http://www.nls.uk/> (Last accessed January 2017).

- 12.3.6 The extent of habitats listed on the AWI under the footprint of the proposed scheme is 10.16ha. The extent of those habitats which are currently wooded was determined based on outputs from the Woodland Connectivity – Ancient Woodland Compensation Strategy (Transport Scotland, 2016b) and is 6.35ha. In the wider context, within 500m of the proposed scheme the total area of AWI woodland is approximately 188ha, of which approximately 162ha is currently wooded.

Biodiversity Action Plans

- 12.3.7 The study area is located within the areas covered by the Tayside LBAP (Tayside Biodiversity Partnership, 2016). The Tayside LBAP, through adopting an ecosystem approach to biodiversity protection and enhancement, aims to deliver Tayside’s vision for a fully functioning ecosystem network by 2030. The LBAP identifies objectives and targets for the conservation of six ecosystems, including the habitats and species present within them, namely:
- water and wetland;
 - coastal and marine;
 - urban;
 - upland;
 - farmland; and
 - woodland.

- 12.3.8 The Cairngorms Nature Action Plan (CNAP) for 2013 – 2018 (CNPA, 2013) covers an area outwith the study area, however some of the 26 key species and 19 habitats are of relevance to the study area. Inclusion of these key species and habitats within this assessment has been directed through consultation with the ESG.

Terrestrial Habitats

- 12.3.9 Habitats within 150m of the existing A9, as recorded during the A9 Dualling Programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b), are identified on Figure 12.2. Grassland and woodland together accounted for the majority of the area (Photographs 12.1, 12.2 and 12.3), with arable habitat, and bracken and fern, making up most of the remaining area. Swamp, standing water and bare ground are infrequent habitats in context of the survey area. Target notes, detailing habitats and plant species, from the A9 Dualling Programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b) are presented on Figure 12.2 and detailed in Table 15 of Appendix 12.2 (Baseline Data and Detailed Survey Methods). Target notes relating to WVI have been included also. Of note, the data from the A9 Dualling Programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b) have been used solely to provide the baseline for habitats present within the study area. DMRB Stage 3 surveys provide a robust baseline for protected species within the study area.

Photograph 12.1: Looking north towards Guay showing an example of typical grassland habitat which comprises the largest proportion of the habitat area.



Photograph 12.2: Typical broadleaved woodland habitat within the survey area.



Photograph 12.3: Looking north along the existing A9 showing typical woodland habitat adjacent to the current road.



- 12.3.10 Parcels of habitats that may contribute to foraging, nesting, breeding and/or commuting habitat for faunal species of conservation importance are included as part of the assessment for the relevant species.
- 12.3.11 Desk-based assessment of terrestrial habitats within River Tay SAC and Shingle Islands SAC/SSSI identified that improved/poor semi-improved grassland and broadleaved woodland habitats were present at locations in which the proposed scheme overlaps the designated sites. Further details are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Groundwater Dependant Terrestrial Ecosystems (GWDTE)

- 12.3.12 The desk-based assessment of Phase 1 habitat survey data, including the A9 Dualling Programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b) and subsequent Phase 1 habitat surveys undertaken in 2016, as described in Table 12.1, did not identify any potential sites that could be considered to be GWDTEs. This is consistent with the conclusion of the hydro-geomorphological assessment discussed in Chapter 10 (Geology, Soils, Contaminated Land and Groundwater). GWDTEs

are therefore not considered further in this assessment. Please refer to Chapter 10 (Geology, Soils, Contaminated Land and Groundwater) for further details on impacts on groundwater.

Aquatic Habitats

- 12.3.13 Three named watercourses (Dowally Burn, Sloggan Burn and Kindallachan Burn) are crossed by the existing A9 within the study area (Figure 12.11). The Dowally Burn forms part of the River Tay SAC to a distance of approximately 0.7km upstream of the existing A9. Kindallachan Burn also forms part of the River Tay SAC up to the crossing point of the Highland Main Line railway and existing A9 (Photograph 12.4). In addition, more than twenty small unnamed watercourses were identified as being crossed by the existing A9, detailed in Chapter 11 (Road Drainage and the Water Environment).

Photograph 12.4: A9 crossing Kindallachan Burn



- 12.3.14 The River Tay runs parallel to the west of the existing A9 for the length of the study area (Figure 12.1). A small section of the River Tummel, which is part of the River Tay SAC, falls within the study area at Ballinluig Junction and is 460m from the main alignment of the proposed scheme at its nearest point.
- 12.3.15 The River Tay, Dowally Burn, Kindallachan Burn and River Tummel were classified by SEPA in 2015 as part of the River Basin Management Plan (RBMP). The River Tay and River Tummel were both classified as having overall Good Ecological Potential. Specifically, the River Tay was classified as Good for macroinvertebrates and fish and High for macrophytes, while the River Tummel was classified as Good for macroinvertebrates and High for fish and macrophytes. Kindallachan Burn was classified as having Good overall status with classifications of Good for macroinvertebrates and High for fish, but no classification for macrophytes. Dowally Burn was classified as having Moderate overall status due to poor hydrology but classifications of Good and High for macroinvertebrates and fish respectively. As with Kindallachan Burn, Dowally Burn has no WFD classification for macrophytes. SEPA sampling points on Dowally Burn and Kindallachan Burn are approximately 3km and 4km respectively upstream of the existing A9 and therefore may not be representative of the condition at the crossing points. For comparison with the results of Jacobs field surveys refer to paragraphs 12.3.60 and 12.3.61.

- 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 steep gradients.

Protected Species

- 12.3.17 Data obtained during the desk-based assessment, as described in paragraphs 12.2.9 to 12.2.18, and the results of fieldwork 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: several records within 10km radius of the study area (NBN, 2016). Scottish Badgers provided records in 2015 and 2017 of badger presence in the study area and setts were recorded during DMRB Stage 2 Assessment (Transport Scotland, 2016a).
 - Bats: 39 trees, 21 buildings and four structures with high bat roost potential were identified during DMRB Stage 2 site surveys, including seven known roosts, within 50m of the existing A9 (Transport Scotland, 2016a). In addition, 19 high roost potential and moderate roost potential (1*/1) trees, including one transitory roost, within 50m of the proposed scheme were identified as part of the 2017 ground investigation works (HEL, 2017).
 - Bird species on Schedule 1 of the WCA: data provided by RSPB indicates the presence of Schedule 1 species including goshawk, capercaillie, hen harrier and osprey as breeding within the wider area, outwith the study area of the proposed scheme. The resolution of some records means their location cannot be determined precisely. Records of other Schedule 1 species within the study area were provided by the TRSG and BTO (received 2015 and 2016, respectively). Furthermore, A9 Dualling Programme route-wide Phase 1 habitat survey data recorded kingfisher within the study area (Transport Scotland, 2015b).
 - Breeding birds: suitable habitat was recorded during the DMRB Stage 2 Assessment, notably in woodland within the study area (Transport Scotland, 2016a).
 - Breeding and wintering birds: species recorded during the BTO Atlas 2007-11 (BTO, 2016) in four 10km² grids associated to the study area. These data include an additional 36 species, of which 20 were breeding season records, which were not recorded during the breeding bird surveys as detailed in 12.3.36 to 12.3.38.
 - Black grouse: several records for black grouse leks are available within 2km of the proposed scheme (RSPB, 2016).
 - Otter: evidence of otter was recorded during the DMRB Stage 2 Assessment (Transport Scotland, 2016a).
 - Water vole: historical records (pre-1960) within a 10km radius of the study area were available (NBN, 2016). The species is undergoing widespread decline (SNH, 2016e) and no recent records were available.
 - Pine marten: a pine marten WVI and suitable habitat was recorded during the DMRB Stage 2 Assessment (Transport Scotland, 2016a). In a recent study, the species was considered to be expanding its range in Tayside (Croose et al., 2014).
 - Eurasian beaver: incidental records of beaver foraging activity were identified during the DMRB Stage 2 Assessment (Transport Scotland, 2016a) and populations of beaver have been known within the Tayside catchment since 2006 (Tayside Beaver Study Group, 2015). Furthermore, NBN hold recent records (within the last two years) of beaver within the study area (NBN, 2016).
 - Red squirrel: incidental sightings of red squirrel and suitable habitat recorded during the DMRB Stage 2 Assessment (Transport Scotland, 2016a) and priority habitats recorded at Craigvinean (Poulsom et al., 2005).
 - Reptiles: adder, slow worm and common lizard were all recorded in the study area, identified through desk assessment as incidental records, during the DMRB Stage 2 Assessment (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). While 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. Although high numbers of juvenile Atlantic salmon had previously been recorded in the lower reaches of Dowally Burn (Atmos Consulting, 2009) these densities are most likely to be as a result of stocking of 30,000 ova and fry in the burn in the months prior to survey (TDSFB, 2009a). Kindallachan Burn has been assessed as containing habitat for spawning and juvenile salmonids (Atmos Consulting, 2013). It has been reported that, without stocking, the contribution of smolts from tributaries to the Tay, including Dowally and Kindallachan Burns is nominal (Lyon & Struthers, 1992).

- FWPM: data provided by SNH (received January 2016, June 2016) indicated that FWPM have been recorded in the study area.
- European eel: records from Dowally Burn (Atmos Consulting, 2009) and suitable habitat identified in River Tay catchment during site surveys (Transport Scotland, 2016a).
- River, brook and sea lamprey: TDSFB indicate that all three species of lamprey are found in the accessible areas of the main stem and larger tributaries of the Tay catchment (TDSFB, 2009b). No lamprey and very little lamprey habitat were recorded during electric fishing surveys conducted on Dowally Burn (Atmos Consulting, 2009). Suitable habitat was identified in the River Tay catchment during site surveys (Transport Scotland, 2016a). Site condition monitoring has recorded all three species of lamprey within the River Tay catchment; however, none of the sites surveyed were within the study area (Watt et al., 2008).
- Trout (brown/sea): TDSFB (2009b) state that brown trout and sea trout are present throughout the study area and suitable habitat was identified in River Tay catchment during site surveys (Transport Scotland, 2016a). High numbers of juvenile trout were recorded in Dowally Burn (Atmos Consulting, 2009).
- Northern damselfly: a local resident noted presence of northern damselfly at Kindallachan (R. Youngman, *pers. comm.*) at a drop-in session in September 2015 and NBN hold records of this species (Table 1 in Appendix A12.2). Northern damselfly is a rare species in Britain, is listed on the Scottish Biodiversity List (SBL) (Scottish Government, 2015), and as a protected species on the Tayside LBAP (Tayside Biodiversity Partnership, 2016). No additional records of this species resulted from subsequent consultations, which were carried out in 2017; however, the pond at Kindallachan (NN 99290 50134; WF42, see paragraph 12.3.62) has supported northern damselfly in previous years.

Wildcat

- 12.3.18 Records of wildcat within a 10km radius of the study area are available, dated 2006 and 2008 (NBN, 2016); however, there are no current data on wildcat activity within the footprint of the proposed scheme.
- 12.3.19 The Wildcat Habitat Suitability Model (Bryce and Mattisson, 2012) shows extensive wildcat cover habitat to both the east and west of the proposed scheme; however, the proposed scheme runs parallel to the east of the River Tay with negligible wildcat cover habitat within the flood plain (refer to Figure 12.3). The River Tay itself presents a natural barrier to movement from the west. Areas of prey habitat exist on the west of the proposed scheme, to the north of the project (refer to Figure 12.3).
- 12.3.20 There are no priority areas within the study area (as defined in Littlewood et al., 2014).

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 including the northern damselfly, plants, fungi and lichens, which have been categorised into relevant broad habitat types. Inclusion on this list is based on the regional 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 which may support key and draft priority non-protected species in relation to the proposed scheme. A habitat-based approach has been undertaken to assess potential impacts of the proposed scheme on habitats that support key species and priority non-protected species.

Deer

- 12.3.23 Deer have been recorded in the study area (NBN, 2016). They are not legally protected for nature conservation reasons; although roe deer are listed on the Tayside LBAP protected species list (Tayside Biodiversity Partnership, 2016). Deer are of concern to the project due to deer vehicle collisions (DVC) and their protection under animal welfare legislation. DVCs have been recorded within the study area (Transport Scotland, 2015b).

Invasive Non-native Species (INNS)

- 12.3.24 INNS present a threat to biodiversity (Department for Environment, Food & Rural Affairs (DEFRA), 2015). Six INNS plant species; Japanese knotweed, Himalayan balsam, giant hogweed, rhododendron, variegated yellow archangel and pink purslane, were recorded in the study area during the A9 dualling programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b) and during other habitat and species surveys undertaken as detailed in Table 12.1. Records of INNS are presented in Table 18 in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Grayling

- 12.3.25 Grayling has been recorded in the River Tay (The Grayling Society, 2015) and although grayling is listed on Annex V of Council Directive 92/43/EEC the species is not considered native to Scotland. 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.

Flowering Rush

- 12.3.26 Flowering rush has been recorded within the wetland habitats near Kindallachan (Transport Scotland, 2015b; R. Youngman, *pers. comm.*). This species is uncommon in Scotland, with its distribution mostly confined to England (middle and south). This species is not protected and furthermore is generally not considered native to Scotland (Preston et al., 2002). Flowering rush has therefore been scoped out from further assessment and is not discussed further.

Site Surveys

Terrestrial Features

Badger

- 12.3.27 Four main setts, one annex sett, 17 subsidiary setts and 50 outlier setts were recorded within the study area, as well as field signs including dung pits, footprints and well-worn paths (Figure 12.4). Full survey results are provided in Table 1 in Appendix A12.3 (Confidential Ecology Features).

Bat Roost Surveys

- 12.3.28 Preliminary ground assessments and summer emergence and re-entry surveys of buildings, structures and trees were undertaken and seven buildings, two structures and four trees were found to contain summer bat roosts as shown on Figure 12.6. The surveys identified five species of bat roosting within the study area: common pipistrelle, soprano pipistrelle, Natterer's bat, Daubenton's bat and brown long-eared bat. Details are provided in Table 5 in A12.2 (Baseline Data and Detailed Survey Methods).
- 12.3.29 Following a change in the design and subsequent consultation with SNH, mist netting was conducted at BB 3.12 (Guay Farmhouse) to confirm the species of Myotis bat roosting in the building, and to ascertain the status of the roost as a maternity colony. Surveys confirmed presence of a maternity roost for Natterer's bat, soprano pipistrelle and brown long-eared bat.

12.3.30 One confirmed hibernation roost (Guay Farmhouse, BB 3.12) was identified during hibernation roost surveys. Furthermore, two structures and one tree were identified as having high hibernation potential for bats, although hibernation was not confirmed at these features (Table 5 in Appendix A12.2 (Baseline Data and Detailed Survey Methods)).

12.3.31 Further details are provided in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Bat Activity Surveys

12.3.32 For all structures, buildings and transect routes that were selected for passive activity monitoring and CSM surveys, an overall valuation method was devised to allow for comparison of the features and areas for bats. The overall valuation method used each feature's/area's bat activity, the rarity of the species recorded and species richness to assign a valuation category of high, moderate or low, as explained in detail in Appendix A12.2 (Baseline Data and detailed Survey Methods). Examples of high, moderate and low valuations are provided below.

12.3.33 One structure was identified to have an overall value of high (exhibiting high activity, high species richness and high rarity) (Collins, 2016) and three structures had an overall value of moderate (exhibiting moderate activity, high species richness and moderate rarity), as shown on Figure 12.6 (refer to Table 6 in Appendix A12.2 (Baseline Data and Detailed Survey Methods)).

12.3.34 Of the five transect routes surveyed, one had an overall value of moderate (exhibiting moderate activity, moderate species richness and high rarity) and four had a value of low (exhibiting either moderate or low activity and low species richness and low rarity). The results are presented in Table 7 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and shown on Figure 12.6.

12.3.35 Of the ten locations selected for monitoring for rare and cryptic species, three locations were identified as having a high overall value, indicating high activity of rarer species (*Myotis* sp. and brown long-eared bat). The remaining locations were classed as either moderate or low value (four and three, respectively). Further details are provided in Table 8 in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Breeding Birds

12.3.36 A total of 1113 breeding records (birds recorded nesting, singing, acting territorially or in family groups) were logged during the breeding bird surveys. A total of 56 species were recorded during the site surveys, of which 48 were confirmed to be breeding.

12.3.37 Of the 48 breeding species, 19 were listed as species of conservation concern, either red-listed or amber-listed (Eaton et al., 2015) as detailed in Table 11 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and shown on Figure 12.7. The most frequently recorded breeding species was chaffinch. Twelve species were listed on the SBL (Scottish Government, 2013) and 17 on the Tayside LBAP (Tayside Biodiversity Partnership, 2016) (Table 9 in Appendix A12.2 (Baseline Data and Detailed Survey Methods)).

12.3.38 A barn owl roost, including owl pellets and a sighting of a barn owl, were recorded within the study area as an incidental record in April 2015. Further survey in 2017 indicated that the roost identified in 2015 was no longer being used regularly by barn owl for roosting or nesting. Furthermore, osprey was recorded within the study area during FWPM surveys in 2016. Details are provided in Appendix A12.3 (Confidential Ecology Features).

Otter

12.3.39 Two otter holts and six couches were recorded within the study area, as well as field signs including spraints and prints (Figure 12.8). Furthermore, an incidental sighting of otter was recorded in 2017, during bat surveys. Full survey details and results are presented in Appendix A12.3 (Confidential Ecology Features).

Water Vole

- 12.3.40 No field signs or suitable habitat was recorded during the DMRB Stage 3 site surveys.

Pine Marten, Red Squirrel and Wildcat

- 12.3.41 Incidental records of evidence of pine marten and red squirrel are detailed in Table 12 in Appendix A12.2 (Baseline Data and Detailed Survey Methods). There were eleven incidental sightings of red squirrel, two dreys and one potential dreys recorded and evidence of squirrel feeding was also found (Figure 12.9). There were two incidental records of pine marten within the proposed scheme; one of which was a WVI, recorded on the existing A9 within the southern extent of the project, and the other a sighting of a pine marten at Guay Farm. No field signs for wildcat were recorded.

Beaver

- 12.3.42 Four beaver burrows and other field signs (including foraging and tree felling) were found along the River Tay within the survey area during the DMRB Stage 3 otter, badger and FWPM surveys (Photograph 12.5; Figure 12.9). See Table 13 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) for details of beaver records.

Photograph 12.5: Beaver field signs within study area



Reptiles

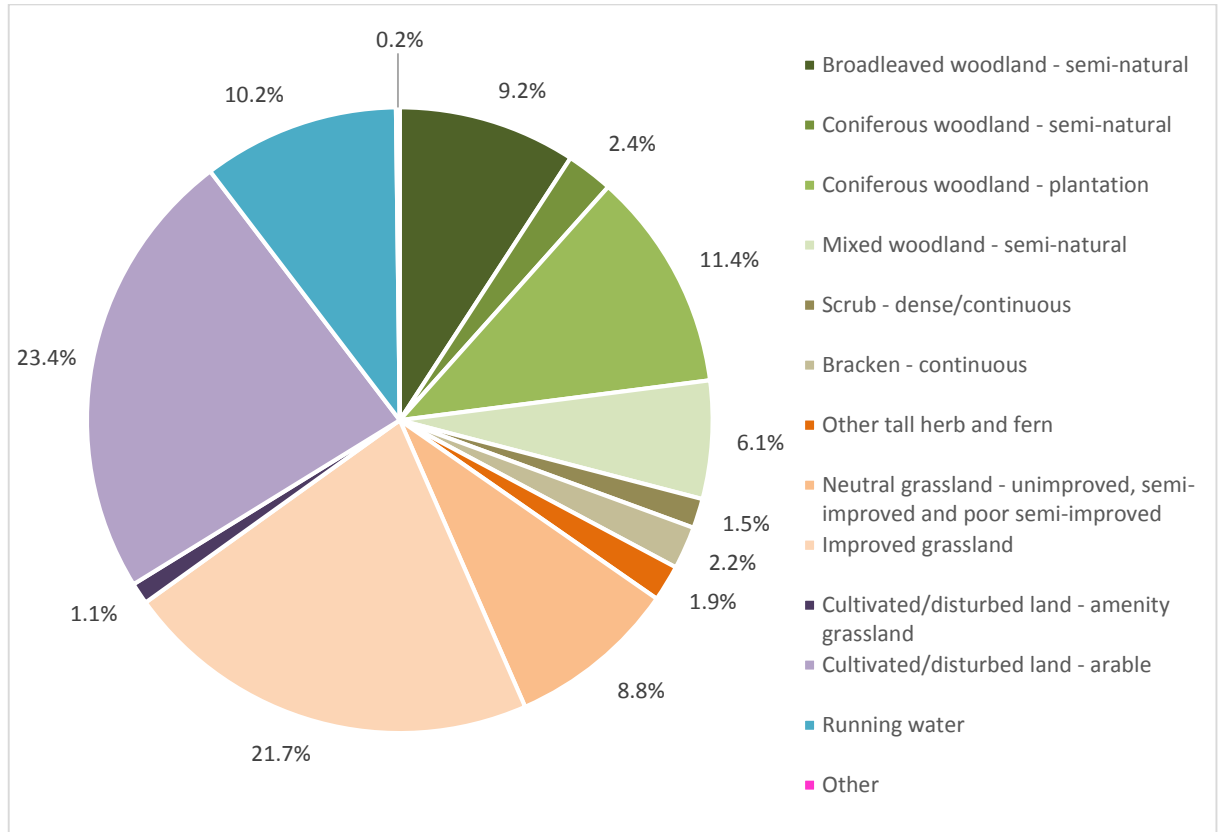
- 12.3.43 Reptile presence was confirmed at all seven sites that were taken through to artificial cover object (ACO) surveys, with four sites categorised as a Key Reptile Site (KRS). Incidental observations of slow worm were also recorded within the proposed scheme footprint in 2017. Results of the reptile surveys conducted, including incidental records, are presented in Table 14 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and on Figure 12.10.

Phase 1 Habitat Survey

- 12.3.44 Phase 1 habitat surveys were undertaken to update previous surveys and include areas that had not been previously surveyed. Diagram 12.1 below shows the proportion of each habitat type within 150m of the proposed scheme, based on the desk-based assessment and updated field surveys. Distribution of these habitats is shown on Figure 12.15. This figure updates Figure 12.2 which presents desk assessment data from the A9 Dualling Programme route-wide Phase 1 habitat survey (see 12.3.9 to

12.3.11). Aerial photography provided by Blom (2014) was used to provide context for areas up to 500m from the proposed scheme (shown on Figure 12.15).

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



12.3.45 Grassland and woodland together accounted for approximately 60.6% of the area within 150m of the proposed scheme, with arable habitat (23.4%) and running water (10.1%), primarily comprising the River Tay, making up most of the remaining area. Swamp, marsh, standing water, bare ground, buildings and spoil are infrequent habitats within the area; these habitats combined comprise <1% of the habitat composition (labelled as other). In the wider area, within 500m of the proposed scheme, similarly grassland and woodland habitats make up the majority of the composition. Arable grassland and improved grassland account for approximately 44% of the area and woodland habitats, including semi-natural and plantation woodland, which comprise 33% of the area.

12.3.46 Relevant target notes from A9 Dualling Programme route-wide Phase 1 Habitat survey (Transport Scotland, 2015b) are provided in Table 15, in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and updated habitat survey target notes are presented in Table 16 in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Phase 2 Habitat Survey

12.3.47 Phase 2 habitat surveys were undertaken at AWI sites and terrestrial areas within designated sites with relevant qualifying features that had the potential to be impacted by the proposed scheme (identified at DMRB Stage 2 and DMRB Stage 3 and considered, following desk assessment, as likely to be more botanically important). None of the areas under the footprint of the proposed scheme, following surveys, were considered to be of high botanical importance, however. Further details from these surveys are presented in Table 17 in Appendix A12.2 (Baseline Data and Detailed Survey Methods) and target notes are shown on Figure 12.15.

Aquatic Features

Aquatic Habitats Visual Assessment

- 12.3.48 Walkover surveys were undertaken in February 2015 with two additional sites (WF41A and WF55A) visited in September 2015. Water features are characterised in Appendix A12.2 (Baseline Data and Detailed Survey Methods). Observations from subsequent FWPM surveys in 2016 and 2017, indicated that the general character of the watercourses has not changed since these walkover surveys were conducted.
- 12.3.49 The main watercourse in the survey area, the River Tay (Photograph 12.6), averaged 80m wide and with varying depth in excess of 2m in places. The flows were predominantly glide and run, and along with the mixed substrate provided habitat for various life stages of protected fish species. Three other named watercourses were present within the survey area: Dowally Burn, Sloggan Burn and Kindallachan Burn. These were small shallow watercourses which average between 20cm and 25cm deep and vary from 1m wide (Sloggan Burn) to 5m wide (Kindallachan Burn). The majority of the unnamed watercourses were shallow, with some holding very little water, with little or no flow. Cobble and gravel substrate upstream of the A9 and finer silt substrate downstream of the A9 provided habitat for invertebrate species, but limited habitat for fish. This characteristic was common of several minor watercourses throughout the area (Photograph 12.7).
- 12.3.50 Six ponds were included in the walkover survey. Four of these ponds (WF41, WF41A, WF42 and WF42A) formed a series of interconnected ponds at Kindallachan which were heavily shaded with an abundance of silt and organic matter, littered with plastic covered hay bales and plastic materials, and experience run-off from the A9 from road inlets. Further surveys were undertaken at WF41 and WF42 to characterise the ecology of these ponds. The other two ponds covered by the walkover survey (WF54 and WF55A) were ephemeral with terrestrial grasses noted and one of these was a SuDS basin. Neither was considered for further survey due to low ecological potential.
- 12.3.51 Refer to Appendix A12.2 (Baseline Data and Detailed Survey Methods) for additional supporting details of aquatic habitats.

Photograph 12.6: River Tay looking upstream (NO 00517 44525)



Photograph 12.7: WF50 (NN 98949 51015) upstream of the A9



Photograph 12.8: Dowally Burn (NO 00016 48163)



Fish

- 12.3.52 Habitat suitable for various life stages of salmonids, lamprey and European eel was present throughout the River Tay. Incidental sightings of Atlantic salmon, grayling, perch and European eel were recorded within the river during aquatic surveys.
- 12.3.53 Dowally Burn (refer to Photograph 12.8) and Sloggan Burn contained suitable habitat for salmonids during most life stages although habitat for adult salmonids was limited. Sloggan Burn was considered inaccessible to migratory fish due to a 100m long small pipe culvert between the River Tay and the A9. Dowally Burn was considered accessible to migratory fish under normal conditions for a distance of only 150m upstream of the existing A9 (within the main settlement of Dowally) due to a series of cascades, which may be passable under high flow conditions. Kindallachan Burn provided habitat for salmonid and lamprey species. Sections of habitat for European eel were present throughout Dowally and Kindallachan Burns.
- 12.3.54 Several small unnamed watercourses which flow down steep, wooded hillsides into the River Tay were not accessible to migratory fish and were characteristic of several other watercourses within the area (refer to Photograph 12.7). These watercourses were considered to offer no suitable habitat for salmonid or lamprey species.
- 12.3.55 Furthermore, heavily modified streams and ephemeral ditches and ponds within the study area did not offer suitable habitat or accessibility for fish.
- 12.3.56 Fish species likely to be present are displayed on Figure 12.11.

Macroinvertebrates

- 12.3.57 Two sites on the River Tay and five tributaries of the River Tay were surveyed for macroinvertebrates (Figure 12.11). Detailed results of the macroinvertebrate surveys are given in Appendix A12.2 (Baseline Data and Detailed Survey Methods). WFD classifications and Community Conservation Index (CCI) conservation value calculated from the samples, along with any species of conservation interest, are displayed on Figure 12.11.
- 12.3.58 The macroinvertebrate community in the tributaries was in good condition and showed minimal impacts from organic pollution, flow or fine sediments.
- 12.3.59 The macroinvertebrate community at the two River Tay sites showed some impacts from organic pollution, flow and fine sediment, although the impacts from low flow and fine sediment may be related to the location of a safe sampling site at the river's edge.
- 12.3.60 A WFD classification for macroinvertebrates could not be assigned to the three unnamed watercourses, WF25, WF38 and WF49, because the macroinvertebrate survey site was within 2.5km of the source (Appendix A12.2 (Baseline Data and Detailed Survey Methods)). The classification assigned to Dowally Burn and Kindallachan Burn was Good in both seasons, which matches the 2015 SEPA classification for macroinvertebrates in both watercourses (see paragraph 12.3.15). The two River Tay sites (6E and 6G) were assigned classifications of Poor, which is lower than the Good rating the river received for macroinvertebrates from SEPA (see paragraph 12.3.15). Most of the macroinvertebrate samples were of Fairly High to Very High conservation value, although two individual samples, from WF25 in November and the River Tay (WF6G) in April, showed Moderate conservation value.

Macrophytes

- 12.3.61 Three watercourses, Dowally Burn, Kindallachan Burn and an unnamed watercourse (WF38) were surveyed for macrophytes (Figure 12.11, Appendix A12.2 (Baseline Data and Detailed Survey Methods)). In Dowally Burn five species were recorded with an overall macrophyte cover of 4% and overall filamentous algae cover of 0.5%. In WF38 the overall macrophyte cover was 5% comprised of six species and the filamentous algae cover was 1.7%. Kindallachan Burn showed the lowest proportion of macrophytes of the three watercourses with three species recorded and only 1.5% of the survey reach covered by macrophytes and 0.5% covered by filamentous algae. Dowally Burn and Kindallachan Burn

were assigned WFD classifications for macrophytes of Good while WF38 was assigned a classification of Poor. No protected macrophyte species were recorded during the surveys.

Predictive System for Multimetrics (PSYM) Survey

- 12.3.62 A PSYM survey, to provide an assessment of the ecological quality of the site compared to ponds nationally, was undertaken at two ponds (WF41 and WF42) in September 2015 (Figure 12.11, Photograph 12.9). The results indicated an overall assessment of Moderate and Poor, respectively, with neither pond receiving the classification of Priority Pond. Detailed results are presented in Appendix A12.2 (Baseline Data and Detailed Survey Methods).

Photograph 12.9: Poor quality pond (WF42) (NN 99290 50134) in winter (left) and summer (right)



Freshwater Pearl Mussel

- 12.3.63 FWPM are present in the River Tay within the study area. Results of the FWPM surveys are presented in Appendix A12.3 (Confidential Ecology Features) and Figure 12.12.

Evaluation

- 12.3.64 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.
- 12.3.65 Deer and INNS were scoped out from ecological evaluation, however INNS have been considered within the impact assessment, as explained in paragraph 12.2.34.
- 12.3.66 The following features are unlikely to be affected by the proposed scheme. This is based on currently available desk-based assessment and/or site survey data. These data indicate that they are not known to be present within the study area, or no effects pathways have been identified that could affect them. These features will therefore not be discussed further.
- Unimproved grassland, recorded in the A9 Dualling Programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b), does not feature within the footprint of the proposed scheme following design refinement. This habitat will not be impacted by the proposed scheme and has been scoped out of the assessment.
 - GWDTes do not feature within the study area and have been scoped out of the assessment.
 - Woodland parcels categorised under the NWSS overlap with AWI and other woodland habitat within the study area and NWSS woodland has therefore been considered under these features for the assessment.
 - Water vole is a regionally important species and protected under the WCA, but no suitable water vole habitat or evidence was identified in the study area during DMRB Stage 3 baseline data collection.

- Scottish wildcat is internationally important, in decline and protected under the Conservation (Natural habitats &c.) Regulations 1994 (as amended), however there are no data to indicate presence in the study area. The floodplain between the proposed scheme and the River Tay provides negligible wildcat cover habitat and the River Tay itself presents a natural barrier to movement from the west. Areas of prey habitat exist on the west of the proposed scheme, to the north of the project, however there are no priority areas within the study area.
- The Schedule 1 bird species, black grouse, capercaillie, goldeneye and hen harrier are regionally important. However, due to a lack of confirmed breeding records for these species within 1km of the proposed scheme and/or a lack of suitable habitat affected, no impacts are predicted.
- The Schedule 1 bird species, kingfisher, is regionally important. A single sighting of kingfisher was made during A9 Dualling Programme route-wide Phase 1 habitat survey in 2015 (Transport Scotland, 2015b). However, due to a lack of confirmed breeding records for this species within 1km of the proposed scheme and/or a lack of suitable habitat affected, no impacts are predicted.
- The Schedule 1 bird species, osprey, is regionally important. This species exhibits high nest site fidelity and can travel up to 10km from its nest to forage (Hardey et al., 2009). An osprey was observed feeding in the River Tay during FWPM surveys in 2016, however this species was not observed breeding within the survey area (which extended to 150m as stated in Table 12.1). Furthermore, no records of this species breeding within 2km of the proposed scheme are available following consultation. It is considered unlikely that osprey will be impacted by the proposed scheme.
- The Schedule 1 bird species, goshawk, is locally important, and has bred within 2km of the A9 in the past (single record in 2005) (see Appendix 12.3 (Confidential Ecology Features)). This species is highly nest site faithful and often returns to the same site, or nest patch, each year (Scottish Raptor Study Group, undated). The suggested disturbance distance for Goshawk nests is 250-500m (Ruddock and Whitfield, 2007); however, no records of Goshawk are available within this buffer to the proposed scheme, or within the wider study area. It is therefore considered that it is unlikely for this species to be impacted by the proposed scheme, provided construction best practice is implemented.
- Grayling is listed on Annex V of Council Directive 92/43/EEC and has been recorded in the River Tay. However, this species is not considered native to Scotland and is not afforded any specific protection. Mitigation for Atlantic salmon and trout would mitigate potential impacts on grayling as habitats and life stages are broadly similar for these species (as discussed in 12.3.25). Therefore, grayling is not considered further in this assessment.

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 in Scotland). WFD watercourse. Listed as a key site in the Tayside LBAP (Water and Wetland Ecosystems).	Statutory designated site which in part falls within the footprint of the proposed scheme (Figure 12.1). The designation comprised predominantly aquatic habitats, with some terrestrial habitat falling within the designation.	Designated for its clear-water lakes, Atlantic salmon, river lamprey, brook lamprey, sea lamprey and otter (SNH, 2016b). Dowally Burn and Kindallachan Burn form part of the River Tay SAC. Only the section of Kindallachan Burn downstream of the A9 crossing is within the River Tay SAC; however, the entire Kindallachan Burn within the study area is included in the River Tay SAC evaluation as there are no barriers to the qualifying species and the section immediately upstream of the A9 is likely to be supporting habitat.	International
Shingle Islands SAC (UK0030274)	Natura 2000 site under Conservation (Natural habitats & c.) Regulations 1994 (as amended in Scotland).	Statutory designated site which, in part, falls within the footprint of the proposed scheme (Figure 12.1). The site is located between ch3600-5500 and ch7600 to the end of the proposed scheme.	A 77.88ha site designated for alder woodland on floodplains, and comprising four islands and areas of river bank within the River Tay. The site extends across the same area as the Shingle Islands SSSI and overlaps with the River Tay SAC (SNH, 2016c).	International
Shingle Islands SSSI (1427)	Designated under Nature Conservation (Scotland) Act 2004 (NCSA, 2004).	Statutory designated site which, in part, falls within the footprint of the proposed scheme (Figure 12.1). The site is located between ch3600-5500 and ch7600 to the end of the proposed scheme.	A 77.89ha site designated for its breeding bird assemblage, fly assemblage, including rare and local species, and for river shingle/sand. The site extends across the same area as the Shingle Islands SAC and overlaps with the River Tay SAC (SNH, 2016d).	National
Ancient woodland Categories 1a and 2a (ancient of semi-natural origin), 2b (long established of plantation origin) and 3 (other on Roy map)	SBL priority habitat (including a variety of semi-natural broadleaved woodland types). Some areas fit the criteria for designation as Tayside LBAP and CNAP priority habitats.	Priority habitat located along the proposed scheme route and likely to be directly affected by the proposed scheme. A total of 188ha of AWI falls within 500m of the proposed scheme, of which 162ha is currently wooded.	Ancient woodland and/or plantation woodland of ancient origin have intrinsic importance as, due to their age, they are not readily replaceable if lost. In addition to their intrinsic value, such habitats have value for the species they support, and for habitat connectivity. There are some AWI areas where trees have been felled, 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). Therefore, areas which may retain indicator species and properties of ancient woodland have been assessed.	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	Areas of non-AWI semi-natural woodland, including NWSS sites, occur across the proposed scheme. Details relating to woodland habitats can be found in the Terrestrial Habitats section and in Diagram 12.1.	This woodland can provide important habitat for species such as pine marten and red squirrel, the latter of which is listed on both the CNAP and Tayside LBAP as a priority/protected species. Areas of this habitat have potential to support lichen species listed as CNAP key and CNPA priority non-protected species.	Regional

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
	habitats in the Tayside LBAP (Woodland Ecosystems). Broadleaved woodland, birch woodland, upland oak woodland, upland mixed ash woodland and native pine woodland are listed in the CNAP.			
Coniferous plantation woodland (not AWI)	Planted coniferous woodlands are listed as priority habitats in the Tayside LBAP (Woodland Ecosystems). Planted conifer woodland is listed in the CNAP.	Areas of non-AWI plantation woodland occur across the proposed scheme. Details relating to woodland habitats can be found in the Terrestrial Habitats section and in Diagram 12.1.	Plantation woodland is generally of low diversity, with a poorly developed ground flora and shrub layer. It is widespread in the area and can provide important habitat for species such as pine marten and red squirrel.	Regional
Semi-improved and poor semi-improved neutral grassland	Lowland meadows is listed as priority habitat in the Tayside LBAP (Farmland Ecosystems).	Results of the A9 Dualling Programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b) can be seen on Figure 12.2, and the results of the updated Phase 1 surveys can be seen on Figure 12.15, with a summary in Diagram 12.1. A full list of relevant Target Notes can be found in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	This habitat is widespread and common throughout the lowlands of Scotland and the UK as a whole and can support a variety of species including reptile, invertebrates, farmland birds of which there are many listed on the Tayside LBAP as protected species, and as CNAP key species. Neutral grasslands are typically more intensively managed than acid or calcareous grasslands. Semi-improved grassland has undergone some modification resulting in lower diversity than unimproved grasslands.	Authority area
Sloggan Burn	Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems).	Not accessible to migratory fish due to long culvert. Resident trout may be present upstream of existing A9.	Directly connected to River Tay SAC, but does not provide suitable/accessible migratory fish habitat.	Authority area
Unnamed watercourses	Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems).	Small watercourses (<1.25m wide) mostly a mixture of run and cascade flowing down steep wooded hillside or ditches across the floodplain. Mixed substrates. Provide good macroinvertebrate habitat, but limited fish habitat.	Most flow into the River Tay SAC, but provide no suitable habitat for fish of conservation interest.	Authority area
Ponds	Listed on SBL. Listed as priority habitat in the Tayside LBAP (Water and Wetland Ecosystems). Ponds provide habitat for protected species on Tayside LBAP and key species on CNAP.	Poor to Moderate quality. No priority species found during surveys and do not meet criteria for Priority ponds. Records of a rare species (northern damselfly) provided through consultation as part of the desk-based assessment.	Low quality examples of pond habitat. Ponds can support a variety of species, including northern damselfly, a species listed on the Tayside LBAP and the CNAP.	Authority area
Scrub	Provides habitat for species listed on the Tayside LBAP and key species on CNAP, including reptile, invertebrate and bird species.	Small areas of scrub are present along the proposed scheme. Results of the A9 Dualling Programme route-wide Phase 1 habitat survey (Transport Scotland, 2015b)	Scrub provides habitat for a variety of species including reptiles, invertebrate and bird species, of which there are many listed on the Tayside LBAP as protected species, and as CNAP key species.	Authority area

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
		can be seen on Figure 12.2, and the results of the updated Phase 1 surveys can be seen on Figure 12.15, with a summary in Diagram 12.1. A full list of relevant Target Notes can be found in Appendix A12.2 (Baseline Data and Detailed Survey Methods).		
Species				
Atlantic salmon	Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Schedule 3 species under the Conservation (Natural Habitats & c.) Regulations 1994 (as amended in Scotland). Listed under Annex II and V of Council Directive 92/43/EEC. A qualifying feature of the River Tay SAC. Listed on the SBL and as a protected species in the Tayside LBAP.	Suitable habitat for all life stages available. Found throughout the River Tay. Incidental records for this species in the river during aquatic surveys.	Species of conservation importance found in the River Tay and accessible tributaries. Host species for critically endangered 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 of Council Directive 92/43/EEC. Listed as protected species under the Conservation (Natural Habitats & c.) Regulations 1994 (as amended in Scotland), Schedule 3 (river lamprey only). A qualifying feature of the River Tay SAC. Listed on the SBL and as a protected species in the Tayside LBAP.	Found throughout the River Tay and accessible tributaries. Suitable habitat recorded in the Tay and tributaries.	Species of conservation importance found in the River Tay. 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 LBAP protected species list and sea trout listed on the SBL.	Widespread throughout the River Tay.	Species of conservation importance found throughout the River Tay catchment. Host species for critically endangered FWPM.	International
European eel	The EC Eel Recovery Plan (Council Regulation No 1100/2007) was initiated to return European eel stock to a sustainable level. The eel Management Plan for Scotland was published in 2010 (DEFRA, 2010).	Records of European eel within the survey area. Suitable habitat found within the River Tay catchment during site surveys. Incidental records for this species during aquatic surveys.	Species of conservation importance undergoing population decline within European waters. Critically endangered based on the International Union for Conservation of Nature 2001 guidelines (JNCC, 2016b).	International

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
	European eel is listed on the SBL. Listed as critically endangered on IUCN Red List of Threatened Species.			
Freshwater pearl mussel	Schedule 5 of the WCA. Listed on the SBL and as a protected species in the Tayside LBAP. Listed under Annex II and V of Council Directive 92/43/EEC.	Both adult and juvenile FWPM were recorded within the survey area. Full survey results are detailed in Appendix A12.3 (Confidential Ecology Features).	A recruiting population of FWPM is present in the River Tay catchment. Critically endangered based on the International Union for Conservation of Nature 2001 guidelines (JNCC, 2016b).	International
Otter	European Protected species (EPS) under the Conservation (Natural habitats & c.) Regulations 1994 (as amended in Scotland). A qualifying feature of the River Tay SAC. Listed on the SBL. Listed as a protected species on the Tayside LBAP.	Two holts and six couches were recorded within the study area, as well as field signs including spraints and prints on watercourses surveyed (Figure 12.8). Full survey results are detailed in Appendix A12.3 (Confidential Ecology Features).	This species is at carrying capacity (i.e. maximum population size of the species that the environment can sustain indefinitely taking account of food, habitat availability, etc.) within the River Tay SAC area and the wider catchment (Strachan, R., 2007).	National
Bats (all species)	All UK bat species are EPS under the Conservation (Natural habitats & c.) Regulations 1994 (as amended in Scotland). All nine species that occur in Scotland are listed on the SBL and as protected species in the Tayside LBAP.	Five of Scotland's nine bat species are recorded within the study area. Eleven confirmed roosts were identified within 50m of the proposed scheme; six in buildings, one in a structure and four in trees. Of these, two buildings, the one structure and two tree roosts fall within 10m of the proposed scheme. One structure was identified to have an overall value of high and three structures had an overall activity value of moderate. Of the five transect routes surveyed, one had an overall activity value of moderate and four had an activity value of low. Of the ten locations selected for monitoring for rare and cryptic species, three locations were identified as having a high overall value. The remaining locations were classed as either moderate or low value (four and three, respectively). 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 surrounding the project are widespread and found throughout Scotland. These are Daubenton's bat, common pipistrelle, soprano pipistrelle, Natterer's bat and brown long-eared bats. 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. Guay Farmhouse supports maternity colonies of two rarer species and one common species. This building is also a summer roost for two common species and a hibernation roost for one common species.	National
Beaver	At present the species is not legally protected. However, legal protection is expected to be in place during 2018 (SNH, 2017a).	Records from the study area (NBN, 2017) from 2012 onwards, and also from SNH's 'Beavers in Scotland' publication (SNH, 2015). Incidental beaver field signs, and four burrows were recorded during site surveys.	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	National

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
			and there is notable activity from this population within the study area. The Tayside LBAP 'Water and Wetlands Actions Schedule' includes an Action to explore the implications of the species in river catchments.	
Badger	Protection of Badgers Act 1992 (as amended). Listed on the Tayside LBAP protected species list.	Four main setts, one annex sett, 17 subsidiary setts and 50 outlier setts were recorded within the study area, as well as field signs including dung pits, prints and paths (Figure 12.4). Full survey results are detailed in Appendix A12.3 (Confidential Ecology Features).	The species is widespread throughout the UK and Scotland. Legal requirements to comply with animal welfare legislation would be the main driver for mitigation of impacts on this species.	Regional
Breeding birds	Birds of Conservation Concern (Eaton et al., 2015) Schedule 1 of the WCA. Species listed on the SBL and on the Tayside LBAP protected species list. Lapwing, linnet, swallow, swift and house sparrow are listed as protected species in Tayside LBAP. Lapwing is listed as a key species on the CNAP.	A total of 56 species were recorded during the site surveys, including incidental records, of which 48 species were confirmed to have bred. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods). An additional 20 breeding species were recorded during the BTO Atlas 2007-2011.	Of the 48 breeding species, 19 were listed as species of conservation concern, either red-listed or amber-listed whilst 12 were listed on the SBL. Of the 20 additional breeding species recorded during the BTO Atlas 2007-2011 surveys, 11 are listed as species of conservation concern, either red-listed or amber-listed.	Regional
Barn owl	Schedule 1 of the WCA. Listed on the SBL and as a protected species in Tayside LBAP.	Records of barn owl are detailed in Appendix A12.3 (Confidential Ecology Features). One confirmed roost, which is considered to be used infrequently and not for breeding, recorded in the study area.	Barn owl were recorded as incidental records during site surveys. Barn owl distribution in Scotland has increased, possibly due to a run of mild winters and though previously amber listed through its loss of UK range, the species was moved to the UK green list in 2015 (Eaton et al., 2015).	Regional
Pine marten	Schedule 5 of the WCA. Listed on the SBL and as a protected species in the Tayside LBAP.	There are several records for pine marten within 10km of the proposed scheme and there were two incidental sightings of a pine marten during site surveys. Full survey results are detailed in Appendix A12.2.	Pine marten has been recorded within the study area. The species is widespread throughout Scotland and has continued to expand its range throughout Perthshire and Tayside (Croose et al., 2014).	Regional
Red squirrel	Schedule 5 of the WCA. Listed on the SBL as a species for which conservation action is needed, as a protected species in the Tayside LBAP and as a key species on the CNAP	Red squirrel records are numerous within the study area and there were eleven incidental sightings of red squirrel during site surveys. Two dreys, feeding signs and two possible dreys were also recorded. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods).	Red squirrel is widespread within Scotland although there has been widespread decline in population and range. The species has been recorded within the study area along the route of the existing A9. Priority woodland has been identified within 500m of the existing A9 at Craigvinean (NN 983 453) which is separated from the A9 by the River Tay (Poulsom et al., 2005).	Regional
Reptiles: Adder, slow worm, common lizard	Schedule 5 of the WCA. Listed on the SBL. Adder listed as a priority species in the Tayside LBAP.	All three species were recorded within the study area, during the desk-based assessment and the site surveys. Reptile presence was recorded in all seven sites identified as having suitable habitat for reptiles	Recorded within the study area and within the surrounding 10km.	Regional

Ecological Feature	Legal/BAP Status	Baseline	Justification	Importance
	Slow worm and common lizard listed as a protected species in the Tayside LBAP.	and four qualified as a KRS. Full survey results are detailed in Appendix A12.2 (Baseline Data and Detailed Survey Methods).		
Northern damselfly	Rare species, listed on the SBL Listed as a protected species on the Tayside LBAP and as a CNAP priority species.	Desk study identified records of this species within 10km. No sightings of this species were made during the DMRB Stage 3 surveys, however consultation with local residents indicates presence of this species under the footprint of the proposed scheme, at Kindallachan.	Present within the study area and undergoing decline due to loss of suitable habitat and climatic pressures.	Regional

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. Standard construction and design best practices would mitigate non-significant impacts.
- 12.4.3 Where a potential impact is initiated in construction but could also occur throughout operation (e.g. permanent habitat removal), it is discussed only within operational impacts.
- 12.4.4 Chapter 16 (Air Quality) discusses potential impacts on the three designated sites in the study area: River Tay SAC, Shingle Islands SAC and Shingle Islands SSSI. Although the River Tay SAC may be nitrogen-sensitive, the contribution of nitrogen from road transport via nitrogen (N) deposition is unlikely to give rise to significant effects on the SAC, particularly given that Scottish transport contribution to N deposition is only 3.2%, a small proportion of the overall source contribution. The Shingle Islands SAC and SSSI are not considered to be sensitive to effects associated with changes in air quality and N deposition on the River Tay SAC, Shingle Islands SAC and Shingle Islands SSSI are, therefore, not considered further in this assessment.
- 12.4.5 During a meeting of the ESG in July 2015, SNH highlighted concerns on the impacts of road salt on the water environment. The salt assessment detailed in Appendix A11.6 (Water Quality) indicates that salt levels are not expected to exceed the Canadian short-term exposure guideline (there is currently no UK guideline) within the River Tay SAC. The short-term exposure guideline may be exceeded in two water features, WF37 and WF55, however these water features contain only poor quality aquatic habitat and salt concentrations will be diluted below the guidelines upon reaching the River Tay SAC. Therefore, the impacts of salt on the water environment are not considered further. Further details are provided in Appendix A11.6.
- 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 Potential construction impacts may include:
- injury or mortality of protected species due to in-stream works, vegetation removal, vehicle movements or becoming trapped in uncovered holes and pipes;
 - disturbance to protected species from noise, vibration, lighting and movement of vehicles, and increased human activity;
 - temporary habitat loss and/or 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.

Qualifying Interests of Designated Sites

- 12.4.8 Qualifying interests of the River Tay SAC (otter, Atlantic salmon and lamprey species) are discussed in Table 12.12 under the relevant species headings. Further detail regarding construction impacts on these qualifying interests is provided in the project's HRA.

Temporary Loss from Designated Sites

- 12.4.9 Temporary habitat loss, resulting from construction works adjacent to and within the River Tay SAC, Shingle Islands SAC and Shingle Islands SSSI, is identified in Table 12.12. This does not include the

0.85ha of terrestrial habitat within the River Tay SAC and the 0.30ha of terrestrial habitat within the Shingle Islands SAC/SSSI which falls under existing access tracks; the tracks will not be modified.

Operation

12.4.10 Potential operational impacts may include:

- injury and mortality of protected species from vehicle collisions (WVIs);
- 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, structures and realignment of watercourses (further detail is provided in Chapter 11: Road Drainage and Water Environment).

Qualifying Interests of Designated Sites

12.4.11 Qualifying interests of the River Tay SAC (otter, Atlantic salmon and lamprey species) are discussed in Table 12.12 under the relevant species headings. Further detail regarding operation impacts on these qualifying interests is provided in the proposed scheme's HRA.

12.4.12 Bank stabilisation works are proposed between ch1600 and ch1900 in an area of high erosion risk, and a small area of terrestrial habitat within the SAC will be temporarily lost for construction, amounting to 0.18ha, less than 0.002% of the total area of the SAC. No operational impacts to the River Tay SAC were identified from these bank stabilisation works. Should the bank stabilisation solution become exposed there are no implications for the River Tay SAC as there will be no likely effects on supporting or functionally important habitats within the river as none are present at this location. Further detail is provided in the proposed scheme's HRA.

12.5 Mitigation

Introduction

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

- avoid adverse impacts in the first instance;
- where avoidance is not possible, reduce the adverse impacts through mitigation; and
- where significant 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). For example, SuDS ponds/basins have been designed to provide biodiversity benefits, with the area surrounding the SuDS to be seeded with species-rich grassland, as appropriate, to provide added wildlife habitat (see 12.5.37 and Chapter 13: Landscape).

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

12.5.4 It is expected that the majority of non-significant impacts would be mitigated through the application of standard mitigation commitments and best working practice (e.g. mitigation of potential pollution impacts through adherence to standard best practice and guidelines, such as SEPA Guidance for Pollution Prevention (GPP) (SEPA, 2017) and Pollution Prevention Guidelines (PPGs) (SEPA, 2003, 2017)) (Table 12.10).

- 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 ('P03' 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 runoff from the mainline carriageway will be subject to a minimum of two levels of SuDS treatment using a combination of filter drains, ponds, basins and swales. A total of five SuDS ponds/basins have been incorporated into the design, with three located between the Tay Crossing and Dowally, and a further two located between Dowally and Ballinluig towards the northern extent of the proposed scheme. Swales located between Dowally and Kindallachan have also been incorporated into the design.
- 12.5.9 On four constrained drainage runs, treatment will be provided by filter drains followed by geocellular storage and hydrodynamic vortex separators (i.e. proprietary SuDS treatment). Filter drains and hydrodynamic vortex separators will provide filtration of sediment and treatment of other pollutants (such as hydrocarbons and heavy metals). Geocellular storage tanks will provide the necessary attenuation.
- 12.5.10 Side road drainage will incorporate a single level of treatment, which will generally be filter drains on either side of the carriageway, which will be designed to allow for infiltration. There are some sections where conditions will also allow the adoption of swales instead of filter drains. Tier 3 accesses (private and/or agricultural accesses) will be treated either via 'over the edge' drainage that will be dispersed over vegetation with subsequent infiltration into groundwater, or collected via filter drains that will allow infiltration to groundwater or discharge to a soakaway structure.
- 12.5.11 The proposed SuDS and proprietary drainage systems are described further in Chapter 11 (Road Drainage and the Water Environment) and Appendix A11.6 (SuDS Strategy).
- 12.5.12 The proposed scheme will result in the loss of pond habitat at Kindallachan. The pond, exhibiting areas of open water, aquatic and marginal vegetation, provides suitable habitat for dragonflies and damselflies; the northern damselfly has been recorded here (see paragraph 12.3.17). In order to mitigate for loss of damselfly habitat, an Ecological/Compensatory Flood Storage Pond has been incorporated into the design located within 300m of the pond habitat to be lost under the footprint (Diagram 12.2 and 12.3, below, and Figure 13.5). This pond will be designed to provide suitable habitat for damselflies (refer to **Mitigation Item P03-E71**). The pond will have a variety of water depths (with areas of deeper water (>75cm) and a constant minimum water depth of 30cm) and will include submerged, emergent and marginal vegetation to provide suitable habitat for damselflies throughout all life stages. Furthermore, SuDS ponds/basins throughout the proposed scheme will be designed with biodiversity benefits, providing suitable habitat for damselflies, amongst other species, such as other invertebrates and amphibians. The conceptual design of SuDS ponds/basins is presented in Appendix A13.6 (SuDS Design Principles).

Diagram 12.2: Conceptual plan of ecological/compensatory flood storage pond

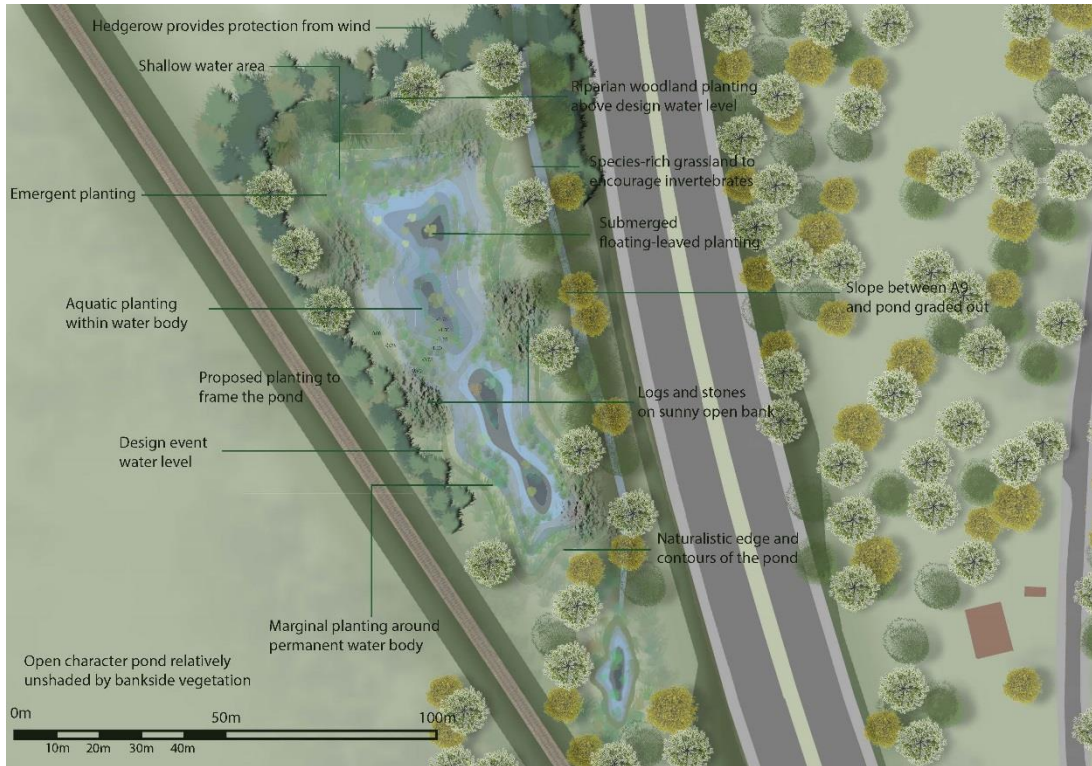
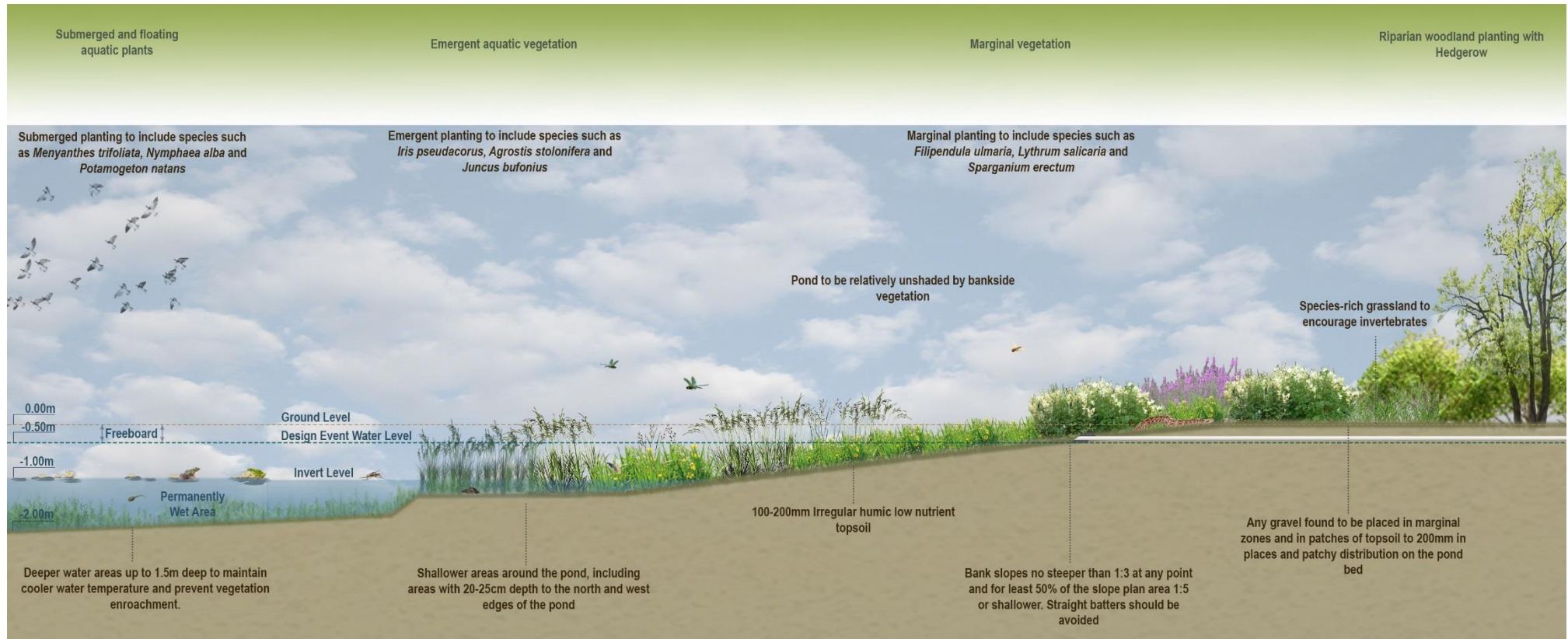


Diagram 12.3: Conceptual cross section of ecological/compensatory flood storage pond



Ecological Clerk of Works

- 12.5.13 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 as required and ensure mitigation measures are implemented to avoid and reduce impacts on ecological features. An employer's ecologist will observe that the Contractor's ECoW are suitably qualified to undertake their role and will audit the contractual obligations with regards to the ecological safeguarding and ecological mitigation requirements (**Mitigation Item SMC-E2**).

Construction

- 12.5.14 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 minimise environmental and other impacts. Some measures detailed are not mitigation in isolation, but their implementation for regulatory/legal compliance purposes will inform the scope of further mitigation and licensing where required (e.g. pre-construction surveys and monitoring). These define the standard construction mitigation required to achieve the objectives of the mitigation and those relevant to Ecology and Nature Conservation are detailed in Table 12.10 below and in Table 21.6 in Chapter 21 (Schedule of Environmental Commitments).
- 12.5.15 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**).
- 12.5.16 The Contractor will use the standard mitigation commitments along with any project-specific or location-specific mitigation measures detailed in this chapter and the project's HRA, to ensure that the residual environmental impacts of the construction of the proposed scheme are in line with those reported within this assessment. If, during construction, impacts are found to be greater than the residual environmental impacts identified within the ES, additional mitigation will be required.
- 12.5.17 The construction method developed for the outline design of the bank stabilisation works between ch1600 and ch1900 includes a number of measures which, although not directly targeted at ecological features, reduce the potential for any impacts on the ecology of the River Tay SAC. Specifically, a minimum offset of 4m between the centre of the bored piles and the current river's edge to minimise the likelihood for bank instability and collapse, and construction drainage which directs site run-off away from the River Tay. Mitigation presented within Table 12.10 and Table 12.12, specifically **Mitigation Items SMC-W1, SMC-W3, SMC-W7, SMC-E9** and **P03-E17**, will also be applicable to works in this location.
- 12.5.18 In addition, to protect sensitive ecological features on the east bank of the River Tay below ch1600, a temporary silt curtain will be made available. This silt curtain will be deployed at ch1550 on instruction of the ECoW (who will be present for the duration of the works at this location) if sediment is mobilised into the River Tay SAC during the bank stabilisation works, between ch1600 to ch1900. The silt curtain will be set in such a way as to be quickly deployed and recovered so that natural river function is maintained when not in use.
- 12.5.19 Certain activities during construction will trigger the need for a protected species derogation licence under relevant legislation. Structures or places which a protected species uses for shelter that are under the footprint of the proposed scheme will be destroyed under licence following consultation with SNH. Works taking place within a certain distance may disturb protected species when occupying a structure or place of shelter and may require a derogation licence. Suggested protection zones for each species are detailed below in Table 12.9 in line with best practice guidance (SNH Protected Species Advice for Developers notes) and professional judgement. 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 species⁶

Species	Normal Protection Zone	Protection Zone of a Proven Breeding Location	Suggested Protection Zone for Specific Activities***
Otter (SNH, 2017b)	30m	200m	100m
Badger (SNH, 2017c)	30m	30m	
Bats*	30m	30m	
Pine marten (SNH, 2017d)	30m	100m	
Red squirrel (SNH, 2017e)	5m	50m	
Beaver**	30m	200m	
Wildcat (SNH, 2017f)	200m	200m	200m

*In the absence of a published distance, 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 and occupy similar habitats, have been used.

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

- 12.5.20 Based on the current baseline, which will be updated following pre-construction surveys, the following derogation licences will be required:
- otter: disturbance licences for two holts and one couch;
 - badger: disturbance licences for five subsidiary setts, one annex sett and sixteen outlier setts, and destruction licences for one main, two subsidiary setts and four outlier setts;
 - bats: disturbance licences for seven known roosts and a destruction licence for four roosts; and
 - FWPM: licences where required (following consultation with SNH).
- 12.5.21 Beavers are due to be accorded protection in line with the EU Habitats Directive in 2018 (Scottish Government, 2016), it is considered that licencing requirements akin to that for otter will be enforced.
- 12.5.22 In accordance with **Mitigation Item SMC-S1** (Table 1, Chapter 21: Schedule of Environmental Commitments), the CEMP will include an Ecological Management Plan which will contain Species Protection Plans and Habitat Management Plans. These will be prepared and developed by the Contractor from the mitigation and environmental commitments identified in this assessment (Table 12.12), and may include:
- 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.
- 12.5.23 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 (refer to paragraphs 12.5.30-12.5.31).
- 12.5.24 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, including within one year prior to construction, 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 all relevant stakeholders including SNH.

⁶ Indicative distances provided by SNH, with the exception of bats and beaver, for which notes are provided.

- 12.5.25 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 including the use of settlement tanks (**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;
 - regular monitoring and sampling for suspended solids concentrations during construction (in conjunction with **Mitigation Item P03-W20**). 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.
- 12.5.26 Adherence to Species Protection Plans will avoid potential breaches of conservation legislation arising from mortality or disturbance, even if these effects are not considered to be ecologically significant, and adherence to the Ecological Management Plan will mitigate for any potential animal welfare issues which could arise during construction of the proposed scheme.
- 12.5.27 Where trees are felled during construction, deadwood will be retained where possible, to provide habitat for invertebrates. The use of deadwood for reptile refugia in temporary reptile translocation areas (as shown on Figure 13.5) will be detailed within the Species Protection Plan for reptiles.
- 12.5.28 It is expected that the majority of impacts during construction will be mitigated through the application of the standard mitigation commitments (as detailed in Chapter 21: Schedule of Environmental 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	<p>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.</p>
SMC-E2	<p>Prior to construction a suitably qualified (or team of suitably qualified) Ecological Clerk of Works (ECoW) will be appointed 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. <p>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.</p>
SMC-E3	<p>Noise and vibration will be minimised 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.</p>
SMC-E4	<p>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).</p>
SMC-E5	<p>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.</p>
SMC-E6	<p>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.</p>
SMC-E7	<p>Tree felling and vegetation clearance to be minimised 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	<p>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.</p>
SMC-E9	<p>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.</p>

Mitigation Item	Description
SMC-E10	A construction lighting plan and method statement will be developed by the Contractor. The plan, as part of the Species Protection Plans, will detail specific mitigation requirements and 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 Institute, 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 Loss

- 12.5.29 Avoiding and reducing woodland loss has been a key consideration during the design process, as explained in Chapter 4 (Iterative Design Development). Where avoidance of habitats (including AWI, woodland and important habitats for protected species) has not been achievable through the iterative design process, mechanisms for landscape scale mitigation have been designed to compensate for this loss.
- 12.5.30 The full extent of habitats listed on the AWI under the footprint of the proposed scheme is 10.16ha. The extent of those habitats which are currently woodland was determined based on the outputs from the Woodland Connectivity – Ancient Woodland Compensation Strategy (Transport Scotland, 2016c) as 6.35ha. This document sets out the agreed approach to compensation for the loss of sites listed on the AWI, which is consistent across the programme. The approach taken mapped 2014/2015 Forestry Commission Scotland National Forest inventory, NWSS (Patterson et al., 2014) and currently wooded sites listed on the Ancient Woodland Inventory (AWI), and overlaid the design information for the proposed scheme to identify affected areas of woodland. This mapping was then used to identify ancient woodland affected by the proposed scheme and consider opportunities to compensate by utilising ‘Lost AWI’ in proximity to areas affected.
- 12.5.31 Candidate sites for compensatory woodland planting (**Mitigation Item P03-E44**) have been identified to maximise the biodiversity benefit of the planting, maintain connectivity or reconnect existing AWI sites, and to maximise opportunities to maintain functionality of local ancient woodland communities throughout the route corridor. The sites which have been selected for compensatory woodland planting are included within the Compulsory Purchase Order (CPO) area and are shown on Figure 12.14.
- 12.5.32 Soils from AWI sites will be re-used as appropriate to maintain fungal and invertebrate biodiversity and provide a seed bank. Soil from AWI sites that are of low quality will not be re-used, for example areas within the existing highway boundary and areas dominated by bracken.
- 12.5.33 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 12.5.23, 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 will reflect native woodland mixes to replace non-native plantations and maximise biodiversity benefit;
 - monitoring and management strategies, which will include the maintenance and replacement of any trees, including those that are missing, damaged or failing to make satisfactory growth, during the operation for the proposed scheme (see **Mitigation Item SMC-LV5** for more details); and
 - management strategies will be undertaken in AWI woodland that is to be retained within the CPO during the course of construction contract, and during the maintenance and establishment period. These will include the retention of dead and fallen wood and will be the responsibility of the Contactor and, in the longer term, the trunk road operating company.
- 12.5.34 As stated above, compensatory planting is intended to maintain or reconnect existing AWI sites. 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.
- 12.5.35 Figure 12.14 shows areas of lost (currently non-wooded) and verified (wooded) AWI, which has informed the development of compensation planting areas shown on Figure 13.5. Eleven areas of wooded AWI will be lost to the proposed scheme, as detailed in Table 12.11a. Five areas, totalling approximately 7.75 ha, have been identified (Table 12.11b).

Table 12.11a: Details of currently wooded AWI loss

Chainage	Area (ha)	AWI category (as detailed in paragraph 12.3.4)
ch600	0.00 (0.0003 to 4d.p.)	2b
ch1550-1620	0.04	3
ch1620-2150 (ch1600-1700*)	1.03	1a
ch2020-2950	1.17	2b
ch3620-3650	0.04	1a
ch4240-5000*	2.46	1a
ch5350-5900	0.12	1a
ch6830-6950	0.15	1a
ch6950-7100	0.43	3
ch7290-7400	0.04	1a
ch7300-8160*	0.87	2b
Total	6.35	

*Soil from these areas are likely to be suitable for re-use, however micro mapping will be required to confirm the suitability.

Table 12.11b: Details of locations of AWI compensation

Chainage	Area (ha)	Figure References
ch1700	0.50	12.14a-b; and 13.5b-c
ch2550	2.31	12.14b; and 13.5c
ch3750	2.48	12.14b-c; and 13.5d-e
ch4850	0.77	12.14c; and 13.5e
ch7150	1.69	12.14d; and 13.5h
Total	7.75	

Mitigation for Other Habitat Loss

- 12.5.36 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 the best areas to plant in order to maintain ecological functionality.
- 12.5.37 The areas around SuDS will be seeded with native grasses and wildflowers vegetation, as appropriate, to provide added wildlife habitat. The margins of SuDS ponds/basins will be planted with native emergent and marginal plant species, and the species-rich grassland mixes will consist of native, non-invasive grasses and wildflower species, to enhance biodiversity, for example by planting species that are favoured by invertebrates as food (as detailed in **Mitigation Item P03-LV9**).
- 12.5.38 Areas of non-significant habitat loss, which are important in supporting protected species, including those listed as CNPA priority non-protected species, are considered to be mitigated through the overall landscape and ecological planting design. This includes areas of woodland, scrub, and grassland of various types as shown on Figure 13.5.
- 12.5.39 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 works adjacent to, and within, the River Tay SAC and Shingle Islands SAC, for example the Dowally Burn Culvert. Whilst the HRA provides more detailed information, this ES contains mitigation measures that are consistent with the HRA requirements.

Mitigation for Protected Species

- 12.5.40 Species permeability is an overarching design theme for the A9 Dualling Programme. The provision of suitable crossing structures (**Mitigation Item P03-E51**) 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 and badger, amongst others.
- 12.5.41 Otter- and badger- resistant fencing will be provided to prevent access onto the A9 carriageway and will be positioned to direct animals to safe crossing points (**Mitigation Items P03-E54 and P03-E64**). Otter fencing has been proposed at watercourse crossings with known otter presence and/or suitable habitat, and badger fencing has been proposed at key areas adjacent to known setts and locations of multiple WVIs. The fencing specifications will follow SNH guidance (SNH, 2001; SNH, 2008b) and has been designed to mirror on either side of the carriageway 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.
- 12.5.42 Replacement artificial resting/roosting features for protected species, including bats and red squirrel, will be provided where there is permanent loss of such features under the footprint of the proposed scheme. Furthermore, mitigation for permanent loss of habitat for protected species, including reptile and breeding birds, will be provided through habitat creation, specifically woodland/scrub, wetland and grassland habitats.

Mitigation for Other Species of Ecological Interest

- 12.5.43 Measures to reduce the potential risk of deer vehicle collisions (DVCs) have been proposed. These include ensuring a suitable distance between the road and landscape planting to improve line of sight and limit the attraction of deer to verges.
- 12.5.44 In addition, although not designed specifically for deer passage, some 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 P03-E51**).
- 12.5.45 To mitigate for the loss of northern damselfly habitat, an Ecological/Compensatory Flood Storage Pond has been included in the design, offering flood compensation as well as being designed to promote native wildlife particularly northern damselfly (see 12.5.12). Sediment from the pond habitat to be lost will be translocated to the receptor pond to allow for natural regeneration of species populations. This will be undertaken prior to construction and will be undertaken following guidance from relevant conservation bodies (**Mitigation Item P03-E72**). Furthermore, SuDS ponds/basins, embedded in the design, offer a potential network of wetland habitats for northern damselfly and other species. This network of wetlands also offers climate change resilience through provision of suitable habitats from the southern extent to northern extent of the proposed scheme
- 12.5.46 Mitigation for impacts to specific ecological features during operation is described in more detail in Table 12.12 in Section 12.6.

Monitoring

- 12.5.47 The Contractor's ECoW will be responsible for ensuring compliance with protected species legislation and commitments stated in this assessment during construction. This will include adherence to Species Protection Plans, Habitat Management Plans and the standard mitigation commitments. Compliance will be monitored by the employer's ecologist.
- 12.5.48 Post-construction monitoring should be undertaken in accordance with Table 12.12, the Species Protection Plans and Habitat Management Plans and any derogation licences required for the proposed scheme. The monitoring should also take cognisance of the recently published SNH Commissioned Report 1003, on *Developing a mitigation monitoring approach for the A9 and A96 dualling projects*

(Macdonald-Smart, 2017). 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. 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 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	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
Construction						
River Tay SAC (International) (Figure 12.1)	Run-off and release of sediment from construction works including chemical and hydrocarbon loads from accidental spillage.	Pond A1 and Outfall A1 ch150-280 A9 Southern Tie-in Interim Roundabout ch620 Pond A2 and Outfall A2 ch660-760 Side road ch920-1000 Bank stabilisation ch1600-1900 Carriageway widening ch1600 Embankment ch1840 Embankment ch1980 Outfall B ch2000 Side Road ch3270 Carriageway widening ch3300 Carriageway widening ch3650 Basin C and Outfall C ch3850-4050 Dowally Burn Culvert and outfalls ch4240-4280 Outfall D2 ch4900 Carriageway widening, access track and side road ch5240 Side road outfall ch5250 Outfall E ch5500 Kindallachan Burn ch6090	Pollution of SAC aquatic and terrestrial habitat such as reduced water quality and increased deposition resulting in modified submerged habitat. Depending on the magnitude of the pollution event, there could be irreversible long-term effects on the SAC and on the viability of populations of its qualifying species. The effect could be long-term and negative.	high (Significant)	Mitigated through compliance of Mitigation Items SMC-W1, SMC-W3 and SMC-W7 including the following specific measures: <ul style="list-style-type: none"> installation of temporary drainage systems/SuDS (or equivalent) including pre-earthworks drainage; the adoption of silt fences, check dams, settlement lagoons, soakaways and other sediment trap structures as appropriate; protecting soil stockpiles using bunds, silt fencing and peripheral cut-off ditches, and location of stockpiles at distances of >10m; restoration of bare surfaces (seeding and planting) throughout the construction period as soon as possible after the work has been completed; undertaking in-channel works during low flow periods (i.e. when flows are at or below the mean average) as far as reasonably practicable to reduce the potential for sediment release and scour; minimise length of channel disturbed and size of working corridor, with use of silt fences or bunds where appropriate to prevent sediment being washed into water feature; and limit the amount of tracking adjacent to watercourses and avoid creation of new flow paths between exposed areas and new or existing channels. The construction method for the bank stabilisation has been designed to include a construction drainage system, preventing run-off entering the River Tay and use of a biodegradable polymer support fluid in a re-circulating system to minimise any environmental impacts.	No significant residual impacts predicted.
	De-watering and in-stream works during outfall and bridge construction.	Outfall A1 ch150 Outfall A2 ch750 Outfall B ch2000 Outfall C ch3850 Dowally Burn Culvert and outfalls ch4240-4280 Outfall D2 ch4900 Outfall E ch5500 Kindallachan Burn ch6090	Alteration of riverbed habitat. This effect would be negative, reversible and short-term.	high (Significant)	Mitigated through compliance of Mitigation Items SMC-W1 and SMC-W4 , specifically: <ul style="list-style-type: none"> undertaking in-channel works during low flow periods (i.e. when flows are at or below the mean average) as far as reasonably practicable to reduce the potential for sediment release and scour; no in-channel working during the salmonid spawning seasons unless permitted within any CAR licence; and minimise length of channel disturbed and size of working corridor, with use of silt fences or bunds where appropriate to prevent sediment being washed into water feature. In addition, natural bed material will be retained and replaced on completion of construction works (Mitigation Item P03-E16).	No significant residual impacts predicted.
	Temporary loss of 0.10ha aquatic habitat within the SAC due to dewatering of areas required for construction. Temporary loss of 2.18ha terrestrial habitat within the SAC to accommodate construction of outfalls, SuDS ponds/basins and side roads. The temporary habitat loss (aquatic and terrestrial) accounts for 0.02% of the total area of the River Tay SAC.	Outfall A1 ch150 Pond A2 and Outfall A2 ch600-810 Side road ch920-1000 Outfall B ch2000-2050 Basin C and Outfall C ch3820-3870 Dowally Burn Culvert and outfalls ch4240-4280 Outfall D2 ch4900 Outfall E ch5500 Kindallachan Burn ch6090	Temporary reduction in extent of habitat in SAC and potential for loss of otter foraging habitat in this internationally important site. This effect would be negative, reversible and short-term.	low (Significant)	Mitigated through compliance with Mitigation Item P03-E17 , as follows: <ul style="list-style-type: none"> terrestrial areas within the SAC temporarily required for construction will be returned to their former habitat type using species appropriate to the local environment and of local provenance; and 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. In addition, natural bed material will be retained and replaced on completion of construction works (Mitigation Item P03-E16) In accordance with Mitigation Item SMC-W4 the area of channel disturbed will be minimised. Mitigation Item SMC-E9 will also be adhered to.	No significant residual impacts predicted.
Shingle Islands SAC (International) (Figure 12.1)	Run-off from construction works including sediment and chemical (nutrient and heavy metal) loads from accidental spillage.	Basin C and Outfall C ch3850 - 4030 Outfall D2 ch4900 Outfall E ch5500	Reduced water quality resulting in degradation to the alluvial forest habitat for which the SAC is designated. 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 permanent and negative.	high (Significant)	Mitigated through compliance of Mitigation Items SMC-W3 and SMC-W7 .	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
	Generation of dust from construction activities near Dowally and Guay, including Dowally overbridge.	ch3800-5500	Degradation of SAC habitat leading to changes in the health of plants and community compositions. This effect would be short-term, negative and reversible.	low (Significant)	Mitigated through compliance with Mitigation Items SMC-AQ1 and SMC-AQ2.	No significant residual impacts predicted.
Shingle Islands SSSI <i>(National)</i> (Figure 12.1)	Run-off from construction works including sediment and chemical (nutrient and heavy metal) loads from accidental spillage.	Basin C and Outfall C ch3850-4030 Outfall D2 ch4900 Outfall E ch5500	Reduced water quality resulting in degradation to the freshwater river shingle and sand habitats for which the SSSI is notified. Depending on the magnitude of the pollution event, there could be irreversible long-term effects on the SSSI and on the viability of populations of its qualifying species. The effect could be permanent and negative.	high (Significant)	Mitigated through compliance of Mitigation Items SMC-W3 and SMC-W7.	No significant residual impacts predicted.
	Construction noise associated with bridge, embankment and drainage works throughout the route. Construction lighting.		Disturbance to breeding birds of the SSSI, potentially leading to nest abandonment and failed breeding. This impact would be short-term, negative and reversible.	low (Significant)	Mitigated through compliance of Mitigation Items SMC-E3 and SMC-NV2.	No significant residual impacts predicted.
	Generation of dust from construction activities near Dowally and Guay, including Dowally overbridge.	Throughout the proposed scheme	Degradation of SSSI habitat which could reduce the populations of flies and breeding birds. This effect would be negative, reversible and long-term.	low (Significant)	Mitigated through compliance of the Standard Mitigation Commitments, particularly mitigated through compliance with Mitigation Items SMC-AQ1 and SMC-AQ2.	No significant residual impacts predicted.
Ancient woodland <i>(National)</i> (Figure 12.1)	Generation of dust from construction activities throughout the proposed scheme.	Throughout the proposed scheme	Degradation of habitat within the first few metres of woodland, leading to changes in the health of plants and community compositions especially. This effect would be negative, reversible and short-term.	low (Significant)	Mitigated through compliance with Mitigation Items SMC-AQ1 and SMC-AQ2.	No significant residual impacts predicted.
Broadleaved, mixed or coniferous semi-natural woodland (not AWI) <i>(Regional)</i>	Generation of dust from construction activities throughout the proposed scheme.	Throughout the proposed scheme	Degradation of habitat leading to changes in health of plants and community compositions. This effect would be negative, reversible and short-term.	low (Not significant)	No mitigation required for this non-significant impact, however, compliance with Mitigation Item SMC-AQ1s and SMC-AQ2 would reduce the effect of this impact.	n/a
Coniferous plantation woodland (not AWI) <i>(Regional)</i>				low (Not significant)	No mitigation required for this non-significant impact, however, compliance with Mitigation Items SMC-AQ1 and SMC-AQ2 would reduce the effect of this impact.	n/a
Semi-improved and poor semi-improved neutral grassland <i>(Authority area)</i>	Generation of dust and other pollutants from construction activities throughout the proposed scheme.	Throughout the proposed scheme	Degradation of habitat leading to changes in health of plants and to community composition. This effect would be negative, reversible and short-term.	low (Not significant)	No mitigation required for this non-significant impact, however, compliance with Mitigation Items SMC-AQ1 and SMC-AQ2 would reduce the effect of this impact.	n/a
Watercourses (Sloggan Burn and unnamed watercourses) <i>(Authority area)</i>	Run-off and release of sediment from construction works including chemical and hydrocarbon loads from accidental spillage.	Sloggan Burn Culverts ch5240-5270 Unnamed watercourses (25 locations)	Pollution of aquatic habitat leading to reduced water quality and increased deposition resulting in modified submerged habitat. This effect would be negative, reversible and long-term (recovery could take several seasons).	medium (Not significant)	No mitigation is required for this non-significant impact however compliance with Mitigation Items SMC-W3 and SMC-W7 would reduce the effect of this impact.	n/a

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
	De-watering of watercourse.		Temporary changes in hydrology; change in functional habitat for species. This effect would be negative, reversible and short-term.	low (Not significant)	No mitigation is required for this non-significant impact however compliance with Mitigation Items SMC-W1 and SMC-W4 would reduce the effect of this impact.	n/a
Ponds (Authority area)	Run-off and release of sediment from construction works including chemical and hydrocarbon loads from accidental spillage.	ch6400-6670 ch8200	Pollution of aquatic habitat leading to reduced water quality and increased deposition resulting in modified submerged habitat. This effect would be negative, reversible and long-term (recovery could take several seasons).	medium (Significant)	Mitigated through compliance with Mitigation Items SMC-W3 and SMC-W7 .	No significant residual impacts predicted.
Scrub (Authority area)	Generation of dust from construction activities throughout the proposed scheme.	Throughout the proposed scheme	Degradation of habitat leading to changes in health of plants and to community composition. This effect would be negative, reversible and short-term.	low (Not significant)	No mitigation required for this non-significant impact, however, compliance with Mitigation Items SMC-AQ1 and SMC-AQ2 would reduce the effect of this impact.	n/a
Atlantic salmon Lamprey species Brown/sea trout European eel (International)	Run-off from construction works including sediment and chemical and hydrocarbon loads from accidental spillage.	At watercourses throughout the proposed scheme	Reduced water quality potentially causing physiological changes and/or affecting fish gill structures. Reduced availability of suitable habitat. Depending on the magnitude of the pollution even this effect could be negative and long-term.	medium (Significant)	Mitigated through compliance with Mitigation Items SMC-W1, SMC-W3, SMC-W7, P03-W18 and P03-W20 . Furthermore, the following measure 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. Toolbox talks with contractors on environmental sensitivities and implementation of mitigation will be conducted. The ECoW will regularly inspect pollution controls and site compounds as appropriate. (Mitigation Item P03-E18). The construction method for the bank stabilisation has been designed to include a construction drainage system, preventing run-off entering the River Tay and use of a biodegradable polymer support fluid in a re-circulating system to minimise any environmental impacts.	No significant residual impacts predicted.
	Noise, vibration and light spill associated with construction works.	River Tay throughout the proposed scheme Kindallachan Burn ch6090	Noise, vibration and lighting may lead to barrier effects to migrating fish, causing temporary fragmentation of habitat through reduction in fish passage. Noise and vibration may also lead to physical damage of hearing apparatus in sensitive species and/or changes in behaviour to avoid disturbance. The effect of habitat fragmentation would be negative, reversible and short-term; however physical damage would be negative and permanent.	medium (Significant)	Mitigated through compliance with Mitigation Items SMC-E3 and SMC-E10 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 sensitive spawning and emergence period for fish at these locations. If in-stream 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). In addition, in-stream and bankside works will be restricted to daylight hours, except at Kindallachan Burn where works during the hours of darkness cannot be avoided. When working during the hours of darkness, directional and/or shielded lighting will be utilised to prevent light-spill and angle light away from the watercourse (Mitigation Item P03-E19). no pile driving will be undertaken within 100m of the River Tay between mid-October and June inclusive to avoid the sensitive spawning and emergence period for fish. Underwater noise monitoring will be undertaken during drilling or piling activities within 100m of the River Tay at any time. If noise levels mid-channel are above 50dBht (Atlantic salmon) works will only continue with agreement from SNH (Mitigation Item P03-E20). 	No significant residual impacts predicted.
		Dowally Burn Culvert and outfalls ch4240-4280		medium (Significant)	Mitigated through compliance with Mitigation Items SMC-E3 and SMC-E10 In addition, the following measure will be adhered to: <ul style="list-style-type: none"> in-stream works will be undertaken between mid-May and mid-October inclusive to avoid the sensitive spawning and emergence period for Atlantic salmon and brown/sea trout at this location. If in-stream 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). In addition, in-stream and bankside works will be restricted to daylight hours. Where this is not possible directional and/or shielded lighting will be utilised to prevent light-spill and angle light away from the watercourse (Mitigation Item P03-E21). no pile driving will be undertaken within 100m of Dowally Burn between mid-October and mid-May inclusive. Underwater noise monitoring will be undertaken during drilling or piling activities within 100m of Dowally Burn at any time. If noise levels mid-channel are above 50dBht (Atlantic salmon) works will only continue with agreement from SNH (Mitigation Item P03-E22). 	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
	De-watering of watercourse sections and in-stream works with construction and demolition of structures that form the footprint of the proposed scheme including bank stabilisation works.	Outfall A1 ch150 Outfall A2 ch750 Outfall B ch2000 Outfall C ch3850 Outfall D2 ch4900 Outfall E ch5500 Kindallachan Burn ch6090	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 disturbance occurs during a sensitive period, this may have long-term negative effects.	high (Significant)	Mitigated through compliance with Mitigation Items SMC-W1, SMC-W4, SMC-E4 and SMC-E5 . 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 sensitive spawning and emergence period for fish at these locations. If in-stream 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). In addition, in-stream and bankside works will be restricted to daylight hours, except at Kindallachan Burn where works during the hours of darkness cannot be avoided. When working during the hours of darkness, directional and/or shielded lighting will be utilised to prevent light-spill and angle light away from the watercourse (Mitigation Item P03-E19). 	No significant residual impacts predicted.
		Dowally Burn Culvert and outfalls ch4240-4280		high (Significant)	Mitigated through compliance with Mitigation Items SMC-W1, SMC-W4, SMC-E4 and SMC-E5 . In addition, the following measure will be adhered to: <ul style="list-style-type: none"> in-stream works will be undertaken between mid-May and mid-October inclusive to avoid the sensitive spawning and emergence period for Atlantic salmon and brown/sea trout at this location. If in-stream 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). In addition, in-stream and bankside works will be restricted to daylight hours. Where this is not possible directional and/or shielded lighting will be utilised to prevent light-spill and angle light away from the watercourse (Mitigation Item P03-E21). 	No significant residual impacts predicted.
Freshwater pearl mussel (<i>International</i>)	In-stream works and de-watering of watercourse sections with construction of structures that form the footprint of the proposed scheme including bank stabilisation works.	See Appendix A12.3 (Confidential Ecology Features).	In-stream works and de-watering may cause mortality of individuals and cause a reduction in reproductive success both directly due to mortality of breeding individuals and indirectly due to prevention of movement of host species. This effect would be negative and permanent.	high (Significant)	Mitigated through compliance with Mitigation Items SMC-W1 and SMC-W4 specifically: <ul style="list-style-type: none"> undertaking in-stream works during low flow periods (i.e. when flows are at or below the mean average) as far as reasonably practicable to reduce the potential for sediment release and scour; minimise the length of channel disturbed and size of working corridor, with the use of silt fences or bunds where appropriate to prevent sediment being washed into the water feature; limit the removal of vegetation from the riparian corridor, and retaining vegetated buffer zone wherever reasonably practicable; limit the amount of tracking adjacent to watercourses and avoid creation of new flow paths between exposed areas and new or existing channels; and submission of construction method statements for any in-channel working to SEPA to comply with any authorisations under CAR. <p>In addition, the following measures will be adhered to:</p> <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. Toolbox talks with contractors on environmental sensitivities and implementation of mitigation will be conducted. The ECoW will regularly inspect pollution controls and site compounds as appropriate. An agreed working area will be established prior to the start of works which will avoid FWPM (Mitigation Item P03-E18). a FWPM Protection Plan (including Emergency Action Plan) will be developed for locations where FWPM may be affected. (Mitigation Item P03-E23). a Silt Control Management Plan (SCMP) will be developed and implemented (Mitigation Item P03-E24). in-stream works will be undertaken between July and mid-October inclusive to avoid the most sensitive periods for FWPM spawning and fish in the River Tay. If in-stream 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). In addition, in-stream and bankside works will be restricted to daylight hours, except at Kindallachan Burn where works during the hours of darkness cannot be avoided. When working during the hours of darkness, directional and/or shielded lighting will be utilised to prevent light-spill and angle light away from the watercourse (Mitigation Item P03-E19). 	No significant residual impacts predicted.
	Noise and vibration associated with construction related activities.		Vibration may lead to physiological stress and reduced fitness of individuals. Disturbance of the host species due to noise, vibration and lighting may result in a reduction in reproductive success of the species. This effect would be negative, long-term and reversible	high (Significant)	Mitigated through compliance with Mitigation Items SMC-E3 and SMC-E10 . 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 in the River Tay. 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). In addition, in-stream and bankside works will be restricted to daylight hours, except at Kindallachan Burn where works during the hours of darkness cannot be avoided. When working during the hours of darkness, directional and/or shielded lighting will be utilised to prevent light-spill and angle light away from the watercourse (Mitigation Item P03-E19). no pile driving will be undertaken within 100m of the River Tay between mid-October and June inclusive. Underwater noise monitoring will be undertaken during drilling or piling activities 	No significant residual impacts predicted.

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	Run-off from construction works including sediment and chemical and hydrocarbon loads from accidental spillage.		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)	<p>within 100m of the River Tay at any time. If noise levels mid-channel are above 50dBht (for FWPM host species, Atlantic salmon) works will only continue with agreement from SNH (Mitigation Item P03-E20).</p> <p>Mitigated through compliance with Mitigation Items SMC-W2, SMC-W3 and SMC-W7. In addition, the following measures will be adhered to:</p> <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. Toolbox talks with contractors on environmental sensitivities and implementation of mitigation will be conducted. The ECoW will regularly inspect pollution controls and site compounds as appropriate. An agreed working area will be established prior to the start of works which will avoid FWPM (Mitigation Item P03-E18). a Silt Control Management Plan (SCMP) will be developed and implemented which will include the following measures (Mitigation Item P03-E24): <ul style="list-style-type: none"> appropriate controls for construction site run-off 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 P03-W18); and any other appropriate measures required following consultation or licencing discussions with SEPA. the Contractor will monitor the weather and river level (as published by SEPA) conditions to assess the potential for high flows or spate events during sensitive works. Where high flows are anticipated, works will be avoided in the first instance. If this is not possible, the ECoW will conduct spot-checks of sediment levels at least once per day (Mitigation Item P03-E25). where sediments exceed safe thresholds for FWPM (determined through monitoring detailed in Mitigation Item P03-W20) an Emergency Action Plan (produced as part of the FWPM Protection 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 P03-E26). <p>The construction method for the bank stabilisation has been designed to include a construction drainage system, preventing run-off entering the River Tay and use of a biodegradable polymer support fluid in a re-circulating system to minimise any environmental impacts.</p>	No significant residual impacts predicted.
	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)	<p>Mitigated through compliance with Mitigation Items SMC-E1, SMC-E8, SMC-E9 and SMC-E12. In addition, the following measures will be adhered to:</p> <ul style="list-style-type: none"> A FWPM Protection Plan (including Emergency Action Plan) will be developed for locations where FWPM may be affected. (Mitigation Item P03-E23); 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. The ECoW will be on site during any pollarding or cutting of trees (Mitigation Item P03-E27); and bankside vegetation to be reinstated as soon as possible upon completion of construction (Mitigation Item P03-E28). 	No significant residual impacts predicted.
Otter (National) (Figure 12.8)	Construction related activities including vehicle movement, culvert and watercourse crossing construction, bank stabilisation works and creation of excavations including those for SuDS.	For locations see Appendix A12.3 (Confidential Ecology Features).	Direct mortality of individuals moving across site from collisions or entrapment in uncovered holes, pipes or machinery. This effect is unlikely to occur in sufficient numbers to affect the wider population. The effect is likely to be long-term, reversible and negative.	low (Significant)	<p>Mitigated through compliance with Mitigation Items SMC-E1, SMC-E9, SMC-E13 and SMC-E14. In addition, construction compounds, storage areas, temporary access tracks etc. (except for temporary access tracks; and compounds/storage and working area for the bank stabilisation works) will be at least 10m from watercourse banks (Mitigation Item P03-E29).</p>	No significant residual impacts predicted.
	Noise, vibrations and light spill associated with construction related activities including bridge, embankment, bank stabilisation works and drainage works.		Disturbance of an EPS, including two hots and one couch, leading to its avoidance of key places of shelter and rest; but not at a level that will cause declines in population as the species is widespread in the catchment. This effect would be negative, reversible and short-term.	low (Significant)	<p>Mitigated through compliance with Mitigation Items SMC-E1, SMC-E6, SMC-E10, SMC-NV2 and SMC-LV4. In addition, the following measures, which will be included within a Species Protection Plan as per Mitigation Item SMC-S1, will be adhered to (Mitigation Item P03-E30):</p> <ul style="list-style-type: none"> piling will not be undertaken within 100m of a resting site. If this buffer distance cannot be achieved, for example where a resting site lies within 100m of the existing road, soft-starts of machinery will be applied to encourage otter to evacuate the area prior to the commencement of works; 	No significant residual impacts predicted.

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					<ul style="list-style-type: none"> working during hours of darkness will be avoided in sensitive areas, where possible, such as watercourse crossings and within 30m of resting sites; directional and/or cowled lighting will be used to prevent light-spill and light angled away from all rest sites and areas of otter activity; and provision of temporary screening to create dark areas around rest sites where construction lighting would result in light spillage on the sites that cannot be controlled through the use of directional lights. 	
	Construction related activities including culvert and watercourse crossing construction.		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 (Significant)	Mitigated through compliance with Mitigation Items SMC-E6, SMC-E10, SMC-NV2 and SMC-LV4 . In addition, the following measure will be adhered to: <ul style="list-style-type: none"> severance and fragmentation of habitat will be avoided or reduced during construction by retention of commuting routes, for example constructing culverts with mammal provision and dry mammal underpasses early in the construction process where possible (Mitigation Item P03-E31); provision will be made to ensure that watercourses are accessible to otter during construction. Where practicable; one bank of a watercourse will remain open and accessible to otter at all times, culverts and bridges will remain open to otter at night, and one side of a double-celled culvert will remain open at all times (Mitigation Item P03-E32). Locations of mammal crossing provisions are presented on Figure 13.5. 	No significant residual impacts predicted.
	Run-off from construction works including sediment and chemical (nutrient and heavy metal) 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 of Mitigation Items SMC-W3, SMC-W4, SMC-W7 and P03-W21 .	No significant residual impacts predicted.
Bats (all species) <i>(National)</i> (Figure 12.5 and 12.6)	Construction related activities, including vehicle movement, site/vegetation clearance and building demolition throughout the proposed scheme.	ch280 ch940 ch1600 ch1640 ch4170 ch4290 ch4420 ch4600 ch4650 ch4725 ch4810 Guay Farmhouse ch5250 ch5650 ch5700 ch6090 ch6830 ch7750 ch7950	Direct mortality of an EPS during removal of roosting habitat. This effect is unlikely to occur in sufficient numbers to affect the wider population. The overall effect on populations is likely to be long-term, reversible and negative.	medium (Significant)	Mitigated through compliance with Mitigation Items SMC-E1, SMC-E6, SMC-E8 and SMC-E9 . The impacts resulting from alteration (Wing of Guay Farmhouse ch5250) and demolition (Guay Cattle Shed ch5250) of buildings in particular will be mitigated through Mitigation Item P03-E33 as follows: <ul style="list-style-type: none"> A Species Protection Plan will be prepared in compliance with Mitigation Item SMC-S1. The plan will include measures to mitigate for impacts on bats, including: <ul style="list-style-type: none"> exclusion of bats from any area which will be directly impacted by alteration, demolition and remedial works; and sensitive alteration to the Wing of Guay Farmhouse to involve alteration by hand where practicable under a bat licensed ECoW's supervision, until such a time that the ECoW is fully satisfied that no bats remain within the structure and all reasonable precautions have been taken to avoid harming bats. 	No significant residual impacts predicted.
	Temporary obstruction of culverts and underpasses	ch280 ch1600 Dowally Burn Culvert ch4240-4280 ch5230 Kindallachan Burn ch6090 ch6610	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 not significant, this impact will be mitigated in compliance with species protection legislation and best practice guidance: <ul style="list-style-type: none"> severance of habitat will be avoided or reduced during construction by retention of commuting routes through culverts and underpasses, such that movement between areas of habitat is maintained (Mitigation Item P03-E34). 	n/a
	Noise, vibration and light spill associated with construction related activities.	ch280 ch430 ch1470 ch1550 ch1650 ch3900 ch3990 ch4050 ch4110 ch4120 ch4130	Disturbance of an EPS, including seven known roosts, and several high potential trees, structures and buildings within and adjacent to the footprint, which could lead to the abandonment of roost sites and increased energy expenditure during roosting periods. Disturbance to other roosts within Guay Farmhouse. This effect would be short-term, reversible and negative.	medium (Significant)	Mitigated through compliance with Mitigation Items SMC-E1, SMC-E6, SMC-E10, SMC-NV2 and SMC-LV4 . Mitigation Item SMC-S1 , specifically related to production and compliance with Species Protection Plans, will mitigate any impacts on bats as a result of construction related activities.	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
		ch4190 ch3000 ch4285 Guay Farmhouse ch5250 ch5325 ch5400 ch6000 ch6110 ch6250 ch6350 ch6500 ch6530 ch6600 ch6620 ch6630 ch6960 ch7360 ch7600 All woodland habitat throughout the proposed scheme.				
Beaver (National)	Noise, vibration and light spill associated with construction related activities throughout the proposed scheme.	River Tay and woodland along the river throughout the proposed scheme. Bank stabilisation ch1600-1900	Temporary disturbance leading to avoidance of key habitats for foraging leading to some displacement of population(s). 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 Items SMC-E6, SMC-E9, SMC-E10 and SMC-NV2 , 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 prevented during construction by retention of commuting routes, for example constructing culverts with mammal provision and dry mammal underpasses early in the construction process (Mitigation Item P03-E31). 	n/a
		ch880-ch900	Temporary disturbance to two beaver burrows leading to avoidance of key places of shelter and rest for a newly reintroduced native species. This effect would be short-term, reversible and negative.	low (Significant)	Mitigated through compliance with Mitigation Items SMC-E6, SMC-E10, SMC-NV2 and SMC-LV4 . In addition, the following measure (Mitigation Item P03-E30) will be adhered to: <ul style="list-style-type: none"> piling will not be undertaken within 100m of a resting site. If this buffer distance cannot be achieved, for example where a resting site lies within 100m of the existing road, soft-starts of machinery will be applied to encourage otter to evacuate the area prior to the commencement of works; working during hours of darkness will be avoided in sensitive areas, where possible, such as watercourse crossings and within 30m of resting sites; directional and/or cowed lighting will be used to prevent light-spill and light angled away from all rest sites and areas of beaver activity; and provision of temporary screening to create dark areas around rest sites where construction lighting would result in light spillage on the sites that cannot be controlled through the use of directional lights. 	No significant residual impacts predicted.
	Construction-related activities including vehicle movement.	River Tay and woodland along the river throughout the proposed scheme. Bank stabilisation ch1600-1900	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 Items SMC-E9, SMC-E13 and SMC-E14 .	No significant residual impacts predicted.
Badger (Regional) (Figure 12.4)	Construction related activities including vehicle movement throughout the proposed scheme.	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 Items SMC-E9, SMC-E13 and SMC-E14 .	No significant residual impacts predicted.
	Noise, vibration and light spill associated with construction related activities throughout the proposed scheme.	See Appendix A12.3 (Confidential Ecology Features).	Temporary disturbance of badgers and sixteen outlier setts, five subsidiary setts and one annex sett leading to a change in the distribution of local population(s). This effect would be short-term, reversible and negative.	low (Significant)	Mitigated through compliance with Mitigation Items SMC-E1, SMC-E6, SMC-E10, SMC-LV4 and SMC-NV2 , and the following mitigation measures (Mitigation Item P03-E35): <ul style="list-style-type: none"> piling/drilling will not be undertaken within 100m of a sett. However, if this buffer distance cannot be achieved, consultation with SNH will be required. If there is a risk of damage to an active sett from vibration, Mitigation Items SMC-E6 and P03-E63 will need to be adhered to where relevant.; 	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
	Temporary loss of badger habitat to accommodate construction.	Throughout the proposed scheme.	Fragmentation through temporary loss of functional habitat This effect would be short-term, reversible and negative.	low (Not significant)	<ul style="list-style-type: none"> directional and/or cowed lighting will be used to prevent light-spill and light angled away from all active setts and areas of badger activity; and maintenance of a 30m buffer zone from all active setts, where possible and following consultation with SNH. <p>Although impacts are not significant, adherence to the following mitigation measures, will ensure compliance with species protection legislation and best practice guidance:</p> <ul style="list-style-type: none"> Severance and fragmentation of habitat used by otter, badger, beaver, pine marten and red squirrel will be prevented during construction by retention of commuting routes, for example constructing culverts with mammal provision and dry mammal underpasses early in the construction process. (Mitigation Item P03-E31). 	n/a
Breeding birds (Regional) (Figure 12.7)	Construction related activities, including vehicle movement and vegetation clearance throughout the proposed scheme.	Throughout the proposed scheme.	Direct mortality of breeding birds and disturbance to breeding birds due to vegetation clearance during the breeding season. Direct mortality would be a permanent, negative effect on an individual level, however is unlikely to have a permanent effect as a whole on breeding bird assemblages. Disturbance during construction would be long-term and negative due to habitat loss caused by construction.	medium (Significant)	Mitigated through compliance with Mitigation Items SMC-E7, SMC-E8, SMC-E9 and SMC-E10 .	No significant residual impacts predicted.
	Temporary loss of habitat to accommodate construction.	Throughout the proposed scheme	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 however Mitigation Item SMC-E9 will reduce the impact.	n/a
Barn owl (Regional)	Noise, vibration and light spill associated with construction related activities.	See Appendix A12.3 (Confidential Ecology Features).	Disturbance of Schedule 1 species which could influence breeding success, feeding behaviour and, if disturbance becomes continuous, could lead to abandonment of nests during that season. This effect would be long-term, reversible and negative.	medium (Significant)	<p>Mitigated through compliance of Mitigation Items SMC-E1 and SMC-E11. The following mitigation will also be implemented:</p> <ul style="list-style-type: none"> to avoid disturbance of barn owl, temporary measures should be undertaken to discourage nesting during the construction. These measures, as detailed by Shawyer (2011), must be undertaken prior to commencement of work and outside the bird breeding season (March to August inclusive). Measures could include (Mitigation Item P03-E36): <ul style="list-style-type: none"> securely covering openings into buildings with plywood panels, focussing on specific features of the building where barn owls have bred or might offer potential nest sites. installation of barn owl boxes as mitigation for operational habitat loss should be carried out at this stage (Mitigation Item P03-E66) to ensure that alternative nest sites are available during the construction period also, with appropriate locations (sited in the suitable habitats that are available outwith the works area) defined during pre-construction surveys. <p>If barn owls are nesting in the building, the following measures to reduce disturbance, as detailed by Shawyer (2011), will be adhered to (Mitigation Item P03-E37):</p> <ul style="list-style-type: none"> a suitable protection zone should be placed around the nest; construction work within the protection zone should avoid taking place between the months of March to August inclusive; construction works will take place in daylight hours when barn owls are largely inactive; and the roost will be visually screened, for example, by the use of high fine mesh netting which will prevent encroachment and shield birds visually from sudden changes in activity levels. 	No significant residual impacts predicted.
Pine marten Red squirrel (Regional) (Figure 12.9)	Construction related activities, including vehicle movement and vegetation clearance.	Throughout the proposed scheme.	Direct mortality of individuals from vehicle collisions and destruction of dreys/dens during vegetation clearance. Direct mortality is permanent and negative on an individual level. However, on a population level this effect would be long-term and negative as the species can readily use unaffected areas and re-colonise a habitat.	medium (Significant)	<p>Mitigated through compliance with Mitigation Items SMC-E6, SMC-E8 and SMC-E10. In addition, the following measures will be adhered to:</p> <ul style="list-style-type: none"> site clearance affecting pine marten and red squirrel habitat should be timed to avoid breeding season (March to June inclusive for pine marten and February to September inclusive for red squirrel) (Mitigation Item P03-E38); 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. Exclusion zones will be marked around dens/dreys. Exclusion zones will be to the following distances, and where works within these exclusions zones are required, these will be supervised by an ECoW, and where necessary will be carried out under a derogation licence from SNH: <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 (Mitigation Item P03-E39); 	No significant residual impacts predicted.

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					<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 P03-E40). 	
	Noise, vibration and light spill associated with construction related activities throughout the proposed scheme.	Throughout the proposed scheme.	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, reversible and negative.	low (Not significant)	No mitigation is required for this non-significant impact; however, compliance with Mitigation Items SMC-E6, SMC-E9, SMC-E10, SMC-NV2 and SMC-LV4 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 prevented during construction by retention of commuting routes, for example constructing culverts with mammal provision and dry mammal underpasses early in the construction process (Mitigation Item P03-E31). 	n/a
Adders Slow worm Common lizard (Regional) (Figure 12.10)	Construction activity including vehicle movement and vegetation clearance.	ch400-920 ch2220-2630 ch3730-3900 ch6985-7310 ch8030-8130	Potential direct mortality of individuals. This effect is unlikely to affect the population of these species. This effect would be long-term, reversible and negative as the species can move to unaffected areas and re-colonise.	medium (Significant)	The following measures will be adhered to by the Contractor prior to vegetation clearance of reptile habitat (Mitigation Item P03-E41): <ul style="list-style-type: none"> pre-construction surveys to understand the population size and distribution of reptiles in Key Reptile Sites (KRS) (Edgar et al., 2010); translocation areas (Figure 13.5) will be created for KRS prior to site clearance; exclusion fencing will be installed around KRS areas that are to be lost and individuals will be captured by hand with use of ACOs and pitfall traps; exclusion fencing will be installed along the boundary of any KRS where it is directly adjacent to construction works to prevent reptiles moving into the works site; translocation of individuals from KRS into created areas (no adders are to be translocated to the area at ch.900 due to the proximity to a residential property); exclusion fencing will be installed along the boundary of translocation areas on commencement of the works to prevent movement of reptiles from the receptor site back into the works footprint. This is to be removed post-construction; phased strimming of favourable reptile habitat will take place during hibernation season (November to February inclusive) (Edgar et al., 2010) following fingertip searches when necessary and under the direction of an ECoW; and soil stripping and removal of potential hibernacula, including but not limited to drystone walls, dense tussocks of grass and log piles, will take place outwith hibernation season. 	No significant residual impacts predicted.
	Noise, vibration and light spill associated with construction related activities throughout the proposed scheme.	ch400-920 ch2220-2630 ch3730-3900 ch6980-7300	Disturbance of individuals resulting in some displacement. This effect would be negative, reversible and short-term.	low (Not significant)	Although not significant, compliance of Mitigation Item SMC-NV2 would reduce the effect of this impact.	n/a
	Temporary loss of reptile habitat to accommodate construction.	ch650-800 ch2220-2630 ch3780-3900 ch8030-8130	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 damselfly (Regional)	Run-off from construction works including sediment and chemical (nutrient and heavy metal) loads from accidental spillage.	ch6400-6450	Reduced water quality and availability of suitable habitat. Depending on the magnitude of the pollution even this effect could be negative and long-term.	medium (Significant)	Mitigated through compliance of Mitigation Items SMC-W3, SMC-W4 and SMC-W7 .	No significant residual impacts predicted.
INNS (n/a)	Transfer of INNS during construction, including Japanese knotweed, Himalayan balsam, giant hogweed, rhododendron.	ch1150 ch1980 ch2270-2320 ch2440 ch2950 ch3190 ch4260 ch5230 ch6100 ch6330 ch6530 ch6640	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)	Potential spread of INNS will be mitigated through compliance of Mitigation Item SMC-E15 , and by following the Ecological Management Plan to be produced by the contractor.	No significant residual impacts predicted. Potential for biodiversity benefits through management of INNS.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
Operation						
River Tay SAC (International) (Figure 12.1)	Loss of 0.17ha of terrestrial habitat to accommodate footprint of construction, including culvert extensions, embankments, bridges and ponds/basins. Loss of 0.04ha aquatic habitat to accommodate footprint of scheme, including culvert extensions and culvert headwalls. The loss of habitat (aquatic and terrestrial) accounts for <0.002% of the total area of the River Tay SAC.	Outfall A1 ch150 Pond A2 and Outfall A2 ch630-810 Access Track ch920-1000 Outfall B ch2000-2060 Outfall C ch3850-3870 Dowally Burn Culvert and outfalls ch4240-4280 Outfall D2 ch4900 Outfall E ch5500 Kindallachan Burn ch6090	Permanent reduction in extent of habitat in SAC and potential for fragmentation or reduction in fish passage in this internationally important site. This effect would be permanent and negative however the area of habitat loss is negligible 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 P03-E42): <ul style="list-style-type: none"> 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, 2008). See Mitigation Items SMC-W13, SMC-W14 and SMC-W17 for more details.	n/a
	Pollution from road run-off.	Outfall A1 ch150 Outfall A2 ch750 Access Track ch920-1000 Outfall B ch2000 Outfall C ch3850 Dowally Burn Culvert and outfalls ch4240-4280 Outfall D2 ch4900 Sloggan Burn outfall ch5200 Outfall E ch5500 Kindallachan Burn ch6090	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 PPG/GPP 1, 5, 6, 21, 22 and 26 (SEPA, 2003; 2017) will be abided by (Mitigation Item P03-E43). Road surface run-off will be subject to treatment via SuDS ponds/basins, swales and geocellular storage. See Mitigation Item SMC-W17 for more details. The locations of ponds/basins, swales and geocellular storage areas can be seen on Figure 13.5.	No significant residual impacts predicted.
	Changes in hydrology due to new and extended structures including any necessary bank protection measures.	Outfall A1 ch110 Outfall A2 ch750 Outfall B ch2000 Outfall C ch3850 Dowally Burn Culvert ch4240-4280 Outfall D2 ch4900 Outfall E ch5500 Kindallachan Burn ch6090	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 be small and not 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 P03-E42): <ul style="list-style-type: none"> 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, 2008). See Mitigation Items SMC-W13, SMC-W14 and SMC-W17 for more details.	n/a
	Shading of the river bed under the footprint of the proposed scheme.	Dowally Burn Culvert ch4240-4280 Kindallachan Burn ch6090	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 habitat affected by shading is not functionally limiting and the amount shaded 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
Shingle Islands SAC (International)	Increased levels of pollution from run-off from the proposed scheme.	Basin C and Outfall C ch3800-4030 Geocellular Storage Outfall D ch5000 Outfall E ch5500 Outfall H ch8200	Degradation to the wet woodland habitat resulting from reduced water quality. In the absence of mitigation being applied during design, this effect is predicted to be long-term, reversible and negative.	low (Not significant)	No mitigation is required for this non-significant impact; operational impacts on the SAC have been mitigated through embedded mitigation within the design and following best practice. Road surface run-off will be subject to treatment via SuDS ponds/basins, swales and geocellular storage. See Mitigation Item SMC-W17 for more details. The locations of ponds/basins, swales and geocellular storage areas can be seen on Figure 13.5.	n/a

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
Shingle Islands SSSI (National)	Increased levels of pollution from run-off from the proposed scheme.	Basin C and Outfall C ch3850-4050 Outfall D ch5000 Outfall E ch5500 Outfall H ch8200	Impacts on the habitats of the SSSI resulting from reduced water quality due to surface run-off. In the absence of mitigation being applied during design, this effect is predicted to be long-term, reversible and negative.	low (Not significant)	No mitigation is required for this non-significant impact; operational impacts on the SSSI have been mitigated through embedded mitigation within the design and following best practice. Road surface run-off will be subject to treatment via SuDS ponds/basins, swales and geocellular storage. See Mitigation Item SMC-W17 for more details. The locations of ponds/basins, swales and geocellular storage areas can be seen on Figure 13.5.	n/a
Ancient woodland (National) (Figure 12.1)	Removal of 6.35ha of ancient woodland to structures that form the footprint of the proposed scheme. (bridges, road and associated cutting/embankments). Loss of wooded AWI habitat of approximately: <ul style="list-style-type: none"> 3.83ha (category 1a) 2.05ha (category 2b); and 0.47ha (category 3). 	Throughout the proposed scheme.	Reduction in the area of ancient woodland sites and includes the reduction of 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)	Mitigation for loss of AWI woodland, in terms of functionality, biodiversity and habitat connectivity, will be undertaken as follows: <ul style="list-style-type: none"> candidate sites for compensation have been identified using outputs from the Woodland Connectivity – Ancient Woodland Compensation Strategy (Transport Scotland, 2016b). These sites have the best potential for creating ecologically functioning units and for connecting existing ancient woodland sites, thus reducing ancient woodland fragmentation in the landscape. (Mitigation Item P03-E44). compensation planting will include the following: <ul style="list-style-type: none"> species mixes will reflect native woodland mixes to replace non-native plantations and maximise biodiversity benefit; ancient woodland soil will be stored appropriately and re-used where appropriate to maintain soil fungal biodiversity and provide a seed bank to promote the re-establishment of ancient woodland ground flora (see Mitigation Item SMC-LV5 for more details); management will be undertaken in AWI woodland that is to be retained which will include the retention of dead and fallen wood; and development of an AWI-specific Habitat Management Plan (Mitigation Item SMC-S1). The locations of sites selected for compensatory planting are detailed in Table 12.11b and shown on Figure 12.14 and Figure 13.5.	Significant adverse residual impact in respect of biodiversity and the intrinsic value of AWI. Although compensation planting will not mitigate for the permanent loss of biodiversity as a result of the proposed scheme, the 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 value of the woodland in respect of habitat connectivity and carrying capacity for other species in the medium to long-term.
Broadleaved, mixed or coniferous semi-natural woodland (not AWI) (Regional)	Loss of approximately 10.22ha of this woodland throughout the proposed scheme with structures that form the footprint (bridges, roads and associated cutting/embankments, bank stabilisation and ponds/basins).	Throughout the proposed scheme.	Reduction 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 P03-E45).	No significant residual impacts predicted.
Coniferous plantation woodland (not AWI) (Regional)	Loss of 0.51ha of this woodland throughout the proposed scheme with structures that form the footprint (bridges, roads and associated cutting/embankments and ponds/basins).					
Semi-improved and poor semi-improved neutral grassland (Authority area)	Loss of 8.70ha of this habitat throughout the proposed scheme with structures that form the footprint (bridges, road and associated cutting/embankment).	Throughout the proposed scheme.	Reduction of this habitat and the associated biodiversity of these less managed grasslands. This effect would be long-term reversible and negative.	medium (Significant)	The loss of this habitat will be replaced through landscape and ecological planting, as shown on Figure 13.5 (Mitigation Item P03-E46).	No significant residual impacts predicted.
Watercourses (Sloggan Burn and unnamed watercourses) (Authority area)	Pollution from road run-off.	Unnamed watercourses (25 locations) Sloggan Burn ch5240 and ch5270	Increased run-off volumes and contaminants leading to decreased water quality. This effect would be long-term, reversible and negative.	medium (Not significant)	No mitigation is required for this non-significant impact however, 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 P03-E43). Road surface run-off will be subject to treatment via SuDS ponds/basins, swales and geocellular storage. See Mitigation Item SMC-W17 for more details. The locations of SuDS ponds/basins, swales and geocellular storage areas can be seen on Figure 13.5.	n/a
	Changes in hydrology due to increase in impervious surfaces.		Altered habitat due to changes in flows around extended culverts.	low (Not significant)	No mitigation is required for this non-significant impact.	n/a

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
			This effect would be permanent and negative however the amount of habitat affected by changes in hydrology will be negligible given the amount of habitat available.			
	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
Ponds (Authority area)	Loss of habitat under the footprint of the proposed scheme.	ch6400-6450	Reduced availability or fragmentation of habitat for aquatic flora and fauna. This effect would be permanent and negative.	medium (Significant)	An Ecological/Compensatory Flood Storage Pond (as described in Mitigation Item P03-E72) will provide mitigation for pond habitat loss, particularly for functionality of habitat through pond network creation. Furthermore, creation of SuDS ponds/basins along the extent of the scheme are considered to provide biodiversity enhancement. The locations of these ponds/basins can be seen on Figure 13.5.	n/a
	Pollution from road run-off.	Outfall ch6570 Outfall H ch8200	Increased run-off volumes and contaminants leading to decreased water quality. This effect would be long term, negative and reversible.	low (Not significant)	Road surface run-off will be subject to treatment via SuDS ponds/basins. See Mitigation Item SMC-W17 for more details. The location of SuDS can be seen on Figure 13.5 (specifically Figure 13.5h for Pond H).	n/a
Scrub (Authority area)	Loss of 1.85ha of habitat under the footprint of the proposed scheme.	Throughout the proposed scheme.	Reduction of this habitat and its availability for species that rely on it for food, shelter and breeding. This effect would be permanent and negative.	low (Not significant)	No mitigation is required in order to adhere to any legislation for this non-significant impact.	n/a
Atlantic salmon Lamprey species Brown/sea trout European eel (International)	Pollution from road run-off	At watercourses throughout the proposed scheme.	Increased run-off volumes and contaminants leading to decreased water quality and altered habitat (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 P03-E43). Road surface run-off will be subject to treatment via SuDS ponds/basins, swales and geocellular storage. See Mitigation Item SMC-W17 for more details. The locations of ponds/basins, swales and geocellular storage areas can be seen on Figure 13.5.	No significant residual impacts predicted.
	Changes in hydrology and shading from 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 lighting. This effect would be permanent and negative; however, the changes are expected to be localised.	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 P03-E42): <ul style="list-style-type: none"> 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, 2008). See Mitigation Items SMC-W13, SMC-W14 and SMC-W17 for more details.	n/a
	Loss of habitat from structures that form the footprint of the proposed scheme.	Dowally Burn Culvert ch4240-4280	Permanent loss of adult passage and juvenile habitat under the footprint of the culvert. This effect would be permanent and negative, however the habitat lost is not limited within the River Tay SAC.	low (Not significant)	Although not significant, creation of pool habitat downstream of the proposed Dowally Burn Culvert (Mitigation Item P03-E47) would further reduce the effect of this habitat loss and is in line with the programme objective of increasing permeability of species along the A9..	n/a
Freshwater pearl mussel (International)	Pollution from road run-off throughout the proposed scheme.	See Appendix A12.3 (Confidential Ecology 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. However, the use of SuDS (ponds, basins and swales) and geocellular storage to treat surface water	medium (Significant)	Road surface run-off will be subject to treatment via SuDS ponds/basins, swales and geocellular storage. 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 P03-E43). Monitoring of FWPM populations will be required for a period of up to 10 years' post-construction, to be agreed following consultation with SNH. (Mitigation Item P03-E48).	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
			run-off and the careful siting of outfalls will minimise this effect.			
	Loss of habitat from structures that form the footprint of the proposed scheme (outfalls).		Reduction in availability of suitable habitat. Where possible outfalls have been sited to avoid areas of suitable habitat. Therefore, although this effect would be permanent and negative the amount of suitable habitat loss would not be significant.	low (Not significant)	Mitigation for this effect is embedded within the design in the form of siting outfalls away from areas of suitable FWPM habitat, where possible. Retention of bankside vegetation in confirmed FWPM locations, where possible should be undertaken. Where this is not possible agreement with SNH required. (Mitigation Item P03-E49)	No significant residual impacts predicted.
Otter (National) (Figure 12.8)	Loss of terrestrial habitat with structures that form the footprint of the proposed scheme (bridges, road, associated cutting/embankments, bank stabilisation and retaining walls).	Dowally Burn Culvert ch4200-4250 Kindallachan Burn ch6090 ch4140 – 4230 ch5280 – 5340 ch6920 – 7000 Bank stabilisation ch1600-1900 All outfalls.	Reduction in availability of foraging habitat. Fragmentation of connecting habitats leading to increase in barriers to movement and access to resources for the species within the catchment. Predicted to be a long-term and negative effect, however current baseline indicates that no holts or couches will be lost and numbers of affected individuals likely to be a low proportion of overall catchment population.	medium (Significant)	Operational impacts will be mitigated as follows: <ul style="list-style-type: none"> the loss of areas identified as otter habitat will be replaced through woodland and riparian planting as shown on Figure 13.5 (Mitigation Item P03-E50); fragmentation of habitat will be prevented during operation by retention of commuting routes or creation of suitable crossing points, including culverts suitable for passage by mammals and dry mammal underpasses, so movement between areas of habitat can be maintained (Mitigation Item P03-E51); 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); and design to minimise need for operational lighting at crossing points (Mitigation Item P03-E52) Furthermore, the destruction of any confirmed holts/couches will be conducted under licence following consultation with SNH (Mitigation Item SMC-E6) A replacement artificial holt will be provided for any active holt lost resulting from the proposed scheme, following consultation with SNH. (Mitigation Item P03-E53) .	No significant residual impacts predicted.
	Increased road width in conjunction with culvert installation.	Throughout the proposed scheme.	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.	high (Significant)	Operational impacts will be mitigated as follows: <ul style="list-style-type: none"> fragmentation of habitat will be prevented during operation by retention of commuting routes or creation of suitable crossing points, including culverts suitable for passage by mammals and dry mammal underpasses, so movement between areas of habitat can be maintained (Mitigation Item P03-E51); otter 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. Otter fencing will follow SNH guidance, Otters and Development (SNH, 2008b). (Mitigation Item P03-E54); and landscape planting will be designed to encourage use of crossing points (Mitigation Item P03-E55). 	No significant residual impacts predicted.
	Pollution from road run-off.	Throughout the proposed route.	Decreased water quality resulting in reduced fitness of individuals and a reduction in prey resource. Predicted to be a long-term and negative effect, but proportion of population affected likely to be low and the species can readily use unaffected areas.	low (Significant)	Operational impacts will be mitigated through embedded mitigation. Road surface run-off will be subject to treatment via SuDS ponds/basins, swales and geocellular storage. See Mitigation Item SMC-W17 for more details. The locations of ponds/basins and geocellular storage areas can be seen on Figure 13.5.	No significant residual impacts predicted.
Bats (all species) (National) (Figure 12.5 and Figure 12.6)	Loss of roost habitat with structures that form the footprint of the proposed scheme (bridges, road and associated cutting/embankments).	ch870 ch940 ch1600 ch1640 ch4290 ch4430 ch4600 ch4670 ch4730 ch4810 Guay Farmhouse ch5250 ch5670 ch5720 ch6490 ch6730	Permanent loss of four roosts (one building, one structure and two tree roosts) and seventeen high potential trees. Loss to result from these features either being under the direct footprint of the proposed scheme or as a result of construction activity. This effect would be long-term and negative.	high (Significant)	Impacts will be mitigated through compliance with measures detailed in a Species Protection Plan to be prepared as part of the contract documents (Mitigation Item SMC-S1) . The destruction of any confirmed roosts will be conducted under licence following consultation with SNH (Mitigation Item SMC-E6) . The loss of habitat and individual trees identified as having bat potential, and roost trees, will be mitigated by the provision of bat boxes, for example Schwegler 1FF and 2F boxes. Three bat boxes will be provided as mitigation for each roost tree or high potential tree lost under the footprint of the proposed scheme (Mitigation Item P03-E56) . The location of woodland habitat identified for erection of bat boxes and landscape planting is shown on Figure 13.5. Following pre-construction surveys, any roosts in structures under the footprint of the design will be mitigated through compliance with Mitigation Item P03-E57 to involve the provision of bat boxes specifically designed for external surfaces of structures. The replacement of roost structures will include the following: <ul style="list-style-type: none"> examples of suitable replacement roosts are Schwegler 1FQ, 1WQ and 2FE bat boxes; bat boxes will be mounted on the abutments/piers (depending on construction) of the new structure; and, 	No significant residual impact predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
		ch6830 ch7780 ch7950			<ul style="list-style-type: none"> during construction of the new structure, bat boxes will be erected in the surrounding habitat to replace the lost roost in the interim. <p>The loss of confirmed roost structures under the footprint that will not be replaced within the scheme design, for example BS3.7 at ch1600, will be mitigated through compliance with Mitigation Item P03-E58 to involve the provision of bat boxes incorporated into a purpose built structure, constructed in advance of removal of the existing roost structure. The replacement roost structure will be built of reclaimed material from the existing structure, where possible, and will include the following:</p> <ul style="list-style-type: none"> suitable replacement roosts, for example, Schwegler 1FR, 2WI 1GS and 2FE bat boxes; and during construction of the new structure, bat boxes will be erected in the surrounding habitat to replace the lost roost in the interim. <p>The loss of roosts in buildings as a result of alteration of Guay Farmhouse Wing will be mitigated through compliance with Mitigation Item P03-E59, specifically through compliance with measures detailed in a Species Protection Plan to be prepared as part of the contract documents (Mitigation Item SMC-S1). The following mitigation will be included:</p> <ul style="list-style-type: none"> provision of integrated bat boxes and bricks, and internal boarding, on and in the new walls; incorporating entrance points and openings to maintain air flow; and boarding up of windows and doors to prevent light ingress, to maintain current conditions. 	
	Loss of foraging habitat with structures that form the footprint of the proposed scheme (bridges, road and associated cutting/embankments and retaining walls).	Throughout the proposed scheme.	Fragmentation of habitat and reduced availability of foraging resources. This effect would be long-term, reversible and negative.	medium (Significant)	<p>Habitat loss and fragmentation of existing habitat will be mitigated by woodland retention and landscape planting as shown on Figure 13.5.</p> <p>This will include:</p> <ul style="list-style-type: none"> landscape planting (including planting of larger individual trees) and woodland retention designed to encourage use of crossing points, including culverts suitable for passage by mammals and dry mammal underpasses and hop-overs, so movement between areas of habitat can be maintained (Mitigation Item P03-E60); landscape planting around SuDS ponds/basins on the northbound carriageway (which is mirrored on the southbound carriageway), to create suitable habitat for foraging bats and to encourage higher flight lines to prevent vehicle collisions (Mitigation Item P03-E61); and minimising operational lighting at crossing points used by bats (Mitigation Item P03-E52). 	No significant residual impacts predicted.
Beaver <i>(National)</i>	Loss of burrow/lodge habitat under the footprint of the scheme (culverts, bank protection, embankments).	River Tay and woodland along the river.	Should beaver build lodges/burrows in the area prior to commencement of the works there is the potential for partial/entire destruction lodges/burrows. This effect would be long-term and negative. Beaver can use unaffected areas and re-colonise areas. Beaver typically move territory every few years due to depletion of food resources (Tayside Beaver Study Group, 2015)	medium (Significant)	<p>Pre-construction surveys would be required to identify any beaver lodges within the works footprint (Mitigation Item SMC-E1).</p> <p>The destruction of any active lodge or burrow will be conducted following consultation with SNH, including licencing if required (Mitigation Item SMC-E6).</p>	No significant residual impacts predicted.
Badger <i>(Regional)</i> (Figure 12.4)	Loss of main, subsidiary and outlier setts with structures that form the footprint of the proposed scheme (bridges, road and associated cutting/embankments).	See Appendix A12.3 (Confidential Ecology Features).	Loss of one main sett, two subsidiary setts and four outlier setts. This effect would be long-term, reversible and negative as badger can move and excavate setts in other suitable, unaffected habitat.	high (Significant)	<p>The destruction of any active sett will be conducted under licence from SNH (Mitigation Item SMC-E6) and through compliance with a SPP (Mitigation Item SMC-S1)</p> <p>Pre-construction surveys will be undertaken to verify and, where required, update the baseline (Mitigation Item SMC-E1).</p> <p>Any main sett that falls under the footprint of the proposed scheme, or which due to the nature of works will be at risk from partial destruction or significant disturbance will be replaced by an artificial badger sett, as close to the existing sett as possible. Further bait marking surveys will be required to identify the extents of the territories, if necessary. Artificial setts will be constructed six months prior to the closure of the main sett which will need to be undertaken between late-June to late-November inclusive. (Mitigation Item P03-E62).</p>	No significant residual impacts predicted.
	Loss of foraging habitat with structures that form the footprint of the proposed scheme (bridges, road and associated cutting/embankments).	Throughout the proposed scheme.	Reduction in availability or fragmentation of foraging habitat. This effect will be long-term, reversible and negative as badger can forage in areas outwith those that are affected.	medium (Significant)	<p>The following mitigation measures will be implemented to mitigate for reduction in foraging habitat and fragmentation of habitat:</p> <ul style="list-style-type: none"> loss of areas identified as badger habitat will be replaced through habitat creation as shown on Figure 13.5 (Mitigation Item P03-E63); fragmentation of habitat will be prevented during operation by retention of commuting routes or creation of suitable crossing points, including culverts suitable for passage by mammals and dry mammal underpasses, so movement between areas of habitat can be maintained (Mitigation Item P03-E51); landscape planting and woodland retention designed to encourage use of crossing points, including culverts suitable for passage by mammals and dry mammal underpasses, so movement between areas of habitat can be maintained (Mitigation Item P03-E55); badger-resistant 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 (Mitigation Item P03-E64); and 	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
	Increased road footprint.		Direct mortality of individuals throughout the proposed scheme through road-traffic related incidents. Permanent negative effect on an individual level, and occurring over the lifespan of the road, but unlikely to occur in sufficient numbers to affect the wider population.	low (not significant)	<ul style="list-style-type: none"> minimising operational lighting at crossing points (Mitigation Item P03-E52). Although not significant, operational impacts will be mitigated as follows to ensure compliance with animal welfare legislation: <ul style="list-style-type: none"> badger-resistant 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 (Mitigation Item P03-E64); fragmentation of habitat will be prevented during operation by retention of commuting routes or creation of suitable crossing points, including culverts suitable for passage by mammals and dry mammal underpasses, so movement between areas of habitat can be maintained (Mitigation Item P03-E51); and landscape planting and woodland retention designed to encourage use of crossing points, including culverts suitable for passage by mammals and dry mammal underpasses, so movement between areas of habitat can be maintained (Mitigation Item P03-E55). 	No significant residual impacts predicted.
Breeding birds (Regional) (Figure 12.7)	Increased road footprint.	Throughout the proposed scheme.	Direct mortality of individuals throughout the proposed scheme through road-traffic related incidents. This effect would be permanent and negative to the low number of individuals affected, and is unlikely to affect the overall breeding bird assemblage.	low (Not significant)	Although there is no specific mitigation for this non-significant impact, planting proposed as mitigation for bats (Mitigation Item P03-E56) will further reduce the effect of this impact.	n/a
	Loss of habitat throughout the proposed scheme with structures that form the footprint (bridges, road and associated cutting/embankments).	Throughout the proposed scheme.	Loss of suitable breeding habitat which could result in reduced breeding success. This effect would be long-term and negative.	medium (Significant)	The loss of areas identified as breeding bird habitat will be replaced through landscape planting, including the planting of woodland, scrub, hedgerow and species-rich grassland, as shown on Figure 13.5 (Mitigation Item P03-E65).	Short-term negative impact of moderate significance. However, on establishment of compensatory habitat, no residual impacts are predicted.
Barn owl (Regional)	Loss of breeding habitat and fragmentation of hunting habitat for barn owl as a result of the proposed scheme, particularly side road infrastructure.	See Appendix A12.3 (Confidential Ecology Features).	Displacement of barn owl from the area, possibly impacting the breeding success of this species within the area. This effect would be medium-term and negative, likely to reduce in significance over time with habituation.	medium (Significant)	Mitigation for loss of breeding habitat to include: <ul style="list-style-type: none"> the loss of areas identified as breeding bird habitat will be replaced through landscape planting, including the planting of woodland, scrub, hedgerow and species-rich grassland as shown on Figure 13.5 (Mitigation Item P03-E65); and provision of barn owl nest boxes as compensation for loss of breeding habitat (Mitigation Item P03-E66). 	Short-term negative impact of moderate significance. However, provision of nest sites, and likely habituation to the new infrastructure over time, no significant residual impacts are predicted.
Pine marten Red squirrel (Regional)	Loss of habitat throughout the proposed scheme with structures that form the footprint (bridges, road and associated cutting/embankments) of the proposed scheme.	Woodland throughout the proposed scheme.	Destruction of dens/dreys and fragmentation of habitat and permanent reduction in availability of this habitat to pine marten and red squirrel 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)	To mitigate for the loss of pine marten and red squirrel habitat and resting places, the following mitigation should be implemented: <ul style="list-style-type: none"> the loss of areas identified as pine marten and red squirrel habitat will be mitigated for through woodland retention and woodland planting as shown on Figure 13.5. Trees of different age and species composition will be planted, for example Scots pine, birch and alder, as appropriate, and as incorporated into Habitat Management Plans (Mitigation Item P03-E67); each lost pine marten den will be replaced by a breeding box (Mitigation Item P03-E68); and each identified lost drey will be replaced by a red squirrel nest box. Locations for nest box replacement is shown on Figure 13.5. (Mitigation Item P03-E69) 	No significant residual impacts predicted.
Adders Slow worm Common lizard (Regional) (Figure 12.10)	Loss of habitat with structures that form the footprint of the proposed scheme (bridges, road and associated cutting/embankments).	ch400-920 ch2220-2630 ch3730-3900 ch6985-7310 ch8030-8130	Reduction in reptile habitat, including loss of KRS. This effect would be permanent and negative.	medium (Significant)	Compliance with Mitigation Item P03-E70 , as described below, will mitigate for impacts on reptiles during operation. The loss of areas identified as KRS will be replaced through landscape planting and habitat creation (to be provided pre-construction) (Figure 13.5), including appropriately located hibernacula (hibernation sites). Additional enhancement of areas used for reptile translocation pre-construction will include: <ul style="list-style-type: none"> areas of insolation (sun exposure) with varied topography; shelter 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; shelter from predators; breeding habitat that is structurally diverse; 	No significant residual impacts predicted.

Ecological Feature and Importance	Impact	Location of Impact	Effect	Pre-mitigation Impact Descriptor and Significance	Mitigation	Summary of Residual Impact, Effect and Significance (Post-mitigation)
					<ul style="list-style-type: none"> • habitat connectivity; and • ecotones (interfaces between habitats and transitional zones). <p>Furthermore, features to include, but not limited to, rock piles will be used to provide basking opportunities for reptiles where appropriate, within the grassland around SuDS (Mitigation Item P03-E71).</p>	
Northern damselfly (Regional)	Habitat fragmentation resulting from the proposed scheme.	ch6400-6450	Fragmentation of habitats leading to population isolation of this species and potential localised extinctions in the long term due to future climatic variations. This effect would be long-term, reversible and negative.	low (Not significant)	<p>The impacts on northern damselfly could be mitigated, with the potential for beneficial effects. Mitigation will be embedded into the design. This is to include an Ecological/Compensatory Flood Storage Pond to be created within 300m of the pond habitat lost between ch6400 and ch6500. The following specifications will also be required as part of the mitigation:</p> <ul style="list-style-type: none"> • a constant water depth of approximately 30cm should be provided in the pond. Deeper areas of at least 75cm deep (although no need to be any greater than 2m deep) should be provided to ensure the pond remains wet throughout the year, and adds diversity to the pond, providing a variety of niches. Shallower areas (c.20-25cm deep) to the north and west edges of the pond should also be provided (British Dragonfly Society (BDS), 2010); • a variety of vegetation to be provided in the pond, including submerged, emergent and marginal vegetation, with large areas of open water, is needed. Suitable species for consideration are provided in BDS guidance (BDS, 2010); • the pond should be designed to be predominantly unshaded by bankside vegetation, but sheltered from wind. Trees/hedges to be provided to the north/west of the pond to achieve this specification. Overhanging trees should be avoided, however, as they can shade the ponds and drop leaf litter which can impact the habitat for damselflies and dragonflies; • landscape planting around the pond to involve the establishment of wet grassland (species-rich and adapted to wet conditions) to encourage invertebrates and thus potential prey species for dragonflies and damselflies species; and • sediment from the pond habitat to be lost will be translocated to the receptor pond to allow for natural regeneration of species populations. This will be undertaken prior to construction and will be undertaken following guidance from relevant conservation bodies (Mitigation Item P03-E72). <p>Furthermore, the provision of SuDS ponds/basins provides potential habitat for this species. The locations of SuDS ponds/basins and the mitigation pond can be seen on Figure 13.5.</p>	No significant residual impacts predicted.
INNS (n/a)	Construction impacts only.				n/a	n/a

12.7 Statement of Significance

- 12.7.1 There are no residual impacts during the construction phase of the proposed scheme, with the proposed mitigation in place. The micro-siting of outfalls away from ecologically sensitive areas, the design of a bank stabilisation solution outwith the River Tay SAC and the incorporation of robust silt and pollution controls ensures that there will be no significant residual impacts on the internationally important River Tay SAC or the critically endangered FWPM.
- 12.7.2 There are no residual impacts, with proposed mitigation in place, which are considered to be significant for the River Tay SAC. During the bank stabilisation works a construction drainage system will be used to prevent run-off entering the River Tay and a biodegradable polymer support fluid in a re-circulating system will be used to minimise any environmental impacts. Furthermore, during operation road surface run-off will be subject to treatment via SuDS ponds/basins, swales and geocellular storage, preventing any impacts on water quality on the River Tay SAC. In addition, outfall headwalls have been located in morphologically stable reaches where erosion and depositional process is considered to be minimal. This limits any impact these structures will have on natural processes of the River Tay during the operational phase of the proposed scheme. Furthermore, the permanent loss of a total of 0.21ha of terrestrial and aquatic habitat within the River Tay SAC accounts for less than 0.01% of the area of the SAC, and as it is it is not functionally important results in a *de minimis* effect.
- 12.7.3 During operation, the proposed scheme will result in a significant adverse residual impact from the loss of 10.16ha of habitat designated as AWI, of which 6.35ha is currently wooded. Measures such as compensation planting of native species in candidate sites (Figure 13.5) will be implemented to minimise the extent of the resulting significant residual impact (Table 12.11a, b). The AWI candidate planting sites will be prepared with appropriately stored soil from areas to be lost to help maintain the fungal and invertebrate biodiversity and seedbank.
- 12.7.4 This planting will not fully mitigate for the permanent loss of intrinsic biodiversity value of ancient woodland 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.
- 12.7.5 Areas of woodland retention for the provision of mammal boxes (as shown on Figure 13.5) will mitigate for the loss of woodland habitat supporting protected species including red squirrel and bats. These woodland areas will also provide connectivity with existing woodland and compensatory planting to reduce habitat fragmentation along the proposed scheme.
- 12.7.6 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 (including culverts and underpasses) at appropriate locations as shown on Figure 13.5. Although the increased barrier effect of a widened carriageway is likely to counteract some of the benefits of this increased permeability, there is anticipated to be a reduction in WVI due to the provision of safe crossings and fencing. Post-construction monitoring to determine the effectiveness of the mitigation will be undertaken. The mitigation monitoring approach will be developed in cognisance of the SNH commissioned report: Developing a mitigation monitoring approach for the A9 and A96 dualling projects (Macdonald-Smart,2017). It is predicted that vehicle collision risks for wildlife will be reduced. Survey results (see Appendix A12.3: Confidential Ecology Features) indicate that the current A9 is a significant barrier to badger; therefore, there is arguably greater scope for increased permeability benefits for this species above others.
- 12.7.7 Provision of ponds/basins (SuDS ponds/basins and Ecological/Compensatory Flood Storage Pond) within the proposed scheme is also considered to deliver positive residual impacts, by creating a series of wetland habitats along the A9, with suitable habitats for a variety of fauna, including northern damselfly.

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