

Theme	Questions	Answers	Support Note Ref
Ecology	What is an ecologist?	<p>bodies like lakes and rivers (aquatic). They focus on the relationship these plants and animals have with their environment; what they need to survive. Ecologists particularly look at how development (building houses and roads for example) might change the environment and whether this will have an impact on those plants and animals.</p> <p>Ecologists usually choose a specialist area, for example, freshwater (rivers), marine (sea), terrestrial (land), fauna (animals), and flora (plants) and they carry out a range of tasks relating to that specialist area. These tasks can include:</p> <ul style="list-style-type: none"> <li>• Surveying (searching for) for specific plants and animals;</li> <li>• Collecting and working with data (that is, the results of surveys, sometimes undertaken over many years by different people);</li> <li>• Conducting desk studies. A desk study involves collecting information from others, such as local councils who may have already undertaken surveys in the past. For a desk study the ecologist uses maps and the internet to see where all the important areas of land are, as well as the rivers and ponds, and they mark down how far everything is from the development; and</li> <li>• Creating new habitat and homes for species that need to be moved.</li> </ul> <p>Ecologists use technology to help them, such as GPS units to plot the ordnance survey grid reference, ipads for recording findings and digital cameras to get good pictures. They have very good map reading skills. They are also able to understand the signs that animals leave, such as paw prints and dung. Looking at these things helps the ecologist to understand where that animal lives, what it eats and where it finds its food.</p> <p>It is very important that ecologists know and comply with both European and UK environmental law. These protect our important plants and animals.</p> <p>Ecologists take the findings of the surveys and assess the impact of any proposed new development on the</p>	<a href="https://www.prospects.ac.uk/10-b-profiles/ecologist">https://www.prospects.ac.uk/10-b-profiles/ecologist</a>
Ecology	What role does an ecologist play in a large infrastructure project like the A9?	<p>Before a large project, like the dualling of the A9 begins, an ecologist will survey the surrounding land to make a record of any animals or plants that are found, as well as the features of the land that provide them with their homes and food. For instance, an otter uses a wide territory, travelling up and down a river to find food and shelter. The ecologist will try use this data to help design the road to make sure the animals, plants are not affected too much. If these need to be moved then the ecologist will find new places for these to go.</p> <p>The ecologist focuses on those animals and plants that are protected by law or that are very rare. A big part of the ecologist's role is interpreting the law for others, so that everyone building a road understands what needs to be looked after and protected. If you look at the new road being built you will see big fences, these are there to stop animals crossing the road and the ecologist will have asked for them to be put in place and told the developers where to put them.</p> <p>When the road is being built an ecologist makes sure that all the workers know about the plants and animals in the area and where they are so that no harm is done to them. There is always an ecologist on site and they make sure fencing and protection for rivers is always in place to keep animals away from construction. This includes protecting rivers from any soil and mud that might contaminate the water. This is done by using straw bales, concrete blocks and fencing. During bad weather and flooding this becomes even more important so the protection measures needs to be checked and maintained regularly.</p>	
Ecology	What other main disciplines do you work with regularly?	Ecologists work with landscape designers, engineers, geologists, planners, architects, construction workers, land owners and environmental organisations and charities.	
Ecology	What environmental constraints are there to building the dual carriageway?	<p>An environmental constraint is a feature of the existing environment that is considered sufficiently important that the location/design or other feature of the development proposed (in this case, the widened road), needs to take into consideration the feature of importance/value. These constraints could be ecological (for example a nest site of a legally protected bird species) but could also be in relation to hydrology, archaeology, land quality, or any other environmental discipline.</p> <p>Other ecological constraints of relevance to this project are the River Tay and the River Spey, which are both designated (protected) sites. Other protected sites include the Drumochter hills and the Cairngorm mountains.</p>	
Ecology	How do you establish the wildlife present along the corridor? How long does this take?	The corridor is surveyed on foot and the ecologist will look particularly at those types of habitat that protected wildlife uses. For instance, the red squirrel lives in trees, the badger likes to feed on earthworms in pasture such as a horse field, and an otter likes to be in or near the water. It can take a long time to look at all the areas along the A9 and this work usually begins years before construction starts. Some animals can only be seen at night such as bats so some of the surveys are done at night.	
Ecology	How will wildlife habitats be affected?	<p>In some areas, wildlife is not directly affected meaning it will not be lost, but during construction animals might change their routine or where they go to feed because they don't like the noise or a path they use regularly has been temporarily blocked. However, every precaution is taken to protect them and avoid disturbing them.</p> <p>If animals that are protected by law are living too close to the work, such as badgers and otters, the ecologist sometimes has to put a plan in place a year before the work begins so that the wildlife can be encouraged to move to an area they will like and where they will not be disturbed. Sometimes this means preparing land and building them new, dry and safe homes that they can find while they are out foraging for food. At other times, plants and animals are 'translocated' by catching and physically moving them. For the A9, ecologists moved over 28 hairy wood ant nests away from the road verge. The time of year that this is done is important as animals can't be disturbed when they are rearing their young so badgers can only be moved in the summer months.</p>	
Ecology	What wildlife habitats already exist along the A9 corridor?	<p>The habitats change along the route. They include</p> <ul style="list-style-type: none"> <li>- agricultural land</li> <li>- grasslands</li> <li>- woodland (conifer and broadleaf)</li> <li>- marshy ground and swamp</li> <li>- rivers and ponds</li> <li>- heathland</li> <li>- urban environments, i.e. villages and towns</li> </ul>	<a href="http://www.snh.gov.uk/about-scotlands-nature/habitat-map-of-scotland/">http://www.snh.gov.uk/about-scotlands-nature/habitat-map-of-scotland/</a>

Ecology	How might we best protect these habitats?	Jacobs' ecologists influence the road design to avoid wildlife habitats for instance by changing the road alignment to by-pass woodland and bridges to clear span rivers where possible. When we can't avoid affecting a wildlife habitat we develop an understanding of how the habitat is used by surveying and research and then we design protection and habitat replacement to lessen the effects on wildlife.	
Ecology	How will local air/water quality be affected?	Road traffic emissions can give rise to particle emissions, nitrogen compounds, organic compounds, and various other hazardous air pollutants. Vehicles also emit greenhouse gases such as carbon dioxide, which can contribute to the problem of climate change.  Water running off roads has the potential to pick up pollutants such as rubbish, oils, metals, de-icers, etc. In sufficiently large concentrations, these compounds can lead to significant declines in localised water quality. However, as the A9 programme is widening the existing A9 road many of these issues will already be occurring in the environment. The new road design incorporates Sustainable Urban Drainage Systems (SUDS) which help to filter pollutants from entering watercourses.	<a href="https://www.google.co.uk/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=1&amp;ved=0ahUKEwiA6en_ikfKAhUByWMKHW4eDbgQFggcMAA&amp;url=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FEnvironmental_impact_of_roads&amp;sg=AFOJCNEqKhCzNAMER7ALYa3Kd4U5OW7cWQ&amp;bvm=bv.111677986.d.cGc&amp;cad=rja">https://www.google.co.uk/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=1&amp;ved=0ahUKEwiA6en_ikfKAhUByWMKHW4eDbgQFggcMAA&amp;url=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FEnvironmental_impact_of_roads&amp;sg=AFOJCNEqKhCzNAMER7ALYa3Kd4U5OW7cWQ&amp;bvm=bv.111677986.d.cGc&amp;cad=rja</a>
Ecology	How will local woodlands/wetlands/farmland be affected?	As the project is a widening of an existing road there will be instances where the widening of the road will result in loss of these habitats. Jacobs' ecologists help to minimise the implications from the road by influencing the design to avoid important habitats where possible and to design mitigation such as replacement habitat and planting to minimise the effect of the road has on important wildlife habitats.	
Ecology	How will the dualling affect flooding?	The Scottish Environmental Protection Agency (SEPA) have stringent requirements for new projects in relation to their effects on flood storage and flood risks. The development of the road design is informed by flood risk modelling to demonstrate SEPA's criteria are met and that the final road design has the least implication for flooding.	<a href="http://www.sepa.org.uk/">http://www.sepa.org.uk/</a>
Ecology	What is an ecological constraint?	An ecological constraint is something that is found by the ecologist to be which needs to be taken into consideration in the design. This can be plant or an animal or a piece of land that is protected by law. Once a constraint is found, a plan is put in place to protect it (see 'mitigation' below).	
Ecology	What is mitigation?	The steps that are taken to protect plants, animals and land is called 'mitigation'. Examples of mitigation that an ecologist would recommend include moving the development to avoid damage to that constraint, or moving the plant and or animal like we talked about above. We also make sure that during construction we do things to reduce the impact of the work on these constraints by making sure that work is carried out in a particular way. For example:  <ul style="list-style-type: none"> <li>• Not working at night, so no lights are used which would disturb otters and bats; and/or</li> <li>• Making sure that any holes that are dug don't trap animals and if they are deep holes that they always have a ramp for animals to escape.</li> </ul>	
Ecology	What are the beneficial environmental effects of dualling?	In terms of the ecology, there is an opportunity to create better habitat to replace some of the habitats that will be lost and the design incorporates Sustainable Urban Drainage Systems which will help to prevent pollutants from entering water courses.	
Ecology	Will any habitats be created or protected by the scheme?	Jacobs' ecologists role on the project are to ensure that habitats are protected both at the construction and operation stages of the road. This includes influencing the design of the road to avoid habitats or to provide designs for wildlife crossings such as dry mammal underpasses or protection barriers such as special fencing to prevent animals such as otters or badgers from getting onto the road. Where there are remaining implications for wildlife our ecologists design replacement habitats such as new areas where bats can roost or replacement homes for badgers called setts so that animals can still live alongside the road.	
Ecology	How will environmentalists react to dualling proposals?	Depending on localised impacts upon environmental factors such as noise, air quality, visual impacts, water and flooding, environmentalists have the potential to react in a number of different ways. They will tend to disagree with scheme proposals which have a negative impact upon the environment, no matter what the other potential benefits of the scheme are. However, their inputs and disagreements with the scheme offer the opportunity for their considered input as to how the scheme proposals can be influenced to achieve the maximum environmental benefit. With any such scheme, there are numerous opportunities for the public to register their opinions in order to provide the best possible option for the scheme design.	Very broad summary of a body such as FOE: <a href="https://www.foe.co.uk/get_involved/act_local_index">https://www.foe.co.uk/get_involved/act_local_index</a>
Ecology	Are there any invasive species along the A9 and what do you do about them?	Yes. One example is Himalayan balsam, the largest annually flowering plant in Britain, which is often found along watercourses. These plants can grow up to 2.5m high from seed in a single season. It is non-native which means it is not natural to the countryside of the UK. It is also termed invasive as it spreads quickly and can out compete other, native, plants around it. It can project seeds up to four metres and these seeds drop into watercourses and contaminate land and riverbanks downstream, but the explosive nature of its seed release means it can spread upstream too. When carrying out any works where soil and plant material has to be moved e.g. dualling the A9, special care is taken to ensure the plant or its seeds are not spread.	<a href="http://www.plantlife.org.uk/wild_plants/plant_species/indian_himalayan_balsam">http://www.plantlife.org.uk/wild_plants/plant_species/indian_himalayan_balsam</a>
Ecology	How do you decide what animal is more important?	We carry out surveys for a range of legally protected animals, and we also undertake literature and database searches to gather as much information as we can about the distribution of different animal species and their habitats. We use that information to help us understand how rare a species is, whether it is on the edge of its natural range or endemic to the area (i.e. not found anywhere else), whether or not we have an especially large population of a species that is generally rare, and whether or not it is in general population decline.	
Ecology	What happens if you find any wildlife on the route you want to build on?	This depends on whether the species is protected by law, or is otherwise considered of particular importance. Some plants and animals are very common, and the benefits of providing a new road are considered more important than the consequences of possibly losing those animals/habitats. If the wildlife is legally protected or under some other circumstances, we would need to take steps to ensure that we don't disturb or kill them. On a day-to-day basis, construction workers are trained in what steps to take if an animal is found on the construction site. In some cases, all work would stop until an ecologist can visit the site to assess what can be done to prevent any harm. Construction methods can be adapted to reduce disturbance to some species, for example by using quieter machinery, or directional lights to avoid disturbing animals that live just outside the construction area. The construction areas are made as safe as possible for wildlife, by covering up excavations overnight, and by making sure all vehicles drive slowly on site.	
Ecology	What happens if you find any protected species on the route you want to build on?	This depends on the species. For bats and badgers, a licence must be obtained which allows ecologists to safely close the animals' place of rest (a roost or a sett), without causing harm to the animals. This process requires the ecologists to show that there is no feasible alternative. For other species, it may be possible to provide enhancements to habitat elsewhere, to increase the amount of available habitat, and encourage the populations to move away from the scheme.	<a href="http://www.ecologyconsultancy.co.uk/what-we-do/mitigation/european-protected-species-mitigation-epsm-licenses/">http://www.ecologyconsultancy.co.uk/what-we-do/mitigation/european-protected-species-mitigation-epsm-licenses/</a>

Ecology	How do we make sure these species are protected if/ when we find them?	This depends on the species. For bats and badgers, a licence must be obtained which allows ecologists to safely close the animals' place of rest (a roost or a sett), without causing harm to the animals. This process requires the ecologists to show that there is no feasible alternative. For other species, it may be possible to provide enhancements to habitat elsewhere, to increase the amount of available habitat, and encourage the populations to move away from the scheme.	<a href="http://www.ecologyconsultancy.co.uk/what-we-do/mitigation/european-protected-species-mitigation-epsm-licenses/">http://www.ecologyconsultancy.co.uk/what-we-do/mitigation/european-protected-species-mitigation-epsm-licenses/</a>
Ecology	When are ecology surveys completed to account for the seasonality?	This depends on the species. An experienced ecologist can survey habitats, and species such as badger, otter and water vole all year round, provided this isn't inhibited by conditions such as snow cover on the ground or vegetation cover. Survey for other species are strictly restricted, for example reptiles and newts hibernate in the winter, and only inspections of bats' hibernation roosts can be conducted. The exact window for survey varies by species.	<a href="http://www.fivevalleysecolgy.co.uk/page.php?pageid=cirences-ter-gloucester-cheltenham">http://www.fivevalleysecolgy.co.uk/page.php?pageid=cirences-ter-gloucester-cheltenham</a> Also, see ecology calendar tab
Ecology	How do we survey species along the route?	Surveys are conducted by a survey team walking over habitats and searching for all species and highlighting any protected species and habitats discovered. There are also special kinds of surveys for different species, such as great crested newts, bats, birds, water voles, otters etc.	
Ecology	How do I become a (ecologist, e.g. botanist, arboriculturalist, wildlife specialist)?	Most ecologists have studied a biological science or related subjects such as environmental sciences, zoology or botany at University. Others may work in a field such as forestry or conservation and build up their skills in species identification that way. Some have a particular interest in a certain aspect of ecology, whilst others maintain a broad interest. From a non-academic perspective, volunteering at local wildlife clubs and forums is also a good way to interact with the ecology community. In terms of pursuing a professional ecology career the professional body for ecologists, the Chartered Institute of Ecology and Environmental Management (CIEEM), or the National Careers Service provide good information.	<a href="http://www.cieem.net/students-careers">http://www.cieem.net/students-careers</a> <a href="http://www.prospects.ac.uk/ecologist_entry_requirements.htm">http://www.prospects.ac.uk/ecologist_entry_requirements.htm</a> <a href="http://www.environmentalscience.org/career/ecologist">http://www.environmentalscience.org/career/ecologist</a> <a href="https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/ecologist.aspx">https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/ecologist.aspx</a>
Ecology	How quickly will habitats re-establish themselves after the scheme has been constructed?	The time depends on the type of habitat affected. Some habitats can establish very quickly for instance new ponds can function effectively after a few weeks whereas woodland obviously will take much longer to re-establish as the trees mature.	
Ecology	Are there any endangered species along the A9 and what do we do about them?	There are a number of protected species along the route including wild cat, otter, golden eagle etc. It is Jacobs ecologists' role to ensure that not only the species but the habitats on which these species depend are protected and maintained through the construction and operation of the road. There are specific legal requirements that are needed to be met by any development and another role of the ecologist is to ensure that the legal protection provided to endangered species is met by the project.	
Ecology	Does the changing altitude of the route affect the habitats / species along the route?	Yes. The A9 passes from the lowlands at the foot of the River Tay near Perth up through the Cairngorm mountains before dropping back down to sea level at Inverness. This change in altitude (height above sea level) means that the characteristics of the land and climate also change. In the lowlands the ground tends to be flatter and suitable for farming and buildings, such as the cities of Perth and Inverness. While on the top of the hills the undulating ground and harsh winters mean that the habitats are more limited to moorland, bog and upland farming like sheep grazing. The change in these habitats due to altitude affects the species that are found there. Broadly speaking, the highest ground tends to have less diversity of species whereas there are often many more species found within the lowlands. Some of this variation can be linked to the difference in temperature between the high ground which may have longer and colder winters compared to the lowlands.	<a href="http://www.snh.gov.uk/about-scotlands-nature/habitats-and-ecosystems/mountains-heaths-and-bogs/">http://www.snh.gov.uk/about-scotlands-nature/habitats-and-ecosystems/mountains-heaths-and-bogs/</a>
Ecology	How much influence do ecologists have?	After the land has been surveyed the ecologist writes a report that tells the engineers and designers if there is anything in the area that is ecologically important and whether it is protected by law. The designers of the road are made aware of all the areas of land that are protected, such as the Cairngorms National Park and any Sites of Special Scientific Interest. Some animals and plants are protected by law so ecologist has a lot of influence over the design. Breaking the laws that protect our plants and animals can incur very large fines and sometimes even prosecution.	