

Wildlife fencing design guide

Harry W Pepper

Independent consultant

Mark Holland

Chris Blandford Associates

Roger Trout

Forestry Commission Forest Research



CIRIA □ Classic House □ 174–180 Old Street □ London EC1V 9BP □ UK
Telephone: +44(0)20 7549 3300 □ Fax: +44(0)20 7253 0523
Email: enquiries@ciria.org □ Web: www.ciria.org



Chris Blandford Associates

The Old Crown □ High Street □ Blackboys □ Uckfield □ Sussex □ TN22 5JR
Telephone: +44(0)1825 891071 □ Fax: +44(0)1825 891075
Email: mail@cba.uk.net □ Web: www.cba.uk.net

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- Dylan Poole (Central Science Laboratories)
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Chris Blandford Associates

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2 EXECUTIVE SUMMARY

A wildlife fence is a barrier that prevents or guides the movement of animals from one area to another. This guide covers all types of fencing that may be used to control wildlife in farming, forestry, landscape management and along linear corridors, in particular along roadsides, but also others, such as, railways and canals. It provides theoretical guidance for designers and planners and practical guidance to managers and fence constructors and, in particular, for those who are involved in fencing roadsides.

The need for wildlife fencing is explained together with the factors that should be considered when deciding whether fencing is necessary. General advice is given on the appropriate standard of fencing as well as the detailed fence type required to provide an effective barrier against the different wildlife species. Specific advice is given in relation to wildlife fencing along different types of road and, in particular, the implications for wildlife fencing alignment, design and maintenance. Comment is also provided on the retrospective fitting of wildlife fences onto existing boundary fences.

3 Introduction

Fencing against wild animals, in any situation, is an expensive operation particularly along highways where long lengths of fencing may be required. In many highway situations there needs to be a more effective barrier than that used in farming, forestry and green bridges, and wildlife underpasses may be needed to ensure the fencing is successful. It is necessary to justify the provision of wildlife fencing in all situations, but particularly so along a road.

There is a wide range of types and specifications of fence available and it is important that the appropriate choice is made for a particular situation if best value for money is to be achieved. Therefore, before deciding on the detail of any fence specification, **it is vitally important to determine if fencing is really necessary** by understanding whether there is either a current or potential wildlife problem, and if a fence will resolve the problem. The consequences of not fencing should always be considered first when planning a fence installation. Consideration should also be given to the alternative options to fencing such as the control of wild animal populations, the use of tree guards/shelters and ground meshing – the laying of mesh netting on the ground or just below the surface, to prevent burrowing.

The presence of wildlife species in an area, their behavioural characteristics, and/or the potential for species to colonise, must first be established. This may be achieved by commissioning a survey of the area or from local sources of knowledge. Local sources of information may include natural history societies, wildlife trusts, regional officers of government agencies such as English Nature (EN), Countryside Council for Wales (CCW), Scottish Natural Heritage (SNH), Countryside Agency, the Environment Agency and the Forestry Commission, as well as respected amateur naturalists.

The degree of risk posed by a potential wildlife problem must be assessed so that the options to fence or not to fence can be compared before a decision is made. The risk of animals breaching a wildlife fence is related to the capabilities of the particular species to climb, jump, burrow or push through, together with population pressures (the number of animals on one side of a fence and their need to be on the other). Generally the more animals that are present, the greater the pressure on the fence and, therefore, the greater the risk that they will overcome it.

The specification of a wildlife fence may also

depend on the degree of risk involved. For example, a fence that is required to prevent deer crossing a busy road will be required to be as effective as possible for as long as the fence is in place. A fence that is just required to prevent deer browsing trees and shrubs may only be needed to keep out the majority of deer.

However, in the latter case, the potential level of damage may not, in itself, be sufficient to justify fencing because the value of the trees lost may be significantly less than the cost of the fence. Therefore an estimate should be made of the amount of damage animals are likely to inflict on, for example, a tree planting scheme so that a judgement can be made on whether the objective of the scheme can be achieved with or without fencing. It is likely that, without wildlife fencing, establishment of trees and shrubs may at best be delayed by a year or two. That may be acceptable, even though the establishment costs will increase.

At worst the planting may not become established at all, resulting in repeated replanting. It may be that wildlife damage is not the main cause of a failed planting scheme, but it may be the one controllable factor. The cost of planting and replanting can be calculated and set against the cost of the wildlife fence, but the loss of landscape amenity due to delayed establishment of trees and shrubs and other vegetation is subjective and, therefore, more difficult to quantify. Normally a judgement will have to be made before planting, so the risk of damage and its impact will have to be based mostly on experience of similar situations elsewhere.

The Forestry Commission has developed a method (The Nearest Neighbour Method) of estimating wildlife damage to trees within a woodland or plantation. This involves the systematic selection of a number of points (cluster points) throughout the woodland that is to be assessed. These “cluster points” are evenly spread throughout the assessment area and around each cluster point a predetermined number of trees are assessed for damage. Trees are chosen objectively and independently of damage observed. The percentage of damaged trees is then calculated. The accuracy of the method depends on the number of trees assessed and the assessor decides the degree of accuracy that is required.

The Nearest Neighbour sequence of operations is:

- 1 Set clear and specific objectives for the assessment.
- 2 Decide the required accuracy of the assessment (usually between ± 5 and $\pm 10\%$). The greater the accuracy the greater the intensity of the assessment. Total accuracy requires every tree to be assessed.
- 3 Calculate the number of trees to be assessed to provide the required accuracy:

$$\left(\frac{100}{\text{Accuracy}} \right)^2 = \text{Number of trees to be assessed}$$

- 4 Choose the cluster size (4 to 7 trees)
- 5 Determine the number of clusters (at least 20 clusters must be visited, adjust the cluster size if necessary):

$$\text{Number of clusters} = \frac{\text{Number of trees to be assessed}}{\text{Cluster size}}$$

- 6 Calculate the distance between clusters:

$$\sqrt{\frac{\text{Area to be assessed (ha)} \times 10\,000}{\text{Number of clusters to be assessed}}} = \text{Distance between clusters}$$

- 7 Complete assessment field work.
- 8 Calculate the percentage of trees damaged:

$$\frac{\text{Total number of trees damaged}}{\text{Total number of trees assessed}} \times 100 = \% \text{ of trees damaged } \pm \text{accuracy}$$

Once a decision to install a fence has been justified the objectives of any proposed wildlife fence must be clearly defined. These objectives must be aimed at preventing, or ameliorating to an acceptable level, the identified problems and their associated risks over a prescribed time. When this is established the fencing needed to achieve the objective can be specified. The specification of a fence for a particular situation will be an amalgamation of a number of different options. It is therefore important to make the decisions logically. The process followed from deciding on the need to fence through the design, implementation and maintenance stages, is illustrated on the flow diagram illustrated in Section 5.

It should be remembered that fencing is only one of the tools available in the armoury of wildlife management and a fence on its own may not be sufficient to overcome a problem. Animal populations are, given ideal conditions of abundant food and cover, capable of attaining levels that may be too great to be managed by fencing alone. In these situations a culling programme, as well as fencing, will be needed.

4 ROADSIDE FENCING

The problems associated with wildlife species in relation to roads, construction sites and, in some cases, other transport modes are principally:

- ❑ the impact of construction, including maintenance and repair, on habitats and populations of wildlife species that are legally protected, including mammals, reptiles and amphibians: badger (*Meles meles*), dormouse (*Muscardinus arvellanarius*), otter (*Lutra lutra*), water vole (*Arvicola terrestris*), lizard (*Lacerta vivipara*), all snakes, all newts (*Triturus spp.*) and toad (*Bufo bufo*)
- ❑ collisions between road traffic (RTAs) and the larger wild mammals [badger, deer – fallow (*Dama dama*), red (*Cervus elaphas*), roe (*Capreolus capreolus*), sika (*Cervus nippon*) muntjac (*Muntiacus reevesi*), Chinese water (*Hydropotes enermis*), fox (*Vulpes vulpes*), hare (*Lepus europaeus*), otter, rabbit (*Oryctolagus cuniculus*) and in some areas wild boar (*Sus scrofa scrofa*) which have escaped or been freed from farms]. Fencing cannot reasonably control the movements of some wildlife species that are involved in collisions (RTAs). These include all bird species, squirrels, martens and adept climbers such as stoats, mink, weasels, feral cats and ferrets
- ❑ the destabilisation of cuttings and embankments and the weakening of the integrity of other infrastructure such as signs, service ducting and safety barriers as a result of badger, fox and rabbit burrowing activity
- ❑ deer, rabbit and hare damage to roadside landscape vegetation (grazing herbaceous plants, browsing, fraying/rubbing and bark-stripping trees and shrubs).

4.1 Responsibilities for roadside fencing

The Highways Agency and other overseeing organisations have responsibility under the Highways Act 1980 for installing and maintaining motorway boundary fences. On other highways the responsible authority (overseeing organisation, local highway authority or developer) has no obligation to fence the highway. A boundary fence is then usually installed only if it is required by the adjacent

landowner. The landowner then takes ownership of the fence and responsibility for its future maintenance. A fence may also be required as a result of some agreement in a lease or statute.

It is possible that negligence claims could be brought against an overseeing organisation if a failure to fence resulted in damage to people or property. Should an overseeing organisation deem it necessary, for whatever reason, the Highways Act Section 80 provides the powers to fence.

Wherever possible, any requirement for a permanent wildlife fence should be combined with a boundary fence, but there are instances when this is neither possible nor desirable. The landowner, if not the overseeing organisation, may not permit the wildlife fence to be attached to his or her side of the boundary fence. This is because there may be a need, as in the case of badger, otter, rabbit and muntjac deer fencing, to turn out the bottom or top of the netting towards the direction of the resident animals. This may limit how close farming activities can approach the actual boundary. Adverse site features along the boundary fence line, such as deep ditches, watercourses and undulating topography, may make it impractical to create or maintain an effective wildlife barrier. A steep rise in the ground immediately on the outside of the fence may enable wild animals, particularly deer, to jump over the fence. There may also be wildlife management considerations based on the behaviour patterns of local wildlife populations that require the fence line to be sited along a particular line away from the boundary fence.

4.2 Fencing for new roads

The Highways Act 1980 gives powers to the Highways Agency (as executive agency of the Secretary of State) and local highways authorities (overseeing organisation) to construct new highways and allows land to be acquired by Compulsory Purchase Order (CPO). Permission to construct a new road results from the confirmation of the Side Road and CPO for that scheme. Orders include all temporary and permanent land required to construct, operate and maintain the road and its associated features, whether it is acquired in perpetuity, temporarily or as an easement. Fence lines are identified on CPO plans to delineate highway land from adjacent landholdings.

If additional land to that required for the purpose of road engineering is necessary to secure the wildlife fencing measures then, under the Acquisition of Land Act, land can be acquired under the CPO. Ultimately, as the scheme progresses, agreements may be reached with landowners to secure the wildlife management measures without the need to acquire land. However, having the authority to acquire land is necessary to ensure delivery of wildlife fencing, should agreement not be possible. Where CPO powers are used, the fence to which the wildlife netting is attached remains in the ownership of the overseeing organisation who will have the future maintenance responsibility.

A private developer may promote a new road when the road is necessary to serve a new development under the Town and Country Planning Act 1991. The land would then normally be secured through negotiation.

On private developer funded schemes, land ownership issues may be less complex, as all land needed for the scheme will normally have been purchased through negotiation. Moreover, the developer may own the land beyond the highway boundary. Future ownership and maintenance of the fence may become an issue if the local highway authority subsequently adopts the road. Under these circumstances future maintenance of the fence, and any wildlife fencing element attached, needs to be resolved at the planning stage.

4.3 Motorway boundary fencing

The Highways Agency and other overseeing organisations have the necessary powers to enter the adjacent land for the purposes of construction and maintenance of boundary fences within its ownership, by use of an easement within the CPO. Decisions on fence location, design and specification rest with the overseeing organisation. Landowner requirements should, however, be taken into account, particularly with regard to enclosing livestock. The presence of a boundary fence does not absolve the adjoining landowners/users from any statutory obligations (under the Animals Act 1971) to contain their livestock within their boundary. The ownership and maintenance responsibility for fences after installation remains with the overseeing organisation.

The standard boundary fence used on the motorway network is a timber post with four or five horizontal rails (BS 1722: Part 7). The decision and authority to attach wildlife fencing to the boundary fence rests with the overseeing organisation. A requirement to turn out netting at either the top or bottom of a wildlife fence may encroach onto the adjacent landownership. Permission for this is required if the CPO has not taken account of the need to install a netting “turn out” during the planning stage. Existing uses of the land, above or below any “turn out”, which are frustrated as a result of netting being turned out, can be considered by the District Valuer in any future compensation settlement. When permission to attach and turn out mesh is obtained from a landowner, future maintenance of the netting rests with the overseeing organisation.

Permission withheld by a landowner for a “turn out” can prevent the provision of suitable wildlife fencing, particularly when the CPO has already been confirmed. Consideration would have to be given to either a different fence specification, a new stand-alone fence inside the boundary fence or the relocation of the boundary fence far enough within the boundary to allow the “turn out” of the netting. This latter option is preferable in visual terms to a separate, stand-alone fence.

4.4 Trunk and county highways boundary fencing

The decision to fence the boundary of a trunk road or county highway usually rests with the adjacent landowner. If the landowner requires a fence, it is implemented as Accommodation Works, normally to a design and specification of the landowner’s choosing, and the cost of provision is deducted from any final compensation figure agreed with the District Valuer.

In the majority of cases, the fence will be a timber post and four or five rail, or a post and wire fence. Very occasionally a wall may be substituted for a fence, particularly in sensitive landscapes where, for example, dry stone walls are a characteristic landscape feature. The fence may be provided in association with a hedge and then the centre line of the hedge will normally be the boundary and the fence will be 1 m inside the adjacent ownership.

After an agreed maintenance period, (usually 12 months for the fence and five years for the hedge) the overseeing organisation has no future maintenance liability for either. The fence and hedge then become the property of the landowner. The landowner must ensure that the fence remains “fit for purpose”.

Should the adjacent land use change after a fence has been installed, it is the responsibility of the new landowner to ensure the fence fulfils its objectives. Should the fence no longer be required by the landowner, there is no requirement for the landowner either to retain or maintain the fence.

As the fence is ultimately the property of the adjacent landowner, any wildlife objective built into the fence specification should be implemented only in agreement with the landowner. In seeking to reach the landowner’s agreement, the following issues require consideration:

- ❑ the need to secure netting to the fence
- ❑ the need to “turn out” and lap netting away from the highway boundary
- ❑ the need for arrangements to inspect and maintain the barrier effect of the wildlife element of the fence for as long as the related problem exists.

Where agreement with an adjacent landowner regarding wildlife fencing attached to a boundary fence cannot be achieved, the overseeing organisation may choose to retain the ownership of the boundary fence and take the responsibility for its future maintenance.

4.5 Wildlife fencing on existing roads

The presence of wildlife fencing on boundary fences along existing motorways, trunk roads and county highways is variable, and largely depends on the age of the scheme. The older the scheme, the less likely it is to have had any significant wildlife provision, although it is possible some will have been installed retrospectively. Over the last 20 years, the increased awareness of the need to protect wildlife – supported by the introduction of UK and European legislation – has seen increasing provision of wildlife fencing along UK roads. The increased distribution and abundance of some wildlife species,

together with increased traffic volumes, has also increased the need for more wildlife fencing to reduce the risk of wildlife-related road traffic accidents (RTAs).

It is the responsibility of the overseeing organisation to reduce the impact of wildlife on road safety. In certain areas there will be a case for retrospective fitting of wildlife fencing, often combined with other mitigation measures such as the management of wildlife populations.

4.6 Environmental assessment for roadside fencing

UK and European legislation concerning the UK’s protected wildlife species, requires that promoters of any new road must ensure that all reasonable measures are taken to minimise any adverse effects on these species. An Environmental Impact Assessment (EIA) will be required for most new construction schemes in the UK, whether they are being promoted under the Highways Act 1980 or the Town and Country Planning Act 1990 (as amended 1991). The results of assessments are reported in an Environmental Statement (ES) which is published with the draft Orders for the scheme or accompanies a planning application.

During the planning stage of a scheme, data collection, baseline surveys and consultation provide an understanding of the wildlife interest within the vicinity of the scheme which informs the design of any mitigation measures ultimately incorporated into the scheme.

There are three biodiversity assessment stages:

- Stage 1:** Desk-based assessment to identify the nature conservation constraints.
- Stage 2:** Preliminary walkover survey to identify potential effects upon habitats and wildlife.
- Stage 3:** Detailed species surveys to identify the location, type and importance of all species/habitats of significant nature conservation interest that may be affected by the construction of the scheme. These are also required to help devise appropriate mitigation, such as wildlife fencing.

The level of detail included within the EIA and presented in an ES will normally be equivalent to Stage 3.

In relation to wildlife, the Environmental Statement describes:

- the biodiversity baseline
- the wildlife management measures, including fencing, that are incorporated into the scheme design to protect against any adverse wildlife effects
- the impact of the scheme on wildlife.

The ES is a legally-binding document and consequently the overseeing organisation must ensure that all wildlife management objectives that are incorporated into the design are implemented on site.

Detailed technical reports usually accompany an ES as supporting data. In addition to reporting on survey findings and assessment of impact, each specialist report dealing with individual species may include detailed protection proposals for that species. So that the overall proposals are more easily understood, it is recommended that the proposals contained within each separate specialist report should be combined into an overall wildlife protection and fencing strategy.

At the Environmental Statement stage, the wildlife fencing proposals may be represented by nothing more than a series of lines on a plan. Consequently, while the intent may be clear, the detail is often limited. This lack of detail can result in future difficulties when outline proposals are being translated into a detailed design. These difficulties are often increased when the original design team is replaced by a new team of professionals who are tasked with developing the detailed design. For this reason alone, it is essential that sufficient information is provided at the Draft Orders stage to explain the proposals and the reasoning behind the measures adopted.

5 Developing a wildlife strategy

As early as possible in the planning stage potential problems, which can ultimately influence the effectiveness of wildlife fencing, need to be addressed and resolved. This needs to be completed before the detailed design and implementation stages (see **Figure 5.1** Wildlife fencing design, implementation and monitoring chart) and regardless of whether the fence is along a roadside or elsewhere. The following issues should be considered:

- ❑ the different fence specifications that will be required for the different species of wildlife to be controlled
- ❑ whether, if more than one wildlife species is present, different fence specifications can be combined into a single fence specification to avoid duplication of fence lines
- ❑ whether the fences are to be free-standing or, in the case of roadsides, attached to a boundary fence
- ❑ the location and extent of the fencing, bearing in mind it may vary for each species
- ❑ the layout of fencing and its relationship with other wildlife protection measures such as tree guards and, in the case of roadside fencing, underpasses and green bridges
- ❑ treatment of the fencing at the interface with other features, such as cliff faces, ditches, walls and gateways, and along roadsides, at bridges and at termination points such as slip roads and side road junctions
- ❑ the future ownership and maintenance responsibility of the wildlife fencing.

The wildlife fencing strategy developed from the consideration of these issues should be summarised on a scheme plan showing all land-take requirements at 1:2500 scale. The Wildlife Fencing Strategy Plan should show:

- ❑ the location of each different wildlife fence
- ❑ the fence type
- ❑ where the fence is to be a combined barrier for more than one wildlife species
- ❑ on-site features that may impact on fence construction, such as water courses
- ❑ where wildlife fencing is to be attached to the boundary fence
- ❑ where the wildlife fence is to be free-standing.

5.1 Detailed design considerations

It is essential that the measures described in the outline design are translated into the detailed design.

The time taken, for the original surveys on which the Wildlife Fencing Strategy Plan was prepared for the ES to the detailed design stage, can be several years. The presence and abundance of wildlife species can change significantly over this time, so additional surveys to either validate the original work or to update the baseline may be necessary before starting detailed design.

The process followed in preparing the detailed design is influenced by the procurement process. For example, contracts increasingly are being procured which require the contractors, and their design team, to develop detailed designs based on illustrative proposals and specific requirements set out within the contract documentation. Under these circumstances it is essential that the commitments made at the planning stage are translated into the Contract Requirements, together with the need to re-survey, if appropriate, before preparing the detailed design and implementing the proposals.

During the detailed design process all of the issues considered at the planning stage should be revisited to ensure the proposals are still relevant and appropriate. In addition, it is necessary to consider the site conditions and the detailed aspects of the new fence more closely to ensure that the final fence will be an effective barrier to wildlife. In particular, thought has to be given to how fences can be accommodated on the site and how their integrity is to be achieved at the interfaces with potential obstacles, such as:

- ❑ changes of slope
- ❑ uneven ground
- ❑ sharp changes in direction of the fence line
- ❑ ditches and watercourses
- ❑ gateways and stiles
- ❑ side roads, slip roads and junctions
- ❑ highway over-bridges and under-bridges
- ❑ green over-bridges and underpasses.