

9 Ecology and Nature Conservation

9.1 Introduction

This Chapter describes and evaluates the impacts of the A82 Pulpit Rock Road Improvement Scheme (“the scheme”) on ecological receptors. Direct impacts on ecological receptors resulting from activities that are an integral part of the project will be considered in this ecological impact assessment. In addition, the indirect and cumulative effects are examined. The duration of the impact (e.g. permanent or temporary and short, medium or long-term), and sensitivity of receptor are taken into account. The legislative requirements associated with the presence of particular features are also described, as are recommendations for mitigation measures to minimise negative impacts. This chapter should be read in conjunction with Chapter 6 – Landscape and Visual Assessment, and Chapter 11 – Road Drainage and the Water Environment as some elements of mitigation are integrated within each chapter.

9.1.1 Definition of Study Area

The study area for land-based ecological field surveys is defined as the road corridor for 300 m north and south of Pulpit Rock and either side of the road for 300 m inland of the Loch down to the Loch shore and littoral zone. For fisheries surveys of Loch Lomond, the study area extends 1 km north and 500 m south of the scheme including the open water out to 250 m offshore.

For desk study archive protected site and species data was collated for a wider area extending to a minimum 5 km radius of Pulpit Rock.

9.1.2 Contextual Background to Ecological Impact Assessment (EclA)

There is no single universally agreed method for ecological impact assessment, although certain general principles and approaches appear to be widely accepted. The method used for this study provides a systematic and transparent assessment of the significance of impacts upon ecological receptors.

It is based upon current best practice outlined in legislation and planning policy and with cognisance of environmental legislation relevant to Scotland. The Assessment was undertaken in accordance with the requirements of the Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment (Highways Agency; June 1993, as amended) and relevant supplementary guidance. Guidance for environmental mitigation is provided in DMRB Volume 10: Environmental Design and Management (Highways Agency; February 2001).

In addition, the Institute of Ecology and Environmental Management (IEEM) (2006) Guidelines for Ecological Impact Assessment in the United Kingdom (“the IEEM Guidelines”) have been used to inform the assessment process.

9.1.3 Legislation, Planning Policy and Guidance

The methodology for the ecology chapter of the Environmental Statement takes account of The Environmental Impact Assessment (Scotland) Regulations, 1999, as

amended, and adheres to the requirements and advice in the following legislation, planning policy and guidance:

9.1.3.1 Legislation

- EC Habitats Directive (92/43/EEC);
- EC Birds Directive (79/409/EEC);
- EC Freshwater for Fish Directive (2006/44/EC);
- EC Water Framework Directive (2000/60/EC);
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended);
- Environmental Impact Assessment (Scotland) Regulations 1999;
- Wildlife and Countryside Act (WCA) 1981 (as amended);
- The Surface Waters (Fishlife) (Classification) (Scotland) Amendment Regulations 2007;
- Nature Conservation (Scotland) Act 2004.

9.1.3.2 Planning Policy & Management Plans

- Scottish Planning Policy: Landscape & Natural Heritage
- LLTNP Plan 2007-2012
- LLTNPA Finalised Local Plan (February 2010)
- Loch Lomond Catchment Management Plan: Action Plan 2003
- UK Biodiversity Action Plan (UKBAP)
- Scottish Biodiversity Strategy (SBS)
- Scottish Biodiversity List (SBL)
- Argyll and Bute Local Biodiversity Action Plan (A&BLBAP)
- Stirling Local Biodiversity Action Plan (SLBAP)
- Loch Lomond, The Trossachs and Breadalbane Natural Heritage Futures
- Loch Lomond and The Trossachs Local Forestry Framework

9.1.3.3 Ecological Guidance

- IEEM Guidelines for ecological impact assessment in the UK 2006;
- BCT Bat survey guidelines 2007
- SNH Otter and development
- SNH Badger and development

9.1.4 Consultation

Statutory and non-statutory consultees were contacted at various stages of scheme development. The Scoping Report outlining the main environmental considerations was issued to statutory consultees in January 2010, and non-statutory consultees were issued a consultation letter at the same time. The purpose of the consultations was to:

- Identify any relevant information that they held, including the presence of protected sites, e.g. Local Nature Reserves (LNR) or protected species, e.g. otter holts;
- Identify any concerns that consultees may have about the proposed road scheme; and
- Identify any issues that the consultees would like to see addressed during the environmental impact assessment process.

Organisations or individuals consulted in relation to ecology and nature conservation, together with their responses are listed in Table 9.1.

In each case only the responses relevant to the Ecology of the scheme have been reproduced.

Table 9.1 - Consultation Responses

Consultee	Date Received	Summary of main comments
Statutory Consultees		
Scottish Natural Heritage (SNH)	25/02/2010	Welcomed that the scoping report content covered topics that were addressed through the Stage 2 Assessment consultation. A summary of this response was provided: Designated Sites – Confirmed that no designated sites lay within the immediate vicinity of the proposals, however, do highlight the scheme lies within the National Park and National Scenic Area. Protected Species – Requested adequate ecological surveys are carried out to confirm/deny presence of protected species. European Protected Species – Likely to be relevant within the study area include bats and otters. Advised that comprehensive surveys for bat roost sites and otter holts be undertaken and mitigation measures be identified. Fish – species including Atlantic Salmon and Lamprey are an interest feature of the nearby Endrick Water SSSI and SAC. Furthermore, several other fish species are present in the loch. SNH advised that a full fisheries study be conducted and mitigation measures be identified.
Scottish Environmental Protection Agency (SEPA)	24/02/2010	Construction phase – environmental impact can be minimised by best practice

Consultee	Date Received	Summary of main comments
		and implementing mitigation measures particularly in relation to works in and around Loch Lomond. The EIA should refer to PPG notes and a construction method statement should be produced with reference to monitoring proposals. CAR Authorisation should be sought prior to all works either in or adjacent to a water body. Surface Water Drainage – reference to the SUDS manual should be made and any discharge should be in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2005 (as amended). Seek to clarify culverting options and request that reference be made to the SEPA Regulatory Method RM08. Request information regarding the 'combined kerbina' on the bridge deck. Flood Risk – Proposed development site lies within the 1 in 200 year flood envelope of the Indicative River and Coastal Flood Map and may be at a medium to high risk of flooding. Does not take into consideration flooding arising from surface runoff, surcharged culverts or drainage systems.
Loch Lomond and the Trossachs National Park Authority (LLTNPA)		Advised assessment of impacts on mature and veteran trees, Loch Lomond Woods SAC, native and protected species, including lower plants, bat roosts, otter, nesting birds and invasive species.
Loch Lomond Fisheries Trust (LLFT)		Advised on fisheries issues including powan, salmon and lamprey, and undertook fish surveys on behalf of Scott Wilson.
Non statutory consultees		
Scottish Badgers	01/02/2010	Advise that a badger survey is carried out to confirm the absence of badgers from the target area. If they are present then a mitigation plan should be drawn up to reduce the impacts on badger populations.
Deer Commission for Scotland	11/02/2010	The Deer Commission for Scotland does not feel that this proposal is of sufficient magnitude to require further consideration.
British Trust for Ornithology (BTO)	01/02/2010	Not able to comment on the development proposals as they are sent unsolicited.

9.2 Desk Study

Sites can be designated under International, European Union and National legislation – referred to as statutory sites. Sites of local importance for nature conservation or that do not have statutory protection are classified as non-statutory sites. Identifying these sites at an early stage is an important part of characterising

the Ecological Baseline, as in some cases such sites can pose significant constraints to development. Information on statutory and non-statutory sites of importance for nature conservation was obtained through consultations with SNH, and using web-based databases such as the SNH 'sitelink' website (www.snh.org.uk), Joint Nature Conservation Committee (JNCC) website (www.jncc.org.uk) and the Forestry Commission (FC) website (www.forestry.gov.uk).

In addition to the Information provided directly by consultees, or contained within on-line databases (e.g. the National Biodiversity Network Gateway <http://data.nbn.org.uk/>), further desk-based information on habitats and species of was obtained from data providers (also listed in Table 9.1).

9.3 Field Surveys

The scope of the fieldwork was informed by desk-based research, consultations with statutory and non-statutory consultees, an initial site walkover at the start of the project, and the timescale of the study.

Initial scoping consultation was carried out with SNH, to determine the scope of the ecological survey requirements and to highlight the pertinent issues of this scheme. A response from SNH (Darren Hemsley, Area Officer) was received on the 5 March 2007, which advised that survey and assessment should be undertaken for bats, otter, fish, other protected mammals and birds.

A hand-held Global Positioning System (GPS) was used throughout the field survey work, to assist in the accuracy of the mapping, target note location, and all further observations.

9.3.1 Extended Phase 1 Habitat Survey

The 'extended' Phase 1 Habitat Survey was conducted in June 2007 using the standard methodology (JNCC 2004).

The aim of the survey was to identify the type, quality and extent of habitats present within an area, and to identify any habitats or features that might require more detailed field investigations. Notes were also made of invasive species that are listed under Schedule 9 of the Wildlife and Countryside Act (1981), as amended. It is an offence to cause the spread of invasive species listed on this schedule such as Japanese knotweed *Fallopia japonica* and giant hogweed *Heracleum mantegazzianum*.

'Extended' Phase 1 Habitat Survey provides a rapid assessment of the types and quality of habitat present. Whilst it is focussed upon categorisation of parcels of land based on their vegetation, the potential of the habitats on site to support protected flora and fauna is also considered. Areas of land are assigned to broad habitat categories (e.g. semi-improved grassland, running water), and marked on a map using either standard alphanumeric codes or mapping colour codes. Target notes are used to provide additional description of features of particular ecological interest or value (e.g. field signs of protected species, badger setts, trees or structures that could harbour protected species, notable plants, etc). Phase 1 habitat survey is not to be regarded as a definitive representation of the ecological value or interest of any

area of land. In addition, it must be noted that plant lists produced from one field survey may not record all species that may occur on a site depending on the time of year that the survey was undertaken.

9.3.2 National Vegetation Classification (NVC)

Following the 'extended' Phase 1 Habitat Survey it was apparent that some habitats within the development footprint were of botanical interest and required further investigation. An NVC survey was conducted to more fully assess the plant species and plant communities present.

The survey area comprised a narrow strip of woodland on north-northeast facing slopes extending from Ordnance Survey Grid Reference NS324138 south-eastwards to NS329131. The survey area was c.750m long (NW-SE) and varied in width from c.40m up to c.200m. The north-westernmost part was grazed by sheep and the whole site was accessible to deer. Parts of the central survey area were extremely steep and were evidently ungrazed.

The vegetation was classified according to the National Vegetation Classification (NVC) system (Rodwell 1991a, 1991b, 1992, 1995, 2000) to sub-community level wherever possible. The vegetation was mapped onto a 1:5,000 scale base-map. Mapped vegetation units were labelled with their NVC codes and an estimated percentage cover value for each code was made.

9.3.3 Lower Plants

During the NVC survey, a list of bryophyte species was made and the approximate extent of each species was recorded using four categories: rare, occasional, frequent and abundant. The habitats in which each species was found together with the locations of uncommon species of particular interest was mapped and recorded and target noted.

9.3.4 Aquatic Macrophytes

A visual assessment of loch shoreline and littoral zone within the footprint of the scheme, including the substrates and aquatic macrophyte plants was conducted on 4 September 2007. The survey methodology was based on standard methodology (Environment Agency 1997). The survey sampling units along the Loch shore are provided in Appendix 4B.

9.3.5 Bats

Bat (Chiroptera) surveys were conducted in September 2007 and in June and October 2009. The bat survey comprised three main methods, these being assessment of potential roost sites, emergence survey of identified roost sites with high potential to support bat roosts and bat activity survey.

Tree Roost Assessment

All trees within and immediately adjacent to the development footprint were inspected for features that could harbour roosting bats such as cracks and fissures, woodpecker holes, splits, loose bark, dense ivy and rot holes. The surveyors used

10x binoculars and a 1 million candlepower Clulite lamp to illuminate features on shaded trees. Trees were assessed from ground level and classified as having low, medium or high bat roost potential, in accordance with Bat Conservation Trust (BCT) guidelines (BCT 2007).

In addition, rock faces and a natural 'cave' system situated on the Loch shore below Pulpit Rock, was also inspected for signs of roosting bats. Due to health and safety constraints (confined spaces) this cave system could only be inspected from the entrance by torchlight.

Signs of roosting bats may be indicated by:

- Staining around a feature (e.g. cracks) caused by natural oils in a bats fur;
- Scratch marks around a feature, caused by bat claws;
- Bat droppings beneath a hole;
- Urine stains below the entrance to a hole;
- Audible squeaking from a cavity;
- Large roosts or regularly used sites may produce an odour which may also attract flies that can be a sign of a well used bat roost.

Roost & Activity Surveys

Initial bat roost emergence surveys were undertaken on 4 September 2007. The surveys focused on identified potential roost sites occurring within the scheme footprint, whilst activity surveys concentrated on foraging areas and commuting routes.

Bats can use many roost sites during the year and some bats may change roosts on a daily basis depending upon factors such as weather and time of year. As such the success rate for bat emergence surveys is low.

As a means of recording such phenomenon, the walked transect survey was timed to coincide with any bat emergence and re-entry periods. The emergence time varies between bat species and the visits were timed in order to cover emergence period of all species and first return to roost site, i.e. 30mins before dusk and up to an hour after dusk.

BatBox III heterodyne and BatBox Duet frequency division bat detectors (Stag Electronics, Steyning) were employed during the walked transect surveys.

Further surveys were carried out in June and October 2009, during the June surveys an Anabat SD1 frequency division bat detector (Titley Electronics, Australia) was remotely placed at two locations (on the Loch shore by the entrance to the cave system and in the woodland between the A82 road and the Loch). Where doubt existed over the identification of bats in the field their recorded calls were later subject to sonogram analysis on PC using AnaLook software.

9.3.6 Red squirrel

While there is little suitable habitat in the study area, survey for field signs of red squirrel *Sciurus vulgaris* was conducted in areas of woodland while undertaking the Phase 1 Habitat Survey and subsequent protected species surveys.

Survey methodology was based on guidance by Gurnell (2001). The only definitive methods of positively identifying red squirrels are through visual surveys and hair tube surveys. Red squirrel is active during the daytime and it is possible to make direct sightings, as well as looking for their nests (dreys). Trees were searched for dreys from ground level. It is not possible to distinguish dreys of grey squirrels from red squirrels without additional supplementary evidence. The presence of red squirrel can also be detected by the presence of feeding remains at the base of trees such as cone 'cores', split hazel nut shells, shells of acorns or sweet chestnuts, or the wings of ash and maple fruits. Feeding remains can sometimes be found in small heaps at prominent feeding points such as a stump or a log.

9.3.7 Water vole

Water vole *Arvicola amphibius* survey was undertaken on 7 June 2007 and comprised a detailed search for field signs as outlined in Strachan (2006), in particular mapping of the following;

- Faeces: 8-12 mm long and 4-5mm wide, cylindrical with blunt ends. They are odourless, of distinct consistency and often green in colour, although this can vary;
- Latrines: Droppings are often deposited at latrine sites as territory markers or at favoured feeding locations. Latrines may consist of a flattened mass of old droppings with a fresh top, although heavy rainfall or high water levels often result in these being washed away. Latrines are typically maintained between February and November;
- Feeding stations: Lengths of vegetation are often taken to favoured feeding platforms at the water's edge, where the distinct remains are left in neat piles;
- Burrows: Typically wider than they are high, with a diameter of 4-8cm. Burrow entrances may occur above or below the water line;
- Lawns: grazed 'lawns' are often found around land holes when the female is nursing young;
- Nests: May be found where vegetation is dense, often woven into the base of rushes, sedges or reeds;
- Footprints: Often found in the soft muddy margins at the water's edge;
- Runways: Low tunnels pushed through vegetation often leading to and from the water's edge or favoured feeding areas.

The presence or absence of mink *Mustela vison* field signs were also recorded, noting the relative abundance of footprints and droppings along the watercourse.

9.3.8 Pine marten

The scheme lies within the known distribution of pine marten *Martes martes* (Balharry *et al.* 1996). The survey techniques followed Balharry *et al.* (1996) and comprised mainly of looking for pine marten scats. Survey was ongoing during the period June 2007 and October 2009, usually whilst conducting other ecological surveys.

9.3.9 Badger

The aim of the badger survey was to search for badger setts and other field signs and assess the status of badger on site. Badger survey was undertaken in June 2007, with follow up checks during subsequent ecological field surveys in 2009. The survey methodology followed Harris, Cresswell & Jefferies (1989) with field data recorded onto a standard proforma.

9.3.10 Otter

Otter *Lutra lutra* survey was ongoing with discrete tranches of survey conducted on 19 April 2007, 7 May 2008, 7 June 2008, 4 June 2009 and 6 and 7 October 2009. Several surveys were undertaken as the habitat within the development footprint was deemed as having high potential to support otter holts and to inform scheme options assessment and ground investigation works. The survey involved recording details of riparian habitat type, suitability and quality, and searching for the following otter field signs (SNH, 1997):

- Spraints;
- Food remains;
- Rolling places;
- Slides down river banks;
- Footprints or paths; and
- Shelters (either holts or couches).

9.3.11 Wildcat

The scheme lies within the known distribution of wild cat *Felis sylvestris* (Easterbee *et al.* 1991). The survey techniques followed Easterbee *et al.* (1991) and comprised of a search for scats (faeces). Survey was ongoing during survey sessions for other protected fauna in June and September 2007, and June and October 2009.

9.3.12 Breeding birds

The Common Birds Census methodology (Marchant 1983) was modified for the survey of the proposed scheme with three survey sessions being undertaken between the 19 April and 1 & 29 June 2007.

A supplementary survey for breeding shorebirds on Loch Lomond shore (common sandpiper or oystercatcher) was conducted in combination with otter survey in June 2009.

Surveys were conducted between 07.00 and 12.00 hours. The survey transect followed the centre of the route of the proposed alignment for a 600 m distance and covered the area between the loch shore and to 100m west of the scheme. Whilst walking the survey transect, the surveyor paused at regular intervals to scan with the aid of 10x binoculars and listen for calling or singing birds.

To minimise the risk of double counting birds, bird behaviour and locations of birds were carefully recorded. Surveys were not conducted in winds below Beaufort Force 5 and avoided periods of persistent rain or poor visibility.

The location and activities of all bird species during each visit were recorded on 1:10,000 maps using standard BTO two-letter species codes and behaviour recording codes (Marchant, 1983). Subsequent map analysis was carried out to produce list of species present and where possible to estimate the number of breeding territories for each species.

Birds were assumed to be breeding if they showed the following behaviour:

- Displaying or singing;
- Territorial dispute;
- Occupied nests;
- Repeated alarm calling or distraction displays;
- Adult(s) carrying food;
- Adults carrying nest material; and
- Newly fledged young with adult(s).

9.3.13 Fish and fisheries

Following initial walkover surveys and consultation with SNH and the Loch Lomond Fisheries Trust (LLFT) it was decided that adequate data on high conservation value fisheries should be collected to determine the locations of habitats important to Atlantic Salmon *Salmo salar*, lamprey *Lampetra* spp. and powan *Coregonis lavaretus*.

The initial fish presence/absence survey was conducted between April and June 2008. A follow up survey was conducted on 17-18 January 2010 in areas of the Loch where powan had been recorded, to assess if these areas were important spawning grounds, including habitat within the construction footprint of the scheme.

Detailed reports of both fish surveys including methodology employed is provided in the fish survey reports in Appendix 4E (including Figure 7) and Appendix 4F to this chapter.

9.3.14 Species scoped out of assessment

9.3.14.1 Amphibians

Aside from the Loch, there is no standing water within the survey area. The section of Loch shoreline adjacent to the scheme is steeply shelving, with little or no

possibility of amphibian access/exit routes. There are many species of fish that would eat the amphibian larvae also, rendering the Loch an unsuitable amphibian habitat. A check of the NBN Gateway website yielded one record of great crested newt c.2km to the south of the scheme on the opposite shore of the Loch.

9.3.14.2 Reptiles

There was little suitable habitat for reptiles within the scheme footprint, being mostly dense woodland and cool, shady habitat with very few potential basking sites. A check of the NBN Gateway website yielded one record of common lizard c.2km to the south of the scheme boundary on the opposite shore of the Loch.

9.3.14.3 Invertebrates

Based on the extended Phase 1 habitat survey, a habitat quality assessment, desk study and consultation it was determined that specialist invertebrate surveys were not required. The habitats on site were not suitable for any of the UK BAP priority species known to occur in Loch Lomond and the Trossachs National Park.

9.4 Assessment Methodology

To determine the significance of the proposed development, it is necessary to define a robust assessment methodology. The method used is based upon various protocols for the assessment of significance. The criteria draw on the IEEM guidelines for ecological impact assessment (IEEM, 2006) and also incorporate good practice from other published documents.

The assessment process is summarised below:

- **Baseline Ecology:** Those habitats and species that might be affected by these elements either directly or indirectly are considered and existing conditions are defined. The existing conditions are known as the baseline;
- **Value:** The importance of nature conservation resources present is evaluated to place their relative biodiversity value, social/community value and economic value into a geographic context from “international” to “zone of influence” levels - as advised by IEEM (2006);
- **Impacts:** Likely impacts arising from the development and the effects (beneficial or negative) of these on species and their habitats are predicted, and where possible quantified. The geographic level at which these effects are considered to be significant is determined (i.e. “international” to “zone of influence”). The significance of the effects of developments was until recently determined using a standard matrix approach, however, IEEM (2006) now suggest ecological experience and professional judgement should be integral part of the assessment process and impacts are described simply as “significant” or “not significant” at certain geographical levels, e.g. “significant at a local level” etc.
- **Avoidance, Mitigation, Compensation:** Measures to avoid or reduce any significant effects, if possible, are then developed in conjunction with other elements of the design and mitigation for other environmental disciplines. If

necessary, measures to compensate for impacts to features of nature conservation importance are also included;

- Residual Impacts: Any remaining (residual) impacts of the development are reported;
- Enhancement: Whether there is scope for enhancement is also considered, even if there are no significant negative impacts. Opportunities to benefit nature conservation interests exist without incurring excessive costs on the development are then proposed; and
- Monitoring: The requirements for post - construction monitoring is considered and proposed where deemed appropriate, e.g. to monitor the success of mitigation proposals.

This assessment approach is fully described below.

9.4.1 Assessing the value of ecological receptors

An ecological receptor is defined as a site, habitat or species of nature conservation value. Each site or area may have more than one receptor of value that it supports (for example different habitats or populations of species). The IEEM guidance assesses value in terms of biodiversity, social, community or economic value including the benefits that such receptors provide to people or society in general, and includes elements such as their contribution to biodiversity. Legal protection is considered separately from value. The values of features are described within a geographical frame of reference (e.g. the feature is of importance at an international level). To attain each level of value and / or importance, an ecological resource or one of the features should meet the criteria set out in Table 9.2 below. In some cases, professional judgement may be required to increase or decrease the allocation of specific value. This judgement is based on consideration of the following additional criteria:

- Population trends;
- Sustainability of resource;
- Representativeness;
- Potential for substitution/re-creation;
- Position in the ecological unit;
- Biodiversity; and/or
- Intrinsic value to stakeholders.

The protection of a particular receptor through national or international legislation is not taken into account when assessing ecological value. For example, badger is protected by national legislation for reasons of animal welfare, but its status on site in relation to its status in the local area or region is what is assessed thus if it is common and widespread it may be of only local or regional nature conservation value.

Likewise, certain habitats may be important within a regional context, and may have been identified for priority action within the LBAP if this has been prepared for an

area, but are not considered to be of national conservation importance. However, the evaluation should be based upon the amount and quality of that habitat type present on the site itself, rather than its presence per se. This ensures that small areas of poor-quality habitat are not over-valued.

Areas considered to be of national value for nature conservation are designated under statute as Sites of Special Scientific Interest (SSSI). There are also international designations including Biosphere Reserves, Ramsar sites, Special Areas of Conservation (SAC) and Special Protection Areas (SPA). Wildlife areas of importance at the local level can be designated statutory Local Nature Reserves (LNR) or non-statutory Sites of Local Nature Conservation Interest (SLNCIs) or more often County Wildlife Sites (CWS).

The criteria used to describe the value of ecological receptors for this study are set out in Table 9.2 and are based upon criteria identified in the IEEM guidance. To attain each level of value / sensitivity, an ecological receptor must meet the criteria in at least one of the areas set out in Table 9.2, although as mentioned previously, in some cases, professional judgement may be required to increase or decrease the allocation of specific value.

Table 9.2 - Value of Receptors (IEEM, 2006)

Nature Conservation Value	Examples of Selection Criteria
International (EU or other)	<ul style="list-style-type: none"> • A site designated, or identified for designation at the international level e.g. World Heritage Sites, Special Protection Area (SPA), Special Area of Conservation (SAC), and / or Ramsar site. Proposed or candidate sites are also given the same consideration as designated sites. • A sustainable area of any habitat listed in Annex I of the Habitats Directive or smaller areas of such habitat that is essential to maintain the viability of a larger whole. • Any regularly occurring population of an internationally important species e.g. UK Red Data Book species, which is listed as occurring in 15 or fewer 10 km squares in the UK, and that is identified as of unfavourable conservation status in Europe or global conservation concern in the UK BAP
UK (England, Wales, Scotland, Northern Ireland)	<ul style="list-style-type: none"> • A site protected by national designations e.g. Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), or Marine Protected Area or a site considered worthy of this designation. • A sustainable area of any priority habitat identified in the UK BAP, or smaller areas of such habitat that is essential to maintain the viability of a larger whole. • A feature identified as of critical importance in the UK BAP. • Sustainable population of a nationally important species (species listed on Schedules 1, 5 and 8 of The Wildlife & Countryside Act 1981 as amended), which is threatened or rare in the county. • Any regularly occurring population of a nationally important species that is threatened or rare in that region of the Country, and for which the LBAP identifies the need to protect all remaining sites.
National	<ul style="list-style-type: none"> • Sustainable areas of key habitat identified in the Scottish

Nature Conservation Value	Examples of Selection Criteria
(Scotland)	<p>BAP or smaller areas of such habitat that is essential to maintain the viability of a larger area.</p> <ul style="list-style-type: none"> • Non-statutory sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves. • Some non-statutory designated sites (Ancient Woodland, TPOs). • Any regularly occurring, locally important population of a species listed in a Regional Red Data Book or LBAP on account of its regional rarity or localisation.
County/District/Heritage Future (County Argyll & Bute Local Authority area/LLT & Breadalbane)	<ul style="list-style-type: none"> • Some designated sites (e.g. Local Nature Reserves). • Some non-statutory designated sites (including SLNCI/CWS). • A viable area of a habitat identified in a county BAP. • Sustainable populations of species that is rare or scarce within a county, or listed in a county BAP. • A viable area of a habitat that is uncommon in the county/district or a degraded example of a habitat identify in a county BAP. • Sites or populations that appreciably enrich the county/district habitat resource.
Local or Parish (within 5km radius of scheme)	<ul style="list-style-type: none"> • Area of internationally or nationally important habitats, which are degraded and have little potential for restoration. • Areas within the site or locally, or populations, that appreciably enrich the habitat resource within the locality, e.g. species-rich hedgerow.
Within the zone of influence (Construction footprint and immediate environs)	<ul style="list-style-type: none"> • Common and widespread species. • Areas of heavily managed or modified vegetation of low intrinsic interest and low value to species of nature conservation interest, that do not appreciably enrich the site or locally.

9.4.2 Assessing the magnitude of impacts

Identification of potential impacts of the development has been based on a variety of approaches. The primary source of information has been the review of similar projects and professional experience of the assessment team. The method for assessing the effects follows the Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2006).

Table 9.3 - Magnitude of impacts

Magnitude of Impact	Description
Severe	Total or major loss or major alteration to key elements/features of the baseline (pre-development) conditions such that the post development character/composition/attributes would be fundamentally changed and may be lost from the site altogether. Guide: 20-80% of population/habitat lost
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/ composition/ attributes would be partially changed. Guide: 5-20 % of population/habitat lost
Slight	Minor shift away from baseline conditions. Change arising from the loss/alteration would be discernible but the underlying character/

	composition/ attributes would be similar to pre-development circumstances/patterns. Guide: 1-5 % of population/habitat lost
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the “no change” situation. Guide: < 1% population/habitat lost

The effect of potential impacts depends upon:

- Magnitude: ‘size’ or ‘amount’ of impact, determined on a quantitative basis where possible, e.g. the numbers of a species that are influenced;
- Extent: The area over which the impact occurs;
- Duration: The time over which the impact is expected to last prior to recovery or replacement of the resource or feature;
- Reversibility: whether recovery is possible within a reasonable timescale; and
- Timing and Frequency: Whether impacts coincide with critical life changes or seasons (e.g. breeding bird season) and how frequent the impacts are likely to be.

These factors are further detailed within Table 9.4 below:

Table 9.4 - Other factors that determine effect of impact (IEEM, 2006)

Environmental Parameter	description
Magnitude	The ‘size’ or ‘amount’ of an impact is referred to as the magnitude of the impact, and is determined on a quantitative basis where possible (Table 9.3).
Extent	The extent of an impact is the area over which the impact occurs. Habitats could be considered to be an area, therefore the magnitude and extent of an impact may be synonymous.
Duration	The duration of an impact is the time over which an impact is expected to last prior to recovery or replacement of the resource or feature. This is considered in terms of life cycles of species and regeneration times of habitats. The duration of an impact may be longer than the duration of an activity. For example, construction activity may cause disturbance over 2 years but the impact from that disturbance may continue for 5 years.
Reversible	<p>Reversible (or temporary) impacts are those from which a spontaneous recovery is possible, or for which effective mitigation is possible. Reversible impacts will arise during the construction phase of the development.</p> <p>Irreversible (or permanent) impacts are those from which recovery is not possible within a reasonable timescale, or for which there is no reasonable chance of action being taken to reverse it. The effects of permanent land-take may lead to irreversible fragmentation of habitats. Some indirect effects may also be irreversible or of an unspecified duration (e.g. the effect of noise pollution on breeding and roosting birds).</p>
Timing and Frequency	<p>Some activities or changes may only cause an impact if they coincide with critical life stages or seasons, and therefore timing of the activity or change is important in assessing the impact. Such impacts may be avoided through careful timing of works.</p> <p>The frequency of an activity will influence the resulting impact.</p>

Impacts on the ecology and nature conservation, and its social and economic values relating to the site can be divided into two main types: negative and positive. Negative and positive impacts can be further sub-divided into those impacts that are direct and those that are indirect.

9.4.3 Cumulative Impacts

Impacts acting in combination may have a cumulative impact that is greater than when the same impacts act in isolation. Cumulative impacts may entail the assessment of all the impacts of the scheme upon a feature (e.g. impacts at the construction and operation stage), or the combined impacts of a number of development schemes in the nearby area. Cumulative and in combination impacts are assessed in Chapter 13 – Cumulative Impact Assessment.

9.4.4 Assessing significance

The magnitude of the impact combined with the sensitivity or ecological value of a receptor is used in this assessment as a guide to assess the level of significance, see Table 9.5 below. Although used here, this approach is considered as rather subjective because it relies on an intuitive understanding of the terms and is therefore open to individual interpretation. This type of matrix also tends to place negative impacts on a feature of local value into a 'slight or low' significance category. This can downplay local values for biodiversity. However, every effort has been made to check for special provisions for protecting local biodiversity within local plans. In this chapter assessment of significance places any impact significance equating to 'negligible' as not significant.

Table 9.5 - Significance of Environmental Effect Matrix

MAGNITUDE OF IMPACT	SENSITIVITY / NATURE CONSERVATION VALUE				
	International / UK	National	Regional / County	Local / Parish	Zone of Influence
	Very High	High	Medium	Low	Negligible
SEVERE	Substantial	Substantial	Moderate	Minor	Negligible
MODERATE	Moderate	Moderate	Minor	Minor	Negligible
SLIGHT	Moderate	Minor	Minor	Negligible	Negligible
NEGLIGIBLE	Negligible	Negligible	Negligible	Negligible	Negligible

The significance of the impact on the ecological integrity of the receptor or resource depends upon all of these factors. The accepted definition of integrity is 'the coherence of its ecological structure and function, across its whole area, that enables it to sustain that habitat, complex of habitats and/or the levels of populations of the species for which it was classified' (Scottish Executive, 2000).

The effect on ecological integrity of the receptor or resource is either deemed to be significant or not significant. The terms 'significant' and 'not significant' are used as described in Table 9.6. Initially, consideration of the impact on ecological integrity does not take account of any recommendations for mitigation that might subsequently be described. Residual impacts and significance takes these mitigation measures into consideration.

Table 9.6 - Description of the terms “significant” and “non-significant”

SCALE OF IMPACT	DESCRIPTION
Significant	The impact is significant if it is assessed to be large in scale or amount, irreversible, have a long-term effect, or coincide with critical life stages. In addition, a combination of any of these parameters will also be assessed as significant.
Not significant	The impact is not significant if it is assessed to be small in scale or amount, reversible within a reasonable timescale and does not coincide with critical life stages.

9.4.5 Confidence in assessment

It is valuable to attribute a level of confidence to the accuracy of a predicted impact. Four levels are used for the purposes of this study, as outlined in IEEM EclA guidelines (2006):

- Certain / near-certain: probability estimated at 95% chance or higher;
- Probable: probability estimated above 50% but below 95%;
- Unlikely: probability estimated at less than 50%; and
- Extremely unlikely: probability estimated at less than 5%.

Certain / near-certain confidence is assigned where the anticipated impact is very likely to occur, based on reliable information (e.g. formal surveys undertaken to a standard methodology) or previous experience. Unlikely level of confidence is assigned where the predicted impact and its level are best estimates, generally derived from first principles of ecological theory and the experience of the assessor. This category has also been used where there is limited information about species occurrence. The reason for including a confidence category of ‘extremely unlikely’ is that though some effects may be very improbable, they would have very serious implications should they occur.

Unless otherwise stated, all impacts are given at certain / near-certain confidence level.

9.5 Baseline Conditions

The baseline conditions have been determined through a desk study and the results of the field surveys, and are presented below.

9.5.1 Statutory Designated Sites

Statutory designated sites within and adjacent to the Scheme are shown in Figure 2.1 Environmental Constraints.

9.5.1.1 International Designations

Loch Lomond Woods Special Area of Conservation (SAC) is located on the opposite shore of Loch Lomond and is designated for Broad-Leaved, mixed and yew woodland and also for the presence of Otters.

9.5.1.2 National Designations

Pollochro Woods Site of Special Scientific Interest (SSSI) is also located on the opposite shore of Loch Lomond on steep westerly facing slopes. It is an extensive area of semi-natural woodland, most of which is classified as ancient.

Ben Vorlich SSSI is located within 1km to the west of the A82 at its nearest point. It is of biological interest regarding its upland habitat, being the highest hill in the District of Argyll & Bute.

9.5.2 Non-Statutory Designated Sites

There are two areas of woodland classified as ancient semi-natural woodland on the SNH Ancient Woodland Inventory (AWI), both of which are more than 400 m from the scheme boundary at their nearest points, one site being on the opposite shore of the Loch.

9.5.3 Phase 1 Habitats

The main habitat within the study area is semi-natural broad-leaved woodland, which varies in character throughout the study area (Figure 9.1 – Phase 1 Habitat Survey). It is generally dominated by downy birch *Betula pubescens*, alder *Alnus glutinosa* and oak *Quercus* sp. with an understorey comprising common bent *Agrostis capillaries*, sweet vernal grass *Anthoxanthum odoratum*, scattered rowan *Sorbus aucuparia* and hazel *Corylus avellana* saplings with bramble *Rubus fruticosus* agg. and bracken *Pteridium aquilinum*. Some areas have diverse herb assemblages and rare liverwort and fern species, dense scrub including bramble, young alder and hazel saplings, continuous bracken, unimproved grassland dominated by common bent, sweet vernal grass, heath bedstraw *Galium saxatile* and tormentil *Potentilla erecta*, marshy grassland, mainly around Pulpit Rock itself, natural rock exposures colonised by ericaceous vegetation and a good bryophyte community and a stretch of the north western shores of Loch Lomond comprising aquatic macrophyte assemblages.

9.5.4 National Vegetation Classifications

A total of 17 types of vegetation were recorded in this survey. Most of the vegetation types were at least moderately common and widespread in north-western Britain, and in this way the site contained typical west Highland woodland.

It is notable, however, that *Quercus petraea*-*Betula pubescens*-*Dicranum majus* woodland, *Isoetium myosuroides*-*Diplophyllum albicans* sub-community (NVC code W17a) has a strongly western distribution in Britain and is one of the most important habitats for oceanic bryophytes (a group of species for which Britain and Ireland are internationally important). This is reflected in the occurrence of several such species, including some which are uncommon (see below). The community *Molinia caerulea*-*Potentilla erecta* mire, *Angelica sylvestris* sub-community (NVC code M25c) is not a common type of vegetation, being thinly but widely scattered in the west.

Detailed results of survey together with a plan showing NVC communities (Figure 9.1 – Phase 1 Habitat Survey) are provided in Appendix 4A. .

9.5.5 Lower Plants

A total of 103 bryophyte species were recorded during the survey (67 mosses and 36 liverworts).

The bryophyte flora is moderately rich with most species found in the survey area being common and widespread in Britain. However, some are notable as they are uncommon or have a strongly western, oceanic distribution in Europe.

The UK and Ireland is the stronghold in Europe for western, oceanic bryophyte species. The western Highlands are particularly important in this respect because they contain a significant proportion of the habitats rich in these plants. A total of fifteen oceanic species in this small area of woodland at Pulpit Rock indicates an oceanic bryophyte flora of at least moderate richness by west Highland standards.

The locations supporting *Sematophyllum micans* and *Plagiochila atlantica* are the most bryophyte-rich places found during this survey. They are good examples of rocky habitat which is rich in oceanic bryophytes and filmy ferns, and for which the woods of the western Highlands are internationally important. Such habitats are of high conservation value, and every effort should be made to maintain them. The high humidity in the shade and shelter of the tree canopy is evidently essential to these plants. Therefore it is important to avoid letting in too much light and wind (for example by felling nearby trees) because this could cause an unfavourable decrease in humidity.

A full list of the species recorded and detailed results of the survey are provided in a separate report in Appendix 4 A.

9.5.6 Aquatic macrophytes

The aquatic macrophyte survey found a typical community of plants for Scotland (Preston *et al* 2002) growing along the edge of Loch Lomond in the footprint of the scheme. These comprised widespread species none of them being classified as of high conservation concern

The following species recorded have a restricted distribution at the UK level (but are still not rare/scarce):

- *Lobelia dortmanna* - common in western Scotland
- *Isoetes lacustris* - common in western Scotland
- *Potamogeton alpinus* - widespread in Scotland and locally common
- *Callitriche hermaphroditica* - widespread in Scotland and locally common, under-recorded
- *Littorella uniflora* - widespread in Scotland and common throughout
- *Myriophyllum alterniflorum* - widespread in Scotland and common throughout

All the other species found are common throughout all or most of the UK and of low conservation concern. The survey results including target notes are provided in Appendix 4B.

9.5.7 Non native invasive plants

There is one stand of Japanese knotweed *Fallopia japonica* within the scheme footprint adjacent to the existing road at approximately NN 32583 13674 (Figure 9.2 – Ecological Features).

9.5.8 Bats

The desk study found one record of common pipistrelle in West Perthshire 1980-1993 (site unknown).

The bat surveys consisted of three main components undertaken in two separate years (2007 and 2009), these being bat activity (foraging & commuting) survey using walked transects, ground-based visual assessment of potential tree roost and cave sites and emergence survey of potential roost sites. The detailed results of bat survey in 2009 are provided in Appendix 4C and are summarised below.

9.5.8.1 September 2007

Bat activity survey

The survey transect followed the road within the study area following woodland edge and loch foreshore habitat. Bat activity observations were made in relation to foraging and potential commuting behaviour. Common pipistrelle and soprano pipistrelle were the only species recorded. The results are detailed in Table 9.7.

Table 9.7 - Results of transect survey

Time (hrs)	Species (no. passes in brackets)	Notes
04.30 to 05.00	[1] Soprano pipistrelle	Flying along the road and into wooded area
	[1] Common pipistrelle	Flew parallel to tree line
	[1] Pipistrelle sp.	No visual
05.00 to 05.30	[1] Soprano pipistrelle	Foraging
	[2] pipistrelle sp.	No visual
	[5] Soprano pipistrelle	Multiple passes with a number of observations of individuals foraging over the road, woodland edge & loch shore
	[2] Common pipistrelle	Foraging along the side of the road & woodland edge
5.30 to 06.20	[3] pipistrelle sp.	Foraging along the side of the road & woodland edge
	[15] Soprano pipistrelle	Multiple passes with a number of observations of individuals foraging over the road, woodland edge & loch shore

Temp at Start: 7c Temp at Completion 9.5c, Cloud cover at Start 90% completion 90%. Wind calm, Dry. Survey Date: 4/09/2007 Survey start/finish time 04.30 to 06.00 hrs

9.5.8.2 June 2009

Automated Anabat Survey

Analysis of the anabat survey data for both locations reinforced the foraging and potential commuting observations made during the previous transect survey.

Additionally, a third species, Daubenton's bat *Myotis daubentonii* was recorded with substantial levels of activity for all three species at location two (cave system). The results from the two automated bat activity surveys are detailed in Tables 9.8 & 9.9.

Table 9.8 - Anabat Survey Location One (North Traffic Lights)

Duration	Species	Number of recorded passes
21.40 to 09.00	Common pipistrelle	10
	Soprano pipistrelle	5
	Daubenton's bat	9

Temp at Start 15.1c - Temp at Completion 9.5c, Cloud cover at Start 100% completion 70%. Wind Light, No rain. Survey Date: 02/06/2009

Table 9.9 - Anabat Survey Location Two (Cave System)

Duration	Species	Number of recorded passes
21.22 to 09.00	Common pipistrelle	46
	Soprano pipistrelle	108
	Daubenton's bat	82

Temp at Start: 13.2c - Temp at Completion 8.6c, Cloud cover at Start 90% completion 65%. Wind Mod, No rain. Survey Date: 03/06/2009

9.5.8.3 October 2009

Tree Roost Assessment

A total of thirteen trees occurring within the footprint of the scheme were considered to have bat roost potential in the form of rot holes within the trunk / main branches and fractures within limbs, etc, as detailed within Table 9.10 and the locations are shown on Figure 9.2 – Ecological Features. A detailed report of the protected species surveys and updated bryophyte survey is provided in Appendix 4C.

Due to the trees location, near a busy road on steep banks and/or above deep water, health and safety restrictions posed a significant constraint on survey. It was not possible to gain close access to classify each tree individually in terms of bat roost potential; however, all trees identified in Table 9.10 are considered to conform with the Bat Conservation Trust bat survey protocol group 2a and 2b (trees with moderate to high potential for containing bat roosts).

Table 9.10 - Trees with potential bat roosts within the scheme footprint

Annotation	Species	Notes	X	Y	Grid ref
T01	Oak	Dead branches	232593	713680	NN 32593 13680
T02	Oak	Dead split branch	232599	713680	NN 32599

					13680
T03	Oak	Dead wood near top, Wilson's Filmy Fern at base	232599	713674	NN 32599 13674
T04	Oak	Small dead branches with splits	232611	713681	NN 32611 13681
T05	Oak	Split broken limb at top	232632	713685	NN 32632 13685
T06	Oak	Small dead branches	232644	713679	NN 32644 13679
T07	Birch	Small rot hole, leaning on oak (may fall on road)	232662	713679	NN 32662 13679
T08	Birch	Few small rot holes	232641	713701	NN 32641 13701
T09	Birch	Large rot hole which goes up inside	232648	713700	NN 32648 13700
T10	Oak	Small rot holes, by traffic lights	232663	713696	NN 32663 13696
T11	Birch	Hollow crack in trunk	232679	713680	NN 32679 13680
T12	Birch	Small rot holes	232744	713524	NN 32744 13524
T13	Birch	Big rot hole, wall adjacent with cracks	232757	713513	NN 32757 13513

Cave system roost assessment

In-addition to the trees, a substantial 'cave system' was recorded during the course of the foreshore survey (shown on Figure 9.2 – Ecological Features as the most southerly anabat location). The cave system occurs within the rock formation immediately below the southern traffic lights. It is likely to have been formed by a land slip or deliberate placement of rock armour in the past.

The cave system extends approximately 4m into the rock face. A significant amount of flotsam debris was present in the entrances to the cave system indicating that it is prone to temporary and partial flooding. Due to confined space issues and unstable ground conditions, a thorough internal inspection of the cave system was not undertaken. However, a number of deep voids were observed within the ceiling of the cave, which may be suitable bat roosting sites and may potentially be a hibernaculum (winter roost) for species such as Daubenton's bat.

Summary

Three species of bat were recorded during the combined surveys, namely common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus* and Daubenton's bat *Myotis daubentonii*. Thirteen trees and a cave system were identified as potential, but unconfirmed bat roosts.

9.5.9 Red squirrel

The desk study found one record of red squirrel in West Perthshire 1650-1958 (site unknown).

Field survey for red squirrel found no evidence of this species within the scheme footprint, and an assessment of the habitat suitability concluded that it to be suboptimal habitat and unlikely to support a resident population of the species but transient animals could occur as the loch shore woodland would act as a dispersal corridor.

9.5.10 Water vole

The desk study found three records of water vole in West Perthshire 1960-1993 (sites unknown).

Water vole is protected under the Wildlife and Countryside Act 1981 and the Nature Conservation (Scotland) Act 2004 making it an offence to:

- intentionally or recklessly kill, injure or take a water vole;
- intentionally disturb a water vole in its place of shelter;
- intentionally damage, destroy or obstruct water vole access to its shelter.

Survey for water vole found no signs of the species within the scheme footprint, and an assessment of the habitat suitability concluded that it to be suboptimal habitat and unlikely to support the species. Water vole is not considered further.

9.5.11 Pine marten

The desk study found no records of pine marten.

Survey for pine marten found one fresh scat of this species was found on the Loch shore within the survey area and the scheme footprint to the south. The loch shore woodland would act as a dispersal corridor.

9.5.12 Badger

The desk study found four records of badger (three in West Perthshire, one in Stirlingshire) 1650-1977 (sites unknown).

Survey for badger found no signs of this species within the scheme footprint, and an assessment of the habitat suitability concluded that the habitats were largely unsuitable for construction of setts and that the use of the area by badger is very unlikely.

Badger is not considered further within the assessment and no specific mitigation is required for badger, however in recognition that badger could pass through the area it is addressed under a general potential impact of habitat connectivity and animal dispersal corridors.

9.5.13 Otter

The desk study found nine records of otter 1978-1991.

During survey visits in June 2007 several fresh and old otter spraints were found along the Loch side, spanning the length of the survey area.

A heavily sprainted site directly beneath the southern traffic lights, is a suspected lying up site, with several cavities in the rocky embankment shelving into the Loch being big enough to allow otters to rest in. Spraints have been recorded outside several of these cavities on numerous occasions suggesting frequent use.

Further survey on 6 - 7 October 2009 recorded a total of 13 otter refuges within the survey area (Figure 9.2 – Ecological Features), ranging from transient lying up areas to active otter holts. In addition to the refuges, eleven sprainting sites were observed within the same survey area, five of the sites were recorded within or immediately adjacent to a number of the otter refuges. More details are provided in Appendix 4C.

Highly suitable otter habitat exists along the full stretch of the shoreline within the scheme footprint in the form of the well-vegetated Loch side and cavernous rock structures.

Habitat suitability assessment of the wider shoreline of upper Loch Lomond (from Tarbet northwards), conducted to inform a Habitat Regulations Assessment in respect of Loch Lomond Woods SAC, enabled the otter habitat within the scheme to be placed into context and it was concluded that although the Pulpit Rock area is important for otter, there is extensive similar habitat and evidence of otter along the shoreline of upper Loch Lomond, particularly along the eastern shore.

There is a small burn (Watercourse 2) that enters the Loch to the north of the northern traffic lights (near chainage 300.000) which is likely to act as a dispersal route for otter.

The detailed report from the otter holt habitat suitability assessment of upper Loch Lomond is provided in Appendix 4D.

9.5.14 Wildcat

The desk study found two records of wildcat in West Perthshire 1960-1993 (Glen Falloch estate and site unknown).

An assessment of the habitat suitability concluded that the habitats on site are suitable for this species but field survey found no evidence within the survey area and scheme footprint. The loch shore woodland would act as a dispersal corridor.

9.5.15 Breeding birds

Table 9.11 summarises the bird species recorded within the study area during the surveys and the estimated number of breeding birds of each species within 100m of the scheme footprint. There are no specially protected species breeding in or adjacent to the scheme footprint. Some nine species recorded, cuckoo, tree pipit, dunnock, song thrush, wood warbler, spotted flycatcher, bullfinch, linnets and redpoll,

are listed as priority species on the UKBAP and Scottish BAP. However, all the species are widespread within the UK and within Scotland.

Table 9.11 - Breeding birds recorded within survey area including scheme footprint.

Species	No. individuals recorded	No. individuals displaying breeding behaviour	UK Conservation Status*
Canada Goose <i>Branta canadensis</i>	4	0	Naturalised alien - No status
Mallard <i>Anas platyrhynchos</i>	2	0	Amber Status
Common Sandpiper <i>Actitis hypoleucos</i>	1	1	Amber Status
Woodpigeon <i>Columba palumbus</i>	2	0	Green Status
Cuckoo <i>Cuculus canorus</i>	2	2	Red Status UK & Scottish BAP
Tawny Owl <i>Strix aluco</i>	1	1	Green Status
Green Woodpecker <i>Picus viridis</i>	1	1	Amber Status
Great spotted woodpecker <i>Dendrocopos major</i>	3	0	Green Status
Tree pipit <i>Anthus trivialis</i>	1	1	Amber Status UK & Scottish BAP
Grey wagtail <i>Motacilla cinerea</i>	3	0	Amber Status
Pied wagtail <i>Motacilla alba</i>	4	0	Green Status
Wren <i>Troglodytes troglodytes</i>	43	33	Green Status
Dunnock <i>Prunella modularis</i>	4	0	Amber Status UK & Scottish BAP
Robin <i>Erithacus rubecula</i>	45	21	Green Status
Song thrush <i>Turdus philomelos</i>	5	4	Red Status Argyll & Bute UK, Scottish & LBAP
Mistle thrush <i>Turdus viscivorus</i>	1	0	Amber Status
Blackcap <i>Sylvia atricapilla</i>	6	3	Green Status
Garden warbler <i>Sylvia borin</i>	7	4	Green Status
Wood warbler <i>Phylloscopus sibilatrix</i>	6	1	Amber Status UK & Scottish BAP
Willow warbler	37	35	Amber Status

Species	No. individuals recorded	No. individuals displaying breeding behaviour	UK Conservation Status*
<i>Phylloscopus trochilus</i>			
Spotted flycatcher <i>Muscicapa striata</i>	6	2	Red Status UK & Scottish BAP
Long-tailed tit <i>Aegithalos caudatus</i>	22	1	Green Status
Blue tit <i>Cyanistes caeruleus</i>	34	3	Green Status
Great tit <i>Parus major</i>	23	1	Green Status
Coal tit <i>Periparus ater</i>	3	0	Green Status
Treecreeper <i>Certhia familiaris</i>	11	0	Green Status
Chaffinch <i>Fringilla coelebs</i>	43	19	Green Status
Siskin <i>Carduelis spinus</i>	22	4	Green Status
Redpoll <i>Carduelis cabaret</i>	9	0	Amber Status UK & Scottish BAP
Bullfinch <i>Pyrrhula pyrrhula</i>	5	0	Red Status UK & Scottish BAP

*Birds of Conservation Concern³; UKBAP Priority Species, Scottish BAP Priority Species

9.5.16 Fish and fisheries

The desk study found six records of Atlantic salmon in Loch Lomond waters in West Perthshire 1966-2002 (exact sites unknown).

Detailed technical reports of the fish surveys are provided in Appendix 4.E&F

The most abundant fish species present in the Pulpit Rock area are ruffe, roach and perch. However, a powan population was also identified.

Fish spawning habitat (Appendix 4E, Figure 7 – Fish Habitat Survey) in the immediate area of Pulpit Rock is of poor quality and is generally unsuitable for powan spawning or as lamprey nursery habitat. However, lamprey nursery habitat is present mainly to the north of the area at some distance (>15-20 m) from the shore where some lamprey ammocoetes are present.

There is high quality powan habitat located at the southern extreme of the study area towards Rubha Ban, 500 m south of Pulpit Rock (Ordnance Survey Grid Reference NN 33000 13250). This is a known spawning site and the steeply shelving nature of the littoral zone in the upper basin means that such sites are limited in northern Loch Lomond and this site should be regarded as being of particular importance. Furthermore, two adult powan were captured during gill netting in Loch Lomond in an area adjacent to Pulpit Rock (see Appendix 4 E & F for details). This is further evidence that this area is important to this species and that a population remains

present. Suitable powan spawning habitat is also present in close proximity to the shoreline immediately north of Pulpit Rock (grid reference NN2324 7138) however, no evidence of powan spawning activity was recorded in this area at the time of survey.

A follow up survey to assess the importance of this area as a powan spawning site was carried out during 17 and 18 January 2010. The conclusions of these findings were that powan are not utilising littoral habitats in the immediate vicinity of the proposed viaduct to any great extent during the spawning season. It is therefore reasonable to assume that disturbance to this species as a result of the scheme is likely to be minimal.

The detailed report from the follow up fisheries survey is provided in Appendix 4F to this chapter.

9.5.17 Limitations and Information Gaps

9.5.17.1 Existing data

The paucity of protected species data available during desk study clearly indicated under-recording within the study area and this is often the case when focussing on a specific area, especially a relatively remote location. The limited contextual data hinders comparison and guidance of judgements on local conservation status and ecological value of some species. Where this occurs, reference to other sources of information covering the wider area up to national scale where appropriate (e.g. for red squirrel, wildcat and pine marten) are used for contextual information.

9.5.17.2 Bats

Only general assessments of bat roost potential in trees can be made at ground level. In addition, a cave system on the loch shore used by otter may also be used by roosting bats but could not be surveyed internally for bats due to confined space and unstable ground. Therefore, mitigation in this chapter shall recommend that pre-construction bat surveys including climb and inspect survey of all potential roost sites in trees is undertaken by an arborist licensed to disturb bats or an arborist supervised by a licensed bat ecologist/Clerk of Works, and further assessment of the cave system.

9.6 Sensitivity / Value of Ecological Receptors

This section evaluates the nature conservation interest of the study area for its habitats and the species it supports in terms of relative importance in geographical context through the framework shown Impact Assessment Methodology section, based on relevant legislation and EclA guidance (e.g. IEEM, 2006) and by combining this with the terminology given for this ES. The importance of the receptor has been assessed with regard to both the local and wider context, with reference to biodiversity audits and national and regional surveys, where these were available. The evaluation is shown in Table 9.12.

Table 9.12 - Valued Ecological Receptors at Pulpit Rock

Ecological receptor (sites/habitat/species)	Status and rationale
Loch Lomond Woods SAC	By default, statutory protected sites designated under EU legislation are of Very High / International Value .
Ben Vorlich SSSI Pollochro Woods SSSI	By default statutory protected sites designated under the WCA 1981 as amended are of Very High / UK Value .
Ancient Woodland	There are two areas of woodland classified as ancient semi-natural woodland on the SNH Ancient Woodland Inventory (AWI). These sites are considered to be of High / National Value .
Atlantic/Western oak woodland	The majority of habitat within the scheme footprint is western oak woodland which is a UK and Scottish BAP and Argyll & Bute LBAP priority habitat and supports nationally scarce bryophytes. It is therefore of high ecological value but the extent of the habitat that will be effected by the scheme is small and is therefore considered to be of High / National Value .
Running Water	Minor watercourses form important tributary streams of Loch Lomond and provide important habitat and corridors for wildlife. This habitat is considered to be of Low / Local Value .
Loch Lomond	Loch Lomond is part of the Loch Lomond and Trossachs National Park and is an important ecosystem supporting fisheries and bird populations of national importance, and an otter population of regional importance in Scotland. Freshwater Lochs is also a priority habitat category for conservation in the Argyll & Bute LBAP. It is also It is therefore considered to be of High / National Value .
Aquatic macrophyte community	The aquatic macrophyte community along the loch shore is composed of mostly widespread species typical of the region of Scotland and the local area as such it is considered to be of Low / Local Value .
Lower plant assemblage	The bryophyte and pteridophyte communities are composed of mostly widespread species typical of the region of Scotland but there were two national scarce fern species located in two particularly species-rich locations within the survey area due to their national status these species are considered to be of High / National Value .
Non native invasive species	One stand of Japanese knotweed is present in the scheme footprint. This non native plant is a nuisance to native flora and fauna and has no conservation value .
Bats	Of the 16 species of UK bat, nine regularly occur in Scotland. Three widespread bat species have been recorded within the area surrounding the scheme these being common pipistrelle, soprano pipistrelle and Daubenton's bat. Pipistrelle bats are UK and Scottish priority species for conservation and they are also listed on the Argyll & Bute LBAP. Pipistrelle and Daubenton's bats are regarded as common and widespread throughout most of Scotland. Bats are therefore considered to be of Low / Local or Parish value.

Ecological receptor (sites/habitat/species)	Status and rationale
Red squirrel	Red squirrel is listed as a priority species for conservation on the UK and Scottish BAPs. Recent studies show that the red squirrel in Scotland appears to have variable population trends depending on the region. As the scheme lies within a stronghold area for the species it is considered to be of Low / Local or Parish Value .
Pine marten	Pine marten is listed as a priority species for conservation on the UK and Scottish BAPs. Recent studies show that the pine marten in Scotland appears to be making a recovery in some areas. As the scheme lies within a stronghold area for the species it is considered to be of Low / Local or Parish Value .
Otter	Otter is a priority species under the UKBAP and also the Argyll & Bute LBAP. It is recognised as a species of principal conservation importance on the Scottish Biodiversity List and is a qualifying feature of the Loch Lomond Woods SAC. There is a high level of otter activity and a number of holt sites along the shoreline of Loch Lomond including within the scheme footprint. However, otters are widespread in most regions of Scotland including Argyll & Bute and the species generally has recovering populations throughout Scotland. Otter is therefore considered to be of Low / Local or Parish Value .
Breeding Birds	The breeding bird community in the vicinity of the scheme is typical of the habitats present and of the wider region of Scotland and comprises of common and widespread species. There are nine UK & Scottish BAP priority species which breed within or adjacent to the scheme footprint which are all red-listed birds of high conservation concern in the UK. Breeding birds are considered to be of Low / Local or Parish Value .
Fish	The powan population in Loch Lomond is one of two natural populations of powan <i>Coregonus lavaretus</i> in Scotland. The river lamprey <i>Lampetra fluviatilis</i> , brook lamprey <i>Lampetra planeri</i> and Atlantic salmon <i>Salmo salar</i> populations are also regionally or nationally important and are therefore assessed as High / National Value .

9.6.1.1 Predicted Trends in the Absence of Development

It is likely that the area would remain largely unchanged in the absence of the proposed scheme. No rapid changes to any species would be anticipated in the absence of development, although mature trees and woody vegetation could mature to provide more suitability for bats and other breeding birds respectively. Climate change may cause a slow change in some flora and some bird populations but this would be part of a larger scale (international) trend, not just at Pulpit Rock.

9.7 Predicted Impacts

The scheme proposals are outlined Chapter 2 – Scheme Description. These activities might have a range of effects (both positive and negative) upon ecological features at either the construction or operation phases. A distinction is often made between direct and indirect impacts. Direct impacts occur where the changes to an ecological feature are directly attributable to an action associated with the scheme, such as the loss of woodland for the construction of new buildings. Indirect habitats usually arise as a ‘knock-on’ effect of a scheme, and would include aspects such as disturbance of otter activity as a result of a change in human use of the site.

Direct and indirect effects can be further sub-divided into temporary or permanent impacts. Permanent impacts include loss of habitat to the scheme. Temporary impacts arise during the construction phase (e.g. temporary use of land for storage materials, noise and lighting), and whilst short in duration may potentially have longer-lasting effects. For example, temporary loss of habitats of high nature conservation value can be as of great a magnitude as the permanent land take of lower value habitats due to the timescales over which recovery occurs (e.g. the time taken to re-establish woodland). Impacts may be cumulative, if, for example, the construction of the scheme and any adjacent development together cause disturbance to the same ecological receptor.

The impacts of the potential effects arising from the proposed scheme are outlined below for the operational and construction phases, following consideration of the baseline conditions.

9.7.1 Construction phase impacts

It is estimated that the works will take approximately 41 months. Construction will involve site clearance (also referred to as enablement), physical removal of soils and vegetation, break-up of existing hard-standing and the introduction of artificial construction materials and active machinery.

The potential negative impacts during the construction phase are:

- Habitat loss (land-take), a direct and permanent effect. The severity of this effect is directly related to the amount of habitat lost and the conservation value of that habitat.
- Habitat fragmentation, a direct and permanent effect. Severance of habitat and/of the wildlife corridor linking habitat along the loch shore is also considered a direct impact. Fragmentation can lead to reduced genetic diversity and increase the likelihood of species being lost;
- Indirect effects: These arise from disturbance (visual, lighting, noise or vibration), dust deposition, increased vehicle traffic and changes in hydrology and drainage. These impacts have the potential to affect habitats outside the boundary of the construction site, and will generally be temporary and link to construction impacts;
- Spread of non native invasive species: Construction traffic could result in fragments of invasive plant species (Japanese knotweed), being spread around the scheme area or further afield stuck to vehicles or during removal and transport of soil, leading to the establishment of new stands of non native species. This would be a permanent impact; and/or

- Possible pollution incidents:
- Release of oils, fuels, chemicals etc. into the watercourses from construction machinery, stockpiles and apparatus; and/or
- Release of soils, sediments etc. from partially constructed embankments or other construction areas.

9.7.2 Statutory designated sites

There is one Special Area of Conservation (designated under the EU Habitats Directive) and two Sites of Special Scientific Interest (designated under the WCA) considered in this section.

The Loch Lomond Woods SAC is designated to protect old sessile oak woodland and otter. Many stands of old sessile oak woodland habitat does not occur within protected areas and the habitat exists within the scheme footprint. Potential sources of impact relevant to this road scheme involve potential impacts to air and water quality as a result of the development. Potential sources of impacts upon otter populations include loss of habitat, disturbance from foraging habitat, increase mortality from road kill and degradation in water quality.

The SAC is located on the opposite shore of Loch Lomond from Pulpit Rock and lies approximately 500 m from the development site. However, otter evidence was recorded on both sides of the Loch shore and any impact on the otters may potentially have an impact on the integrity of the SAC. This potential impact of the scheme on the integrity of the SAC and otter has been considered in a Habitat Regulations Assessment (HRA) undertaken for the scheme (Scott Wilson, March 2010).

There will not be any direct impact on the SAC because there will be no habitat loss or direct disturbance to hydrology or geophysical features of the site. **Any potential effect on water quality of the loch and/or air quality would be localised, Slight magnitude and very remote from the SAC and is not anticipated to incur adverse impacts upon the SAC.**

Ben Vorlich Site of Special Scientific Interest (SSSI) is designated for its flush and wet heath communities occur and include some rare plant species. Six Nationally Scarce montane plants have been recorded on Ben Vorlich over the past 30 year. The range of upland birds, animals and invertebrates provides additional interest. The nearest point of the SSSI to the development footprint lies approximately 1.5 km west. Given the proximity of the SSSI from the development footprint it is thought unlikely that the SSSI will be affected by the proposed development. **No adverse impacts upon the SSSI or its interest features are anticipated.**

Pollochro Woods Site of Special Scientific Interest (SSSI) is located on the opposite shore of the Loch on steep westerly facing slopes and has the same boundary as Loch Lomond SAC. Indirect impacts may include changes to air quality during the construction phases. However, alteration of air quality is not anticipated to be of a magnitude to incur adverse impacts upon the habitat. Potential adverse impacts will be small scale and temporary. Alteration in water quality is not anticipated to be of a magnitude to incur adverse impacts upon the habitats. Any

potential adverse impacts will be small scale and temporary. **No adverse impacts upon the SSSI or its interest features are anticipated.**

9.7.3 Non-Statutory Designated Sites

There are two areas of woodland classified as ancient semi-natural woodland on the SNH Ancient Woodland Inventory (AWI) – one approximately 1km north-west of the scheme Boundary at its nearest point, and the other approximately 500m to the east on the opposite shore of the Loch. No habitat loss or disturbance of these sites is anticipated. **No adverse impacts upon areas of ancient woodland are anticipated.**

9.7.4 Habitats

The impacts on habitats can be divided into direct and indirect impacts.

Atlantic/Western oak woodland (including associated scrub) in the scheme footprint and outwith designated sites is classified as National Value for nature conservation.

9.7.4.1 Direct Impacts

Proposals will necessitate the felling of trees, including seven mature oaks, scrub clearance, encroachment upon supporting habitats which form part of the habitat mosaic of the scheme area including semi improved grassland habitat, removal of rock face, boulders and scree.

Atlantic/Western oak woodland (including associated scrub): A direct impact on a body of woodland can cause fragmentation and affect the wildlife corridor function. It may also have negative impacts on European Protected Species such as bats that are using the woodland for foraging and potentially trees for roosting. There will be direct and permanent land take from semi-natural broad-leaved woodland along the existing carriageway of the A82. The total loss of woodland and tree habitat measures 0.05 ha. The loss of the woodland areas along the existing carriageway between it and the loch shore will cause habitat fragmentation and loss of the wildlife corridor function. However, the land take represents a very small proportion of the woodland resource within the wider area. The impact on woodland habitat is considered **moderate and significant**. **The impact of habitat fragmentation is of slight magnitude and not significant.**

9.7.4.2 Indirect impacts

Dust deposition will arise from site enablement and construction phases. The impacts are primarily that vegetation, coated with dust, suffers drought stress. The effects of wind can carry the dust over a greater area. **However, such impact would be temporary and mainly localised and of low magnitude, and it is considered unlikely that levels of dust or its transportation will have a significant affect on adjacent woodland vegetation.**

9.7.5 Running Water

9.7.5.1 Direct impacts

Three minor watercourses (Watercourses 1 – 3, see Chapter 11 – Road Drainage and the Water Environment) lie within the scheme footprint. During construction, there is potential for disruption to flow and erosion of soil leading to increased suspended sediment load affecting flora, macro-invertebrates and fish. In addition, inappropriate culvert design could create barriers to fish and otter movement along the watercourses.

9.7.6 Loch Lomond

Loch Lomond is classified as being of National Value for nature conservation but also for socio-economic reasons.

9.7.6.1 Direct Impacts

The design proposals will directly impact on c.100m of the Loch Lomond shoreline and littoral waters, and will require the removal of an estimated 0.2 ha of existing boulder scree/rock and lacustrine sediment habitats. These habitats are common along the Loch Lomond shoreline and the removal of a small extent of the habitats is not significant.

Direct impacts on the Loch will occur as a result of permanent habitat removal during construction within the littoral waters of the Loch and along its shoreline. Impacts will be localised but severe and significant.

9.7.6.2 Indirect Impacts

The main indirect impacts of the development may include dust deposition and the potential for contamination of Loch Lomond waters and adjacent habitats either by spillage of sediments and soils during excavation, spillage of concrete during construction of the viaduct, sediment or contaminant laden surface water run-off or ground water seepage. Dust deposition will arise from site enablement and construction phases. The impacts are primarily that vegetation, coated with dust, suffers drought stress. The effects of wind can carry the dust over a greater area. At this site it is considered unlikely that levels of dust or its transportation will significantly affect vegetation. The impacts on water quality could potentially be significant as construction of the viaduct will require the use of heavy machinery within Loch Lomond. This may result in pollution incidents from sediment, hydrocarbons or other substances, which may have adverse effects on plants and animals within the Loch. Without adequate mitigation measures these effects could be significant and possibly extensive and of medium term duration due to contamination of loch benthic sediments. However, best practice pollution prevention guidelines and use of Sustainable Urban Drainage Systems will be followed and adequate mitigation techniques applied, thus any impacts are anticipated to be localised and short-term, occurring only throughout the construction phase. **It is anticipated that indirect impacts during the construction phase could be temporary but of moderate magnitude and significant.**

9.7.7 Aquatic macrophytes

9.7.7.1 Direct Impacts

Aquatic plants growing in littoral waters of the Loch will be disturbed or destroyed during construction but would be expected to re-colonise post construction. **The impact on aquatic macrophytes is expected to be severe but not significant.**

9.7.8 Lower plant assemblage

9.7.8.1 Direct Impacts

Proposals will necessitate the felling of trees, including seven mature oaks, and removal of rock face and boulders will result in damage or destruction of bryophytic and epiphytic flora growing on these features. A direct impact on a body of woodland can cause fragmentation and affect the plant dispersal corridor function. However, the land take represents a very small proportion of the woodland resource within the wider area. **The impact on most bryophytes is considered slight and not significant but moderate and significant for scarcer species such as filmy ferns.**

9.7.8.2 Indirect impacts

Dust deposition will arise from site enablement and construction phases. The impacts are primarily that vegetation, coated with dust, suffers light and drought stress. The effects of wind can carry the dust over a greater area. **However, such impact would be temporary and mainly localised and of low magnitude, and it is considered that vegetation would recover fairly quickly, i.e. after rainfall.**

9.7.9 Non native Invasive plants – Japanese knotweed

9.7.9.1 Indirect Impacts

It is an offence to plant or cause the spread in the wild of plants listed in Schedule 9 to the Wildlife and Countryside Act 1981 (as amended). Two terrestrial plants are currently listed: Japanese knotweed and giant hogweed. To avoid risk of prosecution, developers and others must follow SEPA good practice guidelines during the removal or management of these species. Removal of these plants, except in private gardens, must be undertaken by qualified and licensed persons. Discarded plant material and contaminated soil is controlled waste under the Environmental Protection Act 1990, and must be transported by a licensed waste carrier and buried at a licensed landfill site.

An area of Japanese knotweed is located within the scheme footprint and without careful removal could be inadvertently be spread further afield by transfer on wheels of vehicles of soil removal operations. **Such an impact would be long-term and slight magnitude but could be widespread especially if via the loch, watercourses or along the A82 corridor or further by soil transporters.**

9.7.10 Bats

All bat species are fully protected under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended). This legislation provides substantial protection to bats and their roosts. Without a mitigation licence (issued by Scottish Government) it is an offence to:

- Deliberately capture, injure or kill a bat
- Deliberately, intentionally or recklessly disturb a bat in its roost or deliberately disturb a group of bats
- Damage or destroy a bat roosting place (even if bats are not occupying the roost at the time)
- Intentionally or recklessly obstruct access to a bat roost

For the purposes of bat protection, a bat roost is defined as “any structure or place, which is used (by bats) for shelter or protection”, regardless of whether it is currently in use by bats or not.

9.7.10.1 Direct Impacts

Direct impacts on bats will relate to removal of potential roost sites and foraging habitat.

No confirmed bat roosts were found but a high level of bat activity was recorded within the development footprint. A number of mature trees with features potentially suitable to support roosting bats occur within the scheme footprint.

It is possible that bats roost in the trees and a precautionary assessment **should bat roosts be present in these trees at the time of construction a moderate impact on the local populations is possible which is significant.**

Loss of bat foraging habitat relates mainly to mature trees, woodland edge and scrub. The extent of lost habitats is **certain to have an impact of slight magnitude and not significant.**

9.7.10.2 Indirect Impacts

Bats may be disturbed by the noise, lighting, vibration and presence of people and machinery during the construction phase. However, the bats in this area are presently habituated to traffic on the existing road but this is a temporary impact in an otherwise unlit area. The construction activity will generally be undertaken in daylight hours, which would minimise disturbance to foraging bats. However, the use of artificial lighting overnight may discourage bats (particularly Daubenton's bat, which is more sensitive and reluctant to fly in artificially lit habitat) from foraging in the immediate area especially if the loch shore is illuminated. However, given that the extent of the scheme is small within the context of the loch, woodland habitat available and in the context of typical bat foraging ranges **it is considered that the impact on bats is of slight magnitude and significant.**

9.7.11 Red squirrel

Red squirrel is listed in schedule 5 of the Wildlife and Countryside Act 1981 as amended making it an offence to:

- intentionally or recklessly kill injure or take red squirrels;
- intentionally disturb a red squirrel in its place of shelter;
- intentionally damage, destroy or obstruct red squirrel access to its shelter.

9.7.11.1 Direct impacts

Although no evidence of red squirrel was found within the scheme footprint, it is likely to be transient through the area. The habitat at Pulpit Rock is very suboptimal and unlikely to support a resident population in the locality so the impact of **direct habitat loss is therefore of slight magnitude and not significant.**

9.7.11.2 Indirect impacts

There is an increased risk of road casualties due to faster moving traffic in the local area. **Such an impact is considered to be of slight magnitude and not significant.**

9.7.12 Pine marten

Pine marten is protected under Schedule 5 of the Wildlife and Countryside Act 1981 as amended making it an offence to:

- intentionally or recklessly kill, injure or take a pine marten;
- intentionally disturb a pine marten in its place of shelter;
- intentionally damage, destroy or obstruct pine marten access to its shelter.

9.7.12.1 Direct Impacts

Loss of habitat will be small magnitude and is not significant. There will be ongoing disturbance in the immediate area of the scheme which will displace animals. As a mainly nocturnal animal, there is a possibility that artificial lighting used at night may also discourage animals and prevent dispersal along the shoreline at all times during construction. **Any impacts are likely to be of slight magnitude and not significant.**

9.7.12.2 Indirect Impacts

There is an increased risk of road casualties due to faster moving traffic in the local area. **Such an impact is considered to be of slight magnitude and not significant.**

9.7.13 Otter

Otter is protected by the Conservation (Natural Habitats &c.) Regulations 1994 as amended by the Conservation (Natural Habitats, &c) Amendments (Scotland) Regulations 2007. This makes it illegal to:

- intentionally or recklessly kill, injure or take (capture) an otter;
- intentionally or recklessly disturb or harass an otter;
- intentionally or recklessly damage, destroy or obstruct access to a breeding site or resting place of an otter (i.e. an otter shelter).

9.7.13.1 Direct Impacts

Otter is mainly nocturnal, solitary and semi-aquatic, obtaining most of its food from rivers. The diet of those living inland consists of eels, fish and amphibians. Otters living on rivers may travel up to 6km or more and mortalities can occur when crossing roads and other structures. Otter shelters are often below ground structures and couches are located above ground. The main threats to otters from a scheme of this nature involve direct removal of habitat, mortality, destruction of holts or couches, fragmentation of habitat, pollution of watercourses, and potential impacts upon food resources.

There is a high level of otter activity along the shoreline where the proposed viaduct will be constructed. There are active otter refuges and sprainting sites on the shoreline with seven of the refuges within close proximity of the pier locations. Three of the holts showed signs of recent, high activity levels. It is considered unlikely that the holts were breeding / natal holts as the location is prone to flooding due to frequent fluctuations in the loch water level. The absence of breeding holts within the development footprint does not lessen the importance of this site for otter as it is good quality habitat within upper Loch Lomond. Disturbance of otters and closure and destruction of holts must be licensed by Scottish Government. The direct impact of the construction of the viaduct will be permanent loss of otter habitat, habitat fragmentation and disturbance to the local otter population. Although there is suitable otter habitat in the surrounding area, including potential holt sites, displacement of animals is likely to result in some territorial disputes in the short term. **Overall the level of impact from construction is determined as severe magnitude and significant and certain to happen.**

There is the potential for disturbance to otters due to construction activity. There will be an increase in vehicle movements due to construction related vehicles, which could increase the potential for road kill incidents, though this will be minimised by otter's crepuscular activity patterns. There could also be a disturbance effect upon any otters moving throughout the area. This could arise as a result of human activity, vehicle movements, noise and lighting from construction compounds. **The disturbance impacts upon otters are therefore considered to be of severe magnitude and significant.**

9.7.13.2 Indirect Impacts

The construction phase of the works may result in deterioration of water quality within the construction area of the loch. There is potential for pollution incidents

through oil spills and also disturbance of sediments will result in increased sediment loading in the water column. This could have a direct affect on otters within the Loch but also on their prey items. **Without mitigation the impact of water pollution is anticipated to be severe and significant.** With best practice construction techniques in and around the Loch will minimise the effect on water quality and **reduce the magnitude of impact to slight and not significant.**

9.7.14 Breeding Birds

In Scotland, wild birds are protected under Section 9 of the Wildlife and Countryside Act 1981, as amended, making it an offence to:

- intentionally or recklessly kill, injure or take any wild bird;
- intentionally or recklessly take, damage or destroy or otherwise interfere with any nest habitually used by any wild bird while it is in use or being built
- intentionally or recklessly obstruct or prevent any wild bird from using its nest;
- intentionally or recklessly kill take or destroy the egg of any wild bird;
- intentionally or recklessly disturb any wild bird listed in Schedule 1 while it is nest building or is at or near a nest with eggs or young; or disturb the dependent young of such a bird.

The breeding season for most species in Scotland is generally accepted as being between mid March and mid August inclusive. Potential adverse impacts upon breeding birds as result of the scheme construction during this period could involve direct damage to nests, or loss of eggs or nestlings. Loss of habitat also reduces local food supplies and fragments habitat which can increase predation risk to adjacent nests. Construction activities are also expected to create noise and visual disturbance to breeding birds in adjacent habitats which may deter birds tending nests or result in nest desertion.

9.7.14.1 Direct Impacts

The magnitude of impact on breeding birds depends largely on the timing of construction works.

- a) During the breeding bird season direct impacts of severe magnitude relate to removal of foraging habitat in general and potential disturbance to or destruction of active nests and breeding birds. Removal of habitat alters the availability of foraging, roosting and nesting opportunities potentially creating changes in the population dynamics of an area. The impacts on a particular species can result in a reduction in population, and certainly in the short-term, in the number of breeding pairs that can occupy a site. **If site clearance occurs between mid March and mid August these impacts would be severe magnitude, significant at the local level and certain to happen.**
- b) Outwith the breeding bird season direct impacts would relate to removal of foraging habitat in general and disturbance to birds in the vicinity although there are no legislative restrictions in this respect. Removal of habitat alters the availability of foraging and roosting sites and may decrease the attractiveness of an area to birds, potentially resulting in changes in some

local bird populations. A significant territorial and foraging resource is still available in adjacent areas and areas not directly impacted by the road improvement scheme. **Given the availability of comparable habitat in the wider area, impact magnitude is anticipated to be slight and not significant.**

9.7.14.2 Indirect Impacts

Bird species will be potentially impacted by noise, lighting and visual disturbance of the site during construction. However to a certain extent local birds will be habituated to existing road traffic disturbance levels.

- a) Should works be carried out during the breeding bird season, there is the potential that birds may abandon nests adjacent to construction works, due to levels of disturbance and indirect affects. **Disturbance in these circumstances is considered to be a severe magnitude impact which is certain and significant.**
- b) Work carried out during the non breeding season may displace some birds to forage/roost further from the construction activity area. Once construction is complete it is likely that local birds will habituate to the new environment. **The impact of this would be considered certain, of slight magnitude and not significant.**

9.7.15 Fish

Works proposed within the Loch have the potential to impact on fish of high conservation value. Four fish species are of potential concern. The powan is listed in schedule 5 of the Wildlife and Countryside Act 1981 and Loch Lomond holds one of only two natural populations in Scotland. The river lamprey, brook lamprey and Atlantic salmon are listed in Annex II of the EC Habitats Directive. The Lomond catchment supports significant populations of salmon and lamprey species.

9.7.15.1 Direct Impacts

Direct impacts may result in removal of spawning habitat and potential disturbance or destruction of eggs and larvae/young fish. These fish species require habitats specific to their spawning needs. For example Powan will only spawn in habitats that lie within 10m depth and comprise well washed stony substrate containing low levels of light sediments whereas lamprey will utilise habitats that contain very high levels of light sediment. As these fish species are limited to what areas they can lay eggs in, any damage to suitable spawning areas may have an impact of moderate magnitude on the local population in the Loch.

Following spawning survey carried out by Loch Lomond Fisheries Trust it was concluded that powan are not utilising the littoral habitats in the immediate vicinity of the proposed viaduct to any great extent during the spawning season. In addition, the areas identified as suitable Lamprey spawning habitat were far enough from the scheme to not be affected.

The potential effects of salmon have not yet been determined and pre-construction surveys are recommended to assess the importance of a minor watercourse (at chainage 300.000) within the scheme footprint.

It is therefore reasonable to conclude that loss of spawning habitat and disturbance to Powan and lamprey species is probable but is likely to be of **moderate magnitude and significant**.

9.7.15.2 Indirect Impacts

Indirect impacts on fish may arise from a deterioration of water quality within the construction area of the loch. There is potential for pollution incidents through spills and also disturbance of sediments which will result in increased suspended sediment loading in the water column. This could impact on adults, larvae and eggs present in the vicinity of the construction site and also impact on spawning areas of powan, lamprey spp. and salmon. **The indirect impacts in the absence of mitigation would be localised and of moderate magnitude and significant and likely to occur.**

Table 9.13 - Construction Phase - Summary of predicted impacts (continued over).

Feature & Effect	Ecological Value of receptor	Confidence in Impact prediction	Extent and Magnitude	Duration	Reversibility	Timing & Frequency	Significant before mitigation?	Summary
Loch Lomond Woods SAC	Very High / International	Certain	No scope for direct impacts on site or woodland habitat as scheme is geographically isolated from closest parts of SAC	No impact	No impact	No impact	Not Significant	No scope for impacts on woodlands within SAC. Local water pollution is possible and together with habitat clearance may both affect qualifying feature (otter) in supporting habitats outwith the SAC. See otter impacts (below)
Pollochro Woods SSSI Ben Vorlich SSSI	Very High / UK	Certain	No scope for direct impacts on sites as scheme is geographically isolated from sites	No impact	No impact	No impact	Not Significant	No direct impacts to habitat is possible within the SSSI
Ancient Woodland sites	High / National	Certain	No direct impacts possible as scheme is geographically	No impact	No impact	No impact	Not Significant	No direct impacts to habitat

Feature & Effect	Ecological Value of receptor	Confidence in Impact prediction	Extent and Magnitude	Duration	Reversibility	Timing & Frequency	Significant before mitigation?	Summary
			isolated from sites					
Atlantic / western oak woodland Habitat loss & habitat fragmentation	High / National	Certain	A section of the woodland to clear felled: Moderate	Permanent loss of woodland habitat	Permanent	Loss during the spring & summer months would have highest impact due to disturbance to nesting birds	Significant	Permanent loss of broad-leaved woodland resulting in habitat fragmentation
Running water (minor watercourses outwith designated sites) Water pollution Habitat loss	Low / Local or Parish	Certain	Water pollution would be a localised impact: Moderate Habitat loss is Negligible	Temporary for water pollution Permanent for habitat loss	In short term for most pollutants Not reversible for habitat loss	One off pollution events may be damaging to fish, aquatic invertebrates, flora and otter at any time	Significant for water pollution	One-off sediment flushes are usually assimilated by system in medium term but can asphyxiate invertebrates and fish and smother plants in short term
Loch Lomond Water pollution Habitat loss	High / National	Certain	Localised water pollution: Moderate Localised habitat loss:	Temporary for water pollution Permanent for habitat loss	In short term for most pollutants Not reversible for habitat loss	One off pollution events may be damaging to fish, aquatic invertebrates, and flora at any time	Significant	One off sediment flushes are usually assimilated by system

Feature & Effect	Ecological Value of receptor	Confidence in Impact prediction	Extent and Magnitude	Duration	Reversibility	Timing & Frequency	Significant before mitigation?	Summary
			Severe					Habitat loss will be Slight
Aquatic macrophyte community Habitat loss	Low / Local or Parish Value	Certain	Localised habitat loss: Severe	Permanent for habitat loss	Not reversible for habitat loss	Disturbance to and loss of littoral sediments	Not significant	Habitat and plant loss will be Slight
Lower plant assemblage Habitat loss	High / National value	Probable	Localised habitat loss and common species: Severe	Permanent for habitat loss	Not reversible for habitat loss	During construction – one off occurrence	Significant	Loss of patches of filmy fern spp. on some mature trees
Non native invasive plants	No ecological value	Certain	Potential for accidental spreading in wider environment: Slight Removal using code of practice: Slight	Long term	Reversible with appropriate management	Spreading plant is detrimental at any time and illegal	Significant negative Significant positive	Allowing to spread in environment is detrimental to native habitats and wildlife Eradication would be beneficial and is a legal requirement
Bats	Low / Local or	Possible for roost sites	Direct impact on potential roost	Permanent	Partially reversible in the medium to	Loss during winter & summer	Significant	Loss of a number of

Feature & Effect	Ecological Value of receptor	Confidence in Impact prediction	Extent and Magnitude	Duration	Reversibility	Timing & Frequency	Significant before mitigation?	Summary
Widespread and common species: common pipistrelle, soprano pipistrelle, Daubenton's bat Habitat loss and displacement	Parish	Certain for commuting and foraging habitat	sites: Moderate Impact on commuting routes and foraging habitat: Slight		long term if artificial roost sites are provided, habitat connectivity is maintained and foraging habitat (tree planting) is created as part of landscape remit	months may have the greatest impact through killing or injuring hibernating or breeding bats and their progeny		roost sites, commuting corridors and foraging areas. Habitat fragmentation will occur
Red squirrel Habitat loss Habitat fragmentation	Low / Local or Parish	Probable	Direct impacts on habitat to be cleared and habitat fragmentation: Slight	Temporary for habitat loss Permanent for habitat fragmentation	Loss of trees reversible with new plantings Not reversible for habitat fragmentation	Loss of dreys during breeding season would be greatest impact	Not Significant	Low chance of impacts due to low population density and extent and type of habitat to be cleared
Pine marten Habitat loss Habitat fragmentation	Low / Local or Parish	Certain	Direct impacts on habitat to be cleared and habitat fragmentation: Slight	Permanent	Reversible for habitat loss Not reversible for habitat fragmentation	Loss in spring may be more detrimental as breeding dens may be destroyed; habitat loss at any time will affect dispersal	Significant	Possible loss of dens; and loss of foraging areas. Habitat fragmentation will occur
Otter Habitat (holt) loss	Low / Local or Parish	Certain for habitat loss Probable for	Direct disturbance or displacement; loss of riparian	Temporary disturbance Permanent loss	Disturbance is reversible in short term	Impacts at anytime are likely to be of similar magnitude	Significant	Loss of holts; small loss of riparian foraging

Feature & Effect	Ecological Value of receptor	Confidence in Impact prediction	Extent and Magnitude	Duration	Reversibility	Timing & Frequency	Significant before mitigation?	Summary
Disturbance Obstruction of dispersal routes		disturbance Possible for obstruction	habitats and refuges; habitat fragmentation/ obstruction to dispersal: Severe	of habitat & fragmentation, & obstruction of dispersal routes	Habitat loss and fragmentation/obstruction to dispersal is permanent			habitats on minor watercourse and loch shore; habitat fragmentation / barrier to movement if watercourses obstructed
Breeding bird assemblage Disturbance/ displacement Habitat loss Habitat fragmentation	Low / Local or Parish	Certain	Direct disturbance or displacement; Severe Small loss of habitats in context of region; Severe Habitat fragmentation: Slight	Temporary for disturbance Permanent for habitat loss and fragmentation	Disturbance is reversible in short term. Habitat loss is reversible in medium to long term. Habitat fragmentation is permanent	Loss during breeding season would have greatest impact	Significant	Localised disturbance and displacement of breeding/wintering territories with small extent of habitat loss, which may be reversible in long term when new plantings have matured
Fish Water pollution	High / National	Probable for pollution	Localised pollution source could have far reaching effect down stream or	Temporary for pollution	Pollution is reversible in short to medium term.	During construction period only	Significant	Potential for localised substantial significant effect without

Feature & Effect	Ecological Value of receptor	Confidence in Impact prediction	Extent and Magnitude	Duration	Reversibility	Timing & Frequency	Significant before mitigation?	Summary
Habitat disturbance / loss		Certain for habitat loss/disturbance	<p>within upper Loch Lomond which typically has more nutrient poor water quality</p> <p>Moderate</p> <p>Localised habitat loss may affect spawning or nursery areas or migration routes in minor watercourses</p> <p>Slight</p>	Permanent for habitat loss	Habitat loss is not reversible			mitigation

9.7.16 Operational Impacts

The potential negative impacts due to operation and maintenance of the road improvement scheme are:

- Water quality impacts due to contaminated surface water run-off, especially as over the loch;
- Increased risk of road mortality to otter or other mammals due to faster moving traffic.

9.7.17 Designated Sites

No direct impacts are anticipated for any designated site. A possible indirect impact of water pollution may affect otter (Loch Lomond Woods SAC qualifying feature) in the long-term without mitigation. **Such an impact would be localised and of slight magnitude but is likely to be of minor significance.**

9.7.18 Habitats

No negative impacts acting on terrestrial habitats are anticipated during the operational phase. The landscape planting proposed will mature over time, and will at least partially compensate for woodland and scrub habitat lost. **The impact upon the terrestrial habitats during the operational phase of the scheme is assessed as negligible and not significant.**

Without mitigation measures being implemented, there would be potential negative impacts during the operational phase on watercourses and the loch due to pollutant-laden surface water run-off. Mitigation measures to prevent this are specified below and within the Chapter 11 – Road Drainage and the Water Environment and have been incorporated into the scheme design. **The impact of pollution to watercourses and the Loch without mitigation is likely to be slight and significant.**

9.7.19 Bats

Bats in the area are presently habituated to the noise and lights of the traffic on the A82 and a significant increase in traffic flow is not expected. However, a possible increase in mortality due to road traffic collisions may occur locally due to the change from decelerating and accelerating vehicles to free-flowing traffic due to removal of the traffic lights, although this is expected to be **negligible and not significant at the population level.**

9.7.20 Otter

Otters frequently use the loch shore and a number of refuges are present. The Pulpit Rock foreshore is locally important for otter due to the number of refuge sites, its remoteness and the difficult terrain which presently deters human disturbance.

Otter is a partially aquatic mammal and will be able to swim around the viaduct piers. However, animals which travel over land may stray onto the road and locally will be at higher risk of road traffic collision mortality due to the change from decelerating

and accelerating vehicles to free-flowing traffic. This risk could be increased further by inadequate provision for otter passage along minor watercourses affected by the scheme (e.g. at chainage 300.000). The watercourses currently flow through culverts that are too small to enable unimpeded otter passage, thus animals are encouraged to cross over the road and risk being killed. **Without mitigation this would continue to be a negative impact of slight magnitude and not significant at the population level**, however increasing the dimensions of culverts to make them otter friendly would be a **positive impact of slight magnitude**.

During operation, there is likely to be increased road noise and vibration through the viaduct structure which may deter otter holts or lie up sites close to the scheme. **Such impact would be permanent and of slight magnitude because it would effectively exclude otters from re-using the area, but as there is extensive alternative habitat around upper Loch Lomond it is unlikely to be significant.**

Overall, without mitigation, the operational impact on otter is considered to be of slight magnitude and significant at the minor level.

9.7.21 Breeding Birds

Birds in this area are presently habituated to the traffic noise and visual disturbance along the A82 and it is not considered that there will be a significant increase in noise or visual impacts during the operation of the scheme. Due to the likely relative slow growth rate of replacement plantings compared to less harsh climates there will be locally less woodland habitat in the long-term, until the scheme tree plantings mature. Given that there is alternative suitable breeding and foraging habitat in the wider area, and the bird species encountered were widespread and common nationally, **the impact of reduced habitat is certain to occur in the short to medium-term whilst new plantings and regeneration develops and is considered to be of slight magnitude and not significant.**

9.7.22 Fish

It is possible that the operational phase of the development will have a direct impact on the fish in the minor watercourse or Loch Lomond due to runoff and water pollution. However, such impact is expected to be mitigated by implementing SuDS to minimise/prevent pollutant-laden run-off from entering waterbodies. **Without mitigation the impact is certain to occur and is anticipated to be of slight magnitude and significant at a minor level.**

Table 9.14 - Operational Phase - Summary of predicted impacts

Feature & Effect	Ecological Value of receptor	Confidence in Impact prediction	Extent and Magnitude	Duration	Reversibility	Timing & Frequency	Significant before mitigation?	Summary
Loch Lomond Woods SAC	Very High / International	Certain	No direct impacts anticipated; without mitigation chronic water pollution may occur affecting otter qualifying feature	Long term	Reversible in the medium term	During operation ongoing diffuse pollution effects at any time may have a significant adverse effect	Significant	Local, ongoing pollution due to contaminated surface water runoff may affect the integrity of qualifying species relating to the cSAC, such as otter
Loch Lomond Water pollution	Very High / International	Certain	Mainly localised near minor watercourse inlet: Slight	Long-term	Reversible in short to medium term	During operation ongoing pollution at any time may have an effect	Significant	Local, ongoing pollution due to contaminated surface water runoff may affect the Loch and tributary streams
Running water (minor watercourse outwith designated sites) Water pollution	Low / Local or Parish	Certain	Mainly localised wherever outfall: Slight	Long-term degradation of habitat quality	Reversible in the mid to long term with the creation similar habitat as part of the scheme's landscape remit	During operation ongoing diffuse pollution effects at any time may have a significant adverse impact	Significant	Local, ongoing pollution due to contaminated surface water runoff may affect the integrity of site
Bats Road traffic collision	Low / Local or Parish	Probable	Higher risk of road traffic	Permanent	Probable reversible if bats habituate to	Permanent severance of commuting	Significant	Probable loss of a number of bats

Feature & Effect	Ecological Value of receptor	Confidence in Impact prediction	Extent and Magnitude	Duration	Reversibility	Timing & Frequency	Significant before mitigation?	Summary
mortality			accident mortality: Slight		road, and adopt artificial roost sites, and new plantings/ landscaping adequately compensates. Not reversible as long as lighting persists	routes, displacement of foraging bats and road mortality will continue until bats adapt to changes in environment Permanent		whilst commuting or foraging in short term until bats habituate to new landscape.
Displacement due to artificial lighting			Mainly affecting Daubenton's bat: Slight					Artificial lighting may displace some bats, especially Daubenton's bat
Red squirrel	Low / Local or Parish	Probable	Slight	Permanent	Dependent on breeding success and population growth / replacement	Will occur occasionally	Probably not significant	Population levels of most mammals in this area are favourable and like humans can probably sustain occasional road casualties.
Pine marten	Low / Local or Parish							
Road traffic collision mortality								
Otter	Low / Local or Parish	Probable	Constant but very localised effect:	Permanent	Not reversible	Disturbance would be constant daytime but slightly less at	Possibly significant for disturbance	The effect of noise/vibration transmitted through viaduct is an
Disturbance and displacement through								

Feature & Effect	Ecological Value of receptor	Confidence in Impact prediction	Extent and Magnitude	Duration	Reversibility	Timing & Frequency	Significant before mitigation?	Summary
vibration or road noise transmitted through structure; or noise from bridge deck above			Slight			night.		unknown quantity but possible as viaduct piers in water column; artificial holts should not be placed in or adjoining the structure due to this potential impact
Obstruction to dispersal along minor watercourses			Localised barrier to dispersal: Slight			Barrier to dispersal is permanent	Significant for barrier to dispersal	
Fish and fisheries Water pollution	High / National	Certain	Localised pollution source Slight	Temporary	Pollution reversible in short to medium term	Impacts during Dec-Apr (powan spawning season) are likely to have greater impact	Significant	Potential for highly significant effect

9.8 Mitigation

This section describes the mitigation required in order to meet the legal requirements associated with the ecological receptors of the site. It also highlights specific mitigation measures necessary to reduce any negative effects upon sensitive ecological receptors, identified in the previous sections.

9.8.1 Principles of Mitigation

The principles of mitigation in order of priority are as follows:

- Avoid any negative impact on the target habitat or species;
- Minimise impacts by input into the scheme design.

If this is not possible, then:

- Minimise the scale and magnitude of the impact; and then
- Compensate for the impact through provision of alternatives

Environmental mitigation has been embedded at the design stage of the scheme to ensure that:

- Sensitive habitats are identified and avoided where possible during development;
- Works are designed to avoid harm to protected species, including the choice of construction method;
- Works are timed to avoid the periods of maximum sensitivity of receptors; and
- Pollution incidents are avoided e.g. follow best practice methods.

In the following sections, the extent of mitigation will be assessed as follows:

- Fully – impact fully mitigated, no residual effect predicted;
- Substantially mitigated, some residual effect possible; or
- Partially – impact partially mitigated, some residual effects predicted.

9.8.2 General mitigation measures

The general mitigation measures identified below should be included within the final design and the construction contractor's employer's requirements for the scheme:

- An Ecological Clerk of Works (ECoW) will be employed during the construction phase to deal with any protected species or other ecological issues that may arise. They would liaise with relevant specialists, such as SNH, to provide mitigation as necessary, and would undertake any specified pre-construction surveys;
- The ECoW must hold relevant protected species survey licences or should liaise with specialist licensed consultants to address protected species, such as bats.

- The ECoW will be responsible for 'toolbox talks', whereby all appropriate workers would be briefed on the ecological sensitivity of the site, and would have clear notification of protected species and restricted areas. These briefing meeting would be carried out on a regular basis, as they provide a convenient and effective method of communicating and reinforcing the key environmental messages throughout the workforce;
- The ECoW will be responsible for ensuring that appropriate ecological and environmental information is included within the site briefing or induction received by all construction or site staff;
- The ECoW will also be responsible for the implementation and supervision of mitigation measures, and for any work that would be required under protected species licenses. This individual will also undertake pre-construction checks for otters.
- All relevant SEPA good practice guidelines for working near water must be followed including *PPG5 Working in near or liable to affect watercourses*, *PPG6 Working at Construction and Demolition Sites* and *PPG2 Above Ground Oil Storage Tanks*.
- The ECoW must ensure that any deep excavations are covered by night to prevent mammals falling into them and being injured or becoming trapped. If covering is not possible, suitable ramps must be installed to allow animals to climb out.

9.8.3 Legal Requirements

The following text provides a summary of relevant legislation. The relevant Acts should be consulted for precise wording of the legislation.

In addition to the general legal requirements that planners must consider in regard to potential environmental impacts of proposed activities or developments, certain habitats and species are afforded specific protection under European, UK and Scottish legislation.

The Wildlife & Countryside Act 1981 as amended in the principal legislation in Scotland for the protection and conservation of wildlife and habitats. It is supplemented by the Conservation (Natural Habitats, &c.) 1994, as amended, implementing the EU Habitats and Birds Directives.

European Directives and conventions have been implemented using the national legislation. European Protected Species are protected solely by the Conservation Regulations. The legislation in combination makes it an offence to intentionally, deliberately or recklessly;

- Capture, injure or kill a wild animal of a European Protected Species;
- Harass a wild animal while it is occupying a structure or place which it uses for shelter or protection;
- Disturb such an animal while it is rearing or otherwise caring for its young;
- Obstruct access to a breeding site or resting place of such an animal or otherwise to deny the animal use of the breeding site or resting place;

- Disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution of abundance of the species to which it belongs;
- Disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduces, or rear or otherwise care for its young; and
- Damage or destroy a breeding site or resting place of such an animal

The legislative requirements associated with the protected habitats and species in the Study Area are fully described in the relevant preceding sections.

9.8.4 Statutory Designated Sites

There are a number of mitigation measures that are required to safeguard Loch Lomond Woods SAC qualifying feature (otter) and supporting habitats outwith the SAC. Whilst the exact detailed of design and construction have not been completely finalised, and are subject to clarification during detailed design, as a minimum the following mitigation measures must be implemented, and should form part of any construction method statements and / or construction environmental management plan:

- The ECoW will be retained throughout the construction period, and consulted on all issues that have the potential to cause impacts to otter;
- Method statements for construction activity must be agreed in advance with SEPA and SNH, before work commences;
- Litter management schemes will be implemented to prevent loss of material into the Loch that may be washed up on the SAC;
- Stockpiles of earth and construction materials will not be kept near the Loch or watercourses in order to prevent run off into the Loch;
- On-site storage of chemical, fuel or construction materials will be limited to those needed for immediate construction. All surplus materials will be removed from the works site as soon as their immediate purpose has been concluded;
- Any fuel or chemical stores will be secure from vandalism and appropriately bunded to at least 110% capacity. These stores shall be kept a safe distance (refer to relevant guidance at the time of construction) away from the Loch and watercourses, in locations agreed by the ECoW;
- All potentially polluting liquids and solids associated with vehicles, equipment and machinery must be identified to all staff so that spillages and washwaters can be prevented from entering the Loch and affected the SAC and the its qualifying habitats and species;
- Pollution contingency plans will be developed and approved by SEPA in advance of construction commencing. These should include designated members of staff to deal with emergencies if they arise;
- CIRIA Report SP156, Control of Water Pollution from Construction Sites – Guide to Good Practice will also be referred to.

- Contractors will also have to comply with the regulatory controls of the Water Environment (Controlled Activities) (Scotland) Regulations 2005;
- The contractor shall not wash tools in any waterbody;
- Mobile bunding or material for bund construction will be available should an emergency barrier need to be constructed to prevent material leakage from a works site into the Loch or any watercourses that may affect the qualifying habitats and species for the SAC;
- Quantities of absorbent substrate or spill kits will be available to soak up spillages or leaks;

These measures should form substantial mitigation of the anticipated impacts.

9.8.5 Habitats

Mitigation and compensation to protect terrestrial habitats including minor watercourses is:

- Direct habitat loss will be minimised where this is possible within the design of the scheme. Any impacts on woodlands will be minimised. This would take the form of minimising direct intervention into woodland areas, minimising any edge disturbance, and retaining mature trees where the scheme allows. Where tree removal or arboricultural works are to be undertaken, the trees will be subject to assessment with regard particularly to their bat roost potential and nesting bird potential (see below). Once the necessary trees have been felled during enablement, suitable fencing and signage will be required to prevent site creep, and access by staff and machinery;
- Compliance with SEPA Pollution Prevention Guidelines (PPG) and use of SUDS to protect Loch Lomond and its tributary watercourses.
- Landscape planting will be undertaken along the disused length of road (further details of this are detailed in Chapter 6 - Landscape and Visual Effects). The trees specified will be native species and have local provenance, in accordance with best practice. These should be confirmed with the ECoW as being appropriate to the habitats and species on site.
- Replanting of the disused section of road (after removal/break up of the metalled surface) must be undertaken to partially compensate for lost trees and woodland. Planting plans should take into account the likelihood of natural re-colonisation by trees such as birch and oak and the ground surface should be prepared in such a way to encourage this phenomenon.
- The mitigation measures outlined above for trees and woodland will also apply to the other habitats on site, where applicable, e.g. working areas will be clearly defined in order to minimise risk to affected watercourses, the Loch and other ecologically sensitive habitats.
- An invasive species management plan must be produced and put into operation prior to construction to avoid the risk of illegally spreading Japanese knotweed;

These measures will substantially mitigate impacts on waterbodies and partially mitigate/compensate for loss of or disturbance to other habitats.

9.8.6 Lower plant assemblage

Any trees felled which support diverse epiphytic plant communities on their trunks or major limbs (as determined by the ECoW) must have sections of trunk supporting the plants cut free and translocated to nearby suitable locations with similar aspect and shading. Locations will be determined by the ECoW but should broadly replicate the situation prior to felling, e.g. similar aspect and shade characteristics. Translocated sections of tree must be secured in place to prevent them being disturbed or toppling over.

9.8.7 Bats

As many deciduous trees as possible must be retained to provide potential bat roost and foraging habitat. However, some 13 trees within the scheme footprint that have features which could potentially support roosting bats, and the cave system on the loch shore, will be lost. These sites may as a minimum provide transient roost sites for bats.

The ecological constraints plan (Figure 9.2 – Ecological Features) shows the locations of the trees assessed as having the potential to contain bat roosts within the foot print of the proposed viaduct and associated earthworks.

The mature trees to be felled must be checked during the summer preceding scheduled felling / site clearance by the ECoW or a licensed bat specialist in collaboration with an arborist. This must be done by climbing and inspecting the tree, and if bat roost is identified by undertaking at least two emergence / dawn re-entry surveys during the period May to September.

If a bat roost is confirmed, trees will have to be felled under licence from the Scottish Government, and at a time when it has been confirmed that no bats are present within the roost. Soft-felling techniques must be used but tree-specific mitigation would be determined on a tree by tree basis and undertaken under the terms of any licence. Sections of tree with cavities confirmed as roost sites must be retained and fixed to trees in nearby woodland at a similar height, aspect and level of shading/sun exposure.

If suitable cavities to host bats are found to be unoccupied then these must be blocked to prevent subsequent use by bats prior to felling.

As a means of informing whether a licence is required, it is important that an accurate assessment of each tree's potential to contain roosting bats is undertaken, as previous bat activity surveys in September 2007 and June 2009, recorded substantial levels of bat foraging activity within the foot print area. Pre construction surveys will need to be carried out as the scheme progresses bearing in mind the May–September survey window.

The cave system on the loch shore must be inspected pre-construction for roosting bats using reasonable survey effort and survey techniques by a licensed bat ecologist. If bats are found to roost in the cave enablement works would need to be undertaken under the terms of a mitigation licence from the Scottish Government. Note that licensed disturbance to, or removal of, bats will not be permitted to hibernating (October-March/April) or breeding (mid May-August) bats. Pre-

construction surveys need to be carried out in good time to inform a potential EPS licence prior to suitable time windows (e.g. spring or autumn) for bat exclusion and destruction of this feature.

Appropriate mitigation and compensation for loss of bat roosts will be required as stipulated under the terms of an EPS mitigation licence which will be informed by pre-construction surveys. However, as a general compensation and biodiversity enhancement measure, and irrespective of any licensed bat mitigation, a minimum of 24 bat boxes must be installed on trees within nearby retained woodland habitat and on the viaduct itself. These will act as artificial roost sites replacing lost transient roost sites in trees. The precise number, specification and location of these will be agreed with SNH, however, based on current knowledge of bat status on site the following factors and box specification will suffice:

- The type of bat box provided must be *Schwegler* woodcrete construction for durability and protection against squirrel damage. Some 24 boxes comprising eight of three different designs appropriate for the species present in the locality (pipistrelles and Daubenton's bat) must be installed. In addition, two specialist concrete bat houses designed to install on bridge structures will be secured to the underside of the viaduct.
- At least three bat boxes must be erected for each mature tree removed, which had bat roost potential. These must be erected one year prior to removal of the trees.
- Permission must be obtained from the landowner to install bat boxes on nearby trees. The exact trees and location of the boxes on the trees will be determined by a bat ecologist/ECoW.

The use of artificial lighting during hours of darkness must be minimised. Where this is necessary, lights must be sited to face away from the loch shore and cowls must be fitted to lights to prevent/reduce light spillage in woodland along the loch shore and over the loch itself (*cf.* otter mitigation).

Based on the current knowledge of the status of bats on site, these measures will substantially mitigate for impacts on bats.

9.8.8 Otter

The ECoW must conduct pre-construction survey for otter activity along the watercourses and the Loch shore up to c.100m from the development footprint to establish the current status of otter activity to inform European Protected Species Licence. There is a high level of otter activity currently within the development footprint with twelve active otter refuges identified within study area. Given the mobile nature of these animals it is possible that more refuges may arise throughout the development period. If the whole site is not cleared concurrently or if rock armour is left in place, checks for otter activity must continue weekly through the construction period. Otter holts and resting places are protected by law, however, there are provisions in the legislation to allow actions to take place under licence that would otherwise contravene the law. Disturbance to otter holts that occur within the 50 m of the development footprint must be licensed by the Scottish Government prior to any works starting on site.

It will be necessary to construct a number of artificial otter refuges equal to the number of holts lost as a result of the development. Based on current survey data, the construction of the viaduct will cause the destruction of five active otter refuges along the Loch shore but this must be reviewed by pre-construction survey. The precise design and location of these artificial refuges will be determined at a later stage once pre-construction otter survey is completed and the detailed design plans of the viaduct are finalised. Refuges will be located within the adjacent bank near the loch shore. The provision of artificial refuges will help to compensate for any habitat loss resulting from the construction of the viaduct and will help to minimise the significance of any impacts resulting from the construction phase.

Two existing culverts (Culverts 1 and 2 – see Chapter 11 - Road Drainage and the Water Environment), which service three minor watercourses, are currently unsuitable for otters to pass through as they are too small diameter, regularly flood and become obstructed by debris. As a result otters travelling along these water courses are currently forced to cross over the road at these points making them vulnerable to road traffic collision mortality. Culvert 1 will be retained at 250mm diameter and extended to the new road width. Culvert 2 could be replaced and modified to take greater flow (i.e. excess flow re-routed from Culvert 1) but this is uncertain at this time of writing. Should this culvert be replaced consideration must be given to making this adequate diameter to facilitate otter passage during normal flow rates which would be must be 600mm diameter to facilitate otter passage and be compliant with the DMRB Volume 10 Section 1 Part 9 HA 81/99 (Highways Agency, May 2009).

A number of general precautionary measures must be implemented. Where overnight artificial lighting is used light spill must not be allowed over watercourses, the loch shore or into woodland in order to avoid disturbance to otter. Cowling must be used to prevent light spill over adjacent areas of habitat (*cf.* bat mitigation).

Site staff must be made aware of the potential presence of otters crossing the site or road within the development area and details must be included in the site induction.

These measures will substantially mitigate/compensate against negative impacts.

9.8.9 Breeding Birds

Breeding birds are protected by the WCA as amended by the Nature Conservation (Scotland) Act 2004, whereby it is illegal to intentionally or recklessly kill, injure or take any wild bird, damage or destroy or obstruct the active nest of any wild bird, and take or destroy an egg of any wild bird. In addition, birds listed on Schedule 1 of the WCA are protected against intentional or reckless disturbance on or near an active nest.

Vegetation and tree removal must be avoided and minimised where possible. Habitat clearance work must be undertaken between September and February to avoid the main breeding season. This will substantially mitigate against the potential damage and destruction of active nests and the removal of vegetation providing shelter, protection and foraging habitat for breeding birds and their young.

If clearance work has to be undertaken during the breeding season, an ornithologist (who must be knowledgeable of bird nesting behaviour and experienced at nest

finding) must check for active nests, to ensure that these were not destroyed or disturbed, and to advise accordingly. Active nests will need to be left undisturbed until the nesting attempt is complete. This approach will only partially mitigate for potential disturbance, damage or destruction of nests, and removal of foraging or protective cover habitat for breeding birds and fledglings. However, this approach is often unsuccessful because it results in an increased risk of predation or nest desertion due to excessive disturbance and loss of surrounding habitat and could therefore be viewed as a breach of wildlife legislation.

Landscape planting will be undertaken around the proposed scheme to compensate for the loss of breeding and foraging habitat and further details of planting is provided in Chapter 6 - Landscape and Visual Effects section. The plants used must be locally native and of local provenance. This will partially compensate for habitat loss for breeding birds in the medium to long term.

In order to provide alternative nesting habitat for cavity nesting species to replace cavities in the trees that will be lost during the construction phase, a variety of woodcrete artificial nest boxes to provide for woodland species affected (spotted flycatcher, blue tit and great tit) must be installed one season in advance of habitat clearance. The nest boxes must be erected on trees within adjacent areas of retained woodland. The exact trees and location of the nest boxes on trees will be determined by an ornithologist who will also seek permission from the landowner.

It is recommended that twelve bird nest boxes are erected. The type and number of nest boxes used will be *Schwegler* woodcrete model 1B (2 boxes with 32 mm hole; 2 boxes with 26 mm hole); model 2H (x4); and model 3SV (x4) or similar. Nest boxes must be located at approximately 3-4 m above ground level to protect against human interference and must face between N and SE (i.e. away from the prevailing, rain bearing winds).

In combination these measures will partially mitigate or compensate habitat loss for breeding birds.

9.8.10 Fish and fisheries

Mitigation for fish and fisheries will be largely avoidance of water pollution through implementation of, and the adherence with, SEPA CAR licence requirements and SEPA PPG. Good practice construction methods ensuring that disturbance of lacustrine sediments is minimised and contained, and runoff from loch side habitats is prevented. Water laden with sediment or other pollutants will be contained and prevented from running into watercourses or nearby littoral waters of the loch.

A pre-construction (electro-fishing) survey of the minor watercourse at chainage 300.000, to quantify its importance as a nursery area for salmonids, was recommended by the fisheries consultant. A fisheries expert must be consulted to advise and undertake this survey, and advise on mitigation that may be required as a pre-construction survey.

These measures will substantially mitigate against negative impacts on fish.

9.9 Residual Impacts

Residual impacts are summarised and placed into context in Table 9.15, which shows the receptor, value, stage of impact (construction or operation), impact significance prior to mitigation, mitigation measures, mitigation extent, and residual impacts after mitigation.

All residual impacts are deemed to be significant at a minor level, based on all mitigation measures being fully implemented. The mitigation measures must be implemented through inclusion within the Employer's Requirements for the scheme.

Table 9.15 - Summary of Residual Impacts

Receptor	Ecological Value	Proposed activity	Character of unmitigated impact on receptor	Significance without mitigation and confidence level	Mitigation and enhancement	Residual significance and confidence level
Atlantic/Western oak woodland	High / National	Construction – site clearance	Total habitat loss	Significant negative impact at Local or Parish level: Probable	Replanting on site	Certain localised loss of semi-natural woodland in medium to long-term. Likely to be compensated in long term therefore unlikely to be significant at Local level.
Lower plant assemblage	High / National	Construction – site clearance / tree felling	Loss of nationally scarce filmy fern spp.	Significant negative impact at Local or Parish level: Probable	Translocation of sections of tree trunk or rocks supporting diverse epiphytic communities	Certain very localised loss of bryophyte community in short to medium term. Likely to be compensated in medium term therefore unlikely to be significant at Local level.
Bats	Low / Local or Parish	Construction – site clearance of trees and cave system	Loss of roost sites and foraging / commuting habitat, and habitat fragmentation;	Significant negative impact at Local or Parish level: Probable	Artificial roost provision: Bat boxes on nearby trees; Preservation and re-location of existing roost features in trees; Direct lights sensitively and fit cowls on artificial lighting	Certain localised loss of potential natural roost sites is likely to be not significant at district level. Certain loss of foraging habitat in medium term is significant zone of influence level but with replanting is likely to be not significant in long term. Probable displacement by artificial lighting in short term is significant at zone of influence level even with mitigation.
		Operation	Displacement due to light spill	Significant negative impact in zone of influence: Probable	Pre-construction climb and inspect and emergence / re-entry surveys for trees and cave system Direct lights sensitively and fit cowls on artificial lighting	Probable artificial light spill displacing Daubenton's bat would be significant at zone of influence level and permanent; Probable higher risk of road traffic mortality for

Receptor	Ecological Value	Proposed activity	Character of unmitigated impact on receptor	Significance without mitigation and confidence level	Mitigation and enhancement	Residual significance and confidence level
				Probable		all bats due to faster moving traffic is significant at local level and long term.
Otter	Low / Local or Parish	Construction – site clearance	Loss of natural habitat foraging and refuge sites	Significant negative impact at Local or Parish level: Probable	Artificial refuge provision near the viaduct (not adjoining structure); pre-construction surveys of cave system	<i>Habitat loss:</i> Certain short term loss of refuges and therefore certain significant impact at local level, but with provision of artificial refuges probably not significant in medium term; Certain habitat fragmentation and displacement due to disturbance in short-term during construction phase is significant at local level.
		Operation	Road traffic mortality / traffic noise and vibration through viaduct structure	Significant negative impact at Local or Parish level: Probable	Adequate watercourse culvert specification; Installation of “Slow” wildlife warning signage;	Probable higher risk of road traffic mortality due to free-flowing traffic resulting in probable significant impact at local level. The risk will be increased if no provision is made for safe access along minor watercourses.
Breeding Birds	Low / Local or Parish	Construction – site clearance	Habitat loss and fragmentation	Significant negative impact at Local level: Probable	Clearance Sep-Feb inclusive; Replanting of redundant road area; Provision and adequate siting of specified nest boxes	Certain loss of foraging and nesting habitat for all species in medium term but probably not significant in long term. Certain loss of nest sites in shrubs and trees for non cavity nesting birds in medium term but with compensation probably not significant but perhaps slight positive impact in long term.
Fish	High / National	Construction & site clearance	Habitat loss	Significant minor negative impact at local level: Probable	Measures to reduce extent of sediment disturbance and suspended solids during construction.	<i>Habitat Loss:</i> Certain permanent but small loss of suboptimal spawning habitat for powan, therefore significant at minor level.

9.10 Monitoring

Monitoring of mitigation for protected species and aftercare of compensatory plantings is vital to evaluate the success of mitigation and make adjustments if required. The following features require monitoring annually for 5 years post development:

- Bat boxes and bird boxes for signs of use or species and numbers present.
- Artificial otter refuges for signs of use.
- Culverts on minor watercourses for signs of otter use.

9.11 Summary and statement of significance

The A82 road improvement scheme at Pulpit Rock will affect a site which supports fairly typical flora and fauna communities for the Argyll and Bute County / Loch Lomond, The Trossachs and Breadalbane Natural Futures area.

However, it will result in total loss of existing habitats within the scheme footprint, principally including Atlantic/western oak woodland, rock and scree, mature and immature trees, loch foreshore, littoral zone waters and littoral sediments within the loch itself.

These habitats support or are likely to support communities of plants and protected fauna such as epiphytic plants, bats, otter, pine marten, birds and fish, and other wildlife.

Predicted impacts have been identified and mitigation, compensation and biodiversity enhancement opportunities have been applied where significant effects are anticipated.

There are some minor significant residual impacts remaining which although acting at a local scale are all related to the loss of established woodland habitat which is only replaceable in the long-term, especially mature trees. The habitats on site support scarce bryophytes, otter, breeding birds, bats and potential bat roosts in trees and a loch shore cave system. Although an attempt to compensate for the loss of some of these features will be undertaken through provision of replanting and artificial sites, the use and therefore success of artificial roosting, resting or nesting sites by species is not guaranteed. However, overall the impacts from the scheme are not expected to compromise the favourable conservation status of species' populations in the Loch Lomond and the Trossachs and Breadalbane Natural Futures Area and in the long-term the residual impacts will not be significant.

9.12 References

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