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Acute Hospital Project

Forth Valley NHS Board

Environmental Statement

March 2005

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Abbreviations

AADT	Annual Average Daily Traffic Flows
ACOP	A Code of Practice
BGS	British Geological Society
BPM	Best Practicable Means
CDM	Construction (Design and Management)
CEMP	Construction Phase Environmental Management and Monitoring Plan
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
DoS	Degree of Saturation
EC	European Community
EIA	Environmental Impact Assessment
ES	Environmental Statement
FABAP	Falkirk Area Biodiversity Action Plan
FDRI	Falkirk and District Royal Infirmary
FPS	Flood Prevention Scheme
ha	Hectare
IEEM	Institute of Ecology and Environmental Management
ITN	Invitation to Negotiate
LAQM	Local Air Quality Technical Guidance
NHS	National Health Service
NPPG	National Planning Policy Guidance
NTRF	National Road Traffic Forecast
NTS	Non Technical Summary
NVC	National Vegetation Classification
OPA	Outline Planning Application
PAN	Planning Advice Note
PCB's	Polychlorinated Biphenyls
PCU	Passenger Car Unit
PFI	Private Finance Initiative
PPE	Personal Protective Equipment

Abbreviations

PPP	Public Private Partnership
PS	Planning Supervisor
PSC	Public Sector Comparator
RFC	Ratio of Flow to Capacity
RSNH	Royal Scottish National Hospital
SAC	Special Area of Conservation
SEPA	Scottish Environmental Protection Agency
SFSP	Sir Frederick Snow and Partners
SINC	Site of Importance for Nature Conservation
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPP	Scottish Planning Policy
SRI	Stirling Royal Infirmary
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Urban Drainage Systems
SWT	Scottish Wildlife Trust
TA	Transport Assessment
TP	Travel Plan
TPO	Tree Preservation Order
WEEE	White Goods, Electrical and Electronic Equipment

1.1. Introduction

Mott MacDonald was commissioned in September 2004 by Forth Valley National Health Service (NHS) Board to undertake an Environmental Impact Assessment (EIA) of the proposed new Acute Hospital for the Forth Valley area located at the former Royal Scottish National Hospital (RSNH) site in Larbert. This Environmental Statement (ES) has been prepared to accompany the Outline Planning Application (OPA) for the proposed development.

Forth Valley NHS provides health services to a population of approximately 277,000 in a geographical area stretching from the Trossachs in the north-west to the outskirts of Edinburgh in the south-east. Following extensive public consultation and stakeholder engagement an Integrated Healthcare Strategy for the area was agreed by the NHS Board in July 2003 and the strategic direction for the Forth Valley approved by the Minister for Health and Community Care in November 2003. The current situation where services are divided between Stirling and Falkirk Infirmaries is no longer considered sustainable. The decision to centralise acute services on one site, supported by enhanced primary care and community services across the area, marked the end of a long period of uncertainty and met with broad public and political support across the Forth Valley area.

A number of sites were considered and evaluated in detail before the site of the former RSNH at Larbert was selected as the preferred location for the new hospital (refer Section 3 entitled 'Alternatives Considered'). A former mental institution, the RSNH was deemed surplus by Forth Valley NHS in the late 1990's following a steady decline in the number of residents. This reflects the view that long stay hospital care is no longer the most appropriate environment for people with learning disabilities while developments in community services offer more appropriate support for people with disability and their carers. Figure 1.1 shows the main RSNH building, one of several structures on the site marked for demolition.

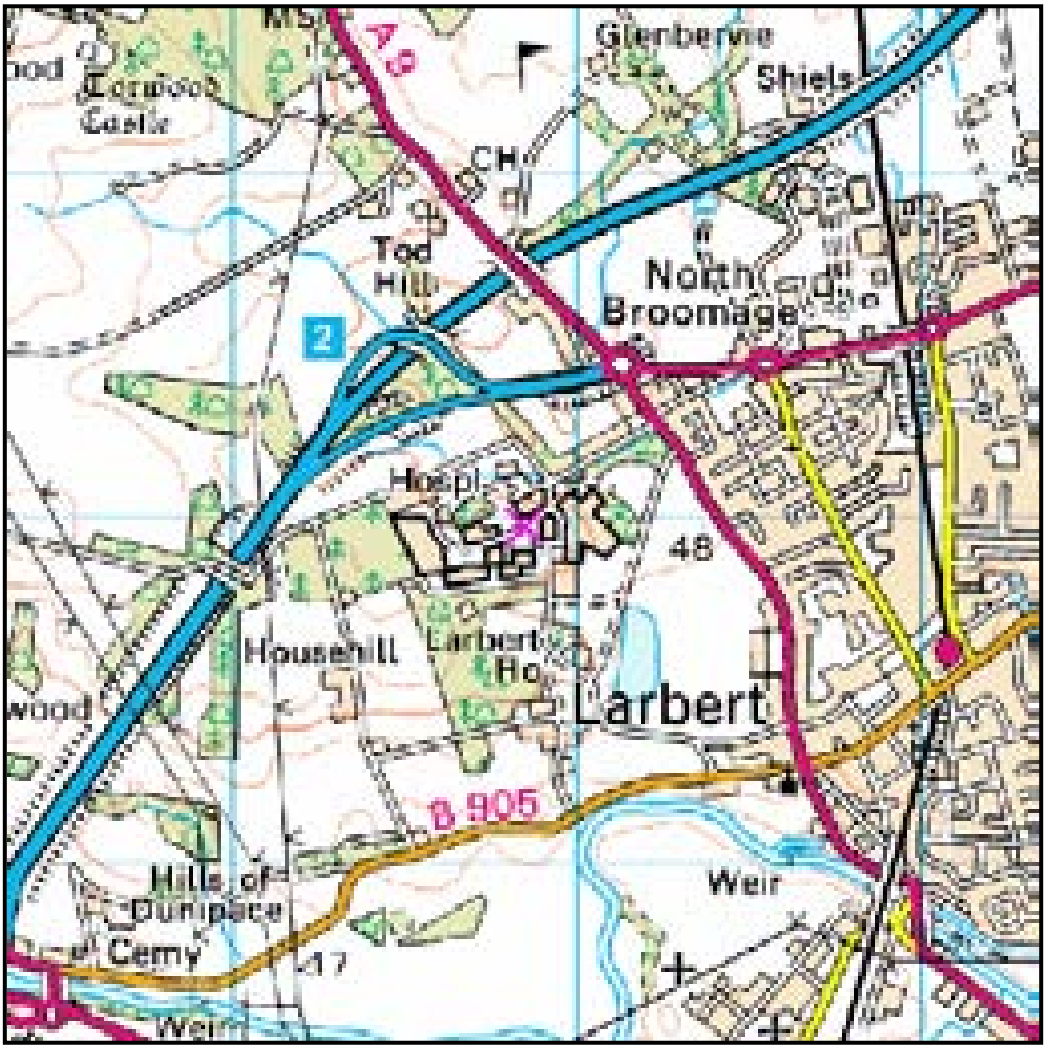
Figure 1.1: Former RSNH Hospital, Larbert

The site is strategically placed in central Scotland, roughly equidistant from Edinburgh and Glasgow, and has direct motorway links with both cities. It is located in a largely parkland setting, extending to some 115 hectares (ha). Around 29ha have been identified as the area within which the new hospital would be developed. A site location plan is illustrated by Figure 1.2.

Procurement of the scheme is being undertaken through Private Finance Initiative (PFI) and at the time of writing this ES the pre-qualification stage is nearing a close. Short-listed developers will be invited to tender in April 2005. It is anticipated that Falkirk Council will be involved in the evaluation of responses.

Due to the extensive nature of the hospital development and importance of the site, the NHS Board worked jointly with Falkirk Council as Planning Authority to agree a Development Framework for the whole site. This identifies other zones on the site outside the area required for the new hospital where there would be the opportunity for other associated developments and improvements to be considered.

Figure 1.2: Site Location Plan



Falkirk Council recently concluded public consultation on the draft Development Framework and the outputs were considered in late November / early December 2004. The Development Framework was subsequently approved in December 2004 and forms the basis of the application for Outline Planning Consent.

1.2. Requirement for an Environmental Impact Assessment

A Scoping Options study undertaken by Mott MacDonald in September 2004 (ref: Scoping Options Report & PSC Development Methodology' paper ref. 213405/Out Doc/022, dated 3 September 2004) identified the need to undertake environmental scoping for an EIA in support of an OPA.

The proposed new Acute Hospital is considered to be a Schedule 2 development under the *Environmental Impact Assessment (Scotland) Regulations 1999* (Scottish Statutory Instrument 1999 No.1), referred to hereafter as the EIA Regulations. For Schedule 2 projects an EIA is not mandatory but may be requested by the respective Local Authority. The requirement for an EIA is dependent on whether a development is likely to have significant impacts on the environment. The EIA Regulations implement the *European Community (EC) Directive No. 85/337/EEC* on the assessment of the effects of certain public and private projects on the environment (commonly known as the EIA Directive) as amended by *EC Directive No. 97/11/EC*.

An EIA will generally be needed for Schedule 2 developments in three main situations:

- Major developments which are of more than local importance;

- Developments which are proposed for particularly environmentally sensitive or vulnerable locations; and
- Developments with unusually complex and potentially hazardous environmental effects.

Falkirk Council requested a formal EIA was undertaken as the development is of more than local importance and it was unanimously agreed by Falkirk Council that an OPA would require an EIA.

Securing Outline Planning Consent is integral to the success of the PFI process in the early stages. The *Development Framework for the Former RSNH Site, Larbert (December 2004)* contains details of the supporting information required by the Council to determine the application.

The reporting of this information together with an indicative development proposal forms the basis of an OPA that should provide sufficient justification of the site chosen, indicative design and function of the proposed development.

Forth Valley NHS has undertaken indicative design work to confirm the robustness and affordability of the scheme, and which will provide a mechanism for benchmarking the Tenderers' submissions. The final design for the scheme will be the responsibility of the successful Tenderer, who will develop the proposals to a level sufficient to support a Detailed Planning Application.

1.3. EIA Process

EIA is a process which identifies the environmental effects (both negative and positive) of a proposed development. It aims to prevent, reduce and offset any adverse impacts and ensures that environmental issues can be taken into account during the design of the project. This involves consultations, data collection and environmental studies to identify the potential effects and propose mitigation measures to prevent, reduce and offset them. The EIA process also identifies any residual impacts following the introduction of mitigation measures. This is reported in an ES which is submitted in conjunction with the planning application.

1.4. The Environmental Statement

This ES sets out the findings of the EIA and forms an important part of the environmental information that will be used by Falkirk Council in their determination of the OPA.

The aim of this ES is to describe the nature of the proposed scheme, the existing baseline environment and to identify and assess those impacts likely to be significant as a result of the scheme and identify measures to mitigate these effects. The ES will also identify any residual impacts. The indicative design has been used, where appropriate, to assist in this process and the points revealed will inform the development of the detailed design to be undertaken by the successful Tenderer.

The ES aims to:

- Draw together in a systematic way an assessment of the likely significant environmental effects of the proposed development;
- Report on the information, studies, techniques and analysis involved in the work;
- Ensure that the likely environmental effects of the proposals and the scope for avoiding or reducing them are properly understood by Falkirk Council, the public and consultation bodies when considering the planning application; and
- Demonstrate that the development proposals have taken full account of the potential environmental effects.

1.5. Structure of the Environmental Statement

The ES is written to accord with the requirements of the EIA Regulations and good practice guidelines. As such, it aims to be comprehensive, objective and easy to understand. However, it is very important to keep in mind that this ES is based upon information available at the time of undertaking. For instance, the PFI process has resulted in the EIA being based on indicative designs only. These designs are likely to change during the PFI process to form a final scheme. Therefore, updated or additional environmental studies may need to be undertaken, as will be specified during the detailed planning phase. The PFI process therefore presents significant constraints to EIA at the OPA stage and causes deficiencies (described in the relevant sections) that will need to be addressed as the process unfolds.

Section 1 defines the need for an EIA and Section 2 describes the proposed development. Section 3 describes the main alternatives to the proposal that have been considered and the reasons for the option chosen, taking into account the potential environmental effects.

Section 4 discusses the Government planning guidance and statutory planning policy context for the proposals and the relevant environmental legislation that has been considered and Section 5 describes the generic assessment methodology and the technical scope of the EIA.

Sections 6 to 14 describe for a range of environmental topic areas, such as 'Transport and Access', the assessment methodologies used, baseline conditions, consultations, potential environmental impacts, proposed mitigation measures and the residual impacts (if any). Section 15 concludes the ES.

1.6. The EIA Team

The EIA was carried out by an experienced consultant team with the following inputs to the ES:

Mott MacDonald: EIA co-ordination; preparation; editing and production of the ES; Policy and Planning Framework; Noise and Vibration; Recreation and Non Motorised User Access; Flora and Fauna; Geology, Soils and Contaminated Land; Water Quality and Resources; Air Quality and Climate; Material Assets and Landscape and Visual Amenity.

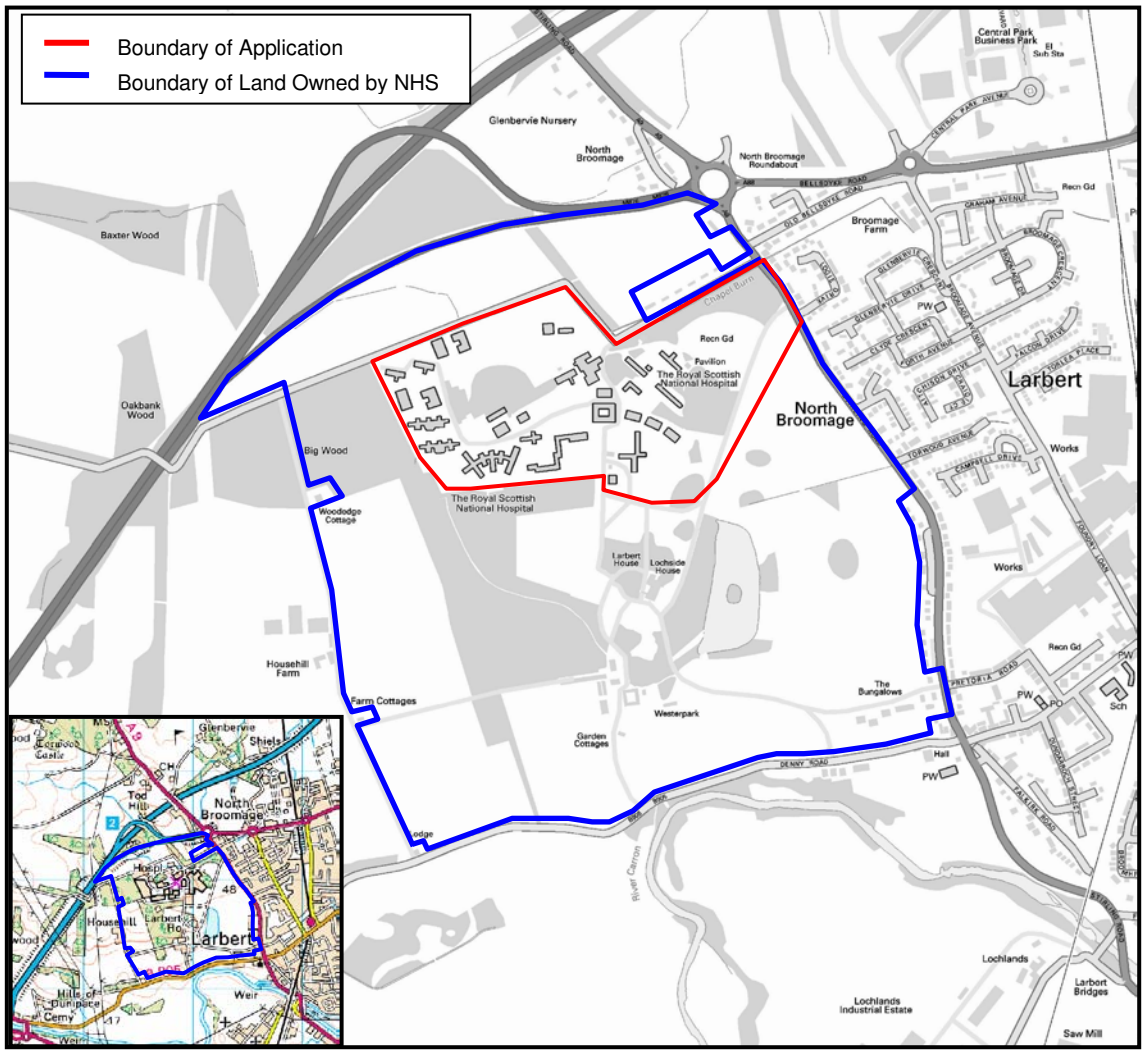
Colin Buchanan: Transportation Assessment and Travel Plan.

2.1. Site Description

The former RSNH site is located in the countryside to the north of Falkirk and east of Larbert and Stenhousemuir. It is an area of land of approximately 114ha bounded to the north by the M876 motorway, to the west by a field boundary, to the east by Stirling Road and to the south by B905 Denny Road. The site itself comprises an extensive and attractive parkland setting including the listed Larbert House and its environs. The centre of the site is at National Grid Reference NS 852 828.

Although all land (outlined in blue in Figure 2.1) is owned by Forth Valley NHS, a 29ha brownfield area in the north of the site (outlined and hatched in red) is proposed to be used for the hospital development. This part of the site was previously occupied by a 1000-bed mental health institution and the intention is to redevelop it to provide modernised acute services for the Forth Valley area. The area of land defined for the new hospital is equivalent to 25 per cent of the area of the total RSNH site.

Figure 2.1: Extent of Forth Valley NHS land ownership (blue) and core hospital site (red)



The extent of Forth Valley NHS's land ownership is bounded in blue on Figure 2.1. The area shaded in red comprises the core hospital site (21ha) and development site 2 (8ha), which together have been considered in this EIA and will contain the hospital development and a combined flood alleviation / urban drainage pond. This is in accordance with the aspirations of the Development Framework (December 2004). Details of the other development sites (outside the red hatched area on Figure 2.1) can be found in *Figure 2* of the *Development Framework for the Former RSNH Site, Larbert (December 2004)*. A site plan and development options are included in Appendix A, with site photographs included in Appendix A of this ES.

A desktop analysis of the new hospital site was conducted to aid appreciation of the opportunities as well as the constraints presented for future development. The information examined during this exercise ranged from estate information provided by Forth Valley NHS, record information made available from a variety of public utilities together with on-site observation of physical features, land use, physical topography and sun-path patterns.

Topographical information was digitised from OS photographic data.

A review and familiarisation of the wider RSNH site was undertaken in order to establish the context and interface between the hospital site and the lands immediately beyond.

2.2. Layout Option Appraisal

2.2.1 Physical constraints

Initial optioneering work quickly established the principal physical constraints. These can be summarised as follows:

- Reduction in effective site area assuming maximum retention of existing mature woodland;
- Narrow site frontage to principal access from Stirling Road;
- 'Long and narrow' site shape with 18.5 metre fall from west to east; and
- Impact on available site area of 'through' vehicular access to adjacent Development Site 2.

2.2.2 Functionality

Modern acute hospital planning recognises the need for areas where patients may visit for 'planned' activity or intervention; typically ambulatory care, outpatients, rehabilitation - and other areas where patients may arrive 'unplanned' in need of emergency or critical care services. Recognition of the need to cater for both groups of patients inside and outside the building generates a series of preferred adjacencies between departments in which the patient and the 'patient journey' is at the heart. A 'patient-focussed' facility will have reduced travel distances between key dependant departments and in doing so pose the best clinical outcomes for patients as well as improving patient comfort and well-being in the process.

Recognising 'planned' and 'unplanned' patient visits and the concept of ambulatory care and inpatient care helps to break down the large mass of clinical accommodation to 'bite sizes' with recognisable patient drop-off and entry points. This approach lends itself to improved patient orientation within the facility, identification with a smaller unit and the proposition of a 'hospital within a hospital'.

District general hospitals taking this approach are best suited to out of town locations where low rise solutions can be achieved and more generous site space may be available. The narrow site and relatively high plot-ratio has constrained efforts in achieving this type of development.

2.2.3 Block Planning

During the layout option appraisal, a number of strategic options were investigated. The physical environment of the site most notably characterised by the mature woodland and rolling topography suggested that a dispersed or horizontal form of development rather than a vertical or multi-storey form of development was more appropriate to the scale of these physical features. For a building of this size and volume it was felt that a height of three or in part four storeys was most likely to minimise impacts to the existing landscape. A building any higher was more likely to breech that scale and be over-intrusive. The layout option appraisal exercise had to test that such a form of spread out development could be accommodated within the site area together with the necessary infrastructure, and access arrangements.

The schedules of accommodation and the clinical adjacencies sought were interrogated to discover how best a development of around three storeys might be configured. The nature of the internal spaces required on a department by department basis had to be understood in order to set appropriate building depths. The need for daylight and a high priority for natural ventilation (where clinically appropriate) emerge as defining factors in the possible configurations. Some departments work best as deep-planned areas; others require shallow depth building widths with double aspect for daylight, view and

natural ventilation. The patient experience is known to be enhanced when access to stimulating views from within is provided. Inpatient wards in particular may benefit from access to views to the outside and in common with most modern hospitals, the ward unit or clusters are a repeating element designed as generic and capable of being repeated many times.

The analysis of the accommodation in this way concludes that a low-rise form of development can only be made to work if the overall footprint is penetrated by a series of internal courtyard spaces or lightwells, providing the much needed daylight, view and ventilation; or to put it another way, the overall mass of the building is broken down into a series of smaller units of accommodation interlinked both vertically and horizontally with their neighbours. The external courtyard spaces then take on their own identity and can be used not simply to attract daylight and ventilation but provide therapeutic spaces which patients can access during their time in care. The design of these spaces needs to be carefully considered in order that the hard and soft landscape is appropriate to the purpose whether it be a patient access space or a staff access space. A variety of sensory experiences can be introduced for patients in this way.

It will be clear from this analysis of the footprint shape and its penetration by light-wells or courtyard spaces that the physical extents of the building boundary will now be considerably in excess of the 90,000 square metres required. Once again this will put pressure on the available site area, with the layout option appraisal used to examine the best site-fit.

In reviewing the layout options and particularly the departmental adjacencies required, it is clear that any level changes within the building footprint is likely to impair those adjacencies and result in a functionally less efficient layout. With a sloping site as described above it is difficult to avoid level changes within such a large footprint and the most successful design will need to address where these changes in level occur and by doing so where entrances or access points to the building are located.

2.2.4 Access and circulation

Of equal constraint on how the new hospital site is developed is the external circulation around the building, and in particular the vehicular circulation. The new hospital has to work efficiently on many levels. It has to provide:

- A clear, legible and obvious approach for patients, visitors and staff whether they are arriving on foot, by car or cycle; whether they are driving themselves or being driven by others and then dropped off;
- A safe, efficient and congestion-free access for ‘blue-light’ ambulance traffic most commonly to the Accident and Emergency department;
- Safe and discreet circulation for goods vehicles servicing the supplies and disposal needs of the hospital through routes which are, as far as possible, segregated from patient, staff and visitor routes; and
- Safe and uninterrupted routes around the site for the use by appropriate fire appliances to all relevant areas.

The layout option appraisal concluded that a new ‘distributor’ road would be required from a point on the A9 Stirling Road (to be agreed precisely in consultation with the Council) in order to bring all the increased vehicular traffic into the site; not solely the traffic attracted by the new acute hospital but also the traffic generated by the adjoining proposed development sites. The precise status, design and construction standard of this road will require further discussion with the Council.

This new ‘distributor’ would require a number of junctions feeding the primary, ‘blue light’ and service accesses into the acute hospital. Subject to some dialogue with the fire service which has not yet been undertaken, it is likely that a second emergency ‘fire-appliances only’ access may be required from Old Denny Road.

The Layout Option Appraisal exercise was carried out without the benefit of a Traffic Impact Assessment and the anticipated level of on site surface car-parking was based empirically on equivalent hospital projects elsewhere in the country. The total number of car parking spaces used for this purpose was 1500. This corresponded with a land take of around 3.75 ha.

The Draft Transport Assessment and Travel Plan dated March 2005, prepared by Colin Buchanan & Partners after the Layout Option Appraisal was completed, suggests that a higher capacity of 1724 car-parking spaces may be required (see section 7).

Precise location, designation and security status of individual areas of car parking will need to be allocated in the final design when their relationship to entry locations in the building can be established and the need for appropriate parking for disabled persons agreed.

Circulation for pedestrians and vehicular traffic accessing the on-site Mental Health Unit which is part of the new acute hospital will require to be integrated into the overall circulation network. The Mental Health Unit is seen by NHS Forth Valley as a 'standalone' facility from the rest of the acute functions, although operationally and from the point of view of facilities management, it will be serviced in the same manner as all other departments. Careful consideration will need to be given to the siting of this accommodation.

2.2.5 Conclusions from Layout Option Appraisal

The Layout Option Appraisal concluded that the core hospital site identified within Falkirk Council's *'Development Framework for the Former RSNH Site, Larbert'* (December 2004) could accommodate a low-rise form of acute hospital development of the size and scale anticipated, whilst respecting the high quality of existing environmental features.

A range of design issues remain to be resolved during the design development stage of the project; such as access arrangements, adjoining development and materials selection.

2.3. Purpose and Objectives of the Development

Forth Valley NHS has been finding it increasingly difficult to provide acute services between the Falkirk and Stirling Infirmaries whilst continuing the drive to improve the quality of services and maintain safety.

The NHS in Scotland promotes the development of accessible patient-centred services that are integrated so that referral, assessment and service delivery are seen as one process. Government policy supports the provision of services in modern settings.

In order to provide sustainable, high quality modern care that is more efficient, effective and patient centred, it is essential that services and facilities within Forth Valley are reconfigured.

There are profound pressures within the healthcare system in Forth Valley, which together provide an overwhelming case for change. Not all of these pressures are unique to Forth Valley NHS and can be summarised as follows:

- The need to change the way health care services are provided to meet the new clinical standards and guidance;
- Increasing public and professional expectations;
- The increasing proportion of older people in Forth Valley and an associated increasing demand for health care services;
- National shortages of health professionals;
- The reduction in the hours that doctors, nurses and other staff can work;
- Duplication of acute services across two district general hospitals, including the particular problem of providing emergency on call rotas to both hospitals; and
- National policies, which emphasise reduced waiting times, improved access to health professionals and integration of acute, primary and secondary care.

Forth Valley NHS's vision is to provide acute inpatient services in a single, centralised location with a range of non-acute inpatient beds together with the facilities for daycase, outpatient and diagnostic services being provided from a number of community and district hospitals throughout Forth Valley.

The new acute hospital is anticipated to contain the services and associated department provision listed in Table 2.1.

Table 2.1: Services and Associated Department Provision for New Acute Hospital

Emergency Care	Emergency Centre
Complex Services	Intensive Care Unit / High Dependency Unit, Coronary Care Unit, Generic Inpatient Ward
Ambulatory Care	Outpatients, Day Unit, Oncology, Renal Unit, Sexual Health
Rehabilitation & Intermediate Care	Rehabilitation Unit, Acute Stroke Unit, Day Hospital, Neurology Department, Therapy Department
Women's & Children's Services	Maternity Outpatients, Maternity Inpatients, Obstetric Inpatients, Gynaecology, Paediatrics.
Clinical Support Services	Area Sterilisation & Disinfection Unit, Operating Theatres, Radiology, Laboratory Services, Pharmacy, Mortuary.
Non-Clinical Support Services	Main Entrance, Corporate Offices, Staff Facilities, etc.
Mental Health	Acute Adult Inpatient, Old Age Psychiatry Inpatient, Intensive Psychiatric Care Unit

2.4. Design, Scale and Size of the Development

The design of the physical environment necessary to house Forth Valley NHS's centralised acute healthcare facilities will require a number of key objectives to be addressed, including:

2.4.1 Design

The design of the proposed scheme will require adherence to the four principles contained with the Scottish Executive's '*A Policy on Architecture for Scotland (October 2001)*' which is summarised briefly as follows:

- The resulting quality of the built environment should uphold our aspirations in meeting social policy objectives;
- The quality of architecture should underline our place in global society as a place of imagination, creativity and innovation;
- Buildings should add to a growing heritage; and
- The quality of the design should demonstrate efficiencies which represent a sound investment in stimulating local economies, promote regeneration and economic competitiveness.

The design will be required to demonstrate awareness of recent initiatives from NHS Estates in England, aimed at improving the achievement of excellence in healthcare buildings, (e.g. *'Better by Design, June 1994*') and shall complement and help facilitate the objectives of the NHS Board's Environmental Management System.

The design of the facilities is to be procured through Public Private Partnership (PPP) by the NHS in Scotland. The process of design of the new acute facility at Larbert is to be regulated by a protocol developed by the NHS in England and Wales, ('*The Design Development Protocol for PFI Schemes, February 2004*'). The objectives of this protocol are:

- To ensure that the process results in clearly understood proposals which address the Board's needs and form a firm basis for the selection of a preferred tenderer prior to entering contractual commitments;
- To ensure that the process does not impose unnecessary burdens, in terms of time and cost, on either the Board or the tenderers;
- To avoid unforeseen changes after the selection of a Preferred tenderer in the project proposals and / or their capital cost; and
- To establish clearly the Board's rights of 'sign-off' on design and the consequent allocation of design risk.

The design has to fully accommodate the delivery of healthcare services to both 'inpatient' and 'outpatient' groups. Clinical services are to be extended to all age groups and to patients attending both elective sessions or following an emergency episode.

The clinical services provided require support from a wide variety of non-clinical specialist and facilities management services.

The design has to afford access to all patients, visitors to the facility and staff, irrespective of any physical disability and by whatever means of transport employed; on foot, by bus (patient transport or otherwise) by private car or bicycle.

Discreet and safe routes are to be incorporated into the design for the delivery of supplies to the facility and for the removal of all waste.

The design has to co-ordinate any necessary infrastructure works resulting from the masterplanning of the RSNH site with the design and layout of the facilities. In particular provision will need to be made for new transport links with adjoining sites as well as facilitate a flood attenuation solution related to problems with the Chapel Burn.

2.4.2 Scale and Size of Development

A building with a total gross area of around 90,000 square metres is considered necessary to accommodate the facilities envisaged. For optimum ease of communication within the facility for both patients and staff it is anticipated that the principal accommodation should extend over no more than three levels. It should also promote the integration of the facility within the existing landscape natural features and mature tree canopy. Operational and/or therapeutic reasons are expected to dictate a ground floor location for a wide range of departments.

The likely form of development will be dependent on a product of the designer's approach to such matters as the dependence on natural light and ventilation in patient areas as well as the chosen approach to fire safety.

The site will also accommodate parking provision and an internal road network to serve the whole of the site. Infrastructure improvements will be required to service the facilities. The layout and arrangement of the buildings and associated facilities has not been fully defined at this time, however Forth Valley NHS has undertaken an extensive development process to draft the clinical and facility management output specifications for the project. This has included significant stakeholder and user discussions. Using the resulting output specifications Forth Valley NHS has developed an indicative design. The aims of this exercise include testing the practicality of the clinical output specifications on the site and supporting discussions with Falkirk Council planners regarding constraints, impact and mitigation evaluation.

Indicative design layouts at 1:1250 scale have been developed and were used to inform the EIA.

In terms of massing, the indicative design has provided approximate footprint areas for the principal elements of the development. These are summarised in Table 2.2 below. It should be noted that the Tenderer's final design is likely to be different from the indicative design produced by Forth Valley NHS and as a result these figures could change as the detailed design work progresses.

Table 2.2: Approximate Footprint Areas for the Principal Elements of the Development

Element	Approx. Footprint (ha)
Acute Hospital	4.0
Mental Health Unit	0.5
Car Parking	4.0
SUDS Ponds	0.9
Landscaping	7.3

2.5. Construction, Operation and Decommissioning

The development will be designed and constructed within the terms of the PFI process. The successful Tenderer will be responsible for operating the facility for a period of around 30 years. At the time of writing, the Tenderers have not yet been engaged and therefore proposed construction methods and timescales have not yet been devised.

During the Tender Evaluation process, which it is anticipated will include input from Falkirk Council, matters such as construction and other criteria will be rigorously examined, giving the Council an opportunity to comment throughout.

2.6. Use of Natural Resources & Emissions of Pollutants

As noted above (in Section 2.4) the Tenderers have not yet been engaged and therefore design proposals are not yet formulated. The details of the Tenderers' methods and intentions will become clear during the PFI process. The Council will be involved in the Evaluation process and will have an opportunity to comment on the design proposals.

2.7. Generation and Disposal of Waste

Forth Valley NHS has a rigorous procedure in place to deal with the various types of waste generated by a modern health service. The current waste management system operated by Forth Valley NHS includes:

- Segregation of all waste;
- Collection of waste from all wards and departments;
- Storage of waste prior to collection by licensed contractors;
- Removal of all waste from the facility; and
- Final disposal of waste.

Forth Valley NHS is responsible for ensuring correct segregation, collection, storage and disposal of all Waste in a fashion which encourages minimal handling and in correct waste streams. All waste generated within the Facility will be properly consigned to ensure compliance with waste management legislation and national and local NHS guidance. Waste collection services will be provided seven days per week to the acute facility which includes, but is not limited to:

- Clinical waste (including sharps);
- Special waste(including radioactive and pharmaceutical);
- Domestic waste;
- Hazardous waste;
- Metal waste;
- Recyclable waste;
- Confidential waste;
- Food waste;
- Furniture; and
- Waste electrical and electronic equipment.

Table 2.3 describes the High Level Projections (Annual) for the volumes of waste which will be handled at the new acute facility:

Table 2.3: High Level Projections (Annual) waste volumes to be handled at the new acute facility

Service	Future Activity
Clinical waste (including sharps)	500 tonnes
Special waste	<7 tonnes
Domestic waste	562 tonnes
Hazardous waste	Ad hoc
Metal waste	Ad hoc
Recyclable waste	<50 tonnes
Confidential waste	< 20 tonnes
Food waste	N/A
Furniture	Ad hoc
White goods and electronic equipment (WEEE)	N/A

There is a potential long-term proposal to move some waste currently classified as clinical waste into the domestic waste stream.

Recycling of domestic waste will be in line with local authority targets. New legislation will require food waste to be collected by a specialist contractor. The EU WEEE Directive (2002/96/EC) on waste electrical and electronic equipment will require separate collection and disposal by a licensed contractor. The Waste Management procedure is designed to adhere to the following legislation:

- *Controlled Waste Regulations 1992*;
- *Special Waste Regulations 1996* and amendments;
- *Environmental Protection Act 1990*;
- *Environmental (Duty of Care) Regulations 1991*;
- *The Health & Safety (Consultation with Employees) Regulations 1996*;
- *The Transport of Dangerous Goods (Safety Advisers) Regulations 1999*;
- *Transport of Dangerous Goods (Safety Advisers) Regulations 1999*;
- *Carriage of Dangerous Goods and Use of Transportable Pressure Receptacles Regulations 2004*;
- *Scottish Hospital Technical note number 3 – Management and Disposal of Clinical Waste 2002*;
- *The Radioactive Substances Act 1993*; and
- *Safe Disposal of Clinical Waste issued by HSAC 2nd Edition 1999*

2.8. Hazards and Risks

At the time of writing this report, a *Pre-Tender Health & Safety Plan* is being produced and it is intended that as the PFI process evolves, the Tenderer will adopt and develop the document.

Forth Valley NHS takes its responsibilities with regard to health, safety and risk identification seriously and to that end has appointed a Planning Supervisor (PS) to ensure that the *Pre-Tender Health & Safety Plan* is developed in accordance with the *Construction (Design and Management) Regulations 1994* (CDM).

In relation to PFI procurement, it is considered that there is in fact more than one client – the originator of the project (in this instance, the Forth Valley NHS Board), and the project company (successful tenderer) who will design, construct and manage the operation of the facility over the concession period. The regulations were not written with dual client roles in mind, and therefore it is essential that clarity of

responsibility is achieved at project level. Fundamental to this is to define the periods over which various client responsibilities will apply.

Paragraph 72 of the ACOP (Code of Practice) states that the "Special Purpose Vehicle or design and build contractor, once appointed, normally takes over as the client for the remainder of the project." Defining the interface as the time of preferred tenderer appointment, the proposed periods of client responsibilities under CDM are summarised in Table 2.4 below.

Table 2.4: Proposed Periods of Client Responsibilities under CDM

Client per phase	Pre Procurement	Pre Qualification	Invitation to Negotiate (ITN)	Preferred Tenderer	Post Financial Close
NHS					
Project Co			* See Note		

* Note : It is particularly highlighted that Client duties under CDM are proposed to be transferred between the NHS Trust and the Project Company at appointment. However, prior to this time each of the tenderers will be required to employ their own Planning Supervisors from the commencement of ITN design onwards, to ensure that sufficient safety influence is brought to bear through the initial stages of design

Forth Valley NHS has overarching duties through all phases of a project to ensure that appropriate arrangements are made to manage the project. In addition, specific duties are required at various stages of a project, which for the purposes of the PFI procurement of this scheme, are identified in Table 2.5 below.

Table 2.5: Purposes of the PFI Procurement

Duty * See Note	NHS	Project Co	Comments
Appoint Planning Supervisor	✓	✓	- NHS to do this at inception of project. - Each tenderer to do this at commencement of ITN design works
Provide Planning Supervisor with relevant hazard information	✓	✓	- NHS to do this from inception of project onwards, and support the setting-up of a Project Data Room - Each tenderer to provide this to their individual Planning Supervisors as design works progress
Ensure any designers and/or contractors are competent and adequately resourced	✓	✓	- NHS to ensure their technical advisors are competent and adequately resourced for health and safety. NHS also to ensure, through the pre-qualification evaluation process, that potential tenderers employ competent designers and contractor(s). - Project Company retains this overarching responsibility when taking over client duties at appointment stage.
Appoint a Principal Contractor		✓	- Project Company to make this appointment at Financial Close. However, tenderers will have previously identified their proposed Principal Contractor earlier in the procurement phase, and as such should satisfy themselves as to competency etc. at time of initial selection.
Ensure adequacy of Principal Contractor's Health & Safety Plan		✓	- Project Company to ensure this is done prior to any works starting on site.
Keep Health & Safety File available for inspection		✓	- Project Company to keep, update and make freely available for reference (by any relevant interested party including the NHS Trust) throughout the period from receipt of file at completion of construction until the end of the concession period. Also note that the Project Agreement should contain an obligation to hand back the up to date file to the NHS on completion of the concession.

* Note : This is a summary only, prepared to illustrate the split of Client duties between the NHS and Project Company. For full description of duties, reference should be made to the Regulations.

For the purposes of PFI, allocation of duties to the Planning Supervisors employed by the NHS and by the Tenderers / Project Company is defined in Table 2.6 below.

Table 2.6: The purposes of PFI, allocation of duties to the Planning Supervisors employed by the NHS and by the Project Company

Duty * See Note	Planning Supervisor to		Comments
	NHS	Project Co	
Submit notification to HSE	✓		- In-so-far as this can be completed with information at time of project inception.
Update notification to HSE		✓	- To supplement original notice with updated information at time of appointment
If required, advise Client on designer's competence and provision for health and safety	✓	✓	- For NHS PS, "designers" means the Board's advisors in so far as they carry out any design. NHS PS also needs to advise, if required, on adequacy of tenderers' designers at pre-qualification evaluation stage. - For tenderers' / Project Company's PS this duty commences from start of ITN design onwards.
Ensure that designs comply with Regulation 13	✓	✓	- For NHS PS, this duty restricted to works carried out by the Board's advisors in defining the scheme requirements to ITN (design work may not apply) - For tenderers' / Project Company's PS this duty commences from start of ITN design onwards
Ensure co-operation between designers	✓	✓	- For NHS PS, this duty restricted to works carried out by the Board's advisors in defining the scheme requirements to ITN (design work may not apply) - For tenderers' / Project Company's PS this duty commences from start of ITN design onwards
Ensure pre-tender Health & Safety plan is prepared	✓		- For issue with ITN document set
[Ensure design hazard information is continually passed to contractor through design development]		✓	- [This "duty" is bracketed because under traditional procurement the pre-tender Health & Safety Plan is the vehicle for this. Recognising that much of the design development occurs post contract award in PFI, Project Company's PS should ensure passing of information to contractor continues to take place]
Be able to give advice to client on contractor's competence	✓	✓	- For NHS PS, this duty applies to pre-qualification and ITN evaluation stages. - For Tenderers' / Project Co PS this duty commences from start of ITN design onwards.
Be able to give advice to contractor on designer's competence		✓	
Be able to advise client on, and ensure suitability of, Principal Contractor's Health & Safety Plan		✓	- To be carried out prior to works commencing on-site.
Ensure Health & Safety File is prepared		✓	- To be carried out on completion of construction.
Ensure Health & Safety File is delivered to Client		✓	

Note : This is a summary only, prepared to illustrate the split of duties between the Planning Supervisors to the NHS and Project Company. For full description of duties, reference should be made to the Regulations.

Forth Valley NHS conducted a wide-ranging consultation in 2002 to select a suitable site for the New Acute Hospital to serve the Forth Valley area. In addition to seeking the views of the public, consultation was carried out with stakeholders and the three local authorities. Technical appraisals by consultants were also commissioned regarding the potential of a number of sites within the patient catchment. This culminated in the decision to select the site at the RSNH at Larbert in January 2003.

The Forth Valley NHS Board adopted the option appraisal and identification process recommended in the "*Scottish Capital Investment Manual*".

The Board established a Working Group comprising representatives from the Medical Staff Association, the Partnership Forum, Forth Valley Local Council, Public Health Medicine, Consultant and General Practitioners to make recommendations on Clinical Options to stabilise and secure services in Forth Valley.

Following consideration of the Working Group's report, submitted to the Board in June 2001, seven options were agreed by the Board in September 2001 and can be summarised as follows:

Option 1 Status Quo: Maintain the current distribution of services between Falkirk & District Royal Infirmary (FDRI) and Stirling Royal Infirmary (SRI).

Option 2 Single-site Working: This option had various sub-options, which concentrate more acute inpatient services on one site with other services being provided at local level. The sub-options were as follows:

Option 2A Centralise acute care on the existing SRI site and provide intermediate care facilities at the FDRI site.

Option 2B Centralise acute care on the existing FDRI site and provide intermediate care facilities at the SRI site.

Option 2C On a green-field / brown-field site:

1. Centralise all acute services on the RSNH site at Larbert in conjunction with the development of Clackmannanshire Community Hospital. The FDRI and SRI sites would not be retained.
2. Centralise all acute inpatient care at RSNH with intermediate care at SRI, FDRI and Clackmannanshire Community Hospital site.
3. Centralise all acute inpatient care at RSNH with intermediate care at SRI and Clackmannanshire Community Hospital site. The FDRI site would not be retained.
4. Centralise all acute inpatient care at RSNH with intermediate care at FDRI and Clackmannanshire Community Hospital site. The SRI site would not be retained.

In July 2002 the Board reduced the options prior to undertaking formal option appraisal. Option 1 was identified as unsustainable and therefore discounted. Options 2A and 2B were not taken forward as neither resulted in a satisfactory development that offered the same level of flexibility and functional suitability as a new, purpose-designed hospital.

A rigorous analysis process was then commenced comprising detailed benefits appraisal, financial and economic appraisal, risk analysis and public consultation.

At its meeting in January 2003, the NHS Board considered the extensive feedback and agreed to the creation of a single site acute hospital, with the favoured location being the RSNH site, and which would lead to the eventual closure of FDRI.

The Board commissioned further work to assess the suitability of the RSNH site at Larbert for a new acute hospital. This involved both engineering and landscape appraisals. The engineering appraisal was a desk-top exercise which considered geo-environmental, hydrological drainage and supply services implications at the site. The principal findings were as follows:

- The majority of the site was classified as good for heavy structures;
- The site is underlain by workings in one seam of coal but at such depth that ground instability was not considered an issue;
- A Sustainable Urban Drainage System (SUDS) would be required to regulate surface water flows from the new hospital and other developments;

- Scottish Water, the body responsible for foul drainage, indicated that the capacity of off-site infrastructure should accommodate flows provided the current combined system was replaced to remove all surface water; and
- Scottish Water advised that they would not agree to diversion of the 915mm Trunk Water Main which crosses the site east-west just north of the ornamental lake. No building works are permitted within 15m of this main.

The landscape appraisal showed that:

- The brown-field site, having previously been developed did not raise any special issues and could be redeveloped for the new hospital without adverse impacts on the environment; and
- The remainder of the site has some special sensitivities relating to the maintenance of the setting around Larbert House and areas of woodland which require careful consideration prior to siting new buildings.

The main conclusion drawn from the engineering and landscape appraisals is that the RSNH site is suitable for the development of a large acute hospital.

Figure 3.1: Existing buildings, roads and car park (Core Hospital Site)

4.1. Introduction

Part of an EIA comprises setting out the planning policy framework against which the OPA for the Acute Hospital will be determined. The relevant national, regional and local planning policies are identified and examined. A general overview of existing planning policy is provided by this section, with specific policies and guidance relevant for each environmental topic area discussed within sections 7 to 15 of this ES.

4.2. National and Regional Planning Guidance

The Scottish Executive's National Planning Policy Guidance notes (NPPG's) and Scottish Planning Policies (SPP's – gradually replacing NPPGs) give advice which should be incorporated into redevelopment plans and will also be material in the consideration of planning applications. Circulars which also provide statements of Scottish Executive policy contain guidance on policy implementation through legislative or procedural change. Planning Advice Notes (PANs) provide advice on good practice and other relevant information. The following national and regional planning guidance have been reviewed.

4.2.1 National UK Policy

- *A Better Quality of Life: A Strategy for Sustainable Development in the UK*;
- *National Planning Framework for Scotland*;
- *National Planning Framework Environmental Assessment Report*;
- *Designing Places, A Policy Statement for Scotland*; and
- *The Land Reform (Scotland) Act 2003*.

4.2.2 National Planning Policy Guidance notes and Scottish Planning Policies

A series of NPPG's set out the policy on nationally important land use and other planning matters, supported where appropriate by a location framework. The following NPPG's / SPP's have been reviewed for the scheme:

- *SPP 1* *The Planning System, November 2002*;
- *NPPG 5* *Archaeology and Planning, January 1994*;
- *SPP 7* *Planning and Flooding, September 1995*;
- *NPPG 10* *Planning and Waste Management, March 1996*;
- *NPPG 11* *Sport, Physical Recreation and Open Space, June 1996*;
- *NPPG 14* *Natural Heritage, 1998*;
- *NPPG 17* *Transport and Planning, April 1999*; and
- *NPPG 18* *Planning and the Historic Environment, April 1999*.

SPP1 outlines how the planning system guides the future development and use of land in cities, towns and rural areas in the long term public interest. The aim is to ensure that development and changes in land use occur in suitable locations and are sustainable. The planning system must also provide protection from inappropriate development. Its primary objectives are:

- To set the land use framework for promoting sustainable economic development;
- To encourage and support regeneration; and
- To maintain and enhance the quality of the natural heritage and built environment.

NPPG 5 sets out the Government's planning policy on how archaeological remains and discoveries should be handled under the development plan and development control systems, including the weight to be given to them in planning decisions and the use of planning conditions.

SPP7 is the Scottish Executive's National Flooding Framework addresses the problems of flooding through 4 areas of action: Awareness, Assistance, Avoidance and Alleviation. This SPP is a key part of the avoidance theme and has an important role to play in alleviation. The role of planning therefore complements other policies and legislation, for example, the requirement to promote sustainable flood management as included in the Water Environment and Water Services (Scotland) Act 2003.

NPPG 11 sets out the Government's objective through the planning system to seek to protect and enhance the land and water resources required for the nation's sport and physical recreation.

NPPG 10 sets out the Government's planning policies for development involving the management of waste; defines the content of structure and local plans in respect of waste; and explains how the planning system should operate in relation to other pollution controls.

NPPG 14 gives guidance on how the Government's policies for the conservation and enhancement of Scotland's natural heritage should be reflected in land use planning. In this context, Scotland's natural heritage includes its plants and animals, its landforms and geology, and its natural beauty and amenity. Natural heritage embraces the combination and interrelationship of landform, habitat, wildlife and landscape and their capacity to provide enjoyment and inspiration. It therefore encompasses both physical attributes and aesthetic values and, given the long interaction between human communities and the land in Scotland, has important cultural and economic dimensions.

NPPG 15 emphasises the Government's commitment to encouraging active community involvement in economic and environmental renewal.

NPPG 17 seeks to achieve better integration within and between different modes of transport, and to accord with environmental aims and policies so that transport choices do not conflict with environmental objectives.

NPPG 18 sets out the Government's planning policies in relation to the historic environment with a view to its protection, conservation and enhancement. Central to the Government's approach is the need to secure preservation whilst accommodating and remaining responsive to present day needs. The guidelines have been prepared on the basis of the existing statutory framework for planning, listed buildings and conservation areas.

4.2.3 Scottish Executive's Planning Advice Notes (PANs)

The series of Scottish Executive's PAN's gives guidance on how best to deal with matters such as local planning, rural housing, improving small towns and town centres. The following PAN's were considered in relation to the proposed acute facility:

- *PAN 33* *Development of Contaminated Land, Revised October 2000;*
- *PAN 37* *Structure Planning, Revised 1996;*
- *PAN 40* *Development Control, Revised March 2001;*
- *PAN 46* *Planning for crime Prevention, 1994;*
- *PAN 47* *Community Councils and Planning, 1996;*
- *PAN 49* *Local Planning, 1996;*
- *PAN 51* *Planning and Environmental Protection, 1997;*
- *PAN 52* *Planning in Small Towns, 1997;*
- *PAN 55* *The Private Finance Initiative and Planning, 1999;*
- *PAN 56* *Planning and Noise, 1996;*
- *PAN 57* *Transport and Planning, 1999;*
- *PAN 58* *Environmental Impact Assessment, 1999;*
- *PAN 60* *Planning for Natural Heritage, 2000;*
- *PAN 61* *Planning and Sustainable Urban Drainage Systems, 2001;* and
- *PAN 65* *Planning and Open Space, January 2003.*

A selection of the most relevant PANs are discussed. Due to the requirement for an EIA, **PAN 58** has been used for guidance as it provides information and advice on:

- The legislative background to EIA;
- EIAs in Scotland;
- The process of environmental impact assessment ;
- Environmental studies and statements;
- The evaluation of environmental information by the planning authority; and
- Implementation through the planning decision.

PAN 57 provides good practice guidance to planning authorities to assist in their policy development, proposal assessment and project delivery. It aims to create greater awareness of how linkages between planning and transport can be dealt with.

PAN 60 looks at the treatment of natural heritage in development plans and supplementary policy guidance in:

- Assessing the resource and setting objectives;
- Landscape character and biodiversity; and
- Local designations and greenspace.

In **PAN 65** the planning system performs two key functions in relation to open space:

- Protecting areas that are valuable and valued; and
- Ensuring provision of appropriate quality in, or within easy reach of, new development.

4.3. Local Policy Context

The following local plans / guidance have been identified as relevant to the site:

- Falkirk Council Structure Plan (June 2002) and Draft First Alteration (2004);
- Falkirk Council, Strategic Environmental Assessment, Local Plan Consultative Draft (June 2004);
- Larbert and Stenhousemuir Local Plan (August 1998) and First Alteration (March 2004);
- Falkirk Council Local Plan Consultative Draft (November 2003); and
- *Development Framework for the Former RSNH Site (December 2004).*

4.3.1 Falkirk Council Structure Plan (Adopted June 2002) and Draft First Alteration (June 2004)

The Structure Plan was approved by Scottish Ministers and came in to operation on 3rd June 2002. It sets out the development strategy and supporting policies for the period up to 2020. It has been produced after consultation with all sections of the community and agencies with an interest in the area. On 30th June 2004 Falkirk Council approved a Consultative Draft Alteration.

The RSNH site is identified within Falkirk Council Structure Plan as a Strategic Development Opportunity (**Policy ECON1**). Proposed uses identified include office, industry, distribution, residential, community facilities, leisure and tourism (ancillary to business). The Structure Plan notes that priority must be given to the sensitive treatment of the existing landscape and buildings on the hospital sites.

The Structure Plan First Alteration is currently being progressed and it updates the dwelling requirement for each of the areas main settlements, identifies strategic development opportunities and updates policies relating to minerals, renewable energy and waste management. There are no specific implications for the RSNH site.

4.3.2 Falkirk Council, Strategic Environmental Assessment, Local Plan Consultative Draft (June 2004)

The Falkirk Council Strategic Environmental Assessment, Local Plan Consultative Draft (June 2004) states that "The development at RSNH of a new Forth Valley acute hospital will have very significant environmental impacts on the area, particularly in terms of increased traffic generation. The development should benefit from the reuse of brownfield land and will allow flooding problems on the Chapel Burn to be addressed. The site is a sensitive one and will require careful masterplanning to ensure development is integrated successfully into the high quality landscape setting."

4.3.3 Larbert and Stenhousemuir Local Plan (Adopted August 1998) and First Alteration (March 2004)

The Larbert and Stenhousemuir Local Plan covers the settlements of Larbert, Stenhousemuir, Carron and Carronshore, and the immediate rural hinterland, an area of 22.6 square km with a population of 21,200. Adopted in August 1998, it is based on a strategy of controlled growth and enhancement.

Important components include:

- The allocation of greenfield land for residential development at the Inches;
- The promotion of high profile inward investment business sites at Glenbervie and RSNH (East);
- Acknowledgement of future growth opportunities at the Bellsdyke and RSNH (West) hospital sites arising from Care in the Community policies;
- Promotion of improved retailing facilities in Stenhousemuir Shopping Centre; and
- Identification of opportunities to improve the provision of open space and play areas.

Policy LAR59 states the Council will prepare a masterplan and design brief in order to guide and control the form and phasing of future development at the site. Public consultation on the plan and brief will be undertaken following general agreement on their terms by the Council, site owners and Forth Valley Enterprise. In **Policy LAR60** the masterplan and design brief will identify and promote new uses for Larbert House, its stable block and walled garden in accordance with **Policy LAR39** (Listed Buildings).

An Alteration to amend the housing chapter of the Local Plan was adopted in March 2004. The purpose of the Alteration was to keep the Local Plan up to date, by implementing the policies of the Falkirk Structure Plan, approved June 2002. The RSNH site was amongst several options which were rejected for significant housing development.

The development of a new Acute Hospital and ancillary healthcare facilities within the core brownfield area is consistent with the development plan.

4.3.4 Falkirk Council Local Plan Consultative Draft (November 2003)

Falkirk Council is producing a new Local Plan covering the whole of the Council area. When adopted, the new Local Plan will replace the current framework of eight Local Plans with a single document which will guide development and land use in the area up to at least 2012.

The Local Plan (Adopted in 1998) identifies four opportunities associated with the future of the RSNH site:

- **RC.L&S1** which covers the core brownfield site identified in the adopted plan and allocates it for the development of the new Acute Hospital;
- **RC.L&S2** which covers the Greenfield parts of the site and highlights the potential for limited hospital/business development which is well integrated into the landscape as well as the re-use of Larbert House;
- **EN.L&S2** seeks to promote the RSNH site for countryside recreation and access and highlights the sites potential to contribute to the Greenspace Initiative; and
- **TR.L&S4** identifies the opportunity to address flooding problems on the Chapel Burn through an attenuation pond within the site. **TR.L&S2** encourages the use of rail transportation though Larbert Railway Station.

The draft Local Plan lays emphasis on the need for a planning brief and a masterplan to guide and co-ordinate the development if the site.

In **Policy EQ1** new development will be required to achieve high standards of design quality and compliance with principles of sustainable development. **Policy EQ2** states that “in order to ensure that the principles set out in **Policy EQ1** are incorporated into development proposals: 1) Masterplans will be required for large development proposals requiring a comprehensive approach to design and infrastructure. The Council will set out the basis for the preparation of Masterplans in Development Frameworks or Briefs…”

Policy EQ4 on Landscape Design states that “Development proposals should include a landscape framework which enhances the development and assists integration with its surroundings.”

In **Policy EQ5** it states that “Development proposals should create a safe and secure environment for all users.”

Policy EQ6 outlines that opportunities to promote more sustainable energy use should be pursued in new developments.

In **Policy EQ9** The Council will encourage the incorporation of public art in the design of buildings and the public realm. Developers will be required to adopt 'Percent for Art' schemes in respect of major commercial development schemes.

The Council will seek to preserve the character and appearance of listed buildings (**Policy EQ14**), protect and conserve archaeological and historic features of significance and their settings (**Policy EQ16**) and there will be a general presumption against development which would adversely effect the character or setting of sites identified in the 'Inventory of Gardens and Designed Landscapes in Scotland' and other historic gardens and landscapes of national, regional or local significance. The Council will seek to encourage sensitive management of historic gardens and designed landscapes (**Policy EQ18**).

Policy EQ21 identifies a network of urban fringe and open space where landscape, access, recreational and habitat improvement is particularly promoted. **Policy EQ22** identifies areas of special landscape character where landscape impact will be particularly important in assessing proposals. **Policy EQ24** looks at sites which are protected because of their ecological value and **Policy EQ25** looks at sites of international, national and local designations which are identified.

In **Policies EQ25, EQ26** and **EQ27** the council recognises the importance of sites containing trees, woodland and hedgerows which are of amenity, landscape, recreational, economic or ecological value, rivers, streams and canals which serve a landscape, recreational, ecological or land drainage function.

In **Policy EQ28** the Council states that it "will seek to safeguard, improve and extend the network of countryside access routes, with particular emphasis on the core path network once it is defined."

Policy EQ30 states that "Development involving the loss of prime quality agricultural land (Classes 1, 2 and 3.1) will not be permitted unless there are overriding local or national circumstances."

For transport **Policy ST2** states that "new development will be required to provide an appropriate standard of pedestrian and cycle infrastructure." **Policy ST3** states that "New development will be required to provide appropriate levels of bus infrastructure or suitable links to existing bus stops, services or stations, as identified within travel plans."

New and improved rail infrastructure will be delivered where this supports the use of rail for mid to long distance commuter journeys and meets the cost / benefit criteria for such investments. Falkirk Council will work where appropriate with other local authorities, rail companies, developers and the Scottish Executive in delivering rail projects (**Policy ST4**). Falkirk Council will work with other authorities, the Scottish Executive and developers in delivering necessary improvements to the road network. Any improvements identified will be taken forward as part of packages of measures that support sustainable transport (**Policy ST6**).

Falkirk Council will require transport assessments of developments where the impact of that development on the transport network is considered likely to require mitigation. In all cases, this mitigation will be delivered to a level that achieves no net detriment to the capacity of the network (**Policy ST7**).

In **Policy ST10** the Council states that it "will manage parking provision as an integral part of wider transport planning policy to ensure that road traffic reduction, public transport, walking, cycling and safety objectives are met."

Policy ST11 states that "Surface water management for new development should comply with Scottish Environment Protection Agency (SEPA)'s "Guide to Surface Water Best Management Practices" and the Council's Supplementary Planning Guidance note. A drainage strategy, as set out in PAN 61, should be submitted with planning applications and must include flood attenuation measures, details for the long term maintenance of any necessary features and a risk assessment." And in areas where there is significant risk of flooding, there will be a presumption against new development which would be likely to be at risk, would increase the level of risk for existing development or would be likely to require high levels of public expenditure on flood protection works. Applicants will be required to provide information demonstrating measures to mitigate the effects of flooding both within and beyond the site (**Policy ST12**).

4.3.5 North Larbert Strategic Development Opportunity, Development Framework for the Former RSNH Site (December 2004)

The Development Framework is to guide the future development of the RSNH site, whilst safeguarding its exceptional natural environment . It seeks to:

- Outline the planning policy context;
- Outline site character and constraints;
- Identify the location and form of core new hospital buildings in broad terms;
- Identify opportunities for complementary development;
- Safeguard and promote the rehabilitation of the Listed Buildings;
- Identify infrastructure and access requirements;
- Outline requirements for management and maintenance of the parkland and woodland; and
- Outline procedural requirements including the information required to support future planning applications.

In terms of development opportunities the core brownfield area of the former RSNH complex is the priority (sites 1 and 2), together with the reuse of the listed buildings.

4.4. Past and Future Planning Applications

The project proposals cover a large area and address an essential facility for the surrounding area. It was therefore considered that an in depth study of past planning applications would not highlight any relevant precedents which would bear reference to this scheme.

4.5. Planning and Policy Conclusions

From a national and regional context the proposed acute hospital development adheres to the overall planning objectives, following the guidance detailed above as well as additional guidance to be identified through the PFI process. Local policy guidance has identified the site as a strategic development opportunity, however careful masterplanning will be required to ensure any proposed development integrates into the existing environment. Following the extensive consultation the resulting Development Framework for the RSNH site published in December 2004 provides specific planning guidance.

5.1. Compliance with Statutory Requirements and Guidelines

This ES has been written in accordance with the following statutory requirements and guidelines:

- *The Environmental Impact Assessment (Scotland) Regulations 1999* ('the EIA Regulations');
- *The Environmental Impact Assessment (Scotland) Regulations 1999 Circular 15/1999* ('the Circular'); and
- *Planning Advice Note (PAN) 58 Environmental Impact Assessment* ('PAN 58').

5.2. Technical Scope

The range of environmental topics addressed in the assessment is referred to as its technical scope. Schedule 4 Part 1 of the EIA Regulations which is entitled 'Information for inclusion' identifies aspects of the environment which should be considered, namely population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors. This list of environmental aspects has been considered in detail during the environmental scoping stage to arrive at the following site and project-specific issues to be addressed by the ES, each of which is presented as a separate section:

- Transport and Access;
- Recreation and Non Motorised User Access;
- Noise and Vibration;
- Flora and Fauna;
- Geology, Soils and Contaminated Land;
- Water Quality and Resources;
- Air Quality and Climate;
- Cultural and Archaeological Heritage; and
- Landscape and Visual Amenity.

5.3. Determining Existing Baseline Conditions

In terms of general approach and methodology, the existing baseline conditions were determined through studies that examined the environmental baseline character of the area likely to be affected by the proposed development. This has been considered in terms of what conditions would persist (the probable future state of the environment) if the development did not proceed, taking account of relevant natural or man-made processes (i.e. the 'do-nothing' scenario).

5.4. Consultation Methods

In 2004 Falkirk Council carried out a consultation inviting responses to the Council's document: *Development Framework for the Former RSNH Site, Larbert; Consultative Draft, September 2004*. The responses relating to each environmental topic area are detailed within the relevant sections of this ES.

As no final design for the Acute Hospital development has been formulated at the OPA stage of the PFI process, further broad community consultation as part of this EIA was not considered beneficial, as it was unlikely to draw-out any new opinions to those gathered by Falkirk Council. As such, only key statutory authorities have been consulted, as described for each environmental topic area in Sections 6 to 14 of this ES.

5.5. Predicting and Assessing Impacts

The magnitude of each impact has been predicted by a variety of mechanisms. These mechanisms have allowed the prediction of the changes that will take place to the baseline environment as a result of the construction and operation of the proposed acute facility. The significance of the impacts has been assessed though the following:

- The known or likely presence of an environmental receptor or resource;
- The value of these resources i.e. designated status;

- The vulnerability or sensitivity of affected resources;
- The extent, nature and duration of physical changes resulting from the acute facility;
- The ability of the resource or receptor to absorb change; and
- The effectiveness of the mitigation measure.

In assessing the magnitude and significance of impacts due to the lack of design information available at this stage of the PFI process a precautionary approach has been adopted and conservative assumptions have been made where appropriate. Where there has been the need to make assumptions to undertake the assessment of particular impacts these assumptions have been described and explained in the different impact sections.

Geographical Influence of Impacts

In order that consistent terminology is used regarding geographical influence of impacts the following definitions have been used:

- **Core Hospital Site**: describes impacts restricted to within the boundaries of the 'Core Hospital Site', as defined by Section 3;
- **Wider Site**: describes impacts that have an influence extending outside the Core Hospital site, but not beyond the boundaries of the 'Wider Site', as also defined by Section 3;
- **Local**: describes impacts that have an influence extending outside the wider site, but not beyond the local area, defined for these purposes as the area controlled by Falkirk District Council;
- **District**: describes impacts that have an influence extending outside the local area, but not beyond the district, defined for these purposes as the neighbouring administrative areas controlled by Clackmannan, Fife, West Lothian, North Lanarkshire and Stirling Councils;
- **Regional**: describes impacts that have an influence extending outside the district, but not beyond the region, defined for these purposes as the contiguous land mass comprising Scotland;
- **National**: describes impacts that have an influence extending outside the region, but not beyond the national area, defined for these purposes as the contiguous land mass comprising Scotland, England and Wales; and
- **Global**: describes impacts that have an influence extending outside the national area defined above.

5.6. Deficiencies

The key deficiency to this ES results from the lack of information available (due to the nature of the PFI process) regarding the final proposed design of the development. As such, many assumptions have had to be made and may be subject to change as the final design develops. The detailed planning stage may therefore require further environmental studies to be undertaken with the possibility of additional mitigation measures needing to be implemented over and above those outlined by this ES. Each section describes any further environmental topic-specific deficiencies

For purposes of clarity and to ensure that 'Transport and Access' is covered thoroughly, Section 6 is organised into the following sub-sections:

- 'Approach and Methods';
- 'Existing Baseline Conditions';
- 'Potential and Predicted Impacts';
- 'Mitigation Measures and Monitoring Arrangements'; and
- 'Conclusions'.

6.1. Approach and Methods

Colin Buchanan has undertaken an Addendum Transport Assessment (TA) and Travel Plan (TP) to accompany the OPA for the new acute hospital in Larbert (an Addendum to the previous TA undertaken by Atkins). Significant work has been undertaken previously by Atkins relating to the preparation of an outline business case for the hospital proposals including a comprehensive TA and TP framework. This should be read in conjunction with the Atkins report. The full TA and TP is included in Appendix C, with this section providing a summary only.

Discussion with Forth Valley, the Scottish Executive, Falkirk Council and Stirling Council, and a comprehensive review of previous reports, including a scoping report by Mott MacDonald, identified the need to provide an addendum to the existing TA and TP. The Addendum Transport Assessment therefore updates the existing studies to provide assessments suitable for the outline planning application. The Atkins report forms the basis of the Addendum. However, various revisions and additions have been necessary as follows:

- The development of a more detailed TP that includes data collected by Forth Valley during surveys with patients and staff;
- Adoption of a people trip approach to trip generation estimates;
- Identification of realistic mode share targets using survey data and local policy guidelines;
- Identification of proposals for pedestrian and cycle facilities, public transport links, car park controls and monitoring arrangements;
- The assessment of the traffic impact at the site access points on the A9 and B905;
- The assessment of the traffic impact of the proposed hospital on 3 additional off site junctions on the A88 and B905; and
- An update of analysis for a number of junctions affected by additional committed development identified in the scoping study.

Colin Buchanan's report should be taken as an Addendum to the Atkins work. It provides an accessibility assessment for the development site, including current and future travel characteristics and mode share targets, an outline TP and traffic impact assessment.

6.2. Existing Baseline Conditions

The RSNH site lies on the western fringes of Larbert. The site is bounded by the M876 to its north and west, A9 Stirling Road to its east and B905 Denny Road to its south. Main access / egress to the site is currently provided via two simple major / minor priority controlled junctions to Stirling Road, on the north east of the site. A further access / egress point exists at The Bungalows from Stirling Road, to the south east edge of the site. An access exists on the B905 Denny Road, approximately 250m west of Larbert Cross.

6.2.1 Parking

Falkirk Council guidelines indicate that parking spaces should be provided at a rate of one per staff member plus one per two beds. This equates to a provision of 4084 spaces based on the figures contained in the Atkins analysis of 3647 staff and 873 beds. However, if only the number of staff estimated to be on duty in any one day is considered (2300) then this equates to a car park with 2737 spaces.

Detailed analysis was undertaken using the arrival /departure profiles and characteristics for staff, patients and visitors as identified in the Atkins TA. These profiles were considered in the context of the mode share targets set out in the Addendum by Colin Buchanan. The resulting maximum car park

occupancy is estimated to be 1,724 occupied spaces between 14:00 and 15:00. This figure allows for shift change over by assuming that a starting shift arrives at the beginning of the hour and an ending shift leaves at the end of the same hour. A full day profile is contained in the TA and TP included in Appendix C.

6.2.2 Public Transport Access

It is essential that the development site is penetrated by public transport to provide an attractive and sustainable alternative to travel by private car. The site layout design will provide for easy access by bus to key elements of the development. Public transport operators will be consulted to identify bus services to bring into the site. Operators will also be asked to inform the design process, ensuring that buses can be physically accommodated.

6.2.3 Pedestrian and Cycle Access

As with public transport, it is vital that the development site is also permeable on foot and by bicycle. Attractive pedestrian and cycle routes within the site will be designed to provide safe movement between internal elements, and will also link into the external cycle and footpath network.

6.2.4 Vehicular Access

It is proposed that all vehicular access to the site is taken via a new 3 arm roundabout on the A9 located between Lodge Drive and Robert Bruce Court. The proposed roundabout has an inscribed circle diameter of 50m with flared two lane approaches on each arm. A preliminary layout for the junction is illustrated in Figure 2.2 in Appendix C.

The roundabout will be located so as to cause minimum disruption to local residents. A buffer zone will be created between the main carriageway of the roundabout on the A9 and the residential properties to the east to provide safe access (to a single property) and protect the amenity of the area.
It has been assumed that there will be no vehicular access to the site via Denny Road (B905) or Old Denny Road. The vertical and horizontal alignment of Denny Road would compromise safety, and the junction of Old Denny Road with Stirling Road (A9) is not considered suitable for accommodating increased traffic volume.

6.3. Potential and Predicted Impacts

6.3.1 Traffic Impact Study

A year of assessment 5 years beyond the design year was adopted for assessing junctions where mitigation measures were required to be considered. However, vehicle trip generation estimates for 2025 were assumed to be the same as for 2020 because it is assumed that the mode share targets set out in the Falkirk Local Plan will have been achieved by 2020. Detailed output from the impact study analysis is contained in Appendix 5 of the report contained in Appendix C of this report.

The junctions subjected to detailed analysis in the Atkins TA have been extended to include the following:

- Antonshill Roundabout;
- Tryst Rd Roundabout; and
- Kirk Avenue / King Street Signals.

6.3.2 Site Access

These junctions have been analysed within the scope of the Addendum by Colin Buchanan. The Atkins TA identified junctions likely to experience operational difficulties as a direct result of the new hospital. The TA did not however identify proposals to mitigate the impact of hospital traffic. The Addendum therefore identifies and tests mitigation measures for the following junctions:

- Bellsdyke Roundabout;
- Inches Roundabout;
- Larbert Cross Roundabout; and
- Camelon Roundabout.

6.3.3 Threshold Analysis

Consultation with the Scottish Executive, Falkirk Council and Stirling Council revealed that the following two junctions should be subject to a threshold analysis:

- Bowtrees Roundabout; and
- South Bellsdyke Roundabout.

As the impact of the Glenbervie slips would cause like for like changes to base and development traffic the threshold analysis results would be identical with or without the implementation of the slip roads.

Bowtrees Roundabout
Development traffic was found to have a significant impact only in the evening peak and on the southern A905 approach where an increase in traffic flow of 35% (139 vehicles) was estimated. Colin Buchanan understands that a PARAMICS model exists of a network that includes the Bowtrees Roundabout. It is recommended that the implications of the impact of the proposed development traffic be subject to further investigation.

South Bellsdyke Roundabout
During the morning peak the A905 southbound approach is predicted to experience an increase of 14% (74 vehicles) due to the hospital development. In the evening peak the A88 approach is predicted to experience a 22% increase in traffic flows. The impact of Hospital traffic on this junction has therefore been the subject of detailed analysis.

6.3.4 Base Traffic Flows

Base traffic for the assessment years has been factored up from the 2003 observed flows in the Atkins TA. Further to discussions with Falkirk Council it was agreed that National Road Traffic Forecast (NRTF) central growth rates should be used for the local road network. Table 6.1 in Appendix C shows the rates used.

6.3.5 Committed Development

The Atkins TA considered the committed development at the former site of the Bellsdyke Hospital. Revisions have been made to the initial junction assessments undertaken by Atkins due to committed development in the local area. Atkins considered the traffic impact of the Bellsdyke development but the junction mitigation measures proposed were not included as part of the assessment. Falkirk Council provided proposed mitigation measures which have been incorporated into the junction assessments. These were provided for the following junctions:

- North Broomage Roundabout;
- Bellsdyke Roundabout;
- Inches Roundabout; and
- Antonshill Roundabout.

The proposed Bellsdyke committed development mitigation measures are included in Appendix 5 to the report contain in Appendix C of this ES. Consultation was undertaken with the relevant authorities to establish if any further committed development existed that should be considered within the scope of the Addendum TA. Falkirk Council stated that construction of a residential development was underway with access taken from Foundry Loan in Larbert. This has been considered within the scope of this assessment. The scope of impact of the Foundry Loan development was considered within the context of the junctions analysed in the Atkins TA and the committed development flows for Foundry Loan are contained in Figures 6.9 and 6.10 in Appendix C. The base plus committed development flows for the four junctions assessed in this addendum are shown in Figures 6.11 to 6.16 in Appendix C. The corresponding total flows, which include the hospital flows, are illustrated in Figures 6.17 to 6.22 in Appendix C.

6.3.6 Base plus Committed Traffic

The following junctions were analysed using combined base and committed development traffic flows:

North Broomage
As indicated in the Atkins TA, this junction operates well within capacity for all base traffic scenarios.

Bellsdyke Road / Broomage Avenue (Bellsdyke)
This junction has no predicted capacity problems in the morning peak with the mitigation measures included as part of the Bellsdyke development in place. In the 2020 evening peak the A88 West approach operates at capacity with a Ratio of Flow to Capacity (RFC) of 0.867. The queue is not predicted to reach as far as North Broomage junction. The other arms of the roundabout are expected to operate satisfactorily.

Inches
With the Bellsdyke mitigation measures in place, the morning peak has no predicted capacity problems in 2010. The A88 East is approaching capacity (RFC of 0.859 with an associated queue of 6 vehicles) in 2020. During the evening peak in 2010 the A88 West is significantly over capacity with queues of 39 vehicles predicted. This is exacerbated in 2020 with queuing predicted to reach back to the Business Park roundabout.

Larbert Cross
There are no capacity problems predicted in all base scenarios at this mini roundabout junction.

Camelon
In 2020 during the morning peak both arms of the A803 are predicted to be over capacity, but the resultant queuing is not predicted to cause problems at adjacent junctions. It is predicted that in the 2010 evening peak the A803 Main Street will operate over capacity, with significant queues in excess of 100 vehicles impacting upon adjacent junctions. The capacity problems are exacerbated in 2020 with the A803 Glasgow Road also overcapacity although the queue lengths are not excessive.

Antonshill
Both morning and evening peaks are within capacity in 2010. In 2020 an RFC of 0.861 on the A88 West approach is predicted during the morning peak. The associated queue length is not problematic.

Tryst Road Proposed Roundabout
This roundabout is proposed as the main site access for the residential element of the Bellsdyke development. The roundabout will replace an existing three arm priority junction. In the morning peak in 2020 it is predicted that the A88 East will be just over capacity with an RFC of 0.875. It is predicted that the A88 East will be over capacity during 2010 in the evening peak. This will be exacerbated in the 2020 evening peak with an RFC of 0.956 resulting in a queue of 15 vehicles.

King Street / Kirk Avenue Signals
This junction is predicted to experience severe capacity problems in both the morning and evening peaks in 2010 with significant queuing predicted on Kirk Avenue and King Street West. The problems are increased further in 2020. It should be noted that this junction analysis is on the basis of the pedestrian stage being called every cycle. The performance of the junction is still predicted to be over capacity, with the exception of the 2010 evening peak, with no pedestrian stages called during the peak hours. No indication was given by Falkirk Council that any mitigation due to the Bellsdyke development would be undertaken at the junction; however the base analysis indicates that some form of mitigation is required.

6.3.7 Effect of Glenbervie Slips on Base Traffic

The Atkins TA assumptions with respect to the implementation of the proposed Glenbervie slip roads have been applied to the capacity assessments for the junctions on the A88.

North Broomage
The North Broomage junction is predicted to operate within capacity in all base scenarios. Due to the shift in flows the A88 East improves slightly while the RFC on the A9 North increases.

Bellsdyke Road/Broomage Avenue (Bellsdyke)
At the Bellsdyke roundabout the inclusion of Glenbervie slips has reduced the RFC values at A88 East and Broomage Avenue during the morning peaks. It is predicted that during the evening peaks the RFC on A88 East will also fall however the RFC of 0.876 on the A88 West is not predicted to change in 2020.

Inches
The performance of Inches roundabout also improves during the morning peaks with the introduction of the slip roads. The RFC on A88 East in 2020 has reduced from 0.859 to 0.740. The evening peak scenarios are predicted to experience little change on the critical A88 West with the RFC in 2010 remaining at 1.029. Similarly in 2020 the capacity problems and queuing predicted on the A88 West do not change with the introduction of the slip roads.

Antonshill
As described above there are no capacity problems predicted at the Antonshill roundabout. The predicted RFC in 2020 of 0.861 on the A88 West approach is not predicted to change with the introduction of the slip roads.

Tryst Road Proposed Roundabout
At the Tryst Road roundabout during the morning peak in 2020 it is predicted that the A88 East RFC of 0.875 will reduce to 0.758. The capacity problems predicted in the evening peak will improve as the RFC of 0.918 is reduced to 0.845 with a queue of 5 vehicles.

6.3.8 Total Traffic

Total traffic analysis of the following junctions is based on the combination of base, committed development and proposed development traffic flows.

North Broomage
With the addition of the Hospital traffic the junction will experience a maximum RFC of 0.836 on the A88 approach during the 2020 morning peak. In the evening peaks the roundabout is predicted to operate within capacity in 2010 and 2020.

Bellsdyke Road/Broomage Avenue (Bellsdyke)
In 2010 during the morning peak the junction is predicted to operate within capacity however in 2020 the Broomage Avenue approach is over capacity with an RFC of 0.920 and an associated queue of 8 vehicles. In the 2010 evening peak the A88 West approach is predicted to operate over capacity with an RFC of 0.911 which increases to 0.977 in the 2020 scenario. The remaining arms are expected to operate satisfactorily.

Inches
In the morning peak of 2010 the addition of hospital traffic will result in the RFC on the A88 East increasing to 0.859. In 2020 the A88 East will be over capacity with an RFC of 0.912 and the RFC on Muirhall Road will be 0.960. Both arms will have queues of 9 vehicles. During the evening peak in 2010 the A88 West is predicted to experience severe capacity problems with an RFC of 1.162 and queues in excess of 100 vehicles. This is exacerbated in 2020 with queues of 188 vehicles predicted, blocking back beyond the Bellsdyke roundabout.

Larbert Cross
The roundabout is predicted to operate at capacity with an RFC of 0.853 during the morning peak in 2020 on the B905 Main Street. In the evening peak in 2010 the A9 North is predicted to operate with an RFC of 0.834 which will increase to 0.938 in 2020. The A9 South is expected to operate within capacity with an RFC of 0.847.

Camelon
By 2010 both arms of the A803 are predicted to operate over capacity during the morning peak. However the resultant queuing is not predicted to cause problems for adjacent junctions. In 2020 the RFC values are 0.988 and 0.959 for the Glasgow Road and Main Street arms of the A803 respectively while the A9 operates at capacity.

It is predicted that in the 2010 evening peak the A803 Main Street will operate over capacity with queues in excess of 100 vehicles that will impact upon adjacent junctions. The capacity problems are exacerbated in 2020 with the A803 Glasgow Road and A9 also over capacity, although the queue lengths are not considered to be excessive.

Antonshill
The junction is predicted to operate within capacity during both the morning and evening peaks in 2010. In 2020 RFC values of 0.866 and 0.869 on the A88 West and Antonshill approaches respectively are predicted during the morning peak. The associated queue lengths are not considered to be problematic. The maximum RFC on the A88 west in the evening peak of 0.869 with a queue of 6 vehicles occurs in 2020.

Tryst Road Proposed Roundabout
In the morning peak in 2010 it is predicted that the A88 East will be just over capacity with an RFC of 0.867. In 2020 this will increase to 0.933 with a queue of 11 vehicles which would not block back to adjacent junctions. The A88 East approach is predicted to be over capacity during the evening peaks in 2010. In 2020 both approaches of the A88 will experience capacity problems, with queues of 21 and 9 predicted on the east and west arms respectively. There is sufficient queue storage at this junction to prevent any detrimental effect to adjacent junctions.

King Street / Kirk Avenue Signals
As indicated previously the junction is severely over capacity in all modelled base traffic scenarios. The addition of hospital traffic adds to the problems and increases the queue lengths at Kirk Avenue and King Street West.

Site Access
The main access to the hospital development will be provided by constructing a three arm roundabout on the A9 Stirling Road. The junction analysis indicates that the roundabout will operate with significant reserve capacity during the morning and evening peaks in the opening year and the design year of 2025.

6.3.9 Effect of Glenbervie Slips on Total Traffic

North Broomage
At the North Broomage junction the maximum RFC of 0.836 predicted on the A88 during the 2020 morning peak will reduce to 0.823 with the construction of the slip roads. Although the RFC deteriorates on the A9 North, the arm is predicted to operate with spare capacity for all scenarios.

In the evening peak during 2020 the RFC on the A9 North increases from 0.797 to 0.839, remaining within capacity. Although there is a proposed shift in traffic from the A88 to the A9 North the junction is still predicted to operate within capacity for all modelled scenarios.

Bellsdyke Road/Broomage Avenue (Bellsdyke)
This junction is predicted to operate within capacity in 2010 during the morning peak. In 2020 the implementation of the slip roads would result in an improvement in the Broomage Avenue approach with a decrease in RFC from 0.920 to 0.766.

The situation in the 2010 evening peak does not change with the introduction of the slip roads. The A88 West approach would continue to operate over capacity with an RFC of 0.911, increasing to 0.977 in the 2020 scenario. The remaining arms are expected to operate satisfactorily.

Inches
The performance of Inches roundabout improves during the morning peaks with the introduction of the Glenbervie slips, with a maximum RFC of 0.793 on the A88 East in 2020. However, the slips have little impact upon the evening peak scenarios with the A88 West continuing to operate severely over capacity in 2010 and 2020.

Antonshill
At the Antonshill junction the Glenbervie slips result in a reduction in RFC on the Antonshill approach during the 2020 morning peak from 0.869 to 0.766. The RFC on the A88 West remains unchanged at 0.866. Similarly in the evening peak the RFC of 0.869 predicted on the A88 West would not improve with the introduction of the Glenbervie slips.

Tryst Road Proposed Roundabout
The Glenbervie slips would improve the operation of the Tryst Road junction during the morning peak. The RFC on the A88 East approach would reduce from 0.867 to 0.751 in 2010 and from 0.933 to 0.807 in 2020.

The A88 East approach will operate at capacity during the peaks with the introduction of the slip roads. In 2010 the RFC would fall from 0.918 to 0.811and in 2020 from 0.977 to 0.863. As with the other

junctions on the A88 the Glenbervie slips would not improve the performance of the westbound approach. It is predicted that this arm would still have RFC values of 0.847 and 0.907 in 2010 and 2020 respectively. A queue length of 9 vehicles is predicted in 2020 which can safely be accommodated on the road network.

6.4. Mitigation Measures and Monitoring Arrangements

Analysis of road capacity in the study area using forecast base traffic flows has demonstrated that several junctions will experience significant operational problems. A sensitivity analysis of the same road capacity, that considers the effects of implementing the proposed Glenbervie slip roads by the Scottish Executive, demonstrated that they would provide significant benefits in terms of improving junction operation. Individual junction mitigation directly attributable to the hospital development has therefore only been considered in conjunction with the implementation of the Glenbervie slip roads.

The following junctions have been identified as requiring mitigation measures over and above the construction of the Glenbervie slips:

- Bellsdyke Roundabout;
- Inches Roundabout;
- Larbert Cross;
- Camelon Roundabout; and
- King Street / Kirk Avenue Signals.

All analysis results for the mitigation are provided in Appendix 6 of the report attached in Appendix C of this report.

Bellsdyke Road/Broomage Avenue (Bellsdyke)
The critical arm at the Bellsdyke junction is the A88 West with a maximum RFC of 0.977 in the 2020 evening peak with an associated queue of 20 vehicles. It is proposed that the entry width is widened on this approach to 7.3m. The analysis of the mitigated junction indicates that an RFC of 0.885 with a queue of 7 vehicles would result during the evening peak in 2025. The corresponding RFC in the base scenario without mitigation is 0.890. The proposed mitigation at the Bellsdyke roundabout is illustrated in Figure 6.23 in Appendix C.

Inches
The A88 West is also the critical arm at the Inches roundabout, particularly during the evening peak where queuing is predicted to exceed 188 Passenger Car Unit (PCU) in 2020 with the hospital traffic. The widening of the entry width to 8.6m combined with an increase in flare length would achieve a no net detriment situation with the additional hospital traffic. The analysis indicates that in the evening peak in 2025 a maximum RFC of 1.056 with a queue of 58 vehicles is predicted. The corresponding RFC in the base scenario in 2025 predicts an RFC of 1.137 with a queue of 106. The proposed widening at the A88 West approach is shown in Figure 6.24 in Appendix C.

Larbert Cross
Falkirk Council indicated that due to the impact of the Bellsdyke development a financial contribution is being sought for Larbert Cross with a signalised junction being the favoured solution. It is proposed that discussions take place with representatives of Falkirk Council for a similar contribution to be made by Forth Valley.

Camelon
The roundabout is predicted to experience severe queuing on the A803 Main Street during the evening peak for all modelled scenarios. It is proposed that traffic signals are introduced to manage the predicted queues more effectively.

LINSIG analysis was undertaken for the proposed signalised layout illustrated in Figure 6.25 in Appendix C. Although the introduction of signals will increase queuing during the morning peak scenarios (from 7 PCUs to 37 PCUs on A803 Glasgow Road in 2025) it is considered that the benefits to junction operation in the evening peak, in terms of queue reduction, are more significant. Under base conditions during the evening peak in the opening year a queue of 102 is predicted on the A803 Main Street. This is predicted to increase to 247 in 2025 if the junction remains as a roundabout. The signals analysis indicates that in 2025 with hospital traffic the junction would operate with a maximum queue of 28 on the A803 Main Street. This is a substantial improvement over the base case scenario.

King Street / Kirk Avenue Signals
As indicated previously the junction is predicted to operate over capacity in all base traffic condition scenarios. The addition of hospital traffic adds marginally to the queue lengths at Kirk Avenue and King Street West. In order to improve the performance of the junction, alterations to the lane widths on King Street West and Kirk Avenue, and the introduction of a left turn lane on King Street East would be required. Minor signal timing adjustments would also be required. The existing bus cage on the south side of King Street East would need to be moved slightly further east. The indicative layout is illustrated in Figure 6.26 in Appendix C.

The length of time given to pedestrians within the staging has been amended. Currently the pedestrian stage operates with a 10 second green time and an 11 second intergreen. This has been reduced to a 5 second green time and a ten second intergreen in accordance with Pedestrian Facilities at Traffic and Signal Installations Guidance TA 15/81. Within the assessment the pedestrian stage has been modelled in each cycle to provide a conservative assessment.

The proposed mitigation is predicted to improve the operational performance of the junction and reduce the queue lengths. In the base scenario of 2025 during the morning peak the right turn lane of King Street West will operate with a Degree of Saturation (DoS) of 233% and a queue of 156 PCUs. The corresponding DoS with mitigation and total traffic flow is predicted to be 124.6% with a queue of 38. In the evening peak in 2025 the comparison is similar. In the base scenario the queues on Kirk Avenue and King Street West are 75 and 76 respectively while the mitigated total traffic scenario is predicted to generate queues of 36 and 51 on the same arms. The mitigation proposals therefore provide a better than no net detriment solution.

6.5. Conclusions

The TA and TP provide advice on mitigation measures for the highway network, maximising the use of sustainable transport modes and ensuring that the TP continues to be a live and flexible tool. The following points can be concluded from the Addendum TA and TP:

- It is essential that the site is penetrated by frequent public transport services;
- A frequent bus link between the hospital site and Larbert train station will be necessary if travel by rail is to be a viable option;
- Access to the site for all vehicles will be via a new roundabout on Stirling Road;
- Provision will be made in the detailed design of the roundabout to retain adequate access to adjacent residential property;
- The site will be permeable by foot and bicycle;
- Detailed investigation should be undertaken with a view to extending existing cycle networks to serve the site;
- Parking provision required for the hospital is estimated to be in the region of 1,700 spaces;
- 95% of staff live within 25km of where they work;
- 82% of staff drive to work;
- 65% of patients drive to the hospital with a further 22% arriving as car passengers;
- The walking catchment of the site is currently limited with 2% of staff living within 2km of the site;
- 13% of staff live within a 5km cycle of the site;
- 12% of staff live within 800m of rail stations that would serve Larbert;
- 32% of staff live within 400m of a bus route;
- 63% of staff live within 400m of all direct and frequent connecting bus services;
- Mode share targets have been set and based on observed mode shares and the Falkirk Local Transport Strategy;
- A travel plan will have to be in place prior to the opening of the hospital to educate and influence staff, patient and visitor travel with respect to options available for travel to the new site;
- A comprehensive threshold analysis revealed that North Broomage, Bellsdyke Road / Broomage Avenue, Inches, Larbert Cross, Camelon, Antonshill, Tryst Road and Kirk Street / Kirk Avenue junctions all required to be analysed in detail;
- The threshold analysis also highlighted that Bowtrees Roundabout and South Bellsdyke Roundabout would require further consideration in the context of the hospital proposal. This is not included in this assessment; and
- Detailed analysis indicated that Bellsdyke Road/Broomage Avenue, Inches, Larbert Cross, Camelon and King Street / Kirk Avenue junctions all require to be mitigated to cater for proposed hospital traffic.

For purposes of clarity and to ensure that 'Noise and Vibration' is covered thoroughly, Section 7 is organised into the following sub-sections:

- 'Approach and Methods';
- 'Existing Baseline Conditions';
- 'Consultation';
- 'Potential and Predicted Impacts';
- 'Mitigation Measures and Monitoring Arrangements';
- 'Unavoidable and Residual Impacts';
- 'Deficiencies';
- 'Scope for Additional Environmental Improvements'; and
- 'Conclusions'.

7.1. Approach and Methods

Wherever new developments are introduced to quiet areas there is potential for noise and vibration to become an issue because of the previously low levels of background noise. This section examines the existing noise climate, using available information, and the potential changes due to the construction and operational phases of the proposed development. Mitigation measures are proposed to reduce the impact of both phases of the development.

Available documentation has been reviewed and information from site visits assimilated to subjectively assess the existing baseline conditions. The proposed activities during both the construction and operational phases are examined for potential noise impacts. Relevant legislation and codes of practice are reviewed for relevance and applicability, and introduced as mitigation measures where appropriate. Further mitigation measures are suggested concerning lay-out and design of the development.

7.2. Existing Baseline Conditions

The RSNH site is situated in an area that is essentially rural in nature. To the north and west the site is bounded by the M876 motorway beyond which lies largely open countryside. To the south of the site is the B905 Denny Road beyond which is open countryside. To the east of the site is the A9 Stirling Road which has residential properties on the eastern side. These are potential receptors for noise from the proposed development. Old Denny Road intrudes into the north-east corner of the general area of the site. This stretch of road has residential properties on the northern side which are the closest properties to the development.

The site is currently used to a limited extent for hospital services and by the local population for recreational purposes including dog walking and cycling. Falkirk Council Environmental Health Department have confirmed that, historically, there have been no noise complaints concerning the site.

In conclusion, the RSNH site currently has no noise issues associated with it. This is because there is limited activity from the use of the hospital services on the site. There is also casual recreational use of the site by the public.

7.3. Consultation

Consultation has taken place with Falkirk Council Environmental Health Department who confirmed that no complaints concerning noise from the site had been received. During consultation on the Development Framework, however, concerns were raised about the potential noise impacts on the residents of Stirling Road from the new development.

7.4. Potential and Predicted Impacts

A number of potential noise impacts are evident. Impacts can be divided into construction phase impacts and operational phase impacts. Many construction activities are inherently noisy. The precise nature of construction phase noise impacts will depend on the techniques used during the construction process. Operational phase impacts from the site are likely to be related to traffic entering or leaving the site. There may also be impacts from the operation of equipment used at the finished hospital.

The main receptors for potential noise impacts are residential properties in Old Denny Road to the north-east of the site and residential properties on Stirling Road to the east of the site. Old Denny Road receptors are closest to the proposed construction site with the nearest residential receptor estimated to be less than 100m from the site. Old Denny Road residents are therefore likely to be most severely affected by noise from construction activities. Stirling Road receptors are estimated to be some 300m from the core construction site and will be less affected by construction activities. However, residents in these properties are more likely to be affected by the increase in traffic, including heavy commercial vehicles and mobile plant, entering and leaving the site during construction. They will also be affected by noise from road alterations at the proposed entrance to the site.
Construction noise impacts are likely to include:

- Movement of heavy vehicles and mobile plant onto and off the site;
- Movement of heavy vehicles and mobile plant within the site;
- Construction activities, for example:
    - Demolition;
    - Excavation and earth moving;
    - Piling;
    - Erection of scaffolding; and
    - Steel work.

Operational impacts are likely to include:

- Staff, patients and visitor's vehicles entering and leaving the site;
- Boiler plant operation (for heating and hot water);
- Air conditioning units; and
- Back-up electricity generators (if present).

7.5. Mitigation Measures and Monitoring Arrangements

Mitigation measures are available for the potential noise impacts. Legislation and codes of practice are available to control noise from a variety of activities.

Construction noise is controlled by the Control of Pollution Act (1974), Sections 60-61. Under Section 60 local authorities have powers to serve notice imposing conditions to control noise by stipulating the manner in which construction activities can be carried out.

Alternatively, under Section 61 the contractor carrying out the work may apply for consent, before commencement of the works, to carry out the works using specified techniques which will result in noise being controlled. Any such consent will reflect best practicable means (BPM) to control the noise. Once the consent has been approved by the local authority the contractor will effectively be immune from action by the local authority concerning noise provided the terms of the consent are being complied with. Reference will be made to British Standard 5228 (Noise Control on Construction and Open Sites) for guidance on noise control techniques. BS 5228 was given formal recognition in Scotland in 2002 as *The Control of Noise (Codes of Practice for Construction and Open Sites) (Scotland) Order 2002, SSI2002/104.* Mitigation measures will include restrictions on times that construction activities can take place with procedures to be followed if extensions to those hours are necessary for specific construction activities. Night-time working would not normally be permitted unless there are overriding reasons. Specified routes for construction traffic, specific techniques to control piling operations and notification of exceptional activities to local residents are measures likely to be adopted.

The establishment of a Section 61 consent, if this approach is adopted, would be subject to extensive consultation with Falkirk Council.

Mitigation of noise from the operational phase of the hospital will largely be achieved at the design stage. It is unlikely that the daily functioning of the hospital will cause any significant noise problems for local receptors. However, some items of plant such as boilers and associated equipment, and air conditioning units have the potential to cause noise disturbance to local residents. Measures can be taken to reduce or eliminate that potential including siting of potentially noisy plant away from sensitive locations and selection of appropriate equipment at the design stage. In addition the layout of the hospital can be orientated to use the structure of the hospital as a screen between noisy operations and potential receptors.

Traffic generated by the site will be an ongoing source of noise during the operational phase of the hospital. Noise from road traffic in this instance is not covered by any legislative measures. Design of

the access roads to and from the site can be used to smooth the flow of traffic. Smooth flowing traffic is less likely to give cause for annoyance than stop-start traffic at congested junctions. Consideration will be given to the positioning and design of access roads to minimise noise impacts. Most traffic related noise impacts will occur during day-time hours. Noise at night is often more intrusive because background levels are much lower, however, night-time traffic levels will be low and hence night-time traffic noise levels will be significantly lower than those experienced during the working day.

7.6. Unavoidable and Residual Impacts

Inevitably there will be some unavoidable noise impacts. These will include some construction activities and some impacts from the ongoing use of the site once complete.

As discussed in section 7.4, many construction activities are inherently noisy. The impacts are, however, limited in duration. Many of the most significant noise impacts will be experienced during the early stages of the process. Once the main structure of the building is complete most construction activity will occur inside the building. The unavoidable noise impacts from the construction phase will be controlled to the standards of BPM as discussed in section 7.5.

Residual noise impacts will mainly be due to the increase in traffic levels using local roads, specifically Stirling Road. Impacts will be minimised by careful design. Residual impacts from the use of the site are likely to be limited given the nature of activities on the site and will be minimised by design and lay-out of the development.

7.7. Deficiencies

Limited data at the outline planning permission stage of this project has restricted the output of the noise and vibration review. Design and layout and hence construction techniques are not yet established so specific potential noise assessments of the construction or operational phases could not be made.

7.8. Scope for Additional Environmental Improvements

There is limited scope for additional environmental improvements with respect to noise. Provided the mitigation measures discussed are implemented the likely impact of noise is limited.

7.9. Conclusions

Development of the Larbert site for the new Forth Valley Acute Hospital will inevitably lead to noise impacts. Impacts during the construction phase will be time limited and controlled by the use of appropriate techniques and by complying with relevant standards and legislation. Noise impacts during the operational phase are likely to be limited to traffic noise and operation of on-site plant such as boilers and air conditioning. Both these impacts are likely to be limited in their effect by the use of careful design and control mechanisms. Impacts at night, when noise has a greater potential to cause disturbance, will be limited by significantly lower activity levels on the site.

For purposes of clarity and to ensure that 'Recreation and Non-Motorised User Access' is covered thoroughly, Section 8 is organised into the following sub-sections:

- 'Approach and Methods';
- 'Existing Baseline Conditions';
- 'Consultation';
- 'Potential and Predicted Impacts';
- 'Mitigation Measures and Monitoring Arrangements';
- 'Unavoidable and Residual Impacts';
- 'Deficiencies';
- 'Scope for Additional Environmental Improvements'; and
- 'Conclusions'.

8.1. Approach and Methods

The Recreation and Non-Motorised User Access section of the ES sets out to:

- Identify existing footpaths, bridle paths and other routes used by non-motorised users of the estate;
- Describe the current recreation amenity of the site;
- Identify planned and existing long distance routes for walkers, cyclists and horse riders that pass through or near the estate;
- Assess the impacts of the development on recreation and non-motorised user access; and
- Make recommendations for mitigation of the recreational impacts and residual impacts.

Information sources and guidance on assessing Recreation and Non-motorised User Access were provided by the following publications and sources:

- Ordnance Survey Maps 1:10,000, 1865 – 1984;
- Forth Valley Primary Care NHS Trust: Royal Scottish National Hospital Landscape Appraisal, Ironside Farrar Ltd, February 2002;
- Consultation carried out by Falkirk Council;
- Paths For All Partnership – www.pathsforall.org.uk;
- Fieldfare Trust (promoting access for all) – www.fieldfare.org.uk; and
- Scottish Outdoor Access Code (Scottish Office), 2005.

The following documents were reviewed:

- *Larbert and Stenhousemuir Local Plan 1998*;
- *Transport Assessment and Travel Plan: New Acute Hospital, Larbert*, Colin Buchanan and Partners Ltd, March 2005;
- Falkirk Council: *Countryside Access Strategy* (new version currently in preparation);
- Falkirk Council / SNH / CCCT / Forth Valley Enterprise: *Greenspace Initiative*;
- *Development Framework for the Former RSNH Site, Larbert September 2004*; and
- Ordnance Survey Map1:25000, 2004.

8.1.1 Legislative Framework

The full detail of the national, regional and local policy context is set out in Section 4 of the ES. The following section identifies the policies and supporting guidance that have informed the baseline and impact assessments of the development. The following legislation and policies are relevant to the Recreation and Non-Motorised User Access section of the ES.

Acts of Parliament
The Land Reform (Scotland) Act 2003: Scotland has never had a trespass law, but this Act clarifies where people have a right to be for recreation and education purposes, and for crossing over land and water. A Scottish 'Outdoor Access Code (2005)' has been devised to guide the public and land managers to make informed decisions. Existing rights of way, paths, tracks, construction roads and areas currently out of or excluded from statutory access rights, must be identified, and details for the provision for their future maintenance must be given. It is estimated that 90% of land will be covered by the Act and paths should be provided by landowners through access land. Land can be exempted from access because of a need for privacy, security and the public safety. Standards for path design,

surfacing, gates, and access for the disabled is covered by the 'BT Countryside for All Project', The Fieldfare Trust.

8.1.2 National Planning Policy Guidelines

NPPG 11: Sport, Physical Recreation and Open Space, states that it is important for physical and mental health that everyone, particularly the disabled, children and the elderly, should have easy access, preferably on foot or by cycle, to public open space. The guideline comments that attractive open space, whether or not there is public access to it, may be important for its contribution to the quality of urban life, and it enhances the character of residential areas, Conservation Areas, Listed Buildings and historic landscapes. NPPG 11 also emphasises the important role of footpaths in providing public access through urban areas and within the countryside, and states that in order to meet the growing demand for informal recreation, it will be necessary to create and maintain a comprehensive network whilst respecting the needs and rights of landowners and farmers.

NPPG 17: Transport and Planning seeks to achieve better integration within and between different modes of transport, and to accord with environmental aims and policies so that transport choices do not conflict with environmental objectives. The guidance particularly states that large developments such as hospitals, schools and offices can have significant implications for travel demand and they should be located so that they are well served by public transport and walking and cycling networks. Walking strategies should form part of an integrated approach to transport, and urban areas should be made more attractive and safer for pedestrians, including in particular people with mobility difficulties. The guidance also highlights the health benefits of safe cycling facilities for people of all ages, and states that these are of particular value to young people, giving them independence and reducing the need for car journeys. In providing for cyclists, the aim should be to design routes no longer than main car routes in existing development, and more direct in new development, without the need for artificial gradients.

8.1.3 The Scottish Executive's Planning Advice Notes

PAN 57: Transport and Planning aims to encourage walking for short trips through good design. This includes traffic calming, improved street lighting, pedestrian friendly road crossings and the creation of links with long distance footpath and cycle routes. Footpaths should be designed to allow disabled, pushchair and pram users, and the elderly to make full use of them. PAN 57 also encourages the creation of safe cycle routes.

PAN 60: Planning for Natural Heritage recognises that regular contact with nature offers benefits in terms of general health and well-being and a rich natural environment provides opportunities for a great variety of recreational and educational pursuits. It states that planning authorities can contribute to the development of improved access for the enjoyment of natural heritage by safeguarding key routes and path networks designed to meet the needs of communities and visitors, identifying locations for key recreational facilities, and making links with other important policy agendas such as health, social inclusion, and sustainable transport.

PAN 65: Planning and Open Space, states that open space is important to our quality of life, providing a range of social, environmental and economic benefits. Open spaces can be important in defining the character and identity of settlements, and well-designed and managed spaces can raise the quality of business, retail and leisure developments making them more attractive to potential investors, users and customers. Where possible, spaces should link together in a network, providing the landscape and townscape structure in the urban area. Networks can encourage walking and cycling, while green networks and corridors can promote biodiversity.

8.1.4 Falkirk Council Structure Plan (2002)

Policy COM.6: Open Space and Recreational Facilities, states that the provision of public open space and recreational facilities is an important determinant of quality of life within communities. The Council will seek to ensure that a satisfactory distribution and quality of open space and recreational facilities exists across the council area.

Policy TRANS.1: Core Paths Network recognises that a significant proportion of journeys made by Falkirk Council residents are short distance local trips, and the Council aims to encourage residents to make such journeys on foot or cycle. Through this policy the Council intends to identify a network of strategic paths and core path networks based on the main communities in the area. Wherever possible

new development proposals should create linkages and strategic routes to the identified core path network.

8.1.5 Larbert and Stenhousemuir Local Plan (1998)

Policy LAR 34: Public Transport Users, Cyclists and Pedestrians, states that there will be a general presumption against development proposals which are not accessible by public transport and do not make adequate provision for cyclists and pedestrians. It states that the introduction of measures to provide attractive, convenient routes for pedestrians and cyclists will have beneficial implications in relation to environmental quality and road safety.

Policy LAR 46: The Greenspace Initiative aims to create a permanent circular link between existing and proposed areas of open space, which will contribute significantly to improving access, habitats and recreation within the Green Belt and urban fringe areas. The Council will seek to ensure that development proposals do not undermine the Greenspace Initiative, and in urban fringe locations in particular, developers will be expected to incorporate appropriate proposals for open space and footpaths / cycle routes into part of any planning application for development.

Opportunity T14 (Larbert and Stenhousemuir Local Plan, 1998) promotes the creation of part of the 'Strategic Off-Road Network' and the proposed Falkirk to Stirling cycle route. Work has started on this route, but not within the application area.

8.2. Existing Baseline Conditions

The grounds of the former RSNH are an important recreational asset to the local community. The beauty of the woodlands and the richness of the wildlife around Larbert House encourage people to come there for walks and cycling. Traffic is barred from the original 18th century arrangement of tracks and drives around the house and stables. These therefore offer a safe, traffic free area for walking and cycling. At present the volume of traffic visiting the existing hospital buildings is low and the whole site has a tranquil feel.

The Larbert and Stenhousemuir Local Plan highlights the need for new developments to make provision for safe footpaths and cycle routes within the development boundary and a general need for more long and short distance footpaths. The Falkirk Greenspace Initiative (Policy LAR 46) aims to provide a network of off-road routes for pedestrians and cyclists which will improve access from urban areas to the countryside.

8.2.1 Existing and Planned Non-motorised User Routes to the RSNH Estate

The following routes cross the site or may be accessed from the site:

- The projected Carronshore – Larbert West Strategic Off Road route runs through the centre of the RSNH estate;
- This will link to the SUSTRANS national cycling network Falkirk to Stirling cycle route;
- There Old Larbert – Denny highway (now a farm track) goes over the M876 and is a popular route used by local people to walk from Larbert to Tor Wood, Kirkland Wood, Denovan House and the countryside north west of the site;
- There are no formal bridle paths through the site but riders use the estate paths linking the Denny Road with the Old Denny Road and route over the motorway; and
- Cyclists use the estate roads and paths which are currently closed to traffic.

8.2.2 Projected Future Non-motorised User Access to the Hospital

Access on Foot
As stated in section 6, the TA calculates that currently 0.6% of existing hospital staff live inside a 1200m catchment of the hospital and 1.9% live within a 200m catchment. The walk-in catchment for patients and visitors is expected to be approximately similar – though in practice many patients will require motorised transport. There are no figures for recreational users of the site. Access to the site is reasonable from the residential areas to the east of the site but there are no controlled crossings on Stirling Road which makes crossing hazardous for the elderly, partially sighted and unaccompanied children. The TA remarks that lighting in the passageways from Logie Drive and Glenbervie Drive needs

enhancing. The indicative layout for the new roundabout at the entrance of the site drawn in Appendix C shows no footpath or crossing to allow pedestrians safe and easy access to the site.

Access by Bicycle
The TA in section 6 calculates that currently 12.8% of existing hospital staff live inside the 5km catchment of the hospital and the cycle-in catchment for patients and visitors would be expected to be the same - though in practice many patients will require motorised transport. There are no figures for recreational users of the site. Access to the site is reasonable from the residential areas to the east of the site but there are no controlled crossings on Stirling Road which makes crossing hazardous for the elderly, partially sighted and unaccompanied children. There are no cycle routes in the immediate vicinity of the site and the indicative layout for site access in Appendix C shows no cycle path to allow cyclists safe and easy access to the site.

Recreation Land
There is a currently disused recreation area included in the Core Hospital Site 1 area. The Falkirk Council Development Framework states that "If the recreation ground is to be developed this should be replaced as a playing pitch for staff use with some community access elsewhere within the overall RSNH site".

8.3. Consultation

In 2004 Falkirk Council carried out a consultation exercise. Consultees were invited to respond to the Council's document: *Development Framework for the Former RSNH Site, Larbert; Consultative Draft, September 2004*. The responses relating to recreation and non-motorised user access summarised below.

Forestry Commission

- Supported the use of the site as a Community Woodland.
- Supported the creation of more woodland.
- Welcomed the opportunity to comment on woodland management objectives and replanting proposals.

Scottish Natural Heritage

- Supported the application of the detailed tree survey to develop the layout option appraisal for the site, thereby reducing the need for important woodland areas to be felled.
- Requested that any loss of woodland should be compensated for by replacement planting.
- Proposed that funding mechanisms for the management plan were investigated and established before planning permission is sought.
- Suggested that it was important to consider how access to the site would be managed. The masterplan should detail a plan of public access across the site during construction and operation.

Sports Scotland

- Welcomed the requirement that the existing playing field would be relocated on the site.
- Considered the eastern pasture an appropriate site for informal recreation use by local residents.
- Welcomed the pedestrian and cycling provision, which should fit with path networks beyond the site.

Stirling Council

- Had concerns that the public access might conflict with the need for site security.

The Garden History Society

- Welcomed proposals for the restoration of the historic garden.
- Supported the use of existing networks of paths and roads for circulation on the site.

Larbert, Stenhousemuir and Torwood Community Council

- Supported retention of the recreation area and the Eastern Pasture as open pasture.

- Requested that any recreational facilities created by the development would be available for community use and hoped that there would not be a perimeter fence reducing access to the site.
- Hoped that traffic would be minimised in the existing parkland and that existing roads would be reused.
- Hoped that the local community would be consulted throughout the project.

Local Residents

- Supported proposals for a perimeter fence.
- Supported the use of the walled garden.
- Supported the reuse of existing roads on the site.
- Wished masterplan to be subject to community consultation.
- Opposed a new entrance to site from Stirling Road.

8.4. Potential and Predicted Impacts

At this stage potential beneficial and adverse recreational impacts have been predicted as follows:

8.4.1 Beneficial Impacts

- A new programme of structure planting and improved management of existing woodlands will improve the amenity value of the estate as a whole. Maintenance of the existing landscape will improve if the site is given a new use. The woodland on the estate may be suitable for adoption as community woodland managed by the local community.

- There has been little landscape maintenance of the loch in recent years and the margins are very overgrown with rhododendron, making access difficult. There is unrealised recreational potential in the loch for fishing, boating and perhaps even swimming if water quality and safety issues could be resolved.

- The landscape could provide an important therapeutic resource for the hospital: the grounds will provide pleasant surroundings for patients who spend long periods of time at the hospital and the walled garden may have a future as part of a therapy and rehabilitation project. Local people could become involved in the project on a voluntary basis which would help to build links between the local population and the hospital.

- The grounds will also add to the quality of the working environment for staff which will help recruitment and staff retention.

- Recreational facilities built on the site (such as tennis courts, playing fields, squash courts) could be shared by hospital staff and local people.

- Existing footpaths on the site are in poor condition in some places and could be improved as part of the development.

- A new landscape strategy will enable a footpath, bridleway and cycle path system to be developed that will separate pedestrians, equestrian users and cyclists from motorists. The paths will provide opportunities for local people and especially children, to exercise safely. The Carronshore – Larbert West Strategic Off Road route could be incorporated into the masterplan and there may be opportunities to link up with other long distance routes planned for the area.

- The new access road could be designed to incorporate a separate footpath and cycle route into the site which would allow safe and easy access to the hospital and its grounds. Improved cycling facilities could be provided between the site and residential areas of Falkirk.

8.4.2 Adverse Impacts

- The volume of vehicle traffic will increase substantially when the hospital is developed leading to a loss of tranquillity in areas which are currently quiet and well used by the local community. Though most of this increase will be experienced during working hours, there will be more traffic at night, when there is currently almost none. There will be a loss of tranquillity around

the areas of the estate which are currently quiet and well used by the local community for recreation.

- The increase in vehicle traffic may make existing paths and bridleways less safe for pedestrians, cyclists and equestrian users. The Stirling Road may be more difficult to cross for Larbert residents (especially for children, the elderly and the partially sighted).
- The new development masterplan may conflict with proposals for long distance footpaths and cycle paths.
- There is likely to be a loss of woodland and open space currently used for recreation by local people. The recreation ground west of the Stirling Road access may be lost (noting that Falkirk Council's Development Framework requires it to be relocated in the event that its current location is developed for other uses).

8.5. Mitigation Measures and Monitoring Arrangements

The following mitigation measures area proposed with regard to recreational issues:

- The masterplanners should consult policy LAR 46 'Greenspace Initiative' of the Local Plan. Future plans for the Carronshore – Larbert West Strategic Off Road route, SUSTRANS and the Falkirk to Stirling cycle route must be provided for when vehicle circulation is being planned.
- Consultation with Ramblers Association, Open Space Society, British Horse Society, Cyclists Touring Club and other local recreation groups to establish their requirements and views on potential mitigation measures.
- Cycle routes from South Broomage, Antonshill and Camelon could be extended to the site to encourage cycling by members of staff and local residents.
- Improved lighting and signage in smaller streets between the new hospital site and Broomage Avenue and in Logie Drive and Glenbervie Drive could encourage staff to walk to work.
- The pedestrian, equestrian and cycle routes to the new hospital and around the RSNH estate must be included in the masterplanning exercise so that the vehicular traffic circulation system does not conflict with the non-motorised users' requirements for a safe and separate circulation.
- Controlled combined pedestrian, cyclist and possibly equestrian crossings across Stirling Road would improve safety and ease of access especially for the elderly, children and partially sighted.
- Sustainable transport policies should be implemented to reduce traffic entering the site.
- Minimise parking areas and site them away from landscapes of high recreational value.
- Plan sports and recreation facilities so that they can have shared use between local residents and the hospital staff and patients.
- Minimise loss of trees and woodlands. A new landscape masterplan will plan structural planting to reduce the impact of the new development on the recreational amenity of the site.
- A lighting strategy could consider sensitive lighting of the area around Larbert House and the Loch so that it could be used for recreation in the evening.
- A lighting strategy should minimise the spillage of light from the new access road, Core Hospital Site 1 and Development Site 2 which could reduce the urbanising effect of street lighting on the rest of the RSNH estate.

8.6. Unavoidable and Residual Impacts

All traffic – vehicular and non vehicular - will increase on the RSNH estate, reducing the tranquillity and amenity of the estate by day and night. There will be a new, wider access road and roundabout on the estate. The road and its attendant street lighting and signage will have the impact of urbanising the estate and there will be increased traffic on the Stirling Road, making it more difficult to cross.

8.7. Deficiencies

Due to the scheme being a PFI the significant deficiency at this stage of the development process is the lack of a masterplan.

8.8. Scope for Additional Environmental Improvements

As part of the construction of the hospital infrastructure, existing paths could be resurfaced to improve access and use by the disabled. Sections of the long distance routes to Stirling, Carronshore etc could be built and advance structure planting could be carried out to mitigate against the effects of development.

8.9. Conclusions

Consultation should be undertaken with the Ramblers Association, Open Space Society, British Horse Society, Cyclists Touring Club and other local walking, cycling and equestrian recreation groups to establish their requirements and views on potential mitigation measures.

A safe and convenient footpath and cycle path network should be included in the masterplan to encourage hospital staff and visitors to the hospital and the RSNH grounds to cycle. The new cycle and footpath system must link with existing footpaths and cycle routes on the estate and planned long distance footpaths and cycle routes in the Falkirk area. A series of crossings to enable pedestrians and cyclists to cross Stirling Road are required.

A new location for the recreation area for local people and hospital staff must be included in the masterplan. Development site roads should be designed to include traffic calming so that vehicles move slowly and pedestrians and cyclists have priority. A lighting strategy must be planned to maintain the visual amenity of the RSNH Estate and environs by night.

For purposes of clarity and to ensure that 'Flora and Fauna: Ecology' is covered thoroughly, Section 9 is organised into the following sub-sections:

- 'Approach and Methods';
- 'Existing Baseline Conditions';
- 'Consultation';
- 'Potential and Predicted Impacts';
- 'Mitigation Measures and Monitoring Arrangements';
- 'Unavoidable and Residual Impacts';
- 'Deficiencies';
- 'Scope for Additional Environmental Improvements'; and
- 'Conclusions'.

9.1. Approach and Methods

The information to complete the ecological assessment for the ES has been gathered from a number of sources involving a range of desk studies, consultation and initial ecological studies. The Phase 1 Habitat Survey, undertaken in November 2004, established an ecological baseline in order to identify and quantify the potential impacts of development on Ecology and Nature Conservation. Due to the final configuration and nature of the hospital development being unknown at this stage, Phase 2 level protected species studies have not been undertaken for this environmental impact assessment.

The Flora and Fauna section presents:

- A summary of the assessment methodology used;
- A summary of the ecological baseline recorded during Phase 1 Habitat Survey (November 2004);
- A general assessment of residual impact of construction and operation on biodiversity; and
- General mitigation measures and recommended further baseline studies.

The purpose of ecological assessment is to judge whether the potential impacts of a development are likely to be 'significant'. For this report the Institute of Ecology and Environmental Management (IEEM) criteria for assessing the significance of impacts on species and habitats followed the Guidelines for Ecological Impact Assessment: Amended Pilot November 2002. Additional guidance was provided by Forth Valley NHS Board: *Acute Hospital Project – Environmental Scoping Report* (2004) and the *Environmental Impact Assessment (Scotland) Regulations 1999*.

9.1.1 Desk Study Methods

A number of documents were consulted during the desk survey, including:

- *Forth Valley Primary Care NHS Trust: Royal Scottish National Hospital Landscape Appraisal*, Ironside Farrar Ltd, February 2002;
- *Larbert and Stenhousemuir Local Plan 1998*;
- Ordnance Survey Maps 1:10,000, 1865 – 1984;
- Ordnance Survey Map 1:25000, 2004;
- *Larbert House Royal Scottish National Hospital, Landscape Appraisal*, Ironside Farrar Ltd, 2002;
- *Development Framework for the Former RSNH Site, Larbert*, Falkirk Council;
- *Falkirk Council Structure Plan* June, 2002;
- *Falkirk Area Biodiversity Action Plan (FABAP), 2002*; and
- *Biodiversity of Falkirk - an assessment of priority habitats and species*, Anna Perks (Falkirk Local Biodiversity Action Plan Steering Group), 2000.

Locations of all designated sites of conservation importance at international, national, regional and local level were identified on site and within approximately 2km of the site.

9.1.2 Field Survey Methods

A Phase 1 Habitat Survey was conducted during a one day initial walkover in September and completed over two days in early November 2004. The survey was undertaken according to guidelines outlined in the *'Handbook for Phase 1 Habitat Survey – a Technique for Environmental Audit'*, Joint Nature Conservancy Council 1993 as modified by the Institute of Environmental Assessment.

All habitats within the study area were classified, notable species of flora, fauna and areas of conservation value were targeted and where possible, botanical species were identified to species level. The following key ecological resources were identified during the scope and targeted during the Phase 1 Habitat Survey as relevant to the development scheme:

- Habitats and flora;
- Birds;
- Mammals;
- Reptiles and amphibians; and
- Invertebrates.

Detailed Phase 2 level studies for protected species and flora have not been carried out, therefore only general impacts and mitigation strategies can be addressed within this section. In order to fully appraise the impact of development on habitats and species of significant ecological value further studies are required once a more final design emerges. The Ecological Survey with plans is included in Appendix B of this ES.

9.1.3 Legislative Framework

The full detail of the national, regional and local policy context is set out in Section 4 of the ES. The following section identifies the UK Acts and Regulations of relevance to this section of the ES:

- *Wildlife and Countryside Act 1981* (as amended);
- *Environmental Protection Act 1996*;
- *Water Resource Act 1991*;
- *Protection of Badgers Act 1992*;
- *Conservation (Habitats & c.) Regulations 1994 as amended 2000* (Habitat Regulations);
- *Environmental Act 1995*;
- *Wild Mammals Protection Act 1996*;
- *Hedgerow Regulations 1997*; and
- *Countryside and Rights of Way Act 2000*

9.2. Existing Baseline Conditions

There are no statutory designated areas of ecological importance within the site. However, there are a small number of national, regional and local designations of importance within 2km of the site. Table 9.1 lists sites of nature conservation value.

Table 9.1: Sites of Nature Conservation Importance

Site name	Type of designation	Closet distance to site (km)	Ecological features
Carron Dams	Site of Special Scientific Interest (SSSI)	1.9	Semi-natural broadleaved woodland, Fen and unimproved grassland
North Stenhousemuir	SINC (Site of Importance for Nature Conservation)	1.5	Broadleaved semi-natural woodland

Site name	Type of designation	Closet distance to site (km)	Ecological features
Camelon Riverside	Wildlife Site	Within 2	Dense continuous scrub
Forth and Clyde Canal	Wildlife Site	Within 2	Open standing water
Roughcastle	Wildlife Site	Within 2	Broadleaved semi natural woodland
South Torwood	Wildlife Site	Within 2	Unimproved acid grassland
Torwood Mire	Wildlife Site	Within 2	Raised bog and unimproved acid grassland
Wallacebank Wood	Wildlife Site	Within 2	Ancient semi-natural lowland oak woodland

The following habitat types were considered of ecological value during the Phase 1 mapping and desk survey exercise undertaken in November:

9.2.1 Habitats and Flora

Woodland
Approximately 30ha of the study area are wooded and comprise a mosaic of semi-natural broadleaved, mixed coniferous plantation and scrub in the form of blocks, copses and shelter belts. In addition there are a number of mature parkland trees associated with the 19th century garden and parkland around Larbert House. Six woodland areas are identified in the inventory of Ancient, Long Established and Semi-Natural Woodland (NCC 1986).

Seven of the wooded areas are considered of important local ecological value. All are of a semi-natural status, comprising a wide variety of habitats from deadwood micro-habitats important for invertebrates to mature trees supporting nesting birds and potential bat roosts. Other mammals and priority vascular plants may also be present.

The largest of the wooded areas to the west, known as 'Big Wood', comprises downy birch (*Betula pubescens*), silver birch (*Betula pendula*) and frequent conifers. The wood connects to a number of other woods of dominant beech (*Fagus sylvatica*), oak (*Quercus robur*) / birch, oak / beech, and mixed broadleaved / conifer blocks comprising of Norway spruce (*Picea abies*), scots pine (*Pinus sylvestris*) and larch sp (*Larix*).

In addition, eight further woodland areas, several comprising partially semi-natural components, can be considered of local ecological value, providing a range of habitats with the potential to support UK and *Falkirk Biodiversity Action Plan* (FABAP) priority species. Remaining woods in the form of shelter-belts clumps and strips of conifers (associated with broadleaved blocks) are generally considered of lower ecological value. However, they still provide a number of potential habitat requirements for protected species and breeding birds.

A summary of the Phase 1 woodland habitat types and ecological values are shown in Appendix B of this ES.

Hedgerows
Few hedges of importance were identified within the study area. Generally hedgerows are sparse, low and species-poor. Boundary hedges often appear absent throughout the majority of the site and boundaries are marked by stone walls and/or post and wire fences. The following hedges were target noted during the Phase 1 Survey:

- A double fragmented hedge along a northern footpath connects to woodland block (A). The northern hedge is defunct and entirely absent in some sections.

- The southern hedge of the bridleway is floristically richer than its opposite hedge, providing a potential wildlife corridor between northern habitats and can be described as a species-poor hedge with gaps. The hedge is likely to be considered as an 'important' hedge under the *Hedgerow Regulations 1997* as it runs alongside a bridleway, includes at least four woody species in an average section and features a ditch and bank system opposite a parallel defunct hedge.

- At the edge of Development Site 3 is a well clipped species poor intact beech hedge with few supporting species.

- To the north parallel to Woodland (E) is a low well clipped species poor intact hedge comprising frequent beech and hawthorn.

Grassland
Over 40% of the grasslands in the study area can be described as improved (pastures that have been significantly affected by heavy grazing, drainage, over-seeding with edible species or the application of herbicides or fertilisers).

The site has minor potential to support grassland types of UK and FABAP importance. Semi-improved and neutral grassland margins were identified to the southern boundary of the site and pockets around the eastern edge of Larbert Loch. Parkland and amenity grasslands have been unmanaged in certain central and northern areas leading to encroachment by coarser grasses and tall ruderals.

Standing Water
Larbert Loch to the east of Larbert House is the largest area of open water with a central tree lined island. The bank-sides are heavily encroached by Rhododendron and mature parkland trees. Two thirds of the loch area is covered by water-lily (*Nuphar*). The area has the potential to support a range of marginal and open water macrophytes. The Phase 1 survey identified pondweed, duckweed, water starwort, reed and sedge.

Running Water
Chapel Burn is the only running water feature within the study area, situated to the north of the site. Chapel Burn is partly in culvert emerging for a short stretch as a boundary feature of wood (B) comprising simple bankside vegetation and stony shingle substrate with small riffles.

A series of ditches appear to the east of the loch comprising a stone wall bank to one side (previous ha structure) and simple riparian vegetation of tall grasses with few macrophytes although the majority of water appears to be standing and moderately eutrophic. A slow flow was observed on the southern ditch. It is assumed that the River Carron outside of the site's southern boundary is the receiving watercourse for Chapel Burn and Larbert Loch drainage ditches.

Flora
No records for any known Nationally Scarce vascular plant species occurring within the site were located during the Phase 1 Survey. During the initial site walkover habitats were identified for bluebell (*Hyacinthoides non-scripta*), ox-eye Daisy (*Leucanthemum vulgare*), field scabious (*Knautia arvensis*) and harebell (*Campanula rotundifolia*). These species are listed in the FABAP as priority species.

9.2.2 Protected Species

No specific protected species surveys have been carried out within the development site during the environmental impact assessment.

Breeding Birds
No breeding bird surveys have been conducted at the site. The Phase 1 habitat survey identified a number of suitable nesting areas within woodlands, scrub and arable margins. Bird species of conservation value may be present but yet to be identified. Woodland edge, tall grassland and rough pasture habitat was identified as suitable for small mammals, potentially providing good hunting opportunities for Barn Owls.

Mammals
No active badger setts are currently known to be situated within Development Sites 1, 2 or within the wider area of the hospital site. A previous survey (Ironside Farrar Ltd, February 2002) identified no signs of Badgers on site. Further survey is required as the wider site supports potential foraging areas within Parkland, broadleaved and woodland areas. Badgers are known to inhabit the wider Falkirk area and are recognised within the FBAP as a Local Priority Species

Good potential for bat roosts exists on site owing to the number of mature trees with potential holes and broken branches. Larbert House, out-buildings (ice house / stables) and boundary walls consist of brick / stone built structures with cracks, crevices and missing bricks, which would provide suitable entry points to potential roost sites, the existing hospital buildings could also provide building roosts. The mosaic of grassland, rough pasture and ornamental garden scrub surrounding the core development area could potentially provide foraging areas for bats. No desk survey records of know roosts were located for the

site. Bats and their roosts are protected internationally, nationally and recognised in the Falkirk Species Action Plan for bats.

The Northern Chapel Burn watercourse provides potential suitable habitat for water voles. Water voles are known to be present in Falkirk area inhabiting vegetated banks of water courses that favour slow-flow conditions. Water voles are recognised nationally and locally with the FABAP. The Species Action Plan identifies water voles present on the River Carron at Larbert

Foxes, rabbits and deer were observed during the Phase 1 Habitat survey. Although not directly observed on site, it is considered likely that the area would also support hedgehogs, brown hare and other small mammal species. Brown hare and hedgehogs are recognised as Local Priority Species within the FABAP for which a Species Action Plan is available.

Reptiles and Amphibians
No ponds capable of supporting amphibians were identified within Development Sites 1 and 2. Within the wider site, the Loch and surrounding drainage ditches low potential exists for amphibians. Great crested newt, common frog, common toad, palmate newt and smooth newt are protected locally within the FABAP

No species of reptile were recorded during the Phase 1 habitat survey although suitable potential habitats were recorded. Adders are protected nationally and locally with the FABAP.

Invertebrates
Ancient trees especially mature oaks and grassland margins supported by tall ruderals provide potential terrestrial invertebrate habitats. The northern and southern watercourses have the potential to support aquatic invertebrates.

9.3. Consultation

Consultations were undertaken with Scottish Natural Heritage (SNH) and Scottish Wildlife Trust (SWT) regarding information requests on site designations, habitats and protected species of conservation importance.

Falkirk Council invited responses to the Council's document: *Development Framework for the Former RSNH Site, Larbert; Consultative Draft, September 2004*. The responses relating to ecology and nature conservation are summarised below.

Forestry Commission

- Supports the use of the site as a Community Woodland.
- Supports the creation of more woodland.
- Would welcome the opportunity to comment on woodland management objectives and replanting proposals.
- Supports Tree Preservation Order (TPO) on the site and protection of the woodland in the future.

Scottish Environmental Protection Agency (SEPA)

- To maximise wildlife habitat of new water features best practice can be obtained in SEPA's publication '*Ponds, Pools and Lochs'*.

Scottish Natural Heritage

- RSNH should be surveyed using Phase 1 Habitat Survey, which should identify areas which merit further investigation by a Phase 2 Survey.
- Support application of the results of the detailed tree survey to develop the Layout Option Appraisal for the site, thereby reducing the need for important woodland areas to be felled.
- Any loss of woodland cover should be compensated by replacement planting.
- Support application of TPOs.
- Recommend survey is undertaken for the presence of badger, water vole and great crested newt.
- All buildings to be demolished should be checked for signs of bat roosts.
- Suggest a number of detailed issues to be included in management plan for the site.

- Funding mechanisms for management plan to be investigated and established before planning permission applied for.
- Management plan should detail who has responsibility for implementing each section of the plan.
- Important to consider how access on site is going to be managed. Masterplan should contain detailed plan of public access to the site (existing, during construction and upon completion).

Larbert, Stenhousemuir and Torwood Community Council

- Supports retention of the recreation area and the Eastern Pasture as open pasture.
- Supports Phase 1 and 2 Habitat Surveys.

9.4. Potential and Predicted Impacts

Potential and predicted construction impacts have been analysed using information provided within the recently issued Consultative (3rd) Draft of the Falkirk Council Development Framework (Falkirk Council, September 2004) and Transport Assessment and Travel Plan (March 2005).

9.4.1 Habitats and Flora

Woodland
Potential construction impacts to woodland habitats are likely to be of short term duration resulting from dust generation and other pollutants largely confined to woodland edge habits of retained woodland within construction areas. The loss of semi-natural woodland C and copse G during operation is considered a local minor negative impact.

Hedgerows
It is likely that impact to hedgerows would be off a short term duration resulting from dust generation and other pollutants. It is assumed that the intact central beech hedges and bridleway to the north will be retained. The impact is therefore considered neutral at this stage off assessment.

Grassland
Grassland within the main development areas consist of amenity and improved grassland. The impact is considered neutral at this stage of assessment.

Standing Water
During the construction phase there is a risk of pollution loading resulting in increased eutrophic conditions to Larbert Loch and changes to the distribution of macrophyte communities. With appropriate mitigation the impact during construction is considered to be neutral.

Running Water
There are potential risks from increased siltation and pollution loading to drainage ditches in the south and Chapel Burn during initial construction. Changes to the hydrological regime of the Burn may affect the distribution of macrophyte communities and its habitat suitability. With appropriate mitigation and detailed environmental management to ensure that construction-related materials and silt are not discharged into any watercourse, the impact during construction is considered to be neutral.

Flora
Species of conservation value were not identified within Development Sites 1 and 2. The impact during construction is considered neutral.

9.4.2 Protected Species

Breeding Birds
Construction activities would be likely to generate a level of noise from site traffic and machinery that is likely to have a minor negative short term impact on breeding bird populations if initial construction is carried out within breeding bird season.

Mammals
Badgers, if present on site, may be affected by habitat loss from construction clearance. The Phase 1 survey did not identified any setts. However, foraging badgers may be at risk from increased traffic and general disturbance. The impact during construction is considered neutral.

The Phase 1 Habitat Survey has identified the potential for bats to be present within the development sites in tree and building roosts. Clearance of woodland and scattered trees would result in noise and disturbance to roosting bats. Hospital buildings to be demolished should be surveyed for roosts prior to being demolished. Impacts to a nationally protected species are considered a major negative unless appropriate mitigation measures to protect bats and roosts are put in place. There is a potential loss of mixed northern grassland and ruderal habitat of potential foraging value for bats. The impact due to loss of foraging areas is considered a minor short-term negative.

It is assumed that Chapel Burn to the north of the site will remain unchanged. If riparian and or channel conditions are changed it is likely that water voles would be affected if present. At this stage of assessment the impact is considered neutral.

Other small mammals would be affected by noise and loss of habitat. With appropriate mitigation including phased clearance the impact is considered neutral.

Reptiles and Amphibians
No ponds known to be capable of supporting amphibians would be lost through land take for northern Development Sites 1 and 2. The impact is considered to be neutral.

Land take would remove a proportion of northern grassland margins of potential habitat for reptiles. Appropriate mitigation of phased clearance and translocation where appropriate would result in a short-term negative impact due to general disturbance and loss of habitat.

Invertebrates
Impact to terrestrial invertebrates is likely to be of short-term disturbance through loss of habitat associated with clearance of woodland and grassland habitat.

9.5. Mitigation Measures and Monitoring Arrangements

Further mitigation strategies will be developed on completion of habitat and protected species baseline studies. General ecological impacts and proposed mitigation are shown in Table 9.2.

General mitigation measures during initial construction should ensure that all vegetation clearance is undertaken in phased stages to minimise potential impacts to protected species. A pre-clearance search of all protected species habitats should be undertaken to avoid unnecessary mortality. Where protected species are identified construction work should cease and the environmental manager / site ecologist notified to allow safe translocation of the species to be carried out in consultation with the appropriate statutory body, utilising non-statutory bodies (Local Wildlife Trusts and Groups) for guidance and advice.

If protected species are identified during specialist surveys as residing within an area to be cleared, an early trapping and translocation programme to an appropriate new receptor site outside of the development site boundary should be undertaken. A monitoring programme for all translocated species should be established and protective fencing erected around the new receptor site habitat. All species should be appropriately monitored throughout and after the construction phase. Further detailed mitigation measures would be developed prior to pre-clearance and detailed in the ecological management plan for the scheme.

9.5.1 Habitats

Woodland
Loss of woodland habitat would be mitigated by re-planting broadleaved and mixed woodland to reflect the local character and habitat type of existing woodland. There is an opportunity to re-plant the previous eastern boundary policy woodland, reducing fragmentation through loss of northern woodland areas.

Retention of single mature trees within Development Sites 1 and 2 would require an exclusion zone to protect trees from construction damage.

Hedgerows
Protection of the few site hedgerows is important for retaining their function as wildlife corridors and potential habitats for protected species. The northern hedgerows should be fenced for protection during initial site clearance.

Grassland
Few grasslands of semi-natural status exist, reseeded grassland as part of the landscaping to consist of a local semi-improved mix would increase the ecological value of the current highly modified or unmanaged grasslands and may provide a habitat for local priority species.

9.5.2 Protected Species

Breeding Birds
Clearance of areas where birds may be nesting would be timed where possible to avoid the breeding bird season. Clearance of vegetation within breeding bird season would require a nesting survey to be carried out prior to clearance.

Mammals
No active badger setts were identified on site however badgers may be foraging within the area. Monitoring of potential badger activity should be ongoing during initial clearance and construction owing to the mobility of badger populations. If setts are identified work should cease and the appropriate licence applied for and action taken to safeguard the species. Work within 30m of active setts would require a licence from English Nature.

The felling of any mature trees, particularly those identified as having bat roost potential, should only be carried out in the absence of bats. The felling of any trees identified as having bat roosting potential will need to be carried out carefully under ecological supervision, to avoid damaging any unseen bats present. Any trees confirmed as supporting a bat roost would require a licence from the Department of Environment Food and Rural Affairs (DEFRA) before they can be felled legally. Bats would be safely excluded from tree roosts in order to protect the species. The loss of bat roosting sites should be mitigated by using suitable bat boxes.

Consideration should be given to any new lighting to ensure that light pollution is minimised. Appropriate lighting may benefit certain bat species feeding on insects attracted by lighting.

Water vole mitigation should be linked to the Local Species Action Plan. A survey of Chapel Burn and southern loch area is required in order to incorporate mitigation into the environmental management plan for the site if the species is found to be present.
A programme of phased pre-clearance would allow other small mammals to move away from construction areas. Appropriate fencing of construction works would prevent mammals re-entering construction zones.

Reptiles and Amphibians
Reptiles if identified as present during further survey may benefit from a programme of phased clearance prior to construction with translocation of species to a safe area, fenced off with reptile proof fencing. A licence would be required to translocate great crested newts if found within northern Development Sites to an appropriate receptor site with temporary amphibian fencing.

Invertebrates
Retention of the older parkland trees and re-establishing marginal grassland areas of semi-improved rather than amenity status would benefit terrestrial invertebrates.

Table 9.2: Ecological Impact Assessment Table

Ecological Resources	Potential Ecological Impact	Proposed Mitigation for negative impact
Woodland	Temporary dust and pollution	Environmental Management Plan-dust suppression planning Fencing of woodland and single trees to be retained
	Habitat loss	Compensatory habitat creation, replanting of policy woodlands to avoid fragmentation
Hedgerows	Temporary dust and pollution	Environmental Management Plan - Implementation of dust suppression

Ecological Resources	Potential Ecological Impact	Proposed Mitigation for negative impact
		plan Fencing of northern and central hedgerows to be retained
	Habitat loss	Replanting to avoid loss of wildlife corridors
Grassland	Temporary dust and pollution	Environmental Management Plan - Excavation to take place in moist environment
	Habitat loss	Compensatory habitat creation
Larbert Loch and Chapel Burn	Increased pollution loading	Environmental Management Plan to control discharge and spillage incidents
	Change to macrophyte distribution	Baseline study and monitoring of communities
Breeding birds	Noise and physical disturbance, loss of nesting sites	Pre-clearance timed to avoid breeding bird season
	Habitat fragmentation	Compensatory habitat creation
Amphibians	Disturbance if on site	Phased clearance, translocation and fencing to be considered
	Loss of habitat	Compensatory habitat creation to be considered
Reptiles	Disturbance if on site	Phased clearance, translocation and fencing to be considered
	Loss of habitat	Compensatory habitat creation to be considered
Badgers	Loss of foraging areas, disturbance during construction	Phased clearance, badger fencing to be considered.
	Habitat fragmentation, potential mortality due to on site traffic	Compensatory woodland habitat creation
Bats	Habitat loss and disturbance of roosts	Pre-clearance check of all potential bat tree roosts prior to felling, replacement of potential roosts.
	Operational disturbance	Assessment of lighting impacts to bats
Water voles	Habitat loss and disturbance	Translocation with post monitoring scheme to be considered
	Fragmentation	Compensatory habitat creation to be considered
Other Mammals	Disturbance	Phased clearance
	Habitat loss	Compensatory habitat creation to be considered

Ecological Resources	Potential Ecological Impact	Proposed Mitigation for negative impact
Aquatic an Terrestrial Invertebrates	Disturbance	Phased clearance Environmental Management Plan to control discharge and spillage incidents to watercourses
	Habitat loss	Compensatory habitat creation to be considered

9.6. Unavoidable and Residual Impacts

Unavoidable and residual operational impacts have been analysed using information provided within the recently issued *Consultative (3rd) Draft of the Falkirk Council Development Framework* (Falkirk Council, September 2004) and Transport Assessment and Travel Plan (March 2005) included in Appendix C.

9.6.1 Habitats and Flora

Woodland
Potential loss of woodlands C, G and I would be a minor negative long- term impact. Replanting of original policy woodland would in the long term mature to replace plantation woodlands lost.

Hedgerows
It is assumed that hedgerows are likely to be retained in the design brief, therefore the impact at this stage is considered neutral. If hedgerows are lost, replanting should be considered to avoid loss of wildlife corridors.

Grassland
No long term loss of grassland habitat is foreseen. The operational impact is considered neutral.

Flora
No long term loss of species considered of conservation value is expected. The operational impact is considered neutral.

9.6.2 Protected Species

Breeding Birds
Loss of woodlands C, G and to a lesser extent I will reduce the available nesting opportunities for breeding birds. It is assumed that woodland re-planting schemes would compensate for loss of nesting sites. The resulting impact is therefore considered neutral.

Mammals
Long term operational impacts to badgers is considered neutral at this stage as no active setts appear to be located in woodlands to be removed.

Long term loss of potential tree roosts within Development Sites 1 and 2 would be mitigated by creation of alternative bat roosts. The operational impact is considered neutral.

New hospital buildings, car parking and access facilities associated with Development Sites 1 and 2 may, when operational, impact on bats through noise and light disturbance. Consideration should be given to the type of artificial lighting used. Development proposals are not clear at this stage and the potential disturbance to bats from lighting should be reviewed.

No long term loss or modification of watercourses is assumed at this stage. The operational impact is considered neutral.

Land take for development may initially restrict habitat potential to small mammals in the short term. No long term impact is considered as woodland and grassland replanting is assumed. The operational impact is considered neutral.

Reptiles and Amphibians
Initial land take for the development scheme is not considered to have a long term operational impact on reptiles and amphibians at this stage of the assessment.

Invertebrates
No long term impacts are expected and the operational impact is considered neutral.

9.7. Deficiencies

Although the Phase 1 Habitat Survey has provided initial updated baseline data, further survey is required in order to fully appraise the impact of development on habitats and species of significant ecological value and design appropriate detailed mitigation measures. Further design details are also required in order to review impacts of the final development.

The site is likely to contain species that are protected within a specific legislative framework and recognised as important through UK and FABAP (priority species) or a species of local conservation concern. No evidence of detailed protected species surveys was identified during the initial desk study and Phase 1 search; with the exception of Water Vole and Badger (neither survey reported their presence on site, although appropriate habitat is present). A full programme of protected species surveys as outlined in the Mott MacDonald report on Environmental Scoping (December 2004) is required to design detailed mitigation measures that can be established prior to pre-clearance.

9.8. Scope for Additional Environmental Improvements

- There is an opportunity to create new areas for the benefit of protected species and to protect existing habitats.
- There is an opportunity for enhancement of biodiversity within woodland, grassland and wetland habitats.
- A major opportunity exists to improve the current status of woodland habitats through a management programme of Rhododendron control, selective thinning, replanting of native broadleaved trees and re-introduction of coppice management.
- There is an opportunity to link fragmented habitats.
- There is the opportunity for the creation of an ecological management plan for the wider site to link with UK and FABAP Local Priority Habitats and Species long term management.

9.9. Conclusions

The main negative impact of the scheme arises from the short-term loss of habitat, disturbance and potential displacement of protected species during initial construction. No statutory designated sites are affected by the Scheme. Land take for development based on existing outline design would involve the removal of woodland blocks C, G and I, including scrub and grassland habitat. It is likely that impacts to surrounding woodlands would be of a short term indirect nature.

The replacement of plantation woodland habitat would in the long term provide adequate mitigation for areas being lost. Re-creation of the original policy eastern woodland belts would also compensate for the loss of woodland. However, semi-natural areas identified in woodland C would take a longer time to reach the maturity of the existing habitat.

A programme of further survey is required to understand the relationship between protected species and habitat loss in order to design appropriate mitigation.

The overall balance of impacts in terms of biodiversity would be beneficial if negative impacts are carefully considered within the mitigation strategy resulting in long term wider site ecological enhancement and appropriate mitigation during construction and operation.

Positive Impacts

- Opportunity to create new areas for the benefit of protected species and to protect existing habitats.
- Opportunity for enhancement of biodiversity within grassland and wetland habitats.
- Major opportunity exists to improve the current status of woodland habitats through a management programme of Rhododendron control, selective thinning, replanting of native broadleaved trees and re-introduction of coppice management.

Negative Impacts

- Loss of existing semi-natural woodland and grassland vegetation in central development areas.
- Severance of surrounding wildlife corridors, particularly in areas of new development.
- Disturbance to protected species and loss of habitat through removal or reduction of the extent of woodland, grassland and aquatic habitats.
- Air, noise and light pollution effects to protected species during initial clearance and construction.
- Division and potential fragmentation of habitats through the new road network and car parking.

For purposes of clarity and to ensure that 'Geology, Soil and Contaminated Land' is covered thoroughly, Section 10 is organised into the following sub-sections:

- 'Approach and Methods';
- 'Existing Baseline Conditions';
- 'Consultation';
- 'Potential and Predicted Impacts';
- 'Mitigation Measures and Monitoring Arrangements';
- 'Unavoidable and Residual Impacts';
- 'Deficiencies';
- 'Scope for Additional Environmental Improvements'; and
- 'Conclusions'.

10.1. Approach and Methods

This section comprises a review of the existing baseline conditions at the RSNH site. It includes an assessment of the historical land use of the site, local geology of the area and the likelihood for potential contamination to be present at the site. The review is based on the following sources:

- Halcrow Group Limited (2003). *Forth Valley Primary Care NHS Trust, Royal Scottish National Hospital Site, Engineering Appraisal*;
- Mott MacDonald Ltd (2004). *NHS Forth valley Acute Hospital Royal Scottish National Hospital Site, Geotechnical Desk Study, Revision A*;
- Envirocheck Data Sheets, Landmark; and
- A site inspection and interview with site personnel which was undertaken by Mott MacDonald on the 17th January 2005 to observe site conditions.

10.2. Existing Baseline Conditions

10.2.1 Review of Existing Baseline Information

The engineering appraisal undertaken by Halcrow Group entitled "Forth Valley Primary Care NHS Trust Royal Scottish National Hospital Site RSNH, Engineering Appraisal" (May 2003), presents the results of a Phase I site assessment on the geo-environmental, hydrogeological, drainage and service supply implications for the proposed new development.

The Geotechnical Desk Study undertaken by Mott MacDonald Ltd entitled "Forth Valley Acute Hospital Royal Scottish National Hospital Site, Geotechnical Desk Study" (June 2004), is a review of the findings of the Halcrow Group desk study and a report on any further information which has been obtained by Mott MacDonald in the intervening period.

As part of this EIA, Mott MacDonald interviewed site personnel with regard to current site operations with particular emphasis on waste and chemical storage and handling.

The report undertaken by Halcrow Group comprises a review of historical Ordnance Survey plans, British Geological Survey (BGS) plans, a Coal Authority report, Envirocheck data sheets and a site inspection. No consultation with statutory authorities has been undertaken and the report does not contain any site investigation data or chemical analyses of the underlying soil.

The site inspection undertaken by Halcrow Group was carried out in April 2003, with the report written in May 2003. It must be noted that the conditions observed on site and the findings expressed in the report by Halcrow Group may have changed. Certain indicators of the presence of hazardous substances may have been latent at the time of the site reconnaissance undertaken by Halcrow Group and may subsequently have become observable.

The Geotechnical Desk study undertaken by Mott MacDonald in 2004 comprises the information obtained from a site reconnaissance survey undertaken on 12th May 2004 and a review of the following reports and data sources:

- Halcrow Group Limited (2003). *Forth Valley Primary Care NHS Trust, Royal Scottish National Hospital Site, Engineering Appraisal*

- *BGS report, Vol.16, Number 8, Engineering Geology of the Upper Forth estuary* by Gostellow and Brown
- Halcrow Group Limited (2001). *Forth Valley Primary Care NHS Trust, Royal Scottish National Hospital, Larbert. Review of proposals for flood prevention on the chapel burn and sustainable urban drainage for the hospital development*
- Halcrow Group Limited (2001) *Central Scotland Healthcare Royal Scottish National Hospital Engineering Appraisal*
- Colin Buchanan and Partners (2001) *Forth Valley Primary Care NHS Trust, Larbert Site Access-Feasibility Study*
- Ironside Farrar Limited (2002) *Forth Valley Primary Care NHS Trust, Royal Scottish National Hospital Larbert House Landscape Appraisal*
- Historical Ordnance Survey (BGS) Plans
- British Geological Survey Plans
- Coal Authority Report
- Envirocheck Data Sheets

Mott MacDonald have noted they were not responsible for the accuracy of the data obtained from these sources or previous studies and have not been able to check the validity of information supplied from the above sources.

The Geotechnical Desk Study undertaken by Mott MacDonald (2004) does not include any consultation with statutory authorities and does not contain any site investigation data or chemical analyses of the underlying soil.

10.2.2 Site Description and History

The site occupies an area of approximately 150ha and comprises a mix of agricultural land, landscaped grounds and woodlands associated with the existing RSNH and Larbert House. There is an artificial loch, located immediately east of Larbert House, which occupies a prominent position in the centre of the site. The review of historical maps indicates the original hospital development has occupied the site since the 1930's when it was bought by the Colony Royal Scottish National Institution to establish a community for the care of adults with learning disabilities. Prior to this the area comprised parkland surrounding Larbert House together with arable fields. It is reported in the baseline information there has been further development of the site comprising one and two storey accommodation buildings during the last thirty years which are anticipated to have been built in lieu of the original ward block and ancillary buildings (boiler house).

A series of site inspection and walkovers have indicated little evidence of contaminating activity having occurred at the site. However, evidence was noted of some localised sources of contamination such as an above ground un-bunded fuel storage tank to the rear of the former Larbert House, two boiler houses (one of recent construction), a laundry in the area of the former hospital and existing building construction on site which may give rise to an asbestos risk during demolition.

Mott MacDonald visited the site and undertook discussions with site personnel regarding current site operations on 17th January 2005.

The hospital has historically and is currently used as a care centre rather than a facility carrying out significant medical procedures. In addition, a number of the buildings on site are offices and used for administrative purposes.

10.2.3 Waste

The facility produces small quantities of clinical waste which are stored in appropriate containers and held in a dedicated storage area on site. In addition, the site acts as the collation point for clinical waste from other facilities in the area (such as surgeries and clinics). The waste is collected on a regular basis by a licensed contractor for disposal to an appropriately licensed site.

Small quantities of domestic type wastes are produced from the remaining wards in the hospital and from staff kitchen areas.

A number of buildings have been undergoing demolition or upgrading and are understood to have contained asbestos. The site holds the reports of asbestos surveys carried out during this period. It was reported that building demolition and asbestos containing materials were disposed off site in the appropriate manner.

To the knowledge of the staff interviewed, no waste has ever been disposed of on site. The hospital did contain an x-ray department but this was decommissioned over 15 years ago to the satisfaction of the authorities involved.

10.2.4 Chemical storage

There is a boiler house on site which was constructed in 1992. Heating for the site is supplied by gas but there are two 20,000 litre above ground oil tanks which provide a back up supply of fuel. The oil tanks are secondarily contained with a brick bund wall with a capacity of 110% of the tank volumes although the feedline to the tanks is external to the bund.

There is a small above ground heating oil tank at the rear of Lambert House. The tank has been emptied and is in a poor state of repair. However, there were no visual evidence of associated contamination (oil staining etc) observed around the tank or surrounding area at the time of the visit.

There is an electricity sub station at the site. It was constructed at the same time as the boiler house and is understood not contain Polychlorinated Biphenyls (PCBs).

There is a commercial laundry on site which deals with items from the wards. It reportedly only conducts routine washing operations and there is no dry cleaning type activities carried out.

10.2.5 Geology

No records of significant (thick or extensive) deposits of man made ground at the site had been reported in the Engineering appraisal undertaken by Halcrow Group. However, the Mott MacDonald site inspection undertaken on the 12th May 2004 noted evidence that some made ground associated former development is likely, specifically where buildings have been demolished. In addition Mott MacDonald (2004) noted that the nature of the existing building construction suggest that asbestos contamination is a potential hazard and this issue should be assessed by an appropriately qualified asbestos surveyor.

The available published geological information indicates superficial deposits beneath the site which comprise glacial till within the western sector and late-glacial raised beach or associated terraced fluvial deposits in the eastern and southern sector. Mott MacDonald (2004) suggests the natural (drift) superficial deposits present are expected to comprise firm to stiff becoming very stiff sandy silty clay with gravel and occasional cobbles. It is noted this material extends to bedrock which varies from approximately 3m depth in the west to 10m depth in the east.

The superficial deposits are underlain by strong sandstone of the Upper Passage Group at depths varying between 3m in the west to 10m in the east. A review of the Envirocheck of 1: 625000 solid geology by Mott MacDonald (2004) describes Namurian (millstone grit) in the south, Westphalian a coal measures in the north east and Basalt Dolerite elsewhere.

There is an east west trending Permo-carboniferous extrusive igneous dyke that crosses the site to the south of the existing hospital buildings and north of Larbert House.

A review of the Coal Authority report by Halcrow Group indicates that the proposed development is within the influence at surface from the presence of a worked coal seam. The last working date of the mine is circa 1959 and is described as being at a depth of between 480m and 530m. It is in agreement by both Halcrow Group (2003) and Mott MacDonald (2004) that any ground movement as a result of these workings should have ceased by now. It is also considered that given the thickness of rock cover to the seam it is unlikely that void migration/crown holes present a risk.

10.2.6 Hydrogeology and Groundwater Vulnerability

The information reviewed by Halcrow Group from the hydrogeological Map of Scotland indicates the aquifer beneath the site is a minor (moderately permeable) aquifer in which the flow is predominantly in fissures or fractures in the rock.

The site of the former RSNH is located within two river catchments. The southern part of the site mostly drains southward to the River Carron, which approaches the B905 at the southern boundary of the site in an incised meander. In its Geotechnical Desk study of the site, Mott MacDonald (2004) has stated there is a potential contamination risk associated with polluted run off from the M876 to the north of the

site, which could be expected to flow south, through the superficials towards the River Carron, although this is considered to be a minor risk.

The northern part of the site however, lies within the catchment of the Chapel Burn, a small watercourse that enters the site on the northern boundary and flows eastward through the site initially in a culvert and then in an open channel.

The Envirocheck Flood map indicates that the only flooded areas within the 100 year period are concentrated in the south around the River Carron. However, the Chapel Burn has suffered some serious incidents of flooding in the past, affecting the housing in Larbert and the Falkirk-Stirling railway line. Falkirk Council has in response conducted studies into the construction of a flood alleviation scheme for the area.

10.2.7 Potential Contamination

Based on their Engineering Appraisal of the site (2003), Halcrow Group presented a preliminary assessment of the contamination risk at the site based upon the historical and current usage. The following tables have been extracted from the report and outline sources of contamination. Each individual risk was categorised by Mott MacDonald in their Geotechnical Desk study (2004) based upon the information provided in the Halcrow Report. The categorisation was a qualitative assessment based upon the preliminary evidence available and combining likelihood with severity.

Table 10.1: Historical site Usage

Historical Site Usage Description	Contaminants	Risk category
Larbert House and Policies	Potential heating fuel/oil or combustible substances	Low
Former Hospital (For treatment of mental conditions rather than medical practice)	Limited contaminated waste and no industrial waste	Low
Glasshouses in walled garden	Combustible substances-coke and coal dust	Low
RSNH Boiler House	Potential heating fuel/oil or combustible substances	Low
RSNH Laundry	None identified	Low
Farmland	Nitrates, pesticides	Low

N.B: No contaminants identified for the RSNH Laundry on site.

Table 10.2: Historical Adjacent Land Usage

Historical Site Usage Description	Contaminants	Risk category
Landfill to the south east	Possible landfill gas or leachate migration onto site	Medium
Quarry (300m to the northwest)	Possible made ground, leachates or metals	Low
M876 motorway embankment	Possible made ground of unknown origin and polluted run-off	Low
Grinding Mill (1850-1890's)	Possible made ground, metal fines	Low

Table 10.3: Current Usage

Historical Site Usage Description	Contaminants	Risk category
Un-bunded fuel tank (Larbert House)	Oil/fuel hydrocarbons	Medium
Boiler House	Oil/fuel hydrocarbons	Low

Note: Above tables extracted from Halcrow 2003 *Engineering Appraisal Report*.

In additional to the above contamination risks identified by Halcrow Group (2003), Mott MacDonald (2004) identified the following risks from undertaking their geotechnical desk study:

1. Asbestos associated with the demolition/demolished existing buildings. This has been classified by Mott MacDonald (2004) to be a medium level risk.
2. Groundwater contamination due to run off from the M876. This has been classified by Mott MacDonald (2004) to be a low level risk.
3. The presence of two fuel stations on the east side of the A9 close to the preferred access to the development. This has been classified by Mott MacDonald (2004) to be a low level risk.

Overall both Mott MacDonald and Halcrow Group identified that any contamination on site is likely to take the form of localised hotspots and that widespread contamination is unlikely.

A preliminary qualitative risk assessment was undertaken by Halcrow Group (2003) using the source-pathway-receptor methodology in line with Part IIA of the Environmental Protection Act (1990). It was carried out relative to the assumption that the end use of the site was to be an acute medical hospital. Table 10.4 presents an overview of this risk assessment:

Table 10.4: Preliminary Qualitative Risk Assessment

Source	Pathway	Receptor		Likelihood	Consequence	Risk
Toxic Metals	Ingestion, inhalation, direct contact	Humans	End User	Unlikely	Medium	Low
			Construction worker	Low Likelihood	Medium	Low / moderate
			Children	Unlikely	Medium	Low
Phytotoxic Metals	Uptake by roots	Flora and Fauna		Unlikely	Minor	Very low
Leachates	Migration through permeable strata or via groundwater	Groundwater		Low Likelihood	Mild	Low
		Aquatic life		Low Likelihood	Mild	Low
		Buildings		Low Likelihood	Mild	Low
Soil gases	Migration via permeable strata	Humans	End user	Unlikely	Severe	Low / moderate
			Construction workers	Unlikely	Medium	Low
		Fire/explosion buildings		Unlikely	Severe	Low / moderate
		Flora and fauna		Unlikely	Minor	Very low
Asbestos	Inhalation	Humans	End user	Unlikely	Medium	Low
			Construction workers	Unlikely	Medium	Low
Hydrocarbons	Ingestion, inhalation, direct contact	Humans	End user	Unlikely	Medium	Low
			Construction workers	Low	Medium	Low

Source	Pathway	Receptor		Likelihood	Consequence	Risk
	Root Uptake	Flora and Fauna		Low Likelihood	Mild	Very low
	Inhibition of concrete curing	Buildings		Low Likelihood	Mild	Very low
Anions (sulphate and chloride), corrosive and aggressive materials	Direct contact	Buildings		Low Likelihood	Mild	Low
		Humans	End user	Unlikely	Minor	Very low
			Construction workers	Low Likelihood	Minor	Very low

Note: the above table has been extracted from the Halcrow (2003) Engineering Appraisal Report.

The overall conclusions from the qualitative risk analysis by Halcrow Group (2003) indicated that any risk to the potential receptors on and surrounding the site was likely to be low or very low due to the absence of an identified, extensive source of contamination. However subsequent to Mott MacDonald's site reconnaissance in May 2004, it has been suggested in their Geotechnical desk study (2004) that a risk from asbestos (associated with the demolition/demolished existing buildings), particularly from inhalation by construction workers, should be increased to moderate. Issues relating to asbestos should be assessed by an appropriately qualified asbestos surveyor.

10.3. Consultation

No consultation has been undertaken with either Falkirk Council or the SEPA as part of this EIA. General feedback was received from statutory authorities on review of an Environmental Scoping Report undertaken by Mott MacDonald in October 2004. The consultation bodies did not have any additional comments in relation to ground conditions or contaminated land.

10.4. Potential and Predicted Impacts

The desk based information provided by Halcrow Group (2003) and Mott MacDonald (2004) indicates that any contamination on site is likely to take the form of localised hotspots and the presence of significant contamination to be present on site is unlikely. Therefore, subject to the information available, no significant potential impacts are anticipated with respect to the redevelopment of the site as an acute bed hospital.

There may be potential for very small quantities of asbestos associated with demolition of the existing building construction, as noted by Mott MacDonald (2004). However it is anticipated that any quantity of contaminated material generated from the demolition will be very small and therefore will only have minimal impact on the overall development of the site. Asbestos should be removed prior to demolition by an appropriately qualified person.

With regard to potential impacts on ground quality from the development, the following additional impacts need to be appreciated:

- Erosion, disaggregation and compaction. The removal of existing vegetation and surfacing during site development can leave the ground vulnerable to erosion by wind and water as the soils are disturbed. The movement of vehicles across the site can compact the soil and reduce its ability to support landscaped or vegetated areas; and

- Ground contamination may be caused through accidental spillages of chemicals, oils etc during the construction and operational phase.

10.5. Mitigation Measures and Monitoring Arrangements

Based on the current level of design and layout information available at this stage no special mitigation or monitoring arrangements are required for the redevelopment of the site. The implementation of standard health and safety procedures and the use of suitable PPE (gloves and overalls) and good construction practice will reduce the risk to construction workers.

10.6. Unavoidable and Residual Impacts

There is potential for very small quantities of contaminated material to be present in hotspots across the site which should be removed during the construction phase. However it is considered that based on the end use of the site, such small quantities are unlikely to pose a significant risk to the future site users. On this basis, no special remedial requirements are anticipated based on the current level of design and layout information available at this stage.

10.7. Deficiencies

The desk based information provided by Halcrow Group (2003) and Mott MacDonald (2004) have both indicated that the presence of significant quantities of contamination is unlikely on the site of the former RSNH.

10.8. Scope for Additional Environmental Improvements

Mott MacDonald is due to undertake a geotechnical investigation at the site during spring 2005. As part of this investigation a number of samples will be sent for chemical analysis as a precautionary measure which will be reviewed. However, no additional studies or investigations are anticipated for contamination purposes.

10.9. Conclusions

Desk based information provided by Halcrow Group (2003) and Mott MacDonald (2004) have both indicated that the presence of widespread/significant quantities of contamination is unlikely on the site of the former RSNH.

There is an indication that small quantities of contaminated material may be present in hotspots across the site. However given the proposed end use of the site, it is considered such hotspots are unlikely to pose a significant risk to the future site users.

Based on the current level of design and layout information available at this stage no special mitigation or remedial measures are anticipated and no further environmental studies are required.

For purposes of clarity and to ensure that 'Water Quality and Resources' is covered thoroughly, Section 11 is organised into the following sub-sections:

- 'Approach and Methods';
- 'Existing Baseline Conditions';
- 'Consultation';
- 'Potential and Predicted Impacts';
- 'Mitigation Measures and Monitoring Arrangements';
- 'Unavoidable and Residual Impacts';
- 'Deficiencies';
- 'Scope for Additional Environmental Improvements'; and
- 'Conclusions'.

11.1. Approach and Methods

With any new development, or redevelopment of an existing site, there is potential for alteration of the water environment both in terms of water quantity and quality.

This section comprises a review of currently available information on water quality and resource and has been undertaken to establish the current baseline, against which an assessment of potential impacts has been carried out, and mitigation measures proposed. The methodology includes a comprehensive review of all relevant and available literature, together with an observational site visit, taking into account relevant legislation and codes of practice where applicable. Consideration of whether there is a need to carry out further studies has also been addressed.

The following documents and information sources have been reviewed in order to comment upon the water resource and water quality baseline:

- *Engineering Appraisal, Royal Scottish National Hospital (RSNH) Site, Forth Valley Primary Care NHS Trust* (Halcrow Group Limited, May 2003);
- *Development Framework for the Former RSNH Site, Larbert; Consultative Draft* (Falkirk Council, September 2004);
- *Review of Proposals for Flood Prevention on the Chapel Burn and Sustainable Urban Drainage for the Hospital Redevelopment; Forth Valley Primary Healthcare Trust* (Halcrow Group Limited, October 2001); and
- *River Quality Classification Interactive Map* (Scottish Environment Protection Agency).

The information reviewed has provided adequate information on river water resources and quality.

11.2. Existing Baseline Conditions

11.2.1 Hydrogeology Baseline Conditions

Mott MacDonald has reviewed information provided within the Engineering Appraisal prepared by Halcrow Group in May 2003. Halcrow Group's report includes reference to the Hydrogeological Map of Scotland, which indicates that the aquifer beneath the site is a minor or moderately permeable aquifer in which the flow is predominantly in fissures or fractures in the rock. The hydraulic gradient of the area is anticipated to be in a general flow of groundwater to supply base flow to the River Carron to the south of the site.

The Halcrow Group report does not provide any data on depth of groundwater, use of groundwater as a local resource (e.g. local abstractions) or groundwater quality. A review of Envirocheck data for the site suggest that the groundwater underlying the site is classified as vulnerable, however, further enquiries with SEPA and Falkirk Council did not indicate that the aquifer is used as a water resource.

A review of the historical uses of the site would suggest that there is limited scope for activities to have resulted in ground contamination and hence groundwater contamination. This is discussed further in Section 10.

The hydrological resources at, and in the vicinity of, the site are as follows:

- Chapel Burn
- River Carron
- Loch Larbert

Information on these watercourses and the loch have been drawn from a review of Halcrow Group's Engineering Appraisal, 2003 and the consultative draft of the Development Framework for the Former RSNH Site, Larbert, September 2004 for Falkirk Council. Consideration of each resource is included below:

Chapel Burn
The northern part of the site lies within the Chapel Burn catchment, which runs across the northern pasture, partly in culvert, and exits the site along the southern edge of Old Denny Road before flowing north and combining with the Tor Burn and other small watercourses, which ultimately drain into the Forth Estuary near Airth. The Burn is subject to downstream flooding problems due to a constriction in the flow within the site caused by the culvert size and cannot currently accept additional discharges.

There is no indication from the information reviewed that the Chapel Burn is used for any purpose other than as a conduit for rainfall related run-off from upstream open land and areas of the northern part of the Larbert site not positively drained. Water quality in the Burn will be influenced primarily by rainfall related run-off, with periodically high levels of suspended solids, but is unlikely to be influenced by any of the current activities on site.

Flow conditions in the Burn are heavily influenced by rainfall levels but are generally low. The flow at the time of the site visit in December 2004 following a period of intermittent rain, as shown in Figure 11.1, shows moderate flow levels for a small watercourse.

Figure 11.1: Chapel Burn at Bridge on Old Denny Road

River Carron
The River Carron is located at the southern boundary of the site and receives rainfall related drainage from the southern part of the site. Available information suggests that the interaction of the River and the site is limited to its receipt of rainfall related drainage. The River Carron at Old Bridge is classified overall as category B which is of fair quality. Its chemical quality is also classified as category B and biological quality as category A2, good quality. Given that the river is likely to be a receiving watercourse for site drainage and the overflow from Loch Larbert, the influence of the site on water quality in the River Carron will be minimal.

The River Carron is a moderately sized river, as shown in Figure 11.2, which rises in the Carron Valley and receives the outflow from the Carron Valley Reservoir, then flows through the Central lowlands, through Denny and Stenhouse Muir before draining into the Forth Estuary near Grangemouth.

Figure 11.2: River Carron south of the Larbert site

Loch Larbert
Loch Larbert is an artificially created large ornamental pond, as shown in Figure 11.3, currently very overgrown with rhododendron. The pond is believed to be fed by rainfall related run-off from the localised area around the pond. Anecdotally the outfall from the pond is believed to drain to the River Carron via a culvert, although this has not been confirmed.

Although there is no water quality information available relating to the Loch, the Loch's use solely as an ornamental pond would not necessitate further investigation of its water quality.

Figure 11.3: Loch Larbert

Water Abstractions
Available information suggests that there are no water abstractions from the Chapel Burn or the River Carron in the local area. Information in the *Review of Proposals for Flood Prevention Report October 2001* by Halcrow Group suggests that the pond may be used for emergency water supply, although it is not clear whether this use relates to current activities at the remaining hospital or to a previous use for the Loch.

There are no groundwater abstractions on the site, but it is not known whether there are any local groundwater abstractions beyond the boundary of the site. Given the nature of the aquifer it would be unlikely to support a public water supply borehole.

11.3. Consultation

During preparation of the ES Mott MacDonald, on behalf of the Forth Valley NHS, has consulted with various stakeholders and statutory bodies on all water-related issues surrounding the redevelopment. The assessment methodology employed herewith was agreed during the scoping stage for the EIA by Falkirk Council, with SEPA also being consulted and offering no comments. The scoping stage has ensured that any of their concerns regarding the redevelopment's water impact have been addressed. In addition, Falkirk Council also consulted with the general public and heard their views on a number of issues, including in relation to site drainage and management of the Loch and Burn.

11.4. Potential and Predicted Impacts

Any development has the potential to impact upon its surrounding environment, both during construction and operational phases. The Sections below consider the potential impacts of the redevelopment on Chapel Burn, the River Carron and Loch Larbert during both these phases.

11.4.1 Construction Phase

The most significant potential for impact on the water environment is likely to occur during the construction phase when construction activities and materials may give rise to the potential for pollution of watercourses from suspended solids during excavations and civil works. The other main area of potential impact is that of oil-contaminated run-off, related to construction vehicles and oil storage. Given the potential impacts during construction phase a comprehensive construction phase environmental management and monitoring plan (CEMP) will be required to ensure that on-site construction activities do not lead to pollution of the water environment. This will include pollution prevention techniques and monitoring requirements to be imposed on the contractor. It is imperative that the CEMP includes the measures detailed below in the Mitigation and Monitoring Section of this report, to ensure minimisation of impacts upon water during the construction phase.

11.4.2 Operational Phase

The Project design does not include for any direct discharges to surface water resources. Discharges from the scheme are expected to be rainfall related from uncontaminated areas. The impact is, therefore, anticipated to be restricted to the hydraulic capability of the receiving watercourses and the attenuation provided by the various drainage schemes to be included in proposals.

The impact of the scheme on surface water resources is very much linked to the flood prevention and drainage arrangements. There is unlikely to be any use made of the local water resources for the proposed development (during either the construction or operational phases) other than as a conduit for carrying away rainfall related surface water.

Once the redevelopment is complete, the water quality of the Chapel Burn, River Carron and Loch Larbert will be influenced solely by rainfall related run-off and any contaminants such as suspended solids or organic matter that are picked up from the passage of rainwater over uncontaminated natural landscape.

Project design should be as sensitive to groundwater resources as is feasible i.e. by limiting the area of paved surface for roads, paths and parking that will reduce the volume of water currently draining back into the aquifer. The prime responsibility of the developer in terms of water is adherence to Falkirk Council and SEPA's requirements in terms of sustainable urban drainage as outlined below. Account will also be taken of the requirements in SEPA's guidelines regarding Watercourses in the Community – A guide to sustainable watercourse management in the urban environment, and Ponds, Pools and Lochans – Guidance on good practice in the management and creation of small waterbodies in Scotland, in order to optimise the benefit from development of the project.

11.4.3 Sustainable Urban Drainage System (SUDS)

The Falkirk Council drainage report recently undertaken by Sir Frederick Snow & Partners (SFSP) identified two possible solutions for the drainage strategy for the new Acute Hospital Site at Larbert. The report aims to clarify requirements in terms of the provision of Sustainable Urban Drainage System (SUDS) which are likely to be necessary to treat and control the increased surface run-off generated by the hospital redevelopment. The Council's drainage strategy is also concerned with a flood attenuation system to alleviate flood problems on the Chapel Burn.

The surface water drainage for the majority of the existing RSNH site is routed to the combined sewers within the area with little surface water discharge to the Chapel Burn, which has a known downstream flooding history. On this basis Falkirk Council has set special requirements in terms of attenuation and water quantity control that has to be achieved / provided to prevent increased post redevelopment downstream flooding.

Attenuated storage in the vicinity of the RSNH is being considered for flood alleviation to control and prevent this flooding. The most likely location for the required attenuation basin has been identified in the low lying marshy area adjacent to and on the north side of the new boiler house within the RSNH grounds. This area of low lying land is also an ideal location for SUDS regional treatment control facility such as a retention pond. The SFSP report considered two options:

- Separate SUDS and flood alleviation basin / pond; or
- Combined SUDS and flood alleviation basin / SUDS pond.

11.4.4 Developer's Drainage Obligations

As a developer the NHS will have certain drainage obligations to fulfil. As a new development, despite being located on the grounds of an existing development, there will be a requirement for a SUDS and on-site attenuation. Considering the drainage aspects of the hospital site in isolation of the Chapel Burn flooding issues the drainage provision will be required to cover two main functions:

- SUDS – based on the provision of regional treatment controls that will be capable of providing water quality treatment and water quality control to the surface water runoff generated within the redevelopment prior to it being conveyed off site.

- Attenuation – the storage diversion of flood water on the site to address flooding for a defined flooding event (1:1000 year return period) based upon the finding of a Flood Risk Assessment. The attenuation scheme would have to demonstrate how the site would be protected against the flooding risk associated with such a storm event. A 1:1000 year return period equates to little or no risk of flood.

In the event that the combined SUDS and Chapel Burn flood alleviation solution is implemented then the requirement for site specific attenuation would not be required as the combined facility would encompass the site's attenuation requirements. Table 11.1 below provides a comparison of the estimated storage volume that the two possible options could offer, indicating that a separate SUDS and attenuation system would be favourable in terms of total volume of water it would be possible to store.

Table 11.1: Comparison of Drainage Options

	Separate SUDS and Attenuation	Combined SUDS and Attenuation
Total Estimated Storage Volume	60 000 m^3	58 300 m^3
Pond / Basin Area	33 000 m^3	24 300 m^3

The total area of the hospital grounds liable to redevelopment that lies within the Chapel Burn's natural surface water runoff catchment is approximately 26 hectares, of which 16 hectares could have its surface water runoff routed to the low-lying area near the boiler house where the flood alleviation attenuation basin is proposed to be sited. The remaining 10 hectares, due to its topography, would tend to be routed to and outfall at the Chapel Burn in the corner of the site formed by the junction of Old Denny Road with Stirling Road. Surface water drainage for the remainder of the existing RSNH site

(some 6 to 7ha) lies within the How Burn's natural surface water runoff catchment and would therefore not drain to the Chapel Burn.

On the basis of the British Insurer's Template, hospital type developments should in flooding terms be designed to adequately cope with up to and including 1 in 1000 year return period storm events and as such the 1 in 1000 year return period storm event will be the limiting surface water runoff drainage design level used in the surface water quantity control design for the proposed RSNH redevelopment. In assessing the disposal of surface water from the site calculations as part of the drainage study have determined that on the basis that no flood alleviation measures being installed in the low lying area adjacent to the boiler house, the permitted discharge rates to the Chapel Burn will be extremely restricted. In order to ensure that quantity control standards are met post-redevelopment run-off from the redeveloped site up to and including 1 in 1000 year storm events, would be limited to a maximum of 2.85 l/s/ha.

Alternatively, on the basis that flood measures are installed, the permitted discharge rates to the Chapel Burn will be less restricted, such that the normal quantity control standards will be met through an approximate discharge rate of 4.42 l/s/ha. Standards would be achieved through the attenuation and retention measures slowing the flow and allowing contamination generated by rainfall related flow to settle/disperse prior to discharge thus allowing the discharge rate to be higher than where no attenuation and retention is available.

Combining the SUDS and flood alleviation attenuation basin is more favourable economically and will offer land use benefits. However, it is SEPA's preference that the surface water treatment is dealt with separately from any flood prevention scheme, as settled pollutants can be flushed out into the river system during high flows. There is also a significant problem with sewage in Chapel Burn at present.

11.5. Mitigation Measures and Monitoring Arrangements

The following section details the mitigation measures and monitoring requirements deemed necessary during both the construction and operational phases of this development.

11.5.1 Construction Phase

The construction contractor will be required to undertake all operations with due care and attention to the environment, and in accordance with a CEMP approved by the developer / developer's environmental advisor. Table 11.2 identifies potential adverse environmental effects that may arise during the construction phase of the redevelopment, and suggests likely mitigation measures to combat these.

It should be noted that the contractor will be required to seek consents from SEPA and/or Falkirk Council prior to undertaking any temporary or permanent works affecting any watercourses / bodies of water. During this consent application process the contractor will be required to demonstrate to SEPA's satisfaction that the construction method for working in or near watercourses will not lead to pollution of the watercourse or lead to a flooding risk. The CEMP should name an individual responsible for liaison with SEPA and Falkirk Council.

Table 11.2: Construction Phase Issues and Mitigation

Potential Adverse Effects	Mitigation Measures	Environmental Aspect
Spillage of fuel, oils and greases and other chemicals may cause contamination of soils and groundwater.	A Pollution Incident Control Plan will be implemented to manage incidents. This will include measures to reduce the occurrence of spillages and also give procedures for containing and cleaning up any spillages as well as preventative measures.	Pollution Incident Control
Refuelling activities on-site may lead to spillage of hydrocarbons.	Refuelling activity should take place in areas of hard-standing which must be connected to an oil water interceptor as part of the site drainage. Drip trays should be used where appropriate.	Pollution Incident Control

Potential Adverse Effects	Mitigation Measures	Environmental Aspect
Spillage of fuel, oils and greases and other chemicals may cause contamination of soils and groundwater.	A Pollution Incident Control Plan will be implemented to manage incidents. This will include measures to reduce the occurrence of spillages and also give procedures for containing and cleaning up any spillages as well as preventative measures.	Pollution Incident Control
Wastewater treatment and disposal.	Sewage generated from domestic facilities will be treated in a temporary storage treatment facility before being discharged (where applicable).	Water
Direct run-off from soil heaps and temporary mounding.	Soil heaps and temporary mounding will be away from watercourses and if necessary temporary settlement ponds will be installed for dewatering excavations. A monitor regime shall be established to assess the necessity for settlement ponds.	Water
Major spillage of fuel, with the possibility of serious water and ground pollution and risks to worker safety	Emergency equipment and procedures for immediate use in the event of spillage (e.g. pumps, containers and dispersants for clean-up action).	Pollution Incident Control

11.5.2 Operational Phase

The potential impact of the scheme on the water environment is mainly limited to the impact on the hydraulic loading on watercourses receiving rainfall related run-off. Proposals for the scheme are likely to include SUDS and a flood prevention scheme at the site. The overall rainfall attenuation scheme may be combined with plans already proposed by the local council, with Forth Valley Hospital development being a partner in the development.

To minimise the potential for contamination of rainfall related run-off, the scheme is expected to include for treatment of drainage from car parking areas and roads including grit traps and for larger car parking areas an interceptor, to minimise the potential for oil contamination of rainfall related run-off and thence of receiving watercourses. Proposed SUDS, including swales, will also provide a further treatment capability to minimise any impact on receiving watercourses.

To minimise the reduction in recharge to the aquifer porous parking and other hard surfaces (an example of sustainable urban drainage) should be considered to increase the flow of surface water back into the aquifer and reduce the amount of surface water collected and channelled off site. This measure does, however, need to be managed to avoid potential oil pollution from parked vehicles seeping into the groundwater and becoming a source of pollution.

11.6. Unavoidable and Residual Impacts

There will be some unavoidable impact on the water environment of the site during construction. However, with the necessary precautions and procedures undertaken during the construction phase, as included within the CEMP, there should be no permanent impacts on water quality or quantity as a result of the redevelopment's construction. Similarly, well designed and implemented SUDS, flood prevention and drainage schemes applied across the site will ensure that there are no lasting or permanent adverse effects from flooding upon the RSNH site.

11.7. Deficiencies

This assessment comprised a desk-based study and site observations. Limited data at the outline planning permission stage of this project has restricted the output. Design and layout and hence construction techniques are not yet established so specific potential water assessment for the construction or operational phases could not be made.

Mott MacDonald considers, however, that given the nature and scale of the redevelopment site investigative surveys with relation to water quantities and quality on the site would not add value to this assessment and, therefore, no further assessment is proposed.

11.8. Scope for Additional Environmental Improvements

There is limited scope for additional environmental improvements with respect to water quality and quantity. The mitigation measures above should ensure minimisation of impacts.

11.9. Conclusions

Development of the Larbert site for the new Forth Valley Acute Hospital could lead to water impacts but these are expected to be limited and not permanent. Impacts during the construction phase will be time limited and controlled by the use of appropriate pollution prevention techniques and by compliance with relevant procedures and requirements imposed by Falkirk Council and SEPA. Water impacts during the operational phase are likely to be limited to and related to rainfall run-off which will be limited by the careful design of SUDS, flood alleviation and drainage schemes.

For purposes of clarity and to ensure that 'Air Quality and Climate' is covered thoroughly, Section 12 is organised into the following sub-sections:

- 'Approach and Methods';
- 'Existing Baseline Conditions';
- 'Consultation';
- 'Potential and Predicted Impacts';
- 'Mitigation Measures and Monitoring Arrangements';
- 'Unavoidable and Residual Impacts';
- 'Deficiencies';
- 'Scope for Additional Environmental Improvements'; and
- 'Conclusions'.

12.1. Approach and Methods

A construction project of any size will interact with the environment and therefore has the potential to cause impacts at a number of levels from local (e.g. dust) to global (e.g. greenhouse gas emissions). This assessment focuses on air quality and atmospheric emissions associated with the construction and operation of the Forth Valley Acute Hospital Project.

Available documentation has been reviewed and information from site visits assimilated to assess the existing baseline conditions. The proposed activities during both the construction and operational phases are examined for potential air quality and climate impacts.

Construction phase impacts will be assessed in relation to dust raising activities, plant and machinery emissions and construction traffic travelling to and from the site. Where appropriate, mitigation methods are recommended. For the operational phase of the project there are two potential sources of air quality impacts; road traffic accessing the site and emissions from heating associated boilers.

Using the *Design Manual for Roads and Bridges* (DMRB) spreadsheet approach (Highways Agency) and traffic flow data for the baseline year of 2003, project completion year (2010) and project completion plus 10 years (2020) the impacts on ambient air quality is assessed with respect to the two main pollutants of concern from road traffic; nitrogen dioxide (NO_2) and particulate matter less then 10 microns in diameter (PM_{10}). A subjective assessment is made of the potential impact of emissions from the boiler plant with respect to NO_2, PM_{10}, sulphur dioxide (SO_2) and carbon dioxide (CO_2). A comparison is made with the existing arrangements at the three facilities to be replaced (hospitals in Stirling and Falkirk plus the existing site). It is assumed that these facilities will close.

12.2. Existing Baseline Conditions

Local authorities in Scotland have a duty under Part IV of the *Environment Act 1995* to review and assess ambient air quality in their areas on an ongoing basis. The review and assessment process examines the current and predicted levels of seven pollutants in relation to objectives specified in the *Air Quality (Scotland) Regulations 2000* as amended and the *Air Quality Limit Values (Scotland) Regulations 2003*. If any of the objectives are predicted to be breached by the relevant target date then Air Quality Management Area(s) must be declared. The review involves a mixture of modelling and monitoring as appropriate.

Principal pollutants of concern for the Forth Valley Acute Hospital Project are those related to road traffic; nitrogen dioxide (NO_2) and particulate matter less then 10 microns in diameter (PM_{10}). Table 12.1 details the relevant objectives and target dates.

Table 12.1: *Air Quality (Scotland) Regulations 2000 and 2003*: Objectives for NO2 and PM10

Species	Air Quality Objective	Target date
Nitrogen Dioxide(NO_2)	200 micrograms per cubic metre when expressed as an hourly mean. Not to be exceeded more than 18 times per year.	December 31st 2005
PM_{10} (particulate matter smaller than10 micrometers in diameter)	50 micrograms per cubic metre (gravimetric) when expressed as a 24 hour mean. Not to be exceeded more than 35 times per year.	January 1st 2005
	40 micrograms per cubic metre (gravimetric) when expressed as an annual mean.	January 1st 2005
PM_{10}	50 micrograms per cubic metre (gravimetric) when expressed as a 24 hour mean. Not to be exceeded more than 7 times per year.	December 31st 2010
	18 micrograms per cubic metre (gravimetric) when expressed as an annual mean.	December 31st 2010

As part of their review and assessment process Falkirk Council currently has five real time air quality monitoring stations including one at Foundry Loan, Larbert which is approximately 400m to the east of the boundary of the proposed site. There is also one semi-automatic monitoring station located at Burnhead Road, Larbert, approximately 1km to the east of the proposed site.

Falkirk Council's web site states that in general air quality in the Falkirk area is good with few exceedences of the national standards. Falkirk Council is actively involved in the review and assessment process, in accordance with the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, and to date has not had cause to declare any Air Quality Management Areas.

The current use of the site, with few remaining hospital buildings in use, generates low levels of traffic movements with minimal adverse contributions to local air quality. The site is bordered to the east by residential areas at Larbert and North Broomage, which are potentially sensitive receptors for emissions from the proposed hospital scheme and associated road traffic.

An assessment of the current situation with respect to three receptors chosen as representative of the highest exposure to roadside pollutants was made using the DMRB methodology. Receptor 1 is on the A9 Stirling Road, south of the Broomage roundabout and represents the property closest to the proposed island at the entrance to the proposed hospital site. Receptor 2 is on the A88 Bellsdyke Road close to the Broomage Roundabout. Receptor 3 is on the A9 Stirling Road immediately south of the Broomage Roundabout.

Table 12.2 shows the situation in 2003, which is the baseline year for the traffic flow figures supplied by Falkirk Council, derived from a DMRB assessment. The relevant air quality objectives are shown as a comparison.

Table 12.2: Baseline air quality 2003

Receptor	NO_2	PM_{10}		Air quality objectives		
	Annual mean µg/m^3	Annual mean µg/m^3	Days >50µg/m^3	NO_2 Annual mean	PM_{10} Annual mean (2005)	Days >50µg/m^3 permitted
R1 Stirling Road	20.36	16.89	0.69	40	40	35
R2 Bellsdyke Road	23.02	17.90	1.32	40	40	35
R3 Stirling Road	22.61	17.79	1.24	40	40	35

Reference to Table 12.2 clearly shows that in the base line year of 2003 the two pollutants of concern, NO_2 and PM_{10}, are both well within current air quality objectives.

The current hospital heating arrangements give no cause for concern in terms of air quality emissions.

12.3. Consultation

Consultation has taken place with Falkirk Council Environmental Health Department who confirmed that, at the time of writing this report, their Air Quality Review and Assessment Progress Report, which is due for submission in April 2005, was being prepared. Falkirk Council confirmed that no Air Quality Management Area is to be declared in the Larbert area at present. During consultation on the Development Framework, however, concerns were raised about potential air quality impacts on the residents of Stirling Road from the new development.

12.4. Potential and Predicted Impacts

During the construction phase potential impacts on local air quality will principally result from dust generated during site activities, especially excavations and materials handling. Local residential receptors to the east of the site could be impacted if the issue is not effectively managed. There is also a potential for construction traffic impacting on local air quality. However, *Local Air Quality Technical Guidance* (LAQM TG (03), Defra 2003) advises that increases in traffic volumes of less than 5% are unlikely to have significant impacts on air quality. The current annual average daily traffic flow (AADT) on the A9 Stirling Road is approximately 9000. Construction traffic would therefore have to be in excess of 450 trips per day before any impact was discernable. Flows of this magnitude are unlikely.

Predicted and potential impacts associated with the operational phase of the development are mainly due to traffic accessing the site. An assessment was carried out using the DMRB spreadsheet methodology. To populate the spreadsheet with data the following sources were used:

- Traffic flow figures were supplied by Falkirk Council for the baseline year of 2003.
- Adjustment factors for the increase in traffic volumes for 2010 and 2020 from the Traffic Study carried out for this development
- Projected traffic flows to and from the hospital site taken from the Traffic Study carried out for this development
- Background air quality data for the area was extracted from the Local Air Quality Management web site (www.airquality.co.uk)

Assessments were made for the projected completion year of 2010 and for 2020, 10 years post project completion both with and without the development. Results of the assessment are set out in Table 12.3. Four scenarios were assessed at each of the three receptors described above. The scenarios were:

- 2010 with predicted traffic increases without the hospital development (do min);
- 2020 with predicted traffic increases without the hospital development (do min);
- 2010 with predicted traffic increases plus increased traffic due to the hospital development (with dev); and
- 2020 with predicted traffic increases plus increased traffic due to the hospital development (with dev).

Table 12.3: Predicted air quality 2010 and 2020

Receptor	Year/do min or with dev	NO2	PM10		Air quality objectives		
		Annual mean □g/m3	Annual mean □g/m3	Days >50□g/m3	NO2 Annual mean	PM10 Annual mean (2010)	Days >50□g/m3 permitted
R1 Stirling Road	2010 do min	18.66	15.96	0.30	40	18	7
R2 Bellsdyke Road	2010 do min	20.46	16.52	0.51	40	18	7
R3 Stirling Road	2010 do min	20.19	16.46	0.48	40	18	7
R1 Stirling Road	2020 do min	17.86	15.64	0.22	40	18	7
R2 Bellsdyke Road	2020 do min	19.29	16.06	0.33	40	18	7
R3 Stirling Road	2020 do min	19.08	16.01	0.32	40	18	7
R1 Stirling Road	2010 with dev	19.82	16.50	0.50	40	18	7
R2 Bellsdyke Road	2010 with dev	21.32	16.95	0.72	40	18	7
R3 Stirling Road	2010 with dev	21.25	16.98	0.73	40	18	7
R1 Stirling Road	2020 with dev	18.63	15.98	0.31	40	18	7
R2 Bellsdyke Road	2020 with dev	19.71	16.27	0.41	40	18	7
R3 Stirling Road	2020 with dev	20.50	16.59	0.54	40	18	7

Reference to Table 12.3 shows that none of the scenarios presented will lead to any exceedance of the air quality objectives for the two pollutants of concern, NO2 and PM_{10}. It should be noted that the PM_{10} objective for 2010 is significantly more stringent than for 2005. Nonetheless, no exceedances of the objective are predicted due to the proposed development.

Other potential impacts from the scheme may include emissions to air from the heating boilers. Whilst the specification of the boiler is not known at this time, so a precise quantitative assessment cannot be made, it is understood that gas fired boilers will be used in this development with fuel oil as a standby fuel in case of gas supply failure. Standby fuel is likely to be used rarely and usually only to test back-up systems. Emissions of NO_2, PM_{10} and SO_2 are all well controlled in modern gas fired boiler installations and are unlikely to cause any adverse air quality issues. Carbon dioxide (CO_2) is not a pollutant considered in the Air Quality Strategy for England Scotland, Wales and Northern Ireland. This is because it has no localised effects. It is, however, a potent green house gas and is associated with climate change and global warming.

12.5. Mitigation Measures and Monitoring Arrangements

To minimise the impact of dust generated from site construction activities a construction phase environmental management plan will include specific measures to control the level of airborne dust. Precise details will be contained in the environmental management plan but measures likely to be included are:

- Hard surfaced haul roads;
- Adequate water supply on site;
- Regular wet sweeping of haul roads and standing areas;
- Use of water sprays on haul roads, standing areas and material stockpiles;
- Sheeting of lorries leaving and entering the site laden with potentially dusty materials;
- Controlled handling of dusty materials on site such as silo storage for bulk cement;
- Wheel-wash installed within the site for exiting vehicles;
- Maintenance of dust suppression equipment to a high standard;
- No bonfires on site;
- Routine cleaning of public roads and access routes using wet sweeping methods;
- Ensure that any crushing or grinding plant used on the site has an appropriate permit;
- Sheet or otherwise enclose loaded bins and skips;
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression; and
- Carry out site inspections regularly to monitor compliance with dust control procedures.

In order to minimise the impact of emission to atmosphere from plant machinery any equipment used on site will be maintained to a high standard. Construction traffic which uses public roads to access the site will be maintained according to the relevant legislative controls.

Mitigation of emissions from road traffic during the operational phase of the development will be addressed in the detailed design phase. Careful planning of traffic routes will help to maintain the smooth flow of traffic which leads to lower emissions.

As discussed above, the hospital heating system will be designed to operate on gas to minimise emissions to air, with fuel oil used for emergency use only.

12.6. Unavoidable and Residual Impacts

Some impacts from the construction phase are unavoidable. Given that the site is currently under used and surrounded on three sides by an essentially rural landscape operations during construction will impact on local air quality. However, construction activities are by their nature temporary and no residual impacts will remain after completion of the construction phase.

It is inevitable that there will be some long term residual impacts of the proposed development during the operational phase. Whilst air quality objectives specified in the *Air Quality (Scotland) Regulations 2000* as amended and the *Air Quality Limit Values (Scotland) Regulations 2003* will not be exceeded the current levels will increase as a result of the development. With the current understanding of air quality impacts on health it is unlikely that the increase in the levels of NO_2 and PM_{10} will have adverse effects on the health of the local populations in Larbert and North Broomage.

12.7. Deficiencies

In order to carry out the DMRB assessment for the impact of traffic related emissions detailed above a number of assumptions had to be made concerning traffic flows.

2003 baseline traffic flows (AADT) for Bellsdyke Road, A9 at Torwood and A9 south of Broomage roundabout were obtained from Falkirk Council. Traffic growth figures for 2010 and 2020 were extracted from the Traffic Study for the project. Therefore a realistic estimate was made of AADT traffic flows that would prevail without the new development. However, assumptions had to be made concerning the traffic flows with the proposed development in place.

Traffic flows to and from the hospital for AM (0800 – 0900) and PM (1630 – 1730) peaks for 2010 and 2020 were extracted from the Traffic Study. From these an AADT had to be derived. The following approach was adopted:

- The daytime period (0900 – 1630) between the two peak hours was assumed to have 20% of the maximum (PM) flow per hour. This allowed for out-patients entering and leaving the site.
- For the period immediately after the PM peak (1730 -2000) it was assumed that there would be 20% of the peak flow per hour to account for visitors entering and leaving the site.
- For the remaining night time period (2000 – 0800) a nominal flow of 20 vehicles per hour was assumed to take account of early morning and late night staff arrivals and departures.
- The five elements (AM peak, PM peak, inter-peak period, evening, night) were then summed to give an overall estimated AADT for inclusion in the DMRB spreadsheet tool.
- The estimated mode share targets predicted in the Traffic Study were taken into account leading to reduced AM and PM peak flows in 2020 and hence a lower estimated AADT.
- The resulting AADTs for 2010 and 2020 were then split between the road-links under consideration. Bellsdyke Road and the A9 at Torwood were assumed to carry 50% of the hospital related AADT each whilst the A9 south of Broomage roundabout (the stretch of Stirling Road that includes the entrance to the site) was assumed to carry 100% of the AADT.

Assumptions also had to be made concerning speeds on the 3 links. The presence of the development was assumed to reduce average speeds. Bellsdyke Road and A9 at Torwood were assumed to have an average speed of 64 kmph (40 mph) without the development and 56 kmph (35 mph) with the development. The A9 south of Broomage roundabout was assumed to have an average speed of 48 kmph (30 mph) without the development and 40 kmph (25 mph) with the development.

12.8. Scope for Additional Environmental Improvements

Selection of appropriate technologies in the design of the proposed development could enhance the reduction of emissions to atmosphere by reducing the need for heat input from the boilers. This could be achieved by effective insulation and incorporation of solar heating for water and to augment space heating where appropriate. Careful design could also reduce solar gain within the building, reducing the need for air conditioning and hence reducing electricity use and emissions to atmosphere at power stations. These options would also lead to reduced energy costs for the NHS Board.

Active participation and promotion of alternative modes of travel to the site including buses, walking and cycling has the potential to reduce vehicle miles travelled and therefore reduce the impact on local air quality.

12.9. Conclusions

There are inevitably impacts on the air quality from a major infrastructure project such as the proposed Forth Valley Acute Hospital Project at Larbert. Impacts will be from dust and vehicle emissions during the construction phase and emissions from increased road traffic and the boiler plant during the operation of the development. However, the impacts are considered to be relatively minor.

By adopting appropriate control techniques and management practices during the construction phase air quality impacts can be reduced significantly. This includes dust control techniques as discussed above and ensuring high standards of maintenance for plant and machinery on site and for vehicles entering and leaving the site.

Impacts of the operational phase are inevitable and quantifiable. Evidence presented here indicates that whilst there will be increases in the levels of NO_2 and PM_{10} nationally set air quality objectives will not be exceeded, even post 2010 when tighter objectives apply. Therefore there is unlikely to be any adverse health effects from these increases.

For purposes of clarity and to ensure that 'Cultural and Archaeological Heritage' is covered thoroughly, Section 13 is organised into the following sub-sections:

- 'Approach and Methods';
- 'Existing Baseline Conditions';
- 'Consultation';
- 'Potential and Predicted Impacts';
- 'Mitigation Measures and Monitoring Arrangements';
- 'Unavoidable and Residual Impacts';
- 'Deficiencies';
- 'Scope for Additional Environmental Improvements'; and
- 'Conclusions'.

13.1. Approach and Methodology

The Cultural and Archaeological Heritage section of the ES sets out to:

- Identify known cultural heritage constraints;
- Assess the impacts of the development on known sites and features;
- Make recommendations for mitigation of the impacts;
- Consider the areas between the known sites and to assess the potential for survival for currently unknown archaeological remains in the development site; and
- Make recommendations for any further investigations needed (if any) to assess more fully the potential for such unknown remains.

Guidance on assessing Cultural and Archaeological Heritage was provided by the following publications and regulations:

- The Garden History Society;
- The British Library;
- National Map Library, Edinburgh;
- Falkirk Council Archaeological Services;
- Information from Ordnance Survey Maps 1:10,000, 1865 – 1984; and
- Forth Valley Primary Care NHS Trust: *Royal Scottish National Hospital Landscape Appraisal*, Ironside Farrar Ltd, February 2002.

13.1.1 Legislative and Policy Framework

The full detail of the national, regional and local policy context is set out in Section 4 of the ES. The following section identifies the policies and supporting guidance that have informed the baseline and impact assessments of the development.

National Planning Policy Guidelines

NPPG 18: *Setting of Listed Buildings* sets out the Government's planning policies in relation to the historic environment, with a view to its protection, conservation and enhancement. Central to the Government's approach is the need to secure preservation whilst accommodating and remaining responsive to present day needs. In particular NPPG 18 states that in the determination of an application for planning permission for development affecting a listed building or its setting, special regard must be paid to the desirability of preserving the building, or its setting, or any features of special architectural or historic interest which it possesses.

NPPG 5: *Archaeology and Planning* outlines the importance of preserving sites and landscapes of archaeological and historic interest, so that they may be enjoyed today and passed on in good order to future generations. The preservation of ancient monuments and their setting is a material consideration in determining planning applications and appeals, whether a monument is scheduled or not.

Falkirk Council Structure Plan (2002)

Policy ENV.5: *Built Environment and Heritage* states that heritage assets such as Important Archaeological Sites and Listed Buildings, and their setting should will be protected from inappropriate development.

Larbert and Stenhousemuir Local Plan (1998)

Policy LAR 39: *Listed Buildings*, states that there will be a presumption against proposals which would destroy or adversely affect the architectural character, appearance or setting of Listed Buildings.

Policy LAR 41: *Sites of Archaeological Interest*, seeks to protect Scheduled Ancient Monuments and other sites of archaeological or historic importance and their setting, in recognition of their importance as a local and national heritage resource.

13.2. Existing Baseline Conditions

A plan indicating the locations of cultural and archaeological heritage within the site is included in Appendix C.

13.2.1 Roman

There are no Scheduled Ancient Monuments in the development area. However there is a large Roman temporary camp believed to be 3rd Century called Househill Camp or Dunipace Camp on the western edge of the area. Ramparts are still evident at the north western and north eastern corners. The north eastern corner extends into 'Big Wood' on the RSNH estate. The camp is one of a group associated with the crossing over the River Carron. The other camps are south of the River and with Househill Camp make up one of the largest known concentrations of such camps in the world.

A Roman road from Camelon to Stirling is thought to have crossed the site but the line of the road is now lost.

13.2.2 Post Roman History

The bridge crossing over the Carron at Larbert made the area of strategic importance. A late 12th Century Motte was located on the north bank of the river and a small river grew up around it. In 1651 Royalists fought Cromwell's army at the bridgehead. They were encamped in Tor Wood and were using the River Carron as their defensive line. A silver Charles II medallion was dropped at Househill Farm nearby, by an officer in Charles's army. The development site lies between Tor Wood and the site of the bridge and more artefacts dropped by the Royalist may be found during the works.

13.2.3 The Historic Landscape

The estate was first shown on General Roy's Military Map (1750). It was consolidated from two parcels of land between 1745 and 1751. The Riddell family bought the land in 1789 and built the first house which appears on John Grassom's map of 1818. The estate passed to the Stirling family who employed the architect David Hamilton of Glasgow to rebuild the house in the neoclassical style. The estate was emparked in the 1820s when part of Larbert Village was demolished. (There may still be remains of the houses in the south eastern corner of the site). The emparked area is illustrated clearly on the 1899 Ordnance Survey map. The estate perimeter was planted with mixed woodland which survived intact until around 1947 when the woodland was cleared from the Eastern perimeter and replaced by housing within the estate walls. The building of the Colony (mental hospital) before 1958 encroached on woodland to the north of the site and woodland on the south perimeter seems to have gone by the same period. However many of the original areas of emparkment planting still remain and the picturesque clumps of mixed deciduous and coniferous trees planted to frame the views to and from Larbert House, are intact (though in places over-mature). The estate is bound by a low stone wall, probably dating from the 1820s.

Sir John Graham, who bought the estate in 1880, was a keen gardener and the planting around the house today still contains examples of his Victorian garden. During his time he planted exotic trees, laid out shrubberies and maintained a highly productive, walled kitchen garden. The walled garden still exists and was in use up until the 1970s when patients of the hospital grew food for the table. In Sir John's time the walled garden contained fruit trees trained on the walls; glasshouses for peaches, nectarines, carnations, ferns, palms and orchids; vine houses with several varieties of grape; strawberries and culinary vegetables and flowers for cutting – tulips, lupins, paeonies, iris, anemone and sweet peas. Outside the walls were glasshouses for tomatoes, melons and Malmaison carnation, mignonette, salvia, geraniums and schizanthus were grown for display in the conservatory.

The loch was created after 1817 and appears on maps by 1865. It was used for curling and is an integral part of the estate design. Despite being largely hidden from view by rhododendrons at ground level, it is an essential component of the picturesque ensemble of house and garden.

13.2.4 Listed Buildings

Larbert House (see Figure 13.1) is a fine neoclassical house (Category B listed), designed by Glasgow architect David Hamilton. It was built for Sir Gilbert Stirling in 1822 , probably by adapting and extending the previous house, Mount Riddell. The house is now uninhabited and boarded up. Associated with the house, and also listed, are stables, a walled garden, an ice house and a ha-ha. An elegant conservatory, with a curved roof, is built on to the west side of the house. The drives are as originally set out when the grounds were first laid out in the early 19th century.

Figure 13.1: Larbert House

13.2.5 Setting of Listed Buildings

Larbert House is built on a promontory of land overlooking Larbert Loch. The entrance to the house faces south, but the main view from the house is to the east, towards Larbert. A Victorian visitor to the garden remarked on the fine views from the estate towards the Forth Estuary, the Ochils range and the 'opulent towns of Falkirk and Grangemouth'. The setting of the house and the careful siting of clumps of trees to frame views in its picturesque parkland is a very important visual amenity for local residents and a key component of the landscape character of the area. Any development must protect Larbert House, its setting and associated buildings.

13.3. Consultation

Falkirk Council carried out consultation in 2004. Consultees were invited to respond to the Council's document: *Development Framework for the Former RSNH Site, Larbert; Consultative Draft, September 2004*. The responses relating to Cultural and Archaeological Heritage are summarised below.

Scottish Natural Heritage

- Supported the use of the detailed tree survey to develop the layout option appraisal for the site - thereby reducing the need for important woodland areas to be felled.

The Garden History Society

- Was encouraged by the emphasis placed in the Development Framework on the designed landscape of Larbert House, the need for its protection and future management. The architectural design must sit with the historic landscape.

- Noted that the new principal access should be sympathetically treated to be in keeping with the historic landscape.
- Was encouraged that the existing network of roads and paths will be utilised as far as possible.
- Would encourage new planting to reflect the original designed landscape.

Local Residents

- Favoured the set back of the hospital from Stirling Road.
- Favoured minimising the visual impact of car parking.
- Wished the Eastern Pasture to be maintained as pasture and open space and opposed the relocation of the playing field to this area.

13.4. Potential and Predicted Impacts

At this stage potential beneficial and adverse impacts have been identified.

Beneficial Impacts

- The development may result, in the longer term, in a new use for Larbert House, the stables and the walled garden which will fund their restoration and long term future.

- The grounds around Larbert House and the loch could be restored to improve the setting of the house and the restoration of views over the loch.

- Improved management of the policy woodlands will ensure the long term future of the estate and the landscape setting of Larbert House.

- Advance planting to restore the policy woodlands, where possible, to their original layout would improve the setting of Larbert House and the integrity of the historic landscape.

- Additional screen planting could reduce the impact of the new development on historic views of the estate.

Adverse Impacts

- The information currently available indicates that no ancient monuments will be directly affected by the development. However the proximity of the Roman Camps and the Civil War battlefield to the site suggests that remains of both may emerge during the construction period and may be damaged by excavations and other earthworks.

- The hospital building, car parks and access roads will have an adverse impact on the setting of Larbert House and its environs. The development zone extends up to the existing access road in the east and woodland belts C, G and F, which currently screen the development site, are likely to be felled. This will have an adverse affect on the landscape setting of Larbert House, the Loch and surrounding woodlands. The new building and associated plant and chimneys will be higher and cover a far wider area than the existing hospital buildings. They will probably be visible behind Larbert House when viewed from the south. The triangular area of the eastern pasture north of the new access road will be lost – this is part of the original 1820s emparked estate.

- Unsympathetic lighting of the new development and access road may have a negative impact on the night time setting of Larbert House and its environs.

- Traffic volumes will increase when the hospital is in operation and a new access road and roundabout will be built from the Stirling road across the eastern pasture. This will have a negative impact on the historic arrangement of paths and drives on the estate. Signs, road markings, street lights and other street furniture will have a negative and diminishing impact on the integrity of the currently, almost intact, historic landscape.

- Sustainable urban drainage and flood attenuation measures will necessitate the building of four water treatment and attenuation ponds on the RSNH estate. Two of the proposed ponds will be outside Core Hospital Site 1 and Development Site 2 and these will have an adverse impact on the historic landscape of the estate. One pond is shown in the area of woodland (F), a clump of

trees shown on the 1899 OS map and part of the original policy woodland of the estate. The second pond is shown in the eastern pasture.

13.5. Mitigation Measures and Monitoring Arrangements

Cultural Heritage mitigation strategies could include the following:

- A 10m wide buffer zone excluding all excavation and development to be established along the eastern edge of "Big Wood" to protect Househill Roman Camp.
- An archaeologist could be in attendance during site stripping to check for the presence of any previously unidentified archaeological features and time allowed for them to be recorded.
- A walkover of the development area using a metal detector could bring to light any undiscovered archaeological or historically important remains.
- Lighting design to minimise light pollution and preserve the night time appearance of Larbert House and its setting.
- Restoration of the original policy woodland planting around the perimeter of the estate.
- Advance planting when the masterplan is complete to screen the development and preserve the setting of Larbert House.
- Careful planning of building materials, street lighting and all street furniture to reduce the impact on the setting of Larbert House and the historic character of the estate.
- Consideration of vernacular materials and details to fit in with the style of the historic Larbert House and landscape.
- Careful planning of SUDS and flood alleviation ponds so that they do not negatively impact on the historic landscape.

13.6. Unavoidable and Residual Impacts

A small corner of the Eastern Pasture will be cut off by the new access road, diminishing the integrity of the policy landscape.

13.7. Deficiencies

Due to the scheme being a PFI the significant deficiency at this stage is the lack of a masterplan.

13.8. Scope for Additional Environmental Improvements

Advance planting in the northern end of the Eastern Pasture could be considered cut off by the new access road, to screen the new development from the north. Additionally it is recommended that policy woodlands are replanted in advance of development commencing.

13.9. Conclusions

In conclusion, it is anticipated that part of the 1820s emparked landscape will be lost to the development and there may be some damage to currently unknown archaeological remains. The setting of Larbert House and its historic landscape will be diminished by the large scale of the new development and loss of screening woodland. Therefore advance replanting of the original policy woodland should be carried out before development begins.

For purposes of clarity and to ensure that 'Landscape and Visual Amenity' is covered thoroughly, Section 14 is organised into the following sub-sections:

- 'Approach and Methods';
- 'Existing Baseline Conditions';
- 'Consultation';
- 'Potential and Predicted Impacts';
- 'Mitigation Measures and Monitoring Arrangements';
- 'Unavoidable and Residual Impacts';
- 'Deficiencies';
- 'Scope for Additional Environmental Improvements'; and
- 'Conclusions'.

14.1. Approach and Methodology

The landscape and Visual Amenity section of the ES sets out to**:**

- Provide a description and evaluation of the existing landscape and the visual receptors in the area affected by the development;
- Describe the legislative and policy framework;
- Describe the consultation that has been undertaken and how the resulting information has been used to inform the development proposals;
- Predict the potential landscape, townscape and other visual impacts arising from the development;
- Assess the significance of the predicted impacts during construction and operation of the development, taking into account the mitigation measures proposed, on the existing landscape townscape and visual receptors;
- Provide a description of mitigation measures to prevent, reduce and where possible, offset any significant adverse effects on the environment; and
- Indicate any difficulties encountered in compiling the required information.

Guidance on assessing landscape and visual impacts was provided by the following publications and regulations:

- '*Guidelines for Landscape and Visual Impact Assessment*' (The Institute of Environmental Assessment and the Landscape Institute, 2002);
- '*Lighting in the Countryside: Towards Good Practice*'(re-released by the ODPM in 2002) and '*Guidance Notes for the Reduction of Light Pollution*' (Institute of Lighting Engineers, 2000); and
- *The Environmental Impact Assessment (Scotland) Regulations 1999*.

Documents reviewed are as follows:

- Forth Valley NHS Board: *Acute Hospital Project – Environmental Scoping Report (2004)*;
- '*Landscape Character Assessment Guidance for England and Scotland*' (The Countryside Agency and Scottish Natural Heritage 2002);
- *Development Framework for the Former RSNH Site, Larbert September 2004*;
- Ordnance Survey Maps 1:10,000, 1865 – 1984; and
- Ordnance Survey Map1:25000, 2004.

The landscape character types of the RSNH estate and immediate environs were verified and evaluated on site in terms of quality, value and sensitivity to change. The following definitions of landscape quality have been prepared for this particular location, which will be used to evaluate the landscape:

- Very High - Areas and/or features which have a particularly high value, by nature of their condition, high scenic qualities, strong characteristics, cultural associations, and/or relative position and amenity.
- High - Areas and/or features which are considered to be of high value by virtue of their positive characteristics, sense of place or local or cultural associations. These areas will be of regional or local importance and are likely to be, but not necessarily, designated by the planning authority as being of landscape value.

- Moderate - Landscapes and/or features which retain a positive character and a sense of place and/or are of local interest or have local cultural associations. These areas are unlikely to be designated for their landscape value.
- Low - Landscapes in fair to poor condition which have undergone change to the extent that they no longer have a distinctive local character, or particular aesthetic quality or they lack cultural associations.
- Very Low - Degraded landscapes and/or features in poor condition whose distinctive character and aesthetic quality has been seriously damaged.

A desktop study identified potential key view points of the development site, taking into account the likely screening effects of topography, vegetation and intervening buildings. Information on landform and woodland was taken from the OS map at 1:25000.

At this stage, because the masterplan has not been issued, a full visual assessment has not been carried out. The key visual receptors and viewpoints were identified - these included: private houses, footpaths, unofficial paths, open spaces and public, institutional or commercial premises. The chimneys of the existing laundry building on Development Site 2 (about 18m high) and the main existing hospital building on Core Hospital Site 1 (10m to the roof ridge) were used to assess the likely impact of the new building (around 13m high to the roof line, with plant on top). The landscape survey information is included in Appendix D.

14.1.1 Legislative and Policy Framework

The full detail of the national, regional and local policy context is set out in Section 4 of the ES. The following section identifies the policies and supporting guidance that have informed the baseline and impact assessments of the development.

National Planning Policy Guidelines

NPPG 14: *Natural Heritage* gives guidance on how the Government's policies for the conservation and enhancement of Scotland's natural heritage should be reflected in land use planning. Natural heritage embraces the combination and interrelationship of landform, habitat, wildlife and landscape and their capacity to provide enjoyment and inspiration. NPPG 14 particularly states that the scale, siting and design of new development should take full account of the character of the landscape and the potential impact on the local environment. Particular care is needed in considering proposals for new development at the edge of settlements or in open countryside.

The Scottish Executive's Planning Advice Notes

PAN 60: *Planning for Natural Heritage*, expands on the advice given in NPPG 14, and states that the inter-relationship between development and natural heritage is crucially important in land use planning, and is as relevant in the urban context as in rural areas. Where it is managed well it can enhance the quality of place, where it is not it can devalue it.

Falkirk Council Structure Plan (2002)

Policy COM.5: *Developer Contribution* outlines the need to ensure that proper provision is made to meet the physical and social infrastructure needs of new development and to mitigate the impact of development on the locality. It particularly states that environmental enhancement is required to mitigate, or compensate for landscape and townscape impacts associated with new development.

Policy ENV.7: *Quality of Development*, states that priority is attached to the achievement of high standards of design in all new development, and comments that in addition to specific enhancement measures, good design of new development is a means of improving the image of the area.

Larbert and Stenhousemuir Local Plan (1998)

Policy LAR 37: *Design and the Local Context*, states that proposals should respect and complement the character of the local townscape and landscape setting. The siting, layout, and density of new development should create an attractive and coherent structure of public spaces and built forms, which integrate well with the surrounding townscape, natural features and landforms.

Policy LAR 38: *Landscape Design*, states that development proposals should include a landscaping scheme which enhances the setting of new buildings and improves the visual qualities of the townscape.

Landscaping should be integral to the development, respect the characteristics of the site and wherever possible, incorporate existing natural features.

Policy LAR 40: *Environmental Enhancements*, outlines the Council's intentions to promote and secure environmental enhancements in the Larbert and Stenhousmuir area.

Policy LAR 42: *Trees and Woodland*, states that felling of trees that is detrimental to the character of the townscape or to the economic, nature conservation or recreational values of the planted area itself will be discouraged. The enhancement and management of existing woodland and other natural landscape features will be encouraged.

Policy LAR 46: *The Greenspace Initiative* is an important component of the *Central Scotland Forest Strategy*, which has sought to improve and link together existing landscape components, particularly woodlands, parks and recreational spaces, and river and canal corridors into a coherent, connected greenspace. The Council will not only seek to ensure that development proposals do not undermine the Greenspace Initiative, but developers may be expected to incorporate proposals that fulfil the aims of the initiative into planning applications for development.

Policy LAR 47: *Landscape and Ecological Strategy*, states that the Council seeks to promote the preparation of a landscape and ecological strategy for urban area in order to provide a comprehensive framework to guide and encourage the protection and enhancement of valuable natural resources.

14.2. Existing Baseline Conditions

14.2.1 Regional Landscape Context

The *Central Region Landscape Character Assessment* considers likely pressures and opportunities for change in the landscape, assesses the sensitivity of the landscape to change and establishes guidelines for development .The development site lies within an area that includes two distinct character types as defined in the '*Landscape Character Assessment Guidance for England and Scotland*' (The Countryside Agency and Scottish Natural Heritage 2002). These are:

East Touch Fringe (North half of the site)

This area is characterised by strongly rolling farmland, mainly improved pasture, with some arable, that forms the transition between the Touch Hills and the Forth Estuary. Mixed and broadleaved woodlands, shelterbelts and clumps characterise the policy landscapes dispersed across the hill slopes. Field boundaries are planted with hawthorn, beech and holly or marked with low stone walls or post and wire fences. Major motorways (M80, M9 and M876 to the north of the development site) cut through the landscape and disrupt the character with bunds, embankments and bridges. Views are obstructed and screen planting may not be appropriate to the local vegetation type. Urban influences in the form of pylons, power lines, dismantled railway tracks and the Stirling to Edinburgh railway line become evident in the south east. The transitional character of the area is accentuated by the infiltration of urban and industrial elements as in Falkirk and Larbert. Views from the site to the east are of the urban conurbation of Larbert and beyond.

Positive Attributes:

- Attractive intimate character with complex mosaic of woodland and farmland.
- High proportion of tree cover including large scale coniferous planting, native broadleaved woodland, mixed woodland shelterbelts and clumps.
- Estates and designed landscapes such as Touch House, Sauchieburn House and Polmaise Castle give distinctive character on parts of the lower northern and eastern fringes.

Negative Attributes:

- Development pressure from urban areas in the east.
- Urban fringe and infrastructure elements such as roads and power lines diminish the landscape value.

Denny Urban Fringe (South half of the site)

The area is characterised by low, gently rolling hills between the slopes of the Touch Hills and the floodplain of the Forth to the East. A mixture of pasture and arable fields lies on the edges of the settlement.

Positive Attributes

- Matrix of open space and recreational areas.
- River Carron corridor to the south.
- Remnant of mixed woodland and estate policies.
- Opportunities to create a robust new visual structure with a high capacity to absorb landscape change.
- Framework for integrated improvement strategies exist under the *Greenspace Initiative* and *Central Scotland Community Woodland Plan*.

Negative Attributes

- Fragmentation and lack of unity due to isolated landscape features.
- Urban fringe and infrastructure elements such as roads, industrial sites and power lines diminish the landscape value.
- Development pressure from the East.

14.2.2 Landscape Character of the RSNH Estate

The grounds of the former RSNH are an asset to the landscape of the local area: they provide an important recreational resource for the local community and have the potential to be an attractive place to work and for patients and visitors of the proposed development. A survey of the woodlands on the estate was carried out by Eamonn Wall and Co, arboriculturalists, in February 2005 which included management recommendations. This is attached in Appendix D.

The land across Core Hospital Site 1 slopes from 55m above sea level in the west to 40m in the east. The slope is fairly gentle over most of the site, but is appreciably steeper on the east side between the woodland marked (C) and the disused recreation ground. Similarly the land falls away sharply from the existing administrative building to the access road to the east. Larbert House stands on a promontory above the valley of the River Carron at around 50m above sea level. It is a landmark building from higher ground Immediately to the west of The River Carron is south of the site at around 15m above sea level. Development Site 2 is flatter.

The landscape character zones of the site can be divided into 4 broad zones. These are:

14.2.3 Parkland: 19th Century Garden and Parkland around Larbert House

The park around Larbert House (built or extended in 1822) comprises: deciduous woodland, parkland with clumps of native trees, stables, a walled garden and an artificial loch. The house stands on a promontory overlooking Larbert Loch and the town of Larbert. The land slopes generally down towards the east. The loch was created after 1817 as a focal point for the house but also for curling in the winter. The loch and its margins need management to reduce rhododendron and thin aquatic growth.

There are many fine quality mature beech and oak trees in the woodland of the park with a mixed under storey of mainly native shrubs. This type of planting is highly characteristic of the policy landscapes of the area. Some exotic planting still remains, probably planted by Sir John Graham and his gardeners after he bought the house and estate in 1880. A description written in 1913 (*Scottish Gardens: no. 179*) records that:

'On a sloping bank on the north side of the garden a fine selection of hybrid varieties of the garden Rhododendrons have been planted. These are outstanding, having brilliant and decided colourings… Any notice would be incomplete without a reference to the policies and the grounds. No estate can boast such fine cover. The hardy Rhododendron ponticum has been used for this purpose, enjoying immunity from rabbits and other vermin. Sir John makes a point of planting a thousand every year; a thirty years' ownership means that he has planted 30,000 of this variety alone.'

Rhododendron ponticum still dominates the vegetation around the loch and, in places, hides the loch altogether. The walled garden was in use in the 1970s when patients from the hospital grew vegetables there. The walled garden, stables, icehouse and haha are essential elements of the 19th Century

character of the landscape. There are attractive views from the drive over the eastern pasture to Larbert Church, with Stenhousemuir in the distance.

Larbert House and the land around is highly valued by local people for its contribution to the landscape, its opportunities for walking, fishing and bird watching and as a local landmark. It is a good example of a small 19th Century estate; it has not been encroached upon by development, it retains the original features of the estate, such as the loch, the stables, the conservatory, the ice house and the walled garden and the 19th Century layout of estate roads remains intact and in use. As the house is currently boarded up, this area of the grounds is dark at night.

Positive Attributes

- Attractive well wooded landscape, enclosing the character area.
- Attractive views to Larbert Church and across the loch to the east.
- Larbert House and associated buildings and garden structures are of a high quality
- Fine specimen trees.
- Larbert House and the grounds form the focal point of the view from the south and west and the railway.

Negative Attributes

- Lack of landscape and woodland management. Woodlands need maintenance and replanting.
- Rhododendron had been allowed to grow unchecked.
- Larbert House and its associated buildings are in a dilapidated condition.

The garden and parkland around Larbert House are typical of the estates and designed landscapes of the East Touch Fringe Landscape Character Area. The landscape is of high quality and is very sensitive to change. The loss of woodland screening would be detrimental to the enclosed and tranquil character of the area. Though the current hospital buildings are well screened by woodland, much of this woodland may be lost through development. The new hospital will be larger and higher and the screening between the proposed development site and Larbert House may not be sufficient to protect the landscape around the house from degradation of the existing character.

14.2.4 Pasture

The Southern and Eastern Pasture areas provide an important setting for the site. The land slopes gently towards Larbert, though there is a steep hillock in the arable field east of the house. Fine clumps of mixed deciduous trees (much sycamore) and conifers (pine and spruce) probably planted in the late 18th or early 19th Centuries, frame views out of the site to the south and east. Mainly pasture, there is some land in arable cultivation in the most northerly field of the Eastern Pasture. The perimeter woodland, characteristic of estate planting of the 18th and 19th Centuries and visible on the 1899 – 1947 OS maps has largely gone. There has been encroachment on the eastern and southern boundaries of the park where development has taken place. Figure 14.1 indicates the southern pasture.

The northern pasture is an attractive pasture bounded by a dry stone wall, characteristic of the East Touch Fringe landscape, on the south side along the Old Denny Road. The higher land to the north west of the site is heavily wooded (probably planted to screen the M876 and its feeder roads) and this has closed the view out of the site in this direction. Gappy hedgerow and hedgerow trees along the edge of the development boundary and the northern pasture fields provide a foreground screen that breaks up the short views out, but there is a long view to the Ochiel Hills in the north. The areas of woodland shown on the 1899 OS map remain today.

Positive Attributes

- Provides an appropriate landscape setting for Larbert House
- Remnant managed estate landscape with some mature specimen trees

Negative Attributes

- Part of the eastern pasture is now under arable cultivation.

The quality of the landscape is good, the pasture areas are an important element of the 19th century character of the RSNH estate and the typical of the mosaic of woodland and farmland of the East Touch Fringe. Any development (including the new access road) in the pasture will be highly visible and may

adversely effects the setting of Larbert House and parkland. The character area is highly sensitive to change.

Figure 14.1: Southern Pasture

14.2.5 Woodland

The west side of the site is thickly wooded with deciduous, coniferous and mixed woodlands (A). Much of this woodland is classified as semi-natural and is included in the inventory of Ancient, Long Established and Semi Natural Woodland (1986). These areas are highly sensitive to change.

The western woodland is mainly on higher ground than the development site – for example the middle of 'Big Wood' is 15m – 20m higher than the middle of Core Hospital Site 1. This means that the western woodland could effectively screen views of the proposed development on Core Hospital Site 1 from the west. The land slopes down to the east and south, into the Carron Valley. These woodlands are typical of the local type and are therefore an important component of the landscape character. There are some areas of coniferous plantation, which are not characteristic of the local vegetation type.

A belt of semi-natural mature deciduous woodland (B) included in the inventory of Ancient, Long Established and Semi Natural Woodland (1986), runs along the Old Denny Road and part of the Stirling Road and screens the existing hospital from the north east. A low stone wall marks the boundary. The woodland is on slightly higher ground than the road but follows the general topography, sloping down towards the east. It is part of the original estate boundary planting, and thus is an important component of the landscape character of the area and highly sensitive to change.

The woodland area to the east of the site (areas C, G and F) are likely to be lost as a result of the development. Woodland C includes mature mixed broadleaves (beech, sycamore, oak, lime and horse chestnut). Woodland F includes mature mixed broadleaves and conifers (beech, Scots pine, Norway spruce, sycamore, oak, lime, birch and ash). It is one of the original 19th Century policy woodland clumps. Woodland G includes mature Scot's pine, Norway spruce, sycamore and laurel. It screens a manhole in the centre of the clump.

Positive Attributes

- Fine quality mixed woodlands are an essential component of the landscape types of the East Touch Fringe and Denny Urban Fringe Character area.
- The woodland frames Larbert House and its attendant buildings; it creates interest, shelter and the experience of seasonal change which makes the estate an attractive place for walkers and other visitors.

Negative Attributes

- The woodland needs better management and new planting.
- Diversity could be improved by selective felling of conifers and replanting with native broadleaves and Scot's pine.

The woodland landscape quality is good and these belts form an important screening and framing element for the parkland and Larbert House. The woodland areas are sensitive to change.

14.2.6 The Existing Hospital and Built Environment (Development Zones 1 and 2)

The existing buildings are in a variety of architectural styles, most without any reference to local vernacular building styles. The landscapes around them are poorly maintained. Many areas are covered with short or rough grassland where buildings have been demolished, but foundations and access roads remain. The planting is similarly mixed in style: the rhododendrons and laurels are remnants of the original 19th Century ornamental planting and the ornamental cherries, maples and rowan trees were planted in the last thirty years, probably when new buildings were erected. There are a few mature parkland trees, mainly beech, in the development zone - survivors of the 18th and 19th Century estate planting - around the main hospital building. Figure 14.2 illustrates existing mature trees and the sports field on the Core Hospital Site 1. The recreation area east of the hospital buildings has become disused and appears to be un-maintained.

Figure 14.2: Existing Mature Trees and Sports Field (Core Hospital Site 1)

The existing hospital and development areas are well screened from the west and north but there are long views in from the east and south.

The land on the development zones slopes east, falls a maximum of 20m across the site. There is a steep drop from the existing hospital site down to the current access road and the disused recreation area. This could provide an opportunity to construct the building down at this point, thus reducing the need for the building to go up to a fourth floor.

Woodlands (B), (C), (G) and (F) currently frame the view of Core Hospital Site 1 from the Stirling Road and effectively screen much of the site from long and short distance, from the east.

Positive Attributes

- The Denny Urban Fringe Landscape Character Area can absorb robust new visual structures.

Negative Attributes

- The landscape value of the development site is already fragmented and diminished by power lines, roads and industrial sites.
- Overall quality of the area is poor given its fragmented and run-down nature. The area can accommodate change and would benefit from strengthening the existing landscape structure.

14.2.7 Night-time Landscape Character

Core Hospital Site 1, Development Site 2 and the access roads and paths to the sites are currently lit at night. The rest of the site is dark. Light spills onto the estate from Larbert in the east and south east and there is a nigh time glow from Grangemouth on the Forth Estuary. The surrounding landscape to the north and west is dark.

14.3. Consultation

Falkirk Council invited responses to the Council's document: *Development Framework for the Former RSNH Site, Larbert; Consultative Draft, September 2004*. The responses relating to Landscape and Visual Amenity are summarised below.

Forestry Commission Scotland

- Supported the creation of new woodland and would welcome the opportunity to comment on woodland management objectives and species choice for new planting.
- Pointed out that a felling licence may be necessary to fell woodland.

Scottish Natural Heritage

- Supported the use of the detailed tree survey to develop the layout option appraisal for the site thereby reducing the need for important woodland areas to be felled.

The Garden History Society

- Was encouraged by the emphasis placed in the Development Framework on the designed landscape of Larbert House, the need for its protection and future management. The architectural design must sit with the historic landscape.
- Noted that the new principal access should be sympathetically treated to be in keeping with the historic landscape.
- Was encouraged that the existing network of roads and paths will be utilised as far as possible.
- Would encourage new planting to reflect the original designed landscape.

Larbert, Stenhousemuir and Torwood Community Council

- Would like all or the most significant elements of woodlands C and G to be retained as a buffer between the new building and Stirling Road and the hospital to be set back to reduce the impact on Stirling Road.
- Hoped that the new building will not exceed three storeys.
- Hoped that parking will be designed to minimise visual impact and was opposed to multi-storey parking; opposed a perimeter fence.
- Proposed that TPOs are served prior to detailed design stage - especially before the parking layout is designed to preserve established woodlands (C), (G) and (I).
- Emphasised need for continued consultation with Community Council and local residents during the design process.

Local Residents

- Favoured the set back of the hospital from Stirling Road.
- Favoured minimising the visual impact of car parking.
- Would like the Eastern Pasture to be maintained as pasture and emphasised the need for new planting there to be sympathetic to the existing landscape.
- Hoped that the impact of new parking will be minimised.
- Proposed that TPOs are served prior to detailed design stage.

14.4. Potential and Predicted Impacts

The key visual receptors identified during the site survey are local residents living on or near the Stirling Road and Old Denny Road, users of the Stirling Road, recreational visitors to the grounds of the RSNH Estate and residents, walkers and riders in the surrounding landscape. Typcial views towards or from the proposed development site are reproduced below.

Refer Appendix D for all visual impact survey photos discussed below and a photographic location plan.

14.4.1 Views from Stirling Road

Residential properties line the Stirling Road. Despite the relatively elevated position of the development site, views towards the existing hospital site and Larbert House are screened, in part, by the existing woodland block C, localised topography and isolated woodland clumps. Long views are afforded into the Parkland and hospital site as illustrated in Photograph 3. This is a key viewpoint both towards the development site and importantly from Larbert House and parkland towards Larbert Church. An overview of how the proposed development could affect the visual amenity is discussed below.

Photograph 1: Woodland (C) currently screens the existing hospital buildings from Stirling Road however, the existing access track is visible. The proposed new access road runs approximately from the middle of the low wall, along the bottom of the slope, to the existing access road (marked by the fence and street lights). It will then continue into the site through the clump of cypress trees in the middle of the picture. A new roundabout will be built in the eastern pasture around this point.

The proposed development site extends to the exiting access road and woodland (C) may be felled. If this is undertaken the development site will be clearly visible from this part of Stirling Road. The roundabout and new access road will be clearly also be clearly visible. In addition, the proposals include lighting at night, which will introduce a greater number of luminaries that exists at present. Given the relatively low light levels at present, this will render the road intrusive in the landscape.

Photograph 2 : There is no view of the development site because of a small hill in the Eastern Pasture between the Stirling Road and the site. The new access road will not be visible from this part of Stirling Road

Photograph 3: The existing hospital building is partially visible through woodland clump (J). The view is currently framed by woodland clump (C) and woodland clump (G) – both these clumps may be removed by the development. The hospital is also screened by a line of Leyland cypress

Larbert House is clearly visible from this location, set in its historic landscape. Rhododendron hides the loch. It is clear from this photograph that opening views of the development site will adversely affect the visual setting for Larbert House. A much larger and taller building (3m higher than the building currently on site) on Core Hospital Site will have an adverse impact on the landscape setting on the landscape setting of Larbert House.

14.4.2 Views from Denny Road and Environs

Long framed views towards Larbert House, across the Eastern pasture as well as towards Larbert Church are afforded due to the gently undulating topography and distinct woodland plots.

Photograph 4: This shows a winter view of Larbert House above the loch, with hospital buildings partially visible beyond, taken from the closed Denny Road access road.
The proposed taller and much bigger hospital building will be clearly visible from here, especially in winter and the visual setting of Larbert House will be adversely affected.

Photograph 5: The photograph looks north between the loch and towards the access road and development site. The rhododendrons that surround the loch can be seen on the left of the picture.

The proposed access road and roundabout will be hidden by the small hill in the eastern pasture. The development site is almost completely hidden by woodlands (F), (K), (G) and (C). If (C) is felled the development site may be more visible from this position.

Photograph 6: Looking towards the development site from the Hills of Dunipace, Larbert church is visible in the distance in the centre of the picture and the Western Woodland is visible on rising land on the left. It forms an effective screen to the development site, even in winter time.

14.4.3 Views from A883 and East

Photograph 7: his shows the development site from Bogton Farm, looking across the valley of the River Carron. Household Farm is visible to the left of the development site but the site itself is well hidden by woodland.

Photograph 8: The development site is not visible from Mungal Farm.

14.4.4 Views from the Higher Land to the South

The large, open field patterns and gently rolling topography allow long open views from the elevated hills to the south of the development site

Photograph 9: The view from west of Shieldhill, at about 186m above sea level towards the site shows that the development site is too far away to make an impact on the open landscape south of Falkirk.

Photograph 10: This shows the view from the Falkirk Wheel. The woodland on the RSNH estate is visible as is Household Farm and Larbert Church, but views of Larbert House and the development site behind it are shrouded in woodland. It maybe that the development site becomes more visible if woodland (C) and the line of cypresses on the development site are felled. Buildings on the skyline could be potentially very prominent if tree screens are removed.

14.4.5 Views from Higher Land to the North and West

Photograph 11: The view from north of Tor Wood towards the site shows how Tor Wood hides the development site. The wood is planted on rising land – it rises to 115 m above sea level at its highest point. The development site is at around 50m – 6o above sea level.

Photograph 12: The view from north of Denny towards the site shows how woodland belts effectively screen the site.

14.4.6 Views from Paths within the RSNH Estate

Photograph 13: This view is from the current access road onto the development site which extends up to the road. The recreation ground shown in the right foreground will be lost and the woodland shown may be felled, completely or in parts.

14.4.7 Views to and from the Old Denny Road

Photograph 14: This shows the view from the centre of Development Site 2 towards the Old Denny Road. The gappy hedgerow shows the line of the road which is used as a footpath linking Larbert with the countryside beyond. The northern pasture is visible as a patch of green on the left and behind it is the screen planting around Junction 2 on the M876. The Ochiels are visible in the distance. Any development on Development Site 2 will be highly visible from the Old Denny Road. Development on Core Hospital Site 1 will be partially screened from the north by woodland (D).

Photograph 15: Woodland belt (B) screens the development site in the summer from the Old Denny Road, but in winter it is much more transparent. The new hospital will be a far larger with taller structures than the existing hospital buildings and will be built much closer to the woodland. It will therefore be visible to local residents and walkers on the Old Denny Road leading out of the town towards Tor Wood.

14.4.8 Summary of Impacts

Beneficial Impacts

- High quality buildings in a unified architectural style could improve the views from Larbert and the Old Denny Road into the site. A landmark building, sympathetic to the settings of Larbert House and Larbert Church, could add to the richness of the existing landscape character of the area. Screen planting associated with the proposed development could help to screen visually intrusive elements and create framed views of Larbert House from the East.

- The new development may help in finding a new use for Larbert House, the stables and the walled garden and ensure their conservation and long term future.

- Implementing a landscape strategy for the whole development area will improve the poor quality landscape of the existing hospital site.

- A new programme of structure planting could ensure the whole site remains an attractive amenity for the local residents in the future and screen the new development more effectively from the surrounding countryside.

- Maintenance of the existing landscape will improve if the site is given a new use. The planting around the loch could be thinned, bringing the loch, which is currently hidden, back into the landscape.

- Improvements to the estate's grounds will add to the quality of the working environment for staff which will help recruitment and staff retention.

- Well designed flood alleviation and water treatment ponds could be an asset to the landscape.

Adverse Impacts

- The proposed development will increase the density of building on the site substantially.

- The development zone extends up to the edge of the current access road, potentially bringing building or parking far closer to the Stirling Road than it is at present. If woodlands (C) and (G) are felled, the three storey hospital building will be highly visible from the east. New planting along the estate boundary with Stirling Road will take many years to form an effective screen.

- The new buildings will be taller than the two storey buildings currently on the site which are well screened by the surrounding woodland. Even with sympathetic site planning and choice of building materials, the development may have an adverse impact on the landscape character of the wider area and could adversely affect the landscape setting of Larbert House and Larbert Church.

- The new roundabout and access road into the site will have a major adverse impact on eastern pasture. A section of the pasture will be cut off by the road and may become agriculturally unviable. Land currently in arable cultivation will be lost to road and the new access may cut through the middle of woodland (C). The roundabout and access will be lit at night.
- A large area of the development site will be required to accommodate car parking. This is likely to be highly visible in the landscape.

- There may be loss of woodland screening and some specimen trees to allow the development to take place. This will increase the visibility of the new development from outside the site.

- The site is mainly dark at night currently but after development the buildings will emit light and there will be street lighting in roads and car parks. This will increase light pollution and make the site visible from the wider landscape.

- There will be an increase in visual clutter from signs, street furniture, lighting, buildings, structures, signage, bollards and so on.

- Flood alleviation and water treatment ponds could be alien elements in the landscape having an adverse effect on landscape character.

14.5. Mitigation Measures and Monitoring Arrangements

- A landscape masterplan should be drawn up for the whole site. This will cover planting, circulation (pedestrians, cyclists and motorists), parking and new uses for existing buildings and structures. The masterplan will include strategic planting for the development infrastructure landscape including new woodland, avenues, pasture and parking zones. It will also propose a planting approach for around the buildings so that though they may be built at different times, an overall, consistent landscape style emerges for the site. The masterplan will enhance and build on the existing landscape character of the area. The masterplan will allow advance planting to reduce the impact of new development and loss of woodland to be carried out.

- The masterplan must retain and take advantage of the landscape value of the healthy, specimen trees of high amenity quality on the site. (A tree survey of all individual trees in the development area has been commissioned). Similarly high quality woodland which usefully screens the development site from the surrounding landscape should be retained. Hedgerows on the site should be retained where possible.

- Woodlands (C) and (G) should be retained, where possible, and used to frame the access road into Core Hospital Site I and to reduce the visual impact of the new development on views from the east and Stirling Road in particular.

- The development proposals indicate a road passing through woodland (C), accommodate infrastructure to maximise retention of high quality blocks and individual specimens such as through existing open areas, where there are no mature trees.

- The ground levels around the new development must be planned so that existing ground levels near retained woodlands do not change. BS5837 (1991) Code of practice for trees in relation to construction should be consulted to determine how close new development can be to existing woodland. If woodland trees are felled, measures should be taken to ensure that remaining trees do not suffer wind throw and have to be felled at a later date.

- A management strategy for all woodland, specimen trees, hedgerows, grasslands, wetlands and the loch should be drawn up to maintain the landscape character and amenity value of the site. This should cover the long term management of the new and the existing landscape. The local community could be involved in this where appropriate.

- Any loss of woodland cover should be compensated by the planting of replacement trees of an appropriate mix of species.
- Trees which are to be retained in the building zone should be protected with fencing prior to ground preparation and construction works commencing on site in accordance with BS5837 (1991) Code of practice for trees in relation to construction.
- The Eastern pasture could be returned to wholly grazing land. Assistance could be given to the farmer to maintain the small section of pasture cut off by the new road in agricultural use.
- The landscape character of the designed landscape in the environs of Larbert House and stables must be maintained.

- Building and landscape materials should be in sympathy with the landscape character of the area. Shiny and reflective materials should be avoided for buildings over three stories and chimneys and ventilation stacks.

- A landscape design guide should be written that covers signage, street furniture, paving materials, planting, lighting and path design so that a clear design style applies to the whole development.

- All lighting should be fully ‘cut off’, restricting lighting to only those areas that need it. It may be possible to leave some areas dark at night. Where areas must be lit, lighting levels should be consistent all over the site, with a minimum of bright areas so that overall lux levels can be reduced.

- Car parking should be in the form of parking groves to allow substantial numbers of trees to be planted within the parking zone. The long term effect will be to create light woodland that will reduce the impact by day and night of the car park on the wider landscape and improve the microclimate in summer by shading trees and the parking surface. Porous parking surfaces (an example of sustainable urban drainage) should be considered to benefit the establishment of new trees.

- The condition of Larbert House and the estate structures such as the stables, walled garden and other garden features should be stabilised so that they do not deteriorate further before a new use can be found for them.

- Flood alleviation and water treatment ponds should be sited away from existing woodland and designed to blend in naturally with the surrounding landscape. The north part of Development Site 2 is low lying and already wet and a pond here could look appropriate, if levels and construction methods are sympathetically planned.

14.6. Unavoidable and Residual Impacts

The density of building will increase on site, the hospital will be highly visible from the east, there will be a loss of trees on the site and flood alleviation ponds will be required.

14.7. Deficiencies

Due to the scheme being a PFI the significant deficiency at this stage is the lack of a masterplan.

14.8. Scope for Additional Environmental Improvements

Replanting of the estate perimeter woodland could be carried out in advance of the construction of the hospital. This would be cost effective and the new woodland screen would become effective earlier in the life of the development.

14.9. Conclusions

The landscape quality of the built element of the RSNH Estate is already diminished by existing buildings and transport and power infrastructure. It could therefore be improved by a high quality building and masterplan. The proposals should retain and enhance the high quality landscape and views associated with Larbert House and the parkland.
The masterplan should use the topography of the site to minimise the impact of high buildings.
Advance replanting of the policy woodland around the perimeter of the site could help to reduce the impact of the new development. The long term management plan for the estate woodlands and a replanting programme should be put in place as soon as possible.

15.1. Summary of Impacts

15.1.1 Introduction

The aim of this ES is to describe the nature of the proposed new Acute Hospital for the Forth Valley area located at the former RSNH site in Larbert in order to accompany the OPA for the proposed development. It looks at the existing base line conditions to identify and assess those impacts likely to be significant as a result of the scheme and identifies measures to mitigate these effects. The EIA process also identifies any residual impacts following the introduction of mitigation measures. The indicative design has been used, where appropriate, to assist in this process and the points revealed will inform the development of a detailed design to be undertaken by the successful Tenderer.

This ES has been written in accordance with the Environmental Impact Assessment (Scotland) Regulations 1999 Circular 15/1999 ('the Circular'); and Planning Advice Note (PAN) 58 Environmental Impact Assessment ('PAN 58') (September 1999). The range of environmental topics addressed in the assessment covers the following:

- Transport and Access;
- Recreation and Non Motorised User Access;
- Noise and Vibration;
- Flora and Fauna;
- Geology, Soils and Contaminated Land;
- Water Quality and Resources;
- Air Quality and Climate;
- Cultural and Archaeological Heritage; and
- Landscape and Visual Amenity.

In assessing the magnitude and significance of impacts due to the lack of design information available at this stage a precautionary approach has been adopted and conservative assumptions have been made where appropriate. Where there has been the need to make assumptions to undertake the assessment of particular impacts these assumptions have been described and explained in the different impact sections.

15.1.2 Transport and Access

A TA was originally undertaken by Atkins and an Addendum was produced by Colin Buchanan in March 2005. The study comprises an analysis of road capacity in the Larbert site area using forecast base traffic flows. The study has demonstrated that several junctions will experience significant operational problems. The TA and TP provide advice on mitigation measures for the highway network, maximising the use of sustainable transport modes and ensuring that the TP continues to be a live and flexible tool. The following points can be concluded from the addendum TA and TP:

- It is essential that the site is penetrated by frequent public transport services;
- A frequent bus link between the hospital site and Larbert train station will be necessary if travel by rail is to be a viable option;
- Access to the site for all vehicles will be via a new roundabout on Stirling Road;
- Provision will be made in the detailed design of the roundabout to retain adequate access to adjacent residential property;
- The site will be permeable by foot and bicycle;
- Detailed investigation should be undertaken with a view to extending existing cycle networks to serve the site;
- Parking provision required for the hospital is estimated to be in the region of 1,700 spaces;
- 95% of staff live within 25km of where they work;
- 82% of staff drive to work;
- 65% of patients drive to the hospital with a further 22% arriving as car passengers;
- The walking catchment of the site is currently limited with 2% of staff living within 2km of the site;
- 13% of staff live within a 5km cycle of the site;
- 12% of staff live within 800m of rail stations that would serve Larbert;
- 32% of staff live within 400m of a bus route;
- 63% of staff live within 400m of all direct and frequent connecting bus services;

- Mode share targets have been set and based on observed mode shares and the Falkirk Local Transport Strategy;
- A travel plan will have to be in place prior to the opening of the hospital to educate and influence staff, patient and visitor travel with respect to options available for travel to the new site;
- A comprehensive threshold analysis revealed that North Broomage, Bellsdyke Road/Broomage Avenue, Inches, Larbert Cross, Camelon, Antonshill, Tryst Road and Kirk Street/Kirk Avenue junctions all required to be analysed in detail;
- The threshold analysis also highlighted that Bowtrees Roundabout and South Bellsdyke Roundabout would require further consideration in the context of the hospital proposal. This is not included in this assessment; and
- Detailed analysis indicated that Bellsdyke Road/Broomage Avenue, Inches, Larbert Cross, Camelon and King Street/Kirk Avenue junctions all require to be mitigated to cater for proposed hospital traffic.

15.1.3 Noise and Vibration

Development of the Larbert site for the new Forth Valley Acute Hospital will inevitably lead to noise impacts. Impacts during the construction phase will be time limited and controlled by the use of appropriate techniques and by complying with relevant standards and legislation. Noise impacts during the operational phase are likely to be limited to traffic noise and operation of on-site plant such as heating boilers and air conditioning. Both these impacts are likely to be limited in their effect by the use of careful design and control mechanisms. Impacts at night, when noise has a greater potential to cause disturbance, will be limited by significantly lower activity levels on the site.

15.1.4 Non Motorised User Access

The RSNH estate is currently well used by local people for informal recreational activities such as walking and cycling. The proposed Carronshore – Larbert West Strategic off road route will run along the southern boundary of the development area and the Old Denny Road, along the north of the site, is an important link for equestrian users and walkers to the open country north west of the estate. It is estimated that approximately 14% of hospital staff could potentially live within cycling and walking distance of the new hospital. The same percentage applies to patients and hospital visitors (though in practice patients may need transport to get to the hospital). There is currently no controlled crossing between the Stirling Road and the hospital grounds. There is a disused recreation ground on the east side of the hospital grounds.

The new hospital will generate significant volumes of motorised traffic by day and night. A new system of footpaths and cycle paths, linking up with historic paths and the proposed long distance off road route will be required to encourage safe walking and cycling to work and improve recreational access to the hospital estate. Controlled crossings will be required across Stirling Road. Benefits of the development may include: better management of the estate landscapes leading to improved recreation facilities, an improved footpath and cycle path system to encourage safe walking and cycling and better footpath and cycle path links to the countryside. A new recreation facility will be provided, to replace the existing one, which will be accessible to local residents. A lighting strategy must be planned to maintain the visual amenity of the RSNH Estate and environs by night.

Consultation should be undertaken with the Ramblers Association, Open Space Society, British Horse Society, Cyclists Touring Club and other local walking, cycling and equestrian recreation groups to establish their requirements and views on proposed mitigation measures.

15.1.5 Flora and Fauna: Ecology

The developments main negative impacts arise primarily through loss of existing semi-natural woodland and potential disturbance and displacement of breeding birds, bats, badgers amphibians, reptiles, water voles and other small mammals. No international, national, regional or, local sites for nature conservation value exist within or adjoining the site.
Construction impacts are considered to be of short term duration through initial site clearance resulting in minor noise and pollution disturbance. Mitigation measures would reduce habitat loss by re-planting woodlands. However, semi-natural woodland would take a longer time to reach the maturity of the existing habitat.

Further ecological surveys are required to fully appraise the impacts of development on habitats and species of ecological value. The overall balance of the development is considered potentially beneficial in terms of general conservation impacts as the scheme would allow positive opportunities for ecological management, restoration and enhancement of the surrounding hospitals biodiversity.

15.1.6 Geology, Soils and Contaminated Land

Desk based information provided by Halcrow Group (2003) and Mott MacDonald (2004) have both indicated that the presence of widespread/significant quantities of contamination is unlikely on the site of the former RSNH. There is an indication that small quantities of contaminated material may be present in hotspots across the site which should be removed during the construction phase. Asbestos should be removed prior to demolition by an appropriately qualified person. However given the proposed end use of the site, it is considered such hotspots are unlikely to pose a significant risk to the future site users.

Based on the current level of design and layout information available at this stage no special mitigation or remedial measures are anticipated and no further environmental studies are anticipated for contamination purposes.

15.1.7 Water Quality and Resources

Development of the Larbert site for the new Forth Valley Acute Hospital could lead to water impacts but these are expected to be limited and not permanent. Impacts during the construction phase will be time limited and controlled by the use of appropriate pollution prevention techniques and by compliance with relevant procedures and requirements imposed by Falkirk Council and SEPA. Water impacts during the operational phase are likely to be limited to and related to rainfall run-off which will be mitigated by the careful design of SUDS, flood alleviation and drainage schemes.

15.1.8 Air Quality and Climate

There are inevitably impacts on the air quality from a major infrastructure project such as the proposed Forth Valley Acute Hospital Project. Impacts will be from dust and vehicle emissions during the construction phase and emissions from increased road traffic and the boiler plant during the operation of the development. However, the impacts are considered to be relatively minor.

By adopting appropriate control techniques and management practices during the construction phase air quality impacts can be reduced significantly. This includes dust control techniques ensuring high standards of maintenance for plant and machinery on site and for construction vehicles.

Impacts of the operational phase are inevitable and quantifiable. Evidence presented here indicates that whilst there will be increases in the levels of NO2 and PM10 nationally set air quality objectives will not be exceeded, even post 2010 when tighter objectives apply. Therefore there is unlikely to be any adverse health effects from these increases. Impacts from the boiler plant are likely lead to a net improvement in air quality for the region due to the closure of three old facilities when the proposed new hospital becomes operational.

15.1.9 Cultural and Archaeological Heritage

There are no scheduled ancient monuments on the site, though remains of a large Roman Camp, west of the estate, have been found. A civil war battle was fought in the valley below Larbert House. The house, category B listed, and its estate together form a good example of a designed landscape, typical of the area. Larbert House sits on a promontory of land surrounded by woodland and is a local landmark, clearly visible from the east. The existing hospital is well screened by woodland.

It is possible that further archaeological remains could be found during development. The new hospital building will be taller and occupy a larger footprint than the existing buildings. Much of the woodland that currently screen the development site will be lost and the landscape setting of Larbert House when viewed from the east, will be diminished by the close proximity of the much larger hospital building. Replanting the original estate tree belt around the perimeter of the estate will, in the long term, help to screen the new hospital. The development may make it easier to find new uses for Larbert House, the stables and the walled garden, thus ensuring their long term viability.

15.1.10 Landscape and Visual Amenity

The RSNH estate falls into two landscape character types: the East Touch Fringe (rolling farmland; mixed woodland, tree clumps and avenues typical of policy landscapes; low walls and hawthorn hedges) and the Falkirk Denny Urban Fringe (gently rolling hills; river valleys; farmland on the edge of settlement; Roman settlements and trunk roads and power lines). The development is well screened from the south, west and north by mixed woodlands. It is currently partly screened from the east by clumps of trees and woodland. Larbert House and its environs is a great asset to the landscape character and quality of the area. The mixed woodlands of the estate and the loch are in need of management.

The development will increase the density of building on the northern part of the site. Large areas will be required for car parking and the development zone will be lit at night. The new building will be clearly visible from the east because the existing tree screen will be felled and this will detract from the local landscape character. The new roundabout and access road will reduce the area or farm land surrounding the estate. Benefits of the scheme will include the improved management of the estate woodlands and opportunities to replant some of the original 19th century planting layout which will in time help to screen the development.

15.2. Conclusions

This ES has been prepared as part of the EIA process, in accordance with the *Environmental Impact Assessment (Scotland) Regulations 1999*, in order that the likely effects of the new Acute Hospital development on the environment are fully understood and taken into account before the proposals are allowed to go ahead. The assessment process so far has investigated the existing conditions and identified and evaluated the likely significant environmental effects of the proposed development and measures required to mitigate any which are adverse. . The EIA process also identifies any residual impacts following the introduction of mitigation measures.

The key topic areas where significant adverse environmental affects are likely to be:

- Traffic and transportation; and
- Landscape and visual amenity.

It is considered that there are likely to be adverse environmental effects for the following:

- Flora and Fauna: Ecology;
- Geology, soils and Contaminated Land;
- Water Quality and Resources;
- Air Quality and Climate;
- Noise and Vibration; and
- Cultural and Archaeological Heritage.

Additionally it is anticipated that there could be beneficial non motorised user access and planning impacts when reviewed against the prevailing planning policy framework.

The EIA process will enable environmental factors to be given due weight along with the wider economic, social and policy issues as the planning application progresses. Both positive and negative impacts have been identified.

15.3. Environmental Commitments

This section summarises the proposed mitigation measures and enhancement measures and the means by which their implementation can be secured. Residual impacts and interactions between environmental impacts have been described in each chapter of the ES where relevant.

15.3.1 Intended Mitigation and Enhancement

The principal mitigation measures (proposed to avoid, minimise or remedy potential adverse environmental effects), environmental enhancements and monitoring activities that are in the design and management of the development are set out in Sections 6 to 14. The many environmental commitments that arise are summarised in Table 15.1 which includes reference to the relevant ES section. Table 15.1

is included in order to demonstrate that the implementation of mitigation has been appropriately considered in the EIA and to give confidence that mitigation measures will be implemented. The list is not exhaustive and is subject to change.

It should be recognised as the development is only at outline planning as part of the wider PFI process that these environmental commitments may be subject to changes after submission of this ES. Additionally post submission negotiation and consultation with Falkirk Council, other stakeholders and the public could require the following table (Table15.1) to be updated and maintained during the next stages of the scheme.

Table 15.1: Schedule of Environmental Commitments

No.	Environmental Commitment	ES Section no.
1	The entry width at Bellsdyke Road/Broomage Avenue (Bellsdyke) is widened to 7.3m to alleviate the traffic impacts.	6
2	The widening of the Inches (A88 West) entry width to 8.6m combined with an increase in flare length.	6
3	Traffic signals are introduced at Camelon (A303 Main Street) to manage the predicted queues more effectively.	6
4	Alterations to the lane widths on King Street West and Kirk Avenue, and the introduction of a left turn lane on King Street East, minor signal timing adjustments and the existing bus cage on the south side of King Street East would need to be moved slightly further east.	6
5	Noise and vibration mitigation measures for construction will be agreed with the local authority and reflect best practicable means (BPM) to control noise.	7
6	Future plans for the Carronshore – Larbert West Strategic Off Road route, SUSTRANS and the Falkirk to Stirling cycle route must be provided for when vehicle circulation is being planned.	8
7	Cycle routes from South Broomage, Antonshill and Camelon could be extended to the site to encourage cycling by members of staff and local residents.	8
8	Measures will be taken through the design to controlled combined pedestrian, cyclist and possibly rider crossings across Stirling Road to improve safety and ease of access especially for the elderly, children and partially sighted.	8
9	Measures will be taken through the design for sustainable transport policies to be implemented to reduce traffic entering the site.	8
10	Minimise parking areas within the site and locate them away from landscapes of high recreational value.	8
11	Plan sports and recreation facilities so that they can have shared use between local residents and the hospital staff and patients.	8
12	A new landscape masterplan should be drawn up for the whole site to include structural planting to reduce the impact of the new development on the recreational amenity of the site. This will cover planting, circulation (pedestrians, cyclists and motorists), parking and new uses for existing buildings and structures. A management strategy for all woodland, specimen trees, hedgerows, grasslands, wetlands and the loch should be drawn up to maintain the landscape character and amenity value of the site. This should cover the long term management of the new and the existing landscape. Advance planting when the masterplan is complete to screen the development and preserve the setting of Larbert House.	8, 14
13	Measures will be taken through the design for a lighting strategy to ensure sensitive lighting of the area around Larbert House and the Loch so that it could be used for recreation in the evening and lighting strategy should minimise the spillage of light from the new access road, Core Hospital Site 1 and Development Site 2 which could reduce the urbanising effect of street lighting on the rest of the RSNH estate.	8, 13, 14
14	Development site roads should be designed to include traffic calming so that vehicles move slowly and pedestrians and cyclists have priority.	8
15	All vegetation clearance is undertaken in phased stages to minimise potential impacts to protected species.	9
16	A pre-clearance search of all protected species habitats should be undertaken to avoid unnecessary mortality.	9

No.	Environmental Commitment	ES Section no.
17	Where protected species are identified construction work should cease and the environmental manager / site ecologist notified to allow safe translocation methods for the species to be carried out in consultation with the appropriate statutory body utilising non-statutory bodies (Local Wildlife Trusts and Groups) for guidance and advice.	9
18	If protected species are identified during specialist surveys as residing within an area to be cleared, an early trapping and translocation programme to an appropriate new receptor site outside of the development site boundary should be undertaken.	9
19	A monitoring programme for all translocated species should be established and protective fencing erected around the new receptor site habitat. All species should be appropriately monitored throughout and after the construction phase.	9
20	Implementation of an Environmental Management Plan – including dust suppression, excavation to take place in moist conditions, control of discharges and spillage incidents.	9, 10,11, 12
21	Fencing of woodland and single trees to be retained. Restoration of the original policy woodland planting around the perimeter of the estate.	9, 13
22	Compensatory habitat creation, replanting of policy woodlands to avoid fragmentation and replanting to avoid loss of wildlife corridors.	9, 14
23	Pre-clearance works should be timed to avoid the bird breeding season.	9
24	During construction works implementation of standard health and safety procedures and the use of suitable PPE (gloves and overalls) and good construction practice will reduce the risk to construction workers.	10
25	A Pollution Incident Control Plan will be implemented to manage incidents.	11
26	Refuelling activity should take place in areas of hard-standing which must be connected to an oil water interceptor as part of the site drainage. Drip trays should be used where appropriate.	11
27	Sewage generated from domestic facilities will be treated in a temporary storage treatment facility before being discharged (where applicable).	11
28	Spoil heaps and temporary mounding will be away from watercourses and if necessary temporary settlement ponds will be installed for dewatering excavations. A monitoring regime shall be established to assess the necessity for settlement ponds.	11
30	Emergency equipment and procedures for immediate use in the event of spillage (e.g. pumps, containers and dispersants for clean-up action).	11
31	Careful planning of traffic routes will help to maintain the smooth flow of traffic which leads to lower emissions	12
32	The hospital heating system will be designed to operate on gas to minimise emissions to air, with fuel oil used for emergency use only	12
33	Measures will be taken through the design for a 10m wide buffer zone excluding all excavation and development to be established along the eastern edge of “Big Wood” to protect Househill Roman Camp.	13
34	An archaeologist could be in attendance during site stripping to check for the presence of any previously unidentified archaeological features and time allowed for them to be recorded.	13
35	Consideration of vernacular materials and details to fit in with the style of the historic Larbert House and landscape.	14
36	Careful planning of SUDS and flood alleviation ponds so that they do not negatively impact on the historic landscape.	14
37	The condition of Larbert House and the estate structures such as the stables, walled garden and other garden features should be stabilised so that they do not deteriorate further before a new use can be found for them.	14

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The following photographs were taken during a site visit on 6th September 2004

Photo 01 (Panorama): Development Site 2 (refer site plan in Appendix A) taken from right of way on north side, looking south

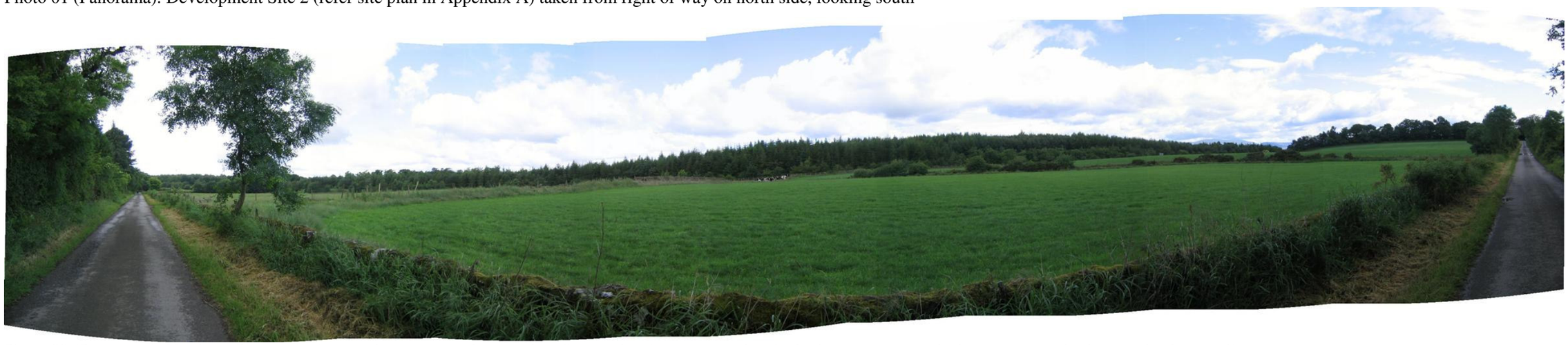


Photo 02 (Panorama): Northern Pasture (refer site plan in Appendix A) taken from right of way on north side, looking west towards the motorway slip lane (in background)

Photo 03 (Panorama): South-east part of Development Site 2 (refer site plan in Appendix A) looking west at existing buildings (left) on north edge of Core Hospital Site 1 and right of way (right)

Photo 04 (Panorama): View east from the Core Hospital Site 1 through gap in woodland looking over to the existing main entry road and Eastern Pasture to the adjacent urban area

Photo 05 (Panorama): Main entry road looking over to the south-eastern corner of the Core Hospital Site 1, adjacent the Eastern Pasture (behind fence on left)

Photo 06 (Panorama): Larbert House main south elevation and entry

Photo 07 (Panorama): Larbert House east elevation

Photo 08 (Panorama): Existing buildings, roads and car parks on Core Hospital Site 1

Photo 09 (Panorama): Existing buildings, roads and car parks on Core Hospital Site 1

Photo 10: Main entry road in southern part of site

Photo 11: Main entry road leading up to existing main building – Core Hospital Site 1

Photo 12: Road leading to Development Site 3 (behind hedge on right)

Photo 13: Existing main building – Core Hospital Site 1

Photo 14: Rear of existing main building – Core Hospital Site 1

Photo 15: Existing building east of main building and car park – Core Hospital Site 1

Photo 16: Existing buildings – Core Hospital Site 1

Photo 17: Existing buildings and concrete slabs of former buildings – Core Hospital Site 1

Photo 18: Existing buildings and concrete slabs of former buildings – Core Hospital Site 1

Photo 19: Existing buildings – Core Hospital Site 1

Photo 20: Existing buildings – Core Hospital Site 1

Photo 21: Existing buildings – Core Hospital Site 1

Photo 22: Existing buildings – Core Hospital Site 1

Photo 23: Existing buildings – Core Hospital Site 1

Photo 24: Existing stone walls adjacent existing watercourse (Chapel Burn) north of the Core Hospital Site 1

Photo 25: Hedge-lined lane leading north from Core Hospital Site towards Northern Pasture

Photo 26: Right of way and Northern Pasture

Photo 27:Existing mature trees and sports field (background) on Core Hospital Site 1

Photo 28: Development Site 3, looking north-west from the south-east corner

Photo 29: Mature planting near Larbert House

Photo 30: Southern pasture (note church in background)

Photo 31: Southern Pasture

Photo 32: View of church from site

Photo 33: Existing stables building near Larbert House (Development Site 4)

Photo 34: Northern edge of The Walled Garden, with existing buildings

Photo 35: Eastern edge of The Walled Garden

Summary of Phase 1 Woodland Survey

Target Note No.	Phase 1 Habitat Type	Location on Development Framework Map	Approximate size	Ecological Value	Further Survey Recommendations prior to development
1	Broadleaved Plantation Woodland	(B)	2.14ha	• Included in the Inventory of Ancient, long Established and Semi-natural Woodland (NCC June 1986) • Potential to support UK and FBAP species	• Semi natural areas and mature trees require further Phase 2 assessment of vegetation and protected species
2	Broadleaved Plantation Woodland	(E)	0.7ha	• Comprises important mature broadleaved trees • Potential to support UK and FBAP species	• Semi natural areas and mature trees require further Phase 2 assessment of vegetation and protected species
3	Broadleaved Plantation Woodland	(D)	1.4ha	• Comprises important mature broadleaved trees • Potential to support UK and FBAP species	• Potential loss of woodland due to development. Bat, and breeding bird assessment prior to felling
4	Conifer Plantation	(I)	0.28ha	• Potential to support breeding birds • generally of lower ecological value in terms of habitat structure and diversity	• Potential loss of woodland due to development. Bat, and breeding bird assessment prior to felling
5	Broadleaved Woodland	Not shown on Development Framework Map	0.2ha	• Small pocket of semi natural sycamore, birch and ash regeneration to the far north western boundary of the site	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
6	Mixed Plantation	North east	0.6ha	• Included within woodland (A)	• Should be assessed in terms of

	Woodland	compartment of (A)		boundary therefore Included in the Inventory of Ancient, long Established and Semi-natural Woodland (NCC June 1986)	enhancing biodiversity as part of the long term ecological management of the site
7	Broadleaved Woodland	(A)	5.3ha	• Largest and most important woodland block in terms of habitat structure and diversity • Likely to support UK and FBAP species • Included in the Inventory of Ancient, long Established and Semi-natural Woodland (NCC June 1986)	• Semi natural areas and mature trees require further Phase 2 assessment of vegetation and protected species
8	Mixed Plantation	Eastern compartment of (A)	1.06ha	• Woodland connecting to the main eastern wooded block, however of lower ecological value than northern and western compartments of (A) due to dominant coniferous structure	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
9	Mixed Plantation	Central eastern compartment of (A)	2ha	• Included in the Inventory of Ancient, long Established and Semi-natural Woodland (NCC June 1986) • Potential to support UK and FBAP species	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
10	Broadleaved Woodland	Outer western compartment of (A)	1.3ha	• Included in the Inventory of Ancient, long Established and Semi-natural Woodland (NCC June 1986) • Potential to support UK and FBAP	• Semi natural areas and mature trees require further Phase 2 assessment of vegetation and protected species

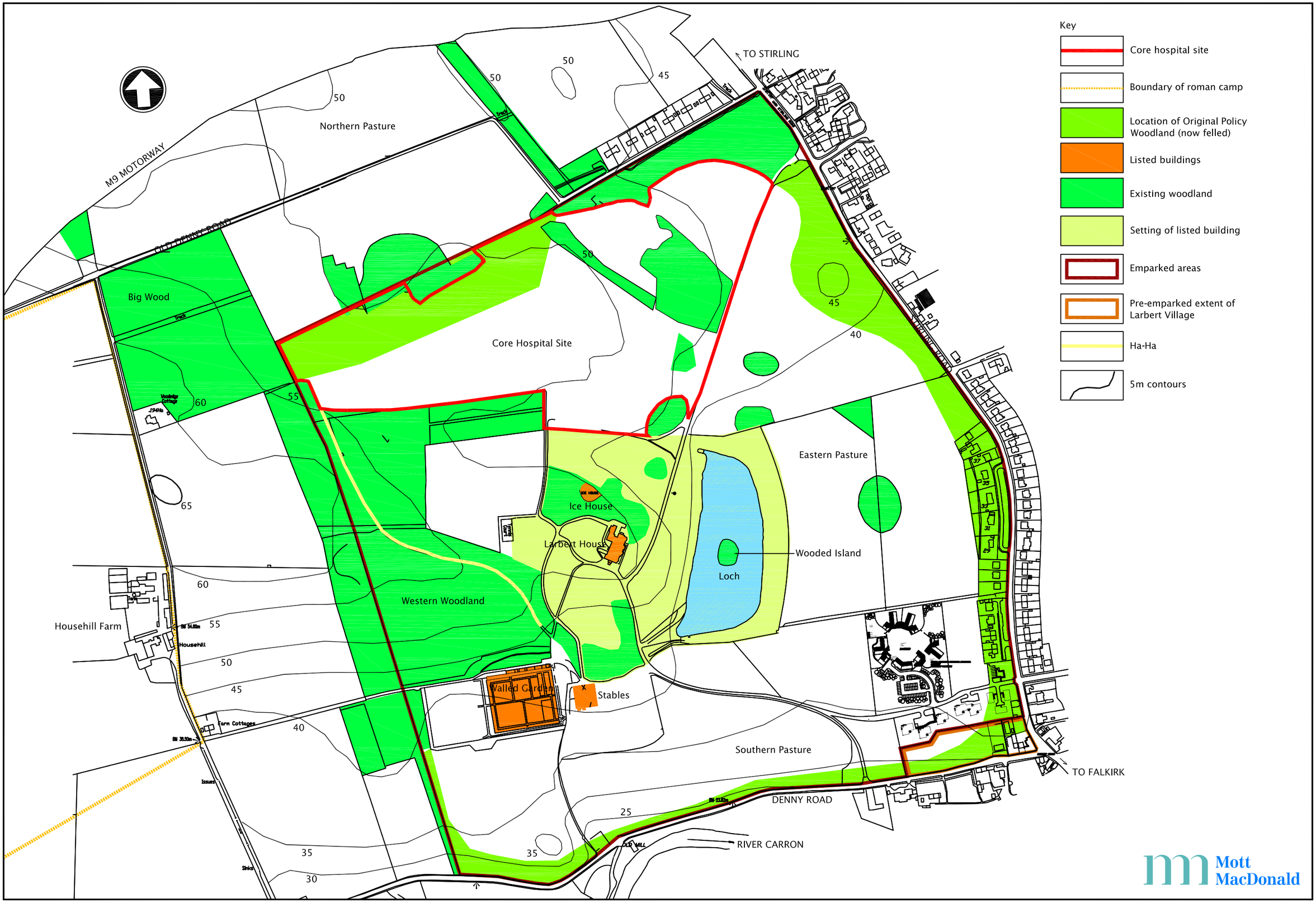
				species	
11	Mixed Plantation	Central western compartment of (A)	0.4ha	• Woodland connecting to the main eastern wooded block, however of lower ecological value than northern and western compartments of (A) due to dominant coniferous structure	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
12	Mixed Plantation	Eastern compartment of (A)	1.17ha	• Woodland connecting to the main eastern wooded block, however of lower ecological value than northern and western compartments of (A) due to dominant coniferous structure	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
13	Mixed plantation	Southern compartment of (A)	4.9ha	• Included in the Inventory of Ancient, long Established and Semi-natural Woodland (NCC June 1986) • Potential to support UK and FBAP species	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
14	Mixed Plantation	South-western compartment of (A)	0.5ha	• Woodland connecting to the main eastern wooded block, however of lower ecological value than northern and western compartments of (A) due to dominant coniferous structure	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
15	Broadleaved Woodland	Not shown on Development Framework Map	0.8ha	• Open semi-natural woodland comprising important mature broadleaved trees • Potential to support UK and FBAP species	• Semi natural areas and mature trees require further Phase 2 assessment of vegetation and protected species
16	Broadleaved Plantation	(M)	0.4ha	• Small oval copse, likely potential for breeding birds and bats	• Should be assessed in terms of enhancing biodiversity as part of the long

					term ecological management of the site
17	Coniferous Plantation	(L)	0.2ha	• Triangular conifer block of low ecological value	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
18	Mixed Plantation	(J)	0.2ha	• Small copse, likely potential for breeding birds and bats	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
19	Mixed Plantation	(K)	0.3ha	• Small copse, likely potential for breeding birds and bats	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
20	Mixed Plantation	(F)	0.5ha	• Comprises semi-natural woodland with a number of mature tree • Potential to support UK and FBAP species	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
21	Broadleaved Plantation	(C)	1.3ha	• Comprises semi-natural woodland with a number of mature trees • Potential to support UK and FBAP species such us	• Potential loss of woodland due to development. • Semi natural areas and mature trees require further Phase 2 assessment of vegetation and protected species
22	Coniferous Plantation	(G)	0.16ha	• Small mainly conifer copse with occasional broadleaved tree likely potential for breeding birds and bats	• Potential loss of woodland due to development.
23	Mixed Plantation	Core Parkland Zone	0.12ha	• Woodland of Larbert Parkland, mature exotic species, potential for breeding birds and bats	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
24	Mixed Plantation	Core Parkland Zone	1.38ha	• Woodland of Larbert Parkland (north of house), mature exotic species, potential for breeding birds and bats	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
25	Mixed Plantation	Core Parkland Zone	0.6ha	• Woodland of Larbert Parkland (south of house), mature exotic	• Should be assessed in terms of enhancing biodiversity as part of the long

				species, potential for breeding birds and bats	term ecological management of the site
26	Mixed Plantation	Core Parkland Zone	0.5ha	• Woodland of Larbert Parkland (west of house), mature exotic species, potential for breeding birds and bats	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
27	Mixed Plantation	Core Parkland Zone	3.5ha	• Woodland of Larbert Parkland (bankside of Larbert Loch), mature exotic species, potential for breeding birds and bats	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
28	Mixed Plantation	Core Parkland Zone	0.8ha	• Woodland of Larbert Parkland (south of Larbert Loch), mature exotic species, potential for breeding birds and bats	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site
29	Mixed Plantation	Core Parkland Zone	0.9ha	• Central Island of Larbert Loch, mature exotic species, potential for breeding birds and bats	• Should be assessed in terms of enhancing biodiversity as part of the long term ecological management of the site

Figure 3

Forth Valley NHS
Cultural & Achaeological Heritage Plan 1:5000 @ A3



30/06/00 A3LFIG.DWT

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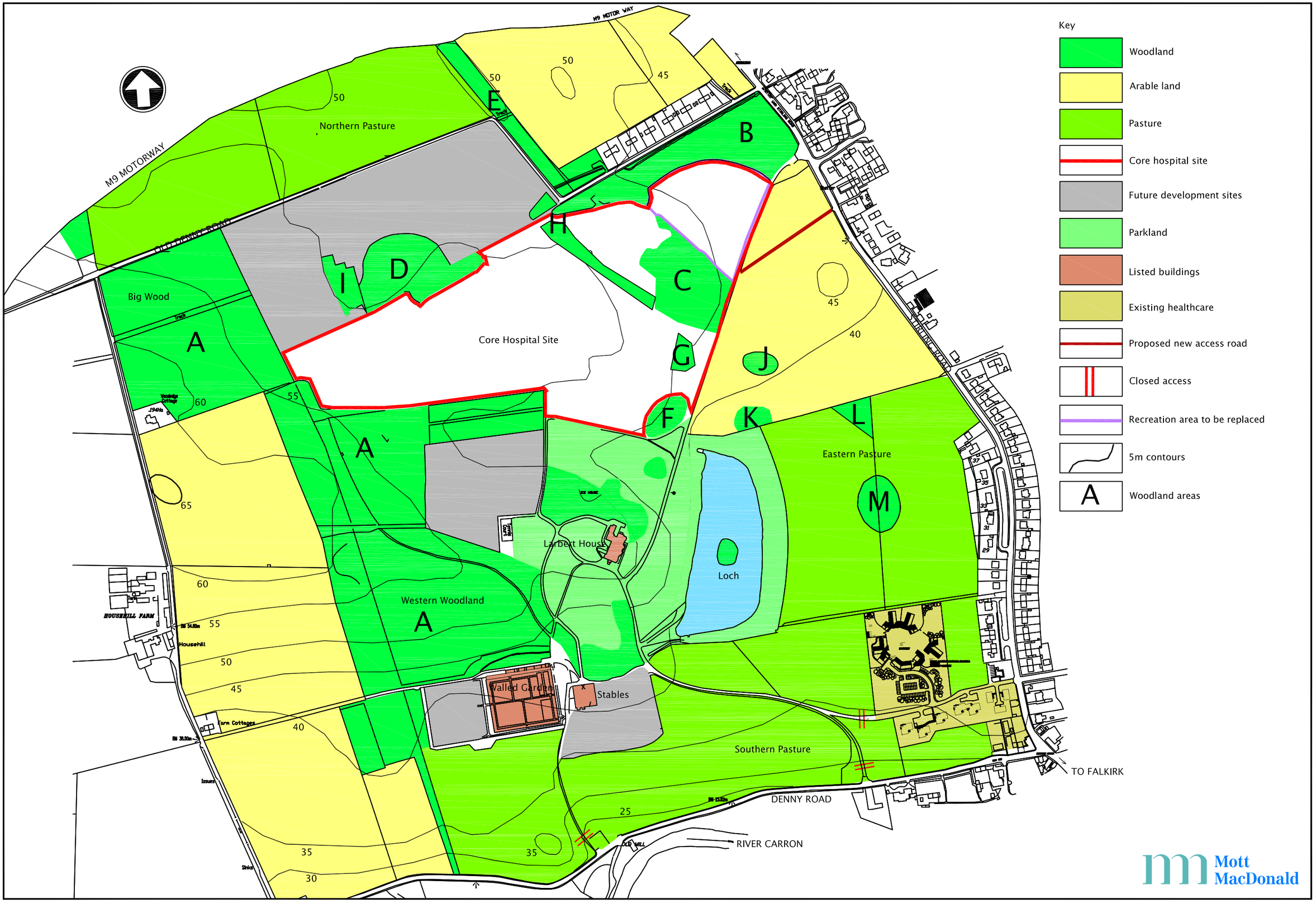
Figure 2

NHS Forth Valley Site Survey Plan 1:5000 @ A3



30/06/00 A3LFIG.DWT

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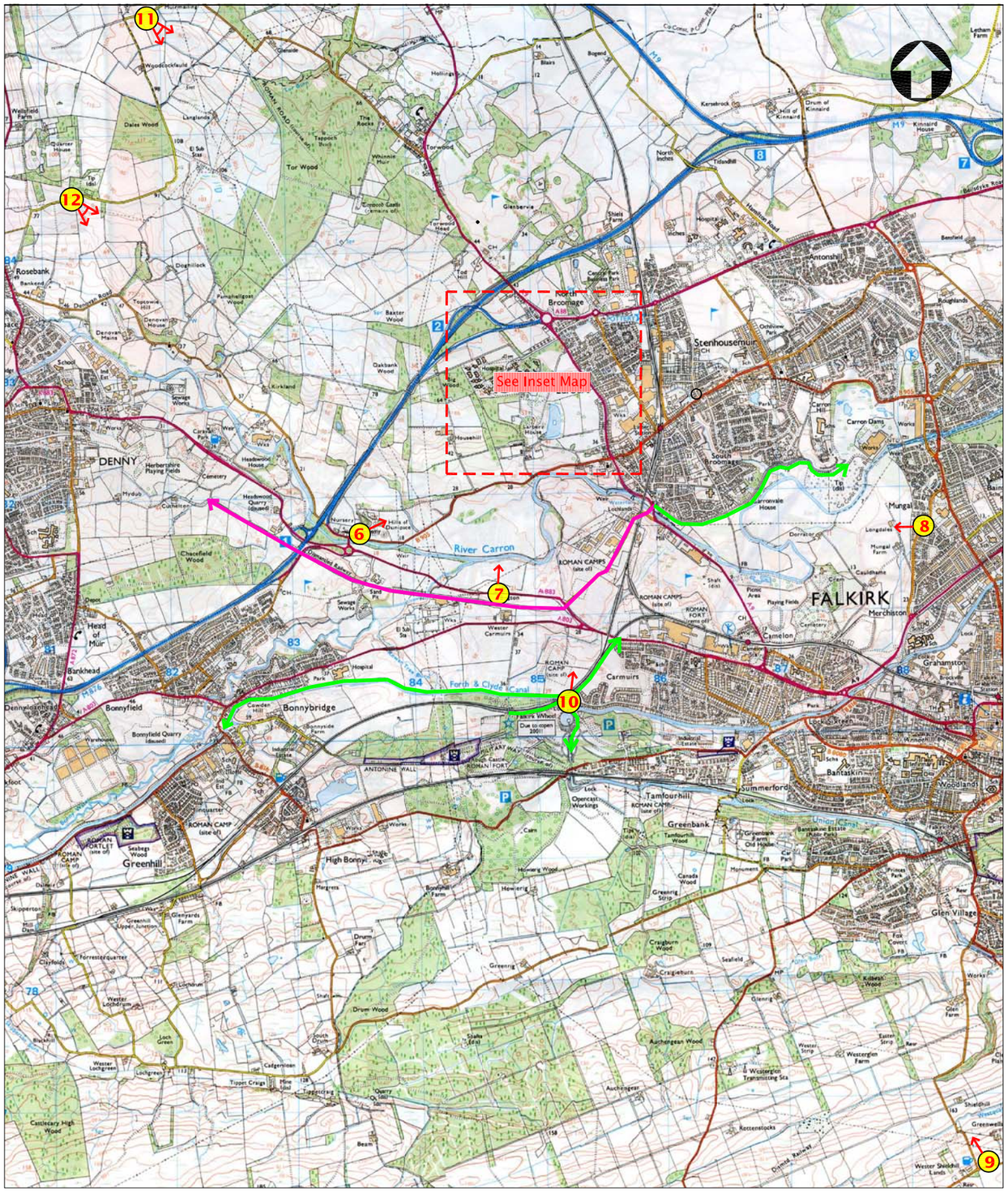
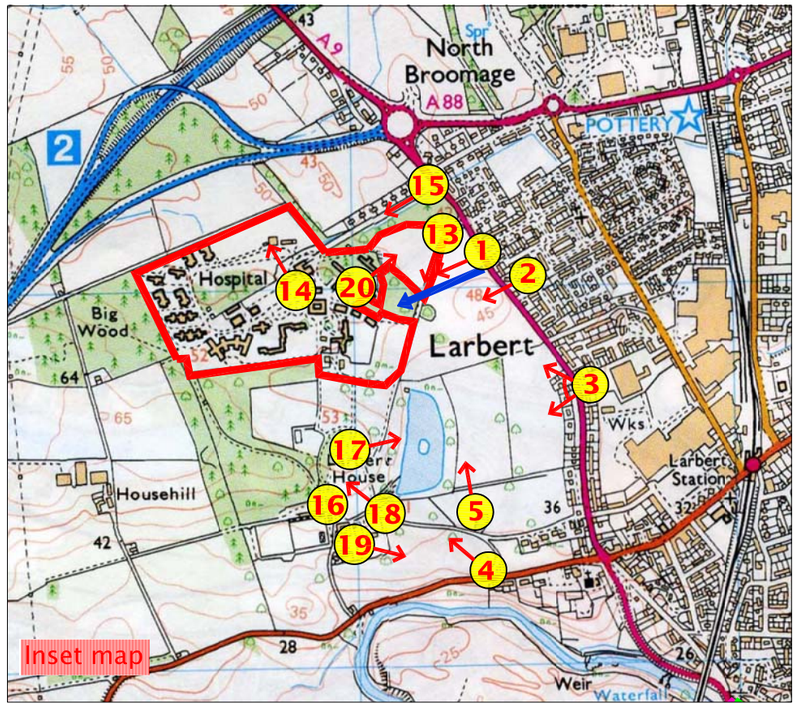
Figure 1
Forth Valley NHS
Photographic Location Plan





Proposed development site

Proposed access road

Falkirk Strategic Cycle Network

Traffic Free Cycle Network

1 Photographic locations

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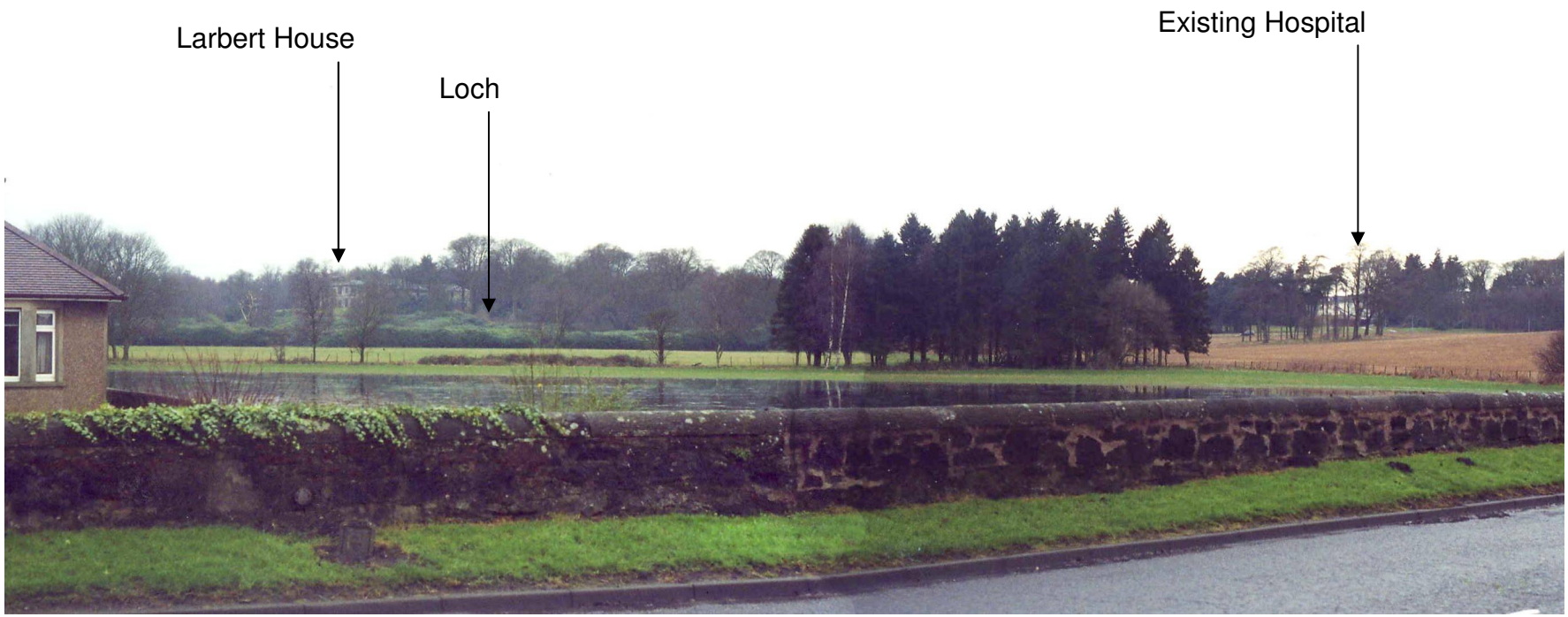
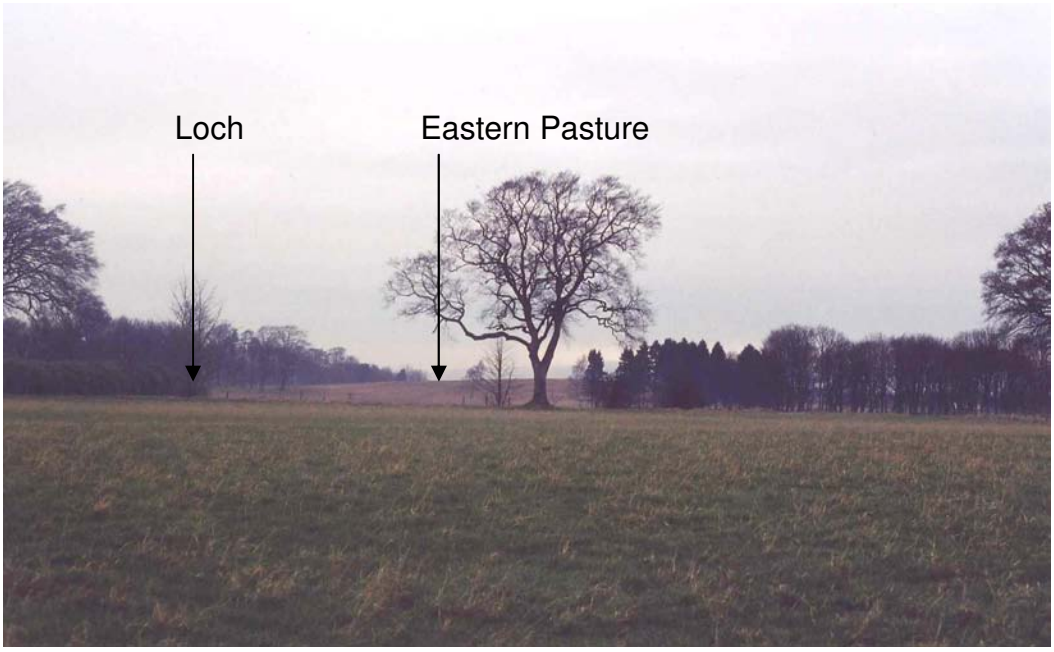
Photograph 1 : View from Stirling Road

Photograph 2 : View from Stirling Road



Photograph 3: View from Road showing Larbert House and the existing hospital building

Photograph 4 : Looking towards Larbert House from the Denny Road Access (B905)



Photograph 5 : View from Denny Road (B905) access towards the new access road

Photograph 6 : Looking towards Larbert House from the Denny Road Access (B905)

Photograph 7 : View from Bogton Farm

Photograph 8 : View from Mungal Farm

Photograph 9 : View from Shieldhill, south of Falkirk towards development site

Photograph 10 : View from the Falkirk Wheel

Photograph 11 : The view from north of Torwood towards the site.

Photograph 12 : The view from north of Denny towards the site.

Photograph 13 : View from the current hospital access road into the development site and woodland C

Photograph 14 : View from development site towards Old Denny Road

Photograph 15 : The woodland along Old Denny Road

Photograph 16 : The stables of Larbert House

Photograph 17: The Lochs, looking west

Photograph 18 : Larbert House, designed by David Hamilton in 1822

Photograph 19: View towards Larbert Church from south of Larbert along entrance road from Denny road (closed)

Photograph 20: View from development site towards Stirling Road between Woodlands B & C