Designing for Sustainability

in the

Highlands

DEVELOPMENT PLAN POLICY GUIDANCE

FINAL NOVEMBER 2006

CAVEAT

The information presented in this document is for guidance only and whilst every effort has been made to ensure the accuracy of the advice given, the authors of these notes, including the Council, cannot accept any liability for loss or damage arising from the information supplied.

FOREWORD

New development in the Highlands can add to our quality of life by providing healthy, comfortable buildings and by bringing new facilities and jobs to our communities. Sustainable design aims to maximise these benefits while also preserving and enhancing the Highlands' internationally-renowned culture, scenery and wildlife.

The three interdependent principles of sustainability are expressed in The Highland Structure Plan (2001) as:

- Supporting the viability of communities;
- Contributing to a prosperous and vibrant local economy;
- Safeguarding and enhancing the natural and built environment.

The Structure Plan describes a range of strategic policies against which all proposed development within The Highland Council area is assessed. Policy G2 sets out the requirement for all development to be *designed for sustainability*. As a result, all new Local Plans for the Highlands will place a requirement on planning applicants to demonstrate, by means of a *Sustainable Design Statement (SDS)*, that their proposals take account of sustainable design practice.

The purpose of the guidance is to support the preparation of an SDS by those involved in applying for planning permission. It is the Council's intention that the statements will be used as a planning tool throughout the Highland Area by the end of 2006. In introducing the SDS requirement the Council's primary focus will be to ensure that planning applicants reap the benefits of sustainable design, while minimising the extra effort involved in preparing a planning application.

The overall framework and content of this guidance was prepared for the Highland Council by Thirdwave Scotland Ltd, who also supplied much of the text. The guidance has been developed in consultation with the public, stakeholders from the construction industry and partner agencies operating within the Highlands, whose contributions have been very welcome and useful. The Council will continue to work with those involved in applying for planning permission to ease and guide the introduction of Sustainable Design Statements and to ensure that Planning Officials provide applicants with appropriate support and advice.

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Contents

FOREWORD

INTRODUCTION

Sustainable development in the Highlands

The purpose of this guidance

What is a Sustainable Design Statement?

Why does the Council require planning applicants to prepare one?

Are any planning applications exempt?

The status of a Sustainable Design Statement

The scope of a Sustainable Design Statement

Using this guidance

Sustainable Design Checklist A: Small-scale Development

Sustainable Design Checklist B: Large-scale Development

GUIDANCE NOTES

1 Enhance the Highlands' economy and communities

1.1 Strengthen the local economy

1.2 Support social inclusion

1.3 Design healthy, safe and secure environments

2 Make best use of the site

2.1 Choose an appropriate site

2.2 Reuse buildings where possible

2.3 Reuse land

2.4 Make efficient use of the site

2.5 Align buildings for shelter and solar gain

3 Design within the Highland context

3.1 Respect existing landscape character

3.2 Protect cultural heritage

3.3 Respect the character of towns and villages

3.4 Design for durability in a changing climate

4 Conserve and enhance the biodiversity of the Highlands

4.1 Identify wildlife habitats and species on or near the site

4.2 Minimise disturbance to habitats and species

4.3 Enhance biodiversity

5 Minimise energy use

5.1 Use natural shelter and passive solar techniques

5.2 Insulate well

5.3 Use efficient heat, lighting and ventilation systems

5.4 Make control systems easy to use

5.5 Consider alternative energy sources

6. Design to conserve water

6.1 Reduce demand for water

6.2 Consider reusing greywater and collecting rainwater

6.3 Install sustainable drainage systems

7. Design in sustainable waste and sewage facilities

7.1 Design for effective waste management during operation

7.2 Treat sewage sustainably

8. Use sustainable materials

8.1 Specify materials that cause minimal harm to the environment and have a positive social impact

8.2 Choose materials that are non-toxic in manufacture, construction and use

8.3 Select components that can be maintained and recycled

9. Encourage sustainable transport choices

9.1 Plan how people will travel to and from the development

9.2 Create high quality pedestrian and cycle routes

9.3 Provide facilities for cyclists

9.4 Link to public transport networks

9.5 Reduce the impact of road traffic

DESIGNING FOR SUSTAINABILITY – AN OVERVIEW

What is it?

Why do we need sustainable design?

The wider benefits of sustainable design

Reconciling social, economic and environmental objectives

Using "Environmental Assessment" as a sustainable design tool

Sustainability and cost

Whole Life Costing

Life Cycle Assessment

APPENDICES

A Useful Resource List

B Glossary

C (1) Housing for Varying Needs; (2) Fire Safe Design

D Protecting and Enhancing Biodiversity

E Renewable Energy Technologies

F Sustainable Urban Drainage Systems (SUDS)

G Sustainable Sewage Treatment

H Construct efficiently and safely

TABLE 1

HIGHLAND STRUCTURE PLAN (2001) Policy G2

Design for sustainability

Proposed developments will be assessed on the extent to which they:

- are compatible with service provision (water and sewerage, drainage, roads, schools, electricity);
- are accessible by public transport, cycling and walking as well as car;
- maximise energy efficiency in terms of location, layout and design, including the utilisation of renewable sources of energy;
- are affected by significant risk from natural hazards, including flooding, coastal erosion, land instability and radon gas, unless adequate protective measures are incorporated, or the development is of a temporary nature;
- are affected by safeguard zones where there is a significant risk of disturbance and hazard from industrial installations, including noise, dust, smells, electro-magnetism, radioactivity and subsidence;
- make use of brownfield sites, existing buildings and recycled materials;
- impact on individual and community residential amenity;
- impact on non-renewable resources such as mineral deposits of potential commercial value, prime quality or locally important agricultural land, or approved routes for road and rail links;
- impact on the following resources, including pollution and discharges, particularly within designated areas :

  habitats freshwater systems

  species marine systems

  landscape cultural heritage

  scenery air quality;
- demonstrate sensitive siting and high quality design in keeping with local character and historic and natural environment and in making use of appropriate materials;
- promote varied, lively and well-used environments which will enhance community safety and security and reduce any fear of crime;
- accommodate the needs of all sectors of the community, including people with disabilities or other special needs and disadvantaged groups; and
- contribute to the economic and social development of the community.

Developments which are judged to be significantly detrimental in terms of the above criteria shall not accord with the Structure Plan.

INTRODUCTION

Sustainable development in the Highlands

The Highland Council's vision for sustainable development is to establish a prosperous future, strong communities and a healthy environment. Sustainable development ensures a better quality of life for everyone, now and for generations to come. It satisfies basic needs, such as the provision of warm homes, while creating opportunities for people to achieve their potential through education, information, participation and good health. It also involves protecting and enhancing the environment not just for its own sake but because a damaged environment will sooner or later hold back economic development and lower the quality of life. Finally, sustainable development requires a robust economy to create the wealth that allows needs to be satisfied, now and in the future.

This vision is set out in the Highland Structure Plan (2001), which maps out a path towards sustainable development over the next twenty years. It describes a range of strategic policies against which all proposed development within The Highland Council area is assessed. Policy G2, presented in Table 1, requires development to be *designed for sustainability* and identifies thirteen criteria on which this is judged. As a result, all new Local Plans for the Highlands place a requirement on planning applicants to demonstrate, by means of a **Sustainable Design Statement**, that their proposals take account of sustainable design practice.

The purpose of this guidance

This guidance has been prepared to support the preparation of a Sustainable Design Statement by those involved in applying for planning permission. It is targeted at self-builders, developers, landowners, building professionals and construction firms.

The guidance advises on what designing for sustainability means in the Highland context and highlights opportunities for developers to add value to their projects by taking account of the way that the economic, environmental and social impacts of development interact over the short and long term. It also seeks to demonstrate that in many cases, sustainable design can be achieved without novel or expensive techniques by looking at the broader consequences of a design decision.

This guidance does not attempt to provide comprehensive advice on all aspects of the design of development proposals. In particular it does not provide guidance on the visual appearance of buildings. Planning applicants should also refer to the Highland Structure Plan (2001), the relevant Local Plan, the Council's guidance on Housing in the Countryside and relevant national guidance such as the Scottish Executive's Policy Statement on *Designing Places;* SPP 3 *Planning for Housing;* PAN 44 *Fitting New Housing Development into the Landscape (*under review); PAN 46 *Planning for Crime Prevention*; PAN 67 *Housing Quality;* PAN 72 *Housing in the Countryside,* and NPPG 5 *Archaeology and Planning*.

What is a Sustainable Design Statement?

A Sustainable Design Statement (SDS) is a description of the chosen design that demonstrates why and how this design is the most suitable and sustainable for the proposed scheme and its context. In particular it demonstrates how a development incorporates the sustainable design practice identified in this guidance.

The SDS allows applicants and their clients to explain the design of their scheme in a structured way. It is an opportunity to demonstrate what has been done to appraise the context of the scheme and how sensitively the design responds to the site, its surroundings and the scheme's intended purpose.

The submission of an SDS allows planning officials to see the extent of analysis, as well as the quality of thought, time and effort that has been dedicated to addressing the sustainability of a scheme. It can also help individuals and communities understand why a particular approach has been adopted.

The aim of the SDS is to explain the design approach, not to duplicate submitted copies of the drawings accompanying the planning application. The existence of this statement does not guarantee planning permission – it is intended to support a planning application but not replace it.

More general information on the presentation of a design statement is contained in the Scottish Executive's Planning Advice Note (PAN) 68 *Design Statements*.

➔ **Appendix A: Useful Resource List**

An SDS will not dispense with the need for an Environmental Impact Assessment (EIA), which is a procedure that must be followed for certain types of development before they are granted development consent. This procedure requires the developer to compile an Environmental Statement (ES) describing the likely significant effects of the development on the environment and proposed mitigation measures. An EIA may address some issues to be covered by an SDS and would deal with these in greater detail, removing the need for duplication in an SDS. Sustainability issues outwith the scope of an EIA will, however, still need to be addressed through the preparation of an SDS for that development.

Why does the Council require planning applicants to prepare one?

The Council has introduced the SDS requirement to encourage higher standards of sustainable design in development and re-development projects in the Highlands. This reflects best practice in raising standards of sustainable design elsewhere in the UK. The Council's primary focus in introducing the SDS requirement is to ensure that planning applicants reap the benefits of sustainable design, while minimising extra effort in preparing a planning application.

Are any planning applications exempt?

All applications for Planning Permission require to be accompanied by an SDS apart from applications for alterations to existing domestic properties. Householders altering or extending their homes are advised, however, to follow the guidelines in this document, especially those relating to materials, energy and water use, as this will result in a home that has lower running costs and is more healthy, comfortable and sustainable than most dwellings.

Applications for Outline Planning Permission require to be accompanied by an interim statement, taking account of issues relevant to outline stage that will impact on the overall sustainability of the development.

The status of a Sustainable Design Statement

The Council will be able to withhold planning permission if an applicant fails to submit an SDS without showing good reason for doing so. In introducing the SDS requirement, however, it is not the Council's intention to enforce stringent or costly planning conditions. Instead the Council is seeking assurance from planning applicants that they are have considered this guidance and are willing to take account of sustainable design practice in their proposals.

Neither are there any hard and fast rules for the assessment of an SDS. Climate, population density and levels of economic activity vary across the Highlands, giving rise to different challenges and opportunities. This means that the best design solution for one area may be quite unsuitable for another. Statements, therefore, will be assessed on a case-by-case basis.

Although statements will inevitably make reference to aspects of sustainable design that relate to the Technical Standards or other statutory requirements, the preparation of an SDS does not dispense with the need to comply with these requirements or seek relevant statutory approvals.

The scope of a Sustainable Design Statement

The Council will not adopt a prescriptive approach to the preparation of an SDS. It recognises that the scope of statements will vary according to the nature and scale of development. For most planning applications it will consist of a short written description supported by appropriate illustrations, such as annotated drawings. Local Planning Officers can provide pre-application guidance about the appropriate scope of an SDS for a particular development.

As a general guide, planning applicants are expected to present the following information:

Background Information	Name of development	Applicant
	Planned use	Agent
	Site ownership	Date
Appraisal of the site and context	Any specific points relating to the existing context and identity (refer to checklists at the end of this guidance note)	
Description of the sustainable design solution	A description of how the proposed design responds to the site, its surroundings and the scheme's intended purpose, in terms of the sustainable design issues identified in the relevant checklist at the end of this guidance note. Aspects of the design that do not conform to sustainable design practice should also be highlighted and an explanation given for why the applicant has adopted this particular approach.	

Using this guidance

This guidance encourages and supports the production of an SDS by those involved in applying for planning permission. It focuses on the principles of sustainable design rather than detailed technical solutions. Design options and solutions vary according to location, scale and end-use. This means that the best design for one area or use might be quite unsuitable for another.

THE CHECKLISTS are intended as a series of prompts to inform the scope and preparation of an SDS. It is up to planning applicants to assess which aspects of the checklists are relevant to their development, drawing on the information in the Guidance Notes as appropriate.

THE NINE GUIDANCE NOTES identify the key issues that need to be considered when designing for sustainability, suggesting practical steps to sustainable solutions and signposting sources of detailed information and further advice. They explain how a development can:

1. **Enhance the Highland's economy and communities**
2. **Make best use of the site**
3. **Design within the Highland context**
4. **Conserve and enhance Highland biodiversity**
5. **Minimise energy use**
6. **Design to conserve water**
7. **Design in sustainable waste and sewage facilities**
8. **Use sustainable materials**
9. **Encourage sustainable transport choices**

DESIGNING FOR SUSTAINABILITY – AN OVERVIEW presents general information about sustainable design including the design approach, principles, methods of assessment and reference to cost issues.

THE APPENDICES provide more detailed information and useful references, including a glossary (Appendix B).

THE USE OF SYMBOLS

Not every aspect of the guidance applies in every case. Developments of different sizes and functions need to address different issues, and relevant guidance is differentiated by these symbols:

Small-scale development (eg a single house)

Large residential developments

Commercial and/or industrial developments

➔ This arrow highlights (by cross-referencing) where a decision on one aspect of the design impacts on another. One of the most important principles of sustainable design is that most design issues cannot be considered in isolation, and many overlap.

Sustainable Design Statement Checklist (A)

SMALL SCALE DEVELOPMENT

This checklist summarises key aspects of designing for sustainability relevant to small-scale development in the Highlands that applicants for planning permission are encouraged to take into account in the preparation of an SDS.

Small scale development is defined as: housing applications for less than ten dwellings (including single houses); or where no number is given, a site area of less than 0.5 hectare; or development where floorspace to be built is less than 1000 sq metres; or where the site area is less than 1 hectare.

Issues addressed in the accompanying Guidance Notes are identified by the relevant section number in the right hand column.

Issues that need to be considered at both Outline and Detailed Planning Permission Stage are highlighted in bold purple text.

	Guidance Note
Site description and layout	
• **Describe the site location and the surrounding land uses.**	
• **State the distance from the site to the nearest public transport and public services and facilities, such as schools, play space and recreational space.**	
• **If appropriate, describe how the project will make use of existing buildings, structures, infrastructure or brownfield sites.**	**2.1 2.2 2.3**
• **Describe the topography (site contours), microclimate (wind, sun orientation, exposure, shelter) views to/from/over the site and extent/nature of existing trees and plants.**	
• **Explain how the position and alignment of the dwelling will make use of solar gain and natural shelter.**	**2.5**
• **Describe the proximity of public utilities eg underground services, drainage systems, overhead power lines and water supply and state how these will be used.**	
• **Show how new services will be designed to use the land efficiently.**	**2.4**
• **Describe any site-specific hazards such as flooding, exposure, subsidence etc and show how the design will address them.**	**2.1 2.5 3.4**
• **Describe any site-specific constraints such as Scheduled Monuments, Archaeological sites, Listed Buildings and Designed Landscapes, and how the design will address the need to protect and enhance these.**	**3.2**
Designing within the Highland context	
• **Describe the character of surrounding buildings in terms of their groupings, scale (height and massing) and appearance (materials, windows, entrances etc); state whether the site is in or near a conservation area.**	
• **Describe the existing landscape character and whether the site is in or near a nature conservation area; describe existing wildlife habitats and other features that support biodiversity (eg trees, hedges, watercourses etc); and describe measures that will be taken to preserve wildlife, trees and plants on the site and enhance wildlife habitats.**	**4.1 4.2**
• Demonstrate how the project's design will fit with and enhance the surrounding landscape or townscape, while respecting natural and cultural heritage.	**3.3**
• Describe how archaeological and historic sites and landscapes will be protected around the development.	**3.2**
• Show how the design will withstand Highland weather conditions.	**3.4**
• Show how the development will help to enhance the Highland economy and community by promoting social inclusion and a secure, healthy environment.	**1.1 1.2 1.3**
• Show how the development will be accessible to people of different ages and physical ability.	**1.2**

Energy

• Show how the design of the development will minimise energy consumption and where opportunities for small scale renewable energy opportunities exist.	5.2 5.4	5.3
• Identify what the development's main energy source(s) will be.	5.1	5.5
• Describe how systems will be designed to ensure a healthy indoor environment.	5.3	

Water

• Show how water use will be minimised.	6.1	6.2
• **Identify the type of drainage system proposed and how this will be designed to reduce flood risk, consider potential impact of runoff and avoid pollution.**	2.4	6.3
• Explain how the development will comply with relevant technical guidance on drainage design.		

Sewage and Waste

• **Explain how sewage will be managed and treated and how the development will comply with relevant technical guidance on sewage disposal.**	7.2	
• Identify where waste, composting and recycling bins will be located to allow for ease of use and Council waste collection.	7.1	

Materials

• Describe what materials will be used in the building and the extent to which these are sustainable – e.g. renewable, responsibly recycled or reused; whether or not timber specified will be local and/or certified to come from a sustainably managed source.	8.1	8.2
• Show how the design has minimised the use of: - toxic or highly-processed materials and finishes; - toxic timber treatment; - composite materials and components that cannot be maintained.	8.1 8.3	8.2

Transport

• **Describe the surrounding road (or street) layout, parking, existing traffic measures and vehicular access to site and areas of vehicular / pedestrian conflict; show what impact the development is expected to have on these.**	9.5	

Sustainable Design Statement Checklist (B)

LARGE SCALE DEVELOPMENT

This checklist summarises key aspects of designing for sustainability relevant to large-scale development in the Highlands, which applicants for planning permission are encouraged to take into account in the preparation of an SDS.

Large scale development is defined as: housing applications for ten or more dwellings, or where no number is given, a site area of 0.5 hectare or more, or developments where floorspace to be built is more than 1000 sq metres or the site area is 1 hectare or more.

Issues addressed in the accompanying Guidance Notes are identified by the relevant section number in the right hand column.

Issues that need to be considered at both Outline and Detailed Planning Permission Stage are highlighted in bold purple text.

	Guidance Note
Site description and layout	
• **Describe the site location and the surrounding land uses.**	
• **State the distance from the site to the nearest public services and facilities, such as schools, play space and recreational space.**	
• **Describe how the project will make use of existing buildings, structures, infrastructure or brownfield sites.**	**2.1 2.2 2.3**
• **Describe the topography (site contours), microclimate (wind, sun orientation, exposure, shelter) and views to / from / over the site.**	**2.5**
• **Explain how the position and alignment of the dwelling will make use of solar gain and natural shelter.**	**2.5**
• **Show how new services will be designed to use the land efficiently.**	**2.4**
• **Describe the proximity of public utilities e.g. underground services, drainage systems, overhead power lines and water supply and state how these will be used.**	
• Describe the proposed site layout; explain how public / private space between buildings will be used by day/by night.	**1.3**
• **Describe any site-specific hazards such as flooding, exposure, subsidence etc and show how the design will address them.**	**2.1 2.5 3.4**
• **Describe any site-specific constraints such as Scheduled Monuments, Archaeological sites, Listed Buildings and Designed Landscapes, and how the design will address the need to protect and enhance these.**	**3.2**
Community and Economy	
• Describe how the local community has been consulted about the project, and what involvement they will have in its planning.	**1.2**
• Identify what facilities will be provided that will benefit the community.	**1.2**
• Demonstrate how the development will support social inclusion by catering to the needs of those of different age, physical ability and income.	**1.2**
• Describe how the development has been designed to provide a secure, healthy environment.	**1.3**
• Explain how the development will benefit the local economy.	**1.1**
Designing within the Highland context	
• **Describe the character of surrounding buildings in terms of their groupings, scale (height and massing) and appearance (materials, windows, entrances etc); state whether the site is in or near a conservation area.**	
• Describe local landmarks, focal points and views to/from/over the site and demonstrate how the design responds to these.	
• **Describe the existing landscape character; state whether the site is in or near a nature conservation area.**	

•	Demonstrate how the project's design will fit with and enhance the surrounding landscape or townscape, while respecting natural and cultural heritage.	**3.1 3.2 3.3**
•	Describe how archaeological and historic sites and landscapes will be protected around the development.	**3.2**
•	**Identify any relevant agencies (e.g. SEPA, SNH, Historic Scotland) that have been consulted and the outcome of that consultation.**	
•	Show how the design will withstand Highland weather conditions.	**3.4**

Energy and Building Systems

•	Show how the design of the development will minimise energy consumption and where opportunities for small scale renewable energy opportunities exist.	**5.2 5.3 5.4**
•	Identify what the development's main energy source(s) will be.	**5.1, 5.5**
•	Describe how systems will be designed to ensure a healthy indoor environment.	**5.3**

Water

•	Show how water use will be minimised.	**6.1 6.2**
•	**Identify the type of drainage system proposed and how this will be designed to reduce flood risk, consider potential impact of runoff and avoid pollution.**	**2.4 6.3**
•	Explain how the development will comply with relevant technical guidance on drainage design.	

Sewage and Waste

•	**Explain how sewage will be managed and treated and how the development will comply with relevant technical guidance on sewage disposal.**	**7.1**
•	Identify where waste, composting and recycling bins will be located to allow for ease of use and Council waste collection.	

Materials

•	Describe what materials will be used in the building and the extent to which these are sustainable – e.g. renewable, responsibly recycled or reused; whether or not timber specified will be local and/or certified to come from a sustainably managed source.	**8.1, 8.2**
•	Show how the design has minimised the use of toxic or highly-processed materials and finishes, toxic timber treatment, composite materials and components that cannot be maintained.	**8.1, 8.2, 8.3**

Biodiversity

•	**Describe existing wildlife habitats and other features that support biodiversity (eg trees, hedges, watercourses etc).**	**4.1**
•	**Describe measures that will be taken to preserve wildlife, trees and plants on the site and enhance wildlife habitats.**	**4.2**
•	Show how the design of landscape features will enhance biodiversity at and around the site.	**4.3**

Transport

•	**Describe the surrounding road (or street) layout, parking, existing traffic measures and vehicular access to site and areas of vehicular / pedestrian conflict; existing pedestrian access to and through the site (where are people coming from / going to? What are the desire lines? Is there disabled access?).**	
•	**Describe the new layout of vehicular access and parking; explain how pedestrians and cyclists will travel to and through the development.**	**9.5,9.1**
•	Identify the distance from the site to the nearest public transport and explain how the development will be accessed by those without a car.	**9.2, 9.4**
•	Describe what facilities will be provided for cyclists.	**9.3, 9.2**
•	Show what measures will be adopted to reduce and mitigate the impact of road traffic.	**9.5**

1 Enhance the Highlands' economy and communities

Your Design Statement should demonstrate:

- how the development will benefit the local economy;
- whether the local community has been consulted about the project, and what involvement they will have in its planning;
- what facilities will be provided to benefit the community;
- how the design takes account of the health, safety and security of the community;
- how the development will support social inclusion by catering to the needs of those of different age, physical ability and income.

Key Themes

The following guidelines will be discussed in this guidance note:

1. **Strengthen the local economy.**
2. **Support social inclusion.**
3. **Design healthy, safe and secure environments.**

Background

The Highlands has a rich cultural heritage, much of which is founded on its communities. There are marked differences, however, in housing standards, employment levels and the quality of jobs available in both rural and urban areas across the region. In addition, the changing population structure of many rural communities is leaving fewer people to support vital services. Good transport links are important (addressed in Guidance 9), but local jobs, schools, shops and leisure facilities also contribute to the sense of community.

Throughout Scotland an increasing number of communities are taking on land ownership, which can make a significant contribution to sustaining rural communities. For example, community ownership initiatives in partnership with housing bodies can identify and provide opportunities for locally-delivered, sustainable housing.

Developments that upgrade existing facilities, create local jobs or make use of local services and suppliers during construction will help to build a thriving local economy and community that will benefit all who live in, visit or do business in the area.

It is important that small rural centres, particularly in the Inner Moray Firth, do not become mere dormitory suburbs for nearby towns. New development can enhance settlement character and support social inclusion if the site is chosen carefully, laid out to encourage integration with the existing community, and developed to a high standard of design that is sympathetic with its surroundings

The Highland Structure Plan (2001) states that proposed developments will be assessed on the extent to which they:

- impact on individual and community residential amenity;
- impact on cultural heritage, scenery and air quality;
- promote varied, lively and well-used environments which will enhance community safety and security and reduce any fear of crime;
- accommodate the needs of all sectors of the community, including people with disabilities of other special needs and disadvantaged groups;
- contribute to the economic and social development of the community.

1.1 Strengthen the local economy

Spending money locally supports local jobs, potentially making a greater range of services available and giving more people the resources to live in the area. Not only does this create a stronger community, it reduces the financial and environmental costs of road transport, and also means that those operating new facilities should be able to draw on skilled local staff or contractors. ➔ **8.1 Specify materials that cause minimal harm to the environment and have a positive social impact**.

Guidelines include:

- As far as possible use locally-sourced building materials, products and services. Employ local staff and contractors, seeking to generate supply chains between local businesses. Bear in mind, however, that it may be necessary to import some specialist skills and materials to assure the best long-term performance of a building.
- For large projects, train local people in skills that will be marketable after project completion.
- Make sure that the site chosen will enable local facilities such as shops, post office, primary school, GP practice, petrol filling station and bus services to be viable but not overstretched.
- Locate development so that it supports existing local services and businesses to create a diverse and robust economy, rather than competing in such a way that existing businesses are forced to close and there is a net loss of jobs.

Photograph courtesy of Lotte Glob

Lotte Glob House, Durness, Sutherland

The structure for this "post-and-beam" house was prefabricated off-site to ensure ease of assembly. This enabled a local contractor to build a highly engineered building in a relatively remote location, thereby supporting the local economy. It also minimised construction costs by making efficient use of time and materials. The design takes advantage of passive solar gain by combining a fully glazed south-facing wall with high levels of insulation. Limiting the size of openings on other elevations further enhances energy efficiency. Other sustainability features include the use of homegrown oak for external timber cladding, and design for ease of disassembly.

Architect: Gokay Devici RIBA ARIAS
Completed: 2003

Urquhart Castle Visitor Centre

Historic Scotland's Visitor Centre at Urquhart Castle was completed in October 2001. The construction and management of the Centre demonstrate how a large project can be designed to benefit the local economy.

- Before construction work started, a liaison group was set up between Historic Scotland and local communities to deal with the impact of the development and maximise its benefit to the local community.
- The contract to run the catering facilities at the Centre was awarded to a consortium of local businesses, creating new employment opportunities.
- The Information Point at the Centre provides visitors with information about local products and services, offering a marketing opportunity for local businesses.
- In the construction of the Centre, sandstone from Highland quarries was used for external wall finishes and paving.

Urquhart Castle Visitor Centre

Architects: LDN Architects

Completed: 2001

1.2 Support social inclusion

Where community facilities are lacking, new developments can benefit an area by incorporating facilities for community meetings or multi-use facilities that serve a variety of activities including sports clubs, youth groups and so on. Where facilities can be provided it is important to seek the opinion of local residents in order to be sure of addressing the actual needs of the community. Facilities should also be designed to be accessible to all members of the community.

All new housing should be easily adaptable as residents' needs change, whether because of a disabling accident, increasing frailty or a need to accommodate an additional family member. Appendix C identifies specific measures to achieve this. Technical details for housing are set out in *Housing for Varying Needs Design Guidance*, published for Scottish Homes (now Communities Scotland) by TSO ➔ **Appendix A: Useful Resource List**.

Measures to support social inclusion include:

- Involve local residents in the design process from an early stage. Not only will this give an indication of actual local needs, it may highlight issues specific to the area, and allow local knowledge to be applied in finding solutions.
- Where appropriate, seek to incorporate space for community involvement, whether through sport, meeting rooms, childcare facilities, after school clubs etc. If it is not feasible to provide dedicated community facilities, consider designing facilities to be flexible so that they can be made available for a range of 'out of hours' activities.
- When designing new housing development:
  - Include a range of different housing types and sizes to accommodate residents of differing age, income, ethnicity and physical ability.
  - Ensure that affordable tenures and homes adapted for those with particular needs are "pepper-potted" throughout the development, so that they cannot be distinguished by their external appearance. Design for less physically able people should not stand out as such.

    ➔ **Appendix C: Housing for varying needs**
  - Incorporate open space into the site layout, which is suitable for a range of age groups and activities – for example children's games, quiet relaxation or social gatherings.

    ➔ **Guidance 2: Make Best Use of the Site**

    ➔ **9.5 Reduce the impact of road traffic**

© Burnett Pollock Associates

Housing for Varying Needs

This new house in Midlothian (above) for Viewpoint Housing Association was designed to achieve barrier-free access throughout, despite the steep slope of the site and a number of protected trees that considerably restrained the layout options.

Architects: Burnett Pollock Associates

Completed: 2001

Facilities for Varying Needs

In Abriachan, Inverness-shire, the Abriachan Community Woodland Trust installed a curving timber ramp to their new composting toilet (below), making it easily accessible to visitors of all ages and physical abilities. This community-built shelter demonstrates how a simple, low-tech approach to sustainable design can significantly improve the community's recreational and educational experience.

Designed and built by: Abriachan Community Woodland Trust

Completed: 2001

1.3 Design healthy, safe and secure environments

A well-designed environment and a sense of security are essential to maintaining the quality of life that enables communities to flourish. In addition, communities need to be safeguarded as far as possible against common hazards such as fire-risk in the home. Every day in the UK, two people are killed and another 50 injured by fire. In 2001, over 75% of deaths and injuries caused by fire occurred in the home with dwelling fires averaging 190 per day. Developments can be made more safe, healthy and secure by following these guidelines:

To promote good health, make sure that buildings are well heated and ventilated. Avoid materials and products that contain toxic chemicals.

➔ **5.3 Use efficient heat, lighting and ventilation systems**

➔ **8.2 Choose materials that are non-toxic in manufacture, construction and use**

Allergy-Free Houses, Perth

Scotland's first "allergy-free" houses were completed in October 2003 for the Fairfield Housing Cooperative in Perth. The materials used in the construction were selected to avoid triggering allergic reactions. Natural materials and untreated timber were used instead of plastics, preservative-treated timber, vinyl wallpaper and carpets. The design also incorporated dynamic insulation (whereby air is drawn into the building through a permeable insulation layer) to prevent the excessive humidity that encourages dust mites, a big problem for asthma sufferers.

© Gaia Architects

The construction of these new houses was the latest phase in the regeneration of an existing housing estate, led by Gaia Architects, which began in the mid 1980s. This flagship regeneration project also featured:

- Extensive community consultation that led to the development of a radical action plan aimed at the economic and physical regeneration of the area
- The establishment of the resident-run Fairfield Housing Cooperative
- Work opportunities and training for residents during construction phases.

The regeneration has resulted in a reduction in fuel poverty and respiratory related illnesses, an increase in employment levels and a dramatic reduction in crime. There is now a 300-strong waiting list for tenancies in the development.

Architects: Gaia Architects **(Allergy-free houses) Completed:** 2003

To prevent crime and the fear of crime:

- Seek advice from the Northern Constabulary on crime prevention through environmental design for all development apart from single houses;

  ➔ **Appendix A: Useful Resource List**.
- Design layouts to ensure that ground floor windows and main entrance doors are overlooked, where this would not compromise privacy
- Site outdoor common space near pedestrian through-routes where it is at least partially overlooked and appropriately lit, to prevent crime and the fear of crime
- Make sure pedestrian routes on the development are well-lit, but specify light fittings that direct light where is it required, to avoid light pollution

  ➔ **3.3 respect the character of towns and villages**

To protect against injury or death from fire:

- Install a fire sprinkler system that is correctly designed, installed and maintained by properly trained, qualified and experienced contractors. For guidance on specification refer to ➔ **Appendix C: Fire Safe Design.** Experience has shown that a life safety fire suppression system, such as sprinklers, will virtually eliminate fire deaths and reduce injuries and property damage by at least 80%.
- Install mains-powered smoke detectors in all living areas, bedrooms, halls and landings (excluding kitchens and bathrooms), with battery- powered back-up. Ensure that one detector sensing smoke will sound all the others.

Prevent outdoor space becoming derelict by making a clear distinction between public and private space and ensuring that there is no “left-over” space in the site layout. Left over space is different to open space that has been integrated into the design for amenity, to protect natural heritage or enhance biodiversity, or to protect subsurface archaeological remains. ➔ **2.4 Make efficient use of the site**

Ensure that residents and employees have access to safe and attractive open spaces that are sheltered from the noise and emissions of motorised vehicles. Where necessary, erect acoustic screens or barriers to mitigate general noise such as that from traffic. In some cases belts of trees and shrubs can be used for this.

Stornaway Trust
Isle of Lewis

This woodland centre with café, interpretation and craft workshop was developed by the Stornaway Trust, with funding from the Millennium Forest for Scotland, to provide an important new community, visitor and educational resource.

© *Neil Sutherland Architects*

Other sustainable design features include:

- Use of homegrown timber for structure and internal / external finishes, as much as possible harvested from the Stornaway Trust Estate;
- Timber windows and doors, manufactured in the Highlands;
- Optimum use of natural light;
- Passive solar design;
- High standards of insulation.

The construction also benefitted the local economy. Virtually all of the timber was milled on the island and the building was constructed by the Stornaway Trust Joinery Team.

Architects: Neil Sutherland Architects *with* Andrew McEvoy

Completed: 1999

2 Make Best Use of the Site

Your Design Statement should demonstrate:

- why the site was chosen for best effect;
- how the project will make use of existing buildings, structures, infrastructure or brownfield sites;
- how new services will be designed to use the land efficiently;
- how the position and alignment of the building or development will make use of solar gain and natural shelter;
- awareness of any site-specific hazards (e.g. flooding, exposure), and strategies for how they will be addressed.

Key Themes

This guidance focuses on the initial choice of site, the reuse of land and buildings and the site layout, under the following key themes:

1. **Choose an appropriate site** with good access to existing services and resources.
2. **Reuse buildings where possible,** taking care to preserve and enhance any historic and culturally significant features.
3. **Reuse land,** ensuring any contamination is identified and dealt with sustainably.
4. **Make efficient use of the site** to conserve resources and space.
5. **Align buildings for shelter and solar gain** to maximise energy efficiency.

Background

Sustainable buildings are designed to fit into and work with their surroundings. Choosing an appropriate site is the first step towards designing for sustainability. Thereafter, positioning buildings with attention to the topography and surroundings will enhance their visual impact and careful layout of services will allow the most sustainable and cost-effective provision of power, water, drainage and sewage disposal. For large developments the appropriate provision of traffic routes, open space and other community facilities is vital for the long-term success of the development.

The Highland Structure Plan (2001) states that proposed developments will be assessed on the extent to which they:

- are compatible with service provision (water and sewerage, drainage, roads, schools, electricity);
- maximise energy efficiency in terms of location, layout and design, including the utilisation of renewable forms of energy;
- are affected by significant risk from natural hazards, including flooding, coastal erosion, land instability and radon gas, unless adequate protective measures are incorporated, or the development is of a temporary nature;
- are affected by safeguard zones where there is a significant risk of disturbance and hazard from industrial installations, including noise, dust, smells, electro-magnetism, radioactivity and subsidence;
- make use of brownfield sites, existing buildings and recycled materials.

2.1 Choose an appropriate site

Observe the following guidelines when selecting a site:

Consult the appropriate Local Plan to identify areas suitable for the intended development. Your local Planning Officer will help interpret the Local Plan if necessary. Avoid locating isolated houses in the countryside – refer to the Council's policy on "*Housing in the Countryside"*.

Avoid Cultural Heritage sites and landscapes and make sure the development will not undermine the special qualities and setting of any nearby sites or landscapes of cultural significance.

Avoid sites that are protected by nature conservation designations or other ecologically sensitive areas such as semi-natural woodland. Make sure that the development will not undermine the special qualities of any nearby designated sites.

➔ **Guidance 3 Design within the Highland context**
➔ **Guidance 4 Conserve and enhance Highland biodiversity**

Avoid building developments on peaty soils where the hydrology of the bog system could be affected, leading to drying out and loss of stored carbon.

Where possible, use brownfield sites (sites that have been developed previously). Identify any existing infrastructure that can be reused.

Locate development close to existing utility networks, roads, public transport links and social facilities such as schools and health centres.

➔ **Guidance 9 Encourage sustainable transport choices**
➔ **Guidance 1 Enhance the Highlands' economy and communities**

Look for natural features such as hill slopes, outcrops or trees that offer shelter. Avoid frost pockets and sites that are heavily exposed to prevailing winds.

➔ **2.5 Align buildings for shelter and solar gain**

Make sure that the size of the facility is consistent with the size of community within which it is to be located.

Look for links to existing networks and means of integrating new developments into existing communities by, for example, making good use of existing 'gap' sites.

Take account of neighbouring land and development and avoid sites that will be adversely affected by neighbouring land uses, particularly in terms of sites that:

- cause nuisance or pose a threat to health;
- have the potential to cause flooding, subsidence, erosion etc;
- have a negative impact on water levels, soil and sub-soil porosity, field drains etc;
- have a negative impact on the surrounding environment, particularly wildlife and habitats;
- block potential access routes;
- block sunlight.

➔ **4 Conserve and enhance Highland biodiversity**

➔ **6.3 Install sustainable drainage systems**
➔ **7.2 Treat sewage sustainably**

Conversely, avoid selecting a site where the new development will have an adverse impact on neighbouring land or developments.

2.2 Reuse buildings where possible

Upgrading or converting existing buildings reduces the environmental impact of using new resources, and the need to dispose of demolition waste. The construction process also makes use of less energy than new-build. Upgrading can lead to more efficient use of resources, such as energy and water, and an overall increase in the building's asset value. In association with the Scottish Civic Trust and Historic Scotland, the Council maintains a Register of Buildings at Risk that

lists endangered buildings of all kinds in the Highlands. This is a useful source of information on buildings that could be reused, although there are many other suitable buildings that are not on the Register. Historic Scotland offers advice on all aspects of building conservation. For more information contact the Council's Conservation Architect.

➔ **3.2 Protect cultural heritage; ➔ Appendix A: Useful Resource List**

When reusing existing buildings:

Seek ways to improve the sustainability of the building during operation. For domestic buildings, refer to the Scottish Building Standards Agency's an online sustainability guide to home improvement, which includes advice on improving energy efficiency and sound insulation, introducing water saving measures and reducing the environmental impact of refurbishment. ➔ **Appendix A: Useful Resource List**

Use construction methods and materials that are compatible with the original fabric. In the repair of traditional masonry and harling, for example, always use an appropriate lime mortar avoid the use of cement. For more information contact the Scottish Lime Centre Trust.

➔ **Appendix A: Useful Resource List**

Design to repair and retain as much existing fabric as possible; in particular, avoid the substitution of uPVC windows for existing timber windows.

➔ **Guidance 8: Use sustainable materials**

Use non-toxic methods to treat timber decay, insect attack and other rot problems. For information on appropriate methods contact Historic Scotland.

As far as possible ensure that all changes to the original building are reversible so as to avoid compromising potential future uses for the building. This includes alterations to the layout of internal walls and partitions.

Bear in mind that the site of an existing building may contain important sub-surface archaeological remains, which may not be visible on the ground surface. Where these are present, or are likely to be present, contact the Council's Archaeology Unit.

➔ **Appendix A: Useful Resource List**
➔ **3.2 Protect cultural heritage**

Astley Hall, Arisaig

This village hall at Arisaig in Lochaber is a Listed Building that was recently repaired, upgraded and extended, whilst retaining a significant proportion of original building fabric. Substantial improvements in energy efficiency were achieved through the introduction of insulation to the walls and roof. Other sustainable design features include the use of homegrown timber for external cladding.

Architect: Simpson & Brown Architects

Completed: 2001

2.3 Reuse land

Making use of previously developed sites (brownfield sites) reduces pressure on agricultural and undeveloped land and is a key feature of sustainable design practice. If the site contains or is suspected to contain important cultural heritage remains, it is important to make sure these are not disturbed by redevelopment, or make appropriate provision for their recording where this may not be possible. Any plot of land could have been contaminated either by previous uses or by neighbouring activities. Developers are legally responsible for ensuring that the land is suitable for the proposed final use. In some circumstances increased risk of flooding will make it appropriate to

consider converting all or part of a brownfield site to function as a flood plain. Following these guidelines will help to make best use of brownfield sites:

When considering the purchase a plot of land find out:

- if there are any historic or archaeological remains upon it, by contacting the Council's Archaeology Unit; ➔ **Appendix A: Useful Resource List**
- what the site has been used for in the past to check for contamination. Records held by the Council may provide relevant information. Refer to the Council's Advice Leaflet on *Planning Applications and Contaminated Land* and where contamination is known or suspected, contact the Council's Environmental Health Officers (Contaminated Land). ➔ **Appendix A: Useful Resource List**

Where cultural heritage features are present, or are likely to be present, contact the Council's Archaeology Unit, and ensure that the remains are preserved in the site layout, or make appropriate provision for their recording where this may not be possible.

➔ **3.2 Protect cultural heritage**

Where a site is contaminated, remediation measures will depend on the nature of the contamination and how the land will be used after development. Biological remediation techniques are more sustainable than 'digging and dumping' contaminated soil, but the best option for a particular site will depend on its specific contamination issues and other site-specific constraints. Contact the Council's Contaminated Land Officers for further advice.

Consider ways of using the site to protect and enhance biodiversity. For example it may be appropriate to convert part of the site into a wetland that protects against flooding. Brownfield sites can be rich in wildlife, especially if they have been derelict for some time.

➔ **3.4 Design for durability in a changing climate**

➔ **4 Conserve and enhance Highland biodiversity**

Keep your Planning Officer informed about discussions with Environmental Health Officers (Contaminated Land), the Archaeology Unit or other public sector agencies.

The Hockerton Housing Project

This small development of five houses at Southwell, Nottinghamshire, demonstrates best practice in sustainable and efficient use of a housing site. The development is the UK's first earth sheltered, self-sufficient ecological housing development. The five houses generate their own energy, harvest their own water and recycle waste materials causing no pollution or carbon dioxide emissions. These houses are amongst the most energy efficient in Europe.

www.hockerton.demon.co.uk

2.4 Make efficient use of the site

When laying out the site:

Where possible, ensure that the site layout makes best use of available space and will accommodate further development or expansion in the future.

Consider the provision of services from the start of the design process. For example,

space can be allocated for sustainable waste-water treatment systems, and taking gradient into account when designing drainage systems can avoid the need for costly pumps.

➔ **6.3 Install sustainable drainage systems**
➔ **7.2 Treat sewage sustainably**

Pay attention to the design of spaces between buildings allowing for wildlife and community amenity. Try to avoid creating unusable pockets of land, and do not let public spaces be determined by road layouts.

Identify what renewable energy resources are available on site from the outset and incorporate these into the design.

➔ **5.5 Consider alternative energy sources**

Site any noisy industrial processes in noise-insulated buildings away from residential areas.

2.5 Align buildings for shelter and solar gain

Understanding the local microclimate enables buildings to be sited and designed so that they work with, rather than against, nature. It can help to:

Avoid building in frost pockets or on exposed hillcrests, or where there is risk of flooding or storm damage from nearby trees or structures. Make use of existing landforms by, for example, setting buildings down into a hillside or bank of land to shelter from prevailing wind.

➔ **3.1 Respect existing landscape character**

Align buildings so that the narrow end faces the prevailing wind, to reduce wind chill. Wind direction and strength will also affect the operation of natural ventilation systems, where these are installed.

Ensure that the building is positioned to take advantage of solar heat and natural lighting.

➔ **5.1 Use natural shelter and passive solar techniques**

Avoid long passages and short gaps between buildings as this can accelerate windspeed. Porches and fences can reduce windspeed without incurring heat loss.

Where the landform does not offer shelter, use nearby buildings or 'shelter belts' of trees to reduce wind chill, but bear in mind that trees will block sunlight. Rules of thumb:

- to reduce wind chill, trees should grow to the same height as the building and be positioned at a distance of not more than 1-2 times their mature height;
- to avoid blocking sunlight from the building, trees should be positioned at a distance of not more that or 3-4 times their mature height.

Trap warm air by means of shrub belts positioned 1-1.5m away from buildings. A layer of vegetation on the building itself offers additional protection. When planting trees, shrubs or vegetation to provide shelter, choose native or sympathetic species that will support or enhance biodiversity on the site.

➔ **4.3 Enhance biodiversity**

3 Design within the Highland context

Your Design Statement should demonstrate:

- how archaeological and historic sites and landscapes will be protected around the development;
- how the development will fit with and enhance the surrounding townscape or landscape while respecting natural and cultural heritage;
- whether guidance has been sought from relevant agencies (e.g. SEPA SNH, Historic Scotland);
- how the design incorporates durability and takes account of climate change.

Key Themes

Follow these guidelines to design within the Highland context:

1. **Respect existing landscape character,** designing new buildings and structures that complement and enhance the surrounding landscape and landscape pattern.
2. **Protect cultural heritage** by ensuring that archaeological and historical sites and settings, including cultural landscapes, are preserved.
3. **Respect the character of towns and villages,** ensuring that new developments fit and enhance their settings.
4. **Design for durability in a changing climate,** taking account of the likelihood of warmer, wetter conditions and more frequent extreme weather events.

Background

Highland landscapes are renowned internationally, with many areas recognised by national or international conservation designations for their particular scenic qualities, natural or cultural heritage value. Natural and cultural heritage is an immensely important part of regional identity that is also vital to the Highland economy because it underpins farming, forestry and especially tourism. The Highlands' strong cultural heritage has always been interwoven with its natural environment, giving rise to distinctive patterns of development such as crofting and small towns.

The Highlands is already one of the windiest places in Europe and many areas experience harsher climatic conditions than other parts of the UK. Climate change predictions for this century reveal that Scotland will experience more frequent extreme weather events, while becoming warmer and wetter. The impacts of global climate change are becoming ever more evident. Winter storms in the UK have doubled over the past 50 years and all of the ten warmest years since records began have occurred since 1990, including each year since 1997. Across the UK, including Scotland, the crippling effects of flash floods and landslips are felt more frequently as a result of heavy rainfall events and whilst it cannot be proven that any one event is due to climate change, scientists predict the frequency of extreme weather events will increase because of it.

This guidance note highlights appropriate measures to ensure that development adapts to and withstands the impact of climate change. It also focuses on how new development can be designed to fit into and enhance the natural and cultural heritage of the chosen site so that Highland communities can continue to benefit from this important economic resource. Further advice on cultural heritage is available from the Council's Archaeology Unit, which maintains a list of Approved Archaeology Contractors and Consultants and can advise on conserving and managing historic sites, monuments and cultural landscapes. Action to mitigate climate change is addressed in Guidance 5. Guidance 4 suggests measures to conserve the Highlands' unique mix of wildlife habitats and species.

The Highland Structure Plan (2001) states that proposed developments will be assessed on the extent to which they:

- *impact on landscape, scenery and cultural heritage;*
- *demonstrate sensitive siting and high quality design in keeping with local character and historic and natural environment and in making use of appropriate material.*

3.1 Respect existing landscape character

All new development should fit with the character of the surrounding landscape and the way it has been settled. Where the landscape is degraded, it should help to enhance it. Highland landscapes are valued for both their natural and cultural significance. Landscape Character Assessments are available from Scottish Natural Heritage for all Highland areas and a number of Historic Landscape Assessments can be obtained from Historic Scotland. These assessments identify and describe the different elements that give each place its character. They also provide guidance in considering what developments will fit a particular context and how development can respond sensitively to that landscape. ➔ **Appendix A: Useful Resource List**

The following general guidance should be observed in the design, layout and massing of buildings and other structures:

Discuss projects with your Planning Officer from the earliest possible stages of the development. Planning Officers can advise on site layout and management, which as well as adding value to the development, may reduce the likelihood of delays later in the planning application process. They can also recommend sources of specialist advice as appropriate (eg SNH, Historic Scotland). Keep your Planning Officer informed about any discussions with relevant statutory organisations.

Avoid:

- undermining the quality and character of landscapes that have natural and / or cultural value;
- dominating or interfering adversely with existing views, particularly horizons.

Respect the character of remote areas that are important for recreation. Development should not impinge on uninhabited areas or on relatively inaccessible countryside where the character of the environment has remained relatively unchanged by human activity.

© Gaia Architects

The layout of the National Trust for Scotland's new Visitor Centre at Glencoe responds sensitively to its mountainous setting. The visitor facilities are comprised of a cluster of buildings laid out to resemble a small traditional Highland settlement. The buildings sit low in the landscape to minimise their visual impact on the surroundings.

Architects: Gaia Architects
Completed: May 2002

Site buildings and infrastructure to suit the gradient and topography of the landscape, and the scale and direction of landscape features.

➔ **2.5 Align buildings for shelter and solar gain**

Locate buildings to observe, rather than contrast with, the existing settlement pattern. For example, in some locations this will involve reinforcing a linear or grid pattern, or observing the traditional relationship of building to road. Elsewhere it may be appropriate to maintain adequate open space between buildings.

Design infrastructure sensitively, responding to any local natural and physical constraints (such as bodies of water, woodland or steep-sided valleys) so that these are not visually overwhelmed. Avoid crossing water courses or affecting water interests, and damaging or removing trees. Pay close attention to minimising the visual impact of access tracks and associated drainage infrastructure, cattle grids etc. Use sensitive alignment to topography and vegetation to minimise disturbance. For advice, refer to SNH's guidance on track construction in upland areas.

➔ **Appendix A: Useful Resource List.**

Retain and where necessary replant trees, woodland and boundary features such as hedgerows, stone dykes and fences - these greatly contribute to landscape character, and also support wildlife. Use native species and avoid coniferous screening. Consider planting additional areas of native woodland tie your development into the landscape and ensure that its setting contributes to landscape diversity and quality.

➔ **Guidance 4: Conserve and enhance Highland biodiversity**

Avoid the use of inappropriate suburban features and construction materials in rural areas such as kerbs, pavements and prominent levels of external lighting (particularly coloured lighting) and signage. Keep the use of concrete and artificial building products to a minimum, using locally-sourced stone as an alternative.

➔ **Guidance 8: Use Sustainable Materials**

New house near Beauly, Inverness

The simple one-and-a-half storey house matches the form and scale of many traditional Highland houses. Located close to the road that runs along one edge the site, its position is also in keeping with the adjacent settlement pattern.

Other sustainable design features include the use of natural materials, such as slate and homegrown external timber cladding. High levels of insulation and the use of passive solar gain make it possible to meet all heating needs with a small wood-burning stove.

Architects: Simpson and Brown Architects

Completed: Spring 2002

3.2 Protect cultural heritage

The Highland area has 3000 Listed Buildings and 30 Conservation Areas. The Highland Sites and Monuments Record (HSMR) maintained by the Council's Archaeology Unit lists nearly 40,000 sites of archaeological interest, including 1,200 scheduled Ancient Monuments. This number increases continually because archaeological survey work in advance of changing land use frequently identifies previously unrecorded sites. PASTMAP, an internet tool for identifying cultural heritage sites, is listed in Appendix A. Internet access to the HSMR will be available in 2006. Bear in mind that developments need not be at or adjacent to an historic building, monument or site to affect its setting. Projects within view of a historic site also need to be designed to avoid having a negative impact on cultural heritage. Following these guidelines will help to conserve this heritage:

Where cultural heritage features are present, or are likely to be present, contact the Council's Archaeology Unit early in the development process. Consult Historic Scotland for information on special procedures relating to Scheduled Ancient Monuments.

➔ **3.2 Protect cultural heritage** ➔ **Appendix A: Useful Resource List**

If the site is likely to contain archaeological features, arrange for a survey of the area to be carried out to identify unrecorded archaeological remains. Ensure that remains are preserved in the design of the site layout, or make appropriate provision for their recording where this may not be possible. A list of Approved Archaeology Contractors and Consultants can be obtained from the Council's Archaeology Unit, along with a specification for the work, to ensure it will meet the Council's minimum requirements.

➔ **Appendix A: Useful Resource List**

For guidance on development that affects Listed Buildings and Conservation Areas, make early contact with the Council's Conservation Architect, who can also signpost practical advice on the alteration and repair of historic buildings, and whether the project might qualify for grant funding.

➔ **Appendix A: Useful Resource List** ➔ **2.2 Reuse buildings where possible**

The Council's Conservation Architect and Archaeology Unit will also advise developers on whether it is appropriate to consult Historic Scotland and other conservation bodies that are statutory consultees in the planning process. Consultation can assist projects to progress smoothly through the planning process. Keep Planning officers informed of the outcome of consultation. ➔ **Appendix A: Useful Resource List**

Take cultural landscape into account when designing the site layout.
Gardens and designed landscapes are also an important feature of the Highlands' cultural heritage. Gardens and landscapes of local, regional and national significance exist across the Highlands. The 'Inventory of Gardens and Designed Landscapes in Scotland', maintained by Historic Scotland and SNH, lists 54 Highlands sites of national significance.

➔ **3.1: Respect Existing landscape character**
➔ **Appendix A: Useful Resource List**

58-59 High Street Ardersier, Inverness

The houses at 58-59 High Street Ardersier demonstrate how the repair and conservation of buildings at risk can enhance the character of a Highland village and make a substantial contribution to safeguarding its cultural heritage.

Unoccupied for over for forty years, these 18th century houses had grown increasingly derelict until acquired by the Highland Building Preservation Trust at the end of the 1990s. Their restoration to residential use has significantly improved the environment of the High Street, breathing new life into this historic village.

Other sustainable design features include maximum retention of original fabric, involving the use of appropriate repair methods and matching materials such as sandstone, lime mortar and timber.

Architect: Leslie F Hunter **Completed:** October 2002

3.3 Respect the character of towns and villages

Developments should respect the *character* of existing villages, towns and townscapes as well as their historical and cultural context. Where this is done sensitively, new development can help improve areas that have been degraded. Following these guidelines will help buildings – whether contemporary or traditional in style – to fit their surroundings:

Adopt traditional patterns of scale and density for new developments, avoiding the introduction of "suburban-style" developments into a rural context. Use materials that are in keeping with the existing character of the town or village, such as lime harling or locally-sourced stone. Seek advice from your local Planning Officer.

In designing the layout of roads and buildings, observe the existing settlement pattern. Often this has evolved in response to environmental conditions – to give shelter for example – and can reduce a development's energy consumption as well as enhance its visual effect. Seek advice from your local Planning officer.

Ensure that the design, scale and materials of new buildings complement neighbouring buildings. Bear in mind, however, that some recent developments may be regarded as a poor fit with their settings and should not be seen as a precedent for unsympathetic design. Seek advice from your local Planning Officer.

➔ **Guidance 8: Use Sustainable Materials**

Make sure that external lighting does not intrude on the character of an area and/or contribute to the orange glow commonly seen over settlements. Select light fittings that direct light where is it required – usually towards the ground.

Conserve, reuse or reinstate any traditional local boundary features, such as stone walls or hedges. Avoid coniferous screening.

Retain and where necessary replant trees. Individual gardens, roadside and street trees often contribute substantially to the character of Highland settlements. Some trees may be protected by Tree Preservation Orders. For advice on tree works consult the Council's Forestry Officers. ➔ **Appendix A: Useful Resource List**

Craite Barn, Applecross, Wester Ross

Developed by Albyn Housing Society Ltd in response to local need for affordable housing, this development sits comfortably within the context of Applecross village. This was achieved through the integration of differing house forms, the use of a variety of materials for roofs and walls, and careful landscaping. An existing listed barn and adjacent slaughterhouse were renovated to form three houses with a further five houses arranged around a central courtyard.

Architect: David Somerville

Completed: 2004

3.4 Design for durability in a changing climate

There is a growing need for the site planning and building design to take account of predicted future climate conditions. Although uncertainties exist about its precise impact, there is no longer any doubt that climate change is taking place and inevitably the Highlands will be affected. The outlook is for Scotland to become warmer over the next century (by between 1 and 3.5 deg C), with increased rainfall in autumn and winter and greater frequency of extreme weather events, including strong winds, heavy rainfall and flooding. There is also an increased risk that coastal areas will experience erosion and flooding from storm surges that arise when strong onshore winds combine with high tides. Across the UK, coastal defence and managed coastal retreat are mounting priorities and increasingly the insurance industry is calling for stringent action to improve the built environment's resilience to climate change. Ensuring that development is designed for durability is a key feature of sustainable design and is likely to become a high priority for insurance companies in the future. There are a number of ways that the forecasted impacts of climate change can be taken into account:

Pay careful attention to climate and site microclimate, in particular flood risk, when determining the site layout, setting design priorities and performance needs, and selecting materials. ➔ **2.5 Align buildings for shelter and solar gain**

Design drainage systems that adequately dispose of rainwater and prevent flooding from excessive run-off; incorporate vegetation cover and /or wetlands where possible to enhance natural heritage and visual amenity.

➔ **6.3 Install sustainable drainage systems**.

Retain trees and shrubs along water courses to slow down the rate of flood water run-off.

Take account of increased risk of subsidence and soil movement in the design of walls foundations and service routes, particularly on clay soils.

Use robust roof designs, such as steep pitches that retain the traditional Scottish practice of sarking. When using timber cladding, protect external walls with a generous eaves overhang (avoiding boxed eaves) and an adequate splash zone at the base of the walls, to minimise

wetting of the building façade.

Design construction details to avoid wetting, maximise drying and enable efficient, safe maintenance. Limit the use of materials, such as plastic, that cannot be maintained by favouring durable materials or those easy to get hold of and maintain.

➔ **Guidance 8: Use sustainable materials**

Size gutters and other rainwater goods to allow for higher rainfall. Collect and recycle water for appropriate re-use.

➔ **6.2 Consider re-using greywater and collecting rainwater**

To offset increased risk of damage from rain penetration:

- Detail junctions between external wall and windows / doors to shed water and dry out rapidly;
- Drain cavities behind external cladding in timber frame construction, and behind the outer leaf of cavity walls;
- Ventilate cavities top and bottom behind timber cladding
- Be aware that some types of cavity insulation will be at risk in exposed sites.

To offset increased risk of summer over-heating, make sure the design of the building fabric incorporates thermal mass.

➔ **5.1 Use natural shelter and passive solar techniques**

4 Conserve and enhance the biodiversity of the Highlands

Your Design Statement should demonstrate:

- what wildlife habitats exist on site and what measures will be taken to protect and enhance them;
- what, if any, protected species might be affected by the development and what measures will be taken to protect them;
- what measures will be taken to support existing wildlife and plants;
- how design of landscape features will enhance biodiversity in and around the site.

Key Themes

The following themes are addressed in this guidance note:

1. **Identify wildlife habitats and species on or near the site** by carrying out an assessment of the site and identifying sensitive and protected areas and / or species.
2. **Minimise disturbance to wildlife and plants**.
3. **Enhance biodiversity** by designing landscape features to provide habitats for a variety of locally occurring wildlife and plant species.

Background

Biodiversity – short for 'biological diversity' – is the term used to describe all the living things on earth and the relationships between them. The Highlands are particularly rich in plant and animal life, hosting 192 of the 238 priority species identified by the UK Biodiversity Action Plan, and 40 of the 42 priority habitats. In many cases the Highlands are their sole location or stronghold so conserving these species is particularly important. As well as being valuable for its own sake, healthy plant and animal life is good for people. Not only does it provide an attractive and stimulating environment, it also underpins the economy by supplying essential services such as soil creation, biological control of pests, water purification, and erosion and flood prevention. Enhancing biodiversity supports traditional Highland activities such as forestry, farming, crofting and fishing, as well as more recent industries such as tourism, fish farming and aquaculture.

Recent legislation such as The Nature Conservation (Scotland) Act 2004, and the Scottish Biodiversity Strategy and Implementation Plans, place a duty on every Local Authority in Scotland to further the conservation of biodiversity. Under UK and European legislation, every member of the public has a duty to avoid harming certain wildlife and plant species and their habitats. The guidelines in this section give a general overview of how developers should respond to the requirements of this legislation. Environmentally sensitive sites will require suitably qualified experts to be employed to give more detailed and site-specific advice. Issues addressed in other guidance notes, such as the protection of landscape features, the choice of building materials and the way that waste is managed, can also have a significant impact on biodiversity.

The Highlands hosts over half of Scotland's designated sites - Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) - that are recognised as being of the highest value and usually very sensitive to development. There is a presumption against development that will have an adverse effect on designated sites bearing in mind that some, for example wetlands, can be affected by development some distance away. Consult the Council's Area Planning Office for information on the location of designated sites and related Planning procedures.

The Highland Structure Plan (2001) states that proposed developments will be assessed on the extent to which they:

- impact on the following resources, including pollution and discharges, particularly within designated areas:

habitats	landscape	marine systems	cultural heritage
species	scenery	freshwater systems	air quality.

4.1 Identify wildlife habitats and species on or near the site

It is essential to know what wildlife habitats and species are present before a site is developed, so that the best measures can be taken to protect them if the development proceeds. Information on locally important habitats and species is contained in the eight Local Biodiversity Action Plans (LBAPs) that have been prepared for each of the Council's administrative areas. In addition, the Council's Biodiversity Officer can recommend sources of specialist advice (eg SNH, Bat Conservation Trust) as appropriate. ➔ **Appendix A: Useful Resource List**

Refer to the following guidelines and Appendix D when assessing a site:

Check for statutorily protected sites that could be affected by the proposed development. These may be distant from the site itself. Information on their location is available from the Council's Planning and Development Service and SNH Area offices.

➔ **2.1 Choose an appropriate site**

Identify potential wildlife habitats that exist on site, including:

- all trees / tree belts
- woodland, in particular native woodland
- water courses
- pools and ponds
- wetlands
- peatland
- grassland, meadow and areas of native wildflowers
- heathland
- hedgerows
- stone dykes
- ditches
- existing buildings (see below).

Where any of the above habitats are present, or protected species are likely to be present, have a qualified surveyor carry out a detailed survey of habitats and species. Remember that the species identified for survey might be affected by the time of year when the survey is carried out – for example:

- A site may be very important for migratory species that are not present year-round;
- Different plant species come into leaf and flower at different times of the year;
- Some animals, for example bats, hibernate in winter.

In some circumstances surveys will have to be carried out more than once during the course of a year.

Make sure that any buildings likely to be affected by the development are surveyed for the presence of bats by a suitably qualified person. Many buildings in the Highlands are habitats for roosting bats, even though their occupants are unlikely to be aware of this. Trees may also be important to bats and to red squirrels.

ANIMAL SPECIES PROTECTED BY LAW

A number of animal species found in the Highlands, including **pine marten, red squirrel, otter, badger and freshwater pearl mussel** are protected by various sections of UK legislation. For most species this protection extends to places used for shelter, protection and breeding. Several species including **otter, wildcat and bat** are given strict protection under the Habitats Regulations. These species, known as European Protected Species, are protected from intentional or reckless disturbance and the breeding sites and resting places are protected from all types of damage or destruction.

BIRD SPECIES PROTECTED BY LAW

All species of wild birds (including their eggs) are protected and it is an offence to damage, destroy or otherwise interfere with the nest of any wild bird while it is in use. It is also an offence to obstruct or prevent any wild bird from using a nest. Certain wild birds are given additional protection, which makes it an offence to disturb them while they are building a nest or are in, on or near a nest containing eggs or young. It is also an offence to disturb their dependent young. These species are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), which can be viewed on the following link: http://www.naturenet.net/law/sched1.html

Photograph: Ken Crossan
Courtesy of The Caithness Biodiversity Collection

National Trust for Scotland Visitor Centre, Glencoe

Glencoe Visitor Centre was designed and constructed to have minimal negative impact on biodiversity:

- The timber frame buildings are supported on a raised steel frame substructure on concrete pad foundations to avoid the need for strip foundations, thereby minimising disturbance to the ground below.
- 'No go' areas were established during the construction phase to prevent building activity, storage and traffic from harming nearby wildlife, plants and habitats
- The site has a wetland-based wastewater management system designed to support and enhance biodiversity.

Other sustainable design features include the use of locally sourced woodfuel for heating. Fuel consumption is minimised by high levels of insulation and energy efficiency standards. All timber used in the construction of the building is home grown and free of preservative treatment. This includes softwood for the timber frame and exterior cladding, oak for windows and doors and sycamore for flooring. Windows and doors were manufactured in the Highlands.

Architects: Gaia Architects
Completed: May 2002.
© Gaia Architects

4.2 Minimise disturbance to habitats and species

Wild animals and birds cannot survive without the habitats they need to feed, forage, nest, breed, roost or hibernate. Many actions to preserve habitats are not costly, but simply require greater awareness by site designers, businesses, individuals and communities. These activities can also improve the appearance and amenity of an area. SNH's *Natural Heritage Futures* publications advise on issues affecting specific habitat types and regions. Additional advice on how to protect habitats and species is contained in the Appendices. ➔ **Appendix D: Protecting and Enhancing Biodiversity**. ➔ **Appendix H: Construct Efficiently and Safely**

When developing a site, these guidelines will help to protect habitats and species:

Seek advice from SNH's Area Office about how to protect designated areas that may be affected by the development. Keep Planning Officers informed of the outcome of this consultation. ➔ **Appendix A: Useful Resource List**

Using the results of a detailed survey of habitats and species, avoid disturbing protected plants and animals or their habitats. More detailed advice is contained in the Appendices.

It is illegal to knowingly or unknowingly destroy the breeding sites or resting places of European Protected Species, or to interfere with badger setts. If a site is occupied by a protected species, consult Planning Officers for advice on how to proceed.

If it is not possible to avoid disturbing protected species or their breeding sites / resting places, a licence is likely to be required from the Scottish Executive before development work commences.

European Protected Species in the Highlands

Wildlife:
Bats *(all species)*
Otter
Wild Cat
Dolphins, porpoises and whales *(all species)*
Great Crested Newt
Marine Turtles (*5 species)*

Plants:
Killarney Fern
Slender Naiad
Floating-leaved water Plantain
Yellow Marsh Saxifrage

Assess how habitats and features on the site relate to features on adjacent sites including foraging areas, and take care not to cut wildlife corridors that link habitat areas. Retain linear features, such as hedgerows, tree belts, dykes, walls and borders and ensure that habitats spreading across a wider area are not fragmented by the proposed development.

Retain trees if at all possible. Some trees are protected by Tree Preservation Orders or their location within Conservation Areas. Cutting down any trees for any purpose without full planning permission is likely to require a licence from Forestry Commission. For advice on tree works consult the Council's Forestry Officer. ➔ **Appendix A: Useful Resource List**

Avoid:

- destruction of semi-natural habitats such as woodland, hedgerows, wetland and meadow habitats, and areas of native wildflowers and grasses;
- crossing watercourses, altering the water flows in ponds, burns and wetland areas, or canalising or culverting burns;
- planting invasive foreign plant species that may damage neighbouring habitats.

Protect habitats and species during the construction phase. Fence off and protect sensitive areas before construction starts.

➔ **Appendix H Prevent land and water contamination during construction**

➔ **Appendix D: Protecting and enhancing biodiversity**

Time construction work to avoid adversely affecting species and habitats on and off site. For instance, interference with nesting birds is illegal. To prevent accidental disturbance, avoid tree felling or shrub clearance between 1st March and 31st July inclusive (although be aware that a few bird species nest before and after this period). Take account of animal life-cycles avoiding disturbance, for example, where bats roost in summer and winter. More information can be obtained from SNH and specialist groups such as the Bat Conservation Trust.

4.3 Enhance biodiversity

For detailed information and recommendations on enhancing biodiversity refer to the Highland Local Biodiversity Action Plans (LBAPs) that have been prepared for each of the Council's eight administrative areas. LBAPs are available at Council Service Points and Area Planning and Building Control Offices, and on the Highland Biodiversity Website. There are a number of simple steps that can be taken in the design of new development to support and enhance biodiversity levels, which include:

Use locally native species for landscaping, adding to existing habitats and features that support native animals, birds, insects etc. Refer to the Local Biodiversity Action Plan.
➔ **Appendix A: Useful Resource List**

Take steps to accommodate wildlife in the development by providing artificial shelter such as bat and bird boxes. Contact SNH for advice on the construction and installation of bat and owl boxes. ➔ **Appendix A: Useful Resource List**

Design landscape features to have several functions that include wildlife enhanced support. Examples include:

- green spaces and water features that create a valued social amenity and enhance community life;

➔ **1.2 Support social inclusion**

- footpaths that can be incorporated into linear features such as tree belts;
- vegetation that reduces noise levels and provides shelter and habitats;
- careful positioning of shrubs and trees that enhance building performance.

➔ **2.5 Align buildings for shelter and solar gain**

Bat box installed during the conversion of a school to offices at Norton Park, Edinburgh.
Architects: Burnett Pollock Associates
Completed: 1999

More detailed advice on how to enhance biodiversity is contained in Appendix D.
➔ ➔ **Appendix D: Protecting and Enhancing Biodiversity**

© *Living Water*

Wetland Treatment System, Glenfiddich Distillery

This wastewater management system at Glenfiddich distillery is a haven to wildlife, including a variety of nesting birds. It treats 40 m^3 of distillery water per day via a series of five wetland beds containing 25 species of native wetland plants. The system is designed to:

- Remove copper
- Provide further treatment to meet SEPA consent levels
- Act as a buffer in emergency such as a major power failure at the site's effluent plant.

The final discharge from the system meets a very high standard that includes a significant reduction in copper, suspended solids and phosphate, thus protecting fish and other aquatic life in the nearby river.

Designer: Living Water **Completed:** 2000

5 Minimise Energy Use

Your Design Statement should demonstrate:

- how the design of the development will minimise energy consumption;
- what the development's main energy source(s) will be;
- how heat, lighting, ventilation and air filtration will be designed and controlled to ensure a healthy indoor environment.

Key Themes

The following guidelines are discussed in this note:

1. **Use natural shelter and passive solar techniques** when designing and siting buildings, taking advantage of the site's landform and orientation.
2. **Insulate well,** incorporating optimum levels of insulation to reduce heat loss.
3. **Use efficient heat, lighting and ventilation systems** that work *with* the building fabric.
4. **Make control systems easy to use** and locate them in readily accessible places.
5. **Consider alternative energy sources to fossil fuels** such as biomass (eg woodfuel), or off-grid electricity from wind, hydro or solar power.

Background

Minimising energy use is a significant part of sustainable building practice in both new development and the re-use or upgrading of existing buildings. Buildings consume 50% of the UK's total primary energy use and although space heating accounts for most of this, consumption is linked to several processes:

- Operating the building (heating, lighting and ventilation) – addressed in this guidance note;
- Production and delivery of construction materials;
- Refurbishment, demolition and disposal;
- Transporting people and goods to and from the building.

Highland homes are currently less efficient than the UK average and the Council aims to improve this. The Highlands' long heating season makes it particularly important that buildings are energy efficient. Across the UK, sustainable building practice is demonstrating that new buildings can have low or no heating demand. This is achieved through a combination of high standards of insulation, thermal mass, passive solar design, air-tight construction, and efficient glazing and ventilation.

Energy prices are already rising sharply in real terms and will continue to rise as a result of global political pressures, carbon taxes, diminishing supplies of fossil fuels and increased dependency on imported energy. From 2007, the EU Energy Performance in Buildings Directive will require all new buildings, public buildings, and buildings that are rented or sold to display prominently a valid energy certificate that identifies the energy performance of that building. Efficient buildings will increasingly be regarded as valuable assets and have no need to cost more to construct if well designed from the outset. For existing buildings it may not be possible to integrate all aspects of energy saving design but performance is significantly improved by upgrading insulation. A careful cost-benefit analysis will identify the most effective investment options. For large development projects it is recommended that a Strategic Energy Plan is followed from the outset, setting targets for energy consumption that are monitored and reported to building users.

The impacts of global climate change are becoming ever more evident. Observed changes are due to a combination of both natural and human causes and most leading scientists agree that high levels of greenhouse gas emissions (eg CO_2 and methane) are the principal human cause. There is widespread consensus that urgent action is needed cut greenhouse gas emissions by reducing our consumption of fossil fuels such as coal, oil and gas. The issue of energy security – ensuring that we are not vulnerable to scarcity or interruptions in the supply of imported energy - is a further reason to reduce our dependency on fossil fuels.

The Highland Structure Plan (2001) states that proposed developments will be assessed on the extent to which they:

- maximise energy efficiency in terms of location, layout and design, including the utilisation of renewable sources of energy.

5.1 Use natural shelter and passive solar techniques

Careful orientation of a new building can reduce energy loss through wind-chill. In addition, up to 25% of a building's heating needs can be met by the sun using passive solar gain, and designing to make use of this heat can therefore reduce energy bills. In offices, however, heat build-up from office equipment and uncontrolled solar gain can reduce workers' efficiency or require costly air conditioning so in some circumstances it will be appropriate to *restrict* solar gain.

➔ **2.5 Align buildings for shelter and solar gain**

The first step is to position and align the building to make the best use of shelter and solar energy. Guidelines include:

Where possible, orient buildings to within 20° of due south and ensure they are not overshadowed. Place rooms needing less heat (e.g. corridors, bedrooms and kitchens) on the north side of the building. Make south-facing windows larger than those facing north.

Position overhangs to provide shade in the summer while letting in heat and light from the lower winter sun.

Incorporate thermal mass (dense building material, e.g. at least 100mm blockwork or concrete floor slab) into the building fabric to absorb and store heat. This is particularly important when the building envelope is made up of well insulated, lightweight construction, such as timber frame.

Fit external shutters or internal blinds to control solar gain and reduce night-time heat loss.

© David Somerville

The curved glass wall at the entrance to this village hall at Ardross in Ross & Cromarty provides both a bright sunlit space and a passive solar collector, distributing free heat gains throughout the building.

Architect: David Somerville

Arrange buildings and landscaping to work with the site microclimate. This can reduce energy costs by up to 5% because:

- Trees and bushes can protect against summer solar gain, but should not be planted too densely. Even in winter, deciduous trees can reduce solar gain by 50%.
- Woodland shelter belts and appropriate positioning of the building can reduce wind cooling. ➔ **2.5 Align buildings for shelter and solar gain**

Incorporate an unheated sunspace or conservatory (preferably south facing) into the design. These can:

- Form an additional insulation layer between living spaces and outdoors.
- Pre-heat air drawn into the building.
- Prevent cold outside air from entering, when used at entrances.
- Store daytime heat for evening use.

However, sunspaces are not cost-effective for energy-saving alone unless they are inexpensive, unheated and preferably single-glazed. If they are heated during the winter and used as an extra room they reduce the efficiency of the building. Making the space narrow can discourage such use. There should be full insulation between sunspaces and the main building.

5.2 Insulate well

To gain maximum benefit from solar gain and heating systems, buildings should be well insulated to slow the loss of heat. Investing in insulation is usually the most cost-effective way of saving energy, as the cost can be recovered in lowered heating bills. Note that Building Standards represent a legal minimum for insulation and do not reflect best practice. To make best use of insulation:

- Insulate roofs, walls and floors well beyond levels that exceed those set out in the Building Standards.
- Choose insulation materials that are natural (e.g. wool) or recycled (e.g. made from recycled newspaper). ➔ **Chapter 8 Use sustainable materials**
- Where practical, install insulation on the outside of dense building materials (thermal mass) to maximise the potential for using the heat they can store. This avoids loss of indoor space, and is particularly cost-effective when upgrading existing buildings.
- Construct the building for low air infiltration, ensuring that windows and doors are well fitted to cut draughts. Note that a manageable supply of fresh air is essential and under no circumstances should the building be completely sealed.

Collingham, Nottinghamshire

Gusto Homes is a small housing developer building houses for the commercial property market that incorporate many aspects of sustainable design practice.

This development at Collingham, Nottinghamshire is laid out to maximise the contribution that solar gain makes towards space heating by featuring south-facing elevations with a high proportion of glazing. Energy efficiency is further enhanced by solar water heating, high performance timber-frame windows and very high levels of insulation that restrict heat loss to half that permitted under the building regulations. In addition each central heating system is fitted with an intelligent boiler management system controlling a gas-fired condensing boiler.

Houses are ventilated either through a whole house heat recovery ventilation system or through a combination of passive stack ventilation and trickle air vents fitted into the window frames. Great care was taken to achieve air-tightness during the construction phase to reduce the amount of heat that could be lost by cold air penetrating the building fabric.

Other sustainable design features include a rainwater recovery system that collects and stores rainwater for use in toilets, washing machines and garden irrigation.

© Gusto Homes

5.3 Use efficient heat, lighting and ventilation systems

Designing for sustainability ensures that heating, lighting and mechanical ventilation systems are used only where absolutely necessary. Up to now, space heating has accounted for the largest portion of energy use in buildings, although artificial lighting is often the greatest single energy cost in offices. A growing number of buildings in the UK are designed for low or no heating demand. Sometimes referred to as **"zero-energy", "zero-carbon" or super-insulated buildings**, this design approach involves:

- Use of exceptionally high standards of insulation;
- Combining air-tight construction with controlled ventilation to avoid heat loss and ensure good indoor air quality;
- Making effective use of passive solar design, thermal mass and energy efficient glazing.

- Ensuring that heating, lighting and ventilation systems work effectively with the building fabric to avoid, for example, the build up of unwanted heat. For this purpose, heat recovery units, which recycle unwanted heat, are often used.

Sustainable alternatives to mechanical ventilation and air conditioning are also emerging and the most commonly used alternative is **passive stack ventilation**. This uses the tendency of warm inside air to rise upwards towards vents (usually installed in the roof) that respond to air humidity. Fresh air is drawn into rooms through window or wall mounted inlets. Passive stack ventilation is quieter than mechanical extraction and contains no moving parts that require a power supply or maintenance. It is an appropriate energy-saving alternative to mechanical ventilation in kitchens and bathrooms, and used in place of air-conditioning, it can halve the energy consumption of offices.

Energy-efficient systems suitable for large-scale development include:

- **Combined Heat and Power**: A Combined Heat and Power (CHP) system recovers the heat produced by electricity generation and distributes it across one or more developments. It is typically used on housing or industrial sites, utilising wood fuel or waste material as the fuel source for electricity generation. The use of domestic-scale CHP plants serving single dwellings is gradually increasing, however, as new products are introduced to the UK market. CHP systems can use up to 35% less energy than separate generation of electricity and heat, resulting in lower costs for heat production and reduced environmental impact. For some applications, grants are available towards feasibility studies and capital costs. CHP is most cost-effective when the demand is balanced over the day, so entering into an agreement with a neighbouring site can be beneficial – for example where a new housing estate is sited next to a commercial development.
- **District Heating:** District Heating (DH) supplies heat to more than one building or dwelling. Although DH is commonly used for housing development in Scandinavia, it has only begun to be used in Scotland in the last decade. To date the fuel sources for Scottish applications have included oil, gas and wood fuel (woodchip and wood pellet), of which wood fuel is the most sustainable option.

For both CHP and DH, heat transmission distances should be kept short, making them most effective where a suitable development, for example a dense housing layout, is located close to the power source.

General guidance on efficient use of heat, lighting and ventilation systems includes:

Ensure that heating, lighting and ventilation systems are sized to meet expected demand but not over-specified, which leads to inefficiency.

When installing a conventional central heating system:

- Specify an energy efficient, low polluting, low NOx condensing boiler;
- Fit thermostatic radiator valves to control heat levels.

Make best use of natural light, which saves money, reduces glare and is healthier for building occupants than artificial lighting. Ensure that large glazed areas are designed, to minimise the cost *and* health and safety risk of routine maintenance (eg cleaning).

Millennium Village Hall, Ardross

The heating and hot water demands of this new village hall at Ardross in Ross & Cromarty are met by a combination of solar panels on the roof and an energy-efficient, oil-fired condensing boiler, incorporating an innovative three-column heat exchanger. The solar panels serve both hot water and space heating through underfloor heating coils. This keeps energy costs to a minimum while ensuring that the building is warm enough to use at all times.

Architect: David Somerville
Completed: 2001

Use exterior lighting sparing; fit low-energy lamps and include automatic controls that will extinguish lights when not required or when there is sufficient daylight.

Where possible, use passive stack ventilation in place of mechanical ventilation or air conditioning. Passive ventilation system products that provide natural and energy efficient ventilation and meet the requirements of the Building Standards are now commercially available for both domestic and commercial buildings.

Use sunpipes where daylight cannot easily reach. Sunpipes are very effective in transmitting daylight from roof level to the interior of a building, via a tube that uses mirrors and other reflective devices.

Specify energy efficient lighting and household appliances. EU Energy labels on fridges, freezers, washing machines etc identify energy efficiency ratings. Each energy efficient light bulb installed will reduce a household's annual electricity bill by £1.

Install solar-powered water heating or pre-heating. Over the year, this can provide 50% of a dwelling's hot water needs.

Use a Combined Heat & Power or District Heating system fuelled by biomass (eg woodfuel).

Undertake a systematic appraisal to identify the appropriate energy source and plant / services for the development. Set energy targets for building users focussed on maintaining optimum consumption. Monitor and report results. For further guidance contact Action Energy and the Carbon Trust. ➔ **Appendix A: Useful Resource List**

Businesses can take part in the Enhanced Capital Allowance (ECA) scheme, which enables them to claim 100% first year capital allowances on investments in energy saving technologies and products. Businesses are currently able to write off the whole cost of their investment against taxable profits from the period during which they make the investment. For details see the ECA website. ➔ **Appendix A: Useful Resource List**

To improve working conditions and productivity in offices, set air changeover rates beyond the levels set out in Building Standards. In polluted areas, increased air filtration may also be necessary.

Shade all air conditioning units. This can markedly increase their operating efficiency.

Kinlochleven Community and Sports Centre

This centre at Kinlochleven in Lochaber was designed to very high standards of energy efficiency. It is heated entirely by locally-sourced woodfuel and features dynamic insulation, whereby air is drawn into the building through a permeable insulation layer to recover heat that would otherwise be lost by conduction. A sweeping roof-light brings natural light into the centre of the building.

Architects: Gaia Architects **Completed:** 2001

5.4 Make control systems easy to use

If energy systems are to achieve their best and most efficient performance, the skill of the person operating the system cannot be ignored. Ideally, the most effective use of a system should be intuitively obvious, and the occupants should see some feedback so that they realise when their actions are costing energy and money. In some situations it may be necessary to take control *away* from the users, for example in a building designed to be lit by daylight where people might keep lights on more from habit than need. The following guidelines apply:

Controls and meters for energy systems should be:

- visible, accessible and user-friendly; for dwellings, they should *not* be hidden at the back of an unlit cupboard;
- localised so that an area or room is only lit or heated when necessary, rather than having an imposed common level;
- easy to manage and maintain, while allowing sufficient flexibility of operation.

Occupiers should be trained in how to use building systems when the building is handed over. This is important, even for simple and domestic systems, because the most efficient course of action is not always the most intuitively obvious.

New House, Lochalsh *© Neil Sutherland Architects*

This house uses renewable energy – wind, solar and biomass - to meet all its energy needs. Electricity from a small wind turbine (right) powers a central thermal store serving the underfloor heating and hot water systems. Photovoltaic cells (left) also generate electricity and a woodfuel stove provides radiant heat. The design uses thermal mass (concrete floors / turf roof), high levels of insulation and passive solar techniques to minimise energy demand.

Architects: Neil Sutherland Architects **Completed:** 1999

5.5 Consider alternative energy sources

Few places in Europe can match the variety and abundance of the Highlands renewable energy resource which includes wood fuel, solar and hydro power, and wind energy. Renewable energy can be particularly useful for generating electricity in remote locations where grid connections can be unaffordable. Even where renewables are not cost-effective in meeting all of a building's energy needs, they can often reduce running costs by offsetting the need to import energy. The availability

of renewable energy sources varies from site to site, so a careful assessment of the resource over different seasons must be undertaken. Professional advice is recommended.

Some renewable energy technologies are more intermittent than others and are consequently more suited to installations where a source of back-up power is available. Appendix E presents a broad comparison of appropriate renewable energy technologies, in terms of installation and running costs, constancy of supply and environmental impact.

These houses at Neil Gunn Road in Dingwall, Ross and Cromarty are fitted with solar roof panels designed for hot water heating.

Architect: David Somerville

There are many sources of advice on using renewable energy systems and installation grants are available for certain applications and uses, for example households and community buildings. More information is contained in Appendix A.

➔ **Appendix A: Useful Resource List**

Many renewable energy systems use a cost-free source of power. Most investment is therefore incurred up-front when the equipment is installed, though there are also ongoing maintenance costs. This means that financial factors such as interest rates have a major impact on payback times. Although renewable energy is generally cleaner than fossil fuel, it does have environmental impacts. Installations usually require planning permission and in some circumstances, other approvals such as water abstraction licences. Consult your local Planning Officer at an early stage. Advice may also need to be sought from other agencies, for example SNH or SEPA.

"Green" tariffs are now widely available from electricity supply companies for those who are unable to install their own generating equipment, but still want their power to be generated from renewable sources.

The following renewable energy technologies are most suitable for use in the Highlands:

- Wood-fired stove fuelled by logs
- Wood fuel boiler fuelled by wood chips
- Solar-Powered Water and Space Heating
- Photovoltaic (PV) roof panels, which convert daylight directly into electricity
- Wind turbine
- Micro-hydroelectric scheme
- Ground Source Heat Pump

More detailed information on these systems is contained in Appendix E. The Energy Savings Trust has produced a useful Advice note entitled "Renewable energy sources for homes in rural environments". ➔ **Appendix A: Useful Resource List**

Glendale Village Hall, Skye

This new village hall at Glendale on Skye (right) is heated by a ground source heat pump (left).

Architects:

The Highland Council Property and Architectural Services

Completed: 2004

6 Design to Conserve Water

Your Design Statement should demonstrate:

- how water use will be minimised, including re-use of greywater and collection of rainwater;
- how drainage systems have been designed to reduce flood risk and avoid pollution;
- how the development will comply with relevant technical guidance on drainage design.

Key Themes

This chapter outlines the following strategies for making the best use of the Highland's water resource:

1. **Reduce demand for water.**
2. **Consider reusing greywater and collecting rainwater.**
3. **Install sustainable drainage systems.**

Background

An absence of adequate water supplies and wastewater treatment combined with the need to save energy and costs is increasing pressure to conserve water in all new development in the Highlands. Housing development in many areas is currently severely constrained by lack of capacity in water services infrastructure. Mains water treatment and distribution demands significant amounts of electricity so reducing consumption will save energy and reduce running costs where water is metered. Extracting water for private supplies can be costly and have a detrimental impact on watercourses and the wildlife and leisure activities they support. Designing to save water is therefore a key process in sustaining Highland communities.

Architects: Fife Council

Completed: 1999

Turner Crescent, Methil, Fife

Waste water management and grey water reuse feature prominently in this housing project for the Kingdom Housing Association at Methil in Fife, which was delivered within the tight financial constraints of housing association development.

The water from baths and showers is collected in underground tanks, filtered and then pumped back into the house for use in WCs. Other water saving measures include low capacity cisterns, showers and spray taps.

The development demonstrates best practice in a range of sustainable design methods including higher than normal insulation values, solar water heating, passive solar design and passive stack ventilation.

The Highland Structure Plan (2001) states that proposed developments will be assessed on the extent to which they:

- are compatible with provision of water, sewerage, and drainage services;
- impact on freshwater systems.

6.1 Reduce demand for water

Adopting water-saving measures will, when taken across the region, reduce the pressure on Highland's water resources. Where it is not possible to locate developments for easy connection to the public water supply, reducing water demand will mean that less water needs to be taken directly from watercourses or underground water reserves. This could reduce the cost of installing a private water supply system. ➔ **2.1 Choose an appropriate site**

The following measures can be taken to reduce a building's water consumption:

Select appliances that use water efficiently:

- Refer to EU Energy Labels on for example, dishwashers, washing machines and washer-driers to identify efficient water consumption;
- Specify low-flush or composting toilets;
- Fit taps that spread out the water flow so that less is needed for washing;

➔ **7.2 Treat sewage sustainably**

- In public buildings, use urinal designs that do not require a constant flow of water.

Install a water meter to monitor the amount of water used so that leaks can be detected and fixed.

When designing landscaping, avoid using plants that will require regular watering at times of low rainfall.

6.2 Consider reusing greywater and collecting rainwater

Mains water is treated to be suitable for drinking, but water of such high quality is not needed for other building uses. For flushing toilets and watering gardens, use can be made of water collected and recycled from other household sources (known as 'greywater') or alternatively, rainwater.

A greywater system collects water from sinks, baths, washing machines etc, and exposes it to screening and treatment against contamination before being re-used. Reusing water in this way reduces the need for water supplied through the mains and will save on running costs where water is metered.

In those parts of the Highlands where rainfall is plentiful, using rainwater is likely to be more cost effective than installing a greywater system. Rainwater collected from a roof is relatively clean – as long as the air is clean – so it only requires minimal treatment for non-drinking water uses. Collecting and using rainwater will also reduce the amount of water entering streams and surface drainage systems, which in turn will help to reduce problems with flooding.

➔ **6.3 Install sustainable drainage systems**

When harvesting rainwater:

Collect rainwater in water butts for external uses such as gardening. Keep water containers covered to prevent algae and insects from breeding.

Alternatively, capture rainwater through standard guttering with fitted filters, and collect it in an underground storage tank.

Where rainwater is harvested and used at mains pressure, ensure that there is an adequate mains or groundwater water back-up for times when supply is insufficient to meet demand.

6.3 Install sustainable drainage systems

Traditional drainage techniques aim to move rainwater quickly from where it has fallen either into a soakaway designed so that water soaks easily into the ground, or a watercourse. This can result in:

- flooding caused by sudden rises in flow rates and water levels in watercourses;
- contamination of surface water run-off by oil from roads car parks, toxic metals and organic matter, especially after heavy rain;
- depleted water levels on land and in rivers due to the diversion of rainwater away into piped drainage systems.

Sustainable Urban Drainage Systems (SUDS) are designed to reduce flood risks and tackle pollution by treating and attenuating water, and returning it to the natural drainage system as soon as possible. Some techniques incorporate vegetation cover and/or wetlands, which can also

help remove pollutants. A large wetland can sometimes be used to grow energy crops, such as willow, for use in biomass heating systems. More information on wetland systems is presented in Guidance Note 7 and Appendix G. Technical details on SUDS are available from the Scottish Environment Protection Agency (SEPA), the Construction Industry Research and Information Association (CIRIA) and Scottish Water. ➔ **Appendix A: Useful Resource List**

Information on how to safeguard watercourses during construction is contained in Appendix H. ➔ **Appendix H Construct Efficiently and Safely**

Design principles and techniques for implementing SUDS are featured here, supplemented by information in Appendix F. ➔ **Appendix F Sustainable Urban Drainage Systems**

Design the drainage system from the start as part of an integrated design that includes all aspects of drainage and sustainability issues for both the building and the site. Consider multiple-use of SUDS areas to enhance natural heritage and visual amenity. If approached in this way SUDS can be designed to connect fragmented habitats, and provide greenspace and local amenity. In the appropriate location, SUDS areas can also become a valuable teaching resource for local schools.

➔ **2.4 Make efficient use of the site** ➔ **4.3 Enhance biodiversity**
➔ **7.2 Treat sewage sustainably**

Dispose of water on site where possible. Roofs and paved areas can be drained onto unpaved areas, and driveways and footpaths can be drained onto surrounding areas of soft landscaping.

Minimise run-off by limiting the extent of paved and compacted surfaces. Up to 5% paved surfacing can be used without a significant increase in the volume of run-off water.

For hard surfaces such as driveways, car parking areas and pedestrian walkways, use porous surfacing (such as porous bitmac) and sub-base materials that allow water to pass through.

Porous Paving

Use of porous surface for paving at a new housing development in Applecross, Wester Ross.

Instead of underground surface water drains, use swales – grassed depressions that leads surface water away overland. Use wetland (marsh and aquatic) plants for lower maintenance swales.

Limit risk of watercourse contamination by ensuring that highly polluting substances such as oil, fertilisers, sewage and chemicals are properly contained to prevent them reaching the drainage system.

Gully Waste Treatment, Perthshire and Tayside

Tayside Contracts is a local authority contracting organisation delivering services including roads maintenance throughout the Tayside area. The company uses an ecological treatment system to treat the liquid discharge from gully tankers. This discharge is notoriously difficult to treat because it contains the full range of lubricating and diesel gas oils and other chemicals, including salt, that enter road gullies.

Over 11 cubic metres of contaminated liquid are discharged into the treatment system each day. The liquid is treated using a range of ecological systems including soil, saltmarsh, wetland and willow trees. Gully solids are composted to produce high quality topsoil that is used to reinstate road verges and other landscaping applications. This waste treatment system attracts up to 100 species of birds, animals and insects.

Designer: Living Water **Completed:** 1997 & 2001

7 Design in sustainable waste and sewage facilities

Your Design Statement should demonstrate:

- what provisions have been made to accommodate receptacles for building users to segregate and store their waste for recycling, and allow for ease of use and waste collection;
- how sewage will be managed and treated;
- how the development will comply with relevant technical guidance on sewage treatment.

Key Themes

The following guidelines are addressed here:

1. **Design for effective waste management during operation,** ensuring that building occupiers will have the facilities to properly segregate and minimise waste;
2. **Treat sewage sustainably,** choosing a system where mains drainage is not available that:
   - complies with relevant legislation;
   - minimises sludge production;
   - does not risk pollution of surface or ground water;
   - has no or low power requirements.

Background

SEPA estimates that around 500,000 tonnes of solid waste is produced in the Highlands each year. During 2005-06 the Council collected and disposed of 161,082 tonnes of waste from the households and commercial businesses it serves, of which 122,383 tonnes was household rubbish. Just less than 20% of this waste was recycled or composted with the remaining 80% being disposed of to landfill. Legislation from the EU and UK will further reduce the amount of waste that can be landfilled by setting targets for the diversion of biodegradable waste and promoting waste minimisation. The Highland Area Waste Plan proposes that by 2020 only 29% of household waste in the Highlands should be landfilled, with 13% composted, 28% recycled and the remainder converted into energy.

The Council has introduced a kerbside collection of dry recyclables (paper and cans) and green waste to 68,000 Highland households. Each participating household is provided with a 55 litre box for the segregation of paper and cans, and a 240 litre wheeled bin for garden waste. The Council has also established a network of approximately 200 recycling points where householders can recycle paper, cans and glass. Many also have textile recycling banks. Home composting has been actively promoted with just over 10,000 composting bins being distributed throughout Highland between 2005 and 2006.

It is therefore vital that all new development - both within and outwith the areas provided with kerbside collections - makes provision to accommodate receptacles that assist householders to segregate and store their waste for recycling. At the very least, new facilities should be easily adaptable to future requirements to avoid inefficient and costly retrofitting.

New developments will usually be connected to the public sewage system but where this is not financially or technically possible a private system will be required. Sewage can be a dangerous pollutant if not treated and managed properly, but it is also rich in nutrients. A *sustainable sewage treatment system* uses a range of plants and organisms to consume these nutrients, thus reducing or eliminating the production of sewage sludge.

The Highland Structure Plan (2001) states that proposed developments will be assessed on the extent to which they:

- are compatible with provision of sewerage services;
- impact on individual and community residential amenity.

7.1 Design for effective waste management during operation

As previously stated, the Council is expanding the introduction of segregated collection of recyclable, compostable and residual waste in larger settlements and establishing recycling points elsewhere, which will require all development to have facilities for waste management, storage and collection. Following these guidelines will help to ensure that building occupants will be able to take full advantage of recycling opportunities.

Seek advice from the Council's Waste Management Officers on the provision of segregated waste storage and recycling collection points, including quantity and type of waste facilities that are required for a specific scale of development.
➔ **Appendix A: Useful Resource List**

Provide enough space to store segregated waste externally and ensure suitable access for vehicles to uplift waste. Make sure that storage facilities can be accessed safely and conveniently by building residents and occupants.

Where development is on a private/unadopted road, provide secure storage facilities for segregated waste collection where private access meets the public road.

Design internal layouts to include space to store waste conveniently before it is composted or taken out to segregated bins.

Allow space for composting garden, "green" kitchen waste and other suitable biodegradable waste. Where appropriate, locate this so that compost can be used for gardening, or conveniently uplifted for use elsewhere.

Where appropriate install facilities for minimising waste in situ, for example bio-waste waste digesters for food waste, garbage disposal units etc.

Big Hanna ™

Big Hanna is the trade name for this biowaste processor, which has been installed at Sabhal Mor Ostaig on Skye to convert food waste into compost.

© Big Hanna

Photo courtesy of J Whiteford, Tain

Highland Grain Ltd, the Black Isle

In 1999, Highland Grain Ltd set up a worm farm to compost its organic waste, adopting environmentally sound practice to avoid expensive landfill disposal. The plant supplies barley to maltsters, brewers and distillers. It produces 500m^3 of waste dust annually, which is fed to the worms. Not only do the worms convert this waste into valuable compost, since 2002 the company has been selling worms to the angling market and to other organisations looking to minimise their waste. The wormeries are the rectangular units at the top of this photo.

7.2 Treat sewage sustainably

Where a mains sewage connection is not available, foul water must be treated before it is discharged to land or watercourses to comply with relevant Building Control and Scottish Environment Protection Agency (SEPA) regulatory regimes. Refer to relevant SEPA guidance notes such as Pollution Prevention Guideline 4 on private drainage systems.
➔ **Appendix A: Useful Resource List**

There are various ways to treat sewage so the best design for a particular development will vary according to site constraints, for example the space available and how well the soil is drained. Applications must be made to SEPA for consent to discharge to water or for larger developments, to land. SEPA's preference is for discharges to be made to land wherever this can be achieved without risk to ground water and for separate systems to be installed to avoid difficulties of enforcement and refurbishment experienced where multiple owners are involved. It is best to consult SEPA at an early stage.

Various "off-the-shelf" sewage treatment plants are available that are compact, can be installed in one day, and can be maintained under contract. These systems require a power supply, which incurs operating costs and in common with all sewage treatment systems, require regular maintenance. They are not generally tolerant of short-term overloads or variable and infrequent loading.

The guidelines below present options when specifying a sewage treatment system. Early consideration of the site requirements may enable a sustainable sewage treatment solution to be found. More detailed guidance is available from SEPA but expert input is also likely to be necessary in order to maximise the system's performance and longevity. Constructed wetlands, for example, must be carefully designed for their location and purpose. For all systems, good maintenance is essential.

There are three stages in sewage treatment - primary, secondary and tertiary. More detailed information about sustainable design and management options for these stages is contained in Appendix G, including information on septic tanks, wetlands, reedbeds and soakaways.

➔ **Appendix G: Sustainable Sewage Treatment**

Broad guidelines for sustainable sewage treatment include:

Determine the site requirements for sewage treatment from the start of the design process, and where available, allocate enough space for a sustainable means of treatment.

➔ **2.4 Make efficient use of the site**

➔ **6.3 Install sustainable drainage systems**

If space on site allows, use a wetland treatment system or vertical flow reedbed for secondary and tertiary treatment. Seek specialist advice and consult your Planning officer and SEPA early in the development process.

➔ **4.3 Enhance biodiversity**

➔ **Appendix G: Sustainable sewage treatment**

If there is not sufficient space for a wetland or reedbed system, use a soakaway to take water from the septic tank to discharge to soil. Where appropriate, consider using a willow soakaway, particularly if the soil is poorly drained.

➔ **Appendix G: Sustainable sewage treatment**

Where appropriate, consider using a dry or composting toilet so that primary treatment step can be avoided. Seek specialist advice and consult your Planning officer early in the development process.

© Living Water

Wetland and willow soakaway for the treatment of sewage at a 30-person development at Romanno Bridge near West Linton, Midlothian.

If an "off the shelf" sewage system is used, choose one with low power requirements and robust and readily maintainable components.

Loch Garten Osprey Observation Post

The RSPB Osprey Centre at Loch Garten in Strathspey makes use of composting toilets to avoid adverse environmental impact from drainage installation. This visitor centre is located on an artificial island in a bog that is highly sensitive to changes in ground water levels. The building was constructed without a mains water supply and all drainage was avoided apart from rainwater disposal.

Other sustainable design features include the use of homegrown softwood for all structural timber, external cladding and roof shingles.

Designer: Bell Ingram Ltd

Completed: 1999.

8 Use Sustainable Materials

Your Design Statement should demonstrate:

- what materials will be used in the building and the extent to which these are sustainable – eg renewable, from a sustainably-managed source, responsibly recycled or reused, have low embodied energy;
- whether timber specified will be local and/or certified to come from a sustainably managed source;
- how the design has minimised the use of:
  - toxic or highly-processed materials and finishes;
  - toxic timber treatment;
  - composite materials and components that cannot be maintained.

Key Themes

The following guidelines are discussed here:

1. **Specify materials that cause minimal harm to the environment and have a positive social impact.**
2. **Choose materials that are non-toxic in manufacture, construction and use.**
3. **Select components that can be maintained and recycled.**

Background

As the resources of the Highlands – and the planet – are finite, energy and materials must be used efficiently. Development should be designed not just to make efficient use of materials, but also to make use of those that are produced with minimal adverse environmental and social impact.

It is also important that materials are safe for construction workers and householders to handle, and will not cause problems following installation. For example, there is growing awareness of the problem of poor indoor air quality, which is likely to become an increasingly important issue over the next few years. Using materials that do not damage air quality can reward householders with better health, businesses with higher productivity, and developers with reduced exposure to litigation.

The benefits of sustainable materials are even greater if the building is designed to last, with components that can be easily maintained and upgraded, and have been selected to take account of whole-life costing, ie up-front construction costs, cost-in use (eg life-span, maintenance) and disposal / replacement costs.

Sustainable materials are:

- produced from a renewable resource or alternatively re-used or recycled;
- sourced near to the point of use as possible, to cut down on transport costs and negative environmental impact, and to support the local economy;
- extracted and/or produced with minimum ecological damage and no exploitation of the workforce;
- non-polluting and non-toxic in manufacture, use and disposal, particularly if burned;
- unprocessed or alternatively, make use of a minimum amount of energy in their production.

Integrating the use of sustainable materials with the technical and economic constraints of a particular project will inevitably involve some compromises. In addition, it is not always easy to determine which materials are the most sustainable. This guidance summarises the key issues - more detailed information is available from organisations such as the Association for Environment Conscious Building (AECB) or the Building Research Establishment (BRE). ➔ **Appendix A: Useful Resources**

The Highland Structure Plan (2001) states that proposed developments will be assessed on the extent to which they:

- impact on non-renewable resources… ;
- make use of recycled materials.

8.1 Specify materials that cause minimal harm to the environment and have a positive social impact

Sustainable materials do not deplete scarce resources, are processed avoiding the use of environmentally damaging techniques or chemicals, and do not require large inputs of energy in extraction, processing and transport, sometimes referred to as *embodied energy.* Their social and economic impact is positive, and their extraction, manufacture and use provides good quality jobs. General guidelines include:

Where possible:

- Specify locally-produced materials to minimise the cost and pollution of transport and bring benefit to the local economy.
- Buy from local businesses rather than national chain-stores.

➔ **1.1 Strengthen the local economy**

Bear in mind, however, that:

- The availability of manufacturers and suppliers is not uniform and in parts of the Highlands the nearest supplier could be a hundred miles away. Local sourcing, therefore, has to take account of four spheres of influence: regional, Scottish, European, global.
- There is a balance to be struck between sourcing materials locally and bringing in specialised products – such as energy-efficient glazing or solar power systems – that will optimise the sustainability and long-term performance of a building.

Where possible, specify products and materials that are:

- renewable (eg timber, insulation from sheep's wool or flax);
- recycled (eg aggregates or insulation made from recycled materials) ;
- responsibly reused (eg salvaged stone, salvaged timber components such as beams, rafters, doors etc BUT excluding materials that have been robbed from sites of cultural, architectural or archaeological significance, such as stone from dry stone dykes).

Mobile crushing machine used to recycle demolition waste into aggregate

As far as possible, limit the use of highly processed materials such as metals, concretes and plastics whose manufacture consumes significant amounts of energy, usually resulting in high levels of CO_2 emissions. Wherever possible, choose alternative materials that have low "embodied energy", eg timber. Using timber in construction has the added advantage of locking up carbon for long periods, which further contributes to reducing CO_2 emissions.

When designing and constructing with timber:

- As far as possible, use timber that is produced in Scotland and wherever possible, use Highland timber to support the local economy and minimise energy required to transport materials.
- Specify timber that is certified to come from a sustainably managed source ie, that meets sustainability standards set out by an independent certifier such as the Forest Stewardship Council (FSC). Bear in mind, however, that not all timber harvested locally, ie within the Highlands, is independently certified. When specifying Highland timber, make sure this felled under a Forestry Commission (FC) Felling Licence. For further information contact FC Scotland, Dingwall.

  ➔ **Appendix A: Useful Resources**
- Avoid specifying tropical timber eg mahogany unless FSC certified.
- As far as possible, avoid the use of timber preservative treatments many of which contain chemical formulations that, for disposal purposes, are increasingly being classed as toxic waste. Much preservative use can be avoided through careful detailing (to keep the timber dry) or through the use of naturally durable species.

Select manufacturers and suppliers for whom there is independent evidence that the manufacture/ processing / extraction of materials and products:

- benefit local communities and avoid exploitation of the workforce;
- cause minimal damage to the environment.

Suitable sources of information include established "green" distributors, chain of

custody audits by reputable bodies such as BM TRADA, or impact assessments by BRE.

➔ **Appendix A: Useful Resources**

© *Bernard Planterose*

Designer: Bernard Planterose

New house at Loch Broom, Wester Ross

This house makes substantial use of sustainable construction materials and technologies. Virtually all the timber was sourced, milled and machined within the Highlands, including douglas fir for the structure and European larch for external cladding. Although the windows and doors are made of Scandinavian pine, they were manufactured in the Highlands.

The house is constructed of prefabricated panels fitted with high levels of Warmcel © insulation (recycled newsprint) and hoisted into place by crane.

No timber preservative was used to treat the structural timber. The internal woodwork is finished with plant-based oils.

Completed: 2001

8.2 Choose materials that are non-toxic in manufacture, construction and use

Designing for sustainability avoids the use of toxic materials wherever possible. Not only do these pose a risk to workers and the environment during manufacture and disposal, when in place they can release toxins. Toxic chemicals are used in the manufacturing of all timber panel products containing a high glue content. They are also emitted from a huge variety of fittings and finishes, including carpets, varnishes, paints, printers and photocopiers. The smell given off by some new carpets is an example of such "off-gassing". These emissions have a damaging effect on indoor air quality, which can lead to respiratory illnesses and allergies and reduce workplace productivity.

➔ **1.3 Design secure, healthy environments**

Many modern paints and varnishes give off 'Volatile Organic Compounds' (VOCs) and where ventilation is inadequate, VOC levels can build up to the detriment of the health of building users. They can also cause problems when released externally because under certain weather conditions they contribute to the generation of ozone, which can damage both building materials and human health. There is also significant debate about the safety of uPVC in construction, both in terms of the health of building users and its eventual disposal through landfill or incineration. uPVC has already been banned by several European countries.

➔ **5.3 Use efficient heat, lighting and ventilation systems**

Guidelines for avoiding the use of toxic chemicals in building construction include:

Avoid paints and varnishes that give off 'Volatile Organic Compounds' (VOCs). For example, solvent-based paints have a higher VOC content than water-based paints. Many paint and varnish products are labelled with the VOC content.

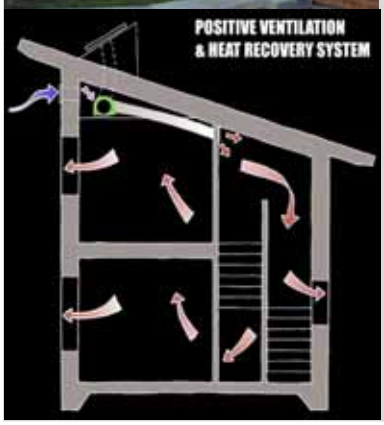
Exercise caution in the use of uPVC products and components, selecting alternative materials where these exist. Alternatives include:

- Timber for doors and windows;
- Vitrified clay pipes for underground services, which are durable and resistant to chemicals;
- Cast iron, galvanised steel or other metals for soil and vent pipes and rainwater drainage;
- Polyethylene and rubber coated power cables, which give off less toxic fumes in a fire and for this reason are used by many underground railway companies.

As an alternative to uPVC trunking for office cabling, this wood-based Econet product was used for the conversion of a school to offices at Norton Park, Edinburgh.

Architect: Burnett Pollock Associates

As far as possible, limit the use of materials and products that make use of, or emit toxins in their manufacture, such as aluminium, cement and engineered timber products.



Aquhorthies Circle, Inverurie, Aberdeenshire

This development of 22 houses for Castlehill Housing Association embraced sustainability as an integral part of the design process rather than something that was tagged on in the later stages.

Use of materials and waste from construction were minimised by factory prefabrication of wall, floor and roof panels by the Aberdeen-based volume house builder, Stewart Milne Timber Systems. These closed panels make use of timber "I-beams" manufactured by James Jones in Forres, which are a very efficient alternative to timber studs. The 240mm thick panels were site-filled with Warmcel ™ insulation (recycled newspaper insulation) to achieve high standards of thermal performance. Other sustainable design features include:

- Locally sourced untreated European Larch for external cladding
- Passive solar design
- Low-E Glazing (high thermal performance)
- A shared boiler that provides hot water and heating to all properties with "intelligent" heating system controls
- Whole-house ventilation combined with a heat recovery system, designed to provide a healthy indoor environment for occupants.

Architects: Michael and Sue Thornley **Completed:** 2004

8.3 Select components that can be maintained and recycled

The sustainable use of building materials includes waste minimisation, so it is important to consider how a building will be disposed of at the end of its life. It should be easy and economic to maintain building components and where possible, use them again. 'No maintenance' products, such as many uPVC window frames, are often impossible to repair, with even minor damage requiring the complete unit to be disposed of and replaced. This wastes both materials and money.

Guidelines for selecting materials and components include:

Design for durability, bearing in mind it is predicted that as a result of climate change our weather will get warmer and wetter. Examples of durable materials that can be locally-sourced in the Highlands include stone and the heartwood of naturally durable timber (eg Oak, European Larch and Douglas Fir.

Exercise care in the design and detailing of non-durable materials (eg all timber containing sapwood) to ensure they will not deteriorate over time.

Design and specify components so that if the building is demolished or refurbished, they can be safely and efficiently disassembled for reuse or recycling. For example:

- Form connections between materials or components with bolts, screws or clips, rather than sealants.
- Avoid composite components such as steel-reinforced uPVC windows or steel cladding with integral insulation, whose component materials are difficult to separate for recycling.

Specify materials that can be satisfactorily repaired and maintained:

- As far as possible avoid 'no maintenance' products, such as uPVC components, which cannot be repaired.
- Be wary of complex assemblies with components from many different manufacturers, whose replacement parts may be difficult to source.
- Select products and materials whose maintenance avoids the use of harmful chemicals or high energy consumption (eg heat / electricity).

Road Maintenance in Sutherland

To facilitate timber extraction in Sutherland, the Council and the Forestry Commission used bales of recycled tyres to replace the sinking embankment over a 100m stretch of the B 871 single-track road between Bettyhill and Kinbrace. The road had sunk into a hollow due to its deep peat base. As well as providing a stable running surface for traffic, the new construction eliminates the need for continual resurfacing using bitumen-based material to maintain road levels in the peat.

9 Encourage sustainable transport choices

Your Design Statement should demonstrate:

- how the development will be accessed by those without a car;
- what facilities will be provided for cyclists;
- what measures will be adopted to reduce and mitigate the impact of road traffic.

Key Themes:

One of the overarching principles of encouraging sustainable transport choice is to choose an appropriate location for development ➔ **2.1 Choose an appropriate site.** In addition, the following key themes apply and will be addressed in this guidance note:

1. **Plan how people will travel to and from the development,** for instance, by preparing a Travel Plan and where appropriate, a Safer Routes to School Travel Plan.
2. **Create high quality pedestrian and cycle routes,** to conveniently connect the places people want to access – particularly local schools and large workplaces.
3. **Provide facilities for cyclists** to use roads safely and park bicycles securely.
4. **Link into public transport networks** to ensure that sites are accessible.
5. **Reduce the impact of road traffic** by designing road layouts and car parks so that vehicle traffic does not inconvenience users of other forms of transport.

Background

The large distances between settlements in many parts of the Highlands means that good transport links are essential for economic well-being and social inclusion. Although car ownership is often seen as a necessity for many in rural areas, fuel costs are high and over 30% of Highland residents have no access to a car. Ideally, facilities should be accessible by other forms of transport.

Encouraging sustainable transport choices does not necessarily mean excluding cars, but it does seek to minimise the number of car journeys by making public transport, cycling and walking at least as convenient as car use, and more so where possible. The Land Reform (Scotland) Act 2003 provides for Local Authorities to work with SNH, landowners and other partners to establish a core-path network throughout relevant parts of rural Scotland, which should, in certain locations, make walking more convenient. The Council has a duty under this Act to draw up and adopt a plan of core paths for the Highland area, which the Planning and Development Service's Access Team is currently working to deliver.

The choice of location and layout for new housing, retail and industrial developments has a major influence on travel patterns. Large developments should be located so as not to depend exclusively on car access. They should also be designed to limit the impact of associated commercial and industrial transport. A development with well-integrated transport links is likely to be a popular place to work and visit.

In many parts of the Highlands the viability of many forms of transport is limited, which means that achieving sustainable transport solutions may not be easy. Developers will, however, be expected to promote sustainable transport options as far as these are applicable to the particular location.

The guidance in the chapter is mainly applicable to developers of large housing, commercial, tourism or industrial projects. Some of the principles addressed, however, apply to all new development. Those designing a home for themselves and assuming they will access services by car are therefore encouraged to take account of this guidance in ensuring that they could still do so if their car is temporarily unavailable.

The Highland Structure Plan (2001) states that proposed developments will be assessed on the extent to which they:

- are accessible by public transport, cycling and walking as well as car;
- maximise energy efficiency in terms of location;
- promote varied, lively and well-used environments which will enhance community safety and security and reduce any fear of crime.

9.1 Plan how people will travel to and from the development

To make appropriate provision for sustainable transport options, developers are encouraged to:

- Carry out a Transport Assessment, predicting how many people will travel to and from the site and by what means.
- Prepare a Travel Plan based on this assessment.
- Where appropriate, incorporate a Safer Routes to School Travel Plan, targeting all categories of road user.

More details on preparing Transport Assessments and Travel Plans are given in The Guide to Transport Assessment in Scotland. ➔ **Appendix A: Useful Resources.**

Broad guidelines include:

- Consult the Council's Planning officers and Transport officers at an early stage. Transport Officers can offer confidential pre-application advice about likely traffic impacts. They can also advise on the level of detail to use in a Transport Assessment, and on what methodologies to apply. Traffic-flow statistics for some locations may be available at a charge.
  ➔ **Appendix A: Useful Resources**
- Make contact with the Northern Constabulary's local Road Safety Officer and, where appropriate, the Council's Safer Routes to School Team.
  ➔ **Appendix A: Useful Resources**
- Take account of travel patterns related to informal recreational activity in and around the development; contact the Council's Access Team for advice on actual or potential patterns of recreational use in the area.
  ➔ **Appendix A: Useful Resources**
- If a site is being developed in phases (for example, a major housing development), consider the whole project rather than treating phases in isolation.

Transport Assessment

A development that is likely to have a significant transport impact (regardless of the size of the development), will require a detailed Transport Assessment that addresses:

- the number of people likely to access the site by different modes of transport;
- assessment of predicted impact on safety, congestion, environment, local accessibility, parking and local community;
- in some cases, a Cycle Audit and Review, to assess existing and potential cycle routes in the vicinity of the development;
- proposed measures to influence transport choices.

This information should be used as the basis of a site Travel Plan, which ensures that a full range of competitive, convenient travel options is available and that people travelling to and from the development are made aware of them. For employers this could include, for instance, the promotion of car-sharing or work transport schemes.

- Show the proposed proportion of trips made by each mode of transport, known as 'Modal Share Targets', for the development, and how they will be met. These targets should aim to avoid adverse transport impacts, but they must be realistic if congestion is not to increase.
- Address freight movements in the Travel Plan. Where possible, seek to reduce trips and especially night runs, by encouraging businesses to share a common carrier, or by using fewer suppliers and / or local suppliers. Where practical seek to use rail freight.
- Once a Travel Plan is in place, monitor the results and adjust measures accordingly.

9.2 Create high quality pedestrian and cycle routes

Pedestrians and cyclists should have safe and convenient access to facilities and ideally links to public transport services. Rigid segregation from other traffic is not always the most appropriate solution. Pedestrians and cycle routes should also support informal recreation in and around the development. Where development is located close to the local core path network, routes should link to and reinforce this network as far as possible. Follow these guidelines when designing pedestrian and cycle routes:

Provide pedestrian and cycle routes to link dwellings with play spaces, bus stops, schools, shops and other community facilities. Also consider what routes are needed to support informal recreation in and around the development.

Pedestrian and cycle routes should meet the 'Five C' principles:

- **Connect** to the places people want to go;
- **Convenient** and direct, with crossings that are easy to use;
- **Convivial** and attractive, well lit, overlooked and feeling safe;
- **Comfortable**, being wide enough for expected pedestrian traffic;
- **Conspicuous**: being easy to find and follow.

Cycling by Design

The Scottish Executive's *Cycling by Design* guidance advocates the following hierarchy of treatment to accommodate cycle routes, on the assumption that the existing and future road network should form the basis for cycle infrastructure:

1. **Traffic reduction**
2. **Traffic calming**
3. **Junction treatment and traffic management**
4. **Re-allocation of road-space**
5. **Cycle lanes and cycle tracks**

➔ **Appendix A: Useful Resources**

Ensure that new developments have good pedestrian links into existing areas of a town or village and, where relevant, the Highlands' new core-path network. For more information on this network contact the Council's Access Team.

➔ **Appendix A: Useful Resources.**

Where it is appropriate to light a pedestrian or cycle route, select light fittings that direct light towards the ground to avoid light pollution. These routes do not require highway-standard lights.

➔ **3.3 respect the character of towns and villages**

Design pedestrian routes to meet the needs of those with reduced mobility or pushing prams and pushchairs: provide appropriate surface materials for wheelchairs/ pushchairs, adequate width and level platforms on ramps; incorporate seating at appropriate intervals; avoid steep gradients and use different colours to highlight changes in gradient.

➔ **1.2 Support social inclusion**

Position pedestrian and cycle entrances to new developments close to existing pedestrian and cycle routes and crossings, to provide convenient access.

Ensure that new crossing facilities are suitable for all users. Raise road crossing points to the level of the pavement to emphasise the crossing to road users, calm vehicle traffic, and accommodate wheelchair and pushchair users. Where this is not possible, use dropped kerbs.

Ensure that access routes into developments are safe for cyclists, with cycle-friendly junctions that place cyclists in the normal field of view of vehicle drivers. Seek advice from the Council's Transport Officers. Where possible, provide links to off-road cycle routes. Consult Cycling Scotland for information on the existing cycle route network.

➔ **Appendix A: Useful Resources**

9.3 Provide facilities for cyclists

For detailed technical information about providing facilities for cyclists, refer to the Scottish Executive's *Cycling by Design* guidance ➔ **Appendix A: Useful Resources**.

In broad terms:

Integrate cycle parking into the streetscape. Cycle parking should be:

- covered, well signed, well lit and overlooked for security;
- designed for easy parking and release of cycles;
- easily accessible and close to the entrance of the building it serves.

Incorporate secure internal cycle parking into housing and office development. In housing development, provide enough space for cycle maintenance and for visitors to secure their

bicycles without obstructing other residents.

- In workplaces, provide showers for cyclists where possible and locker space to store clothing, equipment etc.

9.4 Link to public transport networks

The viability of public transport services depends on the pool of potential users. To ensure that new development links to and reinforces public transport networks, developers are advised to:

- Consult and involve public transport operators from the outset when planning to develop housing, industrial, retail, leisure and tourism schemes that could generate large numbers of journeys.
- Site every new house within 400m (5 minutes walk) of a road suitable for buses.
- Include safe and convenient sites for bus stops, particularly on school routes. Provide bus turning facilities in large developments so that a bus route can start to become established before the development is complete.
- Where practical, link new industrial and commercial development to rail or water transport.
- Where possible, design new development to strengthen public transport links for tourists – 20% of tourists in the Highlands use public transport, and on some rural bus routes high tourist use supports year-round services that are vital to the local community.
  ➔ **Guidance 1: Enhance the Highland's economy and communities**

9.5 Reduce the impact of road traffic

Vehicle parking and use should not dominate an area, or inconvenience users of other forms of transport. The technical requirements for the design of roads, parking areas, bus access and so on are set out in the Council's publication *Road Guidelines for New Developments.*
➔ **Appendix A: Useful Resources.**

Housing developers are encouraged to integrate Home Zones into the design and layout of the development, which can enhance the quality of life for residents and provide an attractive selling point for a new development. A Home Zone is a street or group of streets designed primarily to meet the interests of pedestrians and cyclists rather than motorists, so that the street is opened for social use. Detailed information about Home Zones is available on the Home Zone website.
➔ **Appendix A: Useful Resources**

Observe the following guidelines when designing vehicle parking and roads:

- Do not allow road layouts to dictate the positions of buildings or pedestrian routes. Avoid positioning roads where they might form a barrier to interaction between parts of a community on opposite sides of the road. Plan the development with a view to how and where it will be used for informal recreation.
- Minimise the need for parking by choosing the site carefully and promoting alternative forms of transport and car sharing where appropriate. Providing too much car parking space will discourage the use of other modes of transport. Parking provision has to be adequate enough, however, to prevent unsafe vehicle parking on nearby streets. The provision of parking for developments serving rural areas will differ from that within built-up areas. Seek advice from the Council's Transport officers.
  ➔ **Appendix A: Useful Resources**
- When designing space for car parking:
  - Provide designated parking bays for drivers with disabilities.
  - Integrate car parking areas into the landscape design.
  - Mark car parking bays clearly where cycle routes run close to car parking areas to minimise the hazard to cyclists.
- Design large areas of hard standing to enable rainwater to infiltrate the soil so that it does not contribute to flooding. ➔ **6.3 Install sustainable drainage systems**
- Adopt appropriate traffic calming measures through careful site layout, for instance:
  - Integrate a Home Zone into the development ➔ **Appendix A: Useful Resources**
  - Design residential roads so that vehicle users are obliged to drive slowly and carefully, allowing the road to be used for play and social activity.
  - Carefully site trees and bushes, seating and parking areas to avoid designating the main

part of the road exclusively for vehicle users.

- Avoid creating through-traffic routes that may tempt heavy use by non-residents by constructing roads to the minimum size, alignment and standard for the intended traffic movement.

- Locate and design new loading and unloading bays so that the paths of freight traffic and pedestrians do not conflict.

© Ormlie Community Association

Ormlie Home Zone, Thurso

A Home Zone is a street or group of streets designed primarily to meet the interests of pedestrians and cyclists rather than motorists, so that the street is opened for social use.

Scotland's most northerly Home Zone is located at Ormlie, an estate of 354 households on the edge of Thurso that was built in the 1960s. The Ormlie Home Zone was introduced following extensive consultation with local residents, amid concerns for child safety on the estate.

The HomeZone plans were drawn up by the community in partnership with The Highland Council, Highland Health Board, Caithness and Sutherland Enterprise and the Northern Constabulary. The proposals were aimed to:

- Re-design and reallocate road space to reduce traffic speed.
- Create child-friendly play areas.
- Encourage greater use of street space by the community.

A new children's playground opened in January 2003, followed by the installation of a speed table and two new entrance features to the estate. Future improvements will include new planting and play areas, speed tables and chicanes, and shared road surfaces to replace the separate carriageway and footpath.

DESIGNING FOR SUSTAINABILITY – AN OVERVIEW

What is it?

In the context of this guidance, designing for sustainability refers to maximising the social and economic benefits of new development while minimising its negative environmental impact by factoring in these considerations from an early stage in the preparation of a design proposal. For a development to be sustainable, it must take account of long-term implications of design decisions, such as the wellbeing of communities and building users; running costs; waste disposal; conservation of scarce and finite resources; and maintaining a healthy environment.

Why do we need sustainable design?

Sustainable design produces healthy, comfortable environments to live and work in that reinforce the viability of communities and safeguard the natural and cultural heritage. It also distributes a significant proportion of expenditure on and from development within the local economy, rather than investing remotely in goods and services or removing economic activity from the area. Developments designed for sustainability have a key role to play in improving the quality of life of Highland communities because they:

- make use of locally-sourced goods and services, which has a positive outcome for wider economic development;
- make efficient use of water, energy and building materials by minimising waste, which can have significant cost savings;
- use fewer resources than conventional development, resulting in lower water, energy and waste costs, and can be cheaper to insure;
- make use of natural and renewable building materials that are easily maintained;
- Are healthy to live and work in because they are well-ventilated and avoid the use of materials containing toxic chemicals;
- make use of the natural environment for shelter and solar gain;
- contribute to the wider economic, social and environmental wellbeing of the Highlands.

Sustainable design also limits the negative impact of new development, which currently has significant drawbacks in the way it is designed and constructed. For example:

- Construction waste makes up approximately 57% of all waste sent to landfill in the Highlands, a significantly greater portion than any other sector, even household waste which contributes approximately 22%.
- Buildings currently consume more than 50% of total primary energy use in the UK, generating a substantial proportion of greenhouse emissions, which exacerbate climate change.
- Climate change is forcing a re-think about how and where new development should take place, as scientists predict warmer, wetter conditions, more frequent extreme weather events and a rise in sea levels.

By using resources wisely, minimising waste and mitigating climate change, sustainable design maintains the healthy environment that we need to safeguard economic development and maintain a good quality of life for everyone, now and in the future.

The wider benefits of sustainable design

Highland communities gain

- Homes that are designed for sustainability are more comfortable and healthier for their occupants than conventional houses;
- Energy efficient houses are economic to heat and can eliminate fuel poverty.
- Developments are designed to be accessible to all sectors of the community.
- Buildings are designed to cope with site-specific risks, such as flooding.
- A cleaner environment brings better health and quality of life.
- A conserved cultural heritage from which local communities can benefit socially and economically.
- A stronger economy brings more and better jobs for local people.

Highland businesses gain

- Buidings are cheaper to heat and can be easily maintained.
- Designing for efficiency from the start is cheaper than making modifications later.
- Healthy office buildings result in greater employee productivity.
- Environmental risk is reduced, which may influence insurance premiums in the future.
- Taking sustainability seriously will enhance the reputation of a business.
- The wider economy benefits.

The Highland environment gains	**The Highland economy gains**
• Native plants and animals can flourish. • New buildings fit the character of the towns and villages where they are sited. • Energy efficient buildings minimise energy use thereby limiting their contribution to global warming. • Scarce materials are conserved. • Land, water and air pollution are minimised. • The quality of the Highland landscape and the natural and cultural heritage remains unspoilt.	• Industries such as farming, fishing, forestry and tourism thrive on a healthy environment. • Creating a market for sustainable goods and services diversifies and strengthens the economy. • Fewer resources are wasted and unnecessary transport costs are avoided. • Highland businesses, jobs and skills are supported. • It is cheaper to avoid environmental risks than to clean up afterwards.

Reconciling social, economic and environmental objectives

It is important to emphasise that the sustainable design process involves striking a balance between social, economic and environmental objectives, some of which inevitably compete with each other. For instance, the economic benefit of sourcing all construction materials locally would have to be compromised if a planning applicant chooses to use imported renewable energy components to minimise fossil fuel use.

In using this guidance, developers should aim to choose the combination of measures most effective for a particular project. While all suggestions presented are practical and achievable, some may be mutually exclusive, and others may not be possible due to specific site conditions, proposed use or budget constraints. Design solutions will vary from development to development according to use, scale and context. The best design for one area might be unsuitable for another and there are no hard and fast rules for how developments will be assessed. Planning applicants are encouraged to develop a sustainable design solution that meets the needs of their particular circumstances and present the reasoning for this in their Sustainable Design Statement.

Using "Environmental Assessment" as a sustainable design tool

In this context, environmental assessment refers to the use by developers of a standard assessment method to minimise the negative environmental impact of development. While the Council recognizes and values the benefits of this design approach and is keen to encourage its use, it is important to bear in mind that developments will be assessed on the extent to which the design integrates environmental considerations with social and economic objectives. The Council is nevertheless pleased that an increasing number of developers are integrating environmental assessment into the design process.

Originally developed to assess office design, **BREEAM** (BRE'S Environmental Assessment Method) is now the most commonly used method of evaluating the environmental performance of new and existing buildings in the UK. Environmental performance is measured in terms of energy and water consumption, transport access, construction materials, pollution effects, impact on ecology, health and wellbeing, and the overall management of the facility while in use. The assessment allocates credits in each performance area, which are then weighted according to environmental impact to produce an overall score. The location of the development can also attract credits if, for example, the site is close to public transport. The design is then awarded a BREAAM rating of UNCLASSIFIED, PASS, GOOD, VERY GOOD or EXCELLENT, which takes account of the overall score.

In addition to offices, BREAAM has been extended to cover a wide range of building types, including homes (the **BREEAM/EcoHomes** assessment), industrial units, retail units and schools. Other categories of building such as leisure centres and laboratories can be assessed using a bespoke version of BREEAM. More information is available on the BREEAM website.

➔ **Appendix A: Useful Resource List**

Sustainability and cost

One of the most common barriers to designing for sustainability is the perception that the development will cost more than a conventionally designed scheme. A growing number of studies show, however, that by factoring in sustainability objectives from an early stage in the design process, developers can achieve significant improvements in the performance of a building for little or no additional cost, and this in turn can reduce running costs significantly.

The City of Edinburgh Council's recently published *"Sustainable Design Guide"* presents useful information on the relative difference between the cost of sustainable and non-sustainable options for a wide variety of building materials. ➔ **Appendix A: Useful Resource List**

Another study recently published by the BRE Trust, entitled *"Putting a Price on Sustainability"*, presents a detailed comparison of the actual cost of environment-conscious designs (using BREAAM ratings from PASS to EXCELLENT) with conventional solutions across four building types – a house, a naturally ventilated office, an air conditioned office and a PFI-procured healthcare centre.
➔ **Appendix A: Useful Resource List**

The study compared, for example, the cost of:

- Reducing the environmental impact of construction materials (eg substituting timber windows for uPVC).
- Minimizing energy use (eg increasing insulation levels beyond the Building Standards, using low energy lighting).
- Reducing pollutants (eg installing the least polluting condensing boiler).
- Reducing water consumption (eg installing low-flush toilets and providing for rain-water recycling).

Three types of location were considered for each building type (POOR, TYPICAL, GOOD). Location is an important consideration in achieving a high BREAAM rating because the assessment takes account of site characteristics such as good access to public transport, whether the site has been previously built upon, or has a high ecological value. To achieve equivalent BREEAM ratings a building in a "typical" location needs a better environmental performance than a building in a "good" location.

The study showed that in some circumstances, high BREEAM ratings can be achieved at a lower cost than conventional building methods. The following table presents the % increase / decrease over conventional construction costs to achieve a **BREEAM "VERY GOOD"** rating for each building type:

Building Type	**% increase (or decrease) over conventional build costs to achieve a BREEAM "VERY GOOD" rating**		
	Poor location	Typical location	Good location
House:	3.1	1.7%	1.3%
Naturally ventilated office:	2.0%	(- 0.3%)	(- 0.4%)
Air conditioned office:	5.7%	0.2%	0.1%
PFI-procured healthcare centre:	_	0%	0%

In all cases predicted running costs over the lifetime of the buildings fell as a result of introducing energy and water-saving measures. The range of "in-use" cost savings were identified as follows:

Building Type	**% decrease in "in-use" costs compared to conventional build** (across the range of BREEAM "PASS" to "EXCELLENT")
House:	6% - 40%
Naturally ventilated office:	17% - 71%
Air conditioned office:	26% - 55%
PFI-procured healthcare centre:	3% - 10%

Whole Life Costing

Whole Life Costing (WLC) is a tool used by developers and building professionals to compare the financial cost of different design solutions. WLC takes account of both the up-front capital costs of construction and operational ("in-use") costs. The benefit of a "whole life cost" approach to design is that it highlights so-called false economies in development costs. A typical example is the use of a conventional electric heating system supplied from the national grid (eg storage-heaters), which is relatively cheap to install but significantly more expensive to operate than a "wet" heating system run on woodfuel, oil, or gas. A WLC analysis would demonstrate that, in most cases, the higher installation cost of a woodfuel, oil or gas system is a better investment than electric heat. Although financial cost is by no means the only driver in sustainable design, it is a significant

consideration, and planning applicants are encouraged to take account of the WLC approach from an early stage in the preparation of a design proposal.

Life Cycle Assessment

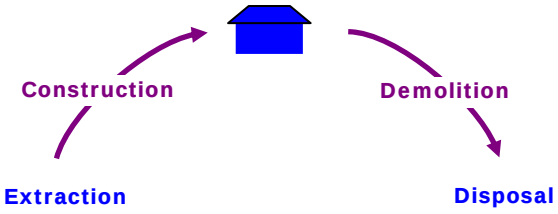
Life Cycle Assessment (LCA) is a method used to measure the environmental impact of construction materials, components and processes by evaluating the energy and raw materials used and released to the environment over their life cycle. LCA should not be confused with Whole Life Costing (discussed above), which assesses the financial cost of construction and ownership. Although very relevant to improving the sustainability of design and construction, LCA is a relatively complex process, which for the time being is generally only applied to large-scale developments. The Forestry Commission recently produced an introductory leaflet on LCA for construction products, targeted at manufacturers and specifiers.

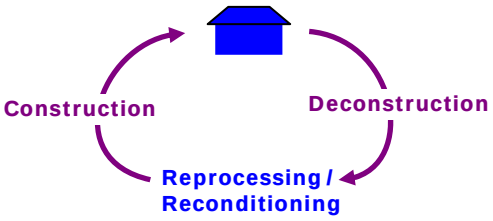
➔ **Appendix A: Useful Resource List**

All buildings can, however, be designed to minimise negative environmental impact across their life-cycle by making the construction, servicing, management and dismantling as cyclical as possible - as illustrated below:

CONSTRUCTION AND DECONSTRUCTION

Instead of using newly extracted, highly processed materials that get buried in landfill sites when the building is demolished…

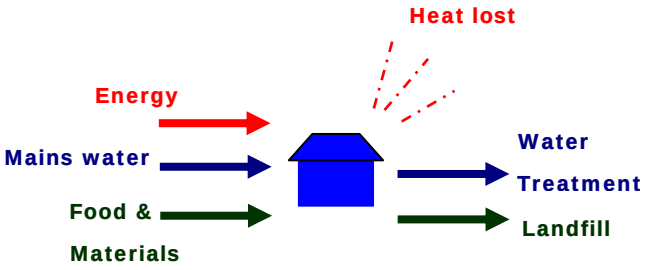




….. sustainable design makes use of materials that are renewable, responsibly re-used or recycled, or obtained from a sustainably managed source. In addition, the structure is designed to be easily deconstructed so that materials and components can be maintained and /or salvaged for re-use as appropriate.

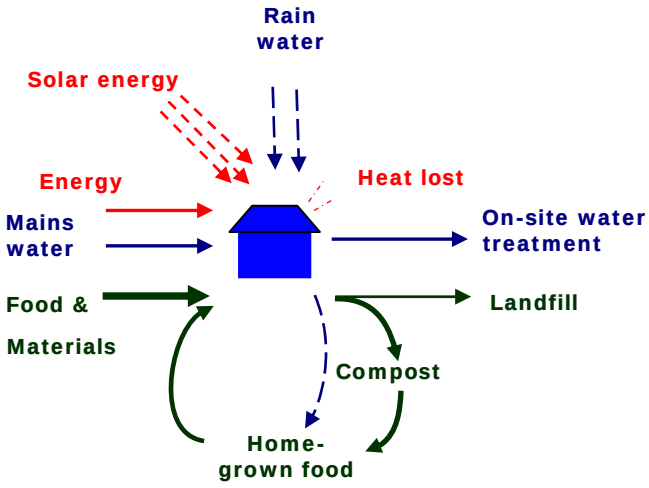
BUILDING SERVICES AND RESOURCES

Buildings that have no measures in place to conserve energy or water use more resources and require more waste treatment than buildings designed to minimise waste and consumption.



Sustainable design makes best use of a site by, for example:

- **reducing energy consumption through insulation and passive solar design;**
- **reducing water consumption through efficiency and re-use;**
- **converting waste material such as wastewater or compost into a resource that can be recycled in-situ rather than disposed of off-site.**



Appendix A: Useful Resource List

Sustainable Design Statements

Planning Advice Note 68: Design Statements	Copies can be requested through the Scottish Executive Planning Helpline on 08457 741741 or downloaded from the Planning and Building area at http://www.scotland.gov.uk

1 Enhance the Highlands' economy and communities

Housing for Varying Needs: a design guide	Web version available at http://www.official-documents.co.uk (Departmental Papers 2002 section, under Communities Scotland)
The Joseph Rowntree Foundation website has a guide to **Lifetime Homes** standards, which aim to ensure that a new home will meet the needs of most households.	http://www.jrf.org.uk (Housing and care section)
Secured by Design is a UK Police initiative, setting out principles on how to design for community safety.	http://www.securedbydesign.com (SBD Design Guides section)
Community Self-Build Scotland provides information, education, advice, assistance, training and development services to Self-Build Groups in Scotland.	http://www.selfbuild-scotland.org.uk/

2 Make best use of site

For advice on Listed Buildings and Conservation Areas, refer to the Planning and Development Service's leaflets, or contact the Council's **Conservation Architect.**	Planning and Development Service, Council Buildings, Glenurquhart Road, Inverness IV3 5NX Phone 01463 702281 E-mail: john.duncan@highland.gov.uk
For advice and guidance notes on contaminated land, refer to the Planning and Development Service's leaflet on Contaminated Land, or contact the Council's **Environmental Health Officers** (Contaminated Land).	Transport, Environmental and Community Services, Council Buildings, Glenurquhart Road Inverness IV3 5NX Phone: 01463 702500 E-mail: TECS@highland.gov.uk
Planning Advice Note 33: Development of Contaminated Land	Copies can be requested through the Scottish Executive Planning Helpline on 08457 741741 or downloaded from the Planning and Building area on http://www.scotland.gov.uk
The UK Government's biotechnology website, **BIO-WISE**, includes information on the techniques and costs of biological	http://www.biowise.org.uk

remediation of contaminated land.

The Scottish Building Standards Agency maintains an **online sustainability guide to Home Improvements** for householders, including guidance on improving energy efficiency, conserving water, preventing waste and minimising the impact of refurbishment on the environment.	www.sbsa.gov.uk/homeimprovements
eco-refurbishment – a guide to saving and producing energy in the home*;* Peter F Smith. Practical design guide for homeowners, designers and architects showing how the principles of environment-conscious design can be adapted and used in the refurbishment of domestic buildings.	Published by the Architectural Press, 2004; purchased from their website: www.architecturalpress.com Linacre House, Jordan Hill, Oxford OX2 8DP Phone 01865 474010

3 Design within the Highland context

The Highland Council Archaeology Unit maintains the **Highlands Sites and Monuments Record**. The Unit can also supply a list of Approved Archaeology Contractors and Consultants, and can advise on conserving and managing historic sites, monuments and cultural landscapes.	Planning and Development Service, Council Buildings, Glenurquhart Road, Inverness IV3 5NX Phone: 01463 702250 E-mail: Archaeology@highland.gov.uk
PASTMAP is a website containing a map-enabled query system for Scottish National Archaeological and Architectural Datasets, including Listed Buildings, Scheduled Ancient Monuments, the National Monuments Record of Scotland and Historic Gardens and Designed Landscapes.	http://jura.rcahms.gov.uk/PASTMAP/start.jsp
Planning Advice Note 36: Siting and Design of New Housing in the Countryside **Planning Advice Note 44:** Fitting New Housing Development into the Landscape	Copies can be requested through the Scottish Executive Planning Helpline on 08457 741741 or downloaded from the Planning and Building area at http://www.scotland.gov.uk
Scottish Natural Heritage (SNH) can provide Landscape Character Assessments. **Constructed Tracks in the Scottish Uplands** is a good practice guide to minimising the effect on natural heritage of track construction, management and use. (Natural Heritage Management publications)	http://www.snh.org.uk/pubs/ Scottish Natural Heritage Publications Unit, Battleby, Redgorton, Perth PH1 3EW Phone: 01738 444177 pubs@snh.gov.uk
Advice on development affecting Scheduled Ancient Monuments and Listed Buildings is available from **Historic Scotland**. Historic Scotland also can provide information on all aspects of conserving cultural heritage. Along with **SNH**, it maintains the **Inventory of Gardens and Designed**	Historic Scotland, Longmore House, Salisbury Place, Edinburgh EH9 1SH Phone: 0131 668 8600

Landscapes in Scotland

The Planning Response to Climate Change: Advice on Best Practice (Sept 2004) is a joint publication from the Office of the Deputy Prime Minister (OPDM), Scottish Executive and Welsh Assembly	Download from: http://www.odpm.gov.uk/embedded_object.asp?id=1144498
Adapting to Climate Change: a checklist for development is a handbook for developers, produced by the Three Regions Climate Change Group (November 2005)	Download from: http://data.ukcip.org.uk/resources/publications/documents/150.pdf

4 Conserve and enhance the biodiversity of the Highlands

The Highland Council has established a Highland Biodiversity Partnership to make progress on key strategic biodiversity issues across the Highland Council area and provide guidance and support to the existing network of local biodiversity groups. For more information contact The Council's **Biodiversity Officers.**	Planning and Development Service, Council Buildings, Glenurquhart Road, Inverness IV3 5NX Phone 01463 702274 mailto:janet.bromham@highland.gov.uk mailto:jonathan.willet@highland.gov.uk
Eight **Local Biodiversity Action Plans** have been prepared for the Highland Area.	Download from: http://www.highlandbiodiversity.com/
The **Highland Biological Records Centre** (Inverness Museum Records Centre) holds a wide range of data on Highland wildlife, with particular emphasis on mammals and invertebrates. The centre offers and enquiry service; library; reference collections; access to a network of local expertise.	http://www.highlandbiodiversity.com/htm/bio_recording/centre.php Jon Watt (Natural Scientist) Inverness Museum and Art Gallery Castle Wynd Inverness IV2 3EB Phone: 01463 237114 E-mail: jonathan.watt@highland.gov.uk
For information and advice on trees, refer to the Planning and Development Service's leaflets on: • Tree Preservation Orders and Conservation Areas; • Trees and development; • Tree planting; and • Tree care and management, or contact the Council's **Forestry Officers.**	Planning and Development Service, Council Buildings, Glenurquhart Road, Inverness, IV3 5NX Phone 01463 702285 robert.patton@highland.gov.uk nick.richards@highland.gov.uk denis.torely@highland.gov.uk
BSI publishes: **BS 3998:** Recommendations for Tree Work **BS 5837:** Guide for Trees in Relation to Construction.	BSI Customer Services 389 Chiswick High Road, London W4 4AL Phone: 020 8996 9001 Order online at http://www.bsi-global.com
Scottish Natural Heritage (SNH) runs the Natural Heritage Futures programme to promote integrated management of the natural heritage. Assessments of the natural heritage resource by region are available on CD-ROM or online.	http://www.snh.org.uk/futures/Data SNH Publications, Battleby, Redgorton, Perth PH1 3EW Phone: 01738 458613

The **Town and Country Planning Association** document **Biodiversity by Design** is aimed at providing guidance on how to maximise opportunities for biodiversity in the planning and design of sustainable communities.	http://www.tcpa.org.uk/downloads/TCPA_biodiversity_guide_lowres.pdf
The **Scottish Wildlife Trust** provides information sheets on Scottish animal species.	http://www.swt.org.uk Cramond House, Cramond Glebe Road Edinburgh EH4 6NS Phone: 0131 312 7765
UK Biodiversity Action Plan website lists Local Biodiversity Action Plans and includes reports and guidance on biodiversity.	http://www.ukbap.org.uk
The Business and Biodiversity Resource Centre focuses on how businesses can conserve and enhance biodiversity.	http://www.businessandbiodiversity.org Earthwatch Institute (Europe) 267 Banbury Road, Oxford OX2 7HT Phone: 01865 318800
The **National Biodiversity Network** contains data on the distribution of species.	http:/www.searchnbn.net
The Scottish Biodiversity Forum publication **Best Value and Biodiversity in Scotland** contains some Planning case studies.	www.scotland.gov.uk/library5/environment/bvbs-00.asp
CIRIA publishes **Working with Wildlife Compliance and Beyond in Construction** and the **Working with Wildlife Pocket Book.**	http://www.ciria.org
The **Business Environment Partnership**, based in Midlothian, is able to offer biodiversity advice to businesses and has produced a sustainability guide for small businesses.	www.thebep.org.uk
The SNH publication **Scotland's Wildlife: The Law and You** outlines wildlife protection legislation. SNH also has publications on **Bats and People, Badgers and Development, Conserving Scotland's Water Vole** and **Otters and Development.**	For details of availability see SNH website: http://www.snh.org.uk/publications
Froglife publishes the **Great Crested Newt Conservation Handbook** which is available online.	http://www.frpglife.org/Handbook%20PDF/GCNCH.htm
The **British Trust for Ornithology** has information on nest boxes for birds.	Download from: www.bto.org
The **Forestry Commission** produces various Practice Guides in relation to biodiversity issues.	Download from: http://www.forestry.gov.uk Forestry Commission Publications PO Box 25 Wetherby West Yorkshire LS23 7EW Phone: 0870 121 4180
Scottish Badgers website	http://www.scottishbadgers.org.uk

Bat Conservation Trust website	http://www.bats.org.uk

5 Minimise energy use

The Carbon Trust provides free, sector-specific factsheets, a telephone helpline and expert advice on saving energy to business and public sector organisations. Various publications are available on the site including GPG 303, "*The designer's guide to energy-efficient buildings for industry*".	The Carbon Trust Energy Home Phone: 0800 085 2005
The Carbon Trust programme, through **Sustainable Energy Ltd**, also includes fully funded consultancy for newbuilds and refurbishment building projects under the 'Design Advice' scheme.	Funded energy advice Phone: 029 20408990
The **Scottish Community and Householder Renewables Initiative (SCHRI)** provides factsheets, advice and grants for renewable energy installations.	http://www.est.org.uk/schri/ Phone: 0800 138 8858
The **Centre for Alternative Technology** sells a range of books and factsheets about household renewable energy and other aspects of practical sustainable living.	http://www.cat.org.uk Centre for Alternative Technology, Machynlleth, Powys, SY20 9AZ Phone: 01654 705950
The **Energy Saving Trust** (EST) produces a wide range of publications on energy efficiency in housing design, including: • Best Practice in new housing – a practical guide; • Passive solar estate layout; • Passive solar house designs; • New and renewable energy; technologies for existing housing; • Renewable energy sources for homes in rural environments; • Building your own energy efficient house (GPG 194); • The Hockerton Housing project. The EST website also provides a support pack for Planners on delivering on-site sustainable energy in Scotland.	http://www.est.org.uk/bestpractice http://www.est.org.uk/housingbuildings/calculators/plannersupportpack/ Energy Saving Trust HELPLINE: 0800 512012
The **Scottish Solar Energy Group** website has basic information on the use of solar techniques in Scotland.	http://www.sseg.org.uk
The **British Wind Energy Association** website carries wind energy factsheets, a list of suppliers and consultants, and a database of average windspeeds across the UK	http://www.bwea.com Phone: 0207 689 1960
The **National Energy Foundation** encourages use of sustainable and green sources of energy, by promoting renewable energy, providing information and advice and signposting relevant trade associations.	http://www.natenergy.org.uk/ http://www.greenenergy.org.uk Phone: 01908-665555

The **British Hydropower Association** website has basic information on evaluating a hydro site and a list of references, suppliers and consultants.	http://www.british-hydro.org British Hydropower Association Unit 12 Riverside Park, Station Rd, Wimborne, Dorset, BH21 1QU Phone: 01202 886622
CADDET (Centre for Analysis and Dissemination of Demonstrated Energy Technologies) carries reports on commercial applications of renewable energy, and a suppliers database.	http://www.caddet.org
The Highland Energy Efficiency Advice Centre offers an extensive range of expertise in energy efficiency and related topics.	Highland Energy Advice The Highland Council, Kinmylies Building, Leachkin Road, Inverness IV3 8NN Freephone: 0800 512 012
Forestry Commission Scotland runs a **Woodfuel Development Programme**, which provides support and advice towards the establishment of clusters of woodfuel suppliers and users throughout the Highlands and Islands.	Rebecca Carr, Woodfuel Project Officer Forestry Commission Scotland, Fodderty Way Dingwall IV15 9XB Phone: 01349 866004 mailto:rebecca.carr@forestry.gsi.gov.uk
Insulation for Sustainability – A Guide A study by XCO2 Conisbee Ltd, showing why and how buildings should be well-insulated and energy-efficient, and discussing the criteria for choosing which insulation material and design of insulating systems.	http://www.insulation.kingspan.com/newdiv/pdf/IfS%20Summary.pdf
Enhanced Capital Allowances (ECAs) enable a business to claim 100% first-year capital allowances on investments in energy saving technologies and products. For details see the ECA website.	http://www.eca.gov.uk/

6 Design to conserve water

The **Construction Industry Research and Information Association (CIRIA)** publishes technical guidance on Sustainable Urban Drainage Systems. Its website has an informative overview of the subject.	http://www.ciria.org.uk/suds CIRIA, Classic House, 174-180 Old Street London EC1V 9BP Phone: 020 7549 3300
Scottish Environment Protection Agency has several information leaflets on SUDS, downloadable from the publications area of its website.	http://www.sepa.org.uk SEPA Corporate Office, Erskine Court Castle Business Park, Stirling FK9 4TR Phone: 01786 457700

7 Design in sustainable waste and sewage facilities

For advice on the provision of recycling and waste collection facilities in new development, contact the Council's **Waste Management Team.**	Transport, Environmental and Community Services, Ross House, High Street, Dingwall IV15 9QN Phone: 01349 868527

Scottish Environment Protection Agency Pollution Prevention Guidance Note PPG 4: Disposal of sewage waste where no mains drainage is available. Downloadable from guidance section of SEPA website.	http://www.sepa.org.uk SEPA Corporate Office, Erskine Court, Castle Business Park, Stirling FK9 4TR Phone: 01786 457700
Supplementary Development Advice Note – **Managing Waste in Housing and Commercial Development** provides straightforward guidance to developers on the inclusion of waste management and recycling facilities in new developments and on minimising and recycling waste during the planning and construction process.	http://www.wascot.org.uk/news/january/news-310105_3.htm Developed by Clackmannanshire, Falkirk and Stirling Councils, with the Scottish Waste Awareness Group.

8 Use sustainable materials

The **Association for Environment Conscious Building** publish a useful magazine and their website has information about sustainable materials. It also produces ***The Real Green Building Book,*** a directory of all AECB members summarising their expertise and activity, which is free with AECB membership.	AECB, PO Box 32, Llandysul, SA44 5ZA http://www.aecb.net/
Green Building Products and Services Directory. Hall, K. and Warm. P. 4th Edition.	Published by the Green Building Press, Nant-y-Garreg, Saron, Llandysul, Carmarthenshire, SA44 5EJ
Green Building Handbook. A guide to building products and their impact on the Environment. 1st Edition 1997.	Published by T J International, Padstow, Cornwall.
Wood.forgood's publication ***Building Sustainably With Timber*** provides advice on the sustainable use of timber in house building, with particular reference to BRE's "Ecohome" assessment method.	Download from: http://woodforgood.com/bwwpdf/BSWT.pdf Wood.forgood, 211 High Road, London N2 8AN FREEPHONE: 0800 279 0016 E-mail: info@woodforgood.com
Timber Cladding in Scotland. Highland Birchwoods 2002. Technical information on the sustainable use of external timber cladding in construction that is specifically relevant to Scottish conditions.	Published by ARCA Publications Ltd, and available to download off the Scottish Executive website: http://www.scotland.gov.uk/library5/housing/tcis-00.asp
WWF-UK's publication ***Window of Opportunity*** highlights the environmental benefits of specifying timber window frames.	Download from: http://www.wwf.org.uk/filelibrary/pdf/windows_0305.pdf WWF-UK, Panda House,Weyside Park, Godalming, Surrey GU7 1XR Phone: 01483 426444

Scottish House, Gaia Research, 2001 A review of recent experience in building individual and small groups of houses with a view to sustainability, the use of traditional and new materials, and innovative design.	Published by The Stationary Office, 71 Lothian Road, Edinburgh (tel. 0870 6065566) and available to download off the Scottish Executive website: http://www.scotland.gov.uk/cru/kd01/orange/shar-00.asp
Sustainable Housing Design Guide for Scotland. Stevenson, F and Williams, N, 2000, prepared for *Scottish Homes* (now *Communities Scotland*). Guidance for housing providers on dealing with specific issues of sustainability and housing.	Published by The Stationary Office, 71 Lothian Road, Edinburgh (tel. 0870 6065566) Now available on the following link: http://www.archive2.official-documents.co.uk/document/deps/cs/shdg/biblio/
sust.org is a Scottish website about sustainable design, with an on-line Green Directory signposting information on sustainable materials.	http://www.sust.org/
WRAP (Waste and Resources Action Programme) is a not-for profit company supporting the delivery of government targets to minimise waste and increase recycling. Relevant publications include: • Opportunities to used recycled materials in building; • Opportunities to use recycled materials in house building; • Construction Product Guide: Recycled Content of Mainstream Products; • Procurement Guide.	http://www.wrap.org.uk/wrap_corporate /about_wrap/index.html The Waste and Resources Action Programme The Old Academy 21 Horse Fair Banbury Oxon OX16 0AH Helpline: 0808 100 2040 Switchboard: 01295 819 900
Relevant **BRE** publications: • BRE Green Guide to Specification; • BRE Green Guide to Housing Specification; • BRE methodology for environmental profiles of construction materials.	BRE, Garston, Watford WD25 9XX Phone: 01923 664000 http://www.bre.co.uk/
Scottish Ecological Design Association (SEDA) is a professional membership organisation that advocates ecological design, providing information, advice and raising awareness through events, site visits, study tours and publications. It is working to establish a web gateway on sustainable design and building materials.	SEDA Membership Secretary, The Library Wing, Abbey St. Bathans Duns, Berwickshire TD11 3TX. E: seda@freezone.co.uk and www.seda2.org
The City of Edinburgh Council's **Sustainable Design Guide** provides a systematic approach to sustainable material specification.	Download in six parts from: http://www.edinburgh.gov.uk (Sustainable Development Unit publications)

9 Encourage sustainable transport choices

For information on the Highlands' new **Core Path Network** and to contact the Council's **Access Team.**	http://www.highland.gov.uk/leisure/countryside/countrysideaccess/Accesscontacts.htm Planning and Development Service, Council Buildings, Glenurquhart Road, Inverness, IV3 5NX Tel: (01463) 702282
The Highland Council's **Road Guidelines for New Developments, Highland Cycling Strategy, Highland Road Safety Plan** and **Local Transport strategy for the Highlands** are available on the publications section of the Council website.	Download from: http://www.highland.gov.uk/yourenvironment/roadsandtransport/roads/roadguidelinesfornewdevelopments.htm
The **draft Guide to Transport Assessment** (2003), **Scottish Executive's Guidance on Safer Routes to School** and **Road Safety by Design** is available from the Consultations areas of the Scottish Executive website.	http://www.scotland.gov.uk
Cycling by Design, available from the Publication areas of the Scottish Executive website, gives technical guidance on designing cycle facilities.	http://www.scotland.gov.uk
The Cyclists' Touring Club publish **Cycle Friendly Infrastructure: Guidelines for Planning and Design**	CTC, Cotterell House, 69 Meadrow Godalming, Surrey GU7 3HS Phone: 0870 873 0060
The **National Cycling Strategy** website has many useful links and guidance on planning for cyclists.	http://www.nationalcyclingstrategy.org.uk
The **Cycling Scotland** website has information on the existing cycle route network.	http://www.cyclingscotland.com/
The **Home Zone News** website has information and links to resources on home zones.	http://www.homezonenews.org.uk

Designing for sustainability – an overview

BREEAM, BRE's environmental assessment method, assesses the environmental performance of new and existing buildings for a range of building types. **EcoHomes** is the method used for dwellings.	http://www.breeam.org/ **BREEAM Office**, BRE, Bucknalls Lane, Garston, Watford WD25 9XX T 01923 664462 E-mail breeam@bre.co.uk
Life Cycle Assessment for Construction Products: an introductory guide for manufacturers and specifiers Booklet available from the Forestry Commission	Available to download from: http://www.forestry.gov.uk/PDF/fcms018.pdf/$FILE/fcms018.pdf Forestry Commission Scotland Woodlands, Fodderty Way Dingwall IV15 9XB Phone: 01349 862 144

Putting a Price on Sustainability
BRE / Cyril Sweett, 2005 published by BRE Bookshop for BRE Trust. This publication presents detailed comparison of the actual cost of environment-conscious designs with conventional solutions across four building types.

http://www.brebookshop.com/

BRE Bookshop, BRE, Garston, Watford, Herts WD25 9XX

The City of Edinburgh Council's ***Sustainable Design Guide*** provides a systematic approach to key sustainability issues such as energy, water, and material specification, including the relative difference between the cost of sustainable and non-sustainable options for a wide range of building materials.

Download in six parts from:
http://www.edinburgh.gov.uk
(Sustainable Development Unit publications)

Appendix B: Glossary

Archaeological Site – Archaeological sites include the more obvious and visually impressive sites, monuments and buildings, as well as smaller features, historic gardens and designed landscapes. Archaeological sites also include sites associated with folklore, place names, historical events or people, or sites mentioned in literature or shown in paintings, of which no trace may now survive.

AGLV – Area of Great Landscape Value, defined by local authorities to protect locally or regionally important landscapes.

Biomass – Living matter. Also refers to energy technologies fuelled by anything derived from plant or animal matter including, for example, wood, straw or agricultural waste.

Blackwater – Wastewater from toilets.

Brownfield site – A site that has previously been built on or otherwise used industrially.

Conservation Area – An area of 'special architectural or historic interest', with a character or appearance that it is desirable to preserve or enhance. It is an offence to demolish buildings, key features of buildings, or high walls, railings or gates in Conservation Areas unless Conservation Area Consent is obtained from the Council.

Cultural Heritage – the qualities and attributes of places that have archaeological, aesthetic, historic, scientific or social value for past, present or future generations.

Development Plan – A Local Authority's policies and proposals for the development and use of land in its area. In Highlands it consists of a *Structure Plan* and several *Local Plans.*

Designated Area – An area officially designated as being of particular scenic, wildlife or scientific value (see *SSSI*, *NSA*, *SPA* etc.).

Embodied Energy – The energy required to produce a product, including the procurement of raw materials, manufacture, transport, construction, maintenance and repair.

Environmental Impact Assessment – An assessment of the projected impact that a larger-scale development may have on the local and regional environment.

Greenfield site – A site previously undeveloped except for agricultural use.

Greywater – Wastewater from washing, bathing and laundry – i.e. all household waste water except for toilet waste.

Highland Sites and Monuments Record – A list of nearly 40,000 sites of archaeological interest, including 1,200 scheduled Ancient Monuments, maintained by the Council's Archaeology Unit.

Historic Scotland – the agency responsible for safeguarding Scotland's built heritage and promoting its understanding and enjoyment.

HomeZone – A street or group of streets designed primarily to meet the interests of pedestrians and cyclists rather than motorists, opening up the street for social use.

Leachfield – A drainage system designed to discharge septic tank effluent below ground into the natural soil for disposal and final treatment by soil-borne bacteria and organisms. Also known as an absorption field.

LA21 – Local Agenda 21. A strategy for local action for sustainable development, arising from the 1992 "Earth Summit" in Rio and requiring local authorities to adopt a Local Agenda 21 strategy and incorporate sustainable development into all aspects of their work.

LBAP – Local Biodiversity Action Plan, prepared by local partnerships of interested organisations and individuals to determine local priorities for biodiversity and to ensure that national plans for habitats and species are implemented at a local level.

Listed building – A man-made structure judged by Historic Scotland to be of special architectural or historic interest. Significant alterations to Listed Buildings require Listed Building consent from the Council.

Local Plan – The Council's detailed policies to guide development in a particular area, including proposals for specific sites.

Modal Share Targets – Targets for the proportion of journeys taken by different modes of transport (bus, train, foot, private car, bicycle etc.). Modal share targets are often specified in Travel Plans.

Natura 2000 – The network of sites across the European Community designated for protection as Special Areas of Conservation (SAC) and Special Protection Areas (SPA).

Natural Heritage – The landscape, habitat and wildlife of an area. The term is not restricted to officially designated or remote areas.

NNR – National Nature Reserve, nationally or internationally important nature conservation areas declared by SNH.

NSA – National Scenic Area, nationally important areas of outstanding natural beauty. The original NSAs were identified by the former Countryside Commission for Scotland (now Scottish Natural Heritage) in 1978. Scottish Natural Heritage is responsible for designating new NSAs.

Priority species – Species highlighted in the UK Biodiversity Action Plan as a priority for nature conservation/biodiversity.

Protected species – European Protected Species: animals and plants protected under the Conservation (Natural Habitats, &c.) Regulations 1994, which implements the Habitats Directive (EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna).

Ramsar sites – Wetland sites designated for conservation under the Ramsar Convention on Wetlands of International Importance. Often these sites are also considered for classification as SPAs, but even if they are not the same considerations are applied to their protection in Scotland.

SAC – Special Area of Conservation, designated under the EU Habitats Directive.

Scheduled Ancient Monument – An archaeological monument of national importance that is legally protected under the Ancient Monuments and Archaeological Areas Act 1979. Alterations to Scheduled Ancient Monuments must be approved by Historic Scotland.

Semi-natural habitat – Areas where there has been some management of the land but where native plants and animals still occur.

Scottish Natural Heritage (**SNH**) – the agency responsible for securing the conservation and enhancement of Scotland's natural heritage.

SPP – Scottish Planning Policy (supersedes NPPGs or National Planning Policy Guidelines). SPPs set out the Scottish Executive's policy on nationally important land use and other planning matters, such as transport, natural heritage, land for housing, shopping and town centres.

SPA – Special Protection Area, designated under the EU's Wild Birds Directive.

SSSI – Sites of Special Scientific Interest, designated in accordance with the UK Wildlife and Countryside Act (1981) as being biologically or geologically important. They can include land, freshwater and inter-tidal areas.

The Highland Structure Plan – The document that presents the vision of how the Highlands should develop in very broad terms over a period of 10 years and beyond, setting out the strategic framework for the use of land and showing the scale and direction of development required to meet the needs of the region for jobs, houses and services, in a manner that safeguards and enhances the environment.

Thermal Mass – Solid or liquid material that absorbs and stores warmth and coolness, thereby reducing temperature swings inside a building. Denser materials have higher thermal mass.

Traffic Impact Assessment – An assessment of the traffic impact associated with a new development, with emphasis on vehicle trips rather than person trips and no consideration of how to encourage more sustainable transport patterns.

Transport Assessment – An assessment of the impact of a new development on travel and transport needs. It should highlight ways in which transport can be made more sustainable, especially reducing the impact of vehicular traffic.

Travel Plan – Measures to reduce the amount of vehicle traffic associated with a development by promoting a wider range of more environmentally friendly and healthy transport options.

U-value – A measure of the rate that heat is lost through a material. The lower the U-value, the better its insulation properties.

Wildlife corridor – A physical link between otherwise isolated habitat areas, enabling wildlife to move across potentially hostile areas. Ideally, the corridor itself can provide shelter, protection, food and breeding sites. Hedges, shelter belts, ditches and – in urban areas – features such as old rail lines can serve as wildlife corridors.

Appendix C:

1. Housing for Varying Needs

The following supplementary guidance identifies specific measures for housing design that can be taken to accommodate residents of differing age and physical ability:

1. Ensure there is a step-free route around the site, where possible keeping gradients gentle.
2. Avoid gravel driveways.
3. Provide step-free access for wheelchair users, with entrance doors at least 800mm wide, passages wide enough for the chair and space in which to turn around easily.
4. Place windows so that seated people can see out. Ensure that windows can be operated by people of various heights.
5. Ensure that the heights and depths of kitchen work surfaces are not inaccessible to wheelchair users, or can be adjusted to be accessible.
6. Design internal staircases so that a stair lift can be economically fitted if required at a later stage.
7. Make sure that double bedrooms have enough space for twin beds.
8. Lay out the accommodation so that there is a room on the ground floor that could be used as a bedroom if required, and so that a through-the-floor lift could be installed without major structural alterations.
9. Incorporate adequate and accessible storage space. For family dwellings, include space to store a pram away from circulation areas.
10. Use slip-resistant floor finishes.
11. Use lever handles rather than doorknobs.
12. Placing electrical outlets and switches higher than skirting-board level is helpful for most users. Ensure that they are in accessible locations, easily identifiable and reachable from wheelchairs.
13. Design electrical and plumbing services to be adaptable, for example by allowing space behind skirting boards so that extra wiring could be installed in response to the requirements of increased technology in the home, or by laying out the drainage so that an extra shower could be added in an entrance-level WC.

2. Fire Safe Design

The following supplementary guidance identifies specific measures to safeguard against injury and death from fires, particularly in dwellings:

All fires start small so if detected soon enough, and fought immediately, they take surprisingly little water to come under control. Allowed to grow unhindered, conditions can become un-survivable within as little as 2 minutes. Quick response is the key.

It is commonly perceived that fire deaths occur in public places or in industrial accidents but the America Burning Report (1973) demonstrated that in the US over 75% of fire casualties occur in the home. UK statistics also reflect this pattern. The America Burning Report included in its recommendations the installation of residential fire sprinkler systems.

Alternative Fire Suppression Systems to fire sprinkler systems include Water Mist, Deluge and Inert Gas Installations.

Fire Sprinklers

- Without sprinklers, the first signal of a fire might be the sounding of a smoke alarm, or an alert from someone who has spotted the fire. The Highland and Islands Fire and Rescue Service is called and should be present in 10 minutes or less. However fires today grow very rapidly - probably because of the amount of foam and plastics we use in our furnishings - so by the time the Fire Appliance arrives, the fire will have had some considerable time to get a hold. By this time a small fire could have become a major one.
- To ensure that a Fire Sprinkler system will operate properly and successfully in the event of a fire, it must be correctly designed, installed and subsequently maintained. It is therefore essential that a specification is used that has been tried and tested and proved to provide the level of protection desired.
- In the UK the design, installation and maintenance of fire sprinkler systems is currently covered either by
  - BS 251 for domestic and residential property and
  - BS 5306 for industrial and commercial installations.

  In addition to these Standards the Loss Prevention Council have issued a series of LPC Rules, which provide further guidance.

  European Standard EN12845 is in the process of replacing BS5306.

  In many parts of the world NFPA Standards are accepted. NFPA 13 covers industrial and commercial installations; NFPA 13D covers domestic installations and NFPA 13R covers residential installations.
- The design, installation and maintenance of all fire sprinkler systems should only be carried out by properly trained, qualified and experienced contractors. The FSA also supports 3rd-party Certification of Installers where greater assurance is required. This can be achieved either through FIRAS (Warrington Certification) for Residential Installers or through LPC (BRE Certification) for Industrial/Commercial Contractors.
- Further information on installing residential sprinklers can be obtained from:

  The Residential Sprinkler Association, Mill House, Mill Lane, Padworth, Reading RG7 4JX or www.firesprinklers.org.uk

Upgraded Smoke Detection

The current minimum standard of fire detection required to comply with the Technical Standards of the Building Regulations provides an alarm of fire only when smoke reaches the escape routes. This gives the minimum possible escape time to the occupants. It may not give alarm to those sleeping in a room where fire starts.

The Highland and Islands Fire and Rescue Service believe that smoke detectors should be fitted in all living areas, bedrooms, halls and landings, with the exception of kitchens and bathrooms. This system will give you the earliest possible alarm of fire and the best opportunity to escape. However, it will not fight the fire.

The system should be powered by mains electricity, with a battery back-up power supply and be interlinked so that one detector sensing smoke will sound all the others.

This system, which complies with British Standard BS5839, Part 6: LD2, can be most economically installed when the house is being built.

APPENDIX D:

Protecting and Enhancing Biodiversity

In the UK protection of key wildlife species and habitats is provided for by a variety of legislative documents, in particular:

- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended SSI 2004 No 475);
- Badgers Act 1992 and the Wildlife; and,
- Countryside Act 1981 (as amended).

The following additional guidance focuses on measures that a developer can take to identify, protect and enhance wildlife habitats, and the species they support. Several of these measures may be easier to apply on larger sites, but many are equally relevant to small projects such as individual houses, which can make a positive contribution to biodiversity.

Identifying wildlife on or near the site:

1. Check trees for the presence of bats and red squirrels, especially old broadleaf trees close to ponds for bats, and old conifers for squirrels.
2. Check watercourses and nearby habitats for the presence of wildlife, for example otters or water voles, especially where the watercourse is relatively undisturbed, has a mix of pools and riffles, and is adjacent to woodland.

Design and management considerations:

3. Avoid destruction of semi-natural habitats such as hedgerows, wetland and meadow habitats, areas of native wildflowers and grasses and woodland. These habitats support key species in the food chain, and their loss in recent years has caused many bird populations to plummet.
4. Take care not to cut wildlife corridors that link habitat areas – this can reduce a species' range so that animals would have to compete with too many others for resources. Where this happens, whole groups of animals can disappear after development of sites that had appeared to have little wildlife value.
5. If semi-natural habitats border the site, see whether it is possible to enlarge them when landscaping the site or designing sustainable drainage systems. Create wildlife corridors where possible: animals such as deer, badgers, red squirrels and hedgehogs all benefit from corridors linking woodlands, agricultural land, hedgerows and wild areas. (The exception to this rule is on the south and east boundaries of the Highlands where care must be taken when extending existing broadleaf corridor, which could threaten the survival of red squirrels by attracting grey squirrels into the area.)
6. Avoid crossing watercourses, altering the water flows in ponds, burns and wetland areas, or canalising or culverting burns, which can damage biodiversity, prevent barriers to fish movement and significantly alter the character of the site.
7. When landscaping, avoid invasive foreign plant species that may invade adjacent habitats. This is a potential problem where new housing developments are sited near protected habitats. Seeds from garden waste can invade these habitats.
8. Encourage locally common species - for example those identified in the Local Biodiversity Action Plan - by designing habitats that incorporate the trees and other plants they need at various stages of their life cycle. For specific suggestions about how to do this, contact the Council's Biodiversity Officers.
9. Support a variety of species by establishing various new habitats appropriate to the area, for example areas of open water of varying depths, native woodland, rough pasture, or short grass areas.
10. When construction has been completed, ensure that the management of the property respects existing habitats, taking account of the movement of wildlife through the site and its seasonal requirements.

The construction phase:

11. Before construction commences:

- Agree a surface water management plan with Planning Officers to deal with water run-off containing sediments or other contamination from building work
- Fence off sensitive habitats and ensure that subcontractors understand which areas need to be protected. To ensure compliance, write this requirement into contracts.
- On large projects consider appointing an Ecological Clerk of Works to oversee measures to protect species and habitats.

12. During construction, take the necessary measures to avoid run-off of untreated sediments and contaminants, following SEPA Pollution Prevention Guidelines available on the following link: http://www.sepa.org.uk/guidance/ppg/index.htm

13. Protect trees while working by avoiding physical damage to branches, trunk and particularly roots. Use protective fencing throughout the construction phase. Ensure that soil characteristics and roots are not altered by excavation, raised soil levels, oil spillage, changing water tables or site drainage. Keep vehicles and plant away from trees – compaction can cause irreparable damage to roots.

14. Where relevant, work with neighbouring developers to take account of impacts that go beyond the boundaries of the site.

15. Consider the impact of off-site associated infrastructure such as access tracks, sewage and drainage arrangements, which indirectly could have a negative effect on valuable habitats.

APPENDIX E:

Renewable Energy Technologies

The **Scottish Community and Householder Renewables Initiative (SCHRI)** provides householders and communities with factsheets, advice and grants for renewable energy installations. http://www.est.org.uk/schri/ FREE PHONE: 0800 138 8858.

In the Highlands, the community component of this scheme is administered by the Highland and Islands Community Energy Company, http://www.hie.co.uk/community-energy.html

Table A:	**Comparison of renewable energy technologies that are suited to use in the Highlands**				
Technology:	**Installation Cost**	**Running cost**	**Constancy of supply**	**Principal Environmental Impacts**	***Consents**
Photovoltaic roof panels	High	Low	Intermittent	Visual	
Small wind turbine	Medium	Low	Intermittent	Visual, slight noise	
Micro-hydro	Medium	Low	Some storage possible	Possible effect on aquatic ecosystems	Abstraction License
Solar water heating	Medium	Low	Intermittent	Visual	
Wood-chip burner	Medium	Medium	Can store fuel	Air emissions, fuel transport	
Heat pump	Medium	Medium	Constant	Slight noise	

* Consult your local Area Planning Office for advice on which of these renewable energy systems require planning permission.

Renewable energy options suited to development in the Highlands include:

1. **Wood fired boilers and stoves**: Across Scotland, the use of wood-fired boilers for space heating is increasing, utilising technology that is widely established in Austria and Scandinavia where boilers are fed by logs, pellets or wood chips. Space heating with wood is relatively cheap, but requires dry fuel, a reliable supplier and adequate storage space for the fuel.

   Government grant aid is supporting the rapid development of a woodfuel supply chain and it is likely that more widespread use will be made of this technology in coming years. The use of low-grade timber to fuel boilers is steadily increasing in the Highlands although for the time being woodchips, rather than pellets, are the only woodfuel available. Chips can be used in automated systems that need refilling only once or twice a week.

   Wood fuel in the form of logs for stoves is already in plentiful supply. Wood burning stoves are usually used as space heaters, but can be fitted with a boiler to heat water and / or central heating systems. The space heating needs of a small house that is suitably well-insulated can be met by a central heating system served by one or two wood-burning stoves.

2. **Photovoltaic (PV) roof panels**: PV panels convert daylight directly into electricity. They need to be installed within 90° of due south and although they produce power on cloudy days,

they will not function if they are overshadowed. PV installations are often used as a supplementary power source to mains electricity, thereby reducing the need to consume electricity generated from a non-renewable source. Their electricity output varies over the course of the day, making battery storage necessary for stand-alone installations. Although the capital cost of installing PV systems are sometimes considered prohibitive, the pay-back period to recover costs is steadily decreasing due to the rising costs of fuel and electricity.

3. **Solar Panels (including solar powered water heating):** Solar panels are amongst the most cost-effective domestic renewable energy systems and are particularly suited to providing domestic hot water in Highland conditions. In general they are not suited to providing space heating. A solar panel installation commonly consists of one or more solar collectors located in a sloping roof to attract direct sunlight. The degree of offset from due south is not as critical as for photovoltaic panels and systems installed within even 45^{o} of due south can provide a significant contribution to hot water demand. The solar collector is a highly insulated box that uses captured warmth from the sun to heat water, which is delivered through a pipe to the hot water storage cylinder. A typical solar-powered hot water system will meet 30% to 70% of annual domestic hot water demand.
4. **Wind turbines**. Domestic-scale wind power is particularly suitable for off-grid locations but because wind is an intermittent source of power some form of energy storage – such as a battery – is required. Alternatively, install a back-up source of power. A number of UK manufacturers are developing roof-mounted **micro wind turbines** for household use, which can reduce consumption of electricity supplied from the grid.
5. **Micro-hydroelectric schemes**: Often referred to as "run-of-river" schemes, these generate a steady supply of electricity provided there is enough water to power them. Usually the supply is only sufficient to meet electricity, not heating, needs. Often they need to be accompanied by a small reservoir that stores water for times of low rainfall. Micro-hydro schemes will require an Abstraction License from SEPA.
6. **Ground Source Heat Pump system**: This consists of a ground heat exchanger, a heat pump that runs off electricity, and heat distribution system. This system extracts heat from the ground, exploiting the fact that ground temperatures are steadier throughout the year than air temperatures (ie warmer in winter and cooler in summer). The system works to transfer heat from one place to another and from a lower temperature to a higher temperature, in the opposite way to a refrigerator. A ground source heat pump requires adequate ground area and appropriate conditions for a trench or borehole to accommodate the heat exchanger, which is typically a loop or coil of pipe buried vertically or horizontally in the ground. These systems are used primarily for space heating, and in some cases to pre-heat hot water. They work best for underfloor heating, though radiator systems can be used. The capital cost of installation is relatively high and they are most cost-effective when combined with high levels of insulation.

APPENDIX F:

Sustainable Urban Drainage Systems (SUDS)

The following guidance on designing and managing a SUDS system supplements the information provided in Guidance 6: Design to conserve water.

➔ **6.3 Install sustainable drainage systems**

1. Take account of following factors when designing a SUDS system:
    - site characteristics and slope
    - rainfall
    - volume of surface water expected during storms
    - catchment area
    - soil type
    - area available for soakaways, ponds etc.
    - landscaping, wildlife and public amenity issues.
2. Incorporate 'filter strips' – vegetated surface features – into hard landscaping to slow water run-off from slopes and aid infiltration of water into the soil. Filter strips should preferably be located near the upstream end of a drainage system where they can intercept run-off before it becomes too concentrated.
3. Provide storage for stormwater in an underground infiltration trench (usually stone-filled) or surface infiltration basin (a 'dry pond') so that it gradually infiltrates into the subsoil and eventually the water table. The amount of water that infiltration devices can handle depends on the rate at which water naturally flows through the local soil. Ensure that there is an emergency overflow for extreme rainfall events that exceed the capacity of the reservoir.
4. Consider using ponds – wet or dry – to detain storm run-off for a few hours to allow sediments to settle. Wet ponds retain some volume of water at all times, which can prevent unsightly exposure of the collected sediment. They can also help to filter out impurities in the water.
5. Ensure that inlet and outlet structures are carefully designed to maximise the performance of the pond, and ensure that collected sediment is regularly removed from the inlet sump.
6. Construct wetlands - shallow areas planted by marsh and aquatic vegetation – for more effective treatment and attenuation of large storm flows in relatively small areas. A complex ecology can be built up that purifies the water by removing nutrients and contaminants.

    ➔ **7.2 Treat sewage sustainably**

    ➔ **Appendix G: Sustainable Sewage Treatment**
7. Educate homeowners and employees about the way the site is drained. Identify and mark all drainage pipes and access points as either foul or surface water.
8. Implement a regular maintenance schedule to clean and maintain drainage pipes and equipment.

APPENDIX G

Sustainable Sewage Treatment

The following guidance on sewage treatment supplements the information provided in Guidance 7: Design in sustainable waste and sewage facilities.

➔ **7.2 Treat Sewage Sustainably.**

1. **Take account of the need to integrate the following factors when specifying a sewage treatment system:**
   - expected load and expected variability of load;
   - available land area;
   - slope of site;
   - level of maintenance that can be supported;
   - ecological sensitivity of the site;
   - budget;
   - power required by the system compared to what is available;
   - likely future uses that the system might have to support.

2. **Consider the following examples of primary, secondary and tertiary treatment:**

PRIMARY TREATMENT	**Purpose:** To remove large particles
Septic tank	A septic tank provides little environmental treatment and needs to be de-sludged and serviced to prevent environmental impact. For guidance on the siting of septic tanks consult the Council's local Building Control Officer. SEPA guidelines recommend that de-sludging should normally take place every 12 months. A septic tank must be accompanied by a soakaway, wetland, solar pond, or vertical or horizontal reed bed that performs secondary treatment.
SECONDARY TREATMENT	**Purpose:** To transform sewage constituents into a stable 'mineral' form, usually by biological means
Wetland Treatment System **Vertical Flow Reedbed**	Wetlands and reedbed systems use plants that absorb minerals and can provide oxygen to micro-organisms that mineralise the sewage sludge. They require a discharge to land or water. If constructed and managed well, these systems yield excellent discharge standards, require only straightforward maintenance, and can be gravity-fed where gradient is sufficient. They also form an attractive landscape feature that uses a diverse range of wetland plants and supports wildlife.
Soakaway	A well-designed soakaway in suitable soil thoroughly cleans the wastewater within about a metre of travel through the soil. A soakaway will become blocked with solids, however, if the septic tank is not de-sludged regularly. If a soakaway gets blocked, it must be rebuilt in a different location to the original.
Willow soakaway	This system uses willow trees to take up water. It is less likely to block than a conventional soakaway because the tree roots keep the soil open, which supports healthy soil ecology. Willows can be coppiced, producing a useful energy crop, and are attractive and good for wildlife.
TERTIARY TREATMENT	**Purpose:** To further improve water quality, using physical, chemical and/or biological methods
Horizontal flow reed bed	Horizontal flow reed beds can be used for tertiary treatment, as they are excellent for removing fine particles of organic matter that may adversely affect watercourses but are too small to be removed in a settlement tank. As with all other systems, they must be constructed and managed well
Wetland Treatment System **Vertical Flow Reedbed**	} *See above*

APPENDIX H

Construct Efficiently and Safely

While it is essential to design to ensure that a building is designed for sustainability, its construction phase also has a significant social, economic and environmental impact and the standard of construction has a direct bearing on building performance. This section highlights the role of the construction process in safeguarding the quality of the Highland environment and the quality of life of Highland communities. To construct efficiently and safely it is necessary to:

1. **Liase with the local community.**
2. **Prevent land and water contamination during construction.**
3. **Design to minimise construction waste.**
4. **Manage construction waste.**

1. Liase with the community

Construction works, especially large projects, can have a considerable impact on their neighbours. Following these guidelines will help to minimise nuisance:

a. Make the safety of the public and site personnel the primary consideration when deciding where to locate site entrances, offices and other facilities.

b. Adhere to the laws covering site safety. For householders and small projects, the Council's Environmental Health Office can give advice. Larger projects fall under the jurisdiction of the Health and Safety Executive. ➔ **Appendix A: Useful Resources**

c. Seek to exceed the standards set by the industry-driven Considerate Contractors Scheme. These include:

- Minimise noise, dirt and inconvenience.
- Eradicate offensive behaviour and language from the site.
- Raise the standards of site management, safety and environmental awareness beyond statutory duties.

➔**Appendix A: Useful Resources**

d. Keep neighbouring residents and businesses informed of the progress on site.

e. Display posters at the site showing names and 24-hour contact details of staff who can be contacted by concerned members of the public.

f. Restrict delivery hours in order to minimise disturbance to neighbours and congestion on local roads.

2. Prevent land and water contamination during construction

If construction will be carried out in or near a watercourse, a method statement for the work must be agreed with the Scottish Environment Protection Agency (SEPA) beforehand. In addition, from 2005 new regulations will be introduced under the EU Water Framework Directive to control river engineering, point and diffuse pollution, abstractions and impounds, which all construction work will have to comply with. Even where there is no formal requirement to consult SEPA, adopting best practice will reduce the likelihood of polluting the environment and the risk of prosecution. Best practice guidance can be found in SEPA's Pollution Prevention Guidelines PPG 6: *Working at Construction and Demolition sites* and PPG 5: *Works in, Near or Liable to Affect Watercourses.* ➔ **Appendix A: Useful Resources.**

Refer to Guidance 4 for measures to avoid damage to wildlife and plants on the site during construction. ➔ **4.2 Minimise disturbance to habitats and species**

Basic steps to prevent contamination during construction include:

a. Discuss pollution prevention measures, strategy and emergency procedures with SEPA at the planning stage.

b. Treat surface water run-off by intercepting silt, oil, petrol, diesel, paint and other potential pollutants. Possible measures include petrol interceptors, balancing tanks, cut-off drains, French drains, silt traps, swales, wetlands or balancing ponds.

c. The system should be retained once construction is complete, to enable on-going management of surface water run-off from roads and car parks. Any SUDS installed during construction (➔ **6.3**) should be completely reinstated before being used for post construction run-off, to ensure that the system is not clogged by silts arising from construction and will continue to perform effectively.

d. Treat surface water run-off as close to the source as possible, to minimise the quantity of water discharged and also the amount of polluting material entering watercourses.

e. Wash tools and equipment away from watercourses. Ensure the water is treated using one of the measures mentioned above prior to discharge.

f. Choose construction plant washing facilities – including wheel washes – that re-circulate water. Where this is not possible, ensure that oil is removed from the washwater and allowed to settle before release.

g. Where ground investigations sink boreholes to establish the soil composition, do not allow the effluent or groundwater to flow into drains or watercourses without treatment.

h. Divert uncontaminated surface water away from the working area, using cut-off drains, fixed shuttering or sandbags, or by damming the flow upstream and pumping it beyond the working area.

i. Take particular care that concrete and cement, and washings from mixing plant, do not enter watercourses. Cement is highly alkaline and corrosive and can damage local ecosystems.

j. Do not use pumps or construction plant in watercourses without prior written approval from SEPA. To gain approval the plant must be secure from leaks.

k. Dispose of chemicals, paint, oil and other hazardous materials at properly designated sites. SEPA can advise on the best disposal routes.

l. Avoid storing potentially-polluting materials near water or where they may be carried into a watercourse.

m. Clearly mark the contents of storage tanks.

n. Locate any oil storage tanks on an impermeable base surrounded by an impermeable bund with no surface water outlet. The bund must be capable of holding at least 11% of the volume of the tanks.

o. Avoid transporting fuel and oil across the site in drums or other containers as far as practicable. Take extreme caution to avoid spillages or leaks.

p. If oil is used on site, maintain stocks of oil absorbent and containment materials on site, and ensure workers know how to use them.

q. Refuel any mobile plant in a designated area with an impermeable surface, away from any drains or watercourses. Check hoses and valves for wear and tear, and never leave a vehicle unattended while refuelling.

r. Use portable toilets or make temporary sanitation connections to a foul sewer, so that sewage will not enter watercourses.

3. Design to minimise construction waste

The Highlands produces 500,000 tonnes of waste every year, over half of it from construction and demolition. Waste is not inherently useless – rather it is resource that has not been used. Minimising it therefore has a direct financial benefit to the developer, especially when transport and disposal costs are considered. Designers can minimise the waste that needs to be dealt with on site by ensuring that the construction process uses materials as efficiently as possible. Guidelines to consider include:

a. Design buildings to fit the site topography, in order to minimise bulk earth movements.

➔ **3.1 Respect existing landscape character**

b. Where possible, re-use any earth that does need to be dug out. Balancing cut and fill on site eliminates transport costs, reduces the amount of soil landfilled and limits the impact on local ecosystems.

c. Where an existing building is being converted, retain as much of the existing fabric as possible, in order to reduce demolition waste.

➔ **2.2 Reuse buildings where possible**

d. Set building dimensions to make use of standard-sized components, to eliminate waste generated by cutting down on site.

e. If the design does require materials to be cut into non-standard shapes, arrange for this to be done off-site in a facility where waste can be more easily controlled.

f. Choose construction methods that will allow the building to be readily deconstructed so that fittings and materials can be reused at the end of their lives.

4. Manage construction waste

Once the project moves into the construction phase, good housekeeping can reduce the waste generated and ensure that it is dealt with appropriately. Practical guidelines include:

a. Provide adequate safe and secure storage for materials, so that they are less likely to get weather-damaged, broken, or stolen.

b. Remove waste from work areas regularly so that it cannot be blown around or off the site. This will also reduce trip hazards, which account for a significant proportion of construction site injuries.

c. Ensure that the main contractor has prepared a Waste Management Plan that identifies:

- types and quantities of waste likely to arise
- how waste produced on site will segregated for reuse or recycling
- who is responsible for managing waste.

d. Make subcontractors responsible under contract, to make proper use of waste segregation facilities.

e. Make sure that site induction for new workers includes instruction on the site's waste management arrangements.

f. Arrange for waste packaging to be returned to suppliers for reuse.

g. Arrange for waste to be collected and removed on a daily basis.

h. Do not bury or burn rubble or other building materials. As far as possible separate site waste into the following categories and take appropriate steps to ensure reuse and / or recycling:

- Unused material (eg left-over flooring, panel products, roof coverings) or, where buildings are under renovation, materials for which salvage markets exist, such as doors, fireplace surrounds or sanitary fittings
- Recyclable materials (such as paper and cans, or rubble that can be recycled into secondary aggregate)
- Bio-degradable material that can be composted.

i. Try to find local uses for reusable materials. This reduces the cost of transporting materials to distant landfill sites and recycling facilities, especially in remote areas. Potential takers may be found through word of mouth, local business associations or community waste projects.

j. It may also be possible to send waste materials such as excess topsoil or broken aggregates to be used on another site with a current planning permission in force. There may be restrictions on waste type and where it can be re-used, and it is best to seek advice from the Scottish Environmental Protection Agency. ➔ **Appendix A: Useful Resources**

k. Take care to ensure that any waste transferred in this way is properly transported and handled at the receiving end to avoid failing in Duty of Care under the Environmental Protection Act 1990.

5. Useful Resource List – Construct Efficiently and Safely

The **Highland Area Waste Plan** can be downloaded from the Initiatives area of the SEPA website.	http://www.sepa.org.uk SEPA Dingwall Office, Graesser House Fodderty Way, Dingwall Business Park Dingwall IV15 9XB Phone: 01349 862021
Scottish Environment Protection Agency Pollution Prevention Guidance Notes are downloadable from guidance area on website. The guidance on 'urban development' may also be useful. PPG5: Works in near or liable to affect watercourses PPG6: Working at construction and demolition sites	http://www.sepa.org.uk SEPA Corporate Office, Erskine Court Castle Business Park, Stirling FK9 4TR Phone: 01786 457700
Considerate Contractors Scheme	http://www.ccscheme.org.uk PO Box 75, Great Amwell, Ware SG12 9UY Phone: 01992 550050
The **Health and Safety Executive** has information about legal requirements and good practice in construction site safety	http://www.hse.gov.uk/construction/ HSE Infoline, Caerphilly Business Park, Caerphilly, CF83 3GG Phone: 08701 545500