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HABITAT TRANSLOCATION: A BEST PRACTICE GUIDE (CIRIA C600)

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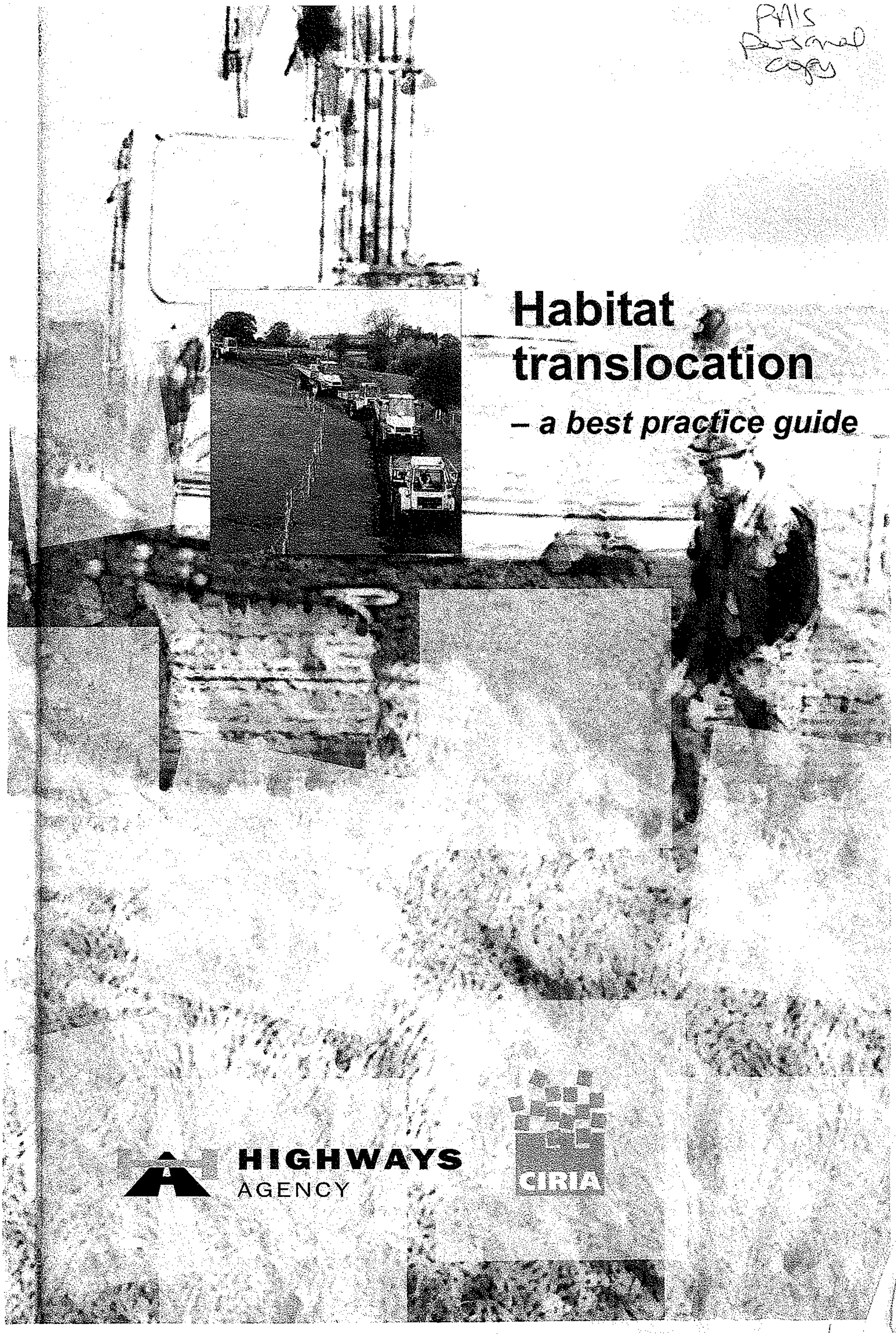

Habitat translocation

– a best practice guide

HIGHWAYS AGENCY

CIRIA

CIRIA C600 London, 2003

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Habitat translocation
a best practice guide

Penny Anderson

A good copy of the Mona Lisa is still <u>not</u> the Mona Lisa

Klotzli, 1987

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GLOSSARY

A horizon — The upper mineral soil horizon, synonymous with topsoil.

B horizon — The mineral soil horizon below the topsoil, synonymous with subsoil.

Biomass — The total mass of all living organisms. Generally referred to as 'vegetation biomass' meaning all living plant material.

Bud bank — Buds from the rhizomes, bulbs and other underground organs that can regenerate after disturbance.

Bulk density/ densities — The relationship of the mass of a soil to its volume, typically expressed in g cm^{-3}.

C horizon — Soil parent materials, weathered but not otherwise altered by pedogenic processes.

Compaction — Damage by smearing or by excess compression.

Compression — The measurement of, or the re-creation of, a certain bulk density of soils or subsoils.

Coppiced — Cutting down of the main stem of a tree or shrub to a few inches above ground level, allowing the tree/shrub to regenerate in a multi-stemmed form.

Critical natural capital — In the ecological sense, the total resource of non-re-creatable habitats.

DAFOR — Measure of abundance: dominant; abundant; frequent; occasional; rare.

Ecological landscape — The patterns and interrelationships of vegetation patches in space, eg. woods, hedges, grasslands, ditches.

Field capacity — Water that remains in soil after excess moisture has drained freely from that soil.

Flushes — Areas where water flows or wells up to the surface of the land colonised by a wetland flora.

Gene flow — The consequence of cross-fertilisation between members of species across boundaries between populations, or within populations, resulting in the spread of genes across and between populations.

Genetic bottlenecks — Poor linkages between habitats that few species or individuals can cross, resulting in a degree of isolation in separated areas.

MG5 — MG stands for mesotrophic grassland, ie a neutral grassland community; the number is the community.

National Soil Survey Classification — Classification of soils by the Soil Survey of England and Wales (for details see Avery, BW, 1990: *Soils of the British Isles.*

Perennating organs — The vegetative means whereby biennial and perennial plants survive periods of unfavourable conditions.

Pollarding — A system of management in which the main stem of a tree is severed about 2 m above ground level, favouring the development of lateral branches.

Quadrat — A basic unit used in vegetation surveys, usually square.

Ruderal — A plant strategy involving a rapid establishment and life cycle, production of many seeds, and ready colonisation of disturbed ground, eg red deadnettle, shepherd's purse and many of the ready colonisers of arable or disturbed ground.

Seed bank — The accumulation of seed of various plants in the upper horizon of the soil profile (although this is dispersed through the profile when the soil is ploughed regularly).

Springs — When water emerges from the ground where subsurface water meets an impermeable barrier, such as a band of shale or clay.

ABBREVIATIONS

BAP	Biodiversity Action Plan
CPO	Compulsory Purchase Order
CWS	County Wildlife Site
CWT	County Wildlife Trust
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMAS	Eco-management and Audit Scheme
EN	English Nature
ES	Environmental Statement
GC/Works	General Conditions of Government Contract for Building and Civil Engineering Works
GPS	Global Positioning Satellite
ICE	Institution of Civil Engineers
IEEM	Institute of Ecology and Environmental Management
JCLI	Joint Council for Landscaping Industries
JCT	Joint Contracts Tribunal
JNCC	Joint Nature Conservation Committee
LNR	Local Nature Reserve
NEC	New Engineering Contract
NJCC	National Joint Consultative Committee for the Construction Industry
NPPG	National Planning Policy Guidance
NVC	National Vegetation Classification. (A classification describing a series of communities and sub-communities reflecting the variation of British vegetation)
PAN	Planning Advice Note
PPG	Planning Policy Guidance
Ramsar	Wetland site of international importance under the Ramsar Convention 1971
cSAC	candidate Special Area of Conservation
SINC	Site of Importance for Nature Conservation.
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TAN	Technical Advice Note

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1 INTRODUCTION

Habitat translocation is defined, and a checklist given of the basic requirements to assist in achieving high standards of work from the planning to the post transplantation monitoring stage.

1.1 WHAT IS HABITAT TRANSLOCATION?

Habitat translocation is the process of moving soils with their vegetation and any animals that remain associated with them, in order to rescue habitats that would otherwise be lost due to some kind of development or extraction scheme. Such activity is essentially associated with habitats of **significant nature conservation value** where a decision has been made to move them rather than lose them totally to another land use, such as development of some kind or mineral extraction.

Essentially, only habitats and their translocation are included in this guidance document and the Review of Translocations that accompanies it. **Species translocations are not covered** specifically, except occasionally as integral parts of a wider scheme. Advice on species translocations is readily available elsewhere (Box 1.1).

> **SPECIES TRANSLOCATIONS**
>
> Species translocations, for example where great crested newts, water voles or bats are moved out of an area and into another habitat, are not covered in this guide; see
>
> - Oxford 2000 for a list of existing guidelines
> - McLean 2001 for the policy context
>
> 1.1

1.2 THE SCOPE OF THE GUIDE

This **best practice guide** sets out minimum standards for habitat translocations. It is not a guide to **promote translocations**, indeed it is stressed that such **translocation should be regarded** for all sites of high nature conservation value as very much a last resort when all other alternative avenues have been explored and discarded. However, where habitat translocation has been accepted, **this guide seeks to set high standards** to help avoid some of the failures (from a variety of causes) found in past translocation projects. It is likely that habitat translocations will continue to take place in certain circumstances. The objective of this guide is to raise the standards of these and reduce the risks that emanate from poor practice.

The **guide is based on** the results of an extensive Review (see Box 1.2) of habitat translocation projects, which used published and unpublished information and involved interviewing key consultants and contractors involved in translocation. The Review is provided on CD to accompany this guide.

> **THE ORIGIN OF THE GUIDE**
>
> A Review was undertaken which:
>
> - evaluated over 30 habitat translocation projects undertaken over the last 20 years
> - consulted key personnel that had been involved in translocations at both the design and contractors' stages
> - assessed the published information on habitat translocations
> - utilised the extensive experience of its authors and steering group.
>
> The Review is provided on CD in the back of this book.
>
> 1.2

The basic principles of habitat translocation should be equally applicable in other parts of Europe and elsewhere, but will need to be set within the pertinent legal and policy framework. The guide focuses on the situation in England, but seeks to accommodate the variation in approach through the legal and policy framework in other parts of the UK. As these, and the processes that emanate from them, change with time, the guidance given in this document will need to be re-set against them. In general, reference to an English or British policy, procedure or government department implies the equivalent in other countries. Table 1.1 provides a framework of the equivalent relevant legal and policy structures for the UK.

1.3 HOW TO USE THIS GUIDE

The need for habitat translocation will usually **arise as a product of a planning application**, or as a corollary of the applications of special parliamentary procedures or other enabling legislation, all usually to allow some kind of development (construction or extraction for example), to take place where a site of significant nature conservation value is affected. However, the guidance is **equally applicable to temporary disturbance** of high value nature conservation sites such as when **pipeline or culvert** installations pass through high value habitats.

TABLE 1.1 *Relevant planning legislation throughout the UK*

	Relevant planning legislation	Relevant EIA Regulations & Circulars	Key wildlife legislation
England	Town and County Planning Act (1990) The Planning and Compensation Act (1991)	The Town and Country Planning (Environmental Assessment) (England and Wales) Regulations 1999 (SI 1999 No. 293)	Wildlife and Countryside Act (1981) Countryside and Rights of Way Act (2000) Conservation (Natural Habitat &c) Regulations (1994) & Amendments (2000)
Wales	Town and County Planning Act (1990) The Planning and Compensation Act (1991)	The Town and Country Planning (Environmental Assessment) (England and Wales) Regulations 1999 (SI 1999 No. 293)	Wildlife and Countryside Act (1981) Countryside and Rights of Way Act (2000) Conservation (Natural Habitat &c) Regulations (1994) & Amendments (2000)
Scotland	Town and County (Scotland) Act (1997)	The Environmental Impact Assessment (Scotland) Regulations 1999 (Scottish SI 1999 No. 1)	Wildlife and Countryside Act (1981) Conservation (Natural Habitat &c) Regulations (1994) & Amendments
Northern Ireland	Northern Ireland Planning (NI) Order (1991)	The Planning (Environmental Impact Assessment) (Northern Ireland) Regulations (Northern Ireland) 1999 (SR 1999 No. 73)	Wildlife NI Order (1985) & Amendment (1995) The Conservation (Natural Habitats etc) Regulations (NI) (1995) & Amendments (1997)

TABLE 1.1 *Relevant planning policy and advice throughout the UK (Nature conservation and biodiversity)*

	Planning guidance on nature conservation issues	Other guidance on biodiversity†
England	Planning Policy Guidance PPG 9 Nature Conservation Circular 11/95 Planning Conditions Circular 1/97 Planning Obligations Circular 2/99 Environmental Impact Assessment (1999)	*Working With the Grain of Nature: A biodiversity strategy for England* (DEFRA 2002) Countryside and Rights of Way Act 2002, section 74 and its lists
Wales	Technical Advice Note TAN 5 Nature Conservation and Planning (1996) Planning Guidance (Wales) Planning Policy 1st Revision (1999) Circular 35/95 Planning Conditions Circular 13/99 Planning Obligations	Countryside and Rights of Way Act 2002, section 74 and its lists
Scotland	National Planning Policy Guidance (NPPG) 14 Natural Heritage (1999) The Scottish Office. Planning Advice Note (PAN) 60 Planning for Natural Heritage (2000). Scottish Executive. Circular 18/1986 The Use of Planning Conditions Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and the Conservation. Revised Guidance (Updating Scottish Office Circular No. 6/1995). Scottish Executive (2000) Circular 12/1996 Planning Agreements Circular 15/1999 Environmental Impact Assessment (Scotland) Regulations (1999) Planning Advice Note 58 Environmental Impact Assessment (1999)	*Scottish Biodiversity Strategy* (draft pending as of Feb 2003)
Northern Ireland	Planning Policy Statement No. 2, 1997, Planning and Nature Conservation	Northern Ireland Biodiversity Strategy (2000). Northern Ireland Environment and Heritage Service

† These references are specific to each country and are additional to the *UK Biodiversity Action Plan* (1994) and *Biodiversity: The UK Steering Group Report* (all volumes; 1995 and onwards).

This guide should be used to cover all aspects of habitat translocation through:

- the proposal, planning and design process
- the construction and management stage
- ecological monitoring and reporting stage.

The guidance reflects **current best practice,** based on the available experience, observations and research findings (see the Review) but, as new techniques and research results become available, it will need to be updated and extended by the user to take account of this new information.

As a general principle, the standards recommended in this guide are equally applicable to any translocation, **but the amount of effort, the resources needed and, therefore, the costs of habitat translocation relate to the nature conservation value of the site.** The higher this is, the greater the effort required to achieve best practice standards (see Fig. 1.1).

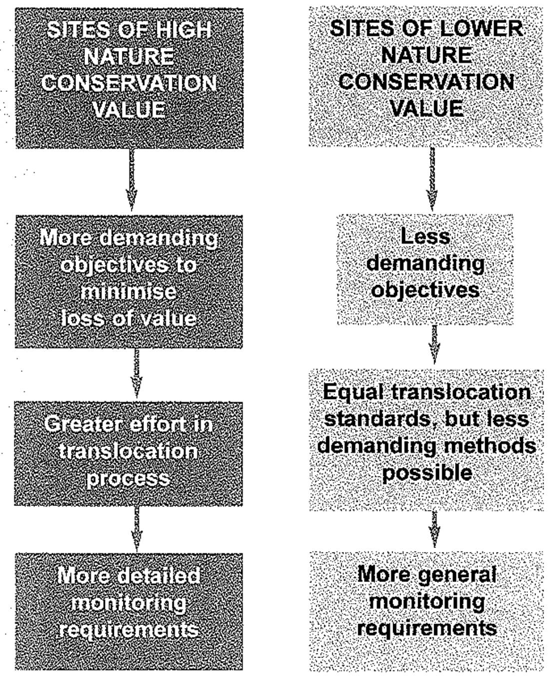


FIGURE 1.1 *Levels of input needed related to habitat quality*

The **guide focuses on translocating habitats of sufficient nature conservation value that their re-establishment to reflect their original characteristics is the principal objective.** However, the advice given is **equally applicable** to situations where **salvage translocation** of individual plants, clumps or small patches is being undertaken for use in creating better new semi-natural areas, especially of species that cannot be purchased as seed. This should be a normal procedure where such materials are present. It is possible that, for low value material, translocation could also be part of an ecological enhancement scheme. The principles of the translocation process will be the same for these different objectives, although the exigencies of monitoring and feedback are likely to be much less for lower value material.

Before considering habitat translocation for habitats of significant nature conservation value, **consult the following checklist**. If any of the items cannot be assured, then the translocation could fail to achieve best practice standards:

- **time** is needed to plan effectively, including prior survey and data analysis
- adequate **resources** are essential
- the developer needs to be **committed** to achieving a successful translocation
- an **ecologist**, suitably experienced in habitat translocation, will be needed to work on the project
- a **contractor suitably experienced and adequately equipped** for habitat translocation should be employed
- a **matching receptor site** is required that can be properly managed for the long-term
- a robust **monitoring schedule** and an appropriate **investigatory programme**, pre and post translocation, are essential for all sites of significant value.

Use **Fig. 1.2** (see page 11) for guidance on the **scale and time** requirements for a translocation project. **Use the expanded checklist in Appendix I** for the scope of the whole translocation process. This checklist doubles as a reminder of all the stages of a translocation, and the decisions that will need to be made, and provides a recording form for registering the outcome of each stage.

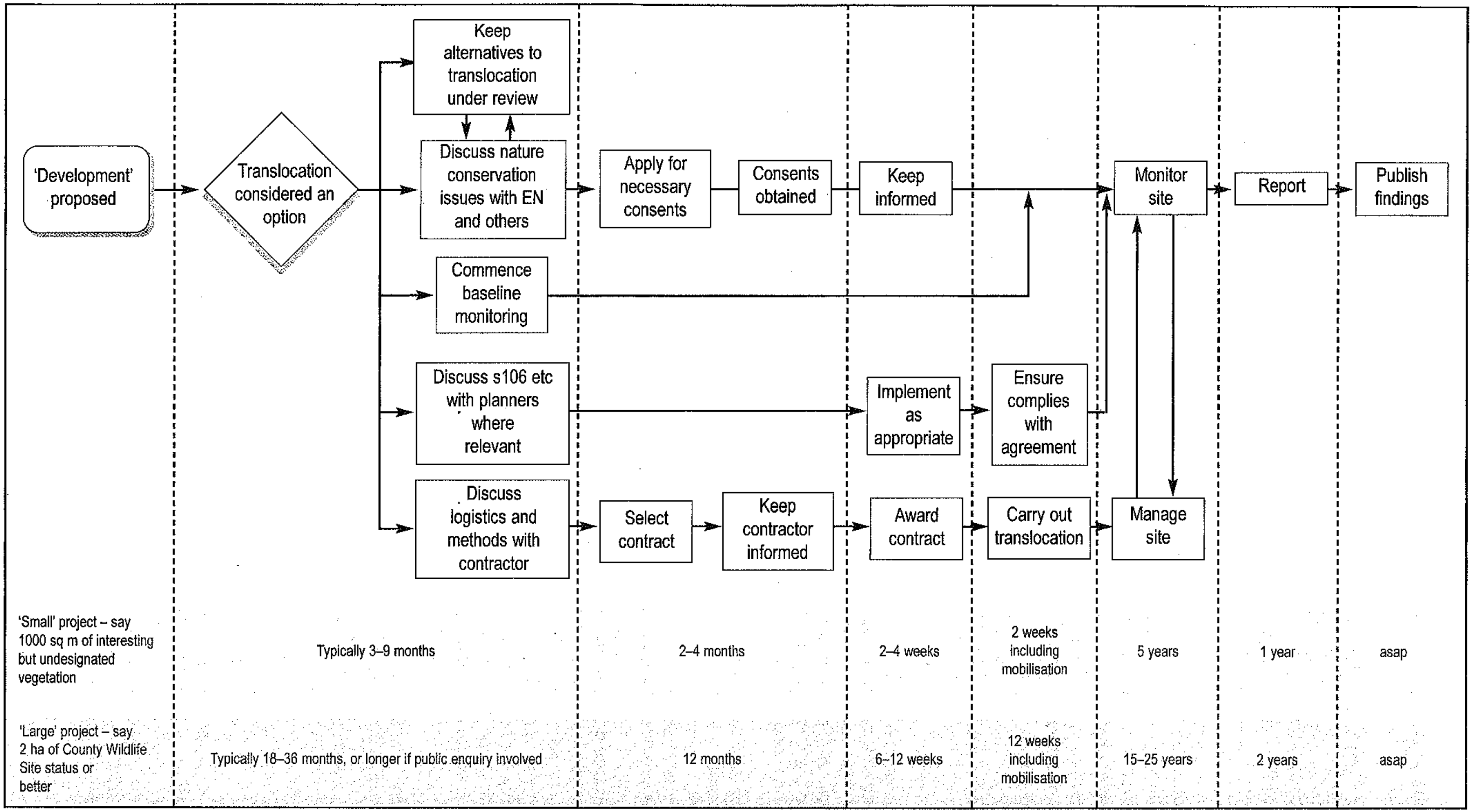


FIGURE 1.2 *The process of planning and implementation of a translocation project*

1.4 FINDING YOUR WAY THROUGH THE GUIDE

Read Section 2 first. This is a **health warning** that assesses the risks involved because of the controversial nature of habitat translocation where high value sites are involved. Assuming translocation is still regarded as appropriate, after considering Section 2, **Section 3** takes you through:

- the policy and formal guidance on the acceptability of habitat translocations
- how to deal with them in an Environmental Impact Assessment
- the kinds of conditions and planning obligations that are appropriate.

Section 4 explains how to plan the translocation operation, from selecting a receptor site, dealing with engineering contracts and method statements, to planning the monitoring and management.

Section 5 deals with contracts, and those most appropriate for translocation exercises.

Section 6 sets out the mechanics of translocation, considering the environmental engineering aspects of a translocation scheme.

Section 7 covers aftercare, monitoring and long-term management.

Section 8 gives information on a range of costs of the whole exercise and sets these in context.

2. HABITAT TRANSLOCATION: A HEALTH WARNING

Learn from the problems others have faced before moving on to further sections. Best practice habitat translocation is dependent on following a sequence of activities. Many of these have the potential to go wrong. This section highlights where mistakes or inadequate attention to detail or to preparation can jeopardise the outcome of the translocation.

2.1 INTRODUCTION

The **decision to offer** habitat translocation as a measure to reduce the impact of a development project **must be based on the efficacy of the process and the nature conservation value of the site.** The decision should not be taken lightly, and the tendency to **offer translocation** without researching alternatives thoroughly **when a habitat is 'in the way' should be avoided.**

However, when habitat translocation is deemed necessary, those involved must **understand fully the potential for success or failure attached to the whole process**, before considering best practice methods. **Habitat translocation is controversial and the risk of failure of any part of the process is high.** It is therefore instructive to understand the problems involved first before considering best practice. The key issues are set out below.

- **insufficient time and resources allowed** for the proper planning of the project
- **failure of the planning system to obtain sufficiently detailed and expert specifications for the proposed translocations works from developers** prior to determination of an application
- **failure** of the planning system **to provide specific and unambiguous planning conditions**
- **lack of a suitably precise planning obligation** where relevant (Section 106 Agreement under the Town and Country Planning Act 1990; and Section 75 of the equivalent Act in Scotland)
- **lack of enforcement** of conditions or obligations by the planning authority
- **lack of interest**, commitment or understanding on behalf of the developer or his agent
- **lack of proper and full understanding** of habitat translocation measures by all involved parties
- **mis-match of the receptor site with the donor site**
- **poor method statements** and **lack of guidance** for contractors carrying out the translocation
- **inadequate enforcement of method statements and of site supervision** of contractors
- **lack of care**, commitment, interest or understanding of contractors (main or sub-contractors)
- **pressure to reduce costs** of a project
- inability to cope with problems of **bad weather**
- disturbance and **damage to soils** in transference
- **damage to the ecological interest** of the habitat due to translocation
- inadequate or **lack of appropriate management** pre- and post-translocation
- lack of or **inadequate monitoring** to provide data for judging ecological effectiveness of translocation.

In the Review of past translocations (see the CD in the back of this book), **examples of most** of the above were **found**, sometimes with **several problems associated with a single scheme**. On the other hand, **translocation projects were found that meet most of the best practice guidelines** given in this document. However, most of these have been implemented fairly recently, and long-term monitoring results to understand the extent of ecological achievements are not yet available. The main risks are outlined below. Best practice guidance is then given from Section 3 onwards.

2.1.1 Habitat translocation costs money and takes time and commitment

Habitat translocation is expensive – significant resources are needed if the total cost of the process from planning, and up to 10 years or more post transfer monitoring is included. The range of likely costs is given in Section 8.

Planning a translocation cannot be completed in a hurry. Time – **at least two years** for complex projects involving a high value site – is needed **prior to translocation** (see Fig. 1.2, page 12). Projects rarely reach adequate quality standards if inadequate time is allowed for the process outlined below.

Successful translocation is also dependent on a committed team – not just the ecologist and contractor, but also the developer, the landowner (if different from the former), and all others involved. Commitment to a high level of workmanship, with sufficient time to execute the project properly, and the resources to undertake it are all essential requirements. **Translocation can fail if these basic requirements are not met.**

A developer who allows insufficient time and resources to implement the scheme properly, and/or who promises translocation to obtain planning permission, and then reneges on that commitment, can inflict a great deal of ecological damage that will **give translocation a bad name**. This damages the reputation of the genuine and committed, and is short-sighted if further arguments for translocation are needed by the same developer for a future scheme. Furthermore, failure to follow through on such commitment is almost certainly likely to mean that the developer *is* in breach of his planning consent and liable to face enforcement action from the local planning authority – which may result in substantial delays and additional costs.

2.2 DEALING WITH THE PLANNING SYSTEM

Habitat translocation affects the character of the habitat negatively to a greater or lesser extent. This will **affect its nature conservation value**; probably significantly for a high value site such as a Site of Special Scientific Interest (SSSI) or equivalent in other countries. In addition, **the translocated site loses its historic context**, which also diminishes its nature conservation value. Where the habitat represents critical natural capital (defined in Box 2.1), **translocation is likely to represent a loss of value** (see Box 2.1). Where **constant natural assets** are involved (recently established grassland or other habitat), the **nature conservation value may be retained**. There may also be opportunities for providing benefits, such as increasing the habitat's area and diversity.

In the past, translocation has been offered both as **mitigation or compensation** in Environmental Impact Assessments. Historically, there has been considerable variation in the ways these terms are used. Beware that they can have different connotations in different places in the literature, in practice and, sometimes, in the law.

With reference to Environmental Impact Assessments (EIA), the difference between compensation and mitigation is a real one and of great importance (see Section 3 and Box 3.4). The advent of the Habitats Regulations (The Conservation (Natural Habitats, &c) Regulations 1994) requires consistent use of these terms as a strict definition of compensation is essential to Section 53 of the Regulations. Mitigation is defined as **'measures aimed at minimising or even cancelling the negative impacts of a plan or project, during or after its completion'** (*Managing Natura 2000 Sites*, EC 2000), whereas, **compensation measures are those that compensate for residual adverse impacts** which have not or cannot be mitigated against. Advice on when and how to use these terms is provided in Section 3. Note that some recent planning inquiry **inspectors** in England have turned down planning applications where translocation had been offered on high value sites (mostly SSSIs) (see Box 2.2).

In general, **information provided with planning applications on habitat translocation is very poor**, being too ambiguous, and lacking specific details and sufficient expert ecological input, which is, in turn, ineffective in acting as a control over the standards of habitat translocation. This seems to be the case whether it is information submitted prior to determination, or submitted to comply with planning conditions or planning obligations† once permission has been granted (see Section 3 for the planning background). In addition, or possibly as a result, planning conditions and planning obligations are too often imprecise, and too general or lacking in detail to be effective controls over the standards of habitat translocation. This is

CRITICAL NATURAL CAPITAL AND CONSTANT NATURAL ASSETS

Critical Natural Capital represents our irreplaceable natural assets. They are not tradeable – for example, ancient woodland and other long-established and intricately diverse habitats.

Constant Natural Assets are the replaceable and tradeable components of our natural assets. Note, it may take time to replace some types, for example, secondary woodland, and conditions need to be suitable for full replacement to take place.

See Gillespie and Shepherd 1995 for discussion of these concepts.

Loss of Nature Conservation Value from translocation arises from:

- losses of species (plants or animals)
- changes in community types from that for which the site was recognised as of importance (even if another equally valued community develops)
- losses in configuration of plant communities
- loss of historical context.

2.1

† In England and Wales, this is under Section 106 of the Town & Country Planning Act (1990)
In Scotland, this is under Section 75 of the Town & Country Planning (Scotland) Act 1997

RECENT PUBLIC INQUIRY DECISIONS ABOUT TRANSLOCATION

CASE 1 Maryport Harbour in Cumbria

- Planning inquiry inspector found against development, on nature conservation grounds
- The site is an SSSI supporting specialist plants and a population of the small blue butterfly
- Inspector agreed that even a highly successful translocation would not avoid damage to the SSSI (Oxford 2000).

CASE 2 ECC International (now Imerys Minerals Ltd) Newbridge Works near Newton Abbot in Devon

Inspector's comments on the translocation proposals in an application to expand a ball-clay tip stating:

"I am in no doubt that the importance of the resources should be weighed against the need to retain the SSSI in situ, and that the potential success or failure to translocate the SSSI should not feature in the argument. Even in the circumstances where the conclusion is finely balanced, I can find no compelling argument which supports the view that the potential success or otherwise of translocations should become material along with any other relevant factors. SSSIs should be retained in situ, and translocation is, as EN claims, a last resort when faced with the inevitable loss of the SSSI."

(DETR 1998a).

2.2

largely because of a dearth of relevant expertise on translocation in local planning authorities, and a lack of appreciation of the need to secure detailed information with the application in order to raise the standards of translocation.

The minimum standards advocated in this guide often exceed those given in planning conditions and obligations, although there have been exceptions. Where there are no such planning-related controls, translocation standards have to be set by those involved. This guide will assist in this process. There is commonly inadequate enforcement of planning conditions and obligations by the planning authority, partly due to a lack of expertise in ecological and habitat translocation issues by enforcement officers, as well as local planning authorities that lack ecologically trained staff. This should not, however, be an excuse for not producing a high quality job.

2.3 PLANNING THE EXECUTION OF THE PROJECT

2.3.1 Setting objectives

There are **fundamental difficulties** in most translocation projects **in assessing the level of achievement. Objectives** that are sufficiently detailed and precise have been too rarely set against which to judge successful execution of the whole project, and the ecological impacts that follow.

2.3.2 Choosing a receptor site

Note that it is often **very difficult to find a suitable receptor site**, and translocations have failed because of this in the past (see Box 2.3, page 16):

- landowners may not wish to sell or otherwise release suitable land
- developers have not been willing to obtain land outside their ownership
- sites with sufficiently comparable soils, hydrology, topography, and climate to the donor site are hard to find
- some site engineering is often needed to manipulate the environmental characteristics, but this may not be sustainable in the long term (eg if it involves pumps, liners etc)
- sites in ecological connection with appropriate habitats, and with any remaining area of the donor site are also desirable, and are difficult to source within the other constraints.

Hydrological issues probably cause more projects to fail than any other factor. Natural variation in water flows, such as springs and flushes, cannot be engineered, although some success has been achieved in manufacturing appropriate groundwater levels. Placing vegetation that is sensitive to particular fluctuating groundwater levels is especially difficult to achieve successfully. Control of the factors affecting the groundwater on the receptor site is vital.

Proper site investigations are needed to be able to make informed judgements about potential receptor sites. Without these, projects can fail because vegetation changes on different soils, and with a different hydrology. Conducting these investigations demands time, possibly more than a year if seasonal investigations are needed.

The **receptor site** must be available for the **long term.** A translocated habitat of significant value should, in project planning terms, be placed on a secure site, not destined for other development, and with a commitment for its conservation, effectively in perpetuity. It must also be **accessible for appropriate management**. This means a committed and friendly owner, and the necessary resources being made available to facilitate the management. Moreover, particular management of the vegetation might be needed prior to translocation. Time has to be allowed for this.

2.3.3 The monitoring scheme

Monitoring is essential (except possibly where nature conservation value is not an issue). It provides feedback on the ecological consequences

UNSUITABILITY OF RECEPTOR SITES

Case†	Problem
Brampton Meadow, Cambridge Neutral grassland, ridge and furrow	Replaced another habitat within the SSSI.
Newhall Reservoir, Nottinghamshire Neutral grassland	Re-placed on the same reservoir roof but with an altered soil profile.
Brocks Farm, Devon Neutral grassland	Receptor site, mostly suitable, but included compacted ground over services' line.
Monkspath Meadow, Warwickshire Neutral grassland	Divided between two receptors, one over a pipeline on already disturbed soils, the other on different soils and too wet.
Hockley Flood Meadow, Hampshire Flood meadow	Site became too wet.
Waddington Fell, Lancashire Heathland	Part of receptor site too wet.
Mold Bypass, Clywd Ancient woodland	Part of site too wet after having created a pond to increase wetness.
Biggins Wood, Kent Ancient woodland	Ground water conditions different, with seepage from an adjacent stream. Soils differed.

† See Appendix II for a list of the case studies mentioned in this guide.

2.3

of translocation, and on management. It shows where modifications are needed of the site or the management measures. It allows the scheme to share with others the problems encountered and success achieved. Many schemes in the Review lacked adequate monitoring.

Monitoring can be 'cheap and cheerful' for low value habitats, or ecologically detailed and more time-consuming for important sites. It may be needed up to two years prior to transfer, and for up to 10 years or more post translocation (although not necessarily on an annual basis during this period). For woodlands, monitoring may be required for 20–25 years or more after translocation. For low value materials being used in new habitat creation and landscape schemes, at least regular annual or bi-annual site checks will be needed during the maintenance period (normally three to five years) to ensure that the ecological development is progressing in the desired direction. For low value materials being used in new habitat creation and landscape schemes, at least regular annual or bi-annual site checks will be needed during the maintenance period (normally three to five years) to ensure that the ecological development is progressing in the desired direction.

Time and resources have to be allocated for effective monitoring and for appropriate analysis and evaluation of the results.

2.3.4 Contract issues

The contractual framework within which the work is to be undertaken is a **fundamentally important** aspect of the effective planning of the execution of the translocation project. A number of different contract routes have been used for past translocation work. **Habitat translocation is almost always advance works and so is very time-sensitive; delays can seriously disrupt the main project implementation programme.** Such delays can lead to significant cost implications. Pressures on time can lead to a reduction in the quality of the finished work.

'Conventional' approaches to the procurement of engineering contracts – **where consulting engineers design the scheme and a civil engineering contractor is appointed to construct the works** – have frequently assumed that the best way forward is for translocation to be carried out as a sub-contract, linked to the site clearance stage of the project. The project engineer oversees all works with an ecologist as adviser. **Ecological control and communication is therefore indirect, through the engineer and main contractor, with consequent increased scope for error or misunderstanding. Quality of output can, therefore, suffer.**

Where the approach to the procurement of the contract is **'design and build', the communication and quality control mechanisms are even more remote**. Whilst the employer's ecologist can ensure that the performance requirements for the habitat translocation are written explicitly into the 'Employer's Requirements', final control of the works can be prejudiced by misinterpretation or misunderstanding, as information passes up and down an often tortuous chain of command.

It is essential that the Employer's Requirements are drawn up in such a way as to achieve efficient and effective communication between

the Employer's agent and ecological advisers and the specialist contractor who is actually undertaking the translocation works. In the context of working with sites of high nature conservation value, the Employer's agent should seek to ensure that the Employer's Requirements are sufficiently prescriptive as to ensure a thorough understanding of the specialist ecological works required, and to ensure that the required standards of workmanship, the quality of supervision, plant and materials are met at all times during the contract.

Where the project has been approached by way of a **separate main contract with the specialist habitat translocation contractor, communication channels are direct**. The ecologist can be appointed as the 'engineer' for contractual purposes, having direct control of the works, with the project engineer as adviser. Whilst the works can still be undertaken within a tight timetable, **quality control remains in specialist hands – those of the ecologist and the habitat translocation contractor**. This is advantageous in that there are no direct external pressures relating to other engineering matters at play.

These matters are explored more fully in Section 5.

2.4 THE MECHANICS OF TRANSLOCATION

Habitat translocation can fail if **inappropriate techniques** are chosen for the habitat involved, and if the process is not carried out in a **professional, orderly manner**. The choice of transfer as turves or as scraped-up soils and vegetation (termed 'soil transfer' in this guide, but also referred to as 'littering', 'blading' or 'mass transfer' in the literature), and the depth of material to take, can determine the final success of the project. **These should not be compromised by costs, or time constraints**: the success of the ecological outcome of the scheme depends on them. **Competent ecologists** with experience of habitat translocation are an essential part of the team for making sound decisions.

PLATE 2.1 *Extracting turves by hand is not recommended. Turves should not be stacked or stored*

Similarly, the success of the translocation process **depends on experienced and professional contractors** who are committed to achieving a high quality of work. In a complex project there are **major logistical issues to solve** when the translocation is sub-contracted by the main contractor, or when it is part of a large development project with different phases proceeding simultaneously, and there is a tight time scale to achieve substantial transfer in a short dormant season. The machines and numbers of work teams have to suit not only the habitat and its requirements, but also its weight, the rate of transfer needed, the quality of the haul roads, site access provisions, and the health and safety requirements.

Such issues require **time to plan** and resolve to the satisfaction of all those involved. Suitably experienced contractors have to be **booked well in advance** – there are currently few of them, and they are in high demand. Contracts and financial arrangements need to be agreed and commitments made with **proper forward planning**.

Translocations fail to reach the desired minimum standards if they are rushed, not carefully planned and the contractors are not able to meet the time limits of a project because of lack of forward planning. With proper planning, contingencies can be incorporated that allow for unplanned, and uncontrollable problems such as bad weather during translocation.

2.5 THE ECOLOGICAL IMPACT OF TRANSLOCATION

There is no comprehensive, rigorous experimental basis from which to judge the ecological effects of translocation, although there has been some relevant research (which is assessed in the Review). For the most part, the **implications** of translocation are **derived from monitoring**, and this is often complicated by:

- the effects of changes in management
- natural fluctuations in species
- having no control plot or an inadequate one left for comparison
- differences in the environment of the receptor site from the donor site.

For the most part, there are few scientific investigations comparing translocation methods and practical results on which to base best practice advice. Although the extensive experience of those undertaking translocation is highly valued, there are many areas where further scientific investigation would assist in decision-making.

Habitats can be translocated as turves, or as scraped-up soils and vegetation. The effects of these contrasting methods are quite different, and are compared below. In general, the effects of soil transfer are far greater than for turf transfer where an important and diverse habitat is involved (see Box 2.4). See the Review for a full evaluation.

Plate 2.2 *Experiments on heather moorland investigating the use of turves, soil transfer after rotavation and seeding with heather*

2.5.1 The effects on soils

Translocation affects soils, and therefore the associated flora and fauna. The significance of this depends on the type of habitat and its value. Note that the main known effects are:

- **a reduction in bulk density** by disturbance, which affects soil structure and therefore aeration and permeability
- some soils can **smear or be compacted**, which affects permeability and aeration
- potential **flushes of nutrients**, especially of nitrogen, as organic matter mineralises with oxygenation resulting from disturbance.

BOX 2.4. SOIL VERSUS TURF TRANSFER

Note that:

- only a limited range of habitats have been transferred as both soil and turves from which comparisons can be made
- more monitoring results are available for grasslands than other habitats
- turves can be used for most vegetation except woodland, hedges and aquatic habitats, and are not limited to grassland.

2.4

2.5.2 The effects on vegetation

Vegetation can also alter:

- there can be a **flush of vigorous growth** of the more competitive species
- **species** especially sensitive to changes in aeration and permeability may **decline or disappear**
- there can be an **influx of ruderal** species from the buried seed bank or from colonisation from elsewhere, as a result of disturbance.

There may be other factors not yet identified that also affect the vegetation. The changes may persist for more than 10 years for soil transfer schemes, or longer if management is incorrect, but are usually much less for turf transplants.

The **changes** to soils and to the vegetation responses are **much greater for soil transfer than for turf translocation** in most habitats. They may be less in dry heathlands where heather† may be dominant but, in other habitats, there can be a significant loss of species, particularly some of the special species that tend to characterise a habitat (see the Review for details).

Other changes in vegetation are also common. It is **rare to be able to match the receptor site adequately to the donor**, and differences produce vegetation changes. Sites can be totally or partially too wet or too dry, too steep or shallow, too acidic or too calcareous, or the wrong aspect, and translocated vegetation can change within 3–4 years to reflect their new situation. Such changes usually represent a loss of diversity and nature conservation value.

Plate 2.3 *Moving grassland vegetation in turves*

Another common problem is ensuring adequate and suitable management in the receptor site. **Vegetation will change without application of appropriate habitat management.**

2.5.3 Changes in the invertebrates

Little is known about changes in invertebrates on the range of habitat types resulting from translocation. In general, the following have been observed:

- **species losses that are greater** than for plants
- **invasion by bare ground and specialist early colonists**, especially predatory ground dwellers and herbivores associated with

† The scientific names of plants mentioned in the text are provided in Appendix III

short turf and bare ground

- **a decline in the total number of individuals** in the first year after translocation
- spiders declining after translocation, even if the structure remains visibly the same
- **an increase in diversity of invertebrates over time after the initial decline**
- a period of **8–10 years** or more for invertebrate species, diversity and populations **to recover**, at least partially
- the ground beetle fauna taking longer than the spider assemblage to recover
- some **wetland invertebrates** re-establishing their diversity and populations more rapidly. In one pond project where invertebrate translocation was undertaken, leeches and true bugs did not translocate as well as other groups.

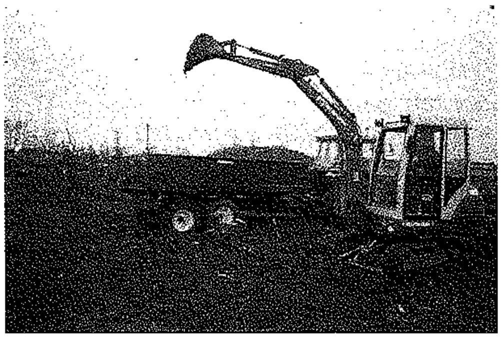


Plate 2.4 *Stripping woodland topsoil*

2.5.4 Other translocation impacts

Moving all or part of a habitat to a new location will result in a different nature conservation value due to changes in such features as:

- its **historic and evolutionary context** (for example, part of the value of an ancient hedge or woodland relates to its location in the historic evolution of the landscape and the cultural value is lost if the habitat is not *in situ*)
- **its naturalness and ecological context** – insofar as the species may be native but its location no longer reflects a natural development within an ecological landscape
- its **scale, layout and pattern** of communities resulting from the often differently shaped and varied receptor site and subcommunities being re-laid in different configurations. These could be lost completely if soil transfer is used
- differences in the **detailed patterning** of vegetation within subcommunities as a result of turves either being turned round and placed against their original neighbours (this is usual in the transfer process), or in different locations within the sub-community because this is in a different configuration from that in the donor site. If soil transfer is used, the original detailed patterning is completely lost.

There are **additional possible effects** depending on the nature of the donor site and the extent of its translocation:

- transferring part of the site results in two smaller sections, although the receptor site could be placed to enlarge an adjacent habitat. Smaller habitat areas are **less ecologically sustainable** than larger ones
- smaller sites can also be more **difficult to manage**, especially if isolated from the 'means of management', for example, grazing
- removing a habitat can **increase ecological fragmentation and isolation** (although the receptor site can help improve these elsewhere)

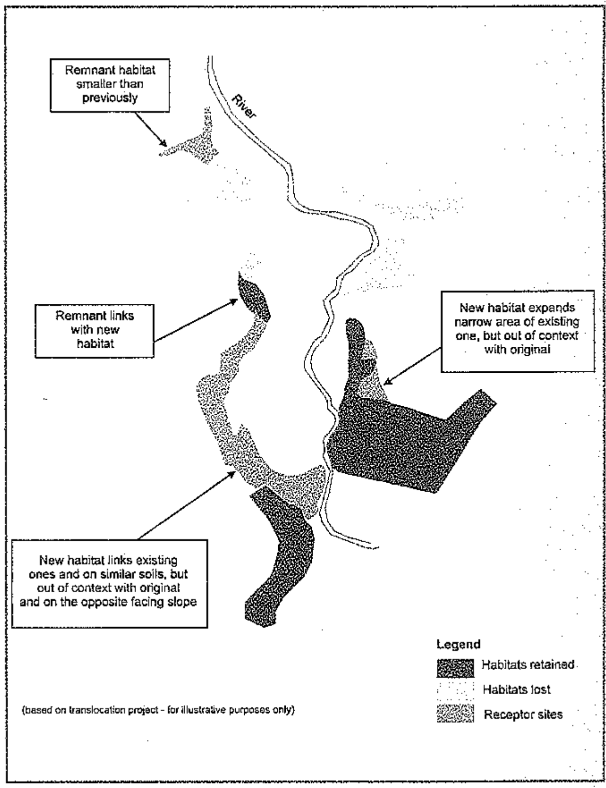


Figure 2.1 *Some effects of translocation*

- removing all or part of a habitat could **reduce gene flow, remove important corridors, and create genetic bottlenecks** that could result in a loss of species (although there is little research available on these subjects)
- **retaining** the site within a development (if it were possible) **could** result in **more significant damage** than if it were translocated – if, for example, it were then seriously affected by trampling or dumping.

Some of these indirect effects of habitat translocation are illustrated on Fig 2.1 (page 19).

2.5.5 The significance of translocation effects

The **significance of effects relates principally to the nature conservation value** of the site (see Box 2.5). For high value sites, especially SSSIs, including sites designated under European Directives, the types of effects outlined could seriously affect the site's integrity and hence its value, and would generally not be acceptable. In extreme circumstances, translocation might be undertaken as a last ditch attempt, when all efforts at conservation *in situ* have failed, to salvage as much as possible of the habitat rather than lose it entirely.

On sites that have no recognised nature conservation value, but still hold some biodiversity that is considered too valuable to lose, and which could contribute to a habitat creation scheme, the translocation effects may be acceptable and, combined with additional habitat creation and management measures, could result in a larger, or/and more valuable nature conservation resource if the project is well planned and executed.

For the many sites of in-between value – the Sites of Importance for Nature Conservation (SINCs† or their equivalent), for example – the particular advantages and benefits of each case will need to be weighed against the relevant planning policies and nature conservation gains or losses. These aspects are expanded in Section 3.

It should be borne in mind that the **new habitat** that develops **from salvaged** material is likely to be superior to a similar habitat created from seeding or natural colonisation, provided this guide is followed. **It will usually be worthwhile, in terms of nature conservation, to translocate habitats that are otherwise to be lost** where there is any appreciable biodiversity present of species (plants and invertebrates) that cannot readily colonise new habitats, and are not available as seed. **This is not to promote habitat translocation when *in situ* conservation is the more desirable approach.** Rather, if a site is to be lost despite *in situ* conservation arguments, then translocation is an appropriate activity to salvage and create a new habitat of some value, albeit a lower one than that lost. Additional compensation is possible if a larger area of new habitat is established compared with the original one.

WHAT ARE HIGH VALUE SITES

High value sites

- Sites of Special Scientific Interest (SSSIs) as designated under the Wildlife and Countryside Act 1981, or Areas of Special Scientific Interest under the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985.
- Candidate or Confirmed Special Areas of Conservation
- Proposed or confirmed Special Protection Areas
- Proposed and confirmed wetlands of international importance (Ramsar sites)
- National Nature Reserves
- Any other high value site that is ecologically non-re-creatable and constitutes part of the critical natural capital of the country.

Second-tier sites

- Local Nature Reserves, where these are not SSSIs.
- Sites of Importance for Nature Conservation (SINCs or their equivalent) that do not fall into the above categories. These are sites identified by local authorities in local plans and may be various labelled in different countries, counties or boroughs. Other labels and processes may be applicable in other countries.
- Sites of equivalent ecological interest may be present, but not previously identified.

Lower value sites

- Sites with no conservation designation, but which may still hold some biodiversity worthy of translocation. These may be recently developed or badly fragmented habitats, eg on road banks, waste ground or disused quarries.

2.5

† SINCs are used here as a generic term for 'local' non-statutory sites. Other equivalent labels are used in some counties and countries.

3. HABITAT TRANSLOCATION AND THE PLANNING PROCESS

Best practice guidance begins here on how to deal with habitat translocations within the Environmental Impact Assessment process, whether mitigation or compensation is more appropriate, and the interaction with the planning process.

3.1 BACKGROUND

Most development in the UK is subject to the land-use planning system and the provisions of the **various relevant Town and Country Planning legislation**†. However, there is a wide range of other developments that for planning purposes fall under different legislation. Motorways and trunk roads, for example are covered by the **relevant Highways Acts. Other development schemes,** such as airports, power stations, power lines, oil, gas pipelines, afforestation, land drainage, ports, harbours, fish farms etc, all have **their own enabling legislation and regulations.** In each case the appropriate legislation needs to be referenced to understand procedures and for this advice to be interpreted appropriately.

Habitat translocation can be relevant to all of theses types of development regardless of the primary legislation. However, the mechanisms for provision will be dictated by the development process, which is in turn driven by the applicable legislation. For example, in a scheme requiring planning permission, habitat translocation might typically be secured – and where necessary enforced – through a planning condition, whereas under a trunk road scheme, translocation would be included in the proposals presented at inquiry and agreed in the decision to proceed.

Within the **planning system,** ideally, information on any development proposals should be submitted as part of the planning application prior to determination and the grant of permission. To encourage this, **local authorities should, therefore, request detailed information to be submitted on any translocation proposal as an actual part of the planning application. Once details have been agreed, local authorities can then impose planning conditions** onto a development to cover translocation requirements. Alternatively, as a part of the planning consent, the developer can agree to undertake the works as part of legally binding planning obligations*.

In either case, planning guidance provides a useful context in which to determine an application involving translocation. In England, paragraph 27 of Planning Policy Guidance 9 (PPG9) Nature Conservation states:

Local planning authorities should not refuse permission if development can be subject to conditions that will prevent damaging impacts on wildlife habitats or important physical features, or if other material factors are sufficient to override nature conservation considerations.

In Scotland, paragraph 74 of National Planning Policy Guidance (NPPG) 14 Natural Heritage states:

> *In negotiating over development proposals, authorities should first seek to avoid any adverse effects on natural heritage. Where this is not possible and other material considerations clearly outweigh any potential damage to the natural heritage, they should endeavour to minimise and mitigate the adverse effects and consider the scope for compensating measures.*

Since translocation schemes cannot by their nature guarantee that damaging impacts will be avoided, the first part of the above test is not relevant. However, the second part certainly should be applied.

Translocation may be an appropriate issue once a local planning authority has decided that there are other material factors sufficient to override the nature conservation considerations. This is unlikely for high value sites in the light of the Inspector's view on the Brocks Farm case (DETR 1999) where he reported that:

...even in the circumstances where the conclusion is finely balanced, I can find no compelling argument which supports the view that the potential success or otherwise of translocation should become material along with any other relevant factors.

However, if a decision is made by the local planning authority to override nature conservation issues, then permission may be granted on the basis that mitigation and compensation measures

† In England and Wales this is: The Town and Country Planning Act (1990) and the Planning and Compensation Act (1991).
In Scotland, this is the Town and Country Planning (Scotland) Act (1997).
In Northern Ireland this is the Planning (NI) Order (1991).

* In England and Wales this is under Section 106 of the Town and Country Planning Act (1990).
In Scotland, this is under Section 75 of the Town and Country Planning (Scotland) Act (1997).
In Northern Ireland, this is under Article 40 of the 1991 Planning Order.

will be required, for example, involving translocation. Paragraph 28 in PPG9 continues:

> *Where there is a risk of damage to a designated site, the planning authority should consider the use of conditions or obligations in the interests of nature conservation.*

Issues related to the planning process involve:

- policy and formal guidance context
- the consideration of translocation in the EIA process and through the determination of the planning application
- the factors affecting judgements of success that translocation might achieve
- the way translocation is dealt with by the planning authorities.

This section addresses the issues associated with these, and gives guidance on the approach needed to ensure translocation is conducted only in the most appropriate circumstances.

3.2 THE POLICY AND GUIDANCE CONTEXT

3.2.1 Translocation of SSSIs is not acceptable

Best practice avoids translocation of SSSIs (or their equivalent in other countries) **on principle**. This will comply with Planning Authority plans that have policies to protect SSSIs. In addition, the Countryside and Rights of Way Act 2000 gives all public bodies in England and the National Assembly for Wales the statutory duty to further the conservation and enhancement of SSSIs, and also gives a new duty to all government departments and the National Assembly for Wales to have regard to biodiversity conservation.

There is, therefore, a strong framework for protecting SSSIs which, by implication, translates into an equally strong commitment not to translocate any part of them. This approach also satisfies the draft JNCC policy (see Box 3.1), and reflects decisions made by two Public Inquiry Inspectors (see Box 2.2, page 15, and Box 3.2). The UK Biodiversity Action Plan (HMSO 1994) provides additional support by stating:

> *the priority must be to sustain the best examples of native habitats where they have survived rather than attempting to move or recreate them elsewhere when their present location is inconvenient because of immediate development proposals.*

In the absence of any further official UK Government policy on where habitat translocations might be acceptable (Box 3.3), **the same principle should ideally be applied to all sites of nature conservation significance – in general, translocation is not a substitute for *in situ* conservation.**

JNCC DRAFT POLICY

the translocation of habitats is considered by the statutory conservation agencies never to be an acceptable alternative to in situ conservation... SSSIs should not be subjected to translocation in whole or in part, and in other areas where there is a significant wildlife interest ... there should be a strong presumption against translocation of habitats.'(McLean 2001).

Note that JNCC[†] represents all the country agencies in Great Britain – English Nature, Countryside Council for Wales, Scottish Natural Heritage.

[†] JNCC – Joint Nature Conservation Committee

3.1

DECISIONS BY PUBLIC INQUIRY INSPECTORS (endorsed by the Secretary of State)

- Translocation should not be considered as a substitute for *in situ* conservation.
- Translocation is essentially a rescue operation.
- Where the case for development is overriding, nothing would be lost by taking the risk to translocate.
- The chances of a successful translocation may be sufficient to tip a finely balanced case in favour of development

(See Oxford 2000 for details).

3.2

THE LACK OF GOVERNMENT GUIDANCE ON HABITAT TRANSLOCATION

- Not mentioned in PPG9 (England only), TAN5 (Wales), or NPPG14 and PAN60 (Scotland).
- No formally recognised codes of practice
- No established framework within which the need or justification of habitat translocation can be addressed systematically.

PPG9 – Planning Policy Guidance 9, Nature Conservation.

TAN5 – Technical Advice Note 5, Nature Conservation and Planning.

PAN60 – Planning Advice Note 60, Planning for Natural Heritage.

NPPG14 – National Planning Policy Guidance 14, Natural Heritage.

3.3

However, there will be situations where there are **overriding planning needs**, such as where scarce resources need to be extracted, and there are no alternative sites, or where an existing facility can only be extended in a particular way, such as a runway extension, or the completion of a transport route, etc. **Habitat translocations might be proposed as a last resort compensation measure in such situations involving sites of high nature conservation value.**

Translocations of sites of lower or no recognised nature conservation value would only be acceptable if:

- the level of significance of the effects is low
- the nature conservation value of the site remains the same or improves
- the likely success of the transfer operation is high
- the threats the site might face if it remained *in situ* are so great that translocation is shown to be a better option.

Some of the factors affecting this decision are presented in Fig. 3.1.

It is important to remember that it is **not only the main development that could be affecting habitats**. All too often these become fixed, possibly without major impacts, only for the **ancillary works to have significant effects**. These could include:

- outfall channel routes
- services diversions
- haul or access routes

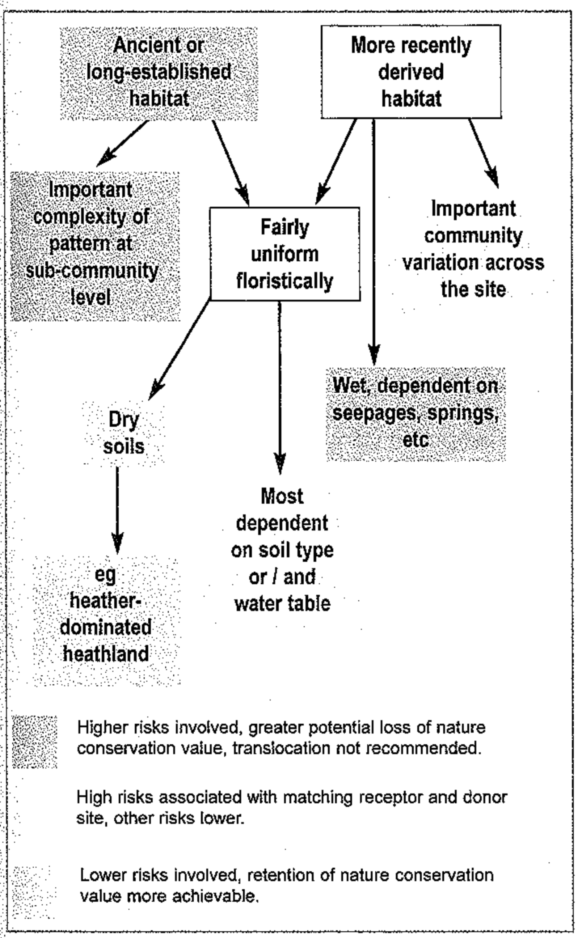


FIG. 3.1. *Translocation suitability: a decision tree for below - SSSI - value habitats*

- contractor's compounds
- site storage (including the temporary stockpiling of excavated material)
- other supporting works needed to allow the main development to function
- noise barriers
- temporary spoil heaps
- permanent spoil disposal.

Best practice would dictate that the location and details for ancillary activities are also considered and addressed adequately through the EIA process and/or through the planning application as an integral part of the main scheme.

Unfortunately, this is not always the case. For a large proportion of development schemes, many of these activities are often neglected in the EIA or planning application and are consequently left out completely. Under these circumstances, such activities will then require additional planning permissions independent of the main scheme proposals.

If left to this late stage, obtaining planning permission for ancillary activities may become the responsibility of the main contractor or even their sub-contractors. This is not ideal, since levels of high environmental performance cannot be guaranteed; and may indeed conflict with the financial imperatives of private sub-contractors who are unlikely to share the same degree of environmental motivation as agreed to by the main developer, and as expressed through the original planning consent.

Whether habitat translocation is the most appropriate way forward for any situation has to be a balanced decision. **It may be cheaper to purchase new land, and restore and manage its existing habitats. This does not replace that lost. Creating new habitats,** even covering a greater area than that lost, cannot, in the human time-scale, **replace those lost** if they are long-established or of ancient origin. On the other hand, **salvaged material from the affected site can be used to create a better new habitat** than could be achieved through purchasing seed or plants, and it could support some invertebrates that might otherwise fail to colonise.

3.2.2 Dealing with translocation in EIAs

In EIAs, translocation should be **addressed with care**. Follow the formal guidance below in:

- not over-stressing the possible benefits of translocation (DoE 1995)
- considering translocation only where impacts cannot otherwise be avoided or reduced (Environmental Resources Ltd, 1994)
- remembering that habitat translocation remains a controversial technique and should be used as a measure of last resort, ie. offered as compensation in most situations (Oxford 2000 and Maclean 2001).

In other countries, apply the appropriate policies and processes that are relevant instead of those listed above.

In assessing the impact of habitat loss in an EIA, **'translocation should not be considered as reducing the damage to a site sufficiently for the category of impact** (major to intermediate for example) **to be reduced'**. Although this guidance is given by the former Department of Environment, Transport and the Regions in relation to road EIAs, it is equally relevant to other schemes (DETR's New Approach to Appraisal (NATA), 1998b). Translocation should only be offered where impacts cannot otherwise be avoided or reduced. It is stressed by DETR that this is **less desirable than restoring habitats *in situ* where possible**.

Use the Institute of Ecological and Environmental Management (IEEM) guidance on defining mitigation or compensation for use in dealing with situations related to planning and EIA (Box 3.4). This is essentially the same as that provided in the Habitats Directive (see Section 2.2). **Where translocation** would, on balance, **result in a loss of nature conservation value** (as is likely to be the norm – see Section 2.2 and Box 2.1, page 14), **treat it as compensation. Translocation could be argued to be mitigation only for some constant natural assets, where any loss of nature conservation value could be adequately replaced.**

Remember, however, that under the **Highways Act 1980 applicable to England and Wales, mitigation covers all measures to reduce the impact** of the road, and **this includes habitat translocation**. Compensation generally means financial or material compensation for those affected by a road, for example, the provision of accommodation bridges to facilitate access to severed land, or payment of monies equal to the district valuer's assessment of the impact.

3.4

IEEM DEFINITIONS OF MITIGATION AND COMPENSATION

Mitigation is defined as *'...measures taken to reduce adverse impacts'* and **compensation** as *'measures taken to offset significant residual adverse impacts, ie. those that cannot be entirely avoided or mitigated to the point that they become insignificant.'*

(Source: Institute of Ecology and Environmental Management (IEEM) 2002).

Habitats of differing nature conservation value are subject to different levels of protection in the planning system. **Consult current planning guidance**†, which identifies a hierarchical level of protection to sites from European Directives (candidate Special Areas of Conservation – cSACs, and Special Protection Areas – SPAs), to SSSIs, and down to Sites of Importance for Nature Conservation (SINCs) and the wider countryside (see Box 2.5, page 20). Local planning authorities are likely to have a range of their own local development plan nature conservation policies, which they will apply to any proposals affecting each of the designations. This guidance is translated into planning policies in the local or unitary plans, which need to be checked for those relevant to nature conservation.

It will be **essential to consult with the statutory nature conservation agencies** on all translocation proposals that affect designated and protected habitats, but such discussions would also be beneficial for other translocation schemes.

Issues of **sustainability and biodiversity** in relation to the proposed translocation need to be fully addressed in an EIA. The **presence of any priority species or habitats** as identified in the UK Biodiversity Action Plan (BAP) and the various volumes of targeted and costed action plans (HMSO 1995, English Nature 1998, or the relevant BAP documents in other countries) needs to be identified, and the **effect of translocation on the objectives and targets of these plans assessed**.

The lists of species and habitats deemed by the English and Welsh governments to be important for biodiversity conservation should also be consulted. These mostly match the key

† In England refer to Planning Policy Guidance 9 *Nature Conservation* (PPG 9).
In Wales refer to Technical Advice Note 5 *Nature Conservation and Planning* (TAN 5).
In Scotland refer to National Planning Policy Guidance 14 *Natural Heritage* (NPPG 14) and Planning Advice Note 60 *Planning for Natural Heritage* (PAN 60).

* In England refer to *Working With the Grain of Nature: A biodiversity strategy for England* (DEFRA 2002).
In Scotland, a draft Biodiversity Strategy is being prepared.
In Wales, no strategy currently exists.
In Northern Ireland refer to the Northern Ireland Biodiversity Strategy.

BAP target species and habitats, and have been produced under Section 74 of the Countryside and Rights of Way Act 2000. UK Government departments and the National Assembly for Wales now have a statutory duty to have regard to the conservation of biodiversity, and to maintain lists of species and habitats for which conservation steps should be taken or promoted.

Also, where published, **further local advice may be available by reference to the country biodiversity strategies* and/or in local BAPs prepared by local biodiversity partnerships (often at the county or district level)** or by the developer. These may identify the BAP habitats and species found more locally throughout the UK, and may offer valuable guidance on how to proceed with new schemes that affect these.

Use **Byron (2000) for guidance on how to treat biodiversity in EIAs.** Although this was specifically developed for road scheme assessments, it can be readily adapted for other types of project (see Box 3.5).

> **BIODIVERSITY AND ENVIRONMENTAL IMPACT ASSESSMENT**
>
> Byron (2000). *Biodiversity and Environmental Impact Assessment: A Good Practice guide for Road Schemes* has as its key objectives:
>
> - to provide guidance on a best practice approach for the treatment of biodiversity in road EIAs, in particular on:
>   - how to treat biodiversity at each stage of the EIA process to ensure the full range of potential impacts are considered
>   - ensuring sufficient baseline information is collected
>   - developing criteria for use in determining impact magnitude and significance
>   - securing post-scheme monitoring.
>
> The guidance is equally applicable to EIAs for other development schemes
>
> 3.5

3.2.3 Judging the potential efficacy of habitat translocation in the EIA process

The overall **impacts of habitat loss and of habitat translocation must be fully recognised** in the EIA. Assuming habitat translocation is judged as compensation, not mitigation (using the definitions given in Box 3.4), assess the loss of the habitat under the direct and indirect effects of the development. This assessment should include addressing the following key questions, as well as evaluating the effects of direct loss of the habitat and its component species:

a) If part of a larger habitat, is there a significant **effect on the size of the remaining area?**

b) Does the habitat have an **evolutionary history** that is dependent on its location (for example, as part of an ancient woodland, or ancient hedge network), and that would be **lost** if moved to a new site?

c) Is the habitat an important element in the **ecological landscape** with functions relating to the dispersal of species, such as corridors, or stepping-stones?

d) Would the removal of the habitat increase the **fragmentation** of the ecological landscape and isolation of other habitats?

e) Would habitat loss have any impact on the ability to **manage** what is left?

(See Bullock *et al.* 1997 for further information).

Assess **compensation proposals separately as part of the residual impacts** in an EIA. **Appraise** the **likely degree of effectiveness of habitat translocation** using the Review and the material referenced therein. Remember to consider whether **retention of the translocated habitat on a receptor site within the development** would secure its long-term future adequately in terms of management and care, or whether a more distant receptor site would be more appropriate. Consider whether (if relevant) the development would place **unacceptable pressure**, in the absence of translocation on the existing habitat compared to that if it were translocated?

3.3 HABITAT TRANSLOCATION COMMITMENTS

For most projects, habitat translocation will be a commitment in the planning application or/and in the environmental statement (ES), and it is the responsibility of the local authority to ensure that **suitably detailed and unambiguous proposals** are submitted as part of the planning application (either prior to determination or through conditions and planning obligations) to ensure that a well conceived scheme is actually prepared and that there is a formal commitment for its effective implementation.

The statutory mechanisms available to local authorities to ensure sufficient information is submitted prior to determination are shown in Box 3.6. Likewise, types of suitable conditions are shown in Box 3.7. Note that for both situations much more detail is needed than is often initially provided by applicants, and that an ecological input into this is essential in order that high standards of translocation execution can be achieved.

For **schemes that are not processed through the planning system**, the commitments made in the

SUBMISSION OF INFORMATION TO LOCAL AUTHORITIES

Often, existing levels of knowledge, even if supplemented by additional information in the planning application, will not be sufficient to enable the effects of a development to be fully assessed. In such cases, the local planning authority has a number of statutory powers available to obtain further information reasonably necessary to assess the proposal. These may be summarised as follows.

Requiring information before the grant of permission

In respect of full planning applications, the planning authority has the power to require information to be submitted under three statutory provisions:

- **General information for full applications:** In England and Wales, Article 4 of the Town and Country (Planning Applications) Regulations 1988 (SI 1988/1812) and in Scotland, Article 13 of the Town and Country Planning (General Development Procedures) (Scotland) Order 1992 (S3) enables local planning authorities to request requiring any further information, plans or drawings necessary to enable them to determine the application.
- **Environmental assessment:** In the case of an application which is accompanied by an Environmental Statement, Regulation 19 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (in England and Wales this is covered in Statutory Instrument SI 1999 No 293 and in Scotland through) (S4) SI 1999 No 1), requiring submission of further information concerning any matter which is required to be, or may be, dealt with in the Environmental Statement, which the applicant could provide, and which is reasonably required to give proper consideration to the likely environmental effects of the proposal.
- **European sites:** In the case of an application that is likely to have a significant effect on a European Nature Conservation Site, either alone or in combination with other plans or projects, that is not necessary to the management of the site for nature conservation – under Regulation 48 of the Habitats Regulations.

In respect of outline planning applications, the planning authority has the power to require information to be submitted under a further statutory provision, namely:

- **Outline applications:** In England and Wales Article 3(2) of the Town and Country Planning (General Applications: Development Procedure) Order 1995 (SI 1995 / 419) and in Scotland (S5) Article 4(3) of the Town and Country Planning (General Development Procedure) (Scotland) Order 1992, requires the submission of all or any "reserved matters" that the planning authority considers it to be necessary to consider before the grant of an outline planning permission.

  Note: there is a one month time limit on the use of this provision, from the date the outline application is submitted, but there is no time limit on the first three provisions above.

3.6

environmental statement (ES) must be translated directly into contract documents. Ensuring high standards of translocation, therefore, is dependent on **writing detailed specifications along the lines of this guide for contractors bidding for advanced works, or for works under various forms of contract such as those of the ICE, the JCT or the GC/Works series.**

For a **design and build** contract, the **Employer's Requirements** should specify adherence to the standards set in this guide. The same principles apply to any other kind of contract. (See Section 5 for more detail on contract and contractor's issues.)

As far as **planning applications** – with or without an accompanying environmental statement – are concerned, often **existing levels of knowledge will not be sufficient to enable the effects of a development to be fully assessed. In such cases, the planning authority should use its statutory powers to obtain further information reasonably necessary to assess the proposal.** These are summarised in Box 3.6.

Local planning authorities will need to give careful consideration to how high standards are secured. For this, there is a useful precedent within the land-use planning system in England†, where published guidance recommends how such control may be achieved within the environmental impact assessment process. In addition to the use of planning conditions to secure necessary mitigation measures, the guidance states that, *"developers may adopt Eco-Management and Audit Schemes (EMAS) to demonstrate implementation of mitigation measures and to monitory their effectiveness".*

The implementation of EMAS, or other forms of environmental management plans and performance accreditation (such as under ISO 14001 Environmental Management Systems) is therefore a relevant and reasonable approach that can be adopted and implemented by developers and their contractors. Such an approach may be particularly valuable because it offers a structured and auditable means of tracking on-site performance and, consequently, for securing prescribed standards.

For items that cannot be covered by planning conditions, planning obligations under the relevant Town and Country Planning legislation‡ should be agreed. The general requirements for these are given in Box 3.8, page 28. These cover items such as:

- **objectives** for the translocation scheme
- conservation **targets**
- any process for the application of **remedial measures**
- the **time-scale** of the monitoring and aftercare programme

MODEL PLANNING CONDITIONS FOR TRANSLOCATION

Condition No. (x) Translocation Plan

Prior to the commencement of development, a detailed translocation plan shall be submitted to and approved by (name of local authority). The plan shall include the following:

- aims and objectives of translocation
- evaluation of ecological requirements of habitats to be rescued and translocated (including any interaction with protected species)
- selection of suitable receptor site(s)
- obtaining any necessary licences and approvals
- method statements for habitat translocation
- location of works? timing of works
- persons responsible for the work
- preparation of a long-term management plan

All habitat translocation shall be carried out in accordance with the approved details, unless otherwise approved in writing by the Council. The works shall be carried out in accordance with the programme and phasing as specified in Clause (y) of the planning obligation.

Reason: To ensure that important habitats are rescued and relocated from areas where they would otherwise be damaged or destroyed by construction and development activities.Condition No. (z) Wildlife Monitoring Plan

Prior to the commencement of development, details of a Wildlife Monitoring Plan shall be submitted to and approved by (name of local authority). The plan shall include the following details:

- purpose of monitoring (this should be for the translocation and other works)
- project aims and objectives
- key ecological thresholds to be monitored
- targets and performance standards to be monitored
- indicators to be used in monitoring
- data gathering and analysis? location of monitoring
- timing for monitoring
- number of years monitoring is to be conducted
- responsible persons
- review of results
- adaptive management and remediation

All wildlife monitoring shall be carried out in accordance with the approved details unless otherwise approved in writing by the Council. All works shall be carried out in accordance with the programme as specified in Clause (x) of the 106 Planning Agreement.

In addition to these, other conditions that inter-relate with translocation could include the following:

- habitat creation and enhancement works
- a protected species contingency plan
- species rescue and translocation plan
- the establishment of native species
- the provision of artificial wildlife structures (eg badger setts, otter holts)
- shaping new water features and landforms
- earth moving and soil management
- wildlife mitigation plan during construction

(Source: Oxford 2000, and Oxford, pers. comm.)

3.7

- the length of an **agreement**
- a **management protocol** and its implementation
- **monitoring**, including the aims and objectives, time table, methods, the location of field sampling, any indicators to be used, reports to be produced and when
- any **financial input** required for the site, or for other compensation works.

Consult any further relevant government advice on planning obligations*. Oxford (2000) gives further detail on their nature. Although a lawyer will be needed to prepare the obligation, an ecological input is essential in order to ensure that the appropriate items are included.

It is essential that the **planning authority ensures that the conditions and planning obligations are properly implemented**, carrying out enforcement action if necessary.

Regular visits to the site will be needed during the translocation process by the authority ecologist, (or another appropriately qualified and experienced ecologist commissioned by the local planning authority), to ensure that the method statements and other commitments are being properly implemented. Regular liaison will be needed throughout the time-scale of the planning obligation for the same purpose.

† See Section 124; Planning Circular 02/1999 *Environmental Impact Assessment* (England).
‡ In England and Wales see under Section 106 of the Town and Country Planning Act (1990).
In Scotland, see under Section 75 of the Town and Country Planning (Scotland) Act (1997).
* In England refer to Circular 1/97 *Planning Obligations*.
In Wales refer to Circular 13/99 *Planning Obligations*.
In Scotland refer to Circular 12/1996 *Planning Agreements*.

GENERAL POLICY ON PLANNING OBLIGATIONS
(see DoE Circular 1/97)

Planning obligations should be:

- necessary
- relevant to planning
- directly related to the proposed development
- fairly and reasonably related in scale and kind to the proposed development
- a reasonable way of adding the means of ensuring a high quality development
- covering matters other than those covered by a planning permission, provided there is a direct relationship.

They should not be seen as:

- unrelated inducements to gain consent
- influencing the planning decision
- having wider development implications
- an alternative to an integrated, high quality project application.

A planning obligation can be taken into account if it is:

- needed to enable development to go ahead;
- necessary from a planning viewpoint, and so directly related to the development that it ought not to be permitted without it where these matters cannot be resolved through planning conditions.

The developer must have a legal interest in the land concerned.

A planning obligation is covered by Section 106 of the Town and Country Planning Act 1990 and Section 12, paragraph 106 of the Planning and Compensation Act 1991.

3.8

Similarly, it is essential that the **developer**, or other organisations that have used special powers or procedures to secure the development outside the normal planning process, ensures that the **contract documentation**, whichever contractors' procurement route is followed, **uses this guide** to achieve best practice standards of habitat translocation, and that these are fully and properly implemented on site by the contractor.

Ensuring that the translocation proceeds to the highest standards is essential. Unlike much construction work, **translocation that does not meet the requirements** of the client, the contract or planning controls is much more difficult to rectify. Remedial measures conducted on turves or soils will compound disturbance and damage the habitats. It is important to avoid any need for such measures.

4. PLANNING THE HABITAT TRANSLOCATION

A great deal of careful planning of a habitat translocation scheme is required before works can begin. This section sets out the process from planning the timetable, to setting objectives, selecting a receptor site, considering long-term ownership and management, and the monitoring requirements.

4.1 A CHECKLIST OF REQUIREMENTS

Compared with the area often impacted by a development, habitat translocation sites are generally small (see Fig. 4.1). Nevertheless, **a great deal of careful planning** is required before implementing any habitat translocation scheme. Box 4.1 provides a **checklist** of issues that need to be considered. It is not a sequential list, since many should be progressed simultaneously. This section amplifies these requirements.

A CHECKLIST FOR PLANNING THE TRANSLOCATION

1. Preparation of programme (1–2 years lead-in period – See Fig. 1.2)
2. Set of ecological objectives for translocation, define criteria for judging these.
3. Select a receptor site:
   - Consider range of alternatives
   - land ownership issues
   - site surveys to match with donor site
   - engineering needs to manipulate receptor site
   - long-term ownership
   - measures needed to prepare selected site - add to programme
   - site access
   - need for additional works, eg. fencing, provision of water
   - long-term management arrangements – undertake negotiations
   - financial arrangements for long-term future of receptor site.
4. Undertake consultations.
5. Pre-translocation base-line surveys; plan and record methods used and their location.
6. Design the post-translocation monitoring scheme using the same methods as in 5.
7. Pre-translocation management needs.
8. Design the configuration of how the donor site fits into the receptor site.

4.1

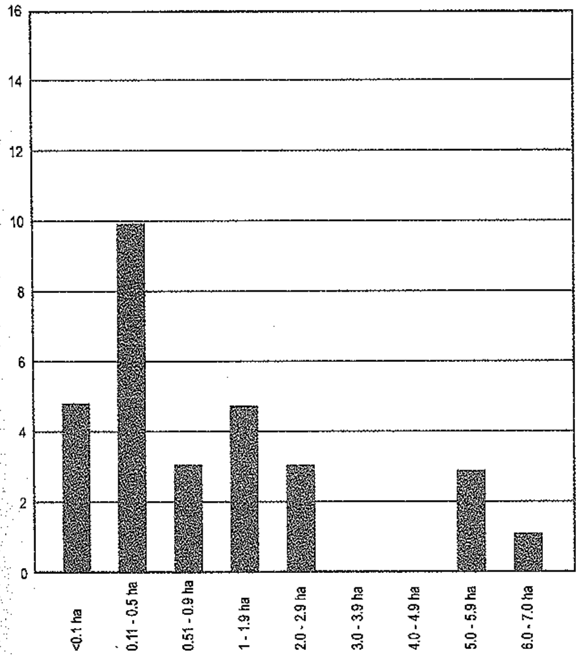


Figure 4.1 *The area of habitats moved in 31 case studies*

It is also **essential to ensure that the translocation is planned and executed professionally by using competent and suitably experienced specialists.** This will certainly involve ecologists and soil scientists with experience of habitat translocation, but could also require hydrologists and other experts, as well as suitably experienced contractors.

4.2 TIMETABLE

Preparing for a translocation scheme takes time. Allow at least **a year for complex schemes** involving sites of significant nature conservation interest. **Two years to cover two growing seasons are needed for sites of high nature conservation value** (see Fig. 1.2, page 11, and Box 2.5, page 20) to enable base-line monitoring to be carried out twice prior to transfer. For small-scale translocations of lower value sites with few problems, six months may be sufficient, but this should include at least one growing season to enable base-line ecological monitoring to be conducted, or longer if hydrological monitoring is needed across the seasons.

4.3 SETTING AIMS AND OBJECTIVES

Clear, realistic aims and objectives must be set in writing for any translocation exercise so that the results can be judged against them. Without these, the achievements of the translocation will be open to debate and challenge. Basic aims and objectives should be included in any EA and/or public inquiry commitments, planning conditions or obligations (see Section 3.3, page 25, Box 3.7, page 27 and Box 3.8, page 28), but this will need to be fleshed out to provide clear targets against more detailed, quantifiable aims. Other schemes may not be the subject of such conditions but objectives are still needed. Suitable broad-brush aims and objectives are shown in Box 4.2, page 30 with examples of more precise detailed aims set out in Box 4.5 (page 31).

HABITAT TRANSLOCATION OBJECTIVES

Aims*	Objectives
1. To maintain the NVC community, subcommunity or botanical composition.	Give the methods for measuring NVC or botanical composition and what the target communities are.
2. To maintain the nature conservation value or the key features of value.	Identify the key features, the criteria for judging the nature conservation value and how these are to be measured.
3. Maintenance of populations of particular species of importance.	Identify the species and target population levels.
4. To establish a particular habitat type (heathland, chalk grassland, blanket bog, etc).	Describe the desired characteristics of the habitat, and how they should be measured.
5. To re-create the best possible new habitat using salvaged material.	Identify the desired characteristics of the new habitat, and how they should be measured.
6. To conserve and enhance particular species populations through habitat translocation.	Give the desired target habitat and species.
7. To undertake research on particular aspects.	Provide the aims, the comparative methods, targeted species or habitats, objectives against which success would be judged.

* There is no implied hierarchy of aims

4.2

For high nature conservation value sites, there will be **multiple aims and objectives**. Use the first four given in Box 4.2 together. The **minimum requirements for high value sites** are:

- maintain or enhance (see Box 4.3) the **habitat and all NVC communities/ subcommunities of value** – this includes the soils as well as the vegetation, and their associated fauna.
- maintain **key ecological features** (defined in Box 4.4)
- maintain the **nature conservation value as far as possible** (given that there is a high risk of it being reduced by the damage caused by translocation (see Section 2.5, page 17).

Use aim and objective 5 (Box 4.2) – to **salvage material and create the best possible new habitat where full translocation is impossible**, for example, for woodland donor sites, or for those sites where soil transfer is chosen instead of turves.

The **basic aims and objectives** (as given in Box 4.2) **need clarification and supplementary objectives**. These should set the limits of acceptable change of the target objective, and identify how these are to be measured. Setting a **realistic time period for reaching and maintaining objectives** is needed. In most cases, **5–10 years** is reasonable, but for habitats that establish slowly (woodland, or habitats at high altitude) longer time scales are needed **(20–30 years minimum for woodland)**.

OPPORTUNITIES TO ENHANCE SITES

- increasing site size using habitat creation methods
- scrub removal
- re-establishing suitable management
- increasing site wetness
- removal of invasive, non-native species
- increasing populations of native species
- involvement of local people

Note: These opportunities do not constitute arguments for translocation of high value sites.

4.3

WHAT ARE KEY FEATURES?

In the context of habitat translocation:

Key features are those ecological attributes for which the site has been selected as an SSSI (ASSI in N. Ireland) or SINC.

For SSSIs, cSACs, SPAs and Ramsar sites, lists of key features are available from the Country Agencies (English Nature, Countryside Council for Wales, Scottish Natural Heritage and Environment and Heritage Service (N. Ireland).

For other sites, key features are those for which the site is important, and will include Biodiversity Action Plan habitats and species.

Key features can be any mixture of habitats, vegetation communities, plant and animal species and their populations.

4.4

Box 4.5 gives **example supplementary objectives**. As well as the main objectives for the translocated materials, consider the potential for **additional objectives to replace or enhance the ecological connectivity of the habitat** to be translocated:

- can the translocation help **extend a smaller site** of equivalent ecological type?
- can the receptor site **help link similar habitats** and thus reduce fragmentation?
- can the translocation receptor site provide a **buffer** to a higher value site, from which the former can also benefit in terms of species colonisation?

EXAMPLE SUPPLEMENTARY OBJECTIVES FOR HABITAT TRANSLOCATION

(based on those used for a neutral grassland case at Durnford Quarry)

Naturalness: To maintain the translocated area as eg unimproved neutral grassland MG51.

Size: To ensure that there is no net loss of area of species-rich turf.

Diversity: To maintain the long-term diversity of the translocated sward as defined by the baseline vegetation surveys.

Rarity: To retain where translocated the presence of the (named) notable species.

Fragility: To secure the long-term management and protection of the translocated grassland.

Typicalness: By retaining species diversity and composition as an MG5 grassland the criterion will be satisfied.

Geographical position: The location of the receptor site is predetermined. The relationship of the receptor site to the reclaimed quarry presents opportunities that are addressed in the restoration proposals.

Important populations of species: To retain the population of (named species).

Continuity of land use: To develop the receptor site as a newly established conservation area integrating with the quarry reclamation and surrounding land.

Physical access: In the medium to long term to provide, subject to the agreement of the relevant local authority, public access into the receptor site. The translocation must be to a standard that facilitates safe access. (This objective will not be appropriate on all sites).

Visual access: To ensure that visual access is maintained from a local lane and in the long term from the restored quarry plant area.

Educational value: A research project will be undertaken to study the performance of the translocated sward and to advance the techniques of translocation. The results of the research project will be published.

Source: M. J. Carter Associates

Offering management on an abandoned site as a benefit of translocation is not a viable argument for sites of high nature conservation value. The statutory nature conservation agencies would argue that there are other opportunities usually to be found to achieve suitable management as well as protecting the site *in situ*.

Finally, identify any objectives that can **tie in with national or local BAP targets**, and with other **ecological and environmental policies** in planning authority plans. **Consider** how all the objectives set can **be measured. Include** the methods for these measurements **in the monitoring protocol.**

4.4 CHOOSING A RECEPTOR SITE

The receptor site must match the donor site adequately and should not be part of the wider site of value from which the donor is taken. The greatest risk of change in the translocated vegetation, and hence of key invertebrates and other species, is from a mis-matched receptor site. Basic matching requirements are for:

- soil type
  - depth
  - subsoil (B horizon)
  - pH
  - levels of the main nutrients
  - any other key mineral on which the donor site is dependent
- water relations/hydrology
  - groundwater levels and fluctuations
  - surface water flows (eg flooding)
  - any springs or flushes
  - water chemistry
- aspect
- slope
- similar interrelationships between the above elements and the ecological processes they support.

Survey all these features first **on the donor site** to provide a **template** for selecting the receptor site. On donor sites of more than a few square metres, **map the variation** in the parameters listed across the site by taking samples on a broad grid with more intensive sampling to identify boundaries of soil types. Relate the intensity of sampling to the variation across the site. **Match the variation in the plant communities with the site features.**

4.4.1 Soils

A competent soil scientist should undertake the soil investigations.

The **minimum requirements** for the donor and receptor sites are for:

- the soil to be of the **same series** using the National Soil Survey Classification
- the **geological** base-material to be the **same**
- the **parent material** (the C horizon) to be the **same**
- ideally, the **B horizon**, if present, should also be the **same**. If it is not, this horizon will need to be brought from the receptor site
- the **pH and available macronutrients**† should be within the same range as those found across the donor site in the B horizon (assuming that the A horizon forms the transferred layer)

- the **water relations** in the soils (in terms of quality and supply) on both sites to be the same, or easily and sustainably engineered **to match**
- the **aspect and slope** to be within the **same range** (although on rare occasions these may be deemed not to be important ecological factors)
- **organic content and proportion of silt, sand and clay** should be within the same range in the B horizon.

4.4.2 Water relations

Note that translocations can fail to meet objectives due to mismatching donor and receptor sites, especially where the soil types, nutrients and hydrology differ. It is particularly difficult to find receptor sites that have flushes or springs that match the donor site requirements. It is even more difficult to engineer such a site with flushes or springs that do not naturally occur in the pattern and character required, although some success is possible for engineering groundwater using liners or an engineered clay basin and a water supply to mimic natural levels in the receptor site (see Box 4.6 and Fig. 4.2).

However, **dependency on ground engineering involving unnatural sources of water and pumps should be avoided** as unsustainable in the long-term. It will always be preferable to find a natural hydrological solution to avoid the risks involved in trying to control water flows and groundwater patterns artificially.

Groundwater depths may be critical to the survival of the translocated vegetation. **Adequate survey time** (at least a year) must be allowed using dipwells or piezometers, as appropriate, to measure groundwater patterns at the receptor and donor sites. The receptor site may then need to be engineered after the topsoil has been removed in order to create a surface that will deliver the desired groundwater conditions. Changes in the depths and distribution of subsoils would be expected in this scenario, and an allowance is needed for the donor site turf depth when calculating final levels.

Water relations depend not only on visible signs of water in soils (groundwater, springs etc), but also on the **depth of soil**. The whole soil profile should be the same depth on the donor and receptor sites (although they may vary across each site), and with the same aspect and slope since this has a significant impact on the plant communities in many areas, particularly grassland ones. In addition, it is **essential that the water chemistry on the receptor site matches that on the donor site**.

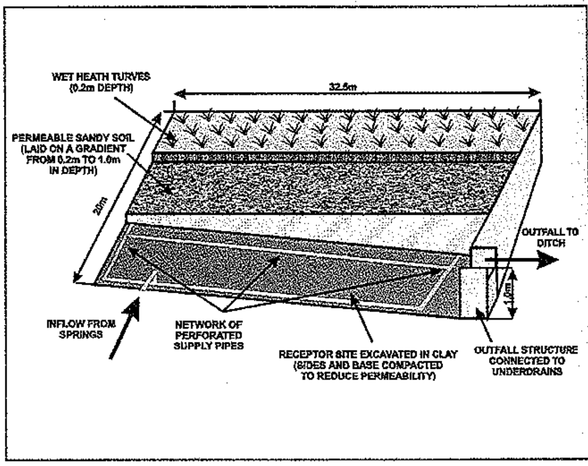


Figure 4.2. *Gadle Knapp, Dorset, Wet Heathland Translocation. Creation of a wet cell*

4.4.3 Site ownership

Having located a suitable receptor site, it must be available for the translocation works. The options are:

- already own the site
- purchase the site
- enter into an agreement with the owner
- CPO the land (possible only for projects where such powers are available).

EXAMPLES OF RECEPTOR SITE ENGINEERING OF HYDROLOGICAL CONDITIONS

Gadle Knapp, Dorset
Wet heathland

A 'translocation cell', 32.5 x 20m, was excavated into the non-calcareous clay at old ball clay pit workings, and compacted on the base and sides. It was level at the top with a sloping base, and filled with permeable sand at various subsoil depths (0.2-1m). A series of inter-connecting pipes was laid at the base to feed water to the site from the associated springs.
A controllable outlet was established at the bottom end. The pH and water chemistry of the inflow to this cell were comparable to those at the donor site (Box *et al*, in prep). See Fig. 4.2, page 31.

Hithermoor, Staines
Dry, moist and wet grassland

Prepared rectangular area 40 x 100m, gravel extracted and replaced by wet clay. Surface excavated to form a pit up to 1m deep. The base was graded to be higher at one end with 400mm unwashed gravel placed for the drier vegetation. Water was pumped into a French drain of coarse aggregate surrounding the cell so the ground water could be controlled (Helliwell 1989).

4.6

† Total nitrogen, nitrate nitrogen, nitrite nitrogen, ammonium nitrogen, total and available phosphorus, available potassium, available magnesium and calcium content.

Remember to secure an access route to the site suitable for the translocation exercise and for subsequent management and monitoring. Such a route may need to be a legally binding easement or right of access.

If suitable land is not already available, the **best option is to purchase by agreement** and then to revert the land, again by agreement, to a County Wildlife Trust or other suitable organisation after a reasonable establishment period. A **CPO** can be used for highway schemes for justifiable, essential mitigation purposes, but only when other avenues have been exhausted. A CPO may also be possible on other schemes where such powers exist to secure essential compensation measures. Relevant experts should be consulted on how best to secure land as a receptor site.

A non-legally binding agreement that does not pass onto to successors with the land is not recommended unless long-term security (such as handing it to a nature conservation organisation) for the habitat at an early stage can be assured.

Where the developer already has a land management portfolio with suitable experience of managing such areas, long-term management of the translocated habitat could form part of his overall land management remit (for example, an airport authority). However, in most other situations, the **developer is not an appropriate organisation to retain and manage valuable nature conservation sites** where he does not have a long-term interest in the site's management, and **other suitable organisations should be found,** for example a county wildlife trust, the Woodland Trust or perhaps the local authority. These need to be willing to adopt the site after a three-year establishment period. A commuted sum to cover the management into the long-term future should be made available to the chosen organisation. **All long-term management arrangements should be agreed in principle before the translocation is undertaken.**

4.5 LONG-TERM OWNERSHIP AND MANAGEMENT

Habitat translocation of sites of significant nature conservation value must be a long-term commitment. Although planning obligations (Section 106 agreements or similar) may last for a limited number of years, and legally pass to new owners with the land (successors in title), the commitment will only last as long as the agreement is valid. This is normally 10–15 years. However, the habitat must have a secure future beyond this. Therefore, it is essential to find a **suitable long-term owner of the translocated site**, and to ensure that suitable management is secured far into the future.

Problems can occur when care of the translocated site has been **dependent on the enthusiasm of a single person** who moves on, or the goodwill and commitment of a **company that then changes hands.** Forward planning and a broader based commitment are needed to overcome such scenarios. A protocol will need to be established to cater for a change of personnel or of ownership.

BEST PRACTICE EXAMPLES OF LONG-TERM MANAGEMENT ARRANGEMENTS FOR TRANSLOCATED HABITATS

Thrislington Plantation, Durham
Magnesian grassland

Translocated grassland is part of an SSSI, the whole SSSI now managed by quarry company as a National Nature Reserve in agreement with English Nature.

Durnford Quarry, North Somerset
Neutral grassland

Translocated field being managed by quarry company.

M3 Bar End to Compton section, Twyford Down, Hampshire
Chalk grassland

Translocated grassland and newly created grassland to be managed by County Wildlife Trust with the adjacent St. Catherine's Hill SSSI.

Wilford Power Station, Nottingham
Grass/open communities

Site given to City Council, leased to Nottinghamshire Wildlife Trust, management sponsored by company occupying offices on donor site.

Longmoor Camp, Hampshire
Roadside open lichen-rich and acid grasslands

Managed by Hampshire County Council as part of their Verge Management Project.

Stansted Airport, Essex
Neutral grassland and woodland

Managed by the Airport as part of the landscape management plan, with continuing ecological input into the measures needed.

M2/A2, Kent
Woodland

Intended to retain in Highways Agency's soft estate, flagged as a hot spot on the Environmental Database, and managed in line with habitat Biodiversity Action Plan objectives.

4.7

The **best options available for the long-term care** of a translocated habitat are for:

- the **developer** to retain and care for the site where appropriate
- the land to be gifted to a charity such as a **wildlife trust** or equivalent organsiation
- the **local authority** to undertake to manage the land as some kind of nature reserve

- a charitable management trust to be established by the developer, that will be responsible for the site's management, and probably other areas of land as well.

Examples are provided in Box 4.7, page 33.

In each case above, **proper financial provision or endowment** will be a necessary part of any agreement. It is normal practice to retain and manage the receptor site for three years and then pass it on to the future owner with the agreed commuted sum. However, it would be advantageous to involve the future owners at an early stage within the three-year establishment period so that suitable management can be agreed. Items for agreement should include water facilities for stock, fencing, access points, and vegetation management.

4.6 SITE MANAGEMENT PRE- AND POST TRANSLOCATION

Plan for the **management of sites** prior to translocation to expedite the process. This is likely to be required where:

- **scrub needs to be removed** – roots of trees and shrubs in grassland or heathland can break up the turves
- **rank grassland obscures the ground surface** – cut immediately prior to translocation if the site has been unmanaged, but otherwise, normal hay cutting or grazing should continue up to the time of translocation
- **hedges and woodlands have to be coppiced** just prior to translocation in the dormant season, but with the trunks cut high enough to be visible to the excavator drivers.

Other habitats will probably not need prior-translocation management, but a competent ecologist should decide this. In general, it is believed that the **above ground biomass reflects the amount of root mass, and the latter is essential in providing the cohesiveness** to hold turves together. Removing the vegetation prematurely could reduce the root mass and therefore should be avoided except in the types of circumstances outlined above.

4.7 PLANNING A MONITORING SCHEME

4.7.1 General issues

A **monitoring protocol must be planned prior to the process beginning** for any site of nature conservation significance, since

- it is an essential part of the translocation exercise, and
- needs to be conducted first to provide base-line surveys before materials are transferred.

Monitoring should be viewed as an essential part of the project. The results should be made public, preferably by publishing, so that the information collected can assist in continuing to improve the standards of translocations for everyone involved. To attain this objective, translocation methods should be detailed along with the ecological results.

The **monitoring protocol must reflect the objectives** already set as described above (Section 4.3), and include the key features of the site (see Box 4.4, page 30, for definition of key features). There should be a control site of some part of the habitat that is not being moved. If not, then a sequence of data over time should be collected for the translocated site without a control. However this is much more difficult to interpret and open to argument. If there is no control, a **reference site** with a similar complement of species should be used as a pseudo-control, but great care will be needed in interpreting the results.

The **monitoring scheme should reflect the nature conservation value** of the site and be **proportionate to the objectives set**, the degree of change that might be expected, the **size of the area** involved (a few square metres warranting far less input than 0.25 or 0.5 ha), and **the level of knowledge** of effects on the habitat present. For high value sites (for example, SSSIs and the best SINCs or their equivalent), where a significant area is being moved, a comprehensive scheme is essential, whereas for very small and lower value sites, the scheme can be less rigorous. Table 4.1

WHAT IS CONDITION MONITORING?

Habitat appraisal to identify the state of the vegetation and species populations in relation to factors affecting the site. This is a subjective method, although it can be extended to be semi-quantitative.

- it focuses on the key features (see Box 4.4)
- desirable attributes of the key features are used
- limits of acceptable change of these attributes are determined
- a field record sheet is prepared listing features and attributes

The results are used to decide on changes in management, or the need to control other factors, and to assess whether the habitat is in favourable or unfavourable condition.

The Country Nature Conservation Agencies have developed condition surveying methods for many habitats, some of which are published.

Useful documents to assist in developing condition monitoring are Robertson and Jefferson 2000a, Robertson and Jefferson 2000b, Mitchley *et al* 2000, Backshall *et al* 2001, MacDonald *et al* 1998 and Kirby *et al* 2001.

4.8

TABLE 4.1 *Monitoring requirements*

	Nature conservation value of site		
	High value site (SSSIs, top quality SINCs) of significant area	Intermediate value site (lower value SINCs)	Sites of low value or very small
Monitoring required			
Plants			
Detailed botanical using random quadrats	□	●	
NVC (with quadrats)	●	●	
Plant species lists and abundances for whole site	●	●	●
Rare, scarce or priority plant species*	□	□	□
Soils			
Macro-nutrients	□	●	
Organic matter*	●	●	
Bulk density	□	●	
Hydrology*			
Dipwells/piezometers	□	●	
Site observations	●	●	●
Inverterbates			
Ground dwelling groups (pitfall trapping) *	□	●	
Other terrestrial groups (sweep netting, searching,* using systematic sampling methods)	□	●*	
Soil invertebrates	●		
Freshwater invertebrates*	●	●	●
Other groups			
Amphibians*	●	●	●
Reptiles*	□		
Birds*	□	●	
Other notable species or habitat indicators*	□	●	
Condition monitoring	●	●	●

□ = More demanding requirements, with larger numbers of samples expected.
● = Less demanding requirements, with fewer samples expected
* = If relevant to habitat or key interest feature

shows the expected level of monitoring. Note that this includes not only detailed species sampling, but also condition monitoring (see Box 4.8) in order to assess the quality of the habitat and any restorative or ameliorative measures needed.

Monitoring should depend on scientific methods using, as appropriate, **randomly and systematically collected data sufficient for statistical analysis.** Statistical advice should be sought before deciding on the monitoring detail.

It is important for monitoring to be repeatable using different surveyors if necessary.

Sound advice on grassland monitoring, which should be adapted for other habitats, is provided in Crofts and Jefferson 1999. Monitoring must be designed to be 'fit for purpose' with the detail related to the objectives set and the area moved (see Table 4.1).

4.7.2 Botanical monitoring

Botanical monitoring will be needed for all translocations (see Table 4.1). **The level of monitoring required will be determined by the area of habitat moved, the complexity of the vegetation** and the nature conservation value of the site. Decisions will need to be made on the following for detailed monitoring:

- the appropriate size of quadrats (which depends on the scale of pattern in the vegetation)
- what to record – estimates of cover value should be avoided as too subject to recorder variation. Presence and absence in whole or subdivided quadrats, or using pin transects, to give a frequency measure would be better. Vegetation height and the quantity of litter should also be recorded
- numbers of quadrats – this depends on the level of precision required, the complexity of the vegetation and the area involved. A statistician should advise
- the frequency of recording – once in the peak flowering season for the species involved may be sufficient, but this may need to be supplemented by additional visits should other key species be present that can only be identified in other seasons
- the layout of quadrats – fixed quadrats are not recommended since, once translocated, samples can be difficult to relocate. In addition, fixed quadrats larger than the machine bucket size are difficult or impossible to move intact. Random quadrats are advocated, with stratified random sampling in different communities or subcommunities as necessary.

Further advice on the above should be sought from those experienced in monitoring, with reference as well to the ecological monitoring literature and documents like Crofts and Jefferson 1999.

NVC determination is complementary to the detailed monitoring and is different in that it is a description of the vegetation community as a whole. Five 2 x 2 m quadrats are normally used, placed in an area of homogeneous vegetation (but see the NVC handbooks for variation between different habitats, Rodwell 1991–2000).

A total species list should be made with relative abundances recorded (using the DAFOR system) for each subcommunity or for each site where the vegetation varies little or subcommunities merge indistinctly. On low value sites, this level of monitoring, plus regular fixed-point photographs, would be adequate. Biomass measurements would be useful to correlate with soil nutrient analysis, and to inform vegetation management decisions, but would be resource intensive and only warranted where increased nutrient availability was perceived to be a likely problem on high value sites.

4.7.3 Invertebrate monitoring

There are equally numerous decisions to take on **invertebrates** as on botanical monitoring. **The level of input should reflect the value of the site for invertebrates and the area transferred**, and be determined by a suitably experienced, professional entomologist. Key invertebrate indicator groups should be selected for monitoring according to the habitat type involved and the species or groups for which the site is important. It is best to focus on soil or terrestrial species like ground beetles, molluscs, ants, orthoptera and craneflies, rather than highly mobile ones like hoverflies. Sedentary species, like some butterflies, would also provide good indicators and could be key site features. Monitoring should employ quantitative, systematic and comparable methods suited to the species, the site, and to their relative importance.

4.7.4 Monitoring soils

Soil monitoring should examine the main nutrients in top and subsoil layers. See Crofts and Jefferson 1999 for advice on collecting soil samples. Little is known about the soil microflora, in relation to translocation, and this needs investigation.

4.7.5 Hydrological monitoring

Where relevant, **hydrological monitoring** should include dipwell or piezometer measurements over all seasons at key locations and, where relevant, water quality measurements.

4.7.6 Monitoring other features

There may be **other key interest/features** that will need to be monitored, depending on the objectives of the translocation. These should be identified in relation to:

- species listed as specially protected under the Wildlife and Countryside Act 1981 and subsequent amendments, or the Habitats Directive
- priority BAP (national or local) species
- habitats and species of importance for biodiversity in England and Wales as defined under Section 74 of the Countryside and Rights of Way Act 2000
- nationally rare, scarce or local species.

4.7.7 Monitoring time-frame

Monitoring should be conducted for at least two years prior to translocation for high value sites (as defined in Box 2.5, page 20), but one year could be justifiable for lower value sites. The **season of pre-translocation monitoring** should be the **same as that for post-transfer** work, and both should be in the season most appropriate for the species and communities involved.

The **length of the monitoring period** after translocation should have been specified in the planning conditions, the planning obligation or as a public inquiry commitment. If this is not the case, **monitoring should be conducted for at least three years annually**. The **results** should then be reviewed with the local authority ecologist and the relevant statutory nature conservation organisations involved, and if there are still differences that can be attributed to translocation then monitoring should continue provided the value of the habitat warrants it. For low growing habitats (ie excluding woodland), **a 10-year programme should be the expected norm** but could warrant an extension in selected cases. For taller **woody habitats, 20–30 years should be the minimum** to reflect the time taken to reach a full canopy.

Monitoring after the first three years can be in alternate years, or less frequently (eg every three to five years) depending on the time frame adopted and the speed of change. However, advice on the validity of altering the monitoring interval should be sought from a statistician. Decisions on the frequency should be related to a review of the results, and these should be agreed with the local authority ecologist and the nature conservation organisations involved in the case.

4.7.8 Marking the translocation site for monitoring

It is very important to ensure that the **areas translocated**, and any different communities that are to be monitored separately are **adequately marked** on the ground, so that they can be **re-found each year**. **Methods of marking** have to take into consideration the **problems**, inter alia of:

- cutting the vegetation
- of stock removing them
- of stakes rotting and disappearing
- of vandals removing posts (even in apparently remote sites)
- of the difficulty of finding posts when vegetation grows taller or more densely (for example, in young dense woodland undergrowth).

GPS may be useful for relocating boundaries and posts but the level of accuracy of the system used needs to be sufficient.

All marked areas, along with those monitored should be accurately shown on plans, with the **monitoring schedule, and the detailed methods** adopted **recorded on paper/and or digitally, and stored safely** so that they can be repeated in future years, if necessary by different recorders.

5. THE CONTRACTUAL CONTEXT FOR HABITAT TRANSLOCATION

Ensuring the most appropriate type of contract is adopted where possible, and that adequate information is included are essential requirements to reduce risks of habitat translocation failure. This section explains the best practice approach for dealing with common contractual issues and their ramifications.

5.1 THE APPROACH TO CONTRACT PROCUREMENT

5.1.1 Types of contract

The procurement of contract works for habitat translocation carried out under construction contracts typically **follows one of two main approaches**:

- the '**conventional**' approach, where the employer retains the services of a construction design team – assisted by an ecologist as a specialist adviser – to produce a scheme design, tender the works and let a contract on his behalf. Usually the construction design team supervises and administers the contract works. Where available, this approach – with the habitat translocation works carried out as a separate main contract – is recommended best practice
- the '**design-and-build**' approach, where the employer, with the aid of a construction design team, draws up a list of Employer's Requirements which are used as the essential technical information for contract procurement. These form the basis for seeking tenders for the works from a select list of approved contractors, who employ their own construction design teams – each with specialist ecological advisors – to produce detailed scheme designs which comply with the Employer's Requirements. The successful contractor implements the works, overseen by the employer's engineering and ecological advisers in order to ensure proper compliance with the Employer's Requirements.

Where the employer's current policy allows for discretion in selecting different methods of contract procurement, it is important to understand the differences between these approaches – and their inherent advantages and disadvantages – before choosing the most appropriate for the task in hand. **The main concept underlying the difference is that of risk management. Under the 'conventional' approach, the employer retains responsibility for a significant proportion of the risk in the project.** The contractor prices for the job as tendered, on the basis of the information provided by the engineering design team at the time of tendering. Subsequent variations – almost inevitable on large or complex construction schemes – are often the subject of prolonged discussions and financial deliberations as to who pays how much for the work that was actually done. Typically, projects may turn out more expensive than the tendered price.

The **'design-and-build' approach evolved as a way of passing a large proportion of risk to the Contractor**, and was borne out of a construction contracting climate that had become inured to the system of recovering profit by claims for loss and expense, as normal practice. This can be particularly evident in times of economic recession where, in order to win work in a highly competitive tendering climate, Contractors may submit low-priced tenders to cover costs and seek to claw back profit at every possible opportunity.

Where the Employer is applying the design-and-build approach to contract procurement, the Employer's Requirements are set out as performance parameters, within which the main contractor* has to produce a detailed, conforming, design, as the basis for his tender. He employs ecological advisors to assist with areas of detailed ecological work, including habitat translocation.

The main contractor therefore takes a major proportion of the risk, as he becomes responsible for designing as well as delivering the project on time and in accordance with all the Employer's Requirements. Any variations to the works or the way in which the works are carried out must be agreed with the Employer, if the nature of such variations is likely to justify a change in the Employer's Requirements – the main basis for a contractor claiming additional payments for extra work done. The employer's perception is likely to be that this approach reduces the risk of overspending and streamlines budgetary control.

There will be additional or alternative forms of contract that will be, or are being, developed. Where best practice contractual relationships change, it will be necessary to combine the necessary principles set out in this section, into any new form of contract to ensure best practice habitat translocation is assured.

* This term applies to the Contractor who is contracted by the Employer to carry out all of the required works. He may choose to sub-contract any part of the works, with the approval of the Employer. Specialist translocation works, requiring special skills and equipment, are very likely to be sub-contracted. The Main Contractor is likely to be the Principal Contractor for those projects that are governed by the Construction (Design & Management) Regulations, 1994.

5.1.2 Implications of the types of contract for habitat translocation work

There are important ramifications for the quality of work – and therefore the likely success of habitat translocation – in each of these approaches to contract procurement. The following summarises the areas of concern:

- the technical specification of the habitat translocation works and the conveyance of accurate project information to the contractor responsible for carrying out the specialist works
- quality control by the employer's specialist ecological advisors within the framework of contract administration and supervision
- time pressures upon the main contractor, driven largely by financial considerations, since habitat translocation work is typically done very early in the works programme, so delays at this stage can have serious knock-on effects. When the translocation works are on the critical path of a project, pressures upon the main contractor are likely to be passed down the line to the subcontractor, thus increasing the risk of not achieving satisfactory ecological work.

APPROACHES TO CONTRACT PROCUREMENT: FACTORS AFFECTING THE QUALITY AND SUCCESS OF HABITAT TRANSLOCATION

Conventional approach	Design-and-build approach
More direct chain of command – leads to shorter and more efficient information path and ease of quality control. Ecologist advises main contractor as technical advisor to the project engineer, who acts as the employer's agent.	Indirect chain of command and longer information paths – greater chance of misunderstanding or misinterpretation of key technical information. Employer's ecologist advises employer's engineer who liases with the main contractor who, in turn, is advised by his ecologist, before instructing the translocation sub-contractor.
Ecologist's specification for translocation works included in tender documents – one point of technical information/contact.	Employer's Requirements are interpreted by the main contractor's ecologist and then incorporated into the overall works design and programme by the engineering design team and submitted as part of tender.
Variations to works by translocation sub-contractor can be addressed by main contractor and cost implications agreed by negotiation – relatively flexible, at extra cost.	Variations may require amendments to the Employer's Requirements, involving approval by the employer. Time delays are likely, putting further pressure on the main works programme – quality may suffer as an indirect consequence.
Tender evaluation is straightforward.	Tender evaluation must take account of alternative approaches to fulfilling the Employer's Requirements – less straightforward.

5.1

The different ramifications of each of these approaches to contract procurement are outlined in Box 5.1.

5.1.3 Important factors to consider

The most important factors to consider in organising habitat translocation works **are those of quality control by the employer's supervising ecologist, and the chain of command within the approach to the works contract.** The achievement of high quality workmanship on sensitive nature conservation sites is more likely to be at greater risk under contractual arrangements where there are several parties involved in designing, approving, overseeing, supervising and implementing the translocation works. **A short chain of command and proper systems of quality control are essential if a high quality of finished work is to be achieved.**

Fig. 5.1 gives the chain of command for both the conventional and the design-and-build approaches to contract procurement, where the translocation works are carried out as a subcontract to a main engineering works contract. Remember, this may be only one of many sub-contracted packages of work for which the main contractor is responsible.

Under the design-and-build approach, control over the work of the habitat translocation subcontractor is via an indirect information path. Communication between the employer's ecologist and the contractor's ecologist must be via the main contractor, and thence instructions passed on to the translocation sub-contractor.

No contractual relationship exists between the main contractor's ecologist and the specialist translocation subcontractor; therefore, all instructions and quality control information must be relayed via the main contractor. In order to overcome these potential shortcomings, when working on sites of high conservation value, **the employer's agent should ensure that the Employer's Requirements are sufficiently prescriptive to achieve the stated ecological objectives**. These should not only cover the technical specification for the required works but

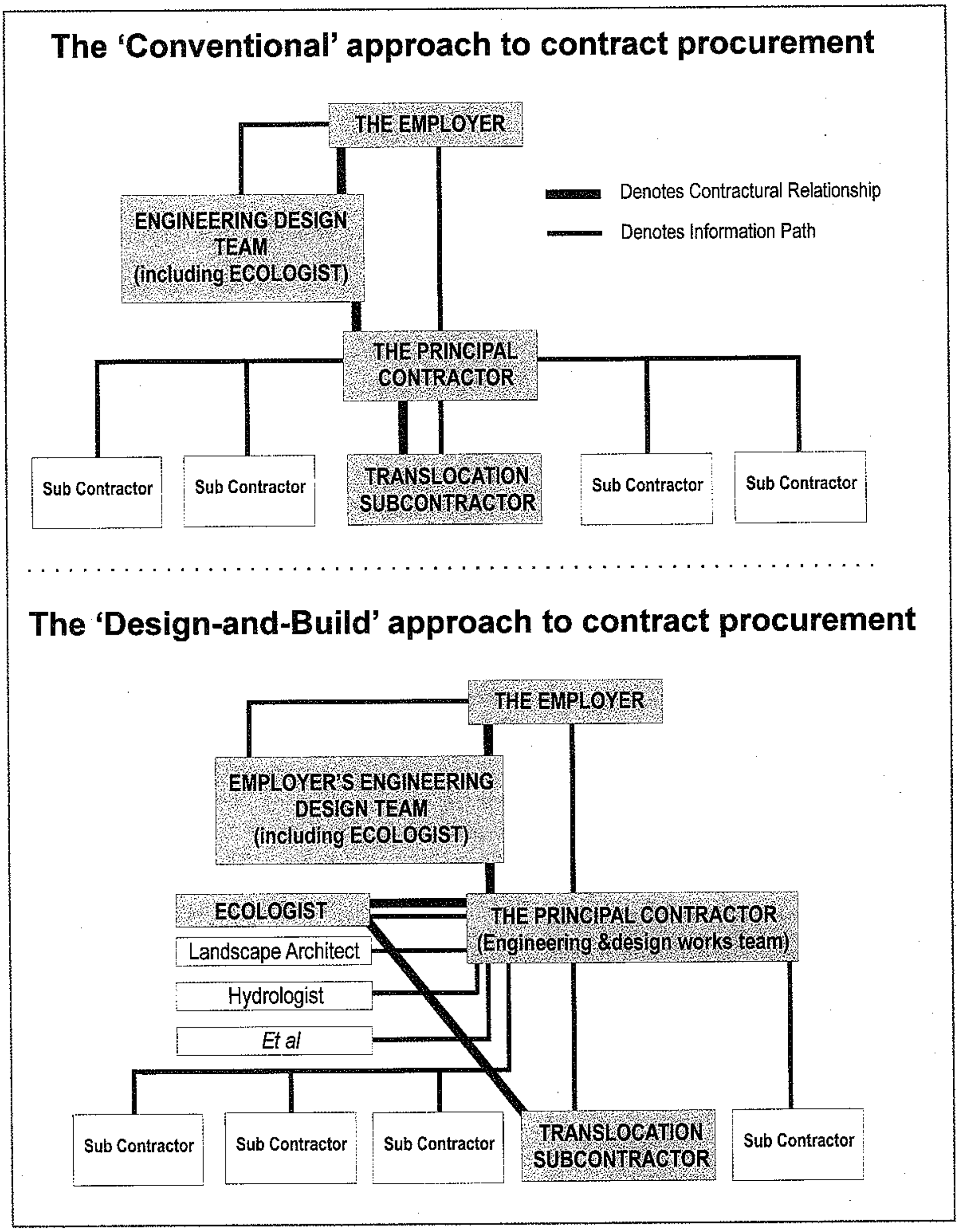


Figure 5.1 *Schematic representation of contractural relationships and information paths*

also the systems for overseeing the works and quality control. The responsibility for devising effective and workable Employer's Requirements appropriate to the project in hand lies ultimately with the Employer. **Full and proper compliance with the Employer's Requirements is a matter for the main contractor, overseen by the employer's agent.**

The more indirect the lines of communication are – and the more links there are in the chain of command – the greater the risk of misunderstandings or misinterpretation of contractual and technical requirements. **The greater degree of quality control is more likely through the more direct channels of communication embodied in the conventional approach. Where the policy framework of the employer permits, this must therefore be regarded as the best practice approach – where translocation works are carried out as part of a larger construction works contract.**

As well as the approaches to contract procurement described above, **consider whether the habitat translocation works can be carried out as a sub-contract of a main construction works contract, or whether they can be implemented as a separate main contract in advance of other works.** If habitat translocation works are carried out as a sub-contract, the degree of risk involved may lead the main contractor to increase his overall price disproportionately. A main contract for translocation works is very likely to be more cost-effective, since true and financial risks are removed from the main contractor, leading to a greater chance of operational and ecological success.

Where the employer's current policy provisions permit, it is **strongly recommended**, borne out of both ecologists' and specialist contractors' experiences of such works, **that habitat translocation works are brought forward into an entirely separate main contract.** This approach is an extension of the conventional approach to contract procurement. In this scenario, the ecologist is the contract administrator and takes full responsibility for specifying the works, tendering and letting the contract, and administering it to completion, seeking specialist advice as necessary.

The advantages of using this approach to habitat translocation works are shown in Box 5.2.

In order to be fully effective, this approach requires sufficient lead-in time on the project to be able to organise and complete satisfactorily such a contract – in the context of the prevailing seasonal and technical constraints – <u>before</u> any follow-on engineering or construction works contract commences. This necessitates a clear understanding of the scope and duration of the proposed habitat translocation works, in the interests of sound project planning. Proper planning is essential in order to ensure that there is minimal risk of jeopardising the programme for any follow-on contract (see Section 2.2, page 14).

Where it is not practicable to carry out habitat translocation works as a separate main contract, or where using a subcontract is considered to be unavoidable, serious consideration should be given to devising some way of sharing the risk between the principal contractor and the specialist subcontractor. This approach has found favour in recent years and is generally referred to as **partnering**.

The time-sensitivity will be critical for translocation works at the beginning or at a very early stage of the construction contract programme. If a normal domestic subcontract for the translocation works is set up, unreasonable pressure may be brought to bear upon the specialist subcontractor by the main contractor to complete his work in the minimum time and make way for follow-on operations. This is not conducive to good quality workmanship and therefore successful translocation. **Partnering can share the risk in a constructive manner**, such as in the example outlined in Box 5.3, **to the overall good of the project, and is definitely in the interests of best practice.**

ADVANTAGES OF IMPLEMENTING TRANSLOCATION WORKS AS A SEPARATE MAIN CONTRACT

There are no **external time pressures exerted directly on the specialist contractor** by the main contractor's engineering works programme.

Financial and operational risks are fewer, leading to a more cost-effective approach.

Where the translocation works are relatively small scale or simple, **a simpler form of agreement and related contract documentation** can be used.

The **ecologist has a direct working relationship with the specialist translocation contractor**, as the sole agent for the Employer; therefore the chain of command and the information path are short and straightforward, minimising the risk of misunderstanding or misinterpretation of technical requirements by the Contractor.

Variations to the works – required by either the ecologist or the contractor – **can be agreed quickly and authorised directly by the ecologist**, resulting in optimum flexibility in response to the prevailing site or weather conditions and minimum time delays.

Payments are made direct to the specialist contractor. Since the contractor is not working under a sub-contract, tender prices can be lower, because the contractor does not have to wait in line and streamlined payments would reduce overheads. **This also gives the ecologist full financial control of the works.**

5.2

AN EXAMPLE OF RISK SHARING ON TIME-SENSITIVE TRANSLOCATION WORKS AS CARRIED OUT AS A SUBCONTRACT

Main contractor and specialist subcontractor enter into a formal agreement to **share risk**.

Specialist subcontractor submits his price for the works to the main contractor. Both parties agree on the scope and details of any support services to be provided by the main contractor, eg additional plant and machinery, setting-out surveying, haul roads, or other facilities.

A **target cost** for the works, including administration and supervision costs to be borne by the main contractor, is **formally agreed**; profit/loss share arrangement is fixed by mutual agreement.

If the subcontractor executes the work for less than the target cost, the **savings are shared** between the two parties on the previously agreed basis; if the expenditure overruns the target cost, the loss is shared on the previously agreed basis.

Thus, it is in the interests of both parties to co-operate effectively and efficiently in carrying out the works.

5.3

5.2 CONTRACT DOCUMENTATION

Contract documents normally consist of the following elements:

- form of agreement
- specification
- bills of quantities/schedules of works/schedules of rates
- contract drawings.

5.2.1 Form of agreement

It is essential that the proposed form of agreement – the legal contract pro forma – to be used for habitat translocation works is <u>proportionate</u> to the scale and complexity of the proposed works. Over-elaboration leads to misunderstanding and a tendency for Contractors to price higher than necessary to cover perceived risks from complicated contracts.

This guide advocates the use of appropriate standard forms of agreement for civil engineering works, landscape works and building works. Non-standard, bespoke forms of contract are not recommended, in the interests of best practice. It is acknowledged that forms of agreement will evolve over time.

The most appropriate form of agreement must be used, in accordance with the Employer's policy preferences and taking into account the professional expertise of the employer's agent.

Where the habitat translocation is to form part of major infrastructure engineering works, the Institution of Civil Engineers (ICE 5th, 6th or 7th Edition) or the New Engineering Contract (NEC) – Engineering and Construction Contract – are most likely to be used. For some public sector works, the GC/Works series of contract forms may be employed. Under any of these forms of contract, translocation would be an area of specialist works likely to be subcontracted.

Use the NEC Engineering and Construction Short Contract (1999) or the Joint Council for Landscaping Industries (JCLI) Form of Agreement for Landscape Works, or the Joint Contracts Tribunal (JCT) Intermediate Form of Agreement for building works, depending upon the working context, where the translocation works can take place as a separate advance works contract. The choice of which form of agreement to use and under what circumstances is governed by a number of factors. A conceptual scheme to assist in making this choice is set out in Fig. 5.2.

Where a civil engineering context prevails, the NEC Engineering and Construction Short Contract is recommended as a more progressive form of agreement than previous ICE forms.

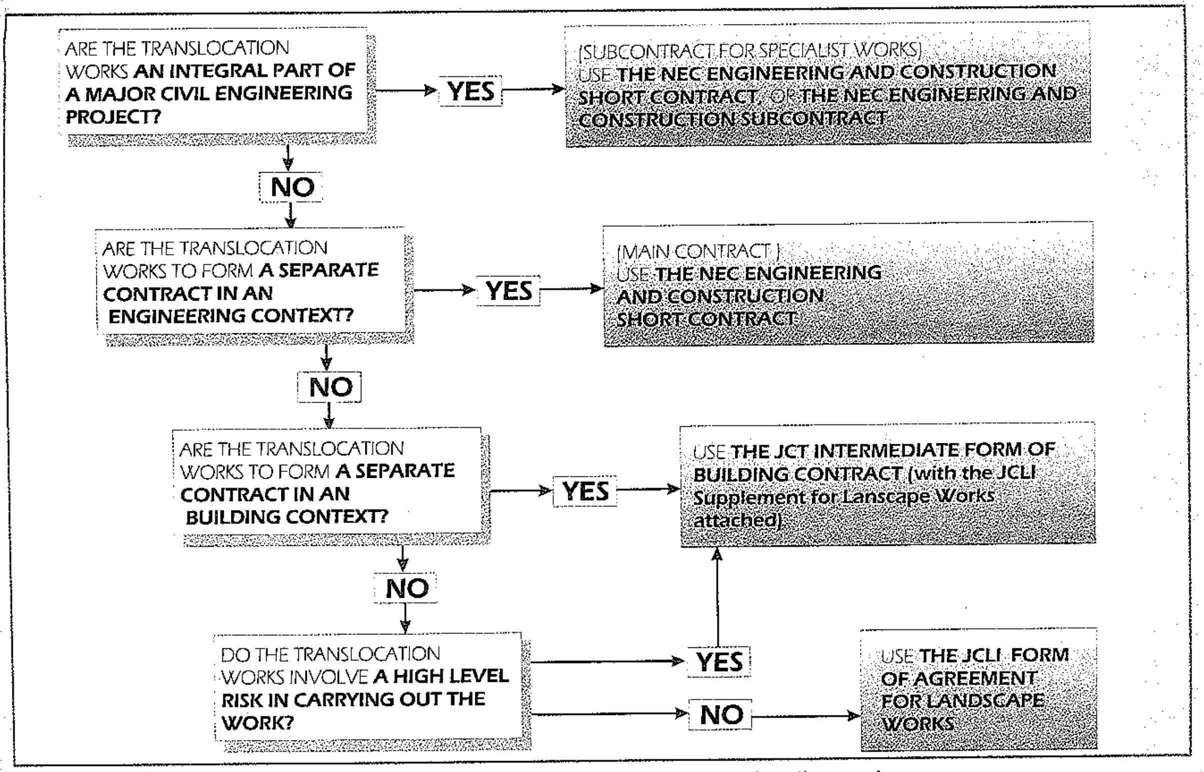


Figure 5.2 *Selection of an appropriate form of agreement for habitat translocation works*

5.2.2 Specification

This part of the contract documentation is the detailed statement of the qualitative aspects of the works – it covers the standards of workmanship to be achieved and the materials to be used. **This should be produced by the ecologist in close collaboration** (if it can be aranged), **with the specialist translocation contractor where the proposed works are of a complex or highly sensitive nature. This dialogue is essential for a successful outcome, whether in a design-and-build context or using the conventional approach to contract procurement.** Each of these parties has specialist knowledge to bring to bear on the project; encouraging a constructive partnership approach from the outset is sound project management practice.

In all aspects of specification writing, precision, concise language and the avoidance of ambiguity are essential. In any contract, the specification clauses covering the technical aspects of the work itself must be differentiated from the preliminaries clauses. Preliminaries clauses, though not actually constituting part of the finished works, contain important details which affect how and when the works are to be carried out, including site-specific operational requirements. These might relate to the type of works envisaged or a particular employer's policy or site working arrangements.

Failure to understand the importance of such matters, or to place sufficient emphasis upon them in contract documents, can adversely affect the programme or the quality of the finished work. All contract preliminaries clauses are priceable – that is, the contractor must be given the opportunity to place costs against any of these clauses when preparing his tender. A basic checklist of preliminaries items to be included when preparing a contract for habitat translocation is given in Box 5.4. **These items need to be included in the contract documents irrespective of the form of contract being used.**

5.4

CONTRACT PRELIMINARIES ITEMS – A BASIC CHECK-LIST

An abstract of each of the clauses of the relevant form of agreement to be used (clause headings and any alterations/annotations/insertions required by the *pro forma*).

A short statement giving the nature and scope of the proposed works.

Details of the site location and a brief description of the access route to the site; location of contractor's storage compound/restrictions on its location; site security arrangements.

A list of contract drawings.

Requirements for site meetings – frequency and place of meeting.

Contractor's programme for carrying out the works – usually required to be provided to the contract administrator (engineer or ecologist) within two weeks of contract commencement.

Contract commencement and completion dates.

Insurance of the works by the contractor to indemnify the employer against injury to persons or damage to property arising from the contractor's activities.

Competent person in charge of the works – to be on site at all times when work is being carried out – so that instructions can be given to the contractor by the contract administrator.

Normal permitted site working hours; any specific restrictions on noise and dust emissions or vibration; weekend working hours, if permitted.

Arrangements for valuations of the work and payments to the contractor – monthly, unless otherwise stated.

Amount of liquidated and ascertained damages for non-completion of the works (daily or weekly).

Health and Safety at Work requirements – including whether the Construction (Design & Management) Regulations 1994 will apply to the works.

Liabilities for damage due to the contractor's activities and required standards for reinstatement by the contractor.

5.2.3 Bills of quantities

These are the **quantitative** part of the contract documents. They describe the amount of work required, in accordance with the standards of workmanship and materials set down in the specification.

There are different degrees of risk for the Employer and the contractor with each approach to quantification used. Bills of quantities are the most precise, but are more exacting to produce, guided by stated conventions (such as Standard Methods of Measurement). The employer, through his agent (engineer, architect, landscape architect or ecologist), takes the responsibility for measuring the required works and drawing up comprehensive bills of quantities, but the risk element is low because of the levels of certainty on costs. The contractor has a reasonable level of risk – he prices the documents as seen.

There is optimum cost control with the use of bills of quantities – variations in the works are paid for on the basis of the rates quoted, with the ability to adjust individual rates by agreement, in relation to changes in the scope of the works to take account of economies of scale. **It is common practice to have bills of approximate quantities for some kinds of work** to be executed under standard forms of building contract or the JCLI Agreement for Landscape Works, especially where time pressures are such that the works must be tendered before accurate quantities can be defined, and where it is undesirable to use a schedule of rates.

This allows for economies of scale to be taken into account instead of pricing based on unit rates, where the employer would take greater risks on out-turn costs. **Use this approach for habitat translocation works, where precise quantities may be impossible to define at the design stage, but where the general scope and the approximate amount of work can be ascertained.** On engineering contracts, all quantities are subject to re-measure as work progresses on completion of the works, so the contractor is paid for the actual amount of work properly executed.

5.2.4 Schedules of works

These are lists of items of work to be undertaken, with quantities shown wherever possible. Unlike bills of quantities, the preparation of these documents is not governed by conventions. They **are suitable for smaller scale and simpler types of work of a limited duration**. Since they have not generally been produced with the same degree of precision as bills of quantities, there is more risk to both the employer and the contractor in using them.

5.2.5 Schedules of rates

Schedules of rates – where the contractor prices items of work on the basis of an individual unit of measure – are also used in construction and maintenance works contracts. This approach can be seen to **place almost all of the risk upon the employer** and no economies of scale are allowed for – the contractor is paid *pro rata*, irrespective of the scale of the works carried out. They are often erroneously used in place of bills of approximate quantities. **Do not use schedules of rates alone in habitat translocation works.**

A further approach sometimes used in minor construction or landscape works is that of issuing <u>a specification and annotated drawings</u>. Here, **there is minimal risk to the Employer as the contractor takes all the responsibility for quantifying the work. This is not recommended, since there is a high risk of reduced quality of workmanship following from the contractor underestimating the actual amount of work required.**

5.2.6 Contingency, provisional and prime cost sums

It is normal practice in construction and landscape works contracts to have elements of work which are not fully determined at the outset of the contract but which the contract must make allowance for. This is equally true of habitat translocation works.

Best practice in contract management includes a **<u>contingency sum</u>** at the time of tendering. This is **an allocation of reserve funds** – normally not more than 5 per cent of the estimated contract value – which is **set aside for dealing with entirely unforeseen events which may arise during the execution of the works.** It is used at the discretion of the contract administrator (engineer, architect, landscape architect or ecologist), but it must not be spent – in whole or in part – without the prior approval of the employer.

Note that some employers have a policy of not allowing general contingency sums to be included in contracts. If this is the case, use one or more **<u>provisional sums</u>** to build in additional financial provisions for foreseeable areas of work, or ensure that the employer has made provision for the contingency even though it is not explicitly described within the contract .

Include provisional sums in the contract for those works that, at the time of preparing the contract, cannot be entirely foreseen, designed or detailed. These offer considerable flexibility, which may be highly desirable in habitat translocation works, where site conditions may change during the works and additional inputs are required to exploit opportunities arising.

These sums are expended in whole or in part following an instruction from the contract administrator. Until such time, the Contractor is not entitled to any profit from such Provisional Sums. **It is far preferable to include named provisional sums to build-in financial and operational flexibility rather than increase the value of the general contingency sum.** Suggested titles for such provisional sums are "Additional drainage works to safeguard receptor sites or boundaries", "Additional protective fencing to donor and receptor site boundaries", "Soil/subsoil sampling and analysis" and "Additional excavation to win further suitable subsoil material."

For specialist areas of work which can be defined at the time of contract preparation, include <u>prime cost sums</u> for works to be carried out by specialist contractors or subcontractors. This includes such items as alterations to services by statutory undertakers. It is this system that is **used when habitat translocation works are carried out by a specialist subcontractor within a main construction works contract.**

A prime cost sum for habitat translocation works is included in the main contract tender documents, based upon the ecologist's assessment of the value of the proposed works (preferably refined in the light of discussion with one or more specialist contractors). The main contractor asks the specialist subcontractor to provide his cost quotation for carrying out the required works – in accordance with the specification, preliminaries, general conditions of contract and contract drawings – and the main contractor is entitled to add a percentage charge for overheads and profit for programming and administering that element of the works.

Use prime cost sums where a particular specialist translocation subcontractor is nominated by the contract administrator, in agreement with the employer. This mechanism allows the use of unique specialist skills and equipment to be guaranteed in a situation where inviting several tenders would be inappropriate. **It is extremely effective in reducing preparation and lead-in times and assuring a high standard of finished work.**

5.2.7 Contract drawings

Contract drawings **are an essential part of the contract documents.** They constitute the final element of project information to be provided to the contractor in that **they show the spatial distribution of the required works. Most importantly, they must show clearly the precise boundary of the contractor's permitted working areas.**

Within the boundary, the contractor is covered by the conditions of contract and all insurances are valid. Beyond those boundaries, none of these provisions applies and the contractor exposes both himself and the employer to the risk of legal action in the event of injury to persons or damage to property caused by his unauthorised activities. This may be of particular importance in habitat translocation works where there are designated nature conservation sites adjacent to the contractor's permitted working areas.

In addition to the demarcation of boundaries of working at the edges of the site, **contract drawings should clearly indicate areas of exclusion from general access within the site, including all translocation donor and receptor sites.** The requirement to fence-off donor and receptor sites should be clearly stated on the contract drawings.

This information gives additional weight to ecological site supervisors in preventing access by unauthorised personnel, plant and machinery and materials, which can have critical implications for the successful outcome of habitat translocation works. By including all such information at the tendering stage, all those parties involved in the works are aware of the site access restrictions and can price their tenders accordingly.

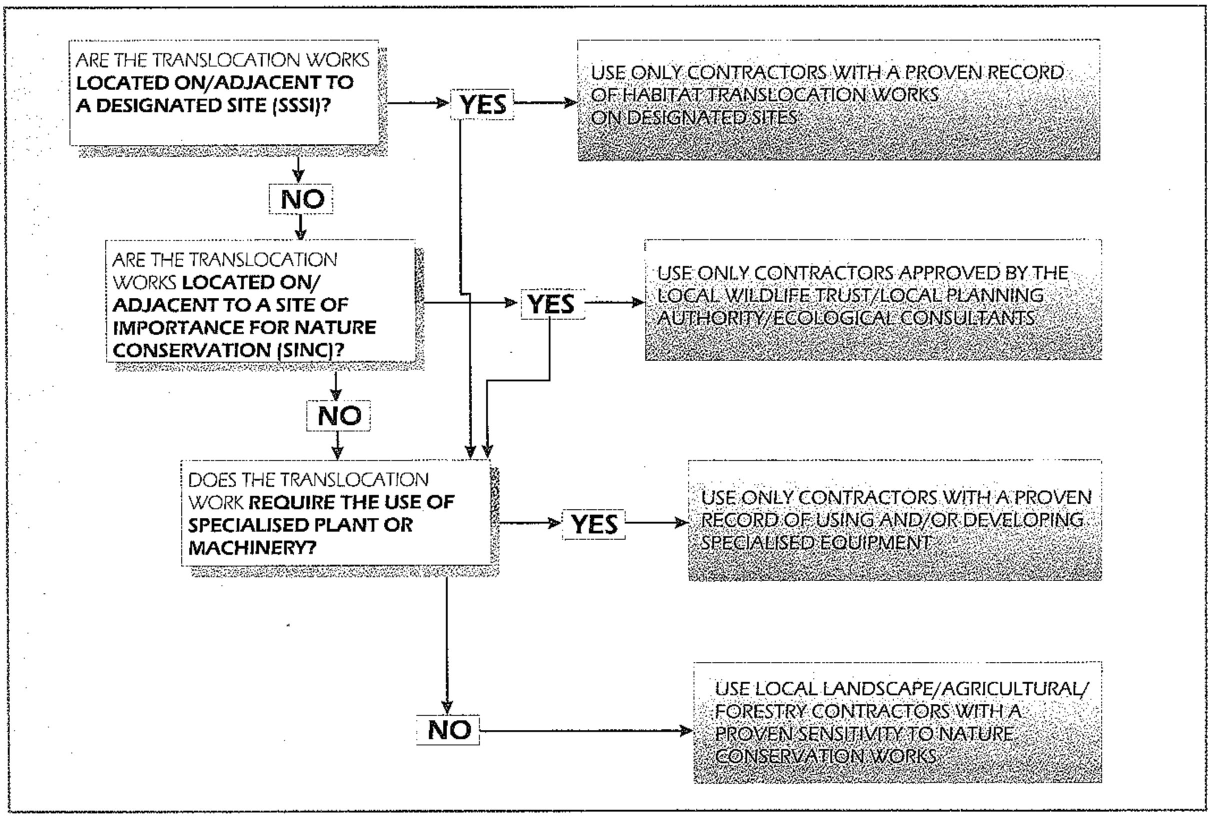


Figure 5.3 *Criteria for selection of suitable contractors for habitat translocation works*

5.3 SELECTION OF CONTRACTORS AND TENDERING

The employment of specialist habitat translocation contractors with a proven track record of competence and financial viability is absolutely essential in seeking to achieve high quality workmanship, and a successful outcome in relation to the stated objectives of the proposed works. Selecting the right Contractor is a vital part of the project and must be taken into account at the planning stage of the work (see Section 4, Planning the habitat translocation).

It is the responsibility of the ecologist responsible for overseeing the work to take up technical references from other relevant parties with whom candidate contractors have worked. Where tenders are to be sought, a minimum of two contractors must be approached. Fig. 5.3 provides a summary of the suggested approach to getting the right contractor.

The basic principle underlying the selection of habitat translocation contractors is to match the potential contractors to the nature conservation value of the site. (See also Section 6.11.)

Follow the employer's tender procedures. Where there is scope to influence such procedures, **it is recommended that tenders are sought in accordance with the most recent edition of the Code of Procedure for *Single Stage Selective Tendering* produced by the National Joint Consultative Committee for the Construction Industry (NJCC).** A **minimum of four weeks** should be allowed between formally inviting tenders and the date for the return of tenders. This allows time for all the contractors to visit the site and identify local resources, as well as sufficient time to raise queries about the nature and scope of the proposed works – and to have these answered by the ecologist – **before** submitting their tenders.

There may be cases **where the nature of the work is so specialised** – perhaps utilising patented equipment that is only available through one organisation – that **tendering is inappropriate**. In such cases, the employer – if his policy framework and procedures permit – should **consider procuring a contract by direct negotiation with a nominated specialist contractor**.

5.4 QUALITY CONTROL AND SUPERVISION OF THE WORKS

It is a natural corollary to the involvement of an experienced ecologist and a specialist habitat translocation contractor with proven expertise, that the highest calibre of personnel responsible for quality control and supervision are employed on the works. **Experienced site supervisors employed by the contractor and the employer** (often called environmental clerk of works or environmental works inspectors) **should be encouraged by the ecologist to develop a partnership approach to efficient working and problem-solving**. This will enable other advantageous measures to be taken, usually at no extra cost, by utilising temporarily idle machines, by creating further new habitats within the scheme and by ensuring that all the ecological and landscape measures are properly integrated. The ecological site supervisors should be suitably experienced in habitat translocation, have sufficient ecological knowledge and understanding to seek out ecological enhancement opportunities in the scheme, and be capable of developing productive working relationships with all those involved in the project. **Where sensitive sites of high nature conservation value are involved, there are likely to be increased levels of checks and balances in overall control of the site works where the Main Contractor has accreditation under ISO 14001 for his environmental management systems.** This should be advantageous in providing a more rigorous operational framework with regard to environmental issues. **It should also lead to a greater emphasis in implementing environmental safeguards and raising awareness amongst site staff. Consider ISO 14001 accreditation as a pre-tender qualification for the main contractor.**

Successful monitoring of progress during the construction phase of the translocation works requires accurate record-keeping. Accurate and concise records of works carried out, relevant dates and times, weather and ground conditions, issues raised and changes approved by the contract administrator should be documented as the work progresses. The role of the "environmental clerk of works" or "environmental works inspector" is fundamental in assisting the contract administrator in this respect. Such records may need to be made available for inspection by the relevant statutory nature conservation body or a statutory consultee, especially where sensitive sites are involved. These records should also be carried forward into the maintenance phase of the works and ultimately be held by the employer upon completion of all the required works, with copies provided for the use of the organisation which is charged with the responsibility for long-term maintenance.

These working arrangements will relate directly to the type of contract and administrative arrangements in place. Under typical contract arrangements, the clerk of works is an inspecting officer, whose role is to ensure the contractor's work complies with the specification. Unless agreed otherwise from the outset, he does not have powers of instruction and the engineer is the only person empowered to suspend the works. The ecological supervisor/clerk of works/inspector may be employed direct by the employer, or by the consultant ecologist, or by the contract administrator. **The greater likelihood of developing a successful partnership approach to quality control and site supervision will occur where the ecologist has direct responsibility as the contract administrator.** Where the engineer, architect or landscape architect is the contract administrator, he should take all reasonable steps to foster such a working relationship within the scope of the contract, in close collaboration with the ecologist. The ecological supervisor/clerk of works/inspector supporting the contract administrator must have the most direct line of communication with the contract administrator, in order to have maximum control over the quality of the translocation works.

Since habitat translocation is frequently an inexact operation, flexibility needs to be maintained in the approach to the works whilst properly accounting for variations. **Where the ecologist is the contract administrator, this process is under their direct control. Where the ecologist is a specialist advisor to the engineer as contract administrator, any delegated powers under the contract arrangements** (eg to instruct or vary the works) **must be entirely clear and unambiguous, documented, and made known to the main contractor and the specialist subcontractor before commencement of the works.**

These arrangements must remain in place for the duration of the works and may extend into the aftercare and maintenance period after the main construction phase of the works has long been completed (see Section 7, Aftercare and maintenance).

6. THE MECHANICS OF TRANSLOCATION

The physical process of translocation is covered in this section. Issues covered relate to timing of translocation, the choice of method – turves or soil transfer, dealing with the receptor site, how to restore vegetation patterns, what size of turf to take, how to lay turves or stripped soils, how to treat trees and shrubs, or the transfer of individual plants and whether to water or not. The logistics necessary to accommodate translocation contractors, and the need for method statements are also considered. Integrating the translocation into other requirements such as site investigations, and allowing for bad weather and protesters, are all covered.

6.1 INTRODUCTION

The mechanics of translocation involve making decisions on how to move the habitat, and then on the most appropriate techniques for achieving this. The **alternative types of translocation are**:

- moving as **turves**
- moving as **soil transfer** (also termed mass transfer, littering or blading) where the vegetation and soils are scraped up and transferred
- moving **trees and shrubs**
- moving **individual plants** (as for ponds and marshes possibly).

This section gives best practice guidance on these matters in relation to habitats and soils.

Whatever method of transfer is selected, it is **essential to protect the receptor and donor sites from other activities.** If translocation is not conducted at the outset of a project, the donor site must be securely fenced and clauses included in the contract documents to ensure no vehicles can access it and no damage can occur. Similarly, the receptor site will need to be secured by suitable fencing from other development activities, or from potentially damaging operations conducted on adjacent land that could inadvertently affect the translocated habitat. However, **establishing** the necessary fencing **must also avoid damaging the habitat. It is essential that unauthorised vehicles do not drive over the habitat** or its subsoils before or after translocation, and that authorised vehicles are limited to those involved in the translocation.

In addition, **no vehicle should run over vegetation** before, during or after translocation at any time, unless for an agreed specified purpose. In cases where subsoils are vulnerable to damage by compaction, wheeled vehicles and dumpers should not run them over if they are to be translocated. Low-ground-pressure tracked vehicles should always be used to avoid compacting and smearing soils.

Although often not needed, **the requirement for any consents or licences from the statutory agencies needs to be considered** for discharges, protected species, fish removal etc.

6.2 TIMING OF TRANSLOCATION

All translocations should take place in the dormant season for terrestrial habitats. **Soils should be at** or near **field capacity** to maximise their cohesiveness. Excess water can create problems. Thus, **the best period for translocation is autumn/early winter** under 'normal' weather conditions. This is especially appropriate for woodland with a vernal flora that can begin to appear as early as December.

Plate 6.1 *Grassland translocation undertaken in dry conditions in August – note the loss of sections of the B horizon, which can them result in turf collapse*

An exception to this norm would be aquatic plants and animals that are best moved in the growing season (except for some invertebrates that might be easier to identify, and be present in the water, at other times).

Justification for any other exceptions to the normal transfer period would need to relate to particular habitat, soil and climatic conditions. For example, high altitude peat moorland might be sufficiently wet in August for safe translocation, but too wet later in the year.

6.3 CHOOSING THE MOST APPROPRIATE TYPE OF TRANSLOCATION

The **sound judgement of a suitably experienced ecologist** is essential to decide the most appropriate method. Factors affecting this decision are:

- the nature and value of the habitat
- practical considerations such as soil cohesiveness, depth and slope angle.

The **nature and value of the habitat** should be the **main determinant. Costs and timescale should not be permitted to influence the decision.** In general, **all habitats should be moved as turves**. The exceptions to this are:

- plant communities where the seed and bud bank can be demonstrated to be capable of regenerating into a vegetation similar to the original community (eg on heather dominated heathland and in some early successional grassland swards)
- woodland, hedges and scrub where turf transfer is mostly impractical except, possibly, for some ground flora
- low value habitats that are not long-established nor intimately diverse
- habitats on very steep slopes or very thin soils with an open community and no turf cohesiveness where turf transfer may not be possible (but see Box 6.1)
- aquatic habitats
- moving subsoils to accompany the turves.

TRANSLOCATION OF A LICHEN-RICH COMMUNITY WITH LOW COHESIVENESS

A specially designed bucket was made to move the lichen-rich community to the receptor site without double handling. A flat plate bucket was used with the normal guillotine structure around the outside on three sides, but with an extra plate in the back to push the sand turf off without having to tilt the bucket as it was lowered to the ground in the receptor site. This prevented the turf from "crumpling" as it was placed on the ground.

6.1

The reasons for moving as turves rather than soil transfer are:

- seed and bud banks do not always represent the above-ground vegetation, especially in old grassland and ancient woodland (see the Review, Section 5)
- a better representation of the original community is usually achieved
- smaller populations of ruderal (and 'weed') species can colonise
- less disruption to the invertebrates
- re-establishment of distinctive subcommunities possible, or more rapidly achieved
- retention of basic soil structure (long undisturbed soils can be as valuable a nature conservation resource as the plants and animals).

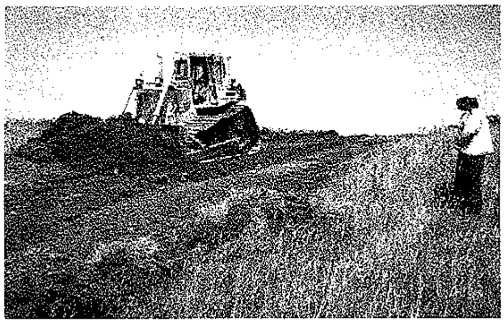


Plate 6.2 *Soil transfer of marshy grassland, 1989*

Plate 6.3 *Soil being respread*

Plate 6.4 *Initial establishment from rootstocks*

Plate 6.5 *Developing sward after two years. Thirty per cent of original species not re-recorded after nine years, but other characteristic species had colonised*

To assist in making decisions, **conduct a selection of seed bank tests** (Box 6.2). Allow sufficient time in the growing season for the seed bank to establish. Beware that the commoner rushes produce a very substantial persistent seed bank. Any soil transfer of rush-occupied vegetation will result in a rush invasion that can be difficult to control.

If in doubt that the **physical constraints** of a site could make turf transfer difficult or impossible, discuss the issues with an experienced contractor.

HOW TO CONDUCT A SEED BANK TEST

The following gives an idea of the range and relative abundance of species in the seed bank, and takes 2–3 months.

- Collect several sub-samples of soil from the top 1–3 cm below any undecomposed litter, or from bare soil.
- Spread out thinly onto a sterile (peat-free) compost in seed trays.
- Label with date of collection and location.
- Water and cover with polythene sheet or plastic lid to maintain humidity and prevent contamination.
- Place on windowsill, in greenhouse or, in summer, outside (but not in full sun).
- Keep moist.
- As seedlings grow, identify, record, pull seedlings out, and disturb soil gently.
- Repeat identification etc as more seedlings grow.
- Analyse and interpret results.

6.2

6.4 PREPARATION OF THE RECEPTOR SITE

A thorough survey of the soils and hydrology of the receptor site (see Section 4.4, page 31) should be undertaken to inform decisions on site preparation for translocation. Normal requirements would be:

- removal of existing vegetation
- removal of topsoil (A horizon)
- removal of subsoil if this does not match that of the donor site.

Further engineering may be needed such as:

- remoulding of subsoil to reduce or increase its depth to match better that on the donor site
- removal of field drains
- engineering of topography and micro-scale aspects to better match those of the donor site
- engineering of the required groundwater conditions.

See Box 4.6, page 32, Fig. 4.2, page 32, and Box 6.3 for examples of these.

All site preparation works should be conducted in the normal earth-moving season when ground conditions are not too wet. Care must be taken to avoid undesirable ground compaction or damage. Suitable vehicles operated in dry conditions should be used to achieve this. Avoidance of smearing and compaction of clay soils is particularly important.

EXAMPLES OF ENGINEERED GROUND CONDITIONS FOR HABITAT TRANSLOCATION

See Box 4.6 for groundwater manipulation.

Longmoor Camp, Hampshire Lichen bank	Prepared a new bank of similar size and gradient on which to place lichen turfs (J Edwards, pers comm).
Bleak House, Staffordshire Wet heathland	Receptor was a pasture adjacent to the site. Excavated 1.2 m soil/subsoil, graded to form correct gradient. Lined with 400 mm of clayey drift material which was compacted, 350 mm layer of sandy loam, and 250 mm thick turves. (N Humphries, pers comm).
Birmingham Northern Relief Road (M6 Toll Road), Motorway Service Area only, Staffordshire Heathland	Construction of the appropriate soils and hydrological conditions by excavating receptor site, placing a landfill liner over the site, about 1 m deep, and adding layers of sand, gravel, and clay taken from the receptor site to a depth of 400 mm. 300 mm subsoil was placed over this from the donor site, then 150 mm of humus-rich subsoil and, finally, the 250 mm-thick donor turves (W Cresswell, pers comm).
Newbury Bypass, Berkshire Wetland for Desmoulin's whorl snail	Receptor site on Bangor Island (in the River Kennet). Soils removed to create shallow scrapes and to manipulate water levels (Stebbings & Killeen 1998).
Durnford Quarry, North Somerset Neutral grassland	Limestone scalpings and brashings added from donor site to increase area of shallow soils with rock close to the surface (G Wilson pers comm).

6.3

6.5 TURF TRANSLOCATION

As a general principle, turves should be neatly and vertically cut along their edges, be as large as possible, be taken without storage or stacking to the receptor site, and re-laid, tightly packed, with a smooth surface, like laying carpet tiles. All **decisions on how to transfer turves should be made jointly between the ecologist and the translocation contractors.**

6.5.1 Turf depth

The **depth to take** is determined by:

- any need to take the subsoil (see 6.3 above)
- the depth of the top (A horizon) and subsoil (B horizon), assuming that both are present

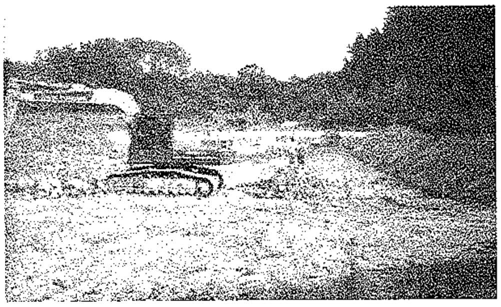


Plate 6.6 *Excavating the cell in clay for Gadle Knapp, Dorset, wet heathland translocation*

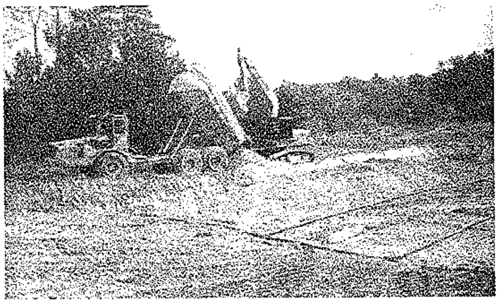


Plate 6.7 *Laying the sand layer over the feeder pipes*

Plate 6.8 *40cm deep turf used for marshy grassland at Potatopot, Cumbria*

Plate 6.9 *1 m-deep turves used for blanket bog translocation*

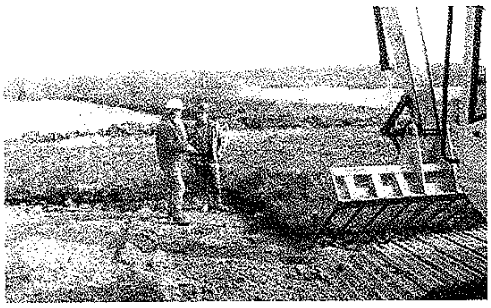


Plate 6.10 *A horizon only being placed on a heathland translocation*

- the rooting depth of the vegetation
- the weight of the soil in relation to the size of turf
- issues related to bulk density of the soils.

TURF DEPTHS USED IN SOME TRANSLOCATION STUDIES – whole soil profile translocated as turf

Potatopot, Cumbria Grassland	35 cm-deep, taking distinctive A and B horizons.
Thrislington Plantation, Durham Magnesian grassland	15–24 cm turves, A horizon only; B horizon not taken as is the same type on the receptor site.
M3 Twyford, Hampshire Chalk grassland	10–20 cm turf moved.
M3 Hockley Flood Meadow, Hampshire Alluvial grassland	30–45 cm turf moved.
Wilford Power Station, Nottinghamshire Pulverised fuel ash open grassland	50 cm turf to remove deep profile of the ash.
Stansted Airport, Essex Neutral grassland	20 cm for one area was the whole profile developed above waste materials. 30–40 cm of whole boulder clay soil profile for other areas.
Inkerman, Tow Law, Durham Blanket peat	1 m-deep to maximise peat depth taken.
Gadle Knapp, Dorset Heathland	20–40 cm-deep, A horizon only for shallower turf, 40 cm to take peat as well.
Waddington Fell, Lancashire Moorland dwarf shrubs	40 cm to take whole peat depth.
Partial soil profiles translocated as turves	
Durnford Quarry, North Somerset Neutral grassland	15–24 cm turves, A horizon only; B horizon not taken as is the same type on the receptor site.
Longmoor Camp, Hampshire Lichen-rich, open grassland	5–10 cm of A horizon only.
Brocks Farm, Devon Natural grassland	20 cm A horizon taken, subsoils moved separately.
Parc Slip, South Glamorgan Damp/wet meadow	35cm A horizon taken, subsoil replaced separately.
Bleak House, Staffordshire Heathland	20–25 cm-deep A horizon, subsoil replaced separately.
Birmingham Northern Relief Road (now M6 Toll), Staffordshire. Heathland	25 cm-deep A horizon, plus different subsoil layers built up in separate layers on receptor site.

6.4

If the subsoil on the receptor site is the same as that on the donor site, only the A horizon of the soil (plus vegetation) should be translocated. Some soils are not differentiated into clear horizons, eg peat soils.

The depth of turf to transfer will then reflect the nature of the soils retained on the receptor site, and the rooting depth of the vegetation. On shallow chalk soils, for example, the whole soil profile is usually only 15–20 cm deep (or less) and would be taken as a single layer.

Decisions on turf depths need further research, but there are **two basic possibilities** when the receptor site has had its subsoil removed:

- take the **whole soil profile as a single turf depth** (see Box 6.4 for examples)
- take the **A horizon separately from the subsoil** (see Box 6.4 for examples).

There are advantages and disadvantages of each, which mostly apply only if a whole profile turf was deep (40+ cm).

Whole soil profile	Topsoil separate from subsoil
Disadvantages if deep	
▶ Difficult to cut turf vertically ▶ Can be very heavy, thus reducing potential turf size ▶ Difficult to abut turf with its neighbour on receptor site ▶ Difficult to restore bulk density of subsoil	▶ Subsoil under turves on receptor site will be offset from that on donor site
Advantages	
▶ Subsoil under turf on receptor site will be the same as on the donor site	▶ Easy to restore bulk density of subsoil ▶ No problem with vertical cutting ▶ No weight constraints, larger turves possible ▶ Easy to abut turves

Thorough investigations of the **soil, the development of horizons, the depths of roots, and the bulk densities of different layers are needed** across the site to provide the basis for making decisions. A competent, suitably experienced, soil scientist should undertake such work.

The decision on turf depth must identify which of the above disadvantages and advantages are more important for the habitat to be translocated. **One key factor is soil bulk density.** Experience suggests this is important (see the Review, Section 5.9), but research has not yet identified the key parameters. The concerns are based on the disturbance to soils that is a product of translocation, and which can affect the soil structure, moisture regime and nutrient cycling. Loosening of the soils by taking turves or by lifting and replacing subsoils reduces the bulk density, which needs to be restored after transfer.

Remember that applying pressure on top of a turf is unlikely to reach the subsoil layer, and that pressure cannot be exerted without damage on dwarf-shrub heathland vegetation. If subsoils are placed separately and their bulk densities restored, turves placed on top will need less compression. Exceptions might be where:

- the subsoils are unique to the vegetation type above
- the plant roots extend through the subsoil (such as some marsh plants like lesser pond sedge).

6.5.2 Turf size

Take as large a turf as is practically possible (see Box 6.5). This:

- **reduces edge effects** (eg drying out, weed invasion)
- **increases the chances of transferring** the terrestrial and soil **invertebrates**
- **reduces the unevenness** of the laid turves.

EXAMPLES OF LARGE TRANSLOCATED TURVES

Potatopot, Cumbria Grassland	2 m x 1.85 m
Thrislington Plantation, Durham Magnesian limestone grassland	4.75 m x 1.75 m
Brocks Farm, Devon Neutral grassland	2.4 m x 1.2 m
Durnford Quarry, North Somerset Neutral grassland	2.35 m x 1.15 m
M3 Twyford, Hampshire Chalk grassland	2.35 m x 1.2 m
M3 Hockley Flood Meadow, Hampshire Alluvial grassland	2.35 m x 1.2 m
Wilford Power Station, Nottinghamshire Pulverised fuel ash and open grassland	2.4 m x 1 m
Parc Slip, South Glamorgan Damp/wet meadow	2.35 m x 1.2 m
Stansted Airport, Essex Neutral grassland	2 m x 0.75 m
Inkerman, Tow Law, Durham Blanket peat	3.5 m x 1 m
Gadle Knapp, Dorset Heathland	2.3 m x 1.2 m
Bleak House, Staffordshire Heathland	2.5 m x 1.5 m
Waddington Fell, Lancashire Moorland dwarf shrubs	2.1 m x 1.2 m

6.5

Plate 6.11 *Extra large turves (4.75 m x 1.75 m) used at Thrislington Plantation, Durham*

Plate 6.12 *Average sized turves (2.35 m x 1.3 m) using macro-turfing machinery*

6.5.3 Cutting and lifting turves

Use a machine with a guillotine to cut the edges cleanly. Bucket edges can be used to cut turves, but this is not as effective as a guillotine. **Turves must not be lifted without cutting** them neatly, or they will not fit together again properly.

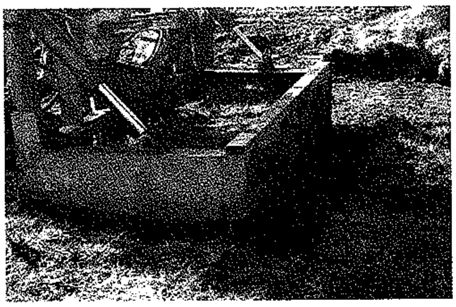


Plate 6.13 *A guillotine attachment on the sides and front of a plate to cut the turf cleanly*

Turf lifting machines can have plates or forks. Having both available during translocation is ideal. Forks have the following benefits:

- reduction of smearing of clay soils
- reduction of resistance when pushing the lifting equipment under the turf, especially on chalk and limestone soils, and on heavy clays
- ease with which the fork can be jiggled into the turf to find the topsoil subsoil division
- less tendency for the turf to stick to the bucket
- less breakage of any roots, which can be pulled out of the subsoil when lifting.

Plate 6.14 *A fork with a guillotine fitted*

Switch between forks and plates as the conditions dictate. This could be related to the season, site conditions or to the soil and vegetation type. A plate may be more appropriate for soft or loose material such as sandy soils, and where the root mass is insufficiently cohesive. The **forks are more useful for clay soils**, especially where smearing can be a problem. **Contractors' experience** of different situations in terms of soil type, ground conditions, slope and vegetation character (rooting depth and density, for example), is invaluable in choosing the most appropriate equipment.

6.5.4 Taking turves to the receptor site

Take turves on the lifting machine to avoid double handling for short distances (probably <100 m, depending on the sites involved). **Otherwise, place turves on a flatbed trailer or flat-based dump truck.** Several will be needed to maintain a continuous process. When moving very sensitive materials that cannot be double-handled effectively (such as deep peat, pulverised fuel ash,

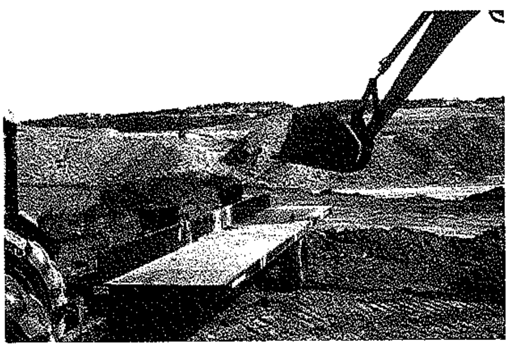


Plate 6.15 *Placing turves onto a labelled flatbed trailer so that they can be reinstated in the order in which they were extracted*

Plate 6.16 *Flatbed dump trucks moving grassland turves at Manchester Airport*

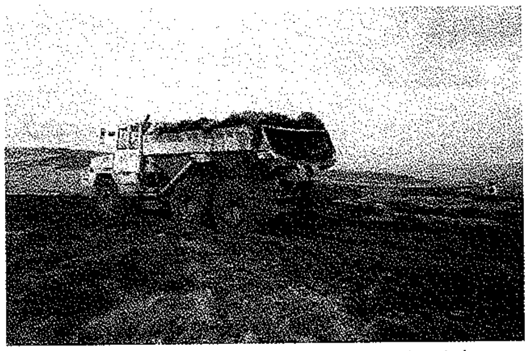


Plate 6.17 *Innovative use of a normal dump truck by placing turves on a board across the top*

fine sandy soils, etc) turves should be moved using the excavator that lifted them. Using two excavators and as many trailers as required to maintain a continuous process is most efficient, and speeds up work which could be constrained by a small weather or programme window. Two 13 tonne excavators with an 8.5 m reach would need a 17 m stand-off distance, and at least two trailers each (depending on the distance to the receptor site).

6.5.5 Taking subsoils

If the subsoil is needed from the donor site the principles to follow are:

- take a line or patch of turves first, and place onto trailers
- remove the full depth of subsoil (B horizon), without penetrating the C horizon below
- re-lay the subsoil on the receptor site to the depth required in the same start position as on the donor. This should extend further than the area from which it was lifted
- restore to about 75 to 85 per cent of the original bulk density on the re-laid subsoil by using carefully calculated pressure, eg from a compression plate, tracked excavator or other suitable machine; under the guidance of a competent soil scientist
- place turves from the trailers over the prepared subsoil on the receptor site
- continue this process using any spare subsoil for habitat creation, possibly next to the turfed area on the receptor site. Repeat for other subcommunities.

If the subsoils are specific to different plant communities, the process outlined above will need to be repeated within defined areas to re-match subsoils and topsoil turves from subcommunities at the receptor site.

6.5.6 Laying turves

Two aspects of turf laying need to be considered:

- **laying abutting turves**, without gaps and with an even surface
- **re-laying** particular vegetation **patterns**.

i) Laying turves effectively

Best practice depends on **abutting turves tightly** so that all gaps are eliminated. This **reduces changes in soils** caused by oxidation, desiccation and mineralisation. In addition, **turves need to be laid as evenly as possible** to produce a level surface. Experience has shown that turves left flat after translocation can develop a hump-back form with time. This is exacerbated if deep turves are used.

The requirements are:

- **ensure turves are the same depth**, which is the key to establishing a level finished surface. This will entail using excavators with tilting and rotating mechanisms where ground conditions are uneven, or where machines become skewed through differential sinking
- **ensure turves are moved only when at field capacity** so that they do not disintegrate and then collapse, losing sections which then allow the turf to sink on settlement
- **ensure all turves abut each other as tightly as possible, with as few gaps as possible**
- **ensure any gaps between turves are filled with the subsoil** associated with them (ie from the same plant subcommunity area). Allow for settlement of the infill material so that the turf surface will be even
- **ensure all turves are in full contact with the surface beneath**, so eliminating air-filled gaps.

Plate 6.18 *Evenly laid, closely abutted turves at Durnford Quarry*

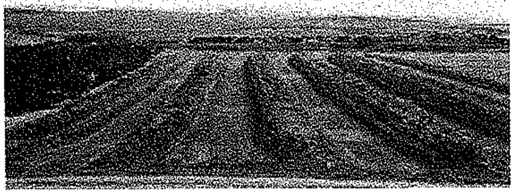


Plate 6.19 *6m wide trenches prepared for deep turves*

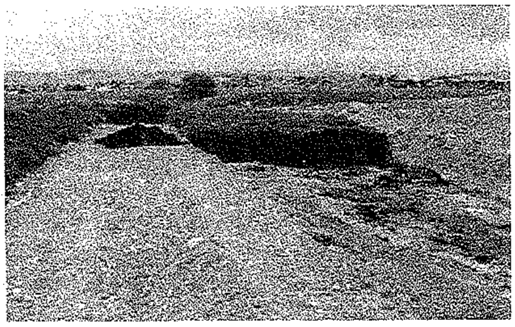


Plate 6.20 *Turves placed two at a time into trench*

SPECIAL CONDITIONS USED FOR DEEP WET PEAT TRANSLOCATIONS

The Issues:

- the risk of slumping of thick peat turves
- the structure of sub turf peat that needs to be maintained
- retention of suitable hydrological conditions for the peat.

How these were resolved at Inkerman, Tow Law, Durham opencast coal site, deep blanket peat:

- long trenches into the replaced overburden twice the width of the turves (which were 3.5 m wide) and 1 m deep, using a CAT 637 motor scraper were excavated
- two turves were placed side by side into trench with no double handling, using a CAT 966 loading shovel
- a second trench was excavated 7 m from first. Repeated turf transfer operation
- this pattern was repeated until the allocated area had been translocated
- the strips between the trenches were covered with peat from the stockpile.

6.6

Plate 6.21 *Heather/cotton grasses growing subsequently, with rush/grass strips on re-spread peat between the trenches*

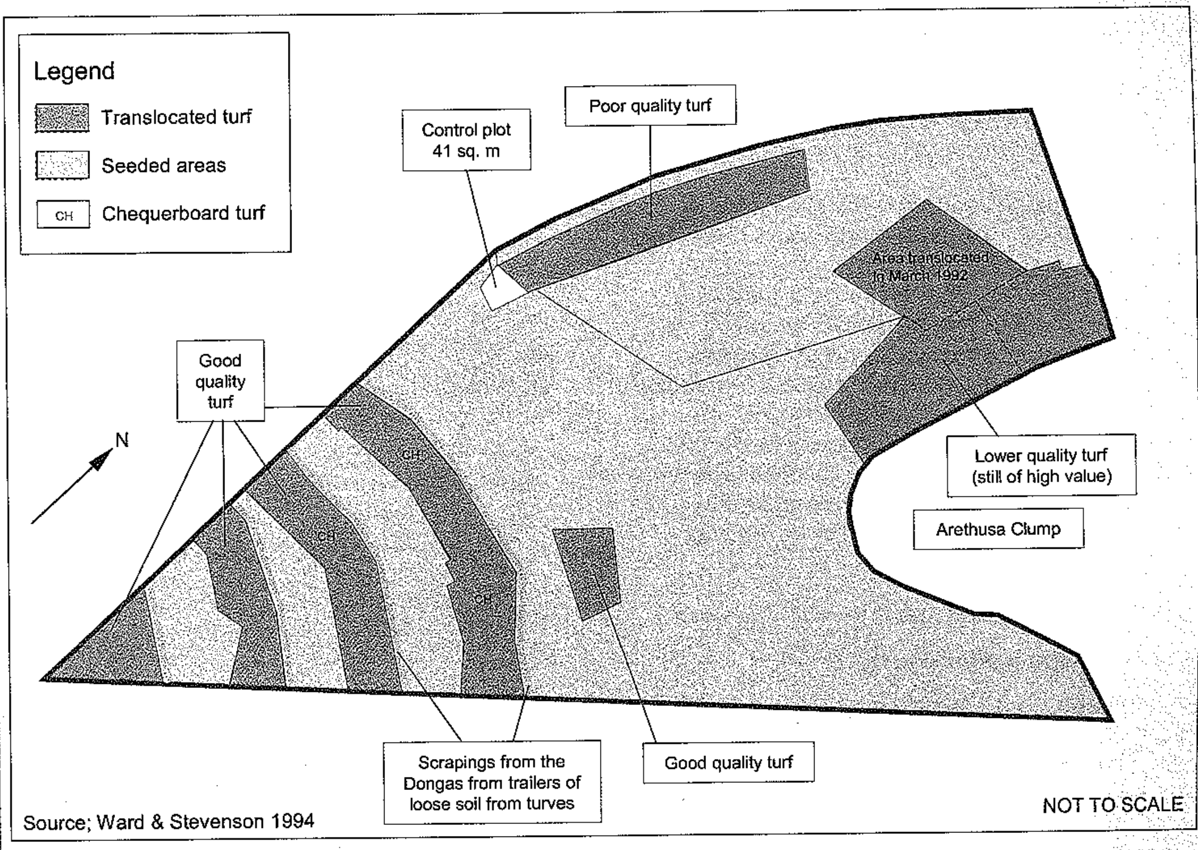
Plate 6.22 *Species-rich grassland with common spotted and pyramidal orchids translocated at Twyford, with seeded area in the background, in July 2000*

Other approaches may be considered for particular reasons. For deep peat turves, their fragility dictates the need for a contained site, for example, in trenches (see Box 6.6). On some heathland sites in particular, gaps leaving bare soils can be very important for reptiles (eg. sand lizards) and should be positively incorporated into the translocation design. Patches could also be left in wet hollows to create new wet heath or mire within a heathland translocation site. If a larger habitat area is the objective, laying the turves as a chequerboard and depending on natural colonisation and/or seeding in between is possible (Fig. 6.1). There are **many innovative ideas** on the theme of **habitat creation** within translocation that **should be considered.**

Where the original habitat has a variable surface (eg. on ridge and furrow), it is essential to **re-create this surface topography** rather than a level receptor site. It is also important to **ensure that vegetation is replaced** on the receptor site **in the same topographical position as it was in the donor site** (see Fig. 6.2, page 58).

Whichever translocation method is adopted, practical experience indicates that it is **best to ensure that the bulk density of the soils in the turf are also restored where necessary** to about 75–85 per cent of their pre-translocation levels.

The issue: creating as extensive an area as possible using the rescued turves. How this was resolved on the M3 Twyford Chalk grassland translocation, in an area adjacent to St Catherine's Hill



This approach will be appropriate only where the aim is to use salvaged material to create the best possible and most extensive new habitat. It is not appropriate when transferring and retaining the nature conservation value of the donor site.

Figure 6.1 *Possible turf layout for creating extensive new habitat*

Plate 6.23 *Reinstated ridge and furrow using turf translocation and replacement on a pipeline*

This allows for further natural consolidation over time through settling and rainfall. **Great care is needed when dealing with wet turves.** If oxidation of organic-rich soils occurs, turves can sink and become too wet. This can result in undesirable changes in the transferred vegetation. Further research is needed on these aspects, and the results integrated into the advice given in this document in the future.

ii) Re-establishing patterns

There are **two scales of patterns:**

- subcommunities on the larger scale that tend to vary with changes in soils or slope
- smaller-scale variation within communities often more closely related to the growth pattern of different plant species.

Care should be taken to **ensure** at least the **plant communities and subcommunities** (for example, based on the scale of those in the NVC) are **carefully replaced** on the receptor site in the same sized units as on the donor site. Ideally, their configuration and relationship with each other should also be preserved, but this is often thwarted by the receptor site being a different shape from the donor area.

It would also be **best practice to re-place the turves in the same small scale patterns as in the donor site**, but whether this is deemed essential will depend on the scale of the translocation, the value of the habitat and therefore on the objectives set. It is achieved by placing individual turves adjacent to their original neighbours from the donor site. This can only be achieved if turves are double handled in the way shown in Fig. 6.3a.

The **next best alternative is for turves to be adjacent to their original neighbours but turned round** by 180° (Fig. 6.3b). This is achieved by labelling positions of turves on the trailers and unloading them in the same order as they were loaded. Again, differently shaped receptor and donor sites will thwart the full replication of these small-scale patterns on many projects, but the **objective should be to achieve as close a replication of patterns on the receptor site as is possible within the site constraints, and in proportion to the value of the communities involved.**

6.6 SOIL TRANSFER

6.6.1 Soil transfer depth

Soil transfer depth is dictated by the mix of seed bank, bud bank and perennating organs that can be rescued from the material being moved. If the **seed bank is the principal resource** (as perhaps on some heather-dominated areas) this should be stripped to no more than **4–6 cm**, which is where seeds are concentrated. If taproots, bulbs and rhizomes (ie the bud bank) are expected to re-grow on the receptor site (as they would in many plant communities), excavate several soil profiles to find out how deep the majority reach. **The soil transfer depth is then determined by these investigations.** Case study examples are given by way of illustration in Box 6.7. The bud bank depth is likely to include all the A horizon, but this depth of soil will dilute the seed bank which is in the upper 4–6 cm. This may or may not be important to consider.

It may be advantageous to cultivate, rotovate, power harrow or otherwise cut up the vegetation prior to soil stripping. This would only be justified if the stripped soil is likely to form large plates of vegetation that could end up being mostly upside-down on the receptor site, or where the seed bank is the key material needed. In general, it is not advocated when the objective is for roots, perennating organs such as bulbs, etc. to re-establish. In this situation, cultivation or other equivalent measures would damage too many of the roots and rhizomes etc that are to be translocated.

If the receptor site soils are identical in all respects to those on the donor site, only the seed or bud bank layer will need to be transferred. However, in most circumstances, it is expected that **at least all the A horizon**, if not the B horizon subsoil, will be **needed** on the receptor site. In this situation, the following operations need to be followed for each subcommunity:

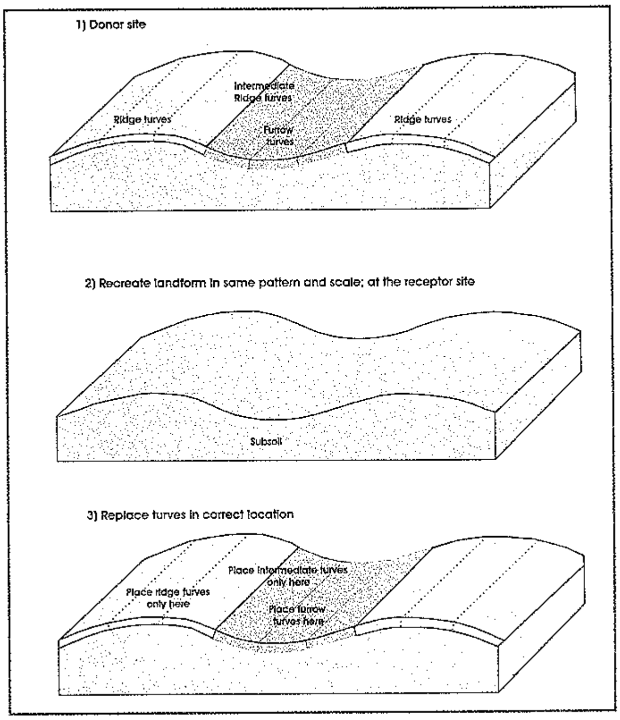


Figure 6.2 *Translocating ridge and furrow grassland*

EXAMPLES OF SOIL TRANSFER DEPTHS

Potatopot, Cumbria Grassland	15–30cm, to include soil seed bank and bud bank on rhizomes, tap roots, etc.
Brocks Farm, Devon Neutral grassland	50cm, to include soil seed bank and a deep bud bank.
Stansted Airport, Essex Neutral grassland	20cm stripped to include seed bank and roots/rhizomes.
Hithermoor, Staines, Surrey Grassland, dry, wet and moist	15cm stripped, with 250mm subsoil taken separately.
South Middlebere Heath, DorsetHeathland	4–5cm stripped to take only the seed bank.
Gadle Knapp, Dorset Heathland	5cm stripped just for its seed bank and spread over lower peat layer on receptor site.
Bleak House, Staffordshire Heathland	20–25cm stripped for seed and bud bank.
Longmoor Camp, Hampshire Lichen-rich, open grassland	10cm stripped and re-laid on sand subsoil. Vegetation mostly shallowly rooted.

6.7

a. Replacing turves exactly next to their original neighbours

b. How a turf turns around with normal translocation methods, but can remain adjacent to its original neighbour but turned round through 180°

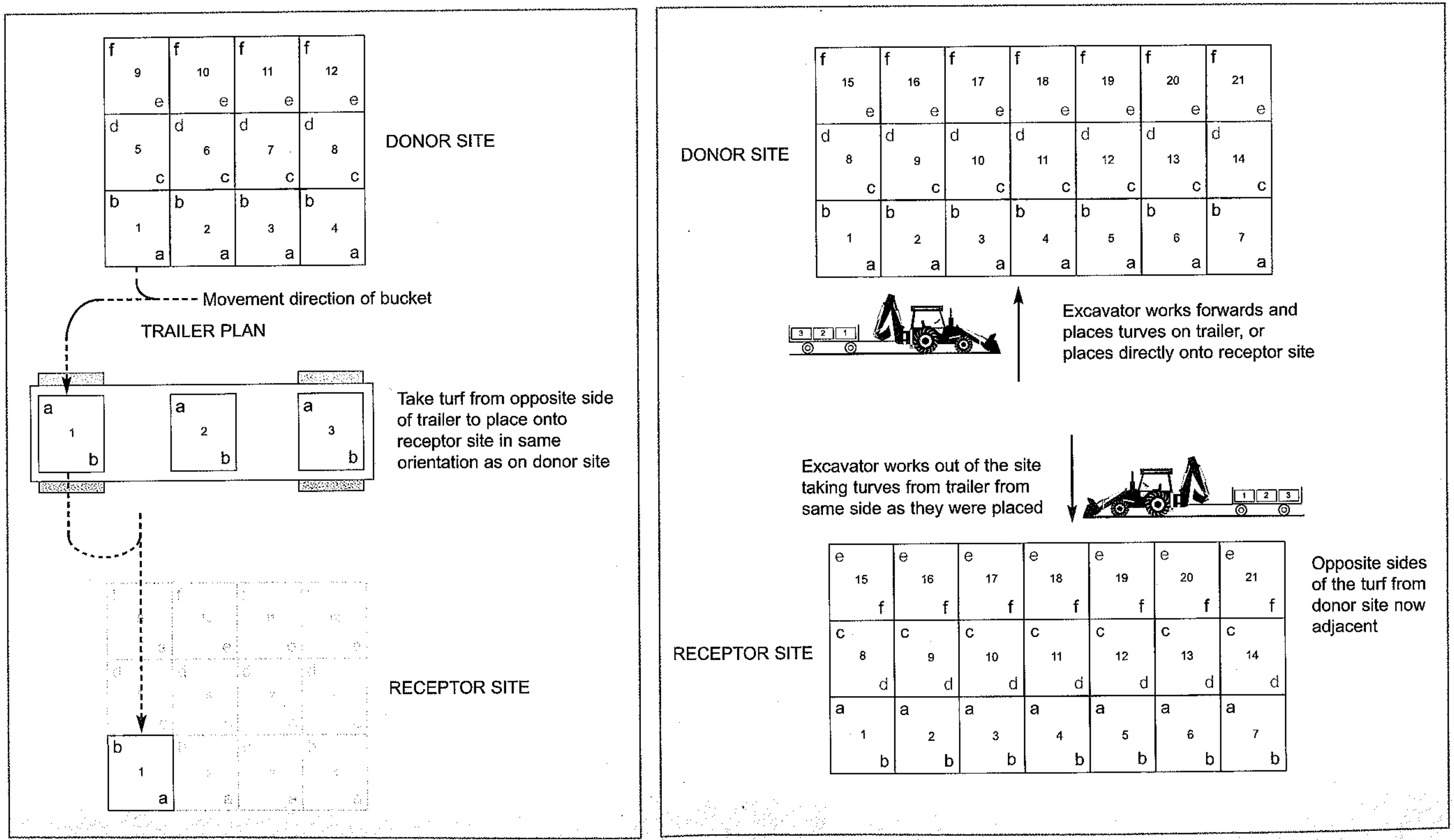
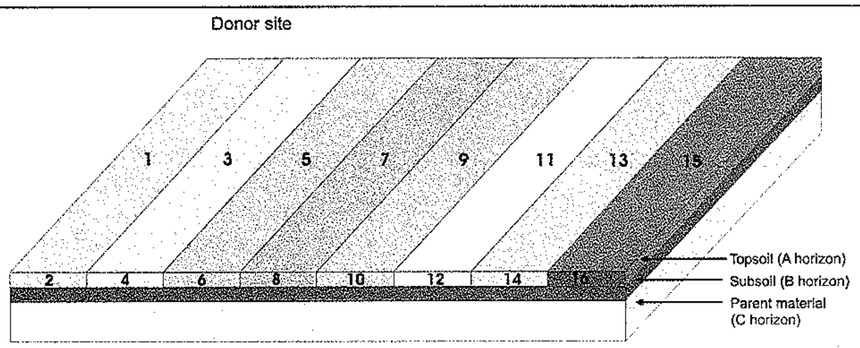


Figure 6.3 *Restoring small-scale community variation in turf translocation*

- rotavate or cultivate, if necessary
- do not run over the areas to be stripped after any pre-transfer treatment (especially topsoils and subsoils where these are prone to compaction and smearing)
- scrape off the first stretch of desired seed or bud bank layer of the subcommunity, and place on labelled dumpers
- if necessary, scrape up the rest of the A horizon (as differentiated by soil colour, texture, character etc) as determined by an experienced soil scientist
- place on separate dumper(s) and label
- scrape off all the subsoil (if required on the receptor site) in as many layers as is deemed necessary by the soil scientist to conserve its character. Place this/these onto the receptor site in the allocated location. This should spread further than the required average depth
- restore the bulk density of the subsoil layer(s) to within the 75–85 per cent range of samples in its undisturbed location
- place the rest of the A horizon on top, and restore its bulk density as above;
- replace the top layer, if separated from the rest of the A horizon, on top to rebuild the original profile. Restore its bulk density as above;
- repeat the process above until all the subcommunity transfer is complete.

By taking all the subsoil down to the C horizon, this should spread out further than the average depth required, thus permitting the translocation to proceed smoothly without waiting for lower layers to be placed before upper ones can be spread. However, if the subsoil is needed on the receptor site, but is limited in quantity, temporary storage will be needed in a more complex procedure as shown in Fig. 6.4.



Procedure:

Strip topsoil layers and store

Strip subsoil and store separately

Strip next topsoil layer and store separately

Strip subsoil and place in same width of strip onto receptor site

Strip topsoil and place on layer 4 on receptor site

Strip subsoil and place as shown on receptor site

Strip topsoil and place on layer 6 on receptor site
continue to strip and replace in same pattern

At end of patch, replace stored layers 1-3 as shown

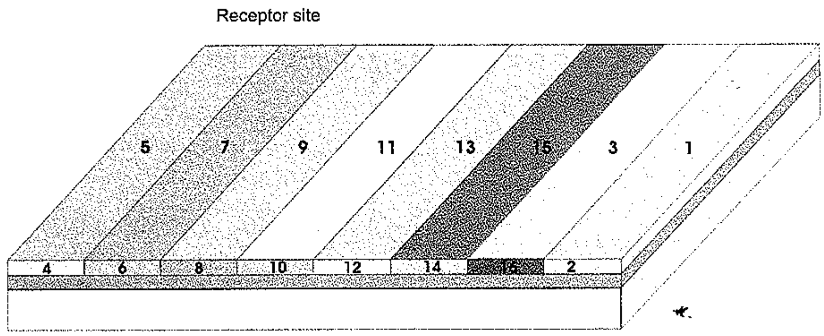


Figure 6.4 *Stripping soil layers when topsoil and subsoil are to be transferred separately, but when subsoil quantities are limited*

Using the sequence described in the paragraph above, the same adjacent vegetation can be replaced as much as possible. The stretches stripped in each pass across the site should be no more than the stretch of the excavator arm, thus permitting it to reach two rows of stripped layers adjacent to each other without running them over (see Fig. 6.4). This is also best practice for soil stripping and restoration, independently of habitat translocation.

It may be desirable to spread the material over a larger area than that of the donor site. Decisions on this will depend on the objectives and likely survival rates of the material moved and the nature of the seed bank. For example, a seed bank dominated by heather could be spread over 150–200 per cent more than the area from which it was derived.

6.7 TREE AND SHRUB TRANSLOCATION

Woodland translocation to date has either **moved as many trees and shrubs as possible as well as the ground flora** (which is usually taken using soil transfer, as described above), **or just transferred the ground flora** and supplemented this with purchased stock. It is certainly **worthwhile translocating the trees and shrubs** in a woodland or scrub translocation provided any non-native species are excluded. There are now machines suited to this operation, such as tree spades, or extra large, suitably shaped, buckets.

The **benefits** of translocating native trees and shrubs are:

- they should consist of the **locally native genetic** stock
- they **re-grow much more quickly than horticultural stock**, especially when competing with the flush of vegetation that appears with the ground flora
- at least some of the invertebrates, fungi and microflora associated with the root balls are also transferred.

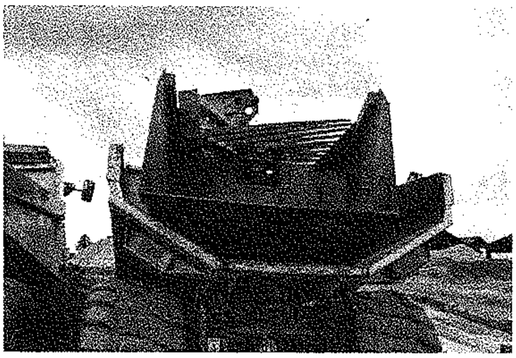


Plate 6.24 *Specially made buckets (with a fork resting on top) for woodland translocation*

Trees and shrubs should be transferred as coppiced stumps, except for those species that do not respond to this treatment (see Rackham 1976 for guidance on this). For the latter group of species, severe pruning or pollarding is more appropriate. **Coppicing** or other treatment should be **conducted immediately prior to translocation in the autumn.**

Large trees are unlikely to survive translocation, but the tolerance levels of species varies. Larger trees of species like alder with a shallow fibrous root system can be moved successfully compared with species like oak that has normally a deeper and more spread out plate of roots. **Consult contractors who have moved trees**, and suitably experienced horticulturalists that move ornamental trees, **to find out** which of the **species** present on the donor site might be transferable. Tree transfer methods are described in Box 6.8.

It is also worth **transferring some of the cut timber as dead wood**, erecting it standing or lying where possible, place some in shade, or in north-facing pockets to avoid it drying out. Shade might be available associated with existing hedges or trees on the receptor site.

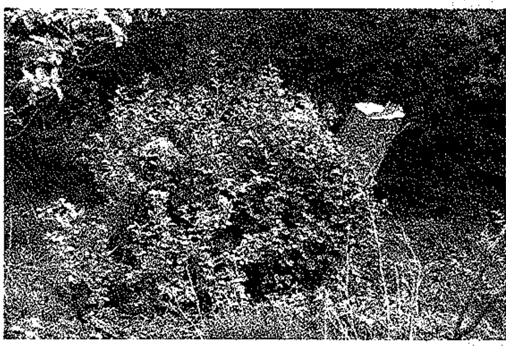


Plate 6.25 *Very large alder successfully translocated for the Mold Bypass*

There is **no real need to provide rapid shade for the translocated material.** The process is equivalent to coppicing in a wood, after which a vigorous and often non-woodland ground flora joins the normal woodland species until the canopy is re-established. Re-growth from the coppiced stumps may be slower than in an *in situ* wood, but little different from, for example, a coppiced wood suffering from grazing and browsing by deer. A **complete canopy can be expected within about 10–12 years.** It is normal for a good mixture of **new tree and shrub seedlings to establish from the transferred soil** to supplement the coppiced specimens.

A mature wood prior to translocation is likely to have widely spaced trees and shrubs. The **transferred pattern should emulate the original spacing**.

TREE TRANSFER METHODS

Aim: To transfer as much of the root stock as possible so that the tree or shrub re-established successfully.

Methods adopted :

Manchester Airport, Cheshire Ancient woodland translocation for runway development	▶ trees and shrubs coppiced ▶ stumps colour-coded as large, medium or small specimens ▶ quick release buckets 1 x 1 m, 1.5 x 1.5 m, 1.75 x 1.75 m square used as a shovel or backactor, depending on the slope for excavating different-sized trees ▶ two to six buckets at a time placed onto dump trucks with stumps inside to transfer to receptor site ▶ buckets re-attached to excavator on receptor site and emptied onto ground ▶ soil (and ground flora) from appropriate part of wood stripped off before trees using conventional grading bucket but with tilt mechanism to enable side slopes to be scraped cleanly. Soil tipped onto appropriate zone of the site and packed around the stumps as they arrived ▶ some excavators switched between tree buckets and grading buckets to extract trees or soil as needed.
M2/A2, Kent Ancient woodland translocation	▶ trees and shrubs coppiced (most trees not transferred as were sweet chestnut, which are not native) ▶ tree spades used for tree/shrub transfer (mostly of hazel) ▶ soils taken on average 14 cm deep (the total soil depth) to transfer bluebells and other flora seed bank and bud/bulb bank.
Stansted Airport, Essex Overgrown hedge/woodland over Access Road route	▶ trees and shrubs coppiced, larger trees over c. 10cm diameter not transferred ▶ backactor dug out coppiced stumps ▶ transferred, laid out carefully, on a trailer ▶ placed on receptor site individually ▶ soil from donor site packed around stumps to leave level ground.

6.8

Plate 6.26 *Re-growing coppiced stool with woodland ground flora at Manchester Airport*

The new seedlings emerging amongst the translocated ground flora will add to their density. If nursery stock is also needed, dense spacing should be avoided since this would rapidly shade out the desirable ground flora. The planting should reflect the likelihood of natural colonisation (as determined in seed bank tests) both in terms of species and densities.

Coppiced boles will regrow through the developing ground flora, although they may be constrained by the herbaceous growth for a few years. However, once the initial nutrient flush has declined, the soils that have been transferred with the ground flora will tend to be fairly infertile, especially if they have come from an ancient woodland. Therefore, large, vigorous, competitive species should not be a major problem. If they are, some control will be needed.

Otherwise, **no special measures are justified to suppress the redeveloping ground flora**.

Indeed, if mulch mats or herbiciding were to be used, these would be at the expense of the ground cover that the translocation has sought to salvage.

Translocate hedges using the same principles as for woodlands. The **trees and shrubs should be coppiced** prior to their transfer, and the boles placed straight away, without any storage, in a trench dug to fit them. **Take as much of the ground flora and soil as possible, undisturbed, with the tree boles** to increase the survival rate of any important ground flora species. Take care not to run over the hedge or damage the *in situ* soils during this operation. Then excavate the rest of the topsoil, along with any further desirable ground flora and pack round the boles, provided this is the required surface layer. Alternatively, use subsoil to pack round the lower parts of the boles first and exclude air gaps before adding topsoil and the ground flora subsequently.

If there are only arable agricultural plants of no interest under the hedge, then the opportunity could be taken to add a woodland ground flora under the transferred hedge using seed or plants of appropriate species.

If the hedge lies on a bank with a valuable herbaceous flora, the reconstruction of the two together will be much more complex, and require a mixture of the grassland and woodland translocation methodologies. It will be necessary to explore the nature of the bank in some detail to understand how it was formed, and, therefore, how best to reconstruct it. It will be essential to replicate its dimensions and relationship with adjacent land surfaces to avoid summer droughtiness and winter water-logging.

For both woodland and hedge translocations, stock and rabbit-proof fencing may be needed to ensure successful establishment.

6.8 TRANSPLANTING INDIVIDUAL PLANTS

Transferring individual plants is only likely to be justified when the vegetation is discontinuous, and species form discrete patches rather than communities. There may also be occasions where individual notable plants are to be rescued, or particular plants are needed to support specific animals. These are likely to be in situations where the rest of the community is of no ecological significance. These situations are most likely to occur in water, in recently established secondary habitats, or in situations where invasive species, such as bulrush, are to be excluded from the exercise, and other species around it removed.

Collecting wetland species involves using buckets rather than plates or forks, or a grab type mechanism to extract the plants. They can be placed in a dump truck for transporting to the new water body. There is less need to cut turves neatly for wetland plants. Some may be better removed by hand in buckets.

Methods for collecting other individual plants will depend on their size, density and population numbers. A larger corer to take 20 x 20 cm columnar cores has been made to fit onto an excavator. In other instances, excavator buckets of various kinds will be suitable, or plants can be dug up by hand where there are few of them.

Plate 6.27 *Translocating reed sweet-grass for the Desmoulin's whorl snail on the Newbury Bypass, Berkshire*

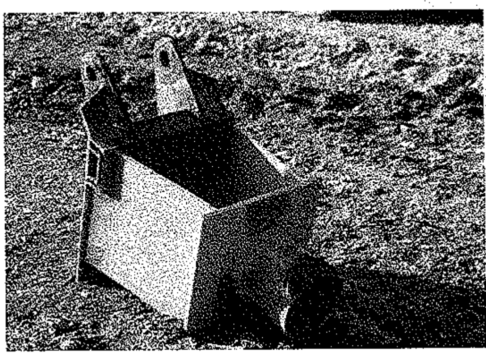


Plate 6.28 *A corer specially made for an excavator to extract bee orchids*

6.9 STORAGE OF TURVES OR SOILS

There should be no storage of turves or soils except for the short period needed when stripping topsoils or turves separately from the subsoils. Even in these cases, storage should not be for longer than 24 hours. It is only for pipelines, culverts or similar schemes where turf is to be replaced in the same position after works that storage will need to be for longer. There is no clear research that gives maximum periods in different seasons or weather conditions, but experience shows that storage in the growing season in general should be for no longer than three to four weeks, with this extended to three to four months in the dormant season.

For pipelines or similar projects turves:

- should be stored in a single layer
- placed close together to minimise water loss
- stored outside areas of vegetation of high nature conservation value on boards or a geotextile where it is important not to mix the ground beneath with the turf, or where picking up the turves to replace them later would be difficult due to the nature of the vegetation on which they are stored temporarily. No watering should be required if turves are handled in the dormant season, but if works have to be in the growing season for other reasons, watering will be essential in dry weather at the first signs of wilting. Water used should be:
  - in the same pH range as the topsoil
  - with low nutrient status so that it does not have a fertiliser effect
  - free of any pollutants.

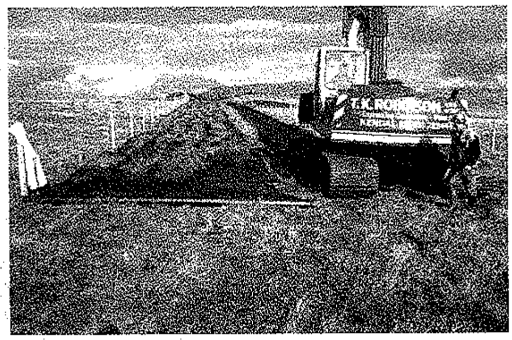


Plate 6.29 *Turves being stored temporarily (no more than three weeks) on Crosby Ravensworth, Cumbria for a pipeline*

6.10 WATERING

Except in the cases outlined above, **watering should be avoided**. Watering should not be necessary in the dormant season. If translocation is being undertaken outside this period, it is not good practice. Watering after translocation should be avoided, since it would encourage the greater growth of the more vigorous species reacting to the release of nutrients. Maintaining the dry conditions increases stress on the vegetation that could be a beneficial control on the effects of enhanced fertility.

However, situations could arise when translocation is being undertaken in particularly dry conditions. Watering may be needed to bring the soils towards field capacity to prevent turves collapsing on transferral.

If watering is deemed to be required, the quality of water should match the specification given in Section 6.9 above.

Plate 6.30 *Watering replaced heather turves after a pipeline installation at Lazonby, Cumbria*

6.11 TRANSLOCATION SPECIALISTS, MACHINERY AND LOGISTICS

Contractors should be used for translocation who **have experience** of moving the type of habitat under consideration. **Those with specialist equipment are preferred**, as they have developed valuable experience and expertise that will be of considerable benefit to the translocation exercise. The benefits of using specialist contractors are:

- valuable experience of a wide range of situations, and therefore greater scope for innovation, and greater understanding of the problems faced
- greater reliability of a good end-product independent of the habitat type and circumstances
- reduction of the risk of failing in bad soil and weather conditions, when there is pressure to continue the work in poor conditions
- advantages of scale and investment to solve particular problems
- ability to accommodate elements of chance without a negative impact on the works
- increased flexibility and choice of equipment in adverse conditions
- ability to innovate in respect of translocation machinery (see Box 6.9)
- greater efficiency (moderated by often higher costs because of specialisation)
- greater experience of dealing with main contractors, and having the confidence to insist on proper translocation requirements.

Where the habitat poses difficulties for translocation, or where innovative methods of translocation are needed, it is essential to **involve the translocation contractors at an early stage**. Where **special equipment** has to be developed and tested, the contractor will need an **early commitment from the developer** to give sufficient time to develop and trial machine adaptations.

The translocation contractor will often need to plan the translocation to fit in with other engineering activities on the site, and has to make careful calculations according to the type of material, the seasonal constraints, and therefore the speed of transfer needed, and the method of movement.

INNOVATIONS FOR TRANSLOCATION MACHINERY

- welded plate extension to shovel buckets with sharp edge to cut and excavate turves
- guillotine structure to cut turves
- developing forks as well as plates
- the quick release buckets for woodland transfer (see Box 6.8, page 62)
- adapted bulldozer bucket with a 'draw' metal plate and hydraulic ram to push out turves while keeping the bucket horizontal.

Plate 6.31 *Specially adapted bulldozer bucket used for extracting pulverised fuel ash turves at Wilford Power Station*

6.9

Examples of some of the engineering requirements of a complex scheme are:

- considering the weight of the material
- planning access routes to extract without destroying the material to be moved, and assessing the size of machines that can do this
- the rate of transfer required to meet the seasonal constraints and the area to be moved
- the type of machines that can work on steep slopes with sufficient stability and reach
- the logistics of moving material to the receptor site, for example, exiting the site and use of haul routes
- the weight of vehicles loaded and the ground pressure of machines in relation to the ambient ground conditions and, therefore, the amount of stone etc needed to reinforce the haul routes
- the number of excavators and dumpers needed to meet the requirements
- their speed of working and number of vehicles working on the same site at the same time (including health and safety constraints)
- who else is using the haul routes in terms of sharing time on them, possibility of one-way traffic, consideration of the size of other machines and the ruts they might cause (which may be too large for some other machines to work effectively).

6.12 METHOD STATEMENTS

Translation of the decisions made above into method statements will be needed. These could satisfy a variety of functions:

- the local authorities/nature conservation organisations
- for a large-scale project, where the planning team will need method statements to inform each other on the overall project requirements
- to inform the health and safety risk assessment
- for use by the contractors and subcontractors
- input into a traffic management scheme if public roads are to be used
- for use by the machine drivers.

The specialist ecologist should prepare method statements for the local authorities and nature conservation organisations. Where the contractor for moving the habitat is appointed, their input into this process is essential.

The statement should:

- set out the objectives
- identify the receptor site
- set out the works needed on the latter
- describe the methods for transfer
- provide details of the monitoring and management requirements.

Details of machines and the logistics of translocation are more appropriate in the statements used for health and safety assessments, the traffic management schemes and for contractors and subcontractors, although these are likely to comprise three separate statements with different functions. Method statements for the machine drivers need to be concise, easily understood, and restricted to the driver's activities and responsibilities. Drivers experienced in habitat translocation will need the statements to stress any differences from normal working rather than how to undertake a job that is entirely familiar to them.

Tool-box talks for the machine drivers and others on the site will be needed at the beginning of each phase of the habitat translocation to outline the reasons for and the need to comply with various environmental procedures and strategies. These would include issues related to:

- features to be protected *in situ*
- the reasons for the translocation, and the objectives to be achieved in terms of the nature and quality of the translocation required
- any sensitive areas and their treatment
- measures for avoidance of water pollution on site
- any fire risks such as on heathlands and moorlands.

The **site supervisor** will have the responsibility for **ensuring** all the **items** covered in the method statements and the tool box talks are **implemented or observed on site.**

6.13 THE WEATHER

The weather is likely to cause problems for translocation. Since transfer is being undertaken in the dormant season for the sake of the habitat, rather than in the normal earth-moving period when the ground should be drier, there will be inevitable conflicts of requirements when ground conditions are too wet. **Weather problems should always be factored into the programme.** A well-planned translocation where there is slack in the programme will be able to accommodate these. It may be necessary to stop work for a period, or other machines may need to be brought in to cope with the changed conditions.

6.14 INTEGRATING WITH OTHER INTERESTS

Habitat translocation is not likely to be the only mitigation or compensatory work being undertaken on the site. **Archaeological investigations**, for example, may need to be undertaken. The demands of these can conflict with those for the habitat translocation, and need to be resolved depending on the relative importance of the two areas of interest. In many instances, **archaeological excavations can be undertaken carefully** by using geophysical surveys and other non-intrusive methods followed by sample trenches if required.

Trenches should be carefully excavated by:

- placing neatly cut turves onto a plastic sheet or board beside the trench
- placing subsoil onto another sheet or board on the other side of the trench
- conducting the investigations
- replacing the subsoils and turf carefully onto the trench in reverse order
- not keeping the trench open for more than three to four weeks in summer, or three to four months in winter.

This process is the same as that for pipeline works in valuable habitats.

Other potentially damaging site investigations include ground investigations of various kinds. These need to be treated in the same way as the archaeological investigations by following the code of practice outlined in 6.14. It is **important** that the **developer integrates all site works into the translocation programme so that the habitat is not inadvertently damaged before it is moved.**

6.15 PROTESTERS

In a number of recent schemes, protesters have occupied construction sites in advance of habitat translocation. In some cases this occupation has resulted in changes to the vegetation to be translocated, and produced unsafe areas for subsequent machine work because of tunnelling. **It is essential to plan for liaison with, and the control and management of, protesters so that they cannot damage the habitats to be translocated.**

Protesters can also hold up translocation works, and force it out of the proper season. **The potential for such delays must be included in project planning from the outset.**

7. AFTERCARE AND MAINTENANCE

Aftercare and maintenance or management will be required for every translocation project. These can be separated into the immediate measures in the first one to two years after translocation, and the long-term aftercare requirements.

7.1 THE REQUIREMENTS

In most contracts, it will be **necessary to include a three-year establishment maintenance period** to run, for the first year, concurrently with the normal defects liability period, (which is usually one year). This is needed to cover the establishment period of the habitat translocation that will coincide with the early management requirements.

7.2 ESTABLISHMENT MAINTENANCE

Regular monitoring in the first three years should be used to:

- assess progress of the vegetation and identify the need for any remedial measures
- decide when the traditional management of the site can recommence.

This is independent of the detailed ecological species monitoring that is also required (see Section 4.7, page 34, and below).

Apart from traditional management, the **following types of measures may be needed,** depending on the habitat type:

- control of undesirable and invasive species such as Indian balsam or Japanese knotweed
- removal of undesirable and non-native species such as sycamore in translocated woodland sites
- replacing failed planted trees or shrubs in woodland sites
- removing unwanted trees and shrubs in other habitats
- controlling the more vigorous growth and greater biomass that can arise with the release of nutrients.

7.2.1 Control of undesirable and invasive species

These will vary according to the habitat. **In grasslands**, various **undesirable** species such as creeping and spear thistles, broad-leaved dock or ragwort could establish in significant populations. All these are covered under the Weeds Act 1959, and **should be controlled** by hand-pulling, selective spot herbicide treatment or weed wiping, taking great care not to affect the rest of the vegetation. Crofts and Jefferson 1999 provide advice on managing these species.

Other **less aggressive** annuals and ruderal **species** may colonise the bare ground between turves, or in the transferred soils, but these will tend to disappear within two or three years, and should not cause a problem. They will **not generally need to be controlled**.

In **woodland** translocations, **similar invasive species** could colonise, and will **need controlling** as for grassland. However, others may also need management. These include non-native tree and shrub seedlings such as sycamore, which should be removed when they are two or three years old, and still small enough to be pulled out. Other invasive species could include Indian balsam that will require cutting or pulling before it seeds (see Environment Agency 1996 for advice on controlling this species).

In heathland translocations, establishing tree and shrub species more typical of woodland will **need control**. Removing invasive trees and shrubs, such as birch and rhododendron, is best achieved by hand when they are small saplings, using spot spraying of herbicides, or by grazing. If the translocation is properly planned, with the correct types of soils, there should not be other invasive species such as undesirable grasses. However, if soil transfer is used, gorse establishment could be too abundant, and need some control to permit a better balance of heathland species to re-develop. Gimingham 1992 and Backshall *et al.* 2001 provide sound advice on management issues on heathland and moorland.

In water, algae can become a problem, or **invasive plants** can extend too fast. Management may then be needed. Guidance can be found in Newbold et al. 1989, Scottish Environment Protection Agency 2000, and RSPB *et al* 1994.

7.2.2 Replacing failed specimens or thinning

Failed nursery stock in translocated woodland will need to be replaced, as in ordinary planting schemes. However, this provides the opportunity to assess first the extent of natural tree and shrub establishment in the ground flora, and then whether new stock is warranted or not.

7.2.3 Controlling increased biomass

The **greater nutrient availability following disturbance has the potential to increase plant growth**, particularly of those species best adapted to respond to such increased fertility. This is the most **likely response in grassland, and should be contained by increasing the management** control through grazing or cutting. **In a hay meadow, the sward should be cut, and the arisings removed.** This could be undertaken earlier than is normal if there is concern about the growth rates, as well as in the normal hay-cropping season.

The decision to use a double cut as a means of containing increased biomass must relate to the species involved, whether annuals such as yellow rattle are of prime importance (since an early cut could destroy them), and whether breeding birds are present, as damaging these needs to be avoided.

Grazing should be used after the hay cut in the first year after translocation, as is normal good practice, and the numbers of animals could be increased to ensure the additional biomass is removed in the first year or two after translocation.

In pastures, start grazing as soon as the turf is firm and well bonded at the edges, with few or no gaps (for those sites where grazing is the traditional management). This should be by the first autumn after translocation. The sward will probably first need to be cut in mid to late summer, with the arisings removed, so that grazing can begin afterwards. Most sheep, in particular, will not readily graze a tall, dense sward when it has grown rank late in the summer. A higher level of grazing than might be normal for the site prior to translocation may be needed for one or two years to contain the increased biomass.

Consider introducing grazing onto heathland within a year of translocation, but at low levels commensurate with good heathland management. If no grazing is available, or the heathland unsuitable for such activity, unwanted tree and shrub removal will be necessary (see Gimingham 1992 and Backshall *et al* 2001).

Where the habitat has been transferred using soil transfer rather than turves, grazing may need to be delayed on those traditionally managed in this way until the sward has re-developed, but cutting and removal of the arisings could be needed from the first year after establishment.

7.3 LONG-TERM MANAGEMENT

7.3.1 The management strategy

A long-term management strategy is essential for the translocated site. A management plan should be prepared, in consultation with the statutory nature conservation organisation, the local nature conservation bodies and the local authority ecologists or equivalent. This should set out:

- the management objectives
- the measures needed to meet the objectives
- detailed management prescriptions
- the monitoring programme and its timescale
- a condition monitoring protocol, and when it is to be conducted
- a report-back mechanism to the nature conservation organisations and the local authority
- budgetary arrangements.

In principle, all habitats should be managed in the same way after translocation as before. However, this assumes appropriate management was in place prior to their transfer. If this was lacking, traditional management suited to the habitat and location, should be introduced. Best practice guidance is available for most habitats from the country nature conservation organisations – for example see Crofts and Jefferson 1999, Gimingham 1992, Backshall *et al* 2001 and Brooks 1988.

There will be **additional general management requirements** such as:

- checking fencing
- caring for stock
- checking/maintaining access for management and for the public (where appropriate)
- checking water supplies for stock
- removing rubbish
- ensuring health and safety responsibilities are met
- checking for any problems that might arise from the translocation. These could still develop after five or more years, especially unevenness of the surface, slumping, or incorrect water levels.

7.3.2 Managing grasslands

More specific management requirements for grasslands will include:

- **grazing, or**
- **hay cut and then grazing.**

Where normal agricultural management like this is impossible because of access or total unavailability of stock, cutting once or twice a year with the arisings removed will be necessary. For two cuts, this is best taken as a late hay crop (August or September) and a spring cut (March or April), so that the vegetation at the beginning of the growing season is short, as specified by Crofts and Jefferson (1999).

An alternative regime would be for a hay cut in the normal period, but with another cut in the autumn or spring before growth begins. The arisings should always be removed. Rabbit grazing may assist greatly in grassland management, and may be essential for some communities.

7.3.3 Managing heaths and moors

Heathlands and moorlands should be grazed lightly if possible to contain grass growth and prevent trees colonising. Without grazing, invading trees will need to be removed. **A burning regime may be appropriate**, depending on the character of the vegetation and the location. Gimingham 1992 and Backshall *et al* 2001 provide details on managing these habitats.

7.3.4 Managing woodlands and hedges

Woodlands can be:

- **left to develop to high forest**
- **managed wholly or partly by coppicing**
- **subjected to light or occasional grazing.**

The management methods adopted should reflect those in place prior to translocation, or those suited to the type of wood and character of the ground flora. Advice on woodland management is given in Brooks 1988, but can be updated with reference to the local nature conservation agencies.

If a woodland translocation site has also been planted with nursery stock, and natural regeneration has been prolific, **some thinning after 10–20 years may be needed**. This will benefit the diversity of the ground flora. Such management should follow ecological best practice to enhance the woodland habitat whilst taking other factors, such as additional woodland functions and objectives, into consideration.

For hedgerow translocations, the regrowing shrubs will need to be managed to produce the same (or better) hedge structure as in the original site. Decisions will need to be made on whether the **hedge should be laid, coppiced, or trimmed**, or some combination of these, and the newly growing hedge managed accordingly. Good guidance is available in Brooks and Agate 1998.

Plate 7.1 *1992, a year after translocation of trees and shrubs*

Plate 7.2 *1997, canopy developing*

Plate 7.3 *2001, well developed tree canopy, little management needed*

7.3.5 Managing wetlands

Wetlands include marshes and ponds. These will also need management, although this may be irregular, and the requirements will vary from site to site. Management may need to:

- control invasive species
- remove fish if the ponds are specifically for breeding amphibians
- repair any leaks
- control access by, for example, Canada geese or coot if these are threatening the survival of particular plants
- reduce shade if too much develops
- encourage light grazing in marshes
- control excessive grazing round ponds.

Some of the more undesirable and invasive species that are difficult to control occur in or around ponds and other wetlands. The worst offenders are the non-native species such as New Zealand pigmyweed, which is widespread, and others that are more locally distributed such as floating pennywort and parrot's-feather. Up-to-date advice on control of these species should be sought on the Internet and from specialists.

7.3.6 Securing long-term management

In the long-term, the translocation site will be **managed most effectively if passed on to a nature conservation organisation** like a county wildlife trust. A commuted sum would be part of any agreement to provide for ongoing management in perpetuity.

8. THE COSTS OF TRANSLOCATION

Translocation should not be considered without an appreciation of the overall costs involved. It could be cheaper to avoid damaging the habitat. The level of costs, though, should not be a reason for lowering the minimum standards given in this guide, nor for destroying a valuable habitat instead of translocating it responsibly. Forced cost cutting during a translocation scheme will result in a reduced standard of translocation.

8.1 THE SCOPE OF COSTS

A translocation scheme, from inception to the long-term management commitment, is difficult to cost since there will be varying requirements at each stage of the whole project, and there will be considerable variation in costs between schemes. Items to include in any costing are:

i) Planning stage

- ecological consultants to assess site and prepare proposals
- EA and environmental statement preparation
- liaison with nature conservation bodies, local authorities, client, solicitors and barristers.
- preparation of evidence at public inquiry – this could take a great deal of time (several weeks) for complex cases and highly sensitive sites (for example, Box 8.1, Brocks Farm)
- presentation of evidence and cross-examination at a public inquiry. This could take 2–3 days or more and costs include those of:
  - barrister(s)
  - solicitor(s)
  - consultant ecologist
  - developer
  - rest of team with interrelated evidence, eg. archaeology, hydrology.

> **BROCKS FARM PUBLIC INQUIRY EVIDENCE**
>
> Ecological evidence on both EN's and the mineral operator's side included:
>
> - visits to a range of other translocation sites to assess their efficacy
> - detailed statistical analysis using various sets of monitoring data at Brocks Farm of earlier translocation
> - preparation of numerous proofs of evidence and their presentation at the Inquiry
>
> These items constituted several weeks of work altogether for two or more people.
>
> 8.1

ii) Implementation phase

- finding a receptor site
- preparation of programme of works. Translocation will be on the critical path and will affect programming of other activities
- purchasing a receptor site
- selecting and briefing a suitable contractor
- preparation of method statements
- development of or adaptations to specialist equipment if needed
- pre-translocation monitoring
- dealing with protesters with site security measures for up to a year, possibly
- pre-translocation preparation of receptor site
- the translocation exercise by the contractors
- an ecological clerk of works
- ecological consultants to supervise translocation
- post translocation management
- post translocation monitoring for up to 10 years or more for woodland
- long-term management
- short and long-term site security (fencing, access, etc).

This list assumes a complex case for a high value site. With a low value site and no planning inquiry, costs will be reduced accordingly. For a large site, the planning stage will be more cost-effective than for a small site needing the same level of input.

Indicative costs for translocation are given in Table 8.1, page 75. These assume a high value 1ha grassland translocation using turves, with a 10-year post translocation monitoring and management period. A number of assumptions are made to generate the figures, as shown in the table. These could vary with different projects and locations in the country (for example, land prices). The costs are approximately 2000–2 prices, but are not meant to be precise.

A woodland translocation could cost much more than a straightforward grassland or heathland one.

POTENTIAL MONITORING COSTS

1. **<u>TWYFORD DOWN</u>, M3 BAR END TO COMPTON SECTION (SSSI)**
(high value chalk grassland). Monitoring conducted by Centre of Ecology and Hydrology over a 10-year period, annually initially for four years, then alternate years.

1990–2 Pre-translocation monitoring included:

Initial botanical surveys comprising:
- specialist surveys for target species
- bryophytes
- species lists from historical records
- species lists from nearby target habitat type
- survey of donor area prior to translocation, to include comprehensive species list and quadrat information
- survey of receptor site prior to translocation to develop guidelines for site preparation (site subsequently stripped of soil because of the enhanced nutrient status of the soil in the receptor arable field)

Initial invertebrate surveys comprising:
- specialist surveys for target species
- species lists from historical records
- species lists from nearby representative habitat type (nearest SSSI or other conservation designation)
- survey to compile comprehensive species lists from donor area prior to translocation;
- vacuum sampling (D-vac) and pitfall trapping;
- identification of material from samples

Soil analysis
Assessment of soil nutrient status

Database
Design of database to store and process data from monitoring exercises

Report production
Initial assessments and recommendations

Approximate total cost £85 600 fees (2002 prices).

Post translocation monitoring

Botanical surveys
- preparation for fieldwork; production of field data sheets and organisation of equipment
- re-locate and record data for all fixed quadrats? record overall species lists for the three translocated areas

Invertebrate surveys
- re-locate positions and replace pitfall traps
- collect pitfall samples every month through the summer from May to September
- vacuum samples collected from all three turf treatments once a month from May to September
- conduct specialist invertebrate surveys
- identification of material from samples

Miscellaneous extras
Species counts: orchids Advice on management particularly for grazing regime

Data processing
Enter data into databases, analysis and production of summary data in the form of graphs, tables and diagrams.

Report production
Output summarising findings produced after each monitoring session.

Approximate total cost/year = £64 330 (2002 prices) plus project administration costs. (Not conducted annually).

2. **<u>HOCKLEY WATER MEADOW</u>, M3 BAR END TO COMPTON SECTION (SSSI)**
Monitoring conducted by Centre for Ecology and Hydrology over a 10-year period, annually initially for four years, and then alternate years.

Pre-translocation monitoring included:

Botanical surveys
- plant species lists for whole area (excluding bryophytes)
- quadrat data for donor site
- specialist survey for bryophytes

Hydrological survey
Assessment of groundwater levels in donor and receptor site using dipwells

Post-translocation monitoring

Botanical surveys
- preparation for fieldwork; production of field data sheets and organisation of equipment
- re-locate and record botanical data for 16 fixed quadrats
- record overall botanical species list

Box continues on next page

8.2

Data processing
Enter data into database, analysis and production of summary data in the form of graphs, tables and diagrams.

Report production
Produced after each monitoring season.

Approximate total fee cost/year = £10 950 plus project administration costs.
(Not conducted annually).

3. STANSTED AIRPORT, TRANSLOCATED NEUTRAL GRASSLANDS (small area of low value)
(Monitoring conducted by Penny Anderson Associates Ltd).

Post-translocation annual monitoring
(7 separate patches translocated totalling c 0.4 ha, largest two monitored regularly).

- Zig-zag walk across patch for about two hours
- Recording plant species encountered, plus relative abundance
- Counts of orchid populations
- Botanical comparisons
- Report back to landscape manager verbally on management requirements

Approximate total fee cost/year £330–£500.

8.2 contd.

Contractor costs of up to about £19/m² (item 14 on Table 8.1) would cover tree, shrub and ground flora transfer. If engineering of the water table, or other significant changes to the receptor site were needed, this could also increase these costs from £5–10 up to £15–20/m² for the translocation part of the exercise.

On controversial schemes where protesters were a problem, security costs could increase significantly. Long-term management costs could be higher too where there was no income from hay or grazing, or where contractors had to be used for various additional operations.

Post translocation monitoring may be less for a low value site, or more in a complex case. For example, a total cost per year of monitoring for the high value sites on the M3 at Twyford Down, where botanical and invertebrate monitoring was conducted, amounted to £85 600 at current prices (see Box 8.2). On the other hand, small low value sites subjected only to basic annual botanical monitoring could cost as little as £500–£1000/year (at 2002) prices).

Table 8.1 *The potential costs of translocation*

	Assumptions	Costs(k) (Approx. or range) based on 1 ha site
General	**1ha high value site, moved as turves 2000–2 prices.**	
EIA public inquiry		
1. Ecological consultants for survey	Botanical, invertebrate and breeding bird surveys (NVC mapping, quadrat recording). 10 days @ £500/day inclusive of expenses.	5
2. EIA and Environmental Statement preparation	Site description and evaluation, analysis and assessment of data collected, translocation proposals. 10 days @ £500/day inclusive of technical support	5
3. Consultation with nature conservation bodies, barristers, etc.	Two meetings with each of wildlife trust, EN or equivalent, local authority; five meetings with solicitors and barristers. Ecologist £500/day including expenses Barrister £2000–3000/day Solicitor £1000–2000/day	 5.5 10 to 15 5 to 10
4. Preparation of evidence.	Say 10 @ £500 inclusive of technical support	5
5. Presentation of evidence		
5a Barrister(s) 5b Solicitor(s) 5c Consultant ecologist	5a-c – say 3 days for giving evidence plus preparation time 5 days 3 days for opposing side's evidence for ecologist, barrister and solicitor at same rates as in 3.	19 to 24
5d Developer 5e Rest of team with interrelated evidence eg. Archaeology	Additional opportunity cost to developer plus other team members (archaeologist, landscape architect, planner. Say £500/day each on average	12
Project planning and execution		
6. Finding a receptor site	Investigate 5 sites – soil evaluation and testing, negotiate with owner for purchase. Say 10 days @ £500	5
7. Programme of works	Say 5 days @ £500	2.5
8. Purchasing receptor site	Based on Shepherd and Harley 1999, with 3%/year added for 2002 prices. High levels are lowland arable; low are for poor grazing, includes 2% legal costs.	2.5-5
9. Selecting contractor	Preparation of tender documents, site briefing meeting, tender evaluation. Say 6 days @ £500	3
10. Development of specialist equipment		0.5-5.0
11. Pre-translocation monitoring	Botanical, soil, invertebrate (no hydrology), including data analysis and reports. 17 days @ £500	8.5
12. Site security	Assume protesters occupy site security guards and fencing needed. 6 months.	Very variable c. 5+
13. Receptor site preparation.	Topsoil stripping, ground engineering £1.5/m³ for 1 ha. No cost for disposal of topsoil included.	3
14. Translocation	Turfing, topsoil layer only @ £5–10/m²	50-100
15. Ecological clerk of works	10 weeks @ £150/day, 6 days/week	9
16. Ecological consultants	1 day/week, 10 weeks, inclusive of expenses 10 days @ £500	5
17. Post translocation management	Cut and remove arisings x 2 in Year 1	0.26
18. Post translocation monitoring	Botanical, soil, invertebrate 17 days for 6 out of 10 years at 2002 rates	51
19. Long-term management	Assume hay cutting costs but grazing free, x 10	c. 3.5
20. Site security (fencing etc.)	Stockproof fence plus water provision around 1 ha x 1	c. 1.5
		£215k–£290k

9. REFERENCES AND BIBLIOGRAPHY

Additional references to those cited in the text are provided to give further information.

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10. APPENDICES

APPENDIX 1

HABITAT TRANSLOCATION BEST PRACTICE PROJECT CHECKLIST

Summary details

Project name ______________________ County ______________________

SSSI/CWS/LNR/CWT reserve/other designation/non designated site

Name of designated site (if appropriate) ______________________

Year translocation began ______________ Year translocation completed ______________

Habitat(s) ______________________ Reason for moving ______________________

Agent/developer ______________________ Main contractor ______________________

Specialist contractor ______________________ Ecological adviser ______________________

Monitoring pre-translocation ______________ Monitoring post-translocation ______________

Clerk of works ______________________

WHAT DECISIONS WERE MADE AND WHY?

Project planning	**Fill in comment or detail**
Why was translocation the solution?	
Scheme considered at Public Inquiry?	
Was the scheme part of a planning condition or obligation?	
Was it agreed with a nature conservation organisation?	
Was it offered voluntarily?	
Aims of translocation	
The aims of the scheme?	
Retention of NVC communities and subcommunities?	
Retention of rare species and current population levels?	
Retention of nature conservation interest?	
Others?	
Who set the aims?	
Site habitat	
Nature of the broad habitat present?	
Was there a diversity of communities present throughout the site or different communities distinct within the site?	

Nature conservation value	
Uncommon habitat type	
Uncommon species (plants & others)	
High species diversity	
Pre-translocation management.	
How was it managed in the years before translocation?	
How was it managed immediately prior to translocation?	
Pre-translocation monitoring	
Which of the following were monitored, for how long and by what methods?	
Botanical	
Invertebrates (which groups)	
Hydrological	
Soil chemistry	
Other	
Was all the donor site moved?	
Area moved	
Area remaining in situ	
Matching donor and receptor site conditions	
Which of the following surveys were undertaken?	
Soil chemistry	
Water chemistry	
Hydrological monitoring	
Aspect	
Slope/gradient	
Others	
The suitability of the receptor site	
Did the receptor site match the donor site in terms of the above conditions?	
Was receptor site engineering required, if so, what?	

Location of receptor site	
Distance between the donor and the receptor site? (Metres)	
Was the final choice for the receptor site based on ecological, financial, ownership or logistical considerations?	
Type of translocation	
Total area translocated?	
Area of turf translocation?	
Size and depth of turf?	
Area of vegetation taken as a soil transfer?	
Area material was re-spread over and depth re-spread at?	
How were the methods used decided?	
Season(s) of translocation.	
Equipment	
Was standard macro turfing technique used?	
Was adaptation of standard machines undertaken?	
Was design of specialist equipment required? If so, who designed it and what were the problems to overcome?	
Other methods, eg tree spades	
How were the turves transported to the receptor site?	
Any storage or stacking of material.	
What was stored, for how long?	
Placement of material	
Exact replica of donor site?	
Communities translocated together?	
Placement of turves to fit to the shape of receptor site?	
Were the soil horizons kept and laid separately or mixed?	
Were they laid in the original order, ie A horizon above the B horizon?	

Selecting suitable contractors	
How was this undertaken?	
Contract management	
Within main contract?	
Separate contract?	
Advanced works?	
Who ran it (main contractor or specialist)?	
Site Supervision	
By ecologist or clerk of works? Full or part time?	
Other points	
Any delay or hindrance during translocation due to protesters?	
Any particular problems with the weather	
Too dry and turf falls apart?	
Too wet and machinery was bogged down or was less effective?	
After care needed, eg watering turf?	
Post-translocation management and ownership of receptor site	
Who proscribes management?	
Who undertakes management?	
How is the management financed (a trust fund/regular payment/pledge)?	
Were the logistics of management considered i.e. could the receptor site be accessed by stock and/or machinery?	
Over what timescale has long-term management been considered?	
What are the risks to the long term future of the site i.e. from the adjacent land use (eg fertilizer drift/reversal of amelioration /abandonment through isolation from local community)?	

Post-translocation monitoring	
Which of the following were monitored, how frequently, for how long and by what methods?	
Botany	
Invertebrates (which groups)	
Hydrology	
Soil chemistry	
Other	
Relative project costs	
Total cost of the translocation operation?	
Cost per m^2 turf translocated?	
Costs of monitoring (annually)?	
Relation between the availability of funds, attitude of the project sponsor, and the translocation success?	
Did the translocation achieve the project aims and over what timeframe?	
Retention of NVC communities and subcommunities?	
Retention of rare species and current population levels?	
Retention of nature conservation interest?	
Others identified earlier?	

APPENDIX II. The case studies mentioned in the guidance

Site ref Number	Site name	County/district	Nature conservation designation at time of translocation[1]	Year moved	Reason	Habitat	Area (m²) translocated
Grassland							
1	Brampton Meadow	Cambridgeshire	SSSI	1991	A1-M1 Link road (A14)	Neutral grassland on ridge and furrow	4000
2	Newhall Reservoir	Nottinghamshire	SSSI	1987	Repair to underground reservoir	Neutral grassland	4000
3	Potatopot	Cumbria	None	1988/89	Opencast coal.	Acidic, marshy grassland	8200
4	Thrislington Plantation	Durham	SSSI	1982–1990	Quarry extension	Magnesian limestone grassland	55,000
5	Brocks Farm	Devon	None	1988/89	Ball clay spoil tip extension	Neutral grassland	16,000
6	Monkspath Meadow	Warwickshire	None	1987	Retail development	Neutral grassland	7,500
7	Durnford Quarry	Bristol	SINC	1998/99	Quarry extension	Neutral grassland	56,000
8	M3 Twyford – Chalk grassland	Hampshire	SSSI	1992	M3 Bar End to Compton	Chalk grassland	3,000
9	M3 Hockley Flood Meadow	Hampshire	SSSI	1992	M3 Bar End to Compton	Wet meadow	5,000
10	Wilford Power Station	Nottinghamshire	SINC	1992	Retail development	Species rich grassland on PFA, ruderal communities	4,800
11	Parc Slip	South Glamorgan	None	1995	Opencast coal	Damp/wet meadow	20,000/30,000
12	Longmoor Camp	Hampshire	SSSI, None	1997	Road	Acid grassland and lichen sand bank	470 + c1160
14	Stansted Airport	Essex	None	1986	Airport development 1986	Neutral grassland	8629
15	Staines, Hithermoor	Surrey	None	1980	Gravel extraction	Dry, wet and moist grassland.	4350
16	Selar Farm – ITE work	Mid-Glamorgan	SSSI	1991	Experimental prior to opencast coal	Neutral grassland and marshy wet grassland	138
Heaths & Blanket Bog							
17	South Middlebere Heath	Dorset	None	1989	Experimental works	Heathland	1500
18	Inkerman, Tow Law	County Durham	None	1991	Opencast coal	Blanket bog and heathland	13,300
19	Gadle Knapp (Dorey's Farm)	Dorset	None	1993	Extension of clay workings	Wet heath/mire	650
20	Bleak House	Staffordshire	SSSI	1993	Opencast coal	Heathland	50,000
22	Waddington Fell	Lancashire	SINC	1998 ongoing	Quarry extension	Moorland	28,400
23	Birmingham Northern Relief Road, MSA only	Staffordshire	SINC	2001/2	Motorway service area associated with the BNRR	Heathland	11,600
Wetlands							
24	Newbury Bypass	Berkshire	SSSI	1996	Road (A34)	Reed sweet grass and sedge swamp	c1200
Woodlands and hedges							
27	Manchester Airport Second Runway	Cheshire/ Manchester City	SINC	1997–8	Airport runway	Ancient woodland and secondary woodland	c20,000 (plus 10,386 secondary woodland)
28	Mold Bypass	Clwyd	SINC	1991	Road (A494)	Ancient woodland	c3,200
29	Biggins Wood	Kent	None	1988	Channel Tunnel Terminal	Ancient woodland	11,000
30	M2 / A2 Woods	Kent	SSSI, SINC, None	1998/2000	Road widening (M2/A2)	Ancient woodland	65,000–70,000
31	Stansted Airport	Essex	None	1986/7	Airport development 1986	Hedge/wood topsoil stripping	c200

APPENDIX III Scientific names of vascular plant species given in the text

Common name	Scientific name
Trees and shrubs	
Alder	*Alnus glutinosa*
Birch species	*Betula spp*
Gorse species	*Ulex spp*
Hazel	*Corylus avellana*
Oak	*Quercus spp*
Rhododendron	*Rhododendron ponticum*
Sweet chestnut	*Castanea sativa*
Sycamore	*Acer pseudoplatanus*
Herbs, sedges and grasses	
Bluebells	*Hyacinthoides non-scripta*
Broad-leaved dock	*Rumex obtusifolius*
Bulrush	*Typha latifolia*
Creeping thistle	*Cirsium arvense*
Floating pennywort	*Hydrocotyle ranunculoide*
Heather	*Calluna vulgaris*
Indian balsam	*Impatiens glandulifera*
Japanese knotweed	*Fallopia japonica*
Lesser pond sedge	*Carex acutiformis*
New Zealand pigmyweed	*Crassula helmsii*
Parrot's feather	*Myriophyllum aquaticum*
Ragwort	*Senecio jacobaea*
Spear thistle	*Cirsium vulgare*
Yellow rattle	*Rhinanthus minor*

HIGHWAYS AGENCY

The Safety, Standards and Research Directorate of the Highways Agency manages a large research programme that assists the Agency in its primary role as network operator for the trunk road and motorway network. The research aims to support the Agency's key objectives by consolidating and improving their information, knowledge, ideas, tools and technologies for (i) corporate technical strategy and (ii) meeting wider Agency needs. The Agency has encouraged the production of this guide for the wider construction industry from work that it originally commissioned.

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This guide has been derived from work undertaken to provide an Advice Note for highways works on the translocation of habitats. The work has been modified and extended to make it applicable to developments of all kinds. It considers the circumstances in which habitat translocation may be appropriate and emphasises that decisions to offer translocation should be thoroughly researched.

The planning context for habitat translocation is described together with recommendations for the initial studies, the long term ownership and management, the necessary monitoring arrangements and the appropriate forms of contract for use in translocations. Extensive details and recommendations for the mechanics of translocation are provided, as are arrangements for aftercare and maintenance.

The guide should lead to the incorporation of better and more successful habitat translocation schemes in development projects. The guide is accompanied by a CD which contains details of a review of more than 30 habitat translocation projects undertaken in the last 20 years. Findings from the review formed the basis for the recommendations in the guide.

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