1. INTRODUCTION
With renewed interest in developing hydroelectric schemes in Scotland (both large and small) there is a need for more comprehensive guidance on the natural heritage impacts associated with these developments. SNH Guidance ‘Guidelines on the Environmental Impacts of Windfarms and Small-scale Hydroelectric Schemes’ (2001) has been revised here to focus on impacts associated with all types of hydroelectric developments. We support the development of hydro schemes and this guidance aims to help developers identify, account for and, where necessary, mitigate against impacts on the natural heritage.

This guidance will be used by SNH staff to help formulate our advice on individual applications, particularly at the pre-application stage where we can influence the design of the development. The guidance does not provide advice on when we should or should not object to an individual application, nor does it set any new standards or thresholds. The advice is focused on design issues and mitigating environmental effects.

Planning Advice Note 45, Renewable Energy Technologies¹ is an additional source of background information on the basic processes behind each technology and detailed technical guidance is not provided here.

1.1 Structure of the guidance
This guidance concentrates upon the natural heritage impacts associated with hydroelectric schemes which are of concern to Scottish Natural Heritage (SNH) and complements the recently published Scottish Environment Protection Agency (SEPA) ‘Guidance for applicants on supporting information requirements for hydropower applications’, which focuses on impacts upon the water environment only. Developers should refer to both of these guidance notes when developing a scheme.

Key elements covered by this guidance include: impacts on wildlife and habitats; landscape and visual impacts; impacts on recreation; access and enjoyment; indirect or secondary impacts as a result of changes in land use; water quality and hydrology; and potential cumulative impacts. The guidance also provides a general background to our renewable energy policy and our role in the development process. There are other environmental impacts including those on the built heritage, the effects of noise on neighbouring properties, safety and traffic. These impacts are within the remit of other organisations, including planning authorities and the Health and Safety Executive, and are not considered in any detail within this guidance. A Scoping Checklist is provided in Annex 1. Sources of Further Information are provided in Annex 2.

1.2 SNH’s general policy position
We support the development of renewable energy as part of Government targets to address climate change and that renewables are developed alongside energy efficiency targets and measures to reduce energy demand. Our Policy Statement on Renewable Energy states:

‘We seek a strategic approach in which renewable energy development is guided towards the locations and the technologies most easily accommodated within Scotland’s landscapes and habitats without adverse impact, and which safeguard elements of the natural heritage which are nationally and internationally important.’

¹ To be updated later in 2010
We support the development of hydroelectric schemes in appropriate locations and with suitable design and mitigation. This guidance seeks to identify design principles and guide developers towards less sensitive locations. We seek to balance the climate change and economic benefits of hydro schemes with the impacts on the natural heritage.

2. LEGISLATIVE CONTEXT AND SNH’S PROCEDURES IN THE DECISION MAKING PROCESS

2.1 General legislative framework
Section 36 of the Electricity Act (1989) sets the threshold of 1 MW for any new hydroelectric scheme\(^2\), above which the application must be submitted to the Scottish Government for consent. Any scheme below 1 MW will be subject to planning consent procedures, with the application determined by the Local Planning Authority.

As a statutory consultee and natural heritage adviser, we deal with renewable energy proposals, applications and enquiries through a number of mechanisms. Reference should be made to our Renewable Energy Service Level Statement, which sets out the level of involvement which we are able to offer at each stage of the consultation process.

\[\text{Stream in a semi-natural upland environment, typical of those favoured for hydro schemes}\]

Determining authorities are obliged to consult us on applications affecting certain designated areas such as Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs), National Scenic Areas (NSAs), and on all applications where an Environmental Statement has been submitted (see Section 2.2 below). Applications some distance away from a designated area may also affect its interests, e.g. by changing river flow regimes, and advice should be sought from SNH. The determining authority may also consult us on other applications, though the level of response we offer may be influenced by available staff resources.

\(^2\) NB – the Scottish Government are consulting, at the time of writing, on the scope to raise the threshold to 50MW.
We look towards the consenting authority to take a lead role in developing the wording of suitable conditions to accompany a planning consent. We will provide advice on the issues to be resolved by conditions through our written submission.

2.2 Requirement for environmental impact assessment
Under the Environmental Assessment (Scotland) Regulations 1999, a developer will be required to undertake an Environmental Impact Assessment (EIA) and produce an Environmental Statement if the proposal is likely to have significant effects on the environment.

The criteria against which the significance of the environmental effects is judged are whether: a project is of more than local importance; a scheme developed in a particularly sensitive location such as a Site of Special Scientific Interest (SSSI) or National Scenic Area (NSA); or a scheme would give rise to particularly complex or adverse effects, for example the discharge of pollutants. Planning Advice Note 58, Environmental Impact Assessment, is a useful source of information on the requirements for an EIA.

Measuring levels in the river as part of the EIA process

A developer must prepare and submit an Environmental Statement under Schedule 1 of the Regulations for any proposal to develop a dammed hydroelectric scheme with a water holdback facility exceeding 10 million cubic metres. For smaller schemes under Schedule 2 of the Regulations a developer must also carry out an EIA if the proposal is likely to have significant effects on the environment. Circular 8/2007 provides further guidance.

2.2.1 Information requirements
In order to identify the landscape and visual impacts of a hydroelectric scheme it will be necessary to have firm details of the scale and location of the components of the scheme.

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e.g. the intake, the penstock, pipeline or canal, the turbine house, the tailrace and tracks. Without these details an assessment of landscape and visual impact will not be possible.

Other aspects of development that are integral to the proposal include the following:

- a separate application for grid connection;
- an application for aggregate extraction, to build a dam, tracks, etc;
- an application for forest clearance, e.g., if this is necessary for site preparation, including the construction of a reservoir; and
- an application for consent for water abstraction, necessary to create either a storage or a run-of-river scheme.

Cumulatively, the impact of related infrastructure – and neighbouring hydro proposals - may be significant, and the most effective means of identifying impacts on the natural heritage is to have all applications available at the same time and addressed by a single EIA.

The advantages of having all applications prepared simultaneously and addressed by a single EIA are clear. The advantages to applicants include reducing the time between first and final applications and reducing the likelihood of being asked to produce additional material for the EIA. However, there is no statutory requirement for the applicant to prepare and provide all applications simultaneously.

2.3 Requirements for habitats regulations appraisal
We have a statutory duty to secure compliance with the requirements of the EU Birds & Habitats Directives. Of particular relevance is the need to advise on potential impacts of proposals within or affecting SACs and SPAs as required by the Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007 (usually referred to as the ‘Habitats Regulations’). SACs and SPAs are known collectively as ‘Natura’ sites. Where Natura sites may be affected by a proposal, the determining authority (known as the ‘competent authority’ in this context) is required to undertake a Habitats Regulations Appraisal. This may include an ‘appropriate assessment’ to ascertain that the integrity of the site will not be adversely affected by proposal. Our comments will include specific advice on this assessment. If adverse effects cannot be ruled out, then the proposal can only go ahead in the absence of alternative solutions and for imperative reasons of overriding public interest. This decision would be taken by the determining authority.

For further information on the requirements of the Habitats Regulations for Natura sites please visit our website. Natura site details, including qualifying interests, conservation objectives and site boundaries, can also be accessed on sitelink. Guidance on the implementation of the Habitats and Birds Directives in Scotland is available in ‘Revised Guidance Updating Scottish Office Circular 6/1995’ (SERAD June 2000). Guidance on the information that will need to be included in any application to SEPA for a CAR authorisation is also available.

2.4 National designations
The presence of a national natural heritage designation such as a SSSI or a NSA is an important planning consideration. This does not mean that development is precluded by such a designation, but proposals will require to be assessed for their effects on the interests which the designation is required to protect. Information on designated sites and
their qualifying interests can be found on sitelink. In our responses to consultations, the likely effect on designated sites will be a key consideration.

2.5 Protected species
Hydroelectric schemes may also affect species that are protected under domestic or international legislation. The species that are most likely to be encountered are Atlantic salmon, lamprey, otter, freshwater pearl mussel, water vole, river jelly lichen and, where there are structures or old trees that are likely to be affected, bats. In some upland situations consideration should also be given to the possibility of the presence of wildcats. For most species this protection extends to places used for shelter, protection or breeding. Several species, including otter, wildcat and bats are given strict protection under the Habitats Regulations. These species, known as European Protected Species (EPS), are protected from intentional or reckless disturbance and their breeding sites and resting places are protected from all types of damage or destruction wherever they occur.

Note that where EPS such as otter are present as a qualifying feature of a Natura site then they will have to be considered a qualifying interest of the site as well as an EPS. Further guidance on protected species is available on our website.

A number of species, such as Atlantic salmon, brook lamprey, river lamprey, sea lamprey and Arctic charr are provided with strict protection within sites designated for nature conservation, such as SSSIs. Outwith these sites, the impact of new hydro developments on other vulnerable fish species, such as the European eel and trout, will also be considered. These species are important components of a functioning, and healthy, aquatic ecosystem. In wooded ravines, the impact on a range of bryophytes (mosses and liverworts) and lichens that depend on sheltered humid conditions will also require consideration.

2.6 Requirements under Land Reform (Scotland) Act
Everyone has access rights established by the Land Reform (Scotland) Act 2003. Access rights must be exercised responsibly. These rights apply to most land, including mountains, moorland, woods and forests, grassland, margins of fields in which crops are growing, paths and tracks, the coast and most parks and open spaces. They also apply to inland water including rivers, lochs and reservoirs.

Scottish Planning Policy highlights the importance of access rights in development management and indicates that planning authorities “should consider access issues and should protect core and other important routes and access rights” (paragraph 150) when making decisions on planning applications. It
also indicates that “new development should incorporate new and enhanced access opportunities, linked to wider access networks”.

Scottish Government Guidance on the Land Reform (Scotland) Act 2003 advises that prior to the commencement of works, a detailed plan for public access across the site (during construction & upon completion) should be provided to the satisfaction of the consenting authority. This will show:

- any area proposed to be excluded from statutory access rights, for reasons of privacy, disturbance or curtilage;
- the lines of all existing paths, tracks and rights of way;
- details of all paths, tracks or other access facilities to be provided for the use of walkers, riders, cyclists and all-abilities users, including water access points where appropriate;
- any closures and temporary diversions of paths proposed for the purposes of the development.

Local and National Park Authority access officers can provide advice on the access implications of development opportunities. Contact details can be found here.

### 2.7 Cumulative impacts

The development of hydro schemes in close proximity to one another presents a challenge in managing potential cumulative effects. These effects could be on a variety of issues, such as the habitats and species in and around watercourses or the local landscape. The rapidly increasing number of smaller-scale hydro developments has increased the potential for cumulative effects. Care is required in the planning of hydro proposals, to take account of nearby schemes.

Cumulative impacts may arise from a collection of small-scale run-of-river schemes along a particular water body, and could also be relevant to two or more storage schemes in catchments in close proximity and of equal importance to particular species (e.g. within bird feeding range) or a particular viewpoint. Possible cumulative impacts could include:

- pressure on available local water resources;
- landscape and visual impacts within a glen or catchment area (especially from particular viewpoints e.g. within National Scenic Areas or along Rights of Way) both from the structure and any ancillary developments;
- disruption to migratory/ feeding areas for species within a catchment area and subsequent knock on effects on the feeding areas of terrestrial species (which could include inter-catchment transfers).

Cumulative impacts should be treated as a material consideration by the consenting authority. Cumulative effects can also occur between hydro schemes and other forms of development such as windfarms and roads. Cumulative effects are particularly important in relation to natura sites and will require detailed assessment.

### 3. HYDROELECTRIC SCHEMES: TECHNICAL ASPECTS

Hydroelectric power involves the extraction of energy from moving water. The amount of power available at a given site will be determined by both the volumetric flow of the water and the hydraulic head or water pressure.
Hydroelectric developments fall into two types: storage or run-of-river. A storage scheme involves the construction of a dam to create a reservoir of water from which flow is controlled to provide energy for turbines and movement of water downstream. Pumped storage schemes allow water to be pumped back up to the reservoir at times of low electricity demand, making use of cheap excess power and providing capacity for periods of high electricity demand. Run-of-river schemes divert water flow down a pipeline to power a turbine and then return the water directly to the river. Most run-or-river schemes will require a small impoundment to control flows.

There are an increasing number of low-head schemes being proposed and developed throughout Scotland and these have also been considered within this guidance.

4. POTENTIAL NATURAL HERITAGE IMPACTS FROM HYDROELECTRIC SCHEMES AND CONSTRUCTION ACTIVITIES.

4.1 Overview
In the 1940s and 1950s there was a UK Government supported programme of constructing large-scale hydroelectric schemes, mainly in the Scottish Highlands. This resulted in a large number of schemes in Scotland, most of which are still in operation today and which provide around 10% of Scotland's electricity needs. The development of some of these large structures led to significant environmental impacts, including the construction of large imposing concrete dams, the flooding of river basins, large drawdown scars, the loss of freshwater habitats and species, and the loss of recreational resources. This guidance seeks to learn lessons from existing developments to inform the siting and design of future hydro-electric schemes.

4.1.1 Wild land
While the term 'wilderness' is often used to describe the wilder parts of the globe, it is best avoided in Scotland, where most wild land shows some effects from past human use. The best expression of wildness is to be found in the more remote mountain and moorland cores, on the most isolated sections of the coast and on uninhabited islands. Natural character, remoteness and the absence of overt human influence are the main attributes of wild land.

Wild land can be described as extensive areas where wildness (the quality) is best expressed. The appreciation of wildness is a matter of an individual's experience, and their perceptions of and preferences for landscapes of this kind. Wildness cannot be captured and measured, but it can be experienced and interpreted by people in many different ways.

Wildness is a quality which people can find in many different parts of the Scottish landscape, sometimes close to settlements, but normally best expressed in remote upland and coastal areas, especially those

Area of wild land characterised by the absence of man made structures and influences
which lie beyond the existing network of public and private roads. The major expansion of hydroelectric development in the post-war period played a significant role in the loss of wild land through the creation of new reservoirs, power lines and roads.

The development of a hydroelectric scheme may have an impact on the wild land qualities of an area. This will mainly arise from the introduction of built structures, in addition to an increase in activity and noise which may diminish the qualities found and valued in wild places. These depend on a strong sense of sanctuary and solitude, a high degree of naturalness in the setting, a freedom from human activity or influence, the absence of any built structures and a sense of awe or, for some, a sense of challenge. Wildness is essentially a perceptual quality, experienced by people at different levels of intensity, according to the setting, their sensitivity to such experience and their experience of other wild locations. Our Policy document ‘Wildness in Scotland’s Countryside’ explores these issues in further detail.

The significance of the effects of a hydroelectric development will depend on its nature, scale, design and location. Generally, however, a well-designed hydroelectric scheme located in a small-scale enclosed glen will have less impact over the wider landscape than large reservoirs with a wide drawdown zone in an open landscape. It is very difficult to mitigate impacts on wildness qualities through design and if a human element can be seen, it often compromises the wildness qualities of any particular area. There are some areas where the qualities of wildness are so valued that any built addition will have a very significant effect.

Increasing recognition of the importance of wildness and wild land can be found in the Scottish Planning Policy. It notes ‘The most sensitive landscapes may have little or no capacity to accept new development. Areas of wild land character in some of Scotland’s remoter upland, mountain and coastal areas are very sensitive to any form of development or intrusive human activity and planning authorities should safeguard the character of these areas in the development plan’ (para 128).

We have published separate guidance on assessing the impacts of development on wild land and this is available on our website.

4.2 Weirs dams and intakes
The intake generally consists of a structure (a dam or weir) behind which water accumulates to a depth sufficient to ensure a flow into the pipeline often via an intake chamber. Screens to prevent debris and fish entering the pipeline/penstock, arrangements for the removal of accumulated sediment and devices for measuring and monitoring flows can all form part of the weir structure. In some cases more than one weir/dam may be required on a water body to prevent egress at points other than the desired outflow.
Potential impacts on habitats & species
Construction of an intake structure can have both direct and indirect impacts on habitats and species. Such a structure can have serious implications for species that may be present within, or on the banks of, rivers including otters, fish, lichens, plants and freshwater pearl mussels. An intake for a hydro scheme can also isolate important fish and invertebrate populations, especially if their free upstream and downstream passage to important habitats is not maintained. Possible indirect effects can include reduced sediment supply downstream, and the pooling of the watercourse upstream of the new structure.

The intake can also damage fish if it is not properly positioned or screened. Good intake design and careful screening should mean that the local fish populations are not adversely affected at any stage in their life-cycle. Guidance is available which provides information on appropriate flow and screen design requirements for migratory salmonids. An increasing number of hydroelectric developments seek to utilise existing historical structures such as mill weirs as part of their intakes. These are likely to be ‘low-head hydropower’ proposals which have benefit of turning historical liabilities into a financial and environmental asset.

Whilst the use of existing structures may seem sensible and cost-effective, a key conservation remedy on a number of our most important rivers is the restoration of physical habitat that has been degraded by structural modification to the channel and its banks. We are working on strategic restoration plans for several affected SAC rivers, which may involve the removal of modifications to allow the recovery of natural geomorphological processes. In such rivers it will be in the best long-term interests of the

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4 SOAFD (Scottish Office Agriculture and Fisheries Department). 1995. Notes for Guidance on the Provision of Fish Passes and Screens for the Safe Passage of Salmon
SAC if a structure such as a historic weir is removed, rather than remain to support a hydro scheme.

The impact of low-head hydroschemes on fish populations is poorly understood. However, water abstraction in such schemes has, in some situations, resulted in low flows that negatively impact fish species downstream of the structure. Low flows can result in a loss of habitat suitability, either through dewatering, reducing sediment transport, increasing water temperature or by changing the behaviour of migratory fish. Turbine strike is the most common cause of mortality for fish which enter hydro schemes through penstocks or tailraces. Some low-head turbine designs, such as the Archimedes Screw, are often considered to be less damaging to fish than conventional turbine types. This has yet to be demonstrated and it is likely that some species may be more vulnerable than others, either during migration or at other stages of their life-history.

Potential impacts on the quality and quantity of water
Dams and their associated reservoirs reduce the amount of suspended material which is transported downstream by reducing water velocity and altering patterns of erosion and deposition. This is particularly true of shallower rivers. Reductions in water depth and flow can affect the availability and distribution of fish spawning and holding habitats. It can also affect the suitability of some streams to host invertebrate species such as freshwater pearl mussel.

Bypasses at intakes can ensure that the watercourses always contain appropriate residual flows, which ensures seasonal river flow variations are maintained. This is discussed in more detail in the SEPA guidance.

Potential landscape and visual impacts
The impact of such a structure will depend on its design and “fit” with the surrounding landscape and its height, form and materials. This will also be influenced by whether the intake is visible and/or audible as this will attract attention. If a structure restricts or traverses a water body it may appear obstructive and create a strong artificial edge which appears very dominant as an element preventing natural flow of both water and views. Debris and sediments may collect where there is restriction of surface flow, highlighting the presence of an obstruction and creating a negative image.

Any structure that cuts across a natural water channel will become a new focal point in the landscape, as a consequence of the structure itself, any impoundment behind it and the altered flow regime downstream. Adverse landscape and visual effects will particularly arise where the form and scale of the intake structure contrast sharply with the dominant natural forms of loch, river channel and adjoining landforms.

To minimise adverse effects, the design of the whole structure should be kept as simple as possible with the form of the weir relating to prevailing landforms and the finish being of a texture and colour that relates to local ground cover, e.g. outcropping rock/vegetation. Protection from spate conditions is often best provided by wing walls which tie sensitively into natural rock prominences at the edge of the channel, i.e. with no hard linear edges. Both rock armouring and gabions (rock-filled wire baskets) tend to increase the clutter of different forms and materials. To the same end, measuring devices and gauges should be kept as low in profile as practical and fencing avoided if possible.
When stone facing a large structure, large units of stone can be used to help give the appearance of weight and mass, even though the stone is not necessarily performing a structural role. However, when facing smaller structures it can be difficult to build something where the applied stonework facing “reads” as an integral part of the construction, and does not appear superficial.

When a weir is to be constructed on a watercourse where migratory fish are known to be present the proposal will have to incorporate some mechanism/device by which fish can pass upstream of the weir. This is likely to mean a more visually complex weir structure, which is more difficult to integrate into the surrounding landscape.

For the duration of construction an area will need to be established close to the weir site for the purposes of storing materials, plant, accommodation, batching concrete etc. The extent of this area will depend on the scale of the project and methods adopted e.g. whether concrete is to be flown in or not; or fuel to be stored on-site. The preparation of the construction area, (removal of vegetation, levelling, grading, bunding), its use (increased activity and clutter) and restoration and reinstatement (re-shaping, replacing vegetation etc) will all have landscape and visual impacts in addition to those of the weir itself.

The landscape and visual impacts of reduced flows in rivers and burns should be assessed, i.e. effects on waterfalls, boulder areas and pools. Any overall effects on the character of a glen for example, and the river as a feature within that glen, as a result of reduced flow, should be assessed. Locations where there are open, or otherwise important (e.g. close-up or popular), views of the river are particularly important.

Potential impacts on recreation & access
The landscape and visual impacts described above can all affect the quality of recreational experience. Hydroelectric developments can also physically affect the recreational use of an area. A dam may enhance access by providing a bridge across a glen through which access was previously limited. The Scottish Outdoor Access Code states that dams are ‘regarded as structures and in these cases access rights do not apply’. However, the Code does
encourage owners to support access across dams where there are no safety issues (refer to Sections 4.23, 4.24 and 4.25 of the Access Code for further guidance).

Depending on the design and structure of the dam, it may also be adapted to create additional recreational opportunities for canoeists. Timed releases from reservoirs that are openly publicised and minor river bed alterations can enhance the area significantly. Conversely, negative impacts can also arise, especially if a previously navigable river will now be obstructed and there is a need for canoeists to portage around the dam. In the case of small weirs, if the watercourse is used by canoeists, a means by which to allow continued water-borne travel may need to be considered in a similar way to fish ladders.

Consideration of the use and value of burns and rivers for water-borne recreation should be part of our assessment of all schemes which entail the construction of weirs and dams.

### 4.3 Impoundment

The need for impoundment distinguishes between run-of-river and storage schemes. Impoundment of water is not always essential for a small-scale hydroelectric development but is common for larger hydroelectric schemes. However, for all hydroelectric schemes, the water supply must be reliable in flow and of a suitable depth to be extracted. Wherever a weir is constructed and water levels raised it is likely that some level of water impoundment will result. In a small run-of-river scheme where naturally deep pools may already exist, this backing-up of water may be minimal. In some situations, however, water impoundments can be substantial.

*Impoundment structure on an upland stream.*
Potential impacts on habitats and species

Key impacts of this water storage regime include the loss of terrestrial, wetland and riverine habitat through upstream inundation. There can also be changes in downstream bankside plant populations as a result of less frequent and reduced downstream flooding and spray/humidity. This can affect plant species requiring moist conditions, notably bryophytes. Disruptions to flow may be particularly problematic during construction. Disruptions to overall geomorphology, flow regimes and wider habitats are typically much greater when a proposed development includes an impoundment for water storage.

In addition, impoundments may destroy spawning areas for Atlantic salmon, trout, and lamprey through inundation or may result in the loss of valuable holding areas for juvenile fish. Downstream of run-of-river developments, spawning reaches may remain, provided compensation flows are sufficiently generous to allow adult fish easy access and they remain wetted throughout the entire egg incubation period. Depending on the nature of the impoundment or the level of compensation flow, changes in surface and hyporheic water temperature may also be an important consideration. Impoundments are also likely to interrupt the downstream transport of riverbed material (e.g. gravel) which can affect the geomorphology of the river and, in time, the habitats and species that the river supports. For species such as freshwater pearl mussel that obtain their nutrients from filtering water, impoundments can have a less obvious, but still negative, impact on their growth and survival.

Where impoundments are large and add to existing lochs, species which are already present in these may be affected by either the inundation of littoral habitats (marginal shallow water where light can penetrate to the bed) and/or drawdown during periods of peak production. Species such as Arctic char, which spawn in lochs may be affected if drawdown occurs when eggs have been laid in littoral habitats. It is important to recognise the need to maintain access from these standing waters to inflowing and outflowing streams for fish which may use these as spawning habitats.

Species such as Atlantic salmon, trout and even Arctic char, are known to utilise these littoral habitats. Where the drawdown zone is wide, aquatic plant species and invertebrates may be unable to colonise these areas. This has consequences for species which predate on those species affected. Rapid changes in water level can also directly affect breeding birds such as black-throated divers and can have significant impacts on riparian mammals such as otters and water voles.

Potential landscape and visual impacts

If impoundment causes the formation of a new reservoir, the landscape and visual effects will require assessment on a case by case basis. This will create a focus of visual attention and will create a wide area of open space within a previously more contained area. In this way it can appear to ‘even-out’ the local landform and make it seem more horizontal.

The visibility of a reservoir will be increased by variable water levels causing a drawdown scar. The landscape and visual impacts of this will depend on the width and depth of the drawdown zone and the nature of the vegetation and soil around it and the ground exposed underneath. Where drawdown levels occur in moorland areas, erosion of the peat edge of the reservoir may reveal bright and light coloured rocks ‘bleached’ by acidic

5 The hyporheic zone is a region beneath and lateral to a stream bed, where there is mixing of shallow groundwater and surface water.
waters. In such instances visibility of the reservoir will be greatly increased in distant views as this bright and light coloured outline of the loch edge appears to isolate it from its surroundings. Impacts can arise from the direct visual effect of this new feature or from the perceived effects on wild land quality.

Close up views of the reservoir edge may also be drawn to an ‘unnatural’ mix of aggregates making up the drawdown beach. These often seem incongruous as they may represent unnatural patterns of deposition or erosion, and create a visual barrier between the reservoir and its surroundings.

The proposed water management regime needs to be considered in relation to its implications for loch drawdown. When attempting to assess the landscape and visual impact of the likely drawdown maximum and minimum levels (natural and managed), the duration of the maximum and minimum levels and the timing (season) are all relevant.

Also relevant are the steepness of the shoreline, the nature of the soil and rock strata and the vegetation cover, all of which can have an effect on the extent of drawdown and visual prominence.

**Potential impacts on recreation & access**
The landscape and visual impacts noted above can all affect the quality of recreational experience. Reservoirs may create opportunities for positive access provision. There is an opportunity to manage access either to the man-made structures or by providing access infrastructure such as car parking, toilets etc where you want to encourage people to go. Such a resource could provide inland sailing, fishing, canoeing and rowing opportunities.

A hydroelectric scheme may result in changes of water levels downstream, affecting recreation in these locations, particularly for fishing or canoeing. During these times water levels may change dramatically and constitute a significant safety issue for anglers and canoeists.

The development of a reservoir or the raising of water levels along a river may result in a loss of access routes through a landscape, particularly where glen floors have traditionally been used as access routes. However, it may allow access via a different method, e.g. by canoe, to the same resource.

**4.4 Penstock**
A penstock or pipeline links the flow of water between the head and the turbine building. Penstock pipes may be laid above ground or be buried underground. Some pipes are flexible and need to be buried to maintain their strength. In areas where the soil is shallow, and there is an abundance of exposed or shallow rock to navigate, it can be very difficult to bury pipes without considerable ground disturbance or engineering works (e.g. rock blasting). Substantial concrete blocks are generally required at corners or bends in pipelines. In low-head schemes the requirements for pipes is often not necessary.

**Potential impacts on habitats & species**
During the construction of tracks or pipelines, there may be loss of riparian vegetation and, in upland stretches, there may be removal of bank side vegetation. This can reduce shading and ambient humidity, creating impacts on internationally important bryophyte communities. Terrestrial habitats along any pipeline route will also be disturbed during construction and, unless restoration is sufficient, in the long term too. Open channels can
trap some species and a way out should be provided. Pipeline routes should avoid native woodland, particularly where the woodland has not previously experienced disturbance, as is the case in many wooded ravines. Any trees that are felled should be left in-situ where possible to supplement the local deadwood habitat.

Large boulders are an important habitat for some species of bryophyte and lichen. To minimise the impact on these species, these boulders should either be returned to their original position and orientation or relocated in similar nearby habitat.

The abstraction of water through a pipeline between the intake and powerhouse will clearly result in reduced water flow in the watercourse. This risks having a serious impact on any habitats and species present. To prevent damage to important habitats and species it is important that sufficient flows are maintained. At particularly sensitive locations, hydro schemes may need to cease abstraction at low flows (e.g. Q85 or Q95 [please refer to SEPA guidance for terminology definitions]) and/or provide sufficient flow variation to maintain viable habitats.

However some locations with particular habitats and species are likely to be too important and sensitive to reduced flows to co-exist with hydro schemes. Examples could be some sites designated as SSSIs and SACs, many freshwater pearl mussel populations and some locations that support internationally significant riparian habitats that are dependent on high humidity.

Where a proposal for a hydroelectric scheme involves the transfer of water between two previously unconnected catchments or water bodies there is the potential for effects on species and habitats in the receiving water body because of potential changes in the water chemistry. The transfer of water between catchments may also result in the unintentional transfer of invasive non-native species, or species which are locally non-native to recipient waters. Issues such as these should be carefully considered when
cross-catchment water transfers are proposed. Insufficient control during operations could also result in occasional pollution spills from turbine lubricants.

**Potential landscape and visual impacts**

Above ground penstocks will create a strong linear feature within the landscape. They tend to be most notable in an area which appears largely undifferentiated; here, a penstock will create a dominant visual edge or divide through the landscape. In contrast, a penstock may appear more rational in a landscape which possesses existing linear features, for example following the route of a road or watercourse. In this context it may appear less incongruous, although it may also seem to dominate the qualities of these features.

The colour of a penstock pipe will affect its visibility and the nature of the image it creates. This is an important distinction to make because the pipes usually pass over vegetation and this varies throughout the year with seasonal differences. It is very difficult to choose a colour of pipe that blends in at all times of the year to limit visibility. It is generally more successful to colour the pipe so that it relates to the shades and hues of the surrounding land through all seasons. In moorland areas, this may be a mid brown or olive green. In grassland areas, a mid green or brown may be appropriate. Plastic pipes fade over time in sunlight and a lighter colour will be likely to be more visible in the landscape. In terms of texture, pipes tend to appear less prominent and contrasting to their surroundings where they are of a matt surface, avoiding light reflection.

The location of penstock pipes underground will result in minimal visual impact once surface vegetation has adequately re-established; however, this may take considerable time within certain parts of Scotland where recovery rates for vegetation and peatland are extremely slow. In some locations, particularly montane or blanket bog environments, it may be questionable whether disturbed vegetation will ever recover. This will obviously be affected by the methods of construction and operation, but also drainage and grazing if a cleared surface encourages run-off or if sheep or deer favour the newly established vegetation upon the buried pipe. Restoration using whole turves is the preferred method.

The use of an open channel, similar to that of a canal structure, is unfamiliar within most upland landscapes. These engineered routes may seem incongruous as they often link two points in the shortest distance, rather than following the ‘lie of the land’ like a natural watercourse.

The impact of a pipeline will depend on its route, but also the nature by which it changes direction, for example sharp corners or smooth curves, and its material of construction.
Light coloured concrete often stands out in a moor or grassland area whilst a darker material may appear more fitting.

**Potential impacts on recreation & access**
Under the Scottish Outdoor Access Code such structures are outwith the current access rights, and as such construction of these structures effectively removes access rights from the affected areas of land. The visual impacts described above can have detrimental effects on recreational opportunities.

On watercourses used by canoeists, water abstraction and return points can constitute safety hazards. Careful assessment of flow-rate data for run-of-river schemes is required to determine whether there will be a significant reduction in the number of paddle-able days on the stretch of river affected by the abstraction. The impacts will depend on the importance/value of the resource: local, regional, national (see the [Scottish Canoe Association](https://www.scottishcanoeassociation.org) for further information) and the nature and scale of impact.

### 4.5 Turbine buildings

The turbine house usually contains the turbine, the generator and associated electrical equipment. The turbine will be sited to optimise the trade-off between the length of the headrace and the drop in water level, but there is a degree of flexibility when determining its location. There may be scope for careful siting or partial burial, where this would reduce the visual impact of the building. In order to minimise the length of the tailrace, the turbine house will normally be situated close to the watercourse.

**Potential impacts on habitats & species**
There can be direct habitat loss associated with the land the building is located on, and disturbance to the immediate surroundings though, if well located, these should be minimal. There can be loss of habitat through the construction of access routes to the building(s). There can also be disturbance to some species such as bats and birds, especially in remote areas, through construction and general access to the buildings. There are also the disturbances associated with noise, lighting and regular servicing of the turbine itself. However, there could be some positive outcomes from the construction of a turbine building through the creation of new habitats, e.g. for bats, and this could be encouraged at the initial design stage.

**Potential impacts on water quality & hydrology**
There could be some impacts through domestic or industrial discharges from the building, although appropriate design and mitigation should minimise these to an acceptable level.

**Potential landscape and visual impacts**
The potential impacts of a turbine building will depend on its design and location in direct relation to the character of the surrounding landscape. This will also affect its visibility, such buildings tending to be more obvious within open landscapes. The sympathetic construction material, partial burial and appropriate screening can minimise visual impacts.
turbine building may be underground or partially buried.

The use of green and brown colouring on this turbine house can help it to ‘blend in’ to its surroundings.

There is a distinct vernacular of hydroelectric turbine buildings in the Highlands of Scotland, these tending to be fairly simple and robust in form and of stone construction or facings. This distinct architecture means that these buildings tend to be easily recognisable in relation to their function within the rural landscape. This function is also emphasised where the turbines and other functional components of the buildings are clearly visible, conveying interest as well as a simple rationale for the structure’s presence.

Structures associated with a hydroelectric development can be designed either to appear as part of the landscape, or as an element which contrasts with its surroundings. Whatever the approach adopted in relation to the landscape and the specific function and requirements of the development, it is important for this to respect the rural character of the environment. This means that the use of formal road design and edging, decorative vegetation, lighting, excessive signage and fencing surrounding a building is generally inappropriate. Screen planting may also be inappropriate in some locations.

Many existing turbine buildings appear to extend out of the bare rock slopes of the steep river glens in which they are located. In recent years, however, the cost and availability of stone has resulted in many of these buildings being faced or constructed in artificial, reconstituted materials which may detract from the vernacular architectural design unless they are carefully detailed and built.
Many hydroelectric buildings are surrounded by a profusion of palisades or other ‘urban’ types of fencing which distract from the simple form of the buildings, but also portray an industrial image which increases the sense of contrast with the surrounding rural, and often remote, landscape. In contrast, turbine buildings surrounded by stock fencing and minimal hard surfacing and formal vegetation tend to appear more integrated within their rural surroundings.

Some turbine buildings have exterior lighting which highlights their presence during darkness and on duller days. This increases their visual impact and appears incongruous in rural areas, and particularly remote landscapes, where such lighting is rare. The impact of this may, however, be affected by the type of lighting used; the orange glow of sodium lamps often seem to portray more of an urban image than whiter lights which are also used on private residences. The use of external lighting should therefore be minimised where possible.

The location of most turbine buildings adjacent to water bodies or watercourses may result in severe weathering of the structure. This means that, in order to portray a positive image, such buildings need to be constructed of high quality materials and be appropriately maintained.

4.6 Tail race
After driving the turbine, water is returned to its natural course via the tailrace. Where the turbine house is close to the watercourse, the tailrace will take the form of a short open channel. As slow-moving water can impair the efficiency of the turbine, the tailrace should have a gradient sufficient to encourage a swift discharge of water.
Potential impacts on habitats & species
The tail race, which returns water from the turbine house to the river, may increase flow velocities within the receiving watercourse and this can result in an increased potential for erosion. An inappropriately designed or oriented tailrace can directly threaten species such as the freshwater pearl mussel by dislodging them or by removing the fine and coarse substrate that they require to survive. Displaced material may be deposited downstream, resulting in, for example, the creation of obstructions to migrating fish or the siltation of fish spawning or holding habitat. To reduce concentrated erosion where the tail race meets the river bed, water may also be expelled within a spray. This can have an effect on the flora further downstream.

The water returned to the river by the tailrace also has the potential to distract migratory fish that may be trying to move upstream. This can be mitigated by careful design, orientation and screening of the tailrace. The tailrace should be screened to ensure that migratory species such as Atlantic salmon, trout, lamprey, eels and other fish cannot reach the turbine. Adult salmonids are often attracted to areas of greatest flow during upstream migration and a screen must be provided at the downstream outlet to prevent adult Atlantic salmon and sea trout from entering the outlet of the off-take. In low-head hydropower projects the returning water from the tailrace will often make up a relatively high proportion of the total flow in the river. In such cases the potential to interfere with migratory fish movements is much greater and will need careful consideration.

Potential landscape and visual impacts
The movement and resulting sound of rushing water through a tail race can attract attention. This structure may be above or below ground and designed either as a chute or similar to a natural water course. Visually, a tail race above ground links the turbine building to the outflow watercourse and thus indicates the rationale and function behind these structures. It can also provide interest in conveying variations of hydroelectric use at different times of the day and year. However, in some locations it can also be perceived as an incongruous element at the edge of the river or burn.

4.7 Access tracks - temporary or permanent
Access roads to hydroelectric developments are typically constructed of crushed stone derived from nearby borrow pits, wide enough to enable the passage of concrete mixers, cranes and heavy lorries. A single access track to the turbine house, dam or weir and substation is usually required. For every hydroelectric proposal, a comprehensive assessment of the potential impact of access tracks will be necessary. Guidance on track development can be found in Constructed tracks in the Scottish Uplands.
Existing upland track. Note that a level of maintenance will be required to prevent ponding and erosion / run-off.

The route of access tracks across steep slopes will usually require a high degree of cut and fill, and wide areas where side-casting may be necessary. On steeper, wetter sites, relatively large drainage channels above the track may also be required. These will generally discharge through streams which may cross the line of the track (through culverts) or by side-casting on to the hill ground, which may affect watercourses down slope.

A hill track, like other roads, usually comprises foundations and surface materials, and requires verge and drainage works. The characteristics of these will depend on the nature of the ground and the function of the track as well as plans for future maintenance and reinstatement.

Typical construction of a track involves the clearance of surface vegetation and top soil until a hard bearing sub soil is exposed. The exposed surface of this is shaped, compacted and, where necessary, made up to the required levels. On firmer ground, however, the contractor may simply lay materials on top of the existing surface to create a raised track. Rough grading of the alignment and cross fall of the carriageway is required and provision made for the drainage of the subsoil. Generally cut and fill will be balanced as near equal in quantity as possible to avoid the cost of exporting or importing material.

The impact of a hydroelectric development will be limited considerably if new access tracks can be avoided and other methods of access utilised, for example via the sea or
helicopter. However, if access tracks are deemed absolutely necessary, their impact may be limited where these are routed, designed and managed sensitively. It may also be possible to use temporary floating or rafted tracks and for routes to be partially or fully removed after construction and the vegetation reinstated. On low-head scheme elements are usually quite close together and can often be reached by the same access track or existing route.

Key to the success of access track construction, use and maintenance is the prior development and agreement of a method statement. This should be worded to be exact and enforceable, possibly as a condition of planning permission, detailing step by step processes. It is recognised that some flexibility needs to be built into such a statement however, as unpredictable issues may arise during the construction and operation phases and improved techniques may also be developed. Applicants should be encouraged to ensure the method statement considers all possible scenarios and details exact procedures by which changes can be considered and agreed. Track construction has the potential to have the most significant environmental impacts and requires through assessment and appraisal.

**Potential impacts on habitats & species**

Track construction can have considerable impacts in terms of loss of habitat and ongoing consequences from changes in drainage, erosion and human activity and disturbance. There is also the risk of imported materials being introduced as part of track construction, or the creation of local borrow pits which then need to be reinstated and the habitat restored. Drains are normally constructed to transmit water off a track or divert it away before it reaches this. When a track is cut across a hillslope, it is therefore almost inevitable that there will be changes in the drainage pattern caused by the interception of surface water and ground water flow. Such changes can cause serious disruption and possibly destruction of the complex mosaic of plant communities which usually occur on upland sites.

New tracks should avoid valued areas of native woodland, particularly where the woodland has not previously experienced disturbance, as is the case in many wooded ravines. When widening an existing woodland track, care should be taken to avoid damaging old wayside trees. These trees often support important populations of bryophytes, lichens, fungi and invertebrates. Any trees that are felled should be left in-situ where possible to supplement the local deadwood habitat.

Although it is preferable to avoid constructing a track on steep ground, some slope may be preferable to flat ground where a track surface usually has to be built up to achieve satisfactory drainage. Generally, snow hollows should also be avoided on high ground as these often harbour blaeberry and mat grass.

It is preferable to avoid access tracks passing over areas of peat and it may even be preferable for a track to detour around, the relative costs of greater length of track balanced against the additional costs of constructing and maintaining tracks upon peat. If a track is to pass over peatland, this is usually achieved by either digging out the peaty area and infilling with aggregate or by floating the track over the peat using geotextiles, the use of this method is now becoming more common place. Further guidance is available in ‘**Floating roads on peat**’ a joint publication between SNH and FCS.
Erosion is a common consequence of the construction of access tracks. On the lower side of tracks the impact is burial of vegetation by erosion debris. On steeply sloping ground, deposits of sediment have been recorded up to 100 m or more from a track. The effect of sediment deposition appears to be most serious on ground above 750 m where the vegetation is short and where growth is slow due to the harsh climate. Studies on higher mountain areas have shown that where erosion debris has buried vegetation, recovery at best has taken several years and has been negligible with depths of sediment over 7 cm.

For these reasons, impacts can be minimised by avoiding steep gradients along a track, by incorporating bridges and culverts that can take storm flow and by routing a track to cross watercourses at right angles to the direction of flow.

When considering restoration and recolonisation, tracks running below the tree line can experience rapid natural colonisation of spoil by a wide range of annual and perennial species, except where the soil or subsoil is very coarse or infertile, or where slopes are steep. There is usually an adequate supply of seed from surrounding ground already present in the soil for colonisation. Above the tree line, re-colonisation becomes progressively slower with increasing altitude attributable to the generally infertile soils and severe climate.

Although some tracks will be needed for both construction and operation phases, some which are built for wide and heavy construction traffic, can be reduced in width on completion of the project. If this is the case partial restoration may be appropriate, reducing the route width by restoring soil and vegetation on one or both sides.

Key factors affecting the successful reinstatement of vegetation along tracks are: timing, in terms of how long the subsoil is exposed and top soil replaced; whether vegetation is replaced as turves or as seeded ground; the extent of excavation, keeping this to a minimum; and ongoing management, for example grazing sheep may favour newly established vegetation so that this is never able to succeed to the climax species and thus always stands out from its surroundings.
Great care must be taken to avoid disturbance to fish and invertebrate species in areas where access tracks cross rivers and streams. Physical damage to riparian and in-stream habitats, siltation and chemical pollution are all issues which have been associated with track construction. Areas may be more sensitive to disturbance at certain times of the year, for example, lamprey spawning beds (redds) are particularly sensitive to disturbance between the months of March and August, depending on the species that is present. Other areas may be particularly sensitive because they contain vulnerable species such as freshwater pearl mussel.

Care must be also taken to avoid disturbance to other European Protected Species such as otters and bats, and species of conservation importance e.g. water voles. Where sensitive species of fish are present, developers should adhere to the advice provided within the Scottish Government publication ‘River Crossings and Migratory Fish: Design Guidance’\(^6\), as well as SEPA’s Pollution Prevention Guidelines for working in or adjacent to watercourses and The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR)\(^7\). It is also worth noting that authorisation under CAR will likely be required for watercourse crossings.

**Potential impacts on water quality & hydrology**

The main cause of deterioration of hill tracks is erosion caused by running water. Surface material can also be moved by wind but it is mainly the higher tracks on exposed hills which suffer this type of weathering. On vegetated ground, plant cover breaks the impact of raindrops and helps trap soil particles being carried by the surface water. In contrast, however, newly built tracks comprising extensive areas of loosely consolidated bare ground have very little cover to offer protection from erosion.

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6 available at www.scotland.gov.uk  
7 available at www.sepa.org.uk
The greatest risk of erosion is after a thaw when the subsoil may still be frozen and largely impermeable. The combination of snow melt water and rain can lead to large amounts of surface water run off and localised flooding.

In terms of conserving the existing drainage patterns, floating tracks usually result in fewer adverse impacts as excavated tracks require fill to be applied to the sub-base beneath the peat. This results in a wider area of disturbance as the large amounts of gravel and rock spread out, often as wide as 7-8 m. Serious problems associated with slumping and subsidence can also occur if the development of a road with associated drainage causes the surrounding peat to de-water. Where geotextiles are used, although some alterations to the drainage are inevitable, the barrier is smaller, more permeable and generally does not require as many drainage channels.

Depending on the type of soil cover being lost through track construction and the type of track being laid there may also be a loss of surface drainage, leading to more surface water and possibly localised flooding of the river system.

Perhaps the greatest risk to water quality comes during the track construction phase when vehicles are used to cross small streams and shallow rivers. These vehicles have the potential to damage stream or river banks, which may in turn, lead to increased rates of bank side erosion and local hydrological changes. This, together with the in-stream displacement of fine and coarse substrates may lead to higher than normal levels of suspended solids in waters downstream of the crossing point. Particular care should be taken when local in-stream or bank side material is used during the construction of access tracks and specialist advice should be sought, particularly from SEPA.

The potential for fuel spills is often acknowledged, but the potential for fuel or other chemicals entering streams and rivers from the surface of access tracks during periods of rainfall also exist. Risks may be lessened through the appropriate use of silt traps or settling ponds. Guidance is available from SEPA, Scottish Government, CIRIA (Control of water pollution from linear construction projects) and SNH (Constructed tracks in the Scottish Uplands) on this issue.

Changes to the hydrology of watercourses may occur if culverts or temporary/permanent bridges are used during the creation of access paths. Downstream of these installations, scouring may, for example, erode the stream bed and result in the displacement or loss of valuable fish habitats or freshwater pearl mussel. Great care must be taken to ensure that new structures are properly sited and that hydrological impacts are minimised.

Potential landscape and visual impacts
Many access tracks to hydroelectric developments have considerable landscape and visual impacts in their own right and may be particularly visible where they cross moorland areas with few features, or steeper ground where cuttings and embankments are most obvious. Some upland tracks are visible for as far as 30-40 km in certain conditions.

Upland tracks can be very prominent especially when the colour of material used does not match the surrounding landscape.
The relative impacts of tracks in relation to an actual hydroelectric development may be considerable and vary greatly in relation to how they are routed and designed. For any proposal, there are many options in relation to access and the best schemes generally explore these extensively to arrive at the best solution.

An access track may create a dominant visual line in the landscape whose impact will depend on the visibility and nature of that line. Lines which run along natural edges of a landscape will tend to appear more appropriate on account of the obvious rationale for their route. This is in contrast to a line across an open moorland or hill slope. It is generally much more difficult to introduce lines into open hill or moorland areas which are devoid of any obvious linear elements or landscape pattern. As a consequence, tracks may distract from the intrinsic landscape character in such places.

The landscape and visual impact of access tracks may be limited where they, and any associated earthworks such as cuttings or embankments, are minimised in length and width; and in relation to track surfacing and in terms of disturbance during construction. Many of the moorland and hill areas of Scotland do not recover quickly, easily, or even at all from construction disturbance and thus it is preferable to limit this in the first instance. To this effect, the appropriate layout and design of tracks may influence the siting and design of the hydroelectric development itself.

The visibility of tracks can also be minimised where they are surfaced with an aggregate of similar tone, colour and texture to the surrounding vegetation and where borrow pits are sensitively sited and designed. The use of temporary access provision, such as geotextiles or temporary road structures should be considered to minimise the need for permanent access tracks.

Potential impacts on recreation & access
Access tracks can make easier walking for part of a longer outing and can allow for more diverse forms of recreational enjoyment. However in wild land and upland settings, the construction of a track suitable for maintenance vehicles may create a significant visual intrusion which will detract from the quality of the recreational experience. In some situations there may be scope to link them to existing paths to provide better recreational opportunities, for example by creating circular routes. Overall, the impacts of access tracks on recreation and enjoyment can be both positive and negative and should be considered on a case by case basis.

4.8 Construction & support infrastructure
Electricity connections & transmission
Electricity connections are required to link a hydroelectric scheme to its substation, usually in the form of an 11kV or 33kV overhead or underground line. Overhead lines can either be on double or single poles and can extend considerable distances.

Fencing
Fencing is generally not a large part of a hydroelectric development, although this may be introduced, with gates immediately around turbine buildings, dam walls and weirs for safety.
reasons. Fencing proposed over a wider area as part of a hydroelectric scheme may occur for many reasons, but principally because: a landowner desires greater control over grazing animals; for land ownership boundaries to be defined; because of the perceived need for additional security; and to create or enhance habitats to mitigate against impacts of a development on species. Fencing must not result in unreasonable interference with access rights.

**Substation**
A substation is often developed as part of a hydroelectric scheme in order to house the necessary machinery to convert the electricity generated to National Grid voltage.

**Potential impacts on habitats & species**

*Electricity connections & transmission*  
The impacts of power lines can include impacts on birds due to a potential for collision, and disturbance to habitats during construction. These impacts will obviously depend on the routing and design of the line and its supports.

Impacts on birds are generally minimised where lines are routed underground, although attention needs to be paid to the method of these works and vegetation reinstatement. The risk of collision and electrocution risk to birds can be minimised by avoiding key flight lines and habitats.

Damage to aquatic habitats generally occurs during the access phase, when materials used to connect new installations to the grid are moved into the area. The issues described for access tracks also clearly apply here. Issues, such as timing and the presence or absence of fish spawning sites, freshwater pearl mussel and European Protected Species are key considerations in areas where disturbance is likely to occur. If underground power lines are planned and these are to be placed under small rivers or streams, then careful consideration should be given to the distribution of sensitive sedentary species, such as freshwater pearl mussel, and the impact of that physical disturbance, changes in water quality and the possible modification of in-stream flows will have on them.

**Fencing**
Fencing can have considerable direct impact on surrounding bird life particularly where there are nearby populations of capercaillie or red or black grouse which are prone to collision. Changes in habitat management delineated by fences may also affect bird populations. The need for fencing requires careful consideration and suitable markers should be used where necessary.

**Potential landscape and visual impacts**

*Substation*  
The impact of this, like any new building in the landscape, will depend largely on its siting and design. A substation may be designed much like traditional hydroelectric turbine buildings in Scotland, where its function is very obvious and the building distinctive in its simplicity and robustness next to a tail race; or alternatively, the turbine building may be developed to appear similar to local agricultural outbuildings or domestic residences. Key to whether these treatments appear appropriate will be their combined siting and design in relation to the surrounding landscape and their function.
Given that most hydroelectric developments are located in rural areas, features associated with urban or industrial areas are generally seen as inappropriate, for example metal palisade or chain link fencing, large expanses of hard surfacing and lighting. The location of a substation near a hydroelectric development may also increase the visual complexity of the development, and thus a simple building form with the minimal amount of associated elements such as fence lines and access routes will tend to appear most appropriate.

**Electricity connections & transmission**
The landscape and visual impacts of power lines associated with a hydroelectric development may be considerable in some locations. These impacts will obviously depend on the routing and design of the line and its supports as impacts to the landscape are generally minimised where lines are routed underground. The routing and design of power lines is a complex subject in itself and, unfortunately, many developers leave the detail of design to the electricity company offering grid connection. Careful route selection and design, as well as the consideration of alternatives, is required.

An important impact in relation to a hydroelectric development will be the nature in which a power line leaves the site to link to the National Grid. A hydroelectric development may directly relate to the linear space of a glen whilst power lines can contrast to this if crossing the glen sides or watercourses.

**4.9 Other potential impacts and considerations**

**4.9.1 Landscape character**
Landscape character assessment considers how one landscape is different from another on account of a distinct, consistent and recognisable pattern of physical and cultural characteristics. It describes how these come together and create a particular sense of place and how this is experienced.

Further guidance on the assessment of impacts on landscape character is available in the Guidelines on Landscape and Visual Impact Assessment.  

**4.9.2 Peat slide and landslide risks**
The construction of some elements of a hydro scheme may necessitate groundwork in areas where there is a risk of slope destabilisation, e.g. the construction of access tracks across peatland or along steep valley sides. The risks associated with landslides include the movement of large quantities of rock and earth into freshwater environments to the detriment of aquatic habitats and species. Geotechnical investigations should be undertaken to determine the level of risk associated with development in areas where the stability of rock or earth slopes may be of concern. The Scottish Government publication 'The Peat Hazard and Risk Assessment Guide' provides best practice methods to identify, mitigate and manage peat slide hazards.

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8 The Guidelines on Landscape and Visual impact Assessment (GLVIA - The Landscape Institute and The Institute of Environmental Management and Assessment, 2002).
5. CONTACT
Please direct any queries about this guidance to Kenny Taylor: kenny.taylor@snh.gov.uk
Tel: 01738 458624 or 07901 008450.

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9 http://www.scotland.gov.uk/Publications/2006/12/21162303/0
ANNEX 1

SCOPING CHECKLIST

Please note that not all the points outlined below will be relevant to all schemes.

HYDRO-SCHEME
Weir / Dam / Intake
- What will be the form of the weir or intake structure - a dam, weir or intake pipe?
- Will this be prominent in the landscape or appear part of the glen?
- Will the intake of water be visible, audible or a safety risk to canoeists?
- What provisions are planned to screen the intake to prevent damage to fish?
- Will the structure create a barrier to water borne recreation?
- Will the flow in the watercourse be affected?
- What will be the affect on sediment movement downstream and accumulation upstream? How will this affect fish and other species?
- What aquatic species or habitats are being impacted?

Impoundment
- Is water to be impounded as part of the proposed hydroelectric scheme?
- If a standing water body is to be impounded, what species of fish are present and what are the impacts of drawdown likely to be on them?
- Are migratory fish present and, if so, will a fish pass be installed?
- How large and what shape will the reservoir be?
- Will there be effects on birds (both positive and negative)?
- Will it significantly affect the sense of containment in the surrounding landscape?
- From where will the reservoir be seen and will this be in both long and short distance views?
- What will be the frequency and extent of any drawdown?
- Will terrestrial habitats or species be affected?
- Will this expose the underlying rocks and will these be highly visible in contrast to the water and surrounding vegetation?
- Is there recreational use downstream that could benefit/be put at risk by a sudden release of water?

Penstock / Tunnel / Pipeline / Aqueduct
- How is water to be transferred over land?
- How far and over what route will this travel?
- What terrestrial habitats or species will be impacted?
- How will flow rates be affected and what impacts will this have on water borne recreation and people’s enjoyment of landscape features such as waterfalls?
- If a penstock is to be used, will it be placed above or below ground or somewhere in between?
- From where will the penstock be seen?
- How will it relate to other linear features in the landscape?
- If a penstock above ground is to be used, what materials will be used and what colour will it be? How does this relate to the surrounding land cover throughout the year?
- How will the route change direction? Will there be an access track associated with this route?
• If a penstock is to be buried, is there a method statement for construction and reinstatement of vegetation?
• What is the likely impact of ground disturbance resulting from construction of the penstock/pipeline?

Turbine Buildings
• Is a new turbine building to be constructed?
• If so, what will be its image? Will it look like a small rural building typical of the area? Will it appear as a distinct hydroelectric turbine building?
• Where will the building be sited? Will it have an obvious connection to the tail race and nearby watercourse?
• What is proposed to surround the turbine buildings? Will there be a turning area, storage area, access road or fencing? Will landscape works result in the turbine building appearing to subtly blend with the surroundings, or stand out against them?
• Is exterior lighting of the turbine buildings and surrounding area proposed? If so, can this be switched off at night when not being used?
• Will the development impact on any terrestrial species or habitats of conservation concern?

Tail Race
• What kind of tail race is proposed? A chute, pipe, spray or watercourse?
• Can its design be adapted to accommodate recreational interests?
• Will this be clearly visible and audible and likely to attract attention by the public?
• Is there a risk of erosion at the point where the tail race meets the river? What measures need to be taken to prevent or limit this, and how will it be monitored?
• What provisions are planned to screen the outflow to prevent damage to fish?
• Will the tailrace discharge be the only attractant flow for salmonids where it enters the river?

Landscape Character
• Referring to the relevant landscape character assessment (LCA), what landscape character types will be affected by the proposed development?
• What are the key landscape characteristics of these? How might a hydroelectric development affect these, particularly watercourses?
• What are the key forces for change and guidance for these? Are hydroelectric schemes discussed specifically, or can general pointers on such developments be gained from the overall discussion?
• Referring to the LCA, both in the introduction and landscape character types, how is the landscape valued?
• Are qualities of remoteness or wild land listed as key characteristics of the landscape in which the development is being proposed and from where will it be seen?
• Are there other built features near to the proposed development?
• What implications might these have on whether the landscape can accommodate a hydroelectric scheme at all and, if so, what image should this portray and how should it be sited and designed?
• Is the hydroelectric scheme being proposed in a designated area?
• Would a hydroelectric scheme affect the integrity of this designation?
• Will this depend on siting and design? If so, how?
• Is a hydroelectric scheme likely to affect the intrinsic qualities of a landscape, irrespective of its design?
• How will its human made character relate to the landscape?

Landscape Characteristics Sensitive to Hydroelectric Scheme Developments - Landscape Scale and Containment
• Is the landscape in which the development is proposed of a large or small-scale and exposed or contained?
• Is it likely that the development will dominate the landscape in scale? Will it appear as a dominant focus over a small or large area? Will it have a cumulative effect with other structures of this scale or visual prominence?
• How is the landscape typically experienced? Will the development affect this? For example, is it located next to a road passing through a contained glen where the focus of attention is to the river and foreground?

Landform and Skyline/ Land Use
• Will the development relate to the linear space of a glen? Or will it obstruct or focus visual movement through or across this?
• Do other human features exist in the landscape such as buildings and elements of landscape pattern? How will the proposed development relate to these in its different function, siting and design?

Impacts on Nature Conservation
• How will the scheme affect sites designated for their nature conservation interest?
• What will be the extent and nature of habitat loss or alteration through the development of a hydroelectric scheme?
• How will the scheme affect protected species?
• What will be the impact of reduced flows on aquatic flora and fauna which are not notified features of a designated site?

Potential Impacts of Storage Schemes
• What will be the range of water level changes? What will be the frequencies of these changes? Will the levels and frequencies of drawdown impact upon wildlife and vegetation which are present in and around the site?
• What species will be affected by reduced storage capacity?
• Can the storage scheme be managed to mimic natural conditions?
• How will the proposed development affect migratory species?
• Is a fish pass proposed? What type of pass is this and what are the likely landscape and visual impacts of it?
• Will discharge be regulated?
• Will the patterns of erosion and sedimentation be affected?
• Will the hydroelectric scheme change water temperatures? What species will be affected by this and how can the effects be minimised?
• Will the chemical composition of the waters change? What species will this affect and how?

Run-of-river Schemes
• How will the scheme affect sedimentation and flow rates?
• Will vegetation need to be removed and will the river banks be affected?
• What controls will be laid in place to prevent and limit pollution?
• Are fishing related improvements proposed as part of the hydroelectric scheme and will these have impacts on the natural heritage?
- Will flows below the intake reflect naturally occurring variations in discharge?
- Is the minimum compensation flow adequate to allow the passage of migratory fish species?
- Are flows below the intake adequate to allow in-stream particle movement?
- Will water draw-off be ramped up or down to provide a smooth transition from the generating to non-generating state, producing a slow de-watering and re-watering of margins below the intake?
- Will there be any flexibility built into water management at the site to allow a response to operational monitoring?

**Impacts on Recreation**
- Do people enjoy and value the area for recreation? Is the development likely to affect this?
- Is the area enjoyed mostly for active or passive recreation?
- Will the proposed development result in increased access to the area? Will this affect the existing sense of remoteness? Will it result in the area being enjoyed by a different kind of user?
- Are there any elements of the proposed development which will prevent or limit access?
- How will changes of water level affect recreation in the area?
- Will water and shoreline activities such as canoeing and fishing be affected?
- Will level changes be strictly regulated and is it possible for this to be agreed with those using the area for recreation?
- Do we have any idea of the numbers of people using the area?
- Are there elements of the development that can be modified to improve enjoyment of the resource?
- Have the governing bodies been asked about use of the area and their opinions on the development?
- Can conditions be used to improve the access potential of the area i.e. by creating link footpaths?
- Has full account been taken of the Land Reform (Scotland) Act?
- Has an access management plan been produced in consideration of the model planning condition to show all possible changes to access over the construction and implementation period?
- Is there any evidence that local recreation businesses will be affected?

**Wild Land**
- Is the proposed development in an area recognised for its wild land qualities? Will this impact on the wild land directly or indirectly, e.g. by views or when moving through an area to reach some wild land?
- Would this be considered core wild land (suggested by Highland Council to be more than 5km from a road or track)?
- If not in an actual area of defined wild land, will the proposed development nevertheless impact on an area which possesses some wild land qualities?
- For what and how is the area of wild land most appreciated and valued? Will these characteristics be directly affected by the proposed development?
- Is the area of wild land frequently visited and/or popular for recreation?
- Over what extent of wild land will the proposed development impact? Is this localised or extensive?
Could the proposed development lead to cumulative impacts upon the wild land with other land uses e.g. forestry?

ACCESS TRACKS
- Does the proposed development include creation of new access tracks? If so, have other options for access been explored, for example access from the sea or via helicopter?
- If access tracks are proposed, where will these be routed and how will they be designed, constructed and managed? Has the design process explored alternatives for these and considered the most up-to-date information available, to ensure the best possible solution?
- How is recreational access to the area currently taken? Will the construction of tracks result in a significant detraction of the area’s appeal / a welcome enhancement of recreational opportunities?

Construction Details
- How wide will the track be along straight stretches and around corners? What has determined this width? Is there any possibility of reducing this, possibly allowing lower tonnage or lorry lengths?
- Is there the possibility of reinstating tracks fully or partially after initial construction?
- Will the proposed route incorporate zigzags up a hill side? If so, are there any other route options possible?
- How will the road be drained?
- Will there be cuttings and embankments? How will these be stabilised and re-vegetated?

Landscape and Visual Impacts of tracks
- From where will the access tracks be seen? Will they be seen as separate or together with the hydroelectric development?
- How will the access tracks relate to the key characteristics of the landscape? Are there other tracks or dominant linear elements in the landscape or will the access tracks be seen as incongruous?

Impacts on Nature Conservation
- Over what habitats will access tracks impact? Are these designated sites?
- Will the tracks or track construction affect/ disturb protected terrestrial or aquatic species or their resting/breeding places?
- Are drainage works proposed and will this water control possibly impact on flora and fauna?
- Are tracks being proposed which will cross deep peat? Will these be floating tracks? If not, why not?
- What provision has been made for crossing existing watercourses?
- Will construction material be won from river banks or in-stream areas?

Erosion
- What is the likelihood that erosion of tracks will occur? In what conditions - any times of heavy rain and thaw, or only in exceptional circumstances not predictable?
- How has the route and design of the track, culverts, bridges and drains minimised the risk of erosion?
- How will vegetation be reinstated to reduce this risk?
• What is the risk of ground being eroded from the road and deposited further down, burying the vegetation? How can this risk be reduced?

**Restoration and Re-colonisation**
• How will vegetation be re-established on disturbed ground? Over what extent and what timescale will this occur?
• How will this be monitored and maintained? If this is not successful for any reason, what contingency plan exists?
• What is the most appropriate method of reinstatement for the site - hydro-seeding or using turves? What would be an appropriate seed mix for the area?
• Will newly re-established vegetation be subject to intensive sheep or deer grazing? How will this be prevented to enable climax species to succeed?

**Method Statements**
• Has a method statement been produced? Is this both exact enough to be enforceable, yet flexible enough to enable agreement by all concerned on alternative procedures if evidence on-site reveals more preferable methods?

**SUBSTATION**
• Where is a substation proposed? Is this located to be near the National Grid or the hydroelectric development?
• Will the building appear fitting to the landscape - i.e. sited in an area typically utilised for buildings?
• How will the building be sited and designed? Will the building’s function be clearly evident? Or will it look more like an agricultural outbuilding or a house?
• Will the building have a yard area or hard standing? Will it be floodlit at night, fenced, or with formally maintained grounds?

**ELECTRICITY CONNECTIONS**
• Are underground or overhead powerlines being proposed to link the hydroelectric development to the substation, and then to the National Grid?
• Where are these to be routed and over what habitats will they pass?
• Is it possible to locate all powerlines underground?
• If above ground, what options exist for different routes and powerline supports?
• Above or below ground, has a method statement been produced to ensure sensitive construction?

**FENCING**
• Are fences proposed as part of the hydroelectric proposal? If so, is this for reasons of security, restricting stock or boundary delineation? Are these requirements clearly evident as being necessary? Or might they be a condition of the land sale/lease from the landowner with no direct relation to the operation of the development?
• Will the route of the fence contrast in line to the existing landscape character and the shape and layout of the development proposed?
• Will the fences proposed cross areas sensitive to bird impacts?
• Are the fences crossing any traditional access routes? If so, will stiles or gates be provided?
ANNEX 2

SOURCES OF FURTHER INFORMATION

SEPA - http://www.sepa.org.uk/


- SEPA has introduced new water monitoring and classification systems that will provide the data to support the aim of the Water Framework Directive (WFD): that all water bodies are of good ecological status, or similar objective, by 2015. Monitoring and Classification - http://www.sepa.org.uk/water/monitoring_and_classification.aspx

- SEPA has established, and will continue to maintain, a register of protected areas. The register will help to ensure that water bodies in these designated areas are managed and that they achieve the objectives required by the Water Framework Directive (WFD) and the Water Environment (Register of Protected Areas) (Scotland) Regulations 2004. Protected Areas - http://www.sepa.org.uk/water/protected_areas.aspx

- The river basin management plans (RBMPs) ensure that public sector bodies, businesses and individuals work together to protect the water environment and address significant impacts by co-ordinating all aspects of water management for the next 6 years. River Basin Planning - http://www.sepa.org.uk/water/river_basin_planning.aspx

- Taking a source-to-sea approach and integrating land and water management are essential for the effective protection and improvement of the water environment. This is because impacts on one part of a river basin can often have effects elsewhere in that basin. River Basin Planning – Area Plans - http://www.sepa.org.uk/water/river_basin_planning/area_advisory_groups.aspx

- River Basin Planning Interactive Map - http://213.120.228.231/rbmp/


- The Water Framework Directive (WFD) resulted in the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act) becoming law in Scotland. The WEWS Act gave Scottish ministers powers to introduce regulatory controls over water activities, in order to protect, improve and promote sustainable use of Scotland’s water environment. If you intend to carry out any activity which may affect Scotland’s water environment, you must be authorised to do so. Discharges, disposal to land, abstractions, impoundments and engineering works are all regulated by SEPA. Water Regulation - http://www.sepa.org.uk/water/water_regulation.aspx
- **Regimes** – CAR Practical Guide

- **CAR Charging scheme**

- **CAR Application forms**

- **CAR Guidance**


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**SNHi** - [http://www.snh.org.uk/snhi/](http://www.snh.org.uk/snhi/)


- The purpose of **SiteLink** is to provide easy access to data and information about sites of national and international importance across Scotland. You can view the extent of designated site boundaries, find out the important features of sites and download supporting documents. **Site link** - [http://gateway.snh.gov.uk/portal/page?_pageid=53,910284,53_920284&_dad=portal&_schema=PORTAL](http://gateway.snh.gov.uk/portal/page?_pageid=53,910284,53_920284&_dad=portal&_schema=PORTAL)

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**Scottish Government** - [http://www.scotland.gov.uk/Home](http://www.scotland.gov.uk/Home)

- The Planning System - [http://www.scotland.gov.uk/Topics/Built-Environment/planning](http://www.scotland.gov.uk/Topics/Built-Environment/planning)

- **The Scottish Planning Policy** sets out: the Scottish Government’s view of the purpose of planning, the core principles for the operation of the system and the objectives for key parts of the system, statutory guidance on sustainable development and planning under Section 3E of the Planning etc. (Scotland) Act 2006, concise subject planning policies, including the implications for development planning and development management, and the Scottish Government’s expectations of the intended outcomes of the planning system. **Scottish Planning Policy** - [http://www.scotland.gov.uk/Publications/2010/02/03132605/0](http://www.scotland.gov.uk/Publications/2010/02/03132605/0)

- **Planning Advice Notes (PAN’s)** provide advice and information on technical planning matters. **Planning Advice Notes** - [http://www.scotland.gov.uk/Topics/Built-Environment/planning/publications/pans/Q/editmode/on/forceupdate/on](http://www.scotland.gov.uk/Topics/Built-Environment/planning/publications/pans/Q/editmode/on/forceupdate/on)
- 58 (EIA)
- 51 (Environmental Protection)
- 69 (Flooding)
- 60 (Natural Heritage)
- 45 (Renewable Energy Technologies)


- *In Scotland, applications to build and operate power stations and to install overhead power lines, are made to the Scottish Ministers for consent. Applications are considered by Scottish Ministers where they are generating stations wholly or mainly driven by water.* **Energy consents** - [http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Infrastructure/Energy-Consents/](http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Infrastructure/Energy-Consents/)


- *Scotland's freshwater fish populations are of international natural heritage value and are the basis for fisheries of global renown.* **Freshwater fisheries** - [http://www.scotland.gov.uk/Topics/marine/Salmon-Trout-Coarse](http://www.scotland.gov.uk/Topics/marine/Salmon-Trout-Coarse)

- **Marine Scotland will combine the functions and resources of the former SG Marine Directorate, Fisheries Research Services and the Scottish Fisheries Protection Agency.** **Fisheries Research Services (Marine Scotland Science)** - [http://www.frs-scotland.gov.uk/default.aspx](http://www.frs-scotland.gov.uk/default.aspx)


*The Association of Salmon Fishery Boards* was established in 1932 to protect, preserve and develop salmon fisheries in Scotland. The Association is the representative body which attends to the interests of its members - Scotland’s 41 District Salmon Fishery Boards (DSFBs). Formal remit is to: Represent, co-ordinate and promote the interests of Scottish salmon and sea trout fisheries and generally to take such steps as may be desirable for the protection, preservation and development of salmon fisheries of Scotland and having regard for the environment and other fauna and flora. **Association of Salmon Fisheries Boards** - [http://www.asfb.org.uk/asfb/asfb.asp](http://www.asfb.org.uk/asfb/asfb.asp)

- **RAFTS’** core objective is the ‘Conservation and enhancement of native freshwater fish and their environments in Scotland’. **RAFTS’** - [http://www.rafts.org.uk/home/home.asp](http://www.rafts.org.uk/home/home.asp)
The SFCC is an association of Fisheries Trusts, District Salmon Fishery Boards, the Scottish Government and others interested in the sound management of salmon and freshwater fisheries in Scotland and directly involved in fisheries data collection and use. SFCC - http://www.sfcc.co.uk/

The National Biodiversity Network (NBN) is concerned with making species data available to anyone interested in the UK’s biodiversity. Whether you are a government planner helping to devise new land use policies, a countryside manager who wants to know if an area is protected, an industrial company wanting to carry out an environmental impact assessment or any individual interested in the wildlife in your area, the NBN Gateway will be of use to you. NBN - http://www.nbn.org.uk/About.aspx

The Biological Records Centre is the national focus in the UK for terrestrial and freshwater species recording (other than birds). BRC - http://www.brc.ac.uk/

The Centre for Ecology and Hydrology (CEH) is a public-sector research centre - part of the Natural Environment Research Council (NERC) - which delivers independent research, survey, training and knowledge transfer in the environmental sciences to advance knowledge of planet Earth as a complex, interacting system. CEH - http://www.ceh.ac.uk/science/corpinfo.html

There is a pressing need for greater knowledge of how to manage scarce environmental resources in a sustainable and integrated manner. The Environmental Information Data Centre (EIDC) has been developed to address this fundamental requirement in support of the whole CEH Science Strategy. The primary objective of the EIDC is to provide researchers (both internal and external to CEH) with access to the coordinated data resources and informatics tools required to deal with complex, multidisciplinary environmental questions. EIDC - http://www.ceh.ac.uk/sci_programmes/env_info.html

River Restoration Centre - http://www.therrc.co.uk/

A map of Demonstration Sites, Case Studies and Restoration Projects undertaken by a wide variety of agencies and organisations. Map of River Projects - http://www.therrc.co.uk/rrc_case_studies.php

Forestry Commission Scotland - http://www.forestry.gov.uk/scotland

Forests and Water Guidelines (4th Edition) -

The Landscape Institute is an educational charity and chartered body responsible for protecting, conserving and enhancing the natural and built environment for the benefit of the public. Landscape Institute - http://www.landscapeinstitute.org/index.php

The Mammal Society works to protect British Mammals, halt the decline of threatened species, and advise on all issues affecting British Mammals. The Society studies mammals, identifies the problems they face and promote conservation and other policies based on sound science. Mammal Society - http://www.mammal.org.uk/

Plantlife carries out practical conservation work, manages nature reserves, influences policy and legislation, runs events and activities that connect people with their local wild plants and works with others to promote the conservation of wild plants for the benefit of all. Plantlife - http://www.plantlife.org.uk/

• Important Plant areas (Scotland) - http://www.plantlife.org.uk/scotland/wild_plants/important_plant_areas_scotland/

The Bat Conservation Trust (BCT) is the only national organisation solely devoted to the conservation of bats and their habitats in the UK. BCT aims are conserving our bat populations through: Determining target population levels; Maintaining target population levels; Acting as the authoritative voice for bat conservation across all areas, including influencing policy and guidance related to bats; Generating greater support for bats, to help it to fulfill its conservation aims. BAT Conservation Trust - http://www.bats.org.uk/

The Royal Society for the Protection of Birds – http://www.rspb.org.uk/


• Advice for Land Managers - http://www.outdooraccess-scotland.com/responsible-access/land-managers/
Relevant Legislation

The Water Environment and Water Services (Scotland) Act 2003 -

The Water Environment (Controlled Activities)(Scotland) Regulations 2005 -

The Flood Risk Management (Scotland) Regulations 2009 -
http://www.opsi.gov.uk/legislation/scotland/acts2009/asp_20090006_en_1

The Conservation (Natural Habitats, &c.) Regulations 1994 -

Environment Act 1995 -

The Environmental Liability (Scotland) Regulations 2009 -
http://www.opsi.gov.uk/legislation/scotland/ssi2009/ssi_20090266_en_1

Land Reform (Scotland) Act 2003 -

Nature Conservation (Scotland) Act 2004 -
http://www.opsi.gov.uk/legislation/scotland/acts2004/asp_20040006_en_1

Protection of Badgers Act 1992 -

Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 -

The Wildlife and Countryside Act 1981 - http://www.jncc.gov.uk/page-1377

Environment Protection Act 1990 -


Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora was adopted in 1992 and is commonly known as the Habitats Directive -

The Town and Country Planning Act (Scotland) 1997 Chapter 8 as amended by The Planning etc. (Scotland) Act 2006 (respectively) –
http://www.opsi.gov.uk/acts/acts1997/ukpga_19970008_en_1


Climate Change (Scotland) Act 2009 -
http://www.opsi.gov.uk/legislation/scotland/acts2009/asp_20090012_en_1