VOLUME 10 ENVIRONMENTAL DESIGN AND MANAGEMENT
SECTION 4 NATURE CONSERVATION

PART 6

HA 98/01

NATURE CONSERVATION MANAGEMENT ADVICE IN RELATION TO AMPHIBIANS

SUMMARY

This Advice Note provides guidance for reducing the impact of new schemes, improvements and routine highways management operations on amphibian populations.

INSTRUCTIONS FOR USE

This is a new document to be incorporated in the manual.

1. Insert HA 98/01 into Volume 10, Section 4.

2. Archive this sheet as appropriate.

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THE DEPARTMENT FOR REGIONAL DEVELOPMENT*

Nature Conservation Management Advice in Relation to Amphibians

* A Government Department in Northern Ireland

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REGISTRATION OF AMENDMENTS

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VOLUME 10 ENVIRONMENTAL DESIGN AND MANAGEMENT

SECTION 4 THE GOOD ROADS GUIDE - NATURE CONSERVATION

PART 6

HA 98/01

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CHAPTER 1 **INTRODUCTION**

1.1 BACKGROUND

The United Kingdom has six species of amphibian currently recognised as native: three newt species, two toad species and one frog. Some populations of introduced non-native European amphibian may also be encountered, mainly in the South of England. The status of the pool frog is under investigation (see Annex B). The great crested newt, natterjack toad and common toad have declined greatly in numbers in the last century due to changes to, and loss of, areas where suitable land and water habitats occur together. The conservation of amphibians has become an increasingly important element for development projects. This is a result of the improved awareness of the legal protection afforded to amphibian species and also of the decline in their status.

1.2 SCOPE

This advice note provides guidelines for 'Best Practice' when dealing with mitigation for amphibian populations. It applies to all highways in the UK. There is no general solution to cover all sites or situations. Advice should be sought from appropriate voluntary bodies and specialists, and agreed where appropriate with the relevant Statutory Nature Conservation Organisation (SNCO) to provide an effective package of mitigation measures. Because of implementation costs, design advice should be based upon good evidence of the number of amphibians concerned, and their distribution within and around the proposed area of works. Competent evaluation should be included at the appropriate time in project development.

1.3 APPLICATION

The information in this advice note is applicable to proposals for improvements to, and maintenance of, existing roads as well as to the construction of new roads. Schemes to improve or upgrade existing roads, and major maintenance operations (eg carriageway reconstruction) may provide opportunities to introduce measures that reduce amphibian road casualties at identified crossing points. Such measures may also restore connectivity between previously isolated areas and assist in the recovery of populations that have declined. Road schemes can also provide significant opportunities to create new terrestrial and aquatic amphibian habitats.

2.1 Plans for Highway works should take account of the potential impact on amphibians. Survey work is required at an appropriate stage of highway planning to identify any amphibian populations present in and around a potential road corridor. This will allow mitigation proposals, should they be needed, to be designed, agreed and, where appropriate, completed, in advance of the commencement of the main construction work.

2.2 Sufficient time, often several months, should be allowed for the procedures involved in obtaining specialist licences to handle protected amphibian species.

2.3 Amphibians require both freshwater and land habitat. For most species, the land phase of the amphibian year is generally longer than the time spent in water. This means that size and quality of land habitat may be as important as the size and quality of water habitat. Land habitat includes most forms of woodland, scrub and grassland, while water habitats are normally standing freshwater ponds, pools, canals, oxbow or still lakes, drainage ditches and occasionally very slow-flowing pools along streams and rivers.

2.4 Installation of amphibian fencing, tunnels and underpasses/overpasses does not mark the completion of a mitigation project. All works must be properly monitored and maintained to ensure that the various components function correctly in the long term. All amphibian mitigation work should be in place, completed and checked before the scheme is opened to traffic.

2.5 Amphibians do not recognise hazardous road areas. In practice this means that where amphibians need to be excluded from certain areas, or need to be channelled towards specially installed tunnels, permanent amphibian-proof fencing is required.

2.6 Amphibian translocation and habitat creation do not provide easy or fast solutions for mitigating the environmental impact of roads, and should only be considered as a last resort. The translocation of amphibians is a labour intensive and time-consuming practice requiring the skills of specialists. Habitat creation is a relatively new concept and not universally accepted as an adequate alternative to habitat protection. While water bodies can be created quite rapidly, as long as a long-term source of clean water is available, relatively long periods of time (ie up to two years or more), are sometimes required to ensure that newly created or enhanced terrestrial habitat is sufficiently developed to provide adequate conditions in which amphibians will survive.

CHAPTER 3 **PROTECTION STATUS**

3.1 All amphibians receive some legal protection in the United Kingdom although the degree and type of protection varies between species. A brief review of the legal protection afforded to each species follows in this section. It must be stressed however, that the legislation itself should be referred to for the definitive text.

3.2 The relevant Ministerial Departments are: in England, the Department of Environment, Transport and the Regions (DETR); in Scotland, the Scottish Executive; in Wales, the National Assembly for Wales; and in Northern Ireland, The Department of the Environment. The Statutory Nature Conservation Organisation (SNCO) consultees are: in England, English Nature; in Scotland, Scottish Natural Heritage; in Wales, The Countryside Council for Wales; and in Northern Ireland, The Department of The Environment for Northern Ireland (Countryside and Wildlife). Chapter 7 (Section 7.1) describes the role of each of these organisations in statutory licensing procedures. Water-related nature conservation issues are also addressed by the Environment Agency in England and Wales, and the Scottish Environment Protection Agency in Scotland.

3.3 Amphibians are afforded protection in the UK through the Wildlife and Countryside Act 1981 (as amended), The Wildlife (Northern Ireland) Order 1985 (SI1985 No.171 (N.I. 2)) and the 'Habitats and Species Directive' (92/43/EEC) implemented in Great Britain by The Conservation (Natural Habitats &c.) Regulations 1994 and The Conservation (Natural Habitats &c.) Regulations (Northern Ireland) 1995. These legal instruments provide mechanisms to protect amphibian species, and sites occupied by amphibians, at different levels dependent upon the species encountered. When schemes are 'unavoidable' and/or there is 'overriding public interest', a method statement must accompany licence applications to handle protected amphibian species. The method statement must detail the nature and extent of any actions likely to disturb any amphibian that is protected under European Law. The statement must also include details of any mitigating actions that are to be taken and maps clearly showing the position of existing and future planned amphibian populations.

3.4 Two amphibian species are subject to protection from killing and injury, and damage and disturbance of their habitats by Section 9 of the Wildlife and Countryside Act 1981 and Regulation 39 of The Conservation (Natural Habitats & c.) Regulations 1994, where they are referred to as European Protected Species. These species do not occur in Northern Ireland. There are also powers under these legislative provisions to allow sites where these species occur to be designated as protected areas (eg SSSI's, SACs).

- Great crested newt (*Triturus cristatus*)
- Natterjack toad (*Bufo calamita*)

3.5 Four species are listed in The Wildlife and Countryside Act 1981 Section 9(5). The common toad and palmate newt are absent from Northern Ireland.

- Smooth newt (*Triturus vulgaris*)
- Palmate newt (*Triturus helveticus*)
- Common frog (*Rana temporaria*)
- Common toad (*Bufo bufo*)

3.6 In Northern Ireland, the smooth newt is the only amphibian that receives full protection under Articles 10 to 13 of the Wildlife (Northern Ireland) Order 1985.

4.1 SPECIES

The six amphibian species that are widely considered to be native to the UK are:

Great crested or crested newt	(*Triturus cristatus*)	England, Wales, Scotland
Smooth newt	(*Triturus vulgaris*)	England, Wales, Scotland, NI
Palmate newt	(*Triturus helveticus*)	England, Wales, Scotland
Common toad	(*Bufo bufo*)	England, Wales, Scotland
Natterjack toad	(*Bufo calamita*)	England, Wales, SW Scotland
Common or grass frog	(*Rana temporaria*)	England, Wales, Scotland, NI

4.2 STATUS

Amphibians are sensitive thin-skinned vertebrate animals that have undergone a substantial decline in number during the last century. Several species are now in danger of localised extinction.

4.3 MOVEMENTS

In general amphibians live at the edge of, or away from water features during most of the year (mostly within 250 metres, but sometimes to greater distances in excess of 500 metres). This varies between species and according to the habitat types available. Though the majority limit their movements to distances up to 1.2 km, each year a small number of amphibians may move a distance in excess of 1.5 km to reach adjoining breeding sites. This process facilitates vital genetic exchange between breeding colonies and can help to maintain healthy amphibian populations.

4.4 BREEDING

Between February and June amphibians congregate for mating and egg laying (spawning) after their emergence from winter hibernation. At this time they may characteristically be observed in large numbers in and around their breeding sites. These seasonal movements mean that areas in and around breeding sites will vary in their importance for amphibians at different times of the year.

4.5 GROWTH

During late spring and summer, amphibian eggs develop into tadpoles (sometimes referred to as larvae) that then grow legs and emerge onto land in the summer and autumn. These juveniles disperse to sites away from the breeding water, but return to this original site to breed after two to three years of growth.

4.6 FEEDING

Amphibians feed on a wide range of invertebrates and are in turn preyed upon by many vertebrate and invertebrate carnivores. In particular, tadpoles and juveniles constitute an abundant food supply for other animals in spring and early summer.

4.7 HABITAT

Amphibians vary in their preferences for breeding sites, but generally prefer fish free waters, without islands that encourage waterfowl. Ponds that readily warm up (ie those that are not too heavily choked with silt or plants or too shaded by trees) are often preferred.

Amphibians are vulnerable to changes in their breeding sites, but especially to interruption of access between these breeding sites and their land habitat. Any highway operation causing such interruption can therefore result in population decline. Individual amphibians may continue to search for habitats that they have previously used. As a result, amphibian populations may not readily adjust to newly constructed or managed areas, and it may take between three and ten years (or more) for the population to stabilise.

CHAPTER 5 **AMPHIBIAN SURVEY METHODS**

5.1 SURVEY METHODS

Preliminary potential route surveys should include assessment of land and water habitats within 1km of the centre line of the road. This will mainly comprise a desktop search for information on amphibian distribution in the landscape, highlighting any identifiable networks of ponds that may be fragmented. A primary aim of most investigations will also be to determine the location of amphibian breeding sites, and the land habitats that they use to feed, disperse and over-winter. Sources of published reference material are given in the bibliography (Chapter 13).

The following survey methods should be employed in all cases where an action (or series of actions) is likely to have an impact on local amphibian populations (ie planning and design for new road schemes, road improvements and routine maintenance operations).

5.2 DESK STUDY

A desk study to identify areas which are potentially valuable as amphibian habitats, should normally form the first stage of any survey. Consultation with the relevant SNCO and other non-statutory bodies eg the local wildlife trust, biological records office, County/District amphibian recorder and the local amphibian and reptile group, forms an essential part of the desk study. The results of this stage of the survey should provide information on known breeding sites, and locations on the road network where amphibian mortality is known to be high. The desk study alone cannot be relied upon to provide exhaustive information about the value of the area under scrutiny for amphibians. It is always necessary to follow up this initial stage with a detailed field survey to substantiate and expand on the existing available information.

5.3 FIELD HABITAT SURVEY

Walkover surveys should be used to identify any habitat features of value to amphibians, with special attention paid to identifying new breeding sites that are not marked on current Ordnance Survey maps. It is also particularly important during a walkover survey to check the existence of ponds, lakes, wet ditches and watercourses that are on, or within, 1km of the centreline of an existing or planned road. The position of land habitats potentially occupied by amphibians (eg woodland) in relation to the possible breeding sites should also be investigated in more detail. This will give an indication of the current or potential severance effects of existing or planned roads on any amphibian populations.

Any standing or slow-flowing water identified during the Stage 1 habitat survey likely to be suitable for use by amphibians, should be investigated in more detail for specific evidence of amphibian use. Experienced, and appropriately licensed amphibian workers should systematically survey water features. At the outset, sufficient time and resources to carry out these more detailed surveys (to detect signs of breeding (eggs and spawn), and adults or juveniles present in or at the water's edge) should be arranged. Potential land habitats (eg the moist areas under logs, rocks and discarded debris) around the vicinity of the pond should be carefully searched for amphibians. The fact that some amphibian species emerge from winter hibernation later than others, and that the dates of emergence vary with local climate mean the time of year when the survey is carried out is crucial for providing accurate results. Searching is, in general, most reliable between April and September. In most areas amphibians can be relatively hard to find between October and February inclusive.

5.4 FIELD IDENTIFICATION OF AMPHIBIAN POPULATIONS AT BREEDING WATERS

Further more detailed examination will be required during the appropriate breeding period of each amphibian species, in order to confirm its presence or likely absence and to get some measure of population size. This may require five or more return visits to each breeding site during suitable weather conditions, utilising a range of methods including evening visits (after dark) to carry out counts of amphibians at the water's edge by torch light. A range of other techniques may be required according to the time of year, accessibility of the pond edge, extent of the vegetation cover and the water clarity (for further guidance see Gent and Gibson, 1998, Herpetofauna Workers' Manual). Some techniques may be more time consuming than others and there may be safety issues to consider. Water features vary greatly and so expert judgement will be required in each case.

5.5 FIELD IDENTIFICATION OF AMPHIBIAN MOVEMENTS ON LAND

Movements of amphibians between their land habitats and their breeding sites can be checked by experienced fieldworkers with the use of temporary drift fencing (simple polyethelene/plastic stapled to stakes) with pitfall traps alongside. These are most effective at detecting migration routes during the spring emergence and autumn pre-hibernation period, but can be used at any time to detect the presence of juveniles and non-breeding adults away from breeding waters. Drift fencing and pitfall traps around breeding waters give not only an indication of the number of individuals involved, but also the direction of their approach to a water feature. This can help indicate the relative importance of habitats around a breeding water. It can also help to identify key overwintering areas. When employing drift fencing and pitfall trapping methods it is important to check them regularly (once daily as a minimum) in order to prevent undue stress or mortality being caused to amphibians or other captured animals.

6.1 ENVIRONMENTAL ASSESSMENT

Environmental Assessment for new road development and existing road improvement is required, under European Directive 85/357/EEC (as amended), where the proposals are considered to have 'significant environmental effects'. The Directive is enacted in the UK by the Highways (Assessment of Environmental Effects) Regulations 1988 (as amended) for motorways and trunk roads, and the Town and County Planning (Assessment of Environmental Effects) Regulations 1988 (as amended) for local authority, private roads and associated works.

This chapter sets out the requirements for amphibian surveys for new road, and significant road improvement, schemes at each stage of the Environmental Assessment Process. The Design Manual for Roads and Bridges (Volume 11: Environmental Assessment), and Departmental Standard HD 18/88 provide further detailed guidance on the environmental survey requirements.

6.2 STAGE 1

As part of the desk study, organisations such as the appropriate SNCO, the local amphibian and reptile group or Wildlife Trust should be contacted at an early stage for any information on amphibians that may be present in the area around the proposed development. A request should be made for details of known breeding sites affected by route corridor options to a distance of 1km from their centrelines.

Within the overall map-based habitat assessment (County Phase 1 habitat survey), habitat features likely to be of particular value to amphibians should be noted, including all water features, and areas such as woodland and scrub which are favoured by amphibians as land habitat.

6.3 STAGE 2

A walkover survey to identify potential breeding sites and land habitats identified during Stage 1 should be carried out. For great crested newt and natterjack toad it may be necessary to carry out a more detailed survey. If the walkover survey indicates that amphibian breeding sites are present, these should be investigated further at Stage 3.

A more detailed desk study should be carried out if a significant period of time has elapsed since the initial investigation at Stage 1, or if the need for additional information is triggered by the findings of the walkover survey.

6.4 STAGE 3

If it is identified at Stage 2 that a breeding site or land habitat will be adversely affected by the proposed development, the detailed potential impacts of the preferred route should be determined. Numbers of each amphibian species should be estimated and monitored by simple counts at breeding waters, preferably throughout the year (or at least at the appropriate time) and for as long a period as is practicable. An assessment of the effects of the proposal on amphibian migration/movement routes and habitats, including hibernacula, as well as the direct impacts on the breeding site/s, should be included at this stage. Techniques such as drift fencing and/or pitfall trapping can be used effectively to make such judgements. The information gathered at Stage 3 should be used to guide the design of the mitigation package associated with the scheme.

The impacts on habitats of value, and the degree of severance of amphibian breeding waters and land habitats should be assessed and recommendations made for mitigation.

7.1 A licence from the appropriate Government Department or SNCO is required in order to capture (by nets or traps) or handle the great crested newt or the natterjack toad. A licence is not required to carry out a general amphibian survey to examine potential breeding waters or to look under logs and debris for any animal, but upon finding protected species, continuation of survey work will then require the possession of a licence.

7.2 SNCOs will issue licences for general survey for great crested newt and natterjack toad. The Government Department responsible in England, Scotland, Wales and Northern Ireland (see Section 3.3) will issue licences for handling in cases where on-site transfer, or off-site translocation is judged to be acceptable by the licencing authority. The procedures need to be planned well in advance leaving at least a ten week period for the licence application to be processed. Licencing qualifications require the proposals to be assessed to determine whether they are truly ‘unavoidable’ and of ‘overriding public interest’.

7.3 It is essential that the surveyor carrying out any non-licensed activities is experienced in amphibian ecology and conservation, and in the assessment of the impacts of highways operations.

CHAPTER 8 **POSSIBLE EFFECTS OF HIGHWAYS ON AMPHIBIANS**

8.1 ENVIRONMENTAL EFFECTS OF HIGHWAYS

There are many aspects of road construction and operation that can have an impact on amphibian populations. Although it is relatively simple to identify the main impacts that a proposed development will have on amphibians, it is much more difficult to determine the precise significance of these impacts without detailed evaluation. In general however, best practice dictates that, wherever possible, the precautionary principle should be applied, with mitigation designed to combat the worst-case scenario. While many impacts may be harmful to existing interests, it is important to consider the often very considerable potential opportunities to improve areas through habitat creation and management.

8.2 DIRECT LOSSES OF HABITAT THROUGH LAND TAKE

Early identification of sensitive sites and good engineering design can result in the most valuable amphibian breeding sites and land habitats being avoided altogether by the planned route or improvements. However, under certain circumstances this may not be possible and the risk of significant effects on amphibian populations remains. The loss of, or change to, a single breeding site can have major impacts on the survival of amphibians over a wide area, and these must be taken into account during the overall impact assessment. The relative importance of both land and water areas will vary greatly and is a matter of expert judgement, as will be the feasibility of providing appropriate substitute habitats and designs to prevent or reduce the likely effects of severance.

8.3 SEVERANCE OF HABITAT FEATURES

Amphibians often move considerable distances from their breeding sites, and isolation of amphibians from their land habitat may occur if roads bisect these areas (see Section 4.3). The busy road environment is generally hostile to amphibians, and without mitigation measures, amphibian populations living near major roads may be reduced in size dramatically or lost completely after 5-10 years exposure. Fragmentation caused by roads has been shown to reduce population sizes and to result in inbreeding. This, in some circumstances, may contribute to localised extinctions and regional declines. The potential significance of the severance of a habitat feature depends on its level of use, the amphibian species concerned, and the availability of alternative habitats and features. This can only be determined by detailed surveys.

8.4 ROAD TRAFFIC RELATED MORTALITY

Amphibian mortality on roads is most obvious during breeding migrations in March when hundreds of individuals may be lost on a single night within a short stretch of road. The impact of such mortality on the wider population will vary according to a range of factors such as the proximity of the road to the breeding site, the proportion of the population that crosses the road and the volume of traffic on the road.

There are particular implications for the construction of new roads close to breeding sites, and where a large proportion of the population may attempt to cross or move along roads.

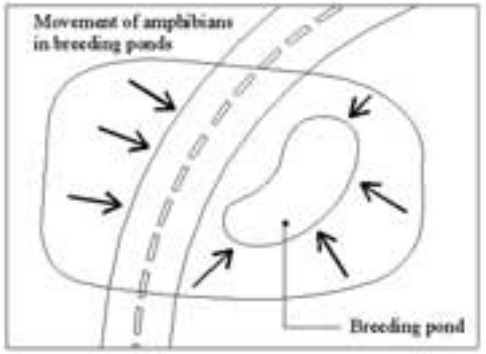
8.5 DISRUPTION TO LOCAL HYDROLOGY

Alteration of natural drainage (eg seepage lines and springs) and artificial drainage (eg ditches and land drains) systems, as a result of road construction, may have a significant effect on amphibian populations. Water levels in breeding ponds may be critically raised or lowered such that conditions become less suitable or even unsuitable for some amphibian species. Changes in water quality may also adversely affect amphibian populations.

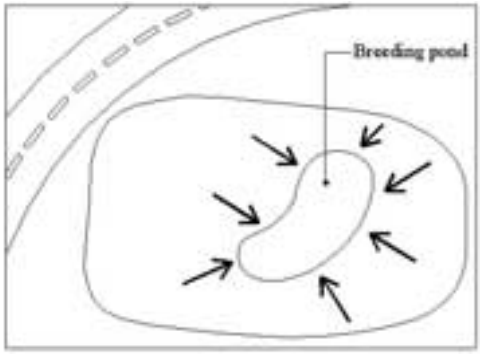
9.1 HABITAT PROTECTION AND ENHANCEMENT

It is preferable when considering mitigation proposals for amphibians, to keep the population centred and located on the same land and water areas (ie '*in situ*') wherever possible, and to maintain favourable conditions there. The services of an experienced and appropriately qualified person will be required at an early stage to evaluate the feasibility of maintaining populations *in situ*, and this must be done on a site-by-site basis. This individual will indicate whether there is a need for enhancement of the existing habitat, or if there is no alternative whether it is more appropriate to safeguard the population by moving a part or all of it to suitable existing sites away from the area most greatly affected. Alternatively, it may be necessary to create a new habitat for the amphibians as part of the mitigation package, to help adjust for the loss of the existing habitat. Where planned or existing roads bisect amphibian territory and migration routes, additional mitigation measures may be required to minimise the negative impacts of the road on the populations (see Figure 1). Measures such as amphibian underpasses, overpasses, fencing and/or tunnels, may be employed, where necessary, to prevent amphibians from crossing busy roads and to help reduce the fragmentation effect of the road on the wildlife community. Construction of new breeding sites and hibernacula, and the restoration of completely silted up former amphibian breeding sites can similarly help to establish and restore adequate linkages across the landscape.

Habitat enhancement may have the aim of increasing the 'carrying capacity' of an area for amphibians, maximising the existing population numbers and possibly encouraging any excluded or translocated individuals to return. Enhancement techniques include the improvement of land habitat or the restoration of existing water bodies through management, and the planting of trees or seeding of grassland to improve foraging habitat and general cover (Plate 1).

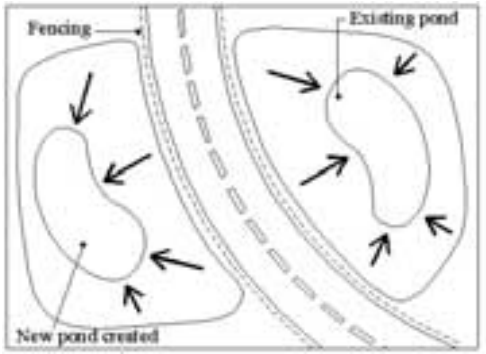


Bad practice - route severs main area from breeding pond

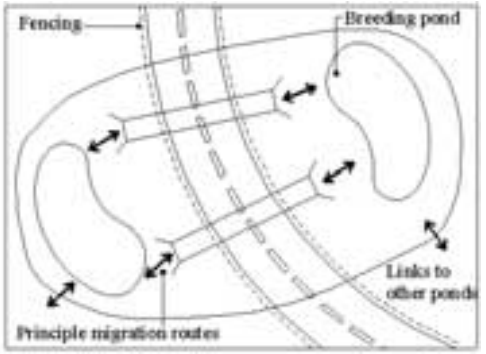


Good practice - main movements unaffected

Toads, frogs and newts use breeding ponds, to and from which they migrate annually. When migration routes cross roads, high amphibian casualty rates may ensue. Specialist advice in identifying the road alignment with the least impact on amphibians, and at the earliest possible stage is essential. Creation of amphibian breeding ponds may be necessary to maintain links.



The new ponds should be constructed in consultation with a specialist. Fencing should be placed along both sides of the road to prevent the amphibians crossing. A further guide fence may be used to direct the amphibians towards the new pond.



The tunnel should be at least 500mm in diameter, although 1m is preferable and two tunnels are preferable to one. The axis of the tunnel(s) should be aligned towards the original and new breeding ponds.

Figure 1 *Maintaining links between amphibian habitats (not to scale)*

The programme of works may cause impacts of different magnitudes on amphibians in ponds and on land at different times. In some instances, to minimise impacts on amphibians, it may be necessary to enclose working areas with temporary amphibian fencing. Access by machinery will be permitted at any time of the year, but amphibians will be excluded until such a time that the areas are ready for amphibian occupation. During the active amphibian season, amphibians may otherwise easily find ways into working areas, piles of soil and under stored materials where they may be accidentally harmed, so separation of working areas into wildlife zones is important. This may require close and continued cooperation on the ground, especially in complex schemes (Plate 2).

Where it is essential that a breeding site or land habitat be altered or removed, appropriate mitigation should be designed and implemented at least one (but preferably two) years in advance in order to minimise the impact on amphibians and to allow for the seasonal constraints of habitat preparation and amphibian trapping. Habitat preparation often requires tree planting and grass seeding (during the October to April season) and amphibian trapping (during their March to September activity period). Measures may involve excluding amphibians from affected areas using fencing, and/or trapping and transferring them to alternative well established and suitable habitat nearby. In practice it may be necessary, following extensive exclusion and trapping, to drain (through screens) and carefully check water areas for amphibians prior to their being infilled. A detailed programme should be prepared by an appropriately qualified and experienced person and the course of action agreed, and where appropriate licensed, by the SNCO or Government licensing authority.

9.2 HABITAT CREATION

Habitat creation for amphibians includes both the construction of aquatic breeding sites, and the provision of adjacent terrestrial habitat. The pond size and shape should be designed for the particular amphibian species assemblages and wildlife community for which it is intended. Substitute ponds can be a very effective measure, but the detailed design specification will vary greatly between species and sites. Wherever possible a range of ponds should be provided, to minimise the impact of any unpredictable environmental events. Pond designs should take into account measures to assist in their long term management for amphibians. For example, a base that falls to a sump close to the edge of the pond will facilitate drainage, in the event that draining is required to remove predatory fish species such as pike, perch, rudd and stickleback. The water-holding capacity of the soil at any site will dictate whether the amphibian breeding site is to have a natural or artificial lining. Ponds in natural water-holding clay soils are generally more trouble-free than those located on permeable or semi-permeable soils, where complicated drainage or artificial liner arrangements may be required.

Land habitat will, like breeding sites, have to be designed specifically for the amphibian species for which it is intended. Ideally, for most species, a mosaic of woodland, scrub and grassland should be planted. Natterjack toad will require special consideration. Mature habitat (especially woodland) will take many years to establish, so additional cover may be provided in the early years of the project by adding specially designed stone or log piles layered with soil, and by using mulching to create a deep litter layer. In many cases, existing features such as hedges, copses, small woodlands and pasture/scrub can be enhanced by incorporating them into the areas for nature conservation management and, in some cases, changing the way they are used or managed. Specialist designs for such structures should be developed using materials that are typical of the surrounding area.

9.3 AMPHIBIAN FENCING

Where there is a need to restrict the movement of amphibians to keep them off the highway, this may be achieved with amphibian fencing (Plate 3). Such fencing is also necessary where amphibians need to be channelled to use a particular crossing facility. Temporary fencing is appropriate for short durations of one or two years during trapping and exclusion/enclosure periods, but more robust permanent fencing with a durability of several decades is required for permanent installations. Permanent amphibian fencing that is heavy duty and durable is often best constructed in sections to facilitate repair or re-assembly. The system can then be altered or reinstated if damaged, or taken up temporarily for any purpose. Most fences act as one-way barriers so that the movement of amphibians is only prohibited in a single direction (Figure 2). At junctions, where fences to intercept amphibian movement would otherwise block side or access roads, permanent ‘grid cross channel’ sections may be required (Figure 3). These sections aim to prevent amphibians bypassing fencing at junctions and take the form of an open topped channel with a metal grating of gap width too great to allow crossing by amphibians, yet strong enough to support the weight of vehicles. They may need to be custom built and connected at either side to amphibian fencing. A soakaway drainage system may also be needed to avoid too much flooding.

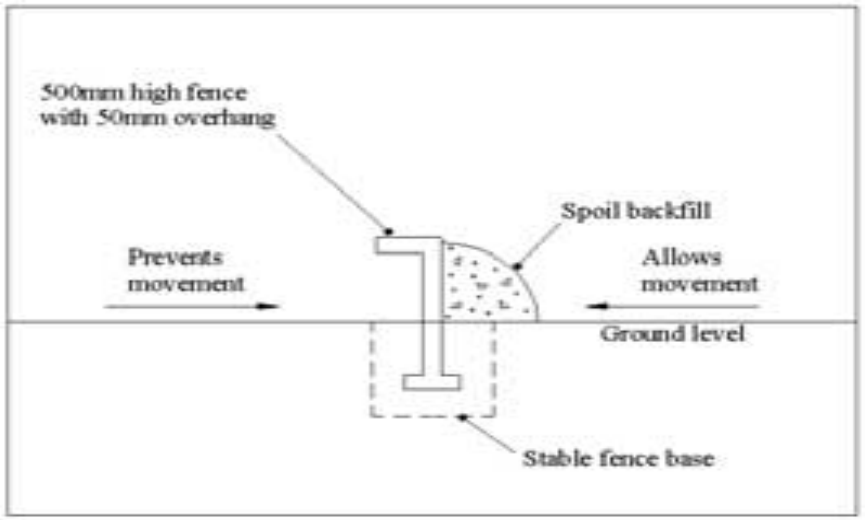


Figure 2 *One way amphibian fence (not to scale)*

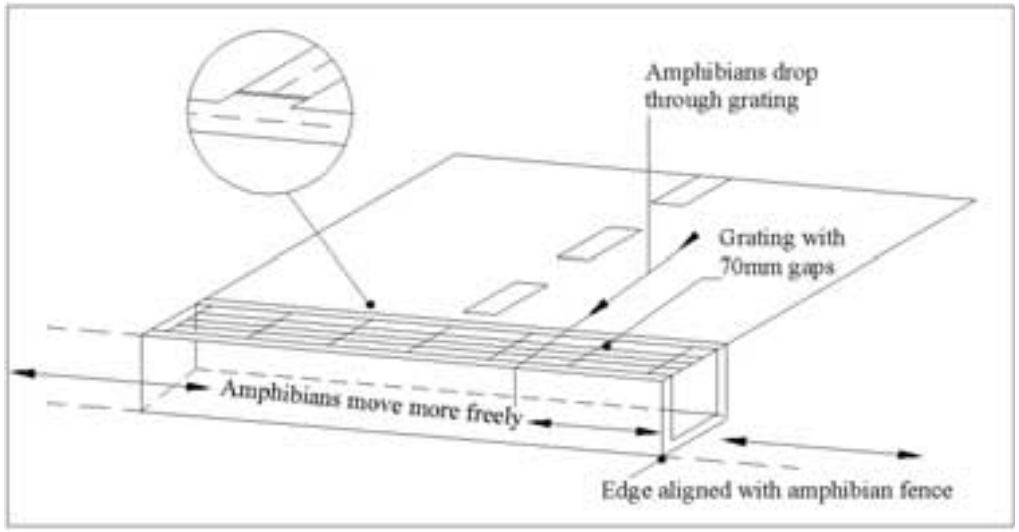


Figure 3 *Cross channel interceptor at road junction*

9.4 AMPHIBIAN UNDER/OVERPASSES AND TUNNELS

Where a road bisects an important amphibian habitat, or separates amphibians from their breeding ponds, a link may be established with a specially designed underpass or overpass (Figures 4 and 5). Traditional bridge structures and culverts (built to contain ditches, streams and rivers as they pass under roads) can in some cases be modified to facilitate safe movement of amphibians under the highway. Since 1987 a variety of amphibian tunnel systems have been installed in the UK. Lists of their location and specific design details are available (see Chapter 13 and Annex D). It is widely recognised that the position and size (length and diameter) of these structures, and the angle that they are approached by amphibians are critical factors determining their success. Amphibians often prefer tunnels that are buried close to the ground surface, and hence more exposed to the surface climate in early spring, rather than those set deep into embankments. Amphibians may be killed by surface residues on cast concrete pipes and these should only be used on buried tunnels in excess of 900mm diameter, and where the floor of the tunnel is covered with a good depth of soil. Tunnel and fence systems can normally be installed within the highway boundary but may require additional land, and this should be considered at the earliest opportunity. The future maintenance operations associated with the structures are also an important factor for early consideration. Larger tunnels may also be designed for multiple species-use, ie combined to accommodate larger animals such as badgers, otters and deer (Figure 5). In general, the greater the tunnel diameter, the greater the likelihood of it's successful and long-term use.

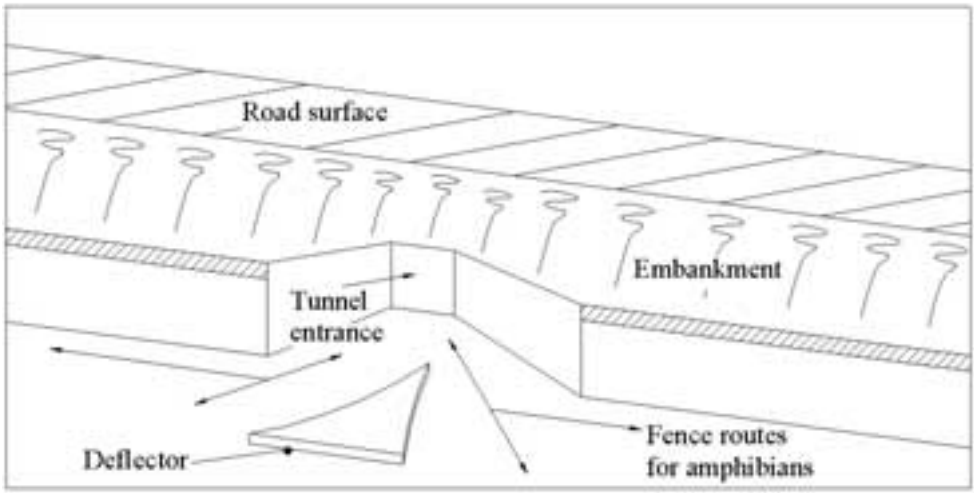


Figure 4 *Tunnel/underpass entrance/exit area*

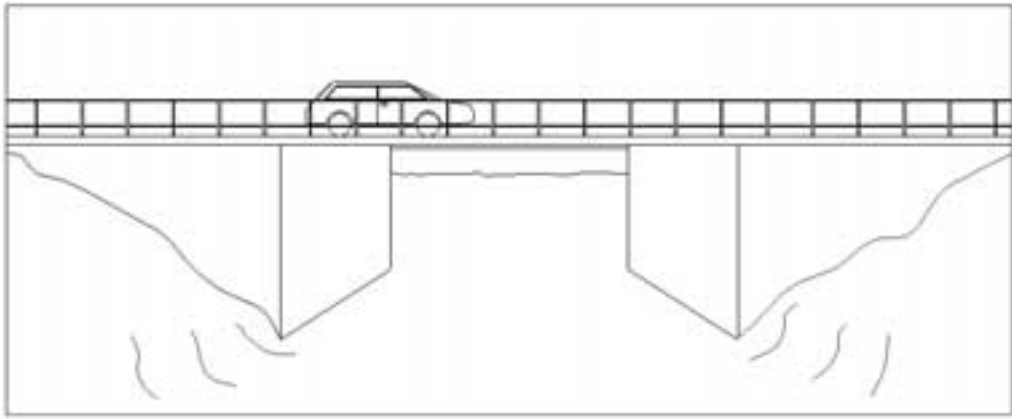


Figure 5 *Underpasses can provide effective links for wildlife*

9.5 KERBS, DRAINS AND GULLY-POTS

Kerbs and road drains, gully pots and buried or sheer sided chambers and pipework, that are designed for fuel, oil or surface liquid interception and storage, may act as a fence and as a trap to amphibians. These features can cause amphibian mortality by trapping them in polluted places where they can suffer from toxic effects, exposure, starvation and drowning. Their use should be avoided in areas where amphibians are present. There are a range of alternative designs available to minimise the impact of kerbs and road drains on amphibians (eg Figure 6). Designs for amphibian tunnels, fences, permeable surfaces and gully pots are continually being developed, and those with appropriate ecological expertise will be able to supply further information.

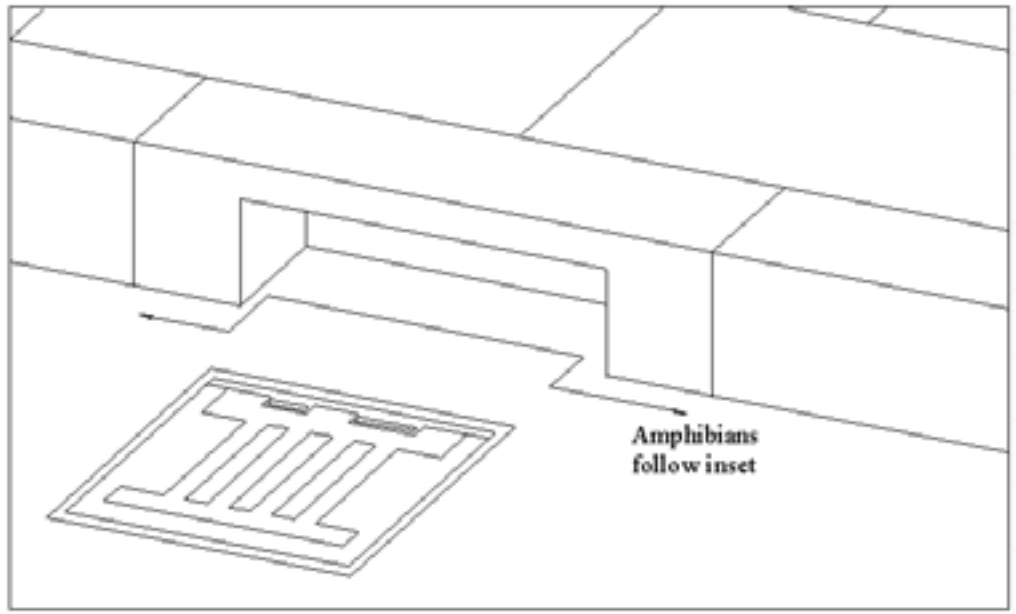


Figure 6 *Inset kerb stones greatly reduce gully pot trapping of amphibians*

9.6 AMPHIBIAN TRANSLOCATION

Where it is not possible to keep amphibians at their original location, or safeguard them by short distance '*in situ*' transfers, it may (as a last resort) be necessary to trap and translocate the entire population to a new site. This is likely to be the case where entire breeding sites or land areas are to be lost and cannot practicably be replaced for technical reasons. Where possible, the receptor site should be within 1km of the original, or at least as close as is practicable. It is vitally important that both receptor and donor site share the same hydrological and ecological conditions as far as possible.

'*In situ*' amphibian transfer and translocation is a time-consuming process, normally requiring a trapping period of several months. Trapping should be carried out both on land (pit-fall trapping) and in water (netting and by draining/hand), and should ideally cover a period of at least one year, or one season as a minimum (March to September). Where great crested newt or natterjack toad are being translocated, the appropriate government licensing authority will be required to license the operation.

9.7 CONSTRUCTION OF AMPHIBIAN BREEDING SITES

Construction of new aquatic breeding sites may be necessary in order to substitute those that are due to be either directly, or indirectly impacted by the highway development. Once mobilised, large machinery can achieve a considerable amount in a short time and imaginative schemes can achieve far more than a simple 'like for like' approach. Studies should be undertaken to determine the number, size and type of breeding sites that will be needed to provide effective mitigation. Best practice dictates the creation of spare capacity in order to maximise the success of the project. Topography, soil type and drainage will constrain the potential location of the new sites.

If necessary, artificial lining of water bodies may be considered, although whenever possible it is to be avoided (Plate 4). Beyond the additional expense of lining materials, the ongoing liability of puncture repair remains. Where artificial lining is advised, natural clay materials are preferred to plasticised sheeting.

The specific design of ponds will vary according to the needs of individual species or amphibian assemblages (up to six species). Specialist assistance from amphibian experts will be required from the design phase, and throughout construction, to address any problems as they become apparent.

When mitigation ponds are close to the Highway, care should be taken to separate their catchment or the inflow from the road drainage system, to avoid the possibility of contamination.

9.8 CONSTRUCTION OF OVERWINTERING SITES

Amphibians will use a wide range of natural places for hibernation and purpose made sites will benefit them. The design and siting will vary with local conditions and materials. Cut wood and shredded mulch may have a shorter life span than stone-based materials (Plate 5). Designs should aim to provide small, humid air-spaces that will not collapse and should be sited so as to be free-draining and not placed in areas that will flood. Soil type will influence drainage and particular care is needed when using heavy clay soils, so as to avoid water-logging. Equally light soils, such as sand, may be too dry for amphibians. Boulders of rock, such as granite and chalk or artificial land drains and clean (cement free) brick rubble may be placed with the help of machinery at suitable places within land habitats. Layering with top soil can also be used to disguise and form a vegetated surface.

Plate 1 *Reversion of farmland to natural habitats can be surprisingly rapid*

Plate 2 *Construction sites can become a jigsaw of ecological treatments prior to the main works and requiring equally diligent supervision*

Plate 3 *Fences to control amphibian movement and public access are often placed prior to final topsoiling, seeding and planting*

Plate 4 *Lining large waterbodies requires detailed design and installation with natural materials to protect and disguise them*

Plate 5 *Shredding cut wood for mulch onsite re-uses natural local materials*

10.1 PLANNING AND ADVANCE WORKS

Pre-construction and site clearance surveys will be required in order to validate/update the findings of any previous surveys (eg those carried out during Environmental Assessment). Where any significant changes in species presence and/or distribution are found, consideration should be given to amending the design of the mitigation package.

Any long-term cost of the specialist management and maintenance of mitigation works for amphibians (that will remain within, or be transferred outside, the Highway Estate) should be identified at the earliest possible stage and accounted for in the project costings.

10.2 CONSTRUCTION

Amphibian mitigation measures should be installed under the supervision of experienced ecologists, and if necessary using specialist contractors. It is essential that amphibian mitigation is properly designed and implemented, since any individual weaknesses will devalue the effectiveness of the mitigation package as a whole. Where specialist contractors are not employed, contract supervision by a person with experience of amphibian work is vital. It is preferable, for technical and ecological reasons, for amphibian mitigation measures to be in place before the road construction work begins. However, in some situations, constraints may require work to continue in parallel, as long as working areas permit this. An Environmental Site Co-ordinator/ Clerk of Works (or equivalent representative) should be present on site, or readily available, to liaise between surveyors/specialist consultants and construction companies to prevent undue damage occurring and to maximise any potential opportunities.

It is essential to ensure that during the implementation stage, the mitigation measures are constructed to the correct quality, standard and specification. For example, specialist amphibian fencing needs to be fixed and buried correctly, to a sufficient depth and to a distance capable of deflecting all of the amphibian population, and with no gaps or climbable structures along its length. It is imperative that the integrity of mitigation work is checked regularly during any construction works, before the road is open to traffic and at least twice yearly thereafter (in accordance with the Trunk Roads Maintenance Manual (TRMM) in England (and the equivlanet documents in Scotland, Wales and Northern Ireland) to ensure successful implementation of the mitigation measures. Important tasks include the inspection of tunnel entrances, to ensure they are not blocked by debris, and of fences, to check for any signs of damage requiring repair.

Checks and safeguards should be made to ensure that general road construction works do not damage, or interfere with the amphibian mitigation measures. Checks should be made to ensure that water levels in new amphibian breeding sites are maintained within their calculated and desired range. Inspections are required to ensure that aquatic vegetation and invertebrate communities in new, restored, or adapted breeding waters and land habitats are sufficiently established to provide good quality habitat for movement, shelter, feeding and breeding, prior to their planned use by amphibians.

11.1 MAINTENANCE

Maintenance obligations beyond the establishment period will depend upon the extent of the Works and negotiations with the adopting authority. Amphibian breeding site management may include the removal of overshading vegetation and invasive emergent plant species. Where the nature conservation status of the amphibians is threatened consideration should also be given to the periodic removal of undesirable fish species that have colonised or been introduced. It is important to engage an experienced consultant in order to correctly cost long-term management needs. Activities such as desilting may be required only once in several decades but are relatively costly and must be accounted for in the management programme.

Larger reserve areas beyond the highway boundary may be passed to the adopting authority or by agreement to a third party capable of competent nature conservation management. Some sites may be retained as part of the Highway Estate and managed directly by the HA's Managing Agents in accordance with Landscape Maintenance Guidance (Chapter 1.11 of the Trunk Road Maintenance Manual TRMM: Volume 2 in England; Appendix 16 of the Term Contract for the Management and Maintenance of the Scottish Trunk Road Network for Scotland, and the equivalents in Wales and Northern Ireland). The provision of aftercare is essential, as neglect can result in the rapid loss in value of areas of special nature conservation interest.

Tunnel, overpass and fence systems require annual inspection for repairs and maintenance. Twice yearly grass cutting may be required to prevent vegetation growth compromising the effectiveness of the fence.

11.2 MONITORING

Monitoring may be needed in order to demonstrate that measures are functioning properly, especially when new techniques have been employed or recommended. Costs of maintenance and specialist monitoring, where agreed, should be included in the adoption sum calculations or other provisions for long-term management. It is essential to provide feedback, through systematic monitoring, on the success, or otherwise, of the mitigation measures. Such information will guide future designs and contribute towards demonstrating value for money in the application of specific measures.

12.1 Standard road warning sign No. WBM (R)551.1 depicting the silhouette of a common toad was approved for use in England and Wales in 1985 on roads where there is a known seasonal migration route for common toads (Figure 7).

12.2 There are around 600 locations in England and Wales that are registered as suitable for signs warning of seasonal amphibian mortality. These are placed at locations where hundreds or thousands of adult toads (and other amphibian species) may be killed each year. A register of sites is maintained for DETR by the non-government organisation Froglife (See Annex D).

12.3 Reviews of the potential for enhancement work on the Highway Estate, other than that associated with major projects, may identify potential actions that may benefit amphibian populations. Enhancement work may be possible by minor alterations to existing land and water habitats, and structures and remedial work can be achieved where problems may exist or be likely to occur in the future.

Figure 7 *Standard amphibian warning sign*

12.4 Opportunities for amphibian habitat enhancement (eg the provision of amphibian crossings and new (or better managed) water bodies) may be greatest outside the Trunk Road network. The potential for carrying out proactive work to enhance areas for amphibians should not be overlooked, especially during repair or upgrading works. However, care should be taken to avoid areas known, or likely to be, disturbed again in the near future, as such work may not be cost effective.

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CHAPTER 14 **ACKNOWLEDGEMENTS**

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Photographs courtesy of Tom Langton and Rob Dryden, with permission of Norfolk County Council and the Department of Transport (now DETR).

The legislation pertaining to the protection of amphibians in Britain is contained mainly within the Wildlife and Countryside Act (1981), and the Habitats and Species Directive (92/43/EC) which is enacted in the UK through the Conservation (Natural Habitats & c.) Regulations (1994). A summary of this legislation, as it relates to the conservation of amphibians in the context of the design and management of highways is given below. However, it must be noted that this is not a complete resume of all of the provisions of this legislation, but only as it may relate to highways operations. Thus, for example, regulations regarding photographing protected amphibian species and other such activities have not been covered.

INTERNATIONAL DESIGNATIONS

Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) (1971)

Sites which are considered internationally important for waterfowl species can be designated by governments as 'Ramsar' sites. In the UK, SNCOs are responsible for determining which existing SSSIs with waterfowl interest should be afforded this extra level of protection.

EUROPEAN CONVENTIONS AND DIRECTIVES

The Council of Europe Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention 1979)

Came into force in 1982, and was the first European convention to promote co-operation between European countries in their wildlife and habitat conservation efforts. Amphibians are listed in the Appendices of the Convention, requiring them to be afforded special protection. Such protection is largely enshrined in the Wildlife and Countryside Act (see below).

The Habitats and Species Directive 92/43/EEC (1992) (as implemented by the Conservation (Natural Habitats & c.) Regulations (1994) – see below)

The Council Directive 92/43/EEC of 21st May 1992 on the Conservation of Natural Habitats and of Wild Flora and Fauna exists to promote the maintenance of biodiversity in Europe. The Annexes of this Directive list habitats and species of importance at a European scale for which sites are designated, or are in the process of being designated as Special Areas of Conservation (SACs) and candidate Special Areas of Conservation (cSACs). Great crested newt and natterjack toad are included in 92/43/EEC as species of European importance, meaning they must be afforded a strict level of protection. The presence of these species in a search area means that any development proposals must be tested to demonstrate that they are 'unavoidable' and that the need for the Works is of 'overriding public interest'. For this reason it is essential at an early stage to ensure that these requirements have been fully considered. Already several candidate SACs (cSAC) sites have been proposed for the specific purpose of conserving the habitats of these two amphibian species.

In the context of Highways schemes, the presence of great crested newt and natterjack toad should be treated as a matter of European importance, and project managers should be aware of the significant status of SAC and cSAC sites.

UK LEGISLATION AND GUIDANCE

The Wildlife and Countryside Act (1981) & The Wildlife (Northern Ireland) Order (1985) (as amended)

Natterjack toad and great crested newt are strictly protected under the Wildlife and Countryside Act (1981).

The relevant Statutory Nature Conservation Organisation must be notified of any proposed operation which could kill or injure a protected amphibian species, or cause damage or disturbance to a protected amphibian species habitat. The SNCO must be allowed a reasonable time to provide advice. Many great crested newt breeding sites are not identified and are outside formal designated sites such as National Nature Reserves, Sites of Special Scientific Interest and Local Nature Reserves. In the context of a highway construction scheme, this means that, when approached as a statutory consultee, the SNCO should be provided with any information regarding amphibians collected during the Environmental Assessment (where there is a potential impact on amphibians). Surveys should be undertaken by an experienced, appropriately licensed amphibian worker. In the context of breeding water disturbance or removal, the SNCO should also be contacted well in advance of any proposed operations which are likely to affect the resident amphibian populations, in order that they may issue the appropriate advice.

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

Implements the Habitats and Species Directive (see above) in the UK through the provisions of the Wildlife and Countryside Act (1981) and The Wildlife (Northern Ireland) Order (1985).

Planning Policy Guidance (PPG) No 9 on Nature Conservation (1994) (England only)

PPG 9 sets out Government Policy as it relates to nature conservation, and although advisory in nature, it may be enforced by legislation where necessary. PPG 9 gives guidance on the roles and responsibilities of the local planning authorities and SNCOs with regards to development control affecting SSSIs and other designated and important sites. PPG 9 has particular relevance for local authority road schemes and ancillary developments such as Motorway Service Areas/Motorway Maintenance Areas which are governed by the Town and Country Planning Act (1990). PPG 9 embodies the Government's commitment to conserving biodiversity and states that 'the presence of a protected (under the Conservation (Natural Habitats & c.) Regulations (1994)) species is a material consideration in a development proposal'. Although the concept of 'material consideration' does not apply to Highway schemes, Planning Policy Guidance can be seen as providing good practice advice. Since the 'presence' of amphibians is not defined, this can be interpreted as including both potential breeding sites and suitable habitats up to a distance of 1000 metres from the proposed development.

Planning Guidance (Wales), Technical Advice Note (TAN) 5 - Nature Conservation and Planning, is the Welsh equivalent of PPG 9.

Biodiversity: The UK Action Plan

The Convention on Biological Diversity was signed by the UK following the 1992 Earth Summit in Rio de Janeiro, and required the production of a National UK Biodiversity Action Plan (BAP). In 1994, the Government produced the UK BAP, a national strategy for the conservation of biodiversity. Individual 'Species Action Plans' have been drawn up for many of the most-threatened species. The great crested newt and natterjack toad have been identified within the list as 'priority species' for which Action Plans have been produced. Any highway scheme or operation potentially affecting these priority species should include mitigation proposals, which are compatible with the Species Action Plans.

[Note: The status of the pool frog (*Rana lessonae*) in England is currently under investigation by English Nature. Advice on activities affecting any possible Pool frog populations should be sought from the SNCO.]

GREAT CRESTED OR CRESTED NEWT (*Triturus cristatus*)

This species is the largest and most distinctive of the native newts, growing to 150 and rarely 170 mm in length. The adult crested newt appears black or very dark on dry land, but can look much paler (orangey-brown) with dark spots when viewed in water. It has a bumpy or granular skin. During the breeding season the male develops a jagged crest which runs along the length of the back, from the head to the tail, with a gap above the base of the tail; the crest is less deeply serrated along the tail. Adults often develop small white speckles along the sides of their head and body. Males have a distinctive silver/white stripe running lengthwise through the middle of the tail. The belly colour is a shade of yellow or orange and has large black spots and vermiculations. In the female, the colour extends along the edge of the underside of the tail.

Crested newts emerge from terrestrial overwintering sites between mid February and April, depending on temperature and weather conditions, and migrate towards their breeding sites. Sites in the south-west of England normally report the earliest migration dates; maps of average spawning dates throughout the country are available. Males normally arrive first, as indicated by their dominance in numbers in waterbodies in early spring. The females lay eggs singly, mainly on aquatic or marginal vegetation, folding them inside a leaf with their feet. The eggs are yellow, approximately 2mm in diameter and surrounded by an oval capsule of clear jelly about 4.5 mm in length. The tadpoles take up to 20 weeks to develop, with young emerging in late summer and autumn. Sexual maturity is usually first reached at 2-3 years of age. Both male and female newts will leave and return to water following mating and egg laying, sometimes moving between ponds. Crested newts mainly overwinter on land, where they remain in an inactive state between October and February. At ponds where they overwinter in water, some newts may be active in winter months depending on climate variation.

SMOOTH OR COMMON NEWT (*Triturus vulgaris*)

The smooth newt grows up to about 110 mm in length and varies from light brown to olive yellowy brown in colour. Males are speckled with dark spots, whilst females tend to be paler and less marked. The males develop an undulating crest running from the back of the head virtually to the tip of the tail during the breeding season. The head of the smooth newt has five dark stripes running lengthwise, which are more obvious in the male. Both males and females have a yellow/orange belly, which is usually spotted. The throat area of both sexes is also spotted.

Like crested newt, most smooth newts usually overwinter on land often hundreds of metres from their breeding site and emerge in early spring to migrate to their breeding ponds. They normally arrive in their ponds at around the same time (mid February to April), or slightly earlier than the crested newts. Smooth newt eggs are laid in the same manner as the great crested newt, singly onto vegetation, but are slightly smaller (approximately 1.5 mm inside a jelly capsule of about 3 mm) and off-white in colour.

PALMATE NEWT (*Triturus helveticus*)

The palmate newt is slightly smaller than the smooth newt, with adult body length up to 90 mm. During the breeding season the male develops full dark webbing around and between the toes of the hind feet and a tail filament up to 7 mm in length. These two features distinguish it from the male smooth newt. The tail is marked with a central dark stripe and a line of darkly coloured spots above and below it.

The overall colour of the palmate newt is generally a pale olive brown to dark brown. The belly is often lighter in colour than the smooth newt, being pale straw to mid orange. The female palmate newt is usually very similar in appearance to the female smooth newt. The throat of the female palmate newt is translucent pink and rarely has dark spots on it. This is an important characteristic to use in distinguishing between the two species.

Like the crested and smooth newt, palmate newts mainly overwinter on land, and emerge in early spring to migrate to breeding ponds. Eggs are laid singly onto aquatic vegetation.

COMMON OR GRASS FROG (*Rana temporaria*)

Frogs (up to 120 mm) vary greatly in colour, ranging from yellow, orange, red, green, brown to even blue. They may have dark spots, or they may be quite plain. Behind both eyes there is a distinctive dark patch, which surrounds the eardrum. The skin texture is smooth and moist. The common frog may be distinguished from the superficially similar toads by its comparatively longer hind legs, and more angular head and body shape. Frogs move in short jumps. The underside of the common frog is typically white-grey in the male and rust-brown in the female.

Spawn is laid in clumps in February or March in shallow water. Common frog tadpoles are very dark in colour when they hatch out, but as they grow they become olive-brown in colour with light markings, producing an overall speckled appearance. The tip of a common frog tadpole tail is rather more pointed than in the common toad tadpole.

Frogs spend a greater part of their time in, or near water than the common toad. Normally they will stay in their breeding ponds until May, when they will move into grassland to hunt for food. In late autumn, frogs will move to their overwintering sites often close to a pond. Some individuals (normally immatures and males) will over winter at the bottom of ponds, where the temperature is likely to remain above freezing, whilst others will overwinter on land under cover and often some distance from the breeding site.

COMMON TOAD (*Bufo bufo*)

Adult female common toads (up to 130 mm) are larger than their male counterparts (up to 80 mm). The common toad has a more rounded outline than the common frog. It has a dry (when on land), bumpy skin, and a distinctive large, raised gland behind each eye, normally speckled with orange. The eye itself has a horizontal pupil and striking copper-red coloured iris. Toads are generally mid to dark brown in colour but can vary dramatically between yellow and reddish. The underside is pale in colour and flecked with grey-brown markings. Common toads have relatively shorter hind legs than frogs and tend to move by crawling rather than jumping.

Spawning generally occurs in March or April. Spawn is laid in strings, which develop a double row of eggs, and are wrapped around vegetation under the water. The tadpoles of the common toad are black. Adult toads normally leave the water after spawning in April, and their young, the newly metamorphosed toadlets, normally leave in mid-summer. Adults and young alike will forage for food on land until night temperatures drop, normally around October. Common toads almost always overwinter on land in some cover eg under a log or stones, in a hole in the ground, or commonly amongst the deep litter layer of woodland. These overwintering sites may be over 1000 m from the breeding sites.

NATTERJACK TOAD (*Bufo calamita*)

The natterjack toad has an olive to brown body colour, bumpy skin and is similar in overall appearance to the common toad. It is smaller than the common toad however (up to 90 mm), and is readily distinguished by a thin yellow stripe that runs along the centre of its back. The eye of the natterjack has a yellow iris and a horizontal pupil. The hind legs of the natterjack are shorter than that of the common toad, and it often moves by running in short bursts.

Natterjack toads spawn later than frogs and common toads, normally from April and sometimes through to June, depending on the weather. Spawn is laid in strings, and the tadpoles are black and not easily distinguished in the field from the common toad. Natterjack tadpoles metamorphose into toadlets more quickly than frogs and common toads, leaving the water from June to August. Adult natterjacks forage on land for food in the summer months, and overwinter in sandy burrows which they may dig themselves or inherit from earlier excavations.

INTRODUCED AMPHIBIANS

Green or water frogs

There are well established colonies of green or water frogs in South and East England, particularly London, Surrey, Sussex and Kent, some dating back for several decades. These often comprise a hybrid species of the edible frog *Rana esculenta,* or its parent species the marsh frog *Rana ridibunda* and/or the pool frog *Rana lessonae.* All three types may be found together in mixed populations. These frogs (to 120mm body length) look very similar and are shades of green and brown with variable amounts of striping, marks and spots on their body and limbs. Release into the wild of edible and marsh frogs is prohibited by law. Introduced pool frogs may be located both with and without the other types. Because of their complex situation and current research by English Nature into the past possible native status of pool frog, all enquiries should be made to English Nature on the correct policy to apply at each location. In some cases removal of green frogs may be advised and it may not be desirable or possible to release them back to wild locations.

Other amphibian species

Hybrid populations of native and continental European crested newt are rare finds and can only be detected by an experienced researcher. The North American bullfrog *Rana catesbeiana* is known to have been released into the wild, and has been reported breeding. These large frogs are now removed on sight because of the potential threat they pose to British wildlife if they become established. Colonies of amphibian species found on the north coast of France such as the midwife toad *Alytes obstetricans* have become established (notably in the Bedford area), as have common tree frog *Hyla arborea* and alpine newt *Triturus alpestris.* None of these species receive a protected status in Britain and it is possible that other species may be encountered from time to time as the result of escapes or releases from captivity.

A11 BESTHORPE – WYMONDHAM BYPASS, NORFOLK

Three new amphibian ponds were built and former gravel pit habitats for great crested newt restored by removal of shading vegetation, when the A11 bypass was constructed within 200 metres of its former habitat. Commissioned studies indicated the potential severance of a proportion of terrestrial amphibian habitat and so the road route was fenced with permanent amphibian fencing and an underpass ledge was built into a river culvert passing at 90 degrees to the new road, to facilitate amphibian movement either side of the road. A pond was retained on the severed side of the road and extensive landscaping work carried out. This included conversion of arable fields to establish a 6 ha native grassland nature reserve around the newly built and restored ponds. Monitoring indicates that the population of great crested newts has grown to be one of the largest known populations within the UK.

A140 SCOLE-STUSTON BYPASS, NORFOLK

Bypass proposals along a river valley threatened to cut off a large population of common toads from a newly built amenity lake where their numbers had built up. In 1994 two 500mm surface tunnels and over 2km of permanent amphibian fencing were installed to enable continued movement of amphibians from their terrestrial farmland habitats and their breeding pond. Access was also provided via this system for other species such as grass snakes that were able to continue their annual movements from the lake to farmyard breeding sites some 500 metres on the other side of the new road. Localised safeguards and improvements were also made to local ponds that were influenced by side roads and/or junction work and a new water body was constructed elsewhere on the scheme.

A34 WILMSLOW AND HANDFORTH BYPASS, CHESHIRE

A £206,500 scheme was implemented by Cheshire County Council to mitigate the impacts of the new A34 dual carriageway on amphibians (1992). Mitigation was directed principally at sites which support populations of the protected great crested newt, and where possible measures were designed to retain amphibian populations in their existing locations. Separate measures, agreed by English Nature and prepared for each pond cluster, formed an extensive package of measures comprising the protection and enhancement of terrestrial habitats; the construction of 17 new ponds (varying in size between 300 and 900 m^2) and restoration of 6 others (by de-silting, re-grading and removal of invasive species); the capture and transfer of 11,000 amphibians, larvae and spawn (by drift fencing, pit-fall trapping, hand netting and bottle trapping) of 5 species (great crested newt (*Triturus cristatus*), smooth newt (*Triturus vulgaris*), palmate newt (*Triturus helveticus*), common frog (*Rana temporaria*) and common toad (*Bufo bufo*); and the protection of amphibians during and after road construction by fencing and tunnels. Throughout the translocation programme, an accurate record was kept of the captured amphibians detailing: date, site name, method of capture, life stage (larva, adult, immature), sex or sex class, point of capture and point of release. Monitoring of selected new and restored ponds has taken place in each of the three seasons following translocation (1992-1995).

A41 NO MAN'S HEATH TO MACFEN BYPASS, CHESHIRE

At the time of writing, the bypass proposal crosses through an important area for great crested newts. While the proposal involves no direct loss of ponds or known hibernacula, newts forage in the area through which the road would pass. Three newt tunnels, temporary (construction) and permanent fencing and suitable terrestrial habitats within landtake are to be provided. Additionally, a pond is to be created either within land take or immediately adjacent to the road pending landowner agreement. The mitigation package seeks to provide conservation benefit to the affected population. Proposals for monitoring and maintenance are being developed.

ANNEX D SOURCES OF FURTHER INFORMATION

Froglife produces a range of publications and operates an enquiry service to assist in the provision of advice and information relating to amphibians. It also holds the register of toad crossing sites in England and Wales.

Froglife
Mansion House
27/28 Market Place
Halesworth
Suffolk IP19 8AY

Tel: 01986 873733
Fax: 01986 874744

E-mail: froglife@froglife.org

Froglife can provide contact details of local Amphibian and Reptile Groups affiliated to Herpetofauna Groups of Britain and Ireland, and local amphibian recorders (who may hold information on local amphibian distribution within their county) and suppliers of tunnel and fence systems.

15. ENQUIRIES

All technical enquiries or comments on this Advice Note should be sent in writing as appropriate to:

Divisional Director
The Highways Agency
St Christopher House
Southwark Street
London SE1 0TE

M A GARNHAM
Divisional Director

Chief Road Engineer
The Scottish Executive Development Department
National Roads Directorate
Victoria Quay
Edinburgh EH6 6QQ

J HOWISON
Chief Road Engineer

Chief Highway Engineer
The National Assembly for Wales
Cynulliad Cenedlaethol Cymru
Crown Buildings
Cathays Park
Cardiff CF10 3NQ

J R REES
Chief Highway Engineer

Assistant Director of Engineering
Department for Regional Development
Roads Service
Clarence Court
10-18 Adelaide Street
Belfast BT2 8GB

D O'HAGAN
Assistant Director of Engineering