

1. INTRODUCTION AND PIPELINE LEGISLATION

Introduction

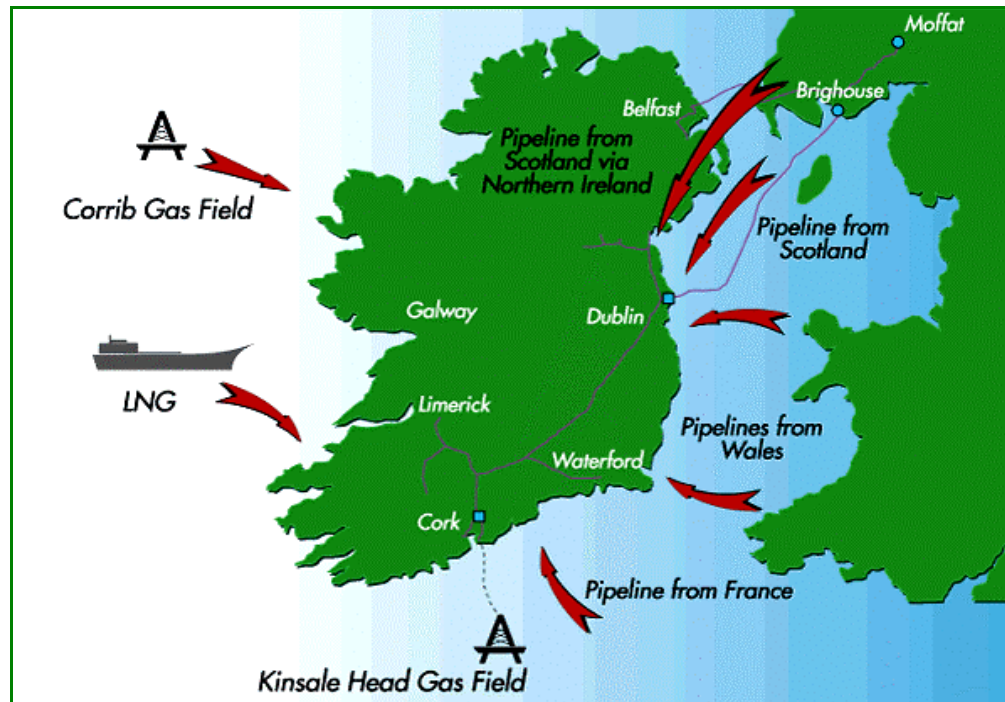
- 1.1. Bord Gáis Eireann propose to construct a new pipeline between Beattock, Scotland and Gormanston, Ireland. The project is called ‘Scotland to Ireland – The Second Gas Interconnector.’ The pipeline will provide additional capacity to supply Ireland with natural gas from the North Sea and other international gas reserves via the existing Transco pipeline network.
- 1.2. The main elements of the project include an extension to Beattock Compressor Station, a new pipeline between Beattock and Brighthouse, an extension to Brighthouse Compressor Station and a new sub-sea pipeline between Brighthouse and Gormanston.
- 1.3. This Environmental Statement examines the potential interaction between the Scottish Land Pipeline and the environment. The Scottish Land Pipeline will be constructed between Beattock and Brighthouse. The land pipeline system will comprise a 36 inch (914mm) diameter pipeline approximately 50miles in length, and four Block Valve Stations (BV’s). The proposed pipeline route is shown in Figure 1.2.

Background

- 1.4. Bord Gáis Eireann and the Irish Department of Public Enterprise initiated a project called Gas 2025 in November 1997, to plan the possible need for further transmission pipelines to meet forecast growth in demand to the year 2025.
- 1.5. In Ireland, gas is sourced from the Kinsale Head Gas Field off the south east coast, and the existing Interconnector pipeline. The Kinsale Head Gas Field is now in final depletion, placing increasing importance on the Interconnector pipeline. This first Interconnector pipeline was constructed in 1993 and runs from Beattock in Dumfries and Galloway, through to Loughshinny in Ireland. Forecasts show that by 2002 the existing infrastructure will be nearing full capacity, and additional supplies will be required.
- 1.6. The Gas 2025 report considered various options to secure additional gas supplies. These included:
 - Reinforcement of existing infrastructure (Reinforcement)
 - Duplicating the existing Scotland-Ireland Interconnector (UK1)
 - Interconnector from Moffat – Stranraer - Belfast - Dublin area (UK2)
 - Interconnector from North Wales to the Dublin area (UK3)
 - Interconnector from South Wales to the Wexford area (UK4)

- Interconnector from Cumbria to the Dublin area * (UK5)
 - Interconnector from Brittany (France) to the Wexford area (FR1)
 - Liquefied Natural Gas imports by ship (LNG Cork & LNG Shannon)
- (* - covered in an addendum report)

Figure 1.1 – Gas Supply Options



- 1.7. After consideration of their feasibility (both environmental and construction), security of supply and cost (both capital and operating) it was recommended that a second Scotland-Ireland Interconnector (UK 1) would provide the optimum system.
- 1.8. Consequently, and in order to transport natural gas, BGE (UK) Ltd is seeking formal approval to construct a new gas pipeline system between Beattock and Gromanston, north of Dublin.
- 1.9. BGE (UK) Ltd currently operates the existing Interconnector pipeline and compressor stations at both Beattock and Brighthouse. It is proposed that the compressor stations will be extended to cover future operating and maintenance facilities required by the new pipeline system. These proposals and associated facilities are covered under separate environmental statements and planning applications.
- 1.10. High pressure gas will be taken from the Transco National Transmission System (NTS) adjacent to BGE (UK) Ltd's Beattock compressor station facility that lies 3.7miles / 6kms south of Moffat between the M74 and A701(T). It is proposed to construct a 36" diameter welded steel underground pipeline to Brighthouse Compressor Station. The proposed land pipeline route between Beattock and Brighthouse is provisionally 50.3miles / 80.9kms long.

- 1.11. A further pipeline will connect Brighouse Compressor Station with a new landfall site at Ross Bay, some 1km to the south. From here a sub-sea pipeline will be laid across the Irish Sea to the Irish landfall at Gormanston. The proposed landfall and sub-sea pipeline are covered under a separate environmental statement and planning applications.

Figure 1.2 –Scottish Land Pipeline – Beattock to Brighouse Route Map



- 1.12. The proposed pipeline route is shown in greater detail on maps in the Addendum of Drawings that accompanies this Environmental Statement (Written Statement).

Alternative Means of Transporting Gas

- 1.13. It is possible to transport fuel in other modes, i.e. transportation by boat, barge, freight train and lorry. These alternative methods offer some advantages,

particularly for local delivery of solid fuel, bottled gas, and petroleum to filling stations. However, they cannot be compared with a welded steel underground pipeline for the purpose of conveying gas from one country to another. Once the pipeline has been laid deep in the ground and the land restored to its normal condition, it will provide a safe, efficient and environmentally friendly means of transporting high pressure natural gas across the land with negligible impact.

Alternative Gas Connections

1.14. Alternative gas connections and other pipeline routes have been considered during the preceding feasibility phase of this project (as stated in 1.5). A summary comparison table is offered as Table 1.1.

Table 1.1 – Results of Option Study

Scheme	No. of Gas Sources	Feasibility	Security of Supply	Ranking in terms of Overall Cost
Reinforcement	1	Not Viable	Low	Not Viable
UK1	1	Good	Medium	1
UK2	1	Good	Medium	3
UK3	1	Medium	Medium	2
UK4	1	Medium	Medium	4
UK5 *	1	Good	Medium	2 nd **
FR1	2	Good	Good	7
LNG Cork	2	Good	Good	5
LNG Shannon	2	Good	Good	6

(* - covered under in an addendum report

** - only rated against UK1)

The Gas Pipeline System

1.15. The overall "Gas Pipeline System" will consist of the following main elements:

- Beattock Compressor Station,
- Scottish Land Pipeline – Beattock to Brighthouse,
- Brighthouse Compressor Station,
- Sub-sea pipeline, and
- Connection with Irish transmission system and Pressure Reduction Station.

Beattock Compressor Station

1.16. The new compressor facilities will be adjacent to the existing BGE (UK) Ltd facility at Beattock. It will be inside the existing fenced compound, and house the Transco “hot-tap” connection, a number of valves, above ground pipework, and a hard-standing area on which a "pig launcher" will be placed [*a description of a pig is given in the Glossary*]. This site will also house meters to measure gas consumption, filters and compressors. To minimise the Offtake's visual impact on the surrounding agricultural landscape it is proposed to plant screening vegetation around the perimeter of the site.

Scottish Land Pipeline – Beattock to Brighthouse

- 1.17. This will comprise approximately 81km of continuously welded high grade steel pipe of 36 inch diameter, incorporating 4 no. intermediate block valve stations. The route is contained wholly within the Dumfries and Galloway Council area and will cross 8 main rivers, 7 ‘A’ classified roads, 1 railway and 45 other roads.

Brighthouse Compressor Station

- 1.18. The new compressor facilities will be adjacent to the existing Brighthouse Compressor Station. The site will be extended to house additional equipment and will share facilities with the existing site. The function of the Compressor Station (CS) is to increase the pressure of the in-coming gas supply to the required level to feed into the sub-sea pipeline. The site will also incorporate pig launching and receiving facilities and associated pipework.

Sub-sea Pipeline

- 1.19. This will comprise of approximately 192kms of continuously welded high grade steel pipe of 30 inch diameter. It will start at Brighthouse CS and run down to Ross Bay, 1 km to the south. From here it will be laid under the Irish Sea to a landfall in Ireland at Gormanston, north of Dublin. Under consideration at present is the installation of a “Tee” connection for the Isle of Man.

Connection with Irish Transmission System

- 1.20. The pipeline will join the transmission system in Ireland near Gormanston 500m from the landfall facility. A new pressure reduction station will be required at the interconnection point to regulate the pressure of the gas entering the Irish system.

Regulatory Background

Legislation

- 1.21. In accordance with the Pipe-lines Act 1962, a Pipeline Construction Authorisation (PCA) application has been submitted to the Scottish Executive for approval to build the cross-country pipeline system. The PCA application must satisfy certain criteria as set out in Section 1 of the Pipe-lines Act 1962.
- 1.22. The relevant Council, i.e. Dumfries and Galloway, will act as major consultee. Ancillary works associated with the Offtake and Reception facilities but not functionally as part of the gas pipeline system, i.e. buildings, access road, new vegetation screening around the sites, security fencing and control kiosk(s) will require local planning permission under the Town and Country Planning (Scotland) Act 1997 as will the four block valve sites along the pipeline route. As requested by Dumfries and Galloway Council local planning applications for these ancillary works will be submitted for planning approval at the same time as the PCA application is submitted to the Scottish Executive.

Other Legislation Requirements

- 1.23. A temporary pipe storage yard and temporary construction base will be established in advance of pipeline construction mobilisation. Once a site has been located and agreement reached with the landowner and occupier then a temporary planning application will be submitted to the relevant local authority.
- 1.24. Prior to construction starting the pipeline contractor will be obliged to obtain consents to cross public roads, railway property, watercourses and utility services. The approving bodies for these purposes are as follows:
- Scottish Executive in respect of trunk road crossings;
 - Dumfries and Galloway, Highways Department for all other public road crossings;
 - Scottish Environment Protection Agency and Fisheries Boards for watercourse crossings;
 - Statutory Undertakers for utility crossings, i.e. BT, ScottishPower, Transco, West of Scotland Water and others;
 - Other interested bodies, for instance where the pipeline is likely to cross any significant archaeological and/or ecological sites, i.e. Scottish National Heritage, County Archaeologist (Dumfries and Galloway); and
 - Railtrack for the Dumfries to Kilmamock railway line and any other property owned by them.

Summary of Relevant Acts of Parliament

- 1.25. Table 1.2 provides a summary of the Acts of Parliament that are applicable to the construction of the “Scottish Land Pipeline – Beattock to Brighouse”:

Table 1.2 – Applicable Acts of Parliament

	Element	Planning Legislation
1.	<p>Gas Pipeline Offtake Facility / Compressor Station Extension at Beattock</p> <p>i. NTS connection including valves and short section of pipe.</p> <p>ii. Operational pipework and valves</p> <p>iii. Other facilities, i.e. buildings, fencing, access road, kiosk(s), landscaping</p>	<p>i. Carried out by Transco under the Gas Act 1995.</p> <p>ii. As per 2 below</p> <p>iii. Town and Country Planning (Scotland) Act 1997</p>

	Element	Planning Legislation
2.	<p>Cross-Country Underground Pipeline comprising 36” diameter welded steel gas pipeline measuring approximately 50.3 miles/80.9 kms long from Beattock Compressor Station to Brighthouse Compressor Station</p>	PCA application in accordance with Section 1 of the Pipe-lines Act 1962
3.	<p>Block Valve Stations (x4) At regular intervals along the route</p> <ul style="list-style-type: none"> i. Operational pipework and valves ii. Other facilities, i.e. marker posts, aerial marker posts fencing, access road, kiosk(s), and landscaping. 	<ul style="list-style-type: none"> i. As per 2 above ii. Town and Country Planning (Scotland) Act 1997
4.	<p>Gas Pipeline Receipt Facility / Compressor Station Extension at Brighthouse</p> <ul style="list-style-type: none"> i. Operational pipework and valves ii. Other facilities, i.e. buildings, fencing, access road, kiosk(s), landscaping. 	<ul style="list-style-type: none"> i. As per 2 above ii. Town and Country Planning (Scotland) Act 1997
5.	<p>Temporary pipe storage yard and temporary construction base - Comprising portacabins, drainage, lighting columns, fencing, parking areas, laydown area, testing areas, water and fuel tanks</p>	Temporary planning application in accordance with the Town & Country Planning (Scotland) Act 1997

[PCA Application Documentation](#)

1.26. The Pipe-lines Act 1962 states that a Pipeline Construction Authorisation (PCA) application submitted to the Secretary of State for Trade and Industry, must be supported by the documentation listed in table 1.3 below. As a process of Scottish Devolution and the fact that the pipeline starts and ends in Scotland, the PCA application will be submitted to the Scottish Executive.

Table 1.3 – List of PCA Documentation to the Scottish Executive

Item No:	Title	Details
1	PL2 Application Form	Numbered document that forms the PCA application, including 1/10,000 scale maps defining the route and limits of deviation

2	Book of Reference	List of landowners and occupiers directly affected by the pipeline route, also statutory authorities, statutory undertakers, other interested bodies, and a list of all specific crossings.
3	Land Referencing Maps	1/10,000 scale maps identifying all affected landowners and occupiers, and road/ rail/ water crossings, by reference number.
4	Environmental Statement (Written Statement)	Full Environmental Statement in 14 chapters and a contents section.
5	Environmental Statement (Addendum of Drawings)	Route maps and other related maps
6	Environmental Statement (Non-Technical Summary)	Non-technical summary of the full ES.

Other Submitted Documentation

- 1.27. To support the PCA application it is necessary to issue separate documentation to the Health and Safety Executive (HSE) – Chemical & Hazardous Installations Division to prove the safe worthiness of the pipeline design. Table 1.4 below lists the relevant documentation.

Table 1.4– List of Documentation issued to the HSE

Item No:	Title	Details
1	Notification under the Pipeline Safety Regulations 1996	List of the basic pipeline technical data
2	Safety Evaluation Report (not obligatory)	Brief description of pipeline route and basic data and provisional listing of gas equipment and linepipe.
3	Wall Thickness Map	Pipeline Route and provisional locations of thicker walled pipe.

Environmental Assessment and Environmental Statement

- 1.28. During the planning phase of a pipeline proposal it is essential to hold informal consultations with relevant authorities and other interested parties at an early stage rather than rely solely on the formal process associated with the statutory procedures. It is equally important to maintain these contacts throughout the design and construction stages and indeed throughout the useful life of the pipeline. To satisfy this principle, planning authorities and other concerned parties and organisations have been contacted during the Environmental Impact Assessment.
- 1.29. This Environmental Statement (ES) presents a systematic evaluation that considers all elements of the pipeline project including its design, construction and operation, with an emphasis placed on potential environmental impact. It identifies those

measures required to eliminate or minimise any significant adverse impacts, which have been identified.

1.30. The Environmental Statement (Written Statement) is set out in three parts:

Part 1 - Description of the Project

Chapter 1 - General Introduction and Pipeline Legislation; and
Chapter 2 – Typical construction methods, criteria used for route selection, pipeline route description and list of specific crossings.

Part 2 - Assessment of Environmental Impact and Mitigation

Chapters 3 to 13 - Identification of baseline conditions, environmental assessment of impacts and their mitigation.

Part 3 - Environmental Management

Chapter 14 – Environmental management procedures.

1.31. In reading this Environmental Statement (Written Statement) it may be helpful to understand its layout:

- A summary appears at the end of most chapters that highlights relevant issues;
- References identifying source material are listed at the end of most chapters;
- From Chapter 3 onwards the format follows a similar pattern as below.
 - i. General Introduction,
 - ii. Baseline Conditions - identifying known existing features and environmental constraints;
 - iii. Environmental Assessment - a professional assessment of the impact that the proposed pipeline may impose on the environment; and
 - iv. Mitigation – providing measures of mitigation to negate or minimise the impact of the proposed pipeline.

Continuing Environmental Responsibility

1.32. The primary function of an Environmental Statement at the route definition/planning application stage is the identification of areas of significant impact and the need for mitigation measures. As such, this document is the first step in an ongoing environmental management process that begins at the project identification stage and continues through route planning, detailed design, construction, operation and eventual decommissioning. Environmental management procedures will be developed and used, and audits carried out to ensure that all environmental requirements identified are implemented before, during and/or after construction as may be appropriate.

General Conclusion

- 1.33. The route of this gas pipeline has been developed to minimise impacts on any sites with statutory designations for their amenity or conservation value. In addition, appropriate management and mitigation measures will continue to be designed, in association with relevant authorities and landowners/occupiers. This will ensure that there will be no significant impacts associated with the construction and operation of the pipeline and the above ground facilities. In particular, pipeline construction activities will be limited to the summer months to minimise soil damage and therefore ensure that there is no significant impact on long-term agricultural activities within the vicinity of pipeline.

Summary

- Bord Gáis Eireann propose to increase both volume and security of gas supplies in Ireland by means of constructing a second Scotland to Ireland Interconnector Pipeline, comprising a Scottish Land Pipeline from Beattock Compressor Station to Brighthouse and a subsea pipeline from Brighthouse to Gormanston, near Dublin, in Ireland. This option was chosen as the most viable of a range of options studied to determine the transmission pipeline capacity needs to the year 2025.
- BGE (UK) Ltd will apply to the Scottish Executive, Energy Division, for planning approval to build a 36” diameter underground gas pipeline, 50.3miles/80.9kms long between Beattock Compressor Station and Brighthouse Compressor Station. The works will also include an above ground offtake facility at the start of the pipeline, four intermediate block valve stations and a gas receipt facility at the termination of the pipeline.
- The works are deemed to be a Cross-Country Pipeline under Section 1 of the Pipe-lines Act 1962. As such, the requirement for a Pipeline Construction Authorisation is in accordance with the Pipe-Lines Act 1962 and relevant environmental regulations.
- Natural gas will be taken from an existing Transco high pressure gas pipelines adjacent to the Beattock Compressor Station that lies 3km south of Beattock between the M74 and A701(T).
- The new pipeline is routed largely through agricultural land to the north west of Dumfries but avoids populated areas and significant environmentally sensitive sites. It will cross several major rivers including the River Dee, River Nith, Cluden Water, and the A75(T) road to the west of Dumfries.
- This Environmental Statement applies only to the Cross Country Pipeline part of the project, including the four block valve stations, but excluding the works at either end of the pipeline.

Reference

1. The Pipe-lines Act 1962: HMSO
2. Town and Country Planning (Scotland) Act 1997: HMSO
3. Gas Act 1995: HMSO
4. European Community Directive 85/337/EEC, “Council Directive of 27 June 1985 on the assessments and effects of certain public and private projects on the environmental”.
5. The Town and Country Planning (Assessment of Environmental Effects) Regulations 1988: HMSO
6. The Environmental Impact Assessment (Scotland) Regulations 1999

Consultees/Contacts

List of bodies contacted during the Environmental Impact Assessment:

Dumfries and Galloway Council
Department of Trade and Industry (DTI)
Scottish Executive, Energy Division
Scottish Executive, Rural Affairs Department
Scottish Environment Protection Agency (SEPA)
Scottish Natural Heritage (SNH)
BT
Cable and Wireless
Scottish Power
Health and Safety Executive
Ministry of Agriculture, Fisheries and Food (MAFF)
Railtrack plc
Royal Society for the Protection of Birds
Transco
Urr District Salmon Fishery Board
Nith District Fishery Board
Dee Fishery Board
Association for the Protection of Rural Scotland
Forestry Commission
Historic Scotland
Scottish Wildlife Trust
West of Scotland Water
National Monuments Record in Edinburgh
Regional Monuments Record for Dumfries and Galloway
Crown Estates Office
Ordnance Survey
British Geological Survey
The Macaulay Institute for Soil Research

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2. PROJECT DESCRIPTION

General

- 2.1 The objective of this chapter is to provide: a general understanding of routing criteria, typical pipeline construction methods, operational safety measures, a detailed description of the proposed pipeline route and lists of specific crossings.

Route Selection

- 2.2 Following outline project approval from BGE for the investigation into the construction of a new gas transmission pipeline from Scotland to Ireland a preliminary engineering study was undertaken looking at possible sub-sea pipeline landfall locations, compressor station locations and land pipeline routes. The recommendations from these studies have been carried forward and form the basis for pipeline routing.

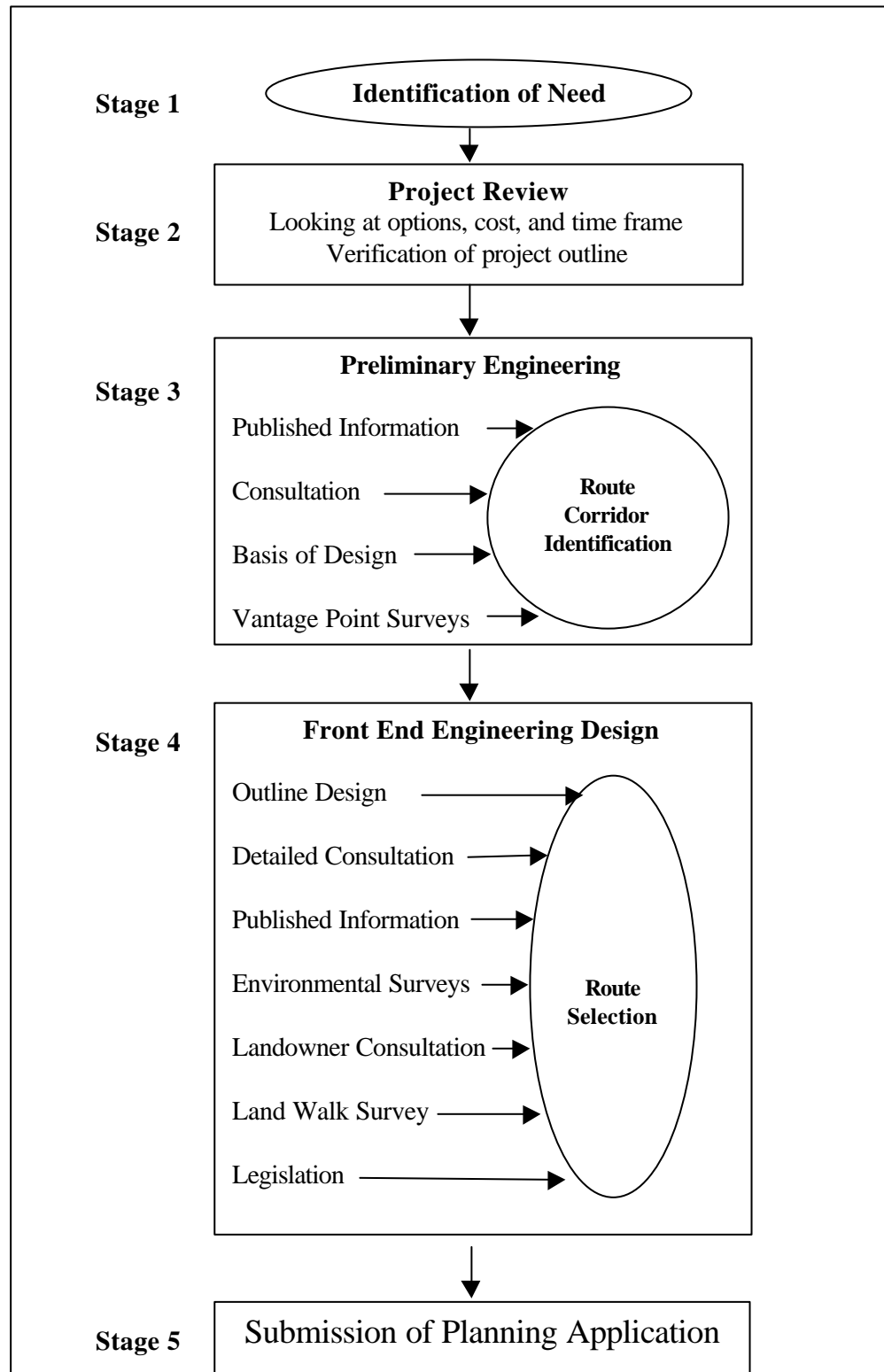
- 2.3 In selecting the location of the offtake from the Transco National Transmission System (NTS) and the route of this pipeline five main criteria have been considered:-

- Safety Risk to the public must be minimised;
- Environment There must be no significant adverse environmental impact;
- Feasibility It must be technically feasible to construct the pipeline;
- Land The views expressed by landowners and farmers are taken into full consideration when routing the pipeline through their land; and,
- Cost The project must be economically viable.

- 2.4 The principal aim in routing a land pipeline is to find the least expensive route which is generally the most direct and the route that minimises Environmental Impact. However, in a populated and developed country like the United Kingdom it is necessary to avoid populated areas both for safety and cost reasons. Rural areas offer low construction costs and it is usually possible to minimise disturbance to the local community and the environment by avoiding development and sensitive areas. Established woodland can normally be avoided and cultivated land quickly recovers from the disturbance caused by construction with no permanent damage.

- 2.5 As with any large-scale infrastructure project, the route selection is an iterative process and as such requires several levels of consultation. Figure 2.1 illustrates the stages in pipeline route selection.

Figure 2.1 - Summary of stages in Planning Application and Conceptual Design



2.6 Following the identification of need for the additional gas supplies and outline project review, construction of a new gas pipeline between Beattock and the coast of Scottish Land Pipeline – Beattock to Brighthouse Environmental Statement – Written Statement

Ireland was selected as the most cost effective solution. A preliminary engineering report was undertaken looking at all possible landfall locations, sub-sea pipeline alignment, compressor station locations and land pipeline routing. A summary of the findings of these reports is given below.

Summary of Subsea Pipeline Landfall Assessment

- 2.7 The following features were deemed desirable during this selection process:
- Stable Beach;
 - Minimum water depth of 10m achieved near shore;
 - Offshore approach perpendicular to beach;
 - Ease of reinstatement;
 - Low area of population;
 - Smooth seabed, and
 - Sandy beach and no rocks.
- 2.8 Following a desk study considering the features as identified above eight possible landfall locations were selected in Scotland. These were:
- Brighthouse Bay (existing landfall location)
 - Ross Bay
 - Fauldbog Bay
 - Kirkandrews Bay (two locations)
 - Sliddery Point
 - Port Allen
 - Portyerrock
 - Garlieston Bay
- 2.9 Following site review and consultation with principal consultees two sites were selected for further investigation, namely Garlieston Bay and Ross Bay. When combined with land pipeline routing and compressor station siting the selected landfall was at Ross Bay

Review of Land Pipeline Routes

- 2.10 To connect the gas offtake facility at Beattock and the proposed compressor station site adjacent to the proposed landfall sites four route corridors were selected for site review following a desk top route assessment utilising existing studies and background data in the public domain such as Structure Plans, Local Plans and geological maps. The possible pipeline route corridors are illustrated in Figure 2.2.
- Route 1: A route closely parallel to the existing BGE Interconnector to the landfall at Ross Bay;
- Route 2: A route loosely parallel to the BGE Interconnector, passing south of Castle Douglas;
- Route 3: A route following either of the above options down to Kirkcudbright then parallel to the Scotland to Northern Ireland Pipeline (SNIPS) route across to Newton Stewart and then south to Garlieston, and

Route 4: An upland route parallel to the A712 north of the Cairnsmore of Fleet then south to Garlieston.

Figure 2.2 – Pipeline Route Options and Landfall Locations



2.11 A matrix showing a summary of the land pipeline route options is provided in Table 2.1.

Table 2.1 – Pipeline Route Options Matrix

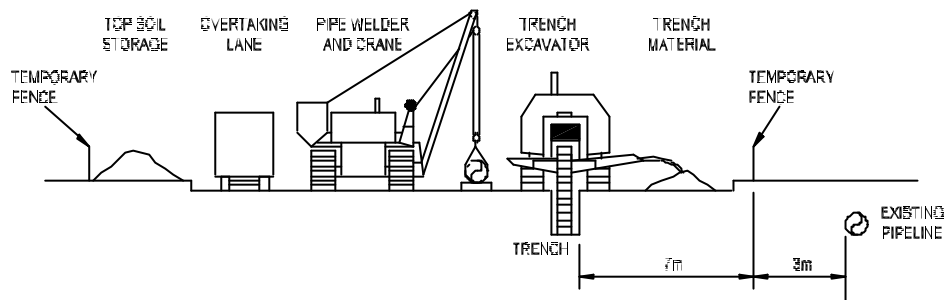
Pipeline Option	Route	1	2	3	4
Landfall Location		Ross Bay		Garlieston Bay	
Pipeline Length (km)		81	81	120	112
Road Crossings					
A Roads		8 A701(T) A76(T) A75(T) x3 A713 A762 A755	7 A701(T) A76(T) A75(T) A745 A711 A762 A755	11 A701(T) A76(T) A75(T) x5 A745 A711 A714 A746	9 A701(T) A76(T) A702 A713 A726 A712 A75(T) A714 A746
B Roads		7	5	8	6
Minor Roads		39	40	51	31
Water Crossings					
Major Rivers		7 Kinnel Water Water of Ae River Nith Cluden Water Urr Water River Dee Tarff Water	8 Kinnel Water Water of Ae River Nith Cluden Water Cargen Water Urr Water River Dee Tarff Water	11 Kinnel Water Water of Ae River Nith Cluden Water Cargen Water Urr Water River Dee Water of Fleet Palnure Burn River Cree R. Bladnoch	7 Kinnel Water Water of Ae River Nith Cairn Water Water of Ken River Cree R. Bladnoch
Railway Crossings		1	1	1	1
Major 3rd Party Service Crossings		20	10	10	10
Restoration Problems		None foreseeable	None foreseeable	Moorland, woodland and wetland	Moorland, woodland and wetland
Slope Stability		None foreseeable	None foreseeable	Steep slopes between Gatehouse of Fleet and Newton Stewart	Steep slopes between New Galloway and Newton Stewart
Visual Impact					
During Construction		Medium	Medium	High	High
1 year on		Low	Low	High	High
5 years on		Minimal*	Minimal*	Medium**	Medium**
10 years on		Minimal*	Minimal*	Low	Low

- * - Visual impact after land, fences, walls and hedges have been reinstated will be marker posts and restrictions on land use
- ** - Visual impact due to scar lines across open moorland and wetland. Restrictions on tree planting within wayleave.

Review of Close Parallel Pipeline Construction

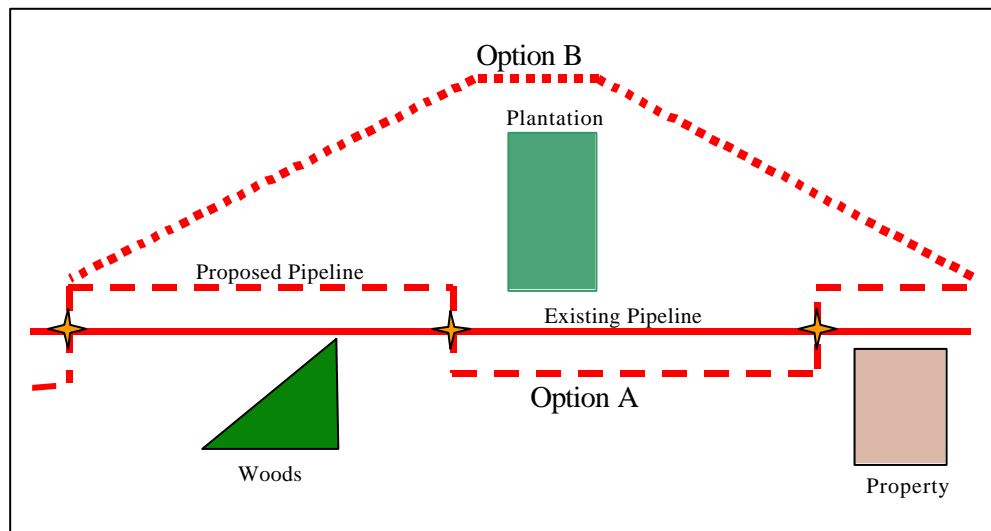
2.12 From a planning point of view, paralleling onshore pipelines in, or in extension of existing wayleaves is desirable as this minimises the amount of land sterilised for future planning, or general conservation. The allowable distance between pipelines is a factor of the existing wayleave and construction methods to be used on the proposed pipeline. In the UK, this has historically been set by British Gas (now Transco) who have specified that the minimum working distance to a live pipeline is 3m. Based upon this standard, pipeline construction typically requires a minimum separation distance of 10m. It is possible to install a pipeline within this zone however the safety and construction requirements increase considerably.

Figure 2.3 – Cross-section of Minimum Working Width



2.13 Where an existing pipeline has already occupied the optimum route, routing and construction difficulties increase exponentially. This is demonstrated in the Figure 2.4.

Figure 2.4 – Parallelism of optimum route



2.14 The disadvantages of constructing a new pipeline in close proximity to an existing pipeline are:

- Since the existing pipeline is routed through a pinch point, little or no available space is left in which to construct another pipeline (i.e. where weak points in tree belts were exploited there would be a requirement for additional tree removal, route skirting edge of properties would sterilise additional land, etc.);
- Optimum route taken by existing pipeline, may require the proposed pipeline to cross it several times, or divert around the obstacle increasing the length of pipeline; and
- Risk of damage to existing pipeline during construction.

2.15 The advantages of constructing a new pipeline in close proximity to an existing pipeline are:

- Detailed knowledge of existing route. This includes ground conditions and landownership;
- Limited increase in land sterilisation; and
- Cost savings during the lifetime of the pipeline on maintenance and field inspection of the pipelines.

2.16 Following site visits and early discussions with Dumfries and Galloway Council, SEPA and SNH the proposed pipeline routes were rated in order of preference with the factors as stated in Table 2.1. A summary of each route is given below identifying the advantages and disadvantages.

Route Option 1

2.17 Following detailed review of as-built records and field visits the main reasons against construction are highlighted above in 2.14 and are related to construction in close proximity to the existing pipeline. Other factors include:

- Blasting techniques were utilised to fracture rock near the surface to allow trench excavation during the construction of the existing Interconnector. To allow similar construction methods to be undertaken would necessitate a minimum distance of 100m from the existing pipeline; and
- The area in the vicinity of the Dee Crossing north of Castle Douglas would prove difficult due to the presence of rock in the river bed. This required blasting techniques to fracture the rock during the construction of the existing Interconnector. When combined with the presence of some archaeological sites, establishing an acceptable route within a similar corridor is considered impractical.

Route Option 2

2.18 The route utilises the existing Interconnector route in locations, however in several areas it deviates significantly. This is to avoid known pinch points and areas of difficult construction, together with limiting the number of crossing points of the

Interconnector. It also allows for the use of standard construction techniques without risk to the existing infrastructure.

- 2.19 The majority of the proposed pipeline route utilises existing service corridors. The first and last 10km of the route follow the existing Interconnector pipeline route, with over 23km of the remainder following overhead Electric Pylon lines.

Route Option 3

- 2.20 This route follows either route options 1 or 2, as described above from the offtake at Beattock down to the Twynholm area. The pipeline route then parallels another pipeline called the Scotland to Northern Ireland Pipeline (SNIP) across open moorland. Routing of the proposed pipeline may prove difficult due to extensive forestry, rough pasture and heathland. This area would require a large reinstatement programme to be undertaken. A large proportion of the area traversed is designated as Scenic Significance. Following this the route drops into the valley floor for the crossing of the River Cree. This is designated as a SSSI.

Route Option 4

- 2.21 Route 4 was the most Northerly route option investigated. This route would only have been feasible if a landfall site at Garlieston was selected. A great proportion of this route traverses areas, which have been classified as of Regional Scenic Value. Following on from initial site route review and early discussions with Dumfries and Galloway Council Planning Department Route Option 4 was not investigated further due to access restrictions, ground conditions, extensive forested areas requiring traversing, and the area being classified as of high scenic value.

Route Selection

- 2.22 Route 2 was selected as the optimum pipeline route. It utilises the best of the existing Interconnector route and deviates in areas where construction or mitigation may prove problematic. The route to the Brighthouse Compressor Station was favoured as it would prove the most environmentally friendly, least difficult to construct and reinstate.

Review of Compressor Station Siting

- 2.23 Five sites for compressor stations were identified in the vicinity of the landfall at Ross Bay and a site was identified for the Garlieston landfall option. Following consultation with the Dumfries and Galloway Planning and Landscape office two of these sites were considered possible. On balance a site adjacent to the existing Brighthouse Bay Compressor Station was considered the most favoured location.

Detailed Cross Country Pipeline Routing

- 2.24 Route selection has been undertaken within the framework of the factors as stated in 2.3, taking into account all of the aspects considered in this Environmental Statement (ES). The pipeline route is depicted on route maps contained within the Addendum of Drawings, which accompanies this Written Statement.

- 2.25 For the purpose of this Environmental Impact Assessment, the “study area”(not to be confused with the Limits of Deviation) is approximately 400 metres wide with a “working width” at its centre. Generally the Environmental Impact Assessment has been confined to this study area with the emphasis placed on the working width within which the pipeline will be constructed.
- 2.26 Listed below are certain constraints which have been identified and wherever possible avoided during the routing of this pipeline:
- i) occupied buildings, and proposed development areas subject to planning applications;
 - ii) areas of significant environmental sensitivity including: Ramsar Sites, Sites of Special Scientific Interest (SSSI), Regional Scenic Areas, woodland, wildlife and bird reserves, and archaeological sites;
 - iii) areas in which it is difficult to install a pipeline due to adverse geology and/or topography; and
 - iv) quarries, areas of proposed mineral extraction, landfill sites and areas of contaminated land

Typical Pipeline Construction Methods

- 2.27 The majority of environmental impacts arising from pipeline projects occur during construction. The following paragraphs describe standard UK pipeline construction practice that is likely to be used in full or in part to build this pipeline. These techniques represent proven methods of construction that have been developed over many years from experience on previous pipelines in the UK.
- 2.28 Construction is by a pipeline "spread", defined as the unit of manpower and equipment necessary to construct a pipeline, from surveying the route through to reinstatement of the land. The rate at which the spread advances is determined by the nature of the terrain, the frequency of "special sections" and other factors.
- 2.29 In addition to the main spread, special teams will be set up by the appointed construction contractor to undertake any work associated with road, rail, and service crossings, or other sections which require some variation from the standard methods. For example, in sections of particular environmental sensitivity modifications are made to the standard spread technique and/or to the timing of construction with a view to minimising environmental impacts.
- 2.30 All construction activities are undertaken within a temporary fenced-off strip, which is referred to as the "working width". This may be increased in size adjacent to road, rail and water crossings to provide additional working areas and storage for materials or special plant. Conversely, its size may be decreased in areas of environmental sensitivity or if close to existing services. Access to the working width will be at defined points to be agreed by Dumfries and Galloway Council and landowners/occupiers. They will be carefully controlled and signposted.

2.31 The normal sequence of events during construction is:-

Fencing

2.32 Before any of the principal construction activities begin and after surveying the route, the first activity is to erect temporary fences along the boundaries of the working width, as previously agreed with landowners/occupiers. The fencing will usually be of wire strands supported on wooden posts or, in areas where livestock requirements dictate, including additional strands of wire, plain or barbed, and/or square mesh netting or as may otherwise be appropriate. Gates and stiles are incorporated into the fence wherever access must be maintained, e.g. public rights of way, farm tracks, or for livestock movements. Fencing and access requirements will have been agreed in advance with the landowners and occupiers. The working width will typically be 36m wide with the pipe offset from the centre line to allow for construction access. Figures 2.5 and 2.6 illustrate the typical working width layout that will be adopted.

Figure 2.5 – Working Width Layout – Mainline

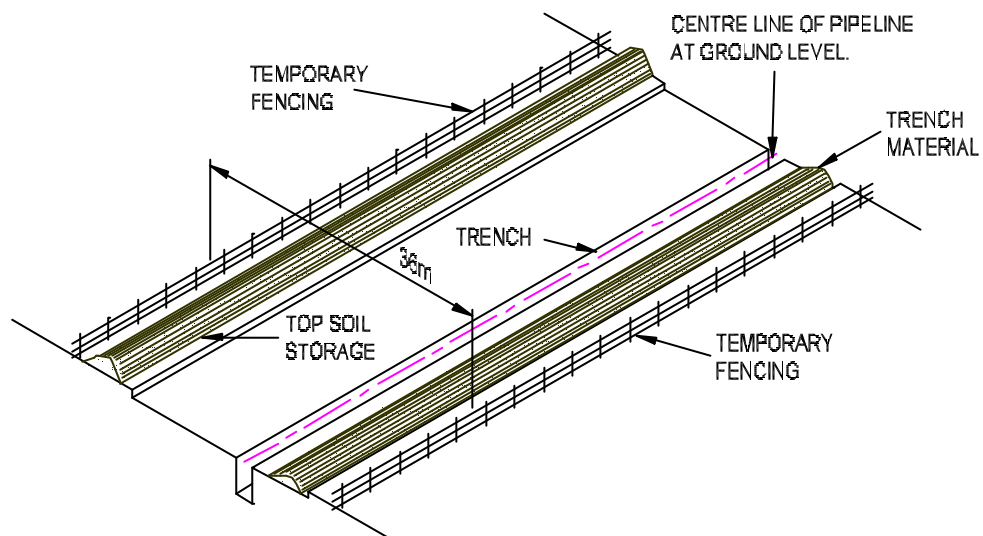
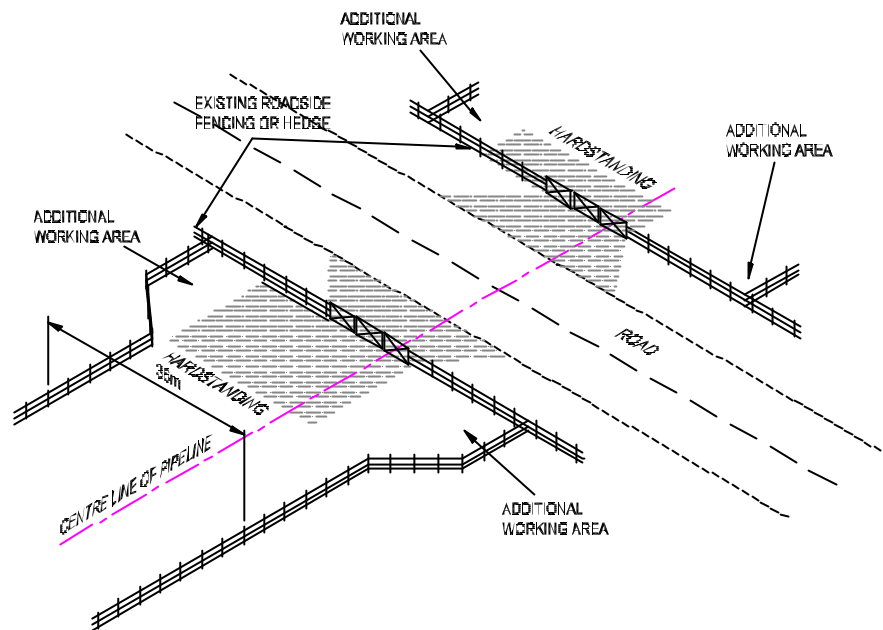


Figure 2.6 – Working Width Layout – Crossing



Topsoil Stripping

2.33 Generally topsoil is stripped from within the working width and stored to one side to prevent it being mixed with subsoil or being damaged by over-compaction. Some hedgerows may need removal to allow continuous access along the working width. Since hedgerows, which have been removed, have to be replaced, only the minimum width required for construction is removed. Established trees are avoided, with both hedging and trees remaining within the working width protected with fencing material where appropriate. Stone dykes will be dismantled and the stone safely stored for later reinstatement.

2.34 At watercourses crossings temporary flume pipes or bridges will be installed, to allow creation of a continuous running track for vehicles along the spread. This will eliminate the risk of vehicles fording running water, thereby damaging the riverbed and increasing pollution. Since banks have to be replaced, only the minimum width required for construction is disturbed. In areas of significant environmental sensitivity or very poor soil conditions, topsoil stripping may be omitted in favour of temporary roadways of a geotextile material and/or hardcore laid over the ground and the excavation limited to the width of the pipe trench alone.

Land Drainage Works

2.35 Particular emphasis is placed on ensuring that installed agricultural land drainage crossed by the pipeline is maintained/reinstated. At the detailed design stage, land drainage in each field will be carefully inspected and a record prepared. In discussion with landowners/occupiers a pre-construction scheme will be developed for those areas where such a scheme is deemed necessary. This may entail the installation of new header drains to intercept the existing land drainage, which will be cut by the pipeline trench. This serves to maintain the existing drainage system during the construction period whilst minimising the possibility of uncontaminated surface water from entering the working area. During actual construction, all drains

encountered during trench digging operation are identified and recorded. An appropriate method of permanent reinstatement will be devised and agreed with the landowner/occupier or agent. Where the pipeline passes under a land drain the usual method of reinstatement is to install a replacement section of drain with a permanent, rigid support carrying it over the filled-in pipe trench. Where necessary, new lateral and header drains are laid to new outfalls to replace drains rendered inoperative by the pipeline.

Stringing

- 2.36 The pipeline is constructed from pre-coated lengths of steel pipe, each about 12m long. They are initially delivered to a pipe storage yard, ideally somewhere close to the pipeline spread (for further details see Chapter 12 Traffic and Transport.) Pipes are then transported to the working width and then laid on wooden sleepers or cradles along a line parallel to the proposed trench. Gaps are left where access across the working width is required. Bends are installed at changes of direction, factory-made where there are sharp changes of direction ('hot bends'), or field bent where the changes are less severe ('cold bends').

Welding and Joint Coating

- 2.37 The pipes are welded together to make a continuous pipeline, and the welds are subjected to radiographic inspection. Any faults detected are repaired, or cut out and replaced, and then reinspected. The pipes will have arrived on site with a protective coating already applied except at their ends. After welding and radiography, the bare metal at the joints is cleaned and a coating applied to make it continuous along the pipeline. The pipeline coating is then tested electronically along the whole of its length to detect any damage or other defects, which are then repaired and the pipeline re-tested.

Trenching and Laying

- 2.38 A trench is excavated to a depth that will allow the pipeline to be buried with a minimum cover over the top of the pipe of 1.1m. At road, rail, watercourses special sections and some other crossings the depth of cover may be increased. There will be an obligation on the part of the construction contractor to obtain consents from statutory authorities and statutory undertakers prior to crossing these features. The subsoil from the pipe trench excavation is placed apart from the topsoil. At times it may be necessary to dewater the open trench. If so, and prior to such an activity commencing, schemes will be developed on an area by area basis in consultation with the SEPA, and the affected landowners/occupiers. Using side boom tractors or equivalent plant, and taking care to avoid damage to the pipe coating, the pipeline is lowered into the trench. By utilising standard factory coatings (3 layer polyethelene) the pipe will have protection from stones and flints, however where field coatings have been applied a bed of sand may be used to provide additional protection. The trench is then backfilled with the excavated subsoil. The subsoil is carefully compacted around and over the pipe up to the top of the trench. Where it is necessary to dispose of surplus trench material, this will be transported away from site by a licensed waste contractor to a suitably licensed site in accordance with the requirements of SEPA and the Environmental Protection Act 1990.

Cleaning, Gauging, Testing

- 2.39 The pipeline is cleaned internally using a "pig" driven through the pipe by water or compressed air. A gauging pig is then driven through to check the internal diameter of the pipeline so as to enable irregularities to be detected and, if necessary, rectified. The pipeline is then hydrostatically tested by closing off the ends, filling it with water and increasing the pressure to a pre-determined level. Normally, water used for this purpose is drawn from a suitable local watercourse and will subsequently be discharged in accordance with approved method statements and SEPA requirements. On completion of pressure testing the pipeline is dried.

Permanent Reinstatement

- 2.40 Reinstatement including spreading of the stored topsoil and reseeded of pastureland is normally carried out within the same year as construction, unless prevented by adverse weather. Reinstatement can include deep cultivation or ripping of the subsoil if it has been significantly compacted, and spreading of the stored topsoil. Banks, walls and fences are reinstated and hedges replanted between protective fences. Permanent pipeline markers and cathodic protection test posts are installed at agreed locations, generally on field boundaries, so as to minimise interference with normal agricultural operations. Finally the temporary fencing along the working width is removed, unless the occupier prefers it to be left in place until the re-seeded pastureland is fully established. In ecologically sensitive areas reinstatement may be modified to suit the particular conditions prevailing.

Typical Crossing Methods

- 2.41 Road, rail, river, burns and other service crossings are regarded as "special sections" where the standard construction procedure is adapted to suit each site's specific needs and to satisfy the requirements of the relevant authorities and landowners/occupiers.
- 2.42 In addition to adapted construction methods, additional measures may be taken to reduce the risk of third party damage to the pipeline. These may include increased depth of cover, thicker walled pipe, concrete slab placement above the pipeline or concrete weight coating applied to the pipe.
- 2.43 A schedule of specific crossings can be found in Table 2.2. Crossing techniques normally however fall into the following categories:

Open Cut – Road Crossings

- 2.44 For minor roads where the disturbance to traffic is small and fairly easily controllable, and in the absence of significant environmental sensitivity, construction of the crossing is by open cut whereby a trench is dug directly across the road. Once dug, a short section of pipe is installed and the trench backfilled with the graded excavated material. The surface of the road will then be reinstated with appropriate material. Roads are kept open during construction by means of traffic management measures, with a temporary steel bridge usually being laid over the supported open trench.

Dry Open Cut – Watercourse Crossings

2.45 Watercourses shall mainly be crossed using this modified open cut technique whereby the disturbance is minimised and where required the flow maintained. Where flow needs to be maintained a temporary flume pipe of appropriate size will be placed in the bed of the watercourse, and its ends packed around with soil filled sacks to seal around the pipe. Alternatively in larger watercourses, where soil conditions are poor or the ground too permeable, steel sheet piling may be used to form a cofferdam at either end. Where little or no flow is expected, the temporary flume pipe may be omitted.

2.46 The water within the closed in section at the intended crossing point of the watercourse, will be pumped out to leave the bed dry and exposed. For these crossings their cross-section will have previously been surveyed and a section of pipeline fabricated to fit the trench that will pass beneath it. This method allows the pipe trench to be cut through the bed and banks of the watercourse and the pre-formed pipe installed and backfilled in a relatively short time. Where concrete protection above the pipe is required at the crossing, this will be installed below the normal hard bed of the watercourse. Following backfilling the crossing will be reinstated, with banks rebuilt and seeded, or where additional stability is required covered with a temporary geo-textile material or soil filled sacks, as may be required by the appropriate authority. All temporary works may then be removed in a controlled manner so as to minimise sedimentary disturbance and so return the watercourse to its original condition.

Thrust Boring (typical trenchless method)

2.47 This method may be used at busy roads and railways where the disturbance that a pipeline crossing by open cut would cause is unacceptable, it may also be used at some water courses. Thrust boring is a relatively simple trenchless procedure that limits surface disturbance. Two pits are dug at either end of the section to be thrust bored. A length of sacrificial pipe is then thrust through the ground beneath the obstacle until it reaches the reception pit on the far side. An auger tool is then placed within the sacrificial pipe to remove the spoil material. After this process a new section of permanent pipe can be welded on and thrust through into its permanent position while the sacrificial pipe is recovered. To facilitate the drilling equipment, the normal pipe trench on the launch side is enlarged in width and slightly deepened, to form a pit which is at least 13m long to accommodate a standard length pipe section. Increased working width at the crossings is required to facilitate the storage of the extra spoil generated by this increase in excavation size and to accommodate additional plant and vehicles. Locations for crossing these obstacles are selected to avoid deep excavations. It should be noted that in some ground conditions, including locations where large boulders are present, the thrust bore method is impractical.

Figure 2.7 – Thrust Bore Machine Being Used at Road Crossing



- 2.48 Horizontal Directional Drilling (HDD)
- This technique uses a steerable cutting head to bore under an obstacle, and is particularly useful for wide and sensitive crossings. Detailed site investigation is essential in determining this method's feasibility since not all ground conditions are suitable. The working areas need to accommodate extra plant and equipment and to store any additional stripped topsoil. Powered by a mobile rig, the drill enters the ground at a shallow angle to bore a small pilot hole. It is steered to follow a pre-determined constant radius to achieve the required clearance from the crossing. The drill emerges on the opposite side of the obstacle, normally within the space of a shallow pit. The diameter of the drilled hole is then increased incrementally by subsequent pull throughs of a reamer until the hole is of a suitable size for installation of the pipe. A fabricated permanent length of pipe is connected to the end of the drill pipe by means of a swivel bearing, and the drill string rotated and withdrawn. As it is withdrawn it pulls the pipe string into position behind it. This part of the pipeline is later tied into the remainder of the pipeline system. Bentonite, a natural fine clay, is normally used as a drilling lubricant. It is pumped from tanks to the head of the drilling bit through the centre of the drill pipe. The lubricant mixes with the drillings, which are forced back along the hole under pressure, and into a recycling plant to recover much of the bentonite. Waste material is then transported away by a licensed waste contractor to a suitably licensed site under the requirements of SEPA and the Environmental Protection Act 1990. Good working practices ensure this pipeline installation method imposes no significant impact on the land.

Examples of Special Crossings

- 2.49 Woodlands and Hedgerows
- Wherever possible, pipelines are routed to avoid woodland areas but there may be occasions when belts of trees or hedgerows cannot be avoided and which the

pipeline must cross. Construction techniques require that short sections of these trees or hedgerows be removed, although it is often possible to align the pipeline to cross at a naturally "weak" point and avoid any isolated mature or semi-mature trees. For hedgerow crossings, a new hedge incorporating suitably matched indigenous varieties will be planted within a suitable double, post and rail, or, post and wire fence, which is maintained until the new hedge is established. For woodland, new trees can be planted but a strip 3m either side of the pipeline must be kept free of trees to prevent root damage to the pipeline.

Conservation Areas

- 2.50 Areas of archaeological or ecological conservation value including those having statutory designation are treated as special crossings. The construction technique depends on the nature and sensitivity of the area, but a restricted working width may be adopted. The limits of topsoil stripping may also be reduced, special arrangements for construction traffic may be included, and special reinstatement methods may be required. The approach to crossing these areas is developed in consultation with the relevant authorities.

Existing Pipelines and Other Services

- 2.51 Prior to construction work commencing, services crossed by and close to the pipeline will be positively located by trial pit excavation and/or by an indirect location method. This work will be carried under the guidance and supervision of the responsible service authorities' inspector, as required.

General Pipeline Technical Considerations

- 2.52 The 36" diameter gas pipeline will be manufactured from high-grade steel in accordance with the standard used in the UK. Thicker walled (Heavy Wall) pipe will be used where added protection is called for, i.e. where the pipeline crosses major roads, watercourses and railways or at locations where the pipeline is routed through areas of high population density, or close to existing or proposed developments.
- 2.53 Pipeline construction will be confined to a fenced-off "working width" as shown in Figures 2.5 and 2.6. This is normal practice for pipelines lying across open agricultural land. A site investigation survey will be undertaken before details of pipeline construction and crossing techniques can be finalised in consultation with relevant bodies such as the Landowner, Dumfries and Galloway Council, SEPA, SNH, statutory undertakers, other interested parties, and landowners/occupiers.
- 2.54 BGE (UK) Limited has appointed a land agent to negotiate permanent rights of access within the pipeline "Wayleave". A wayleave is a necessary requirement in order to gain access to the pipeline if and when the operator needs to carry out inspection, maintenance and repairs during the lifetime of the pipeline. Appropriate compensation payments for these rights will be agreed with farmers and landowners.
- 2.55 As part of these agreements to be entered into with landowners and occupiers, some land-use controls are necessary to maintain pipeline integrity, e.g. exclusion of

building within the wayleave. Normal agricultural activities can continue as before except those involving deep workings (over 300mm) within the wayleave.

- 2.56 The land agent's remit will also include negotiating the land acquisition and access provision for all AGI requirements along the pipeline route.
- 2.57 In agricultural land it is normal practice to provide a depth of cover of not less than 1.1m over the top of the pipeline. At the road, rail, water, and pipeline crossings the depth of cover may increase to meet the specifications of the consenting statutory authority and/or statutory undertaker. Installing a concrete slab and/or increasing the pipe wall thickness may be necessary to increase protection further.

Corrosion Protection

- 2.58 It is essential to protect the pipeline system from external corrosion due to biological and chemical activity. This is achieved in two ways:-
- i) a high integrity anti-corrosion coating applied during manufacture of the pipe, with further coatings applied at the welded joints during pipeline construction; and
 - ii) an impressed current cathodic protection system and/or a sacrificial anode arrangement where special circumstances require, to supplement the anti-corrosion coating.
- 2.59 There will be no significant internal corrosion since natural gas is dry and non-corrosive.
- 2.60 In designing the cathodic protection system it will be necessary to carry out a resistivity survey along the route to define corrosion levels. Other factors that may influence the design and location of the cathodic protection system are:-
- i) availability of a conveniently located power supply;
 - ii) the location of any other cathodic protection systems in the vicinity of the pipeline;
 - iii) the pipeline diameter, wall thickness, coating material; and
 - iv) constraints identified in this Environmental Statement.
- 2.61 The coating applied to the pipeline will be inspected and tested electronically for coating damage immediately before laying. A pre-commissioning cathodic protection survey will be carried out and repeated at regular intervals as a continuing check during the operational life of the pipeline. In the event that protection is not to the required level then remedial work will be implemented.

Pipeline Route Description

- 2.62 The following paragraphs provide a detailed description of the proposed pipeline route, section by section within the Limits of Deviation. For purposes of clarity and understanding it is advisable to read the pipeline route descriptions in conjunction

with maps bound in the Addendum of Drawings. The route is described on a map by map basis working south from Beattock to Brighouse..

Transco Connection and Offtake Facility – 0.0km

- 2.63 The natural gas connection will be taken from the existing Transco National Transmission System (NTS) at the existing BGE Compressor Station at Beattock. The site is located 2.6kms south of the village of Beattock between the A74(M) and the B7020. The station extension required to maximise the gas flow through the pipeline will be subject to an individual Environmental Statement and Local Planning Application.

Map 1 - 0.0km to 2.2km

- 2.64 The cross-country pipeline departs the western boundary of the Beattock Compressor Station and crosses the B7020. The pipeline then turns and heads due south running parallel to the Interconnector pipeline. The terrain here is in the main gently undulating improved pastureland with elevations between 120m and 160m AOD. In addition to the B7020 the pipeline will cross one minor road and five drainage channels (open-cut) in this section. It will be necessary to cross two Transco NTS gas pipelines feeding into the Transco Moffat Compressor Station. A crossing of the existing Interconnector pipeline will be required to allow the optimum crossing location of the Threegills Cleuch to be attained. The pipeline will pass within 100m of Stockholm Farm and skirts the eastern boundary of the Greystone Clump, an area of commercial woodland.

Map 2 – 2.2km to 5.1km

- 2.65 The route continues south paralleling the existing Interconnector pipeline and the B7020. To maximise the distance between the properties along the B7020 and the gas pipeline, it will be constructed between the existing Interconnector and Lochwood Wood, between the properties of Thrummyrig and Royal Oak. Two burns, one minor road and a farm access track will be traversed in this section. To the south of the covered reservoir, south of Lochwood Farm, the new pipeline will pass beneath the Transco 36” diameter Number 11 Feeder Pipeline.

- 2.66 Running to the west of the Hazelbank Plantation will allow the pipeline to be routed through predominantly improved grassland. The access track to Hazelbank Farm will be crossed (open cut) as will three burns (dry open cut). During the installation of the 1st Interconnector a weak point was utilised in crossing a pinch point between the Hazelbank Plantation and Kilnspot Wood, near Kilnspot Rig. In recent years Kilnspot wood has been subjected to severe wind damage and has recently been felled (Summer 2000). This will allow the installation of the new pipeline to impinge on the woodland without causing any initial damage. This will impose a restriction on any future planting of trees within the pipeline easement to eliminate any possible damage to the pipeline from the tree roots.

Map 4 – 7.9km to 9.9km

- 2.67 The route passes between Springwells Farm and Springwellsgate. Two minor road crossings and three classified burns are crossed on this sheet. It is proposed to cross the roads by open cut methods and the burns by dry open cut methods. Passing to the north of Greenbeck Wood the pipeline route starts to diverge from the

existing Interconnector. The existing Interconnector takes a more southerly route for the next 20km. The proposed alignment passes 150m to the north of Greenbeck Farm as the pipeline continues across open improved grassland in a south-westerly direction.

Map 5 – 9.9km to 12.3km

- 2.68 On the south side of Kerse Moor the pipeline runs south-westerly across flat improved farmland at approx. 85m AOD. To avoid a crossing of the Kerse Plantation and the construction of the pipeline through the Kerse Farmstead a short section of pipeline will be constructed along the minor road. By utilising this route a longer road crossing will be installed but will save in overall pipe length and two track crossings.
- 2.69 From here the pipeline route descends towards the Kinnel Water. The alignment of the river is straighter now than the line shown on the current Ordnance Survey mapping, however the alignment at the proposed crossing location is correct. The pipeline crossing location has taken into account a colony of sand martins that occupy holes in the gravely western bank. As far as the Kinnel Water is concerned it would be preferable to use the thrust-bore method because this would ensure minimal impact on this environmentally sensitive watercourse. However, due to the gravely ground conditions and the depth of pits required a trenchless crossing method may not be the optimum installation technique. It will not be possible to establish which crossing method is suitable until ground conditions have been fully determined. This will involve drilling boreholes on either side of the river. This exercise will be undertaken during the detailed design stage, which will follow submission of the PCA application to the Scottish Executive. It will only be undertaken after permission to enter private land has been obtained from landowners/occupiers. At that time it will be necessary to consult further with SEPA, SNH and other relevant authorities.

Figure 2.8 – Kinnel Water at crossing location looking upstream (north)



- 2.70 South of the Kinnel Water the route skirts the southern extent of a small clump of trees located on a rocky knoll before crossing a minor road and drainage ditch (open cut).

Figure 2.9 – Kinnel Water - Vertical photograph



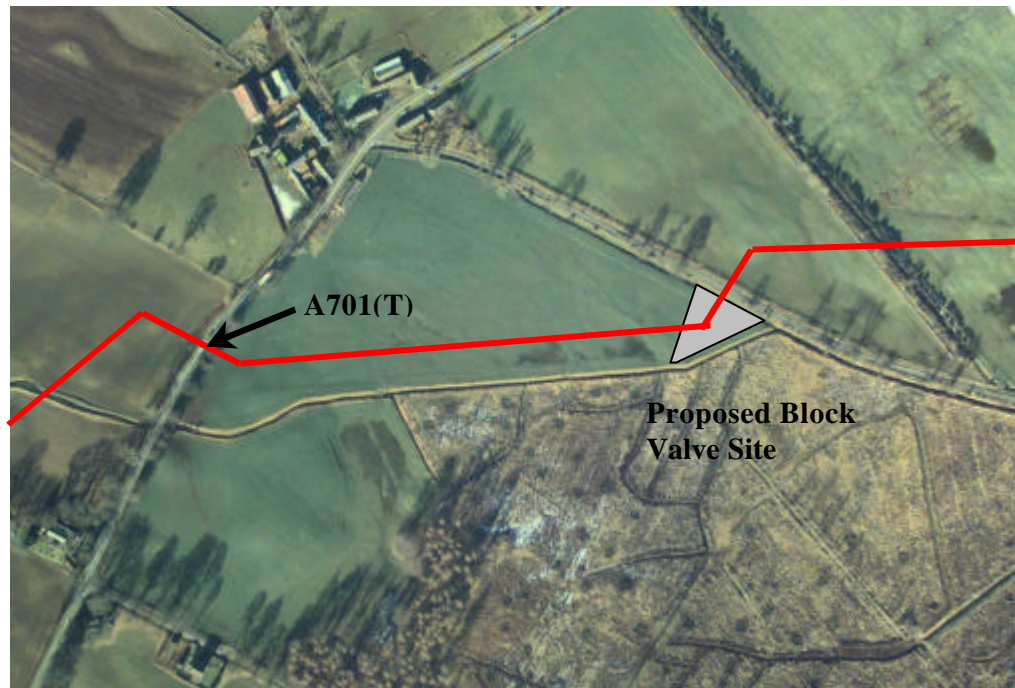
Map 6 – 12.3km to 14.4km

- 2.71 The pipeline will pass to the south of Meikleholm Farm, and cross a country lane, before traversing the Garrel Water. The landscape in this area takes on a pattern of much larger open grassland. The flat landscape has been improved in recent years and several field boundaries have been removed.

Map 7 – 14.4km to 16.4km

- 2.72 Barony Agricultural College lies 1km due south of the pipeline route, which allows public access to its farmland, riverside, parkland and wooded grounds. Five water course crossings are encountered in this area along with one minor and one major road crossing. The crossings of the burns will utilise dry open cut techniques whilst the minor road will be undertaken by open cut. To minimise disruption to the A701(T) a trenchless installation method will be utilised. To comply with current design standards a Block Valve (BV) Station will be required in this area. The selected BV site will be subject to Local Planning approval as stated in Section 4.

Figure 2.10 – A701(T) Crossing – Vertical Photography



Map 8 – 16.4km to 18.9km

- 2.73 Skirting the south east limits of the Forest of Ae, the pipeline continues past the village of Parkgate (250m to the west). The engineering works at Parkgate will be some 250m from the pipeline route allowing sufficient separation for future expansion and still maintain pipeline safety standards. Continuing across improved grassland the route crosses a minor road and a burn before encountering the second main river crossing, the Water of Ae. The proposed crossing point is 500m upstream of Ae Bridgend through a relatively narrow flood plain area. The Nithsdale Local Plan indicates that the Water of Ae around the crossing location has been classified as of Nature Conservation Importance. Improved grassland edges the northern bank of the proposed crossing location, and falls away in a 3m high gravel bank into the main channel. The route emerges from the river across a broad shingle apron and through a belt of young alders, before rising into improved pasture. It would be preferable to use a thrust-bore method of pipe installation, as this would ensure minimal impact on this environmentally sensitive watercourse. However, due to the high northern gravel banking and the depth of pits required a trenchless crossing method may not be the optimum installation method. Boreholes will be undertaken on either side of the river during the detailed design stage of the project and at that time it will be necessary to consult further with SEPA, SNH and other relevant authorities.
- 2.74 The next crossing is the minor road leading into the Forest of Ae. Although this road has a minor classification it is heavily used for both tourist access into the forest and the export of wood. It is intended to open-cut this road as installation can be completed quickly. The working width will also be enlarged slightly at the crossing point to allow plant and materials to be parked off the road, and also store any

additional spoil material. The pipeline then turns westward and starts to climb towards Fulton Moor.

Figure 2.11 – Water of Ae Crossing – Vertical Photography



Map 9 – 18.9km to 21.2km

- 2.75 The pipeline climbs to a height of 145m as it crosses the open moor to the north of Rorie Hill, before descending into Annfield Moor. The Park Burn and five other watercourse crossings are anticipated in this section along with a crossing of a minor road. It is proposed to cross these by open cut methods as water flows during the summer months are normally at their lowest and by utilising a temporary bridge low traffic flows will be maintained without penalising traffic movements.

Map 10 – 21.2km to 23.7km

- 2.76 The crossing point of Newlands Linn is a major pinch point in this area. On the approach to this crossing the pipeline passes 400m to the north of Castle Hill, an important archaeological site. The pipe installation below the two farm tracks and minor public road shall be undertaken by open cut, whilst the two burns shall be crossed utilising dry open cut techniques. The tree-lined ravine has in recent years suffered severe wind damage at the crossing location and as such only limited clearance of woodland will be required. During reinstatement trees will be replanted to replace the wind damage except within the wayleave which will allow the pipeline protection from tree roots. South of the Newland Linn a 100m stretch area of recently planted saplings is crossed. It is proposed that the pipeline will follow the existing horse gallop through this area. To facilitate construction the removal of saplings will be required, and these will be reinstated following installation of the pipeline. As the pipeline will follow an existing break in the wood, only minimal impact is expected. The pipeline continues south crossing the private access road into Newlands Hall and skirting the northern edge of the Duncow Mill Lake. From

here the pipeline starts its descent into the Nith Valley falling from over 100m down to 20m AOD.

Map 11 – 23.7km to 26.1km

2.77

Avoiding cross slopes wherever possible the pipeline drops into the low lying River Nith Valley. Crossing a minor road 600m north-west of Duncow the pipeline maintain a south-westerly heading. The Pennyland Burn is crossed 200m to the west of Kerricks Farm as the route turns due west towards the River Nith. Arable crops and improved pasture within medium and large scale fields are characteristic across the floodplain. The proposed pipeline crossing location of the River Nith lies 700m upstream of Cowhill Tower. The river course is constrained by 4m high flood banks, which are approx. 150m apart. At the crossing location the river meanders with the main flow channel tight against the eastern bank, with a shingle bed visible on the western bank. . It would be preferable to use a non-disruptive crossing method because this would ensure minimal impact on this environmentally sensitive watercourse. However, due to the extended flood plain such a method may not be viable. Boreholes will be undertaken on either side of the river during the detailed design stage of the project and at that time it will be necessary to consult further with the relevant authorities regarding crossing methodology.

Figure 2.12 – River Nith and Railway Crossings – Vertical Photography



Figure 2.13 – River Nith Crossing – Looking north-east from crossing



Map 12 – 26.1km to 27.8km

2.78

The Nith Valley Railway line will be crossed some 8.5km north of Dumfries. The railway line at the crossing location is elevated above the field levels on either side of the track. In accordance with Railtrack specifications it is intended to cross at or as near as possible to 90o and by thrust boring beneath the tracks.

Figure 2.14 – Nith Valley Railway Crossings – looking west along pipeline route

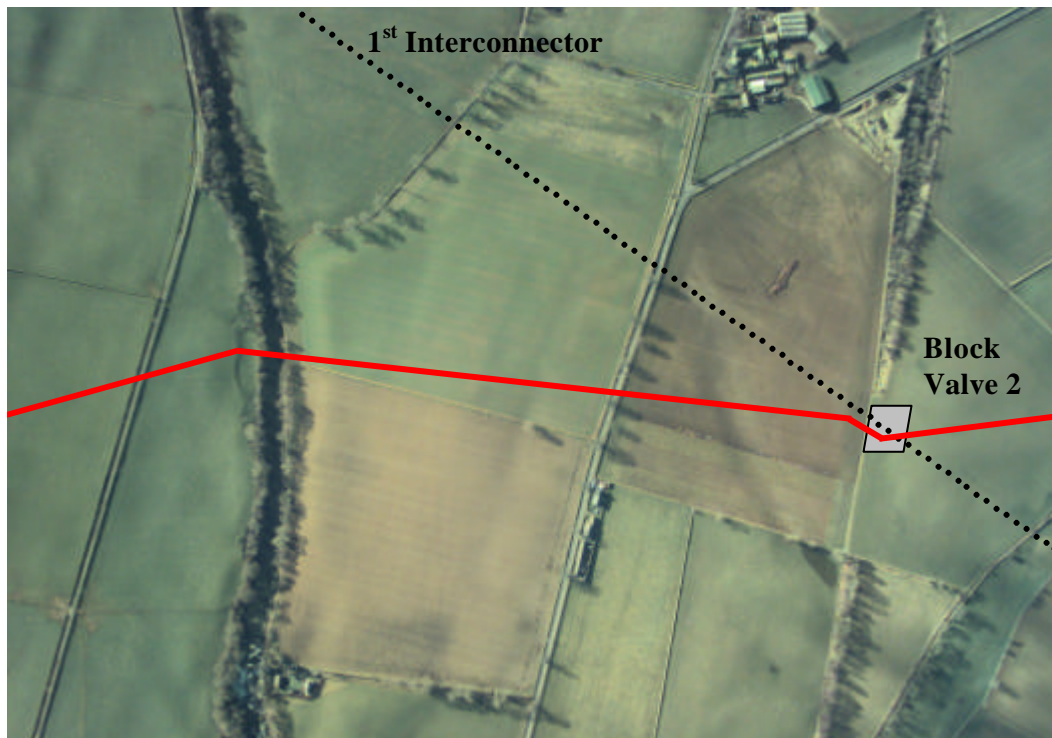


2.79 Climbing out of the Nith Valley the route crosses a minor road before encountering the A76(T). The crossing of the A76(T) is located between Glengower and McWhanrick Farms and avoids recent landscaping and a pond on the west of the road. The pipeline will cross under the A76(T) by thrust bore, ensuring no disruption occurs to normal traffic flow.

Map 13 – 27.8km to 30.7km

2.80 Now heading due south the pipeline rises across open grassland to a height of 50m AOD before descending to a dismantled railway line. It is planned to install the second of the four block valve stations adjacent to the disused railway line. The 1st Interconnector pipeline is crossed at this location and siting the station at this location it will allow cross connection of the pipelines. Access will be from the B729 to the north of Nether Gribton Farm, partly along an existing farm access track. It is intended to upgrade this track and extend it down to the proposed site. Routing at the Cluden Water has exploited breaks in the woodland cover on both north and south banks. The water quality of the Cluden is the highest of the rivers crossed (rated as A1 quality by SEPA 1996) and every effort will be made to negate any effects that pipeline construction will have on this watercourse. During detailed design, ground investigation work will be undertaken and installation methods determined.

Figure 2.15 – River Cluden Crossings – Vertical Photography



Map 14 – 30.7km to 33.9km

2.81 Skirting the western extent of Lochside and threading its way to the east of Terregles the pipeline continues southwards crossing several minor burns and three minor roads. Several new bungalows have been constructed along Hardthorne Road, limiting the route options through this area. The pipeline route skirts the edge of the deserted medieval village of Terregles. An archaeologist will be employed to

undertake a watching brief during topsoil stripping and trenching. If any significant “finds” are discovered they would be carefully unearthed, photographed and recorded by a professional archaeologist who will be allowed reasonable time to carry out the task, (refer to the Archaeology Section for more details).

Figure 2.16 – A75(T) and Castle Hill – Vertical Photography



- [Map 15 – 33.9km to 36.1km](#)
- 2.82 Passing to the west of Dumfries the route crosses the Cargen Water in the flat valley floor (8m AOD.) The A75(T) has recently been upgraded to the west of Dumfries with significant earthworks being undertaken to improve road alignment. The proposed pipeline crossing of this important trunk road is adjacent to Terraughtie Wood where the road has been elevated by some 8m. The pipeline will be installed by a trenchless technique to eliminate any disruption to traffic flow. Following this crossing and that of the ‘old’ A75 alignment the pipe enters its steepest and longest climb, turning west over Castle Hill. The pipe route climbs from 20m AOD at the A75 to the highest point of 130m AOD over a distance of some 800m. The steepest section of the climb will be at approx. 130.

- [Map 16 – 36.1km to 38.1km](#)
- 2.83 Continuing westerly the pipeline passes through an undulating area avoiding several rocky outcrops before a gradual descent to the Nunland Burn. A natural weak point is utilised in crossing the tree lined burn to minimise tree removal. The pipeline then starts a steady ascent to cross in the saddle between Cargenbank Hill and Nunland Hill, to the south of Nunland Farm and holiday chalets.

- 2.84 [Map 17 – 38.1km to 40.2km](#)
The route descends into the gently undulating valley floor and passes to the north of West of Scotland Water's, Lochfoot Filter Station. It is anticipated that the pipeline route between the A75(T) (Map 15) and Black Bridge will be treated as a 'special section.' Reinstatement of the pipeline working width will be treated as a priority following installation of the pipeline. This action is necessary to limit any possible impact caused by erosion and visual impact on the steep slopes around Castle Hill.

Figure 2.17– Minor road crossing



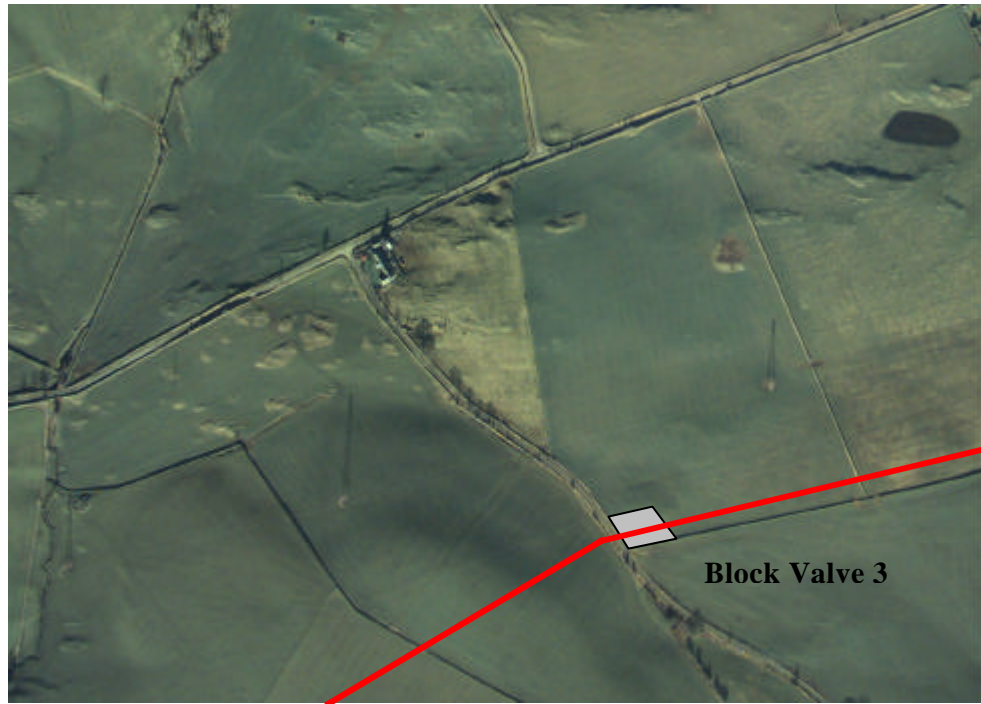
- 2.85 [Map 18 – 40.2km to 42.7km](#)
In this area the landscape changes from an upland fringe to drumlin pasture. The major features in this area are the Old Military Road and the metal pylon overhead electric powerlines. The pipeline route joins this pylon corridor line and runs at approx. 100m separation. To obtain this line a crossing of the Old Military Road is necessary. A detailed archaeological watching brief will be undertaken during the installation of the pipe.

- 2.86 [Map 19 – 42.7km to 45.3km](#)
To avoid crossing over the top of Head Hill the pipeline will stay in the valley floor following the line of the Old Military Road. Several burns are crossed along with three farm access tracks.

- 2.87 [Map 20 – 45.3km to 47.8km](#)
Running 250m south east of Milton village the route continues south-westerly, running close to the overhead electric power lines. It is necessary to cross under the powerlines in order to avoid close proximity to Burnside of Urr Farm and the crossing of an existing Transco gas distribution main. The pipeline will also cross four burns and two minor roads in this area. The third of the four block valve stations is proposed to lie in the corner of a pasture field on the north side of the road

leading to Little Culmain. The site has been chosen, as it is overlooked from only a few locations will have limited effect on both agricultural activities and landscape.

Figure 2.18 – Block Valve 3 – Vertical Photography



2.88

Map 21 – 47.8km to 50.8km

Staying close to the power lines allows the route to avoid the majority of the drumlins and rocky knolls through the area and avoiding a crossing of the Cocklick Lane burn, however the crossing of several other burns and a minor road are required.



Map 22 – 50.8km to 53.7km

2.89 Passing 1.5km to the south east of the Haugh of Urr the route descends into the Urr Valley and the River Urr crossing. The crossing is located some 450m south of the Mote of Urr (an important archaeological site), where the vegetation is sparse along the riverbank. At the crossing point in the river is broad and shallow with a bed of cobbles and larger stones.

2.90 Climbing out of the valley floor the route rises and crosses Buittle Burn and a disused railway.

Map 23 – 53.8km to 56.4km

2.91 With Dalbeattie 3km to the south and maintaining a south-westerly heading the route passes to the north of Barskeoch Hill avoiding the steep slopes and rocky knolls. The road linking Castle Douglas and Dalbeattie, the A745 will be crossed by a trenchless installation method to minimise any disruption to the traffic flow. Additional working area here will also be required to allow plant and other vehicles to park off the road, and also to store any additional spoil material.

Map 24 – 56.4km to 57.9km

2.92 The pipeline will pass 2.5km to the south of Castle Douglas staying in close company to the overhead electric pylon line. The route avoids all major tree belts and environmental constraints and crosses two burns (dry open cut methods) and a minor road (open cut methods).

Map 25 – 57.9km to 60.1km

2.93 After crossing the B736 the route leaves the overhead electric pylon line and turns off in a more westerly direction. The route stays within the gently undulating drumlin pasture landscape and avoids the village of Gelston (1km south of the pipeline).

2.94 Map 26 – 60.1km to 62.0km
Staying away from rocky knolls the route continues westwards, crossing a minor road and Slack Burn.

2.95 Map 27 – 62.0km to 64.0km
Rising to a height of 89m AOD over Brown Hill the route starts its descent into the Dee Valley, passing 150m to the north of Auchlane Farm and under both the farm access road and Auchlane Burn. The final block valve station is located between Arkland Farm and Arkland Bridge on the east side of the C2 road. The site is located in the field corner and access will be obtained through the existing field gateway, which will be upgraded and widened. Field access for the farmer will be maintained and thus not intended to create any new accesses onto the highway. A vegetation screen will be planted around the proposed site and the existing hawthorn hedgerow on the southern boundary will be strengthened to lessen visual impact of the site.

Figure 2.20 – Block Valve 4 – Vertical Photography

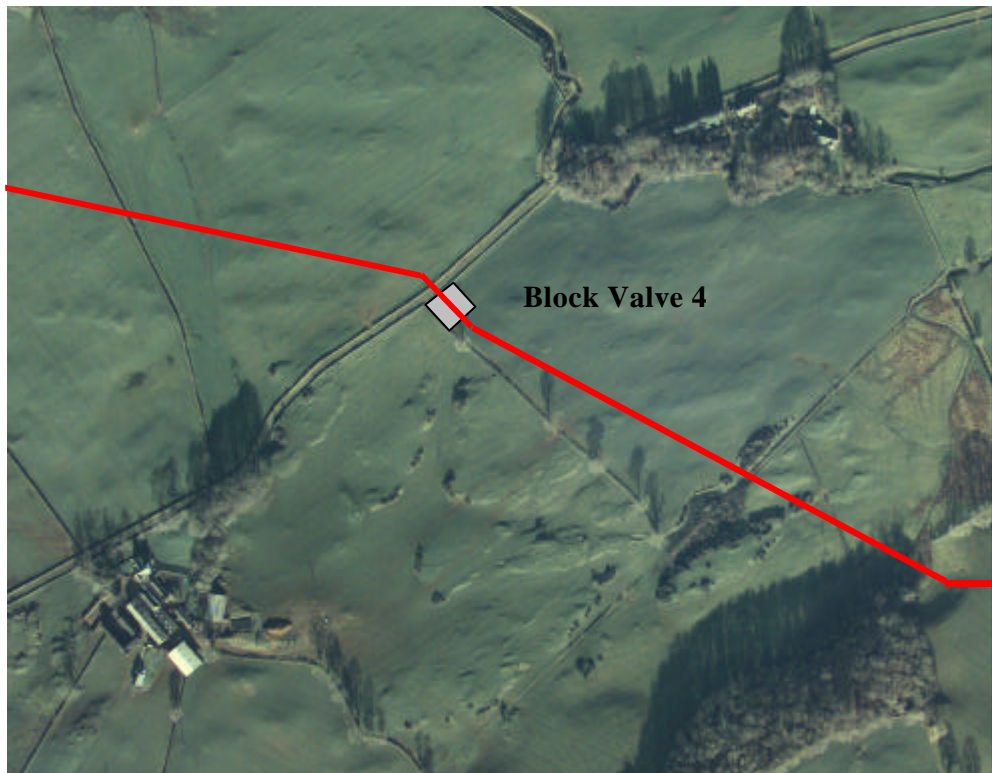


Figure 2.21 – River Dee Crossings – looking west



[Map 28 – 64.0km to 66.5km](#)

- 2.96 The River Dee crossing point is situated to the east of Agrennan House where the water is above the influence of the Tongland Dam. The flow rates are controlled by the Glenlochar Barrage that lies to the south of Loch Ken some 8km upstream of the crossing. The grass banks are free of trees and shrubs and are grazed down to the water edge at the crossing location. To minimise environmental impact a detailed assessment of ground conditions by boreholes and trial pits will be undertaken during detailed design and a full method statement and mitigation measures will be submitted for approval by SEPA, SNH and other relevant authorities. Turning south the route runs between the River Dee and the A711 passing through the gently undulating valley floor with drumlins and rocky knolls.

[Map 29 – 66.5km to 68.9km](#)

- 2.97 Crossing the A711 1km north of the Park of Tongland Golf course and driving range the route climbs from the valley floor (45m AOD) to a height of over 100m AOD, passing to the east of Argrennan Mains Farm. The installation of the pipeline beneath the A711 will be undertaken by a trenchless method to eliminate any impact on traffic flow, however access to the working width will be required at this location.

Figure 2.22 – River Dee Crossings – Vertical Photography



Map 30 - 68.9km to 71.8km

2.98 Descending in the direction of the Tarff Water, the route crosses the A762 between Chapel Farm and Underwood Farm. Turning south the pipeline proceeds towards the Tarff Water crossing. At the crossing location of this watercourse the vegetation thins and the riverbanks become less severe than both upstream and downstream of the crossing location.

2.99 Rising from the Tarff the route skirts the southern edge of Kempleton Plantation, to the south of Kempleton Hill and north of Kempleton Farm, and continues southwards.

Map 31 – 71.7km to 73.9km

2.100 Kirkcudbright lies 2.5km to the east of the A755 road crossing, it is the last A-classified road crossing along the pipeline route. This, as with all A-classified road crossings will be installed utilising a trenchless crossing method, eliminating any impact on traffic flows. Access to the working width will be required at this location for materials and plant. Due to the weak Kirkcudbright Bridge (17 tonnes weight limit) vehicular access through Kirkcudbright town centre will be limited to light traffic and cars for personnel access whilst materials and plant will be hauled along the A75(T) to Glenterry and east along the A755.

Figure 2.23 – Tarff Water Crossings – Vertical Photography



Map 32 – 73.9km to 76.1km

2.101 Turning south the pipeline route rejoins the existing Interconnector pipeline alignment through to Brighthouse Bay. The maximum separation between the pipelines in this area will be 400m. Passing to the west of Newton Hill the route runs in close alignment with the minor road avoiding severe changes in slopes wherever possible.

Map 33 – 76.1km to 79.0km

2.102 The route selected by the existing Interconnector ran between several rocky knolls in this area. The selected route limits the number of pipeline crossings required and is also influenced by topography and ecology issues. An example of this is in the vicinity of the High Nunland Plantation. The existing pipeline ran to the east of this wood, however due to ground constraints a route to the west has been selected by this pipeline. The B272 is crossed 2km east of the village of Borgue.

Map 34 – 79.0km to End

2.103 The final leg of the pipeline runs due south and virtually parallel to the 1st Interconnector. The land cover is predominantly pasture with gorse frequent in the more exposed rocky areas. The termination point of the proposed pipeline will be within the Brighthouse Bay Compressor Station. The compressor station will be extended to cater for increased gas flows; this however is covered under a separate ES.

Block Valves

2.104 Block Valves are required to enable the pipeline to be shutdown for operational and maintenance (section isolating) reasons. The spacing of these valves is based on statutory requirements. Four block valve locations have been identified along the

pipeline route. In locating these valve station sites the following factors have been taken into account:

- Safety Evaluation;
- Topography;
- Preservation of natural amenity;
- Ease of access for future operation and maintenance;
- Visual Impact; and,
- Land Take.

Specific Crossing Details

2.105 Each crossing will be individually assessed during the detailed engineering stage to ensure that the construction method suits the particular engineering and environmental needs and conditions. Provisionally 7 major road, 8 major watercourses and 1 railway crossing have been identified. These and other important crossings along the proposed pipeline route are listed below.

Table 2.2 – Schedule of Principle Crossings

Crossing Number	Description	Location	Provisional Crossing Method
RDX 1	B7020	NY 085 995	Trenchless
RVX 1	Kinnel Water	NY 059 898	Specific Method Statement
DX 8-1	Garrel Water	NY 044 888	Dry Open Crossing
DX8-3	Kirkland Burn	NY 037 885	Dry Open Crossing
RDX 10	A701 (T)	NY 021 882	Trenchless
RVX 2	Water of Ae	NY 007 870	Specific Method Statement
DX 16-1	Newlands Linn	NX 968 847	Dry Open Crossing
DX 17-1	Pennyland Burn	NX 957 834	Dry Open Crossing
RVX 3	River Nith	NX 946 833	Specific Method Statement
RLX 1	Railway – Double Track	NX 941 828	Trenchless
RDX 19	A76 (T)	NX 946 822	Trenchless
RDX 20	B729	NX 933 800	Opencut
RVX 4	Cluden Water	NX 933 796	Specific Method Statement
RVX 5	Cargen Water	NX 941 761	Dry Open Crossing
RDX 35	A75 (T)	NX 936 754	Trenchless
DX 26-2	Lochfoot Burn	NX 902 746	Dry Open Crossing
DX 30-1	Milton Burn	NX 847 701	Dry Open Crossing
DX 33-2	Buittle Burn	NX 816 641	Dry Open Crossing
RDX 33	B794	NX 819 644	Trenchless

Table 2.2 – Schedule of Principle Crossings cont.

Crossing Number	Description	Location	Provisional Crossing Method
RVX 6	Urr Water	NX 818 644	Specific Method Statement
RDX 36	A745	NX 795 628	Trenchless
RDX 38	B736	NX 773 598	Trenchless
DX 38-1	Gelston Burn	NX 773597	Dry Open Crossing
DX 41-1	Auchlane Burn	NX 739 585	Dry Open Crossing
RVX 7	River Dee	NX 723 584	Specific Method Statement
RDX 43	A711	NX 708 567	Trenchless
RDX 45	A726	NX 684 555	Trenchless
RVX 8	Tarff Water	NX 684 548	Dry Open Crossing
RDX 49	A755	NX 666 520	Trenchless
RDX 51	B727	NX 647 475	Trenchless

Note:

RDX – Road Crossing

RVX – River Crossing

RLX – Railway Crossing

DX – Other Watercourse Crossing

Construction Impacts and Mitigation

- 2.106 Top-soil stripping, trench excavation, activity at crossings, and plant movements along the working width are the principal areas where construction impacts can arise due to damage to the soil structure through compaction. These aspects are covered in subsequent chapters of this ES. The main measure to mitigate soil composition damage is to carry out pipeline construction work in the summer months when the soil is less susceptible to damage (see Chapter 6). The crossing and/or cutting of drainage systems is also an area of potential sensitivity as discussed in Chapter 8. Chapter 11 addresses the possibility of problems from noise or emissions during construction.

Construction Constraints

- 2.107 Specific obligations will be included in the construction contractor's responsibilities to avoid or minimise environmental damage during construction and to avoid public nuisance. These include, as a minimum, the following requirements:
- i) to obtain construction consent approvals from landowners and occupiers, and from statutory authorities, statutory undertakers and environment bodies, in advance of pipeline construction;
 - ii) to ensure that all work is carried out within the agreed working width;
 - iii) to provide adequate notice to landowners/occupiers before commencement of works so that they have time to make any advance preparations;
 - iv) to ensure that all public roads affected by construction and/or construction traffic are kept clean and in a good state of repair;

- v) to maintain essential access for landowners/occupiers including passage of livestock;
- vi) to maintain rights of way affected by construction and/or construction traffic;
- vii) to restore drainage systems, should any be affected by the pipe trench;
- viii) to adhere to restrictions on the felling or lopping of trees;
- ix) to maintain the working width in a clean and tidy condition;
- x) to store and use materials in an appropriate manner to minimise the potential for accidental spillage;
- xi) to reinstate all land to the condition found, or as otherwise agreed; and
- xii) to abide by any conditions imposed by the approving local authority.

2.108 Normal working hours for general activities such as top-soil stripping, welding, and pipe-laying, and the movement of vehicles and the running of motorised plant and equipment, are 07.00 to 19.00 hours. The exceptions to this could be during non-destructive and pressure testing and commissioning. These are continuous activities that generally only affect the ends of the pipeline and also in the event of special circumstances that may include horizontal directional drilling operations.

2.109 For all of the above obligations to be met, the pipeline construction contractor must be experienced in working in the UK, in complying with such conditions and have available the appropriate skilled staff, plant and resources.

Supervision of Construction Activities

2.110 BGE (UK) Limited will appoint a project management team to oversee construction of the gas pipeline and all other facilities. This team will ensure that all works are carried out in a safe, efficient and professional manner. Further, they will insist that all works conform to best construction practice, and are carried out in accordance with the requirements of all consents, authorisations or other permissions granted to BGE (UK) Limited. They will also ensure that the terms of the operating licence as issued by the Health and Safety Executive are met following satisfactory inspection of construction and completion of pressure testing.

2.111 To assist Dumfries and Galloway Council, SEPA and SNH it is proposed that BGE (UK) Ltd finance the engagement of an independent consultant to work on their behalf to provide assistance in method statement approval, auditing and site supervision of works. The consultant will be appointed following acceptance by all parties and will report directly to the principal consultees. This position will be in addition to the contractors environmental management team who will assist in the preparation and mitigation for the method statements along with supervision during construction.

Operation and Maintenance

- 2.112 After the pipeline system is fully commissioned it will be operated and maintained in such a manner as to keep it safe and in good condition. Protective measures, inherent to the pipeline design, together with regular monitoring will ensure that uncontrolled third party activities, which represent the major risk to pipelines, are minimised and so are unlikely to cause damage.
- 2.113 Monitoring is normally carried out in the following ways:
- i) **Periodic Visual Monitoring**
A “care and maintenance” team will carry out visual monitoring. Their duties will include regular surveillance. Their observations will provide a record of changing ground conditions and third party activity along the pipeline.
 - ii) **Pigging**
At regular intervals, special on-line equipment called "intelligent pigs" will be passed through the pipeline as an inspection exercise to check on the condition of the pipeline and detect any evidence of corrosion or damage.
 - iii) **Cathodic Protection System**
Monitoring consists of monthly checks of the Cathodic Protection (CP) station power unit and/or through the electronic monitoring system and twice a year soil potential measurements will be taken at the CP test posts. For ease of access these posts are normally sited adjacent to road crossings.
- 2.114 Operation and Maintenance Procedures will be implemented. As part of these procedures an Emergency Plan will be prepared to cover contingency plans and remedial measures. The emergency services and the local authorities will be consulted and provided with full details.
- Decommissioning**
- 2.115 The pipeline will be decommissioned when it reaches the end of its useful life. At that time detailed decommissioning procedures will be produced. As recommended in the pipeline codes and standards it is likely that the buried pipe will be left in place and stabilised, as lifting the pipeline could cause more disturbances to the environment. The above ground installations will be removed.

Summary

- In selecting a route for this pipeline five main criteria were considered:-
 1. There is no significant safety risk to the public
 2. There are no significant adverse environmental impacts
 3. It is technically feasible to construct
 4. It is routed through land that has the general agreement of landowners and occupiers, and
 5. It is economically viable.
- All routine construction tasks will be undertaken within the working width, or "spread" that covers, topsoil stripping, pipe stringing and welding, trench excavation, lowering in of the pipe, testing, and reinstatement.
- BGE (UK) Limited will negotiate and pay landowners and occupiers for permanent rights of access within the pipeline Wayleave. BGE (UK) Limited will also purchase areas of land on which to build the above ground facilities along the pipeline route.
- The proposed welded steel gas pipeline is 80.9km long and will be buried with a minimum cover of 1.1m.
- The proposed pipeline will cross 7 A-Roads, 5 B-Roads and 40 other roads. The pipeline will be installed beneath A and B classified road utilising trenchless installation methods.
- The proposed pipeline will cross 8 major watercourses, 9 significant minor watercourses and 81 other watercourses.
- A archaeological watching brief will be maintained during construction, paying particular attention during topsoil stripping and pipe trenching.
- The pipeline construction contractor's responsibilities will include specific obligations to avoid or minimise environmental damage, and to avoid public nuisance.
- To assist Dumfries and Galloway Council, SEPA and SNH it is proposed that BGE (UK) Ltd finance the engagement of an independent consultant to work on their behalf.
- Construction work will be carefully controlled and supervised to ensure that upon completion the land is restored to as near to its original condition as practicable.
- Operation and Maintenance Procedures will be implemented. These procedures will include an Emergency Plan to cover contingency plans and remedial measures.

3. LEGISLATIVE FRAMEWORK AND PROCEDURES

Introduction

- 3.1. There is a significant amount of legislation relating to Pipeline Construction Authorisation (PCA) and to environmental protection generally within the UK and the European Union (EU). Legislation is summarised in this chapter together with a short account of some of the associated procedures and current practice.
- 3.2. In December 2000, the responsibility for the authorisation of pipelines under the Pipe-lines Act 1962 which begin and end in Scotland was devolved from the Secretary of State for Trade and Industry to the Scottish Executive, Energy Division. For the purposes of this pipeline, which runs between Beattock and Brighouse, both in Dumfries and Galloway the application for PCA will be made to and processed by the Scottish Executive.
- 3.3. A cross-country pipeline is considered to be a pipeline whose overall length exceeds 10 miles (16.093 km) (Section 1 of the Act). Authorisation procedures for the construction of cross-country oil and gas pipelines are determined by the Scottish Executive, Energy Division using the powers of the Pipe-lines Act, 1962 (Ref. 1).
- 3.4. The proposed new gas pipeline from the Transco National transmission System (NTS) to the Brighouse Facility is more than 10miles/16kms in length. Indeed, it measures approximately 50.3 miles/80.9kms and as such it is necessary to submit an application for Pipeline Construction Authorisation (PCA) to the Scottish Executive, Energy Division under the Act as described above. Th PCA application is accompanied by this Environmental Statement (ES), Book of Reference and 1:10,000 scale drawings of the route.
- 3.5. The purpose of the Pipe-lines Act 1962 is to ensure the orderly development of pipelines in such a way as to meet the requirement of pipeline users whilst at the same time minimising disturbance to landowners and occupiers by the careful planning of routes and by avoiding unnecessary proliferation of pipelines. Specifically excluded are pipelines such as water and sewage pipelines: these are covered by other Acts.
- 3.6. Consideration for authorisation to construct a cross-country pipeline under the Pipe-lines Act 1962 is the responsibility of the Scottish Executive, Energy Division. It is outside the development control of local government planning strategies although Policies stated in their Structure Plans and Local Plans are given due consideration in the routing of the pipeline. In determining the application the Scottish Executive has power to grant deemed planning permission.

Environmental Considerations

3.7. When considering a PCA application environmental considerations are taken into account. With regard to the preservation of amenity, the Act specifies:

"Where-

- *a person is formulating proposals for the execution of pipe-line works, or*
- *the Minister is considering any such proposals, whether in relation to the grant of a pipe-line construction or diversion authorisation or the imposition of conditions under section five of this Act, that person or the Minister, as the case may be, having regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographic features of special interest, and of protecting buildings and other objects of architectural or historic interest, shall take into account any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, buildings or objects, and in so doing shall have particular regard to the desirability of ensuring that things constructed in the course of the execution of the proposed works are kept below ground so far as that is practicable,"* (Section 43, Pipe-lines Act, 1962).

The Minister is also required to:

- *"have constant regard to the need of protecting against pollution any water, whether on the surface or underground, which belongs to any statutory water undertakers or local water authority or which they are for the time being authorised to take,"* (Section 44, Pipe-lines Act, 1962).

3.8. Furthermore, the Act imposes an obligation on the developer to restore agricultural land so as to be fit for its original use (Section 45, Pipe-lines Act, 1962).

EU Environmental Directive

3.9. In June 1985, the European Community (now EU) adopted Environmental Assessment Directive 85/337/EEC *"on the assessment of the effects of certain public and private projects on the environment"* (Ref. 2). Affected projects appear in two lists: Annex I and Annex II of the Directive. Oil and Gas pipelines are project types listed under Annex II. The Directive made assessment of the environmental effects of a project a mandatory requirement for listed projects in Annex I. For those in Annex II the requirement to an assessment is not mandatory but *"where Member States consider their characteristics so require"*. It took effect when notified to Member States, and was implemented in the UK during 1988 and 1989 as the implementing regulations came into force.

3.10. The principal requirement of the EU Directive (Article 3) is that developers of a project which is likely to have significant effects on the environment are required to undertake an environmental impact assessment which:

- *"will identify, describe and assess in an appropriate manner, in the light of each individual case and in accordance with the Articles 4 to 11, the direct and indirect effect of a project on the following factors:*
 - *human beings, fauna and flora*
 - *soil, water, air, climate and the landscape*
 - *the inter-action between the factors in the first and second indents*
 - *material assets and cultural heritage".*

3.11. The developer is required to submit information on the project and its environmental effects to a competent authority, which in the case of cross-country pipelines is the Scottish Executive, Energy Division. The information must also be made available to other public authorities with environmental responsibilities and also to the public likely to be affected by the development. The competent authority is obliged to take into account any information and representations made to it when taking a decision. The Directive also specifies the minimum information requirements under Article 5.2 to be:

- *"a description of the project comprising information on the site, design and size of the project;*
- *a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects;*
- *the data required to identify and assess the main effects which the project is likely to have on the environment".*

3.12. A Non-Technical Environmental Statement Summary of the information specified under Article 5.2 is also required.

The Environmental Impact Assessment (Scotland) Regulations 1999

3.13. Under item 16 of Schedule 1, a

- *Pipeline for the transport of gas, oil or chemicals with a diameter of more than 800 millimetres and a length of more than 40 kilometres.*

is defined as a 'Schedule 1 Development' and subject to Regulation 2(1) of the Environmental Impact Assessment (Scotland) Regulations 1999.

Electricity and Pipe-line Works (Environmental Assessment) Regulations 1990

3.14. The requirements of the EU Directive as they apply to oil and gas pipelines are covered by the Electricity and Pipe-line Works (Assessment of Environmental Effects) Regulations 1990; S.I. No 442 (Ref. 3). These Regulations specify the procedure that will be adopted when considering the need for Environmental Assessment (EA) and the production of an Environmental Statement (ES) that accompanies an application for Pipeline Construction Authorisation. The Scottish Executive needs to take into account environmental information, and decide whether

a particular project is likely to have a significant effect. Generally, the Scottish Executive will require that an Environmental Statement be produced.

- 3.15. Where an application is made including an ES and the application is allowed to proceed, the applicant is required to include in those public advertisement notices served under paragraph 3 of Schedule 1 to the Pipe-lines Act:
- *a description of the application and a statement that it is accompanied by an ES;*
 - *details of where copies of the ES can be obtained in the locality and, where a charge is made, specify that charge.*

General Procedure (Post Application)

- 3.16. After the Pipeline Construction Authorisation (PCA) application, which will include an Environmental Statement, is received at the Scottish Executive, it will, as a minimum notify Dumfries and Galloway Council. The Executive may also contact other bodies such as: the Scottish Environment Protection Agency, Scottish National Heritage, Scottish Executive – Rural Affairs Department, and Association for the Protection of Rural Scotland. In addition to providing these bodies with plans of the pipeline route the Scottish Executive will ascertain if they wish to receive copies of the ES and inform them that they may make representations to the Executive.
- 3.17. On notification by the Scottish Executive of those consultees wishing to receive copies or parts of copies of the Environmental Statement, then arrangements will be made to supply these and notify the Executive that it has done so.
- 3.18. After the Scottish Executive has received representations from these selected consultees the Executive may invite BGE (UK) Limited or its appointed representative to respond.
- 3.19. Subsequently, the Scottish, Executive will decide whether or not to allow the PCA application to proceed to the public advertisement stage. On advertising the proposal, further representations may be received which will further widen the consultation process and include non-statutory groups including national and local wildlife and amenity organisations, etc. At this advertisement stage copies of the ES will be made available as directed by the Executive for inspection or purchase.
- 3.20. A public inquiry can only be called if the Scottish Executive considers the statutory bodies' objections to be relevant.
- 3.21. As well as a PCA application being submitted to the Scottish Executive it is necessary to notify the Health and Safety Executive (HSE) about the project. The HSE will be issued with a list of technical data in a document known as the "Notification to HSE under Pipelines Safety Regulations 1996" and a "Safety Evaluation Report" will also be provided for information purposes only. The HSE normally carries out its own analysis to ensure the pipeline is designed, constructed, and operated in accordance with all relevant British Standards and Safety Regulations.

Summary

- The planning and construction of oil and gas pipelines in the UK is governed by the Pipe-lines Act, 1962. Environmental considerations are further governed by the European Union Directive 85/337/EEC, "*on the assessment of the effect of certain public and private projects on the environment*", as covered by the Electricity and Pipe-lines Works (Assessment of Environmental Effects) Regulations 1990.
- The procedures to be followed and the award of the Pipeline Construction Authorisation for pipelines which begin and end in Scotland are the responsibility of the Scottish Executive, Energy Division from December 2000.

Reference

1. The Pipe-lines Act, 1962: HMSO.
2. European Community Directive 85/337/EEC, “Council Directive of 27 June 1985 on the assessments and effects of certain public and private projects on the environment”.
3. Electricity and Pipe-line Works (Assessment of Environmental Effects) Regulations 1990, SI No 442: HMSO.
4. The Environmental Impact Assessment (Scotland) Regulations 1999.

4. PLANNING

Introduction

- 4.1. This chapter identifies relevant planning policies that may influence the route of the proposed underground gas pipeline and the location of the above ground facilities along the pipeline route.
- 4.2. The proposed cross-country pipeline falls entirely within the jurisdictions of Dumfries and Galloway Council, a Unitary Authority.

Planning Framework

- 4.3. Planning policy for local government jurisdictions in Scotland is defined at two levels:-
- **The Structure Plan** is the means by which a Council sets its key strategic planning framework for the overall development and use of land in its county. The document should state in the broadest terms general policies from which to shape local planning; and
 - **The Local Plan** is the means by which each District/Borough Council identifies its particular development policies and proposals, and lays down specific land uses. It must conform generally with the Structure Plan.
- 4.4. An application to construct a "**cross country pipeline**" in Scotland, under the Pipelines Act 1962, is the direct responsibility of the Scottish Executive, Energy Division. In determining this application the Scottish Executive has power to grant deemed planning permission. Even though local planning authorities are not empowered to approve such a pipeline proposal, their consultative views will play a vital part in the Scottish Executive decision whether or not to award Pipeline Construction Authorisation (PCA). Should the local planning authorities formally object and refuse to withdraw their objection then the Scottish Executive may call for a public inquiry.

Baseline Conditions and Assessment of Impact

Land Use and Development

- 4.5. This section provides a review of Regional and Local Planning Policies and has been developed in consultation with the planning department of the Dumfries and Galloway Council.

- 4.6. Consultations have included a discussion on the extent and scope of the Environmental Statement, and advice on the strategy for on-going liaison and environmental management that will be required during construction, reinstatement and operation.

The Planning System

- 4.7. As shown in Figure 4.1, the pipeline route corridor lies wholly within Dumfries and Galloway Region and passes through three of the former districts which are still used for Local Planning purposes:

- Annandale and Eskdale;
- Nithsdale; and
- Stewartry District.

Figure 4.1 – Local Planning Areas within Dumfries and Galloway Region



- 4.8. The Structure and Local Plans are in a constant state of development. The Structure Plan Written Statement was approved by Scottish Ministers on 10th December 1999.

- 4.9. Local Plans are in the process of being revised to reflect the written Structure Plan policies and are in their consultation draft stage. The Local Plans for the three districts which the pipeline crosses have all been issued as consultation drafts up to June 2000. Until they are approved the policies of the following documents apply and are discussed:

Annandale and Eskdale	-Upper Annandale Interim Planning Guidance (1994)
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Stewartry	-Stewartry Final Draft Modifications Local Plan (1991); and
Nithsdale	-(Mid and Upper Nithsdale Interim Planning Guidance 1994 and Dumfries and District (1993).

- 4.10. Where relevant, policies from the recently issued consultative draft Local Plans will also be taken into consideration.

Land Use Planning Policy

Regional Guidance

- 4.11. The Town and Country Planning (Scotland) Act 1997 provides the basis for the Scottish Planning System under which Structure and Local Plans form the framework for development. These documents express the Council's views, as the Planning Authority, for the development and use of land in Dumfries and Galloway. The Structure Plan sets out:

- a strategy to guide the location of development for 10-15 years;
- firm guidance on the future use of land and the pattern of development of the first five years of the plan;
- opportunities for development and redevelopment;
- standards to be achieved in the new development; and
- ways to conserve and enhance the urban and rural environment and protect the diversity of the natural and cultural heritage.

- 4.12. The Structure Plan seeks to balance the requirement for development of the land with environmental conservation and provide a stable framework within which investment decisions can be made with confidence.

- 4.13. Dumfries and Galloway Council is in the process of preparing Subject Plans on Wind Energy, Minerals, Waste Disposal and Forestry which will cover the whole of the Region. Where these aspects are likely to affect the routing or construction of the pipeline they are considered in the relevant sections of the ES.

- 4.14. Policies considered to be relevant to the construction of a pipeline are summarised and discussed below:

D9 Large Scale Industrial Development

- 4.15. Policy D9 states, "*Large scale industrial development on land not allocated for such use will be considered favourably subject to the Council being satisfied in relation to:*

- *the reasons for selecting the site in preference to allocated or serviced sites;*
- *impact on the landscape and the environment can be minimised;*
- *discharges to air and water;*

- *traffic impacts;*
- *safety, security and noise implications; and,*
- *the availability of service infrastructure during construction and operation.*

The council will continue to work in partnership with other agencies to provide advice to the developers to assist in site selection.”

- 4.16. Whilst the proposed underground pipeline is regarded as part of a large scale industrial project it does not fully constitute an industrial development as implied in Policy D9. By their very nature, large diameter high pressure gas pipelines and their associated facilities, such as the existing BGE Interconnector pipeline and Transco NTS gas pipeline and two Compressor Stations, are generally built in open countryside for the specific reason of avoiding populated settlements. It naturally follows that this proposed gas pipeline would also cut across some agricultural land. It should also be borne in mind that pipeline construction is a temporary activity lasting only a few months during one summer season. Subsequently, agricultural land will revert to its original use apart from four small land-takes on which will be built block valve compounds. These small above-ground facilities will be screened by vegetation to reduce their visual impact. During normal operations the block valves have no means to produce either noise or dust emissions.

D31 Safeguarding Mineral Resources

- 4.17. Policy D31 states, *“Development proposals likely to sterilise significant workable reserves of minerals will not normally be permitted, unless it can be clearly demonstrated that suitable alternative sites are not available”.*

- 4.18. In response to Policy D31, there are very few areas of known mineral deposits within the vicinity of the pipeline corridor. Those that have been identified comprise of sand and gravel deposits, but the proposed pipeline has been routed to avoid these areas and thus safeguard such known mineral resources.

D36 Design of Development

- 4.19. Policy D36 states, *“The Council expects development proposals to take into account:*

- *Siting, scale, form, massing and layout in relation to townscape and landscape setting;*
- *local building styles; and*
- *the access needs of all groups.*

Further policy guidance on the siting and design of development will be provided in Local Plans”.

- 4.20. As stated in the previous response to D9, the only visual part of the development will be four small block valve compounds comprising: a small kiosk surrounded by a 2.4m high security fence and planted strip of vegetation and post and wire fencing. The design is such that visual impact is kept to a minimum, and the selected sites are at sufficient distance from local dwellings.

D38 Environmental Assessment and Monitoring

4.21. Policy D38 states, “*Environmental Assessments will be required in accordance with Government Regulations. The Council may require the impact of the development to be monitored following its implementation where an Environmental Assessment indicates this would be appropriate*”.

4.22. In response to D38 above, BGE recognises the importance attached to this issue. Moreover, this Environmental Statement devotes a chapter to environmental management issues, refer to Chapter 14. To ensure that the environmental assessment process is fully integrated into the overall pipeline project an Environmental Management Plan (EMP) shall be developed. This will enable any unidentified or unforeseen environmental impacts to be adequately mitigated, as well as ensuring that all environmental controls identified during the environmental assessment process are incorporated in practice. Furthermore, once planning permission has been granted, BGE (UK) Ltd will appoint a contractor to undertake the construction of this gas pipeline system. The detailed contract specification will also incorporate a number of environmental safeguards. During the construction work, it will be necessary to monitor activities in compliance with “*The Construction (Design and Management) Regulations 1994*”. A project management team that will comprise of expertise in pipeline engineering, agriculture, archaeological and ecological matters, will accomplish effective monitoring and auditing of the works.

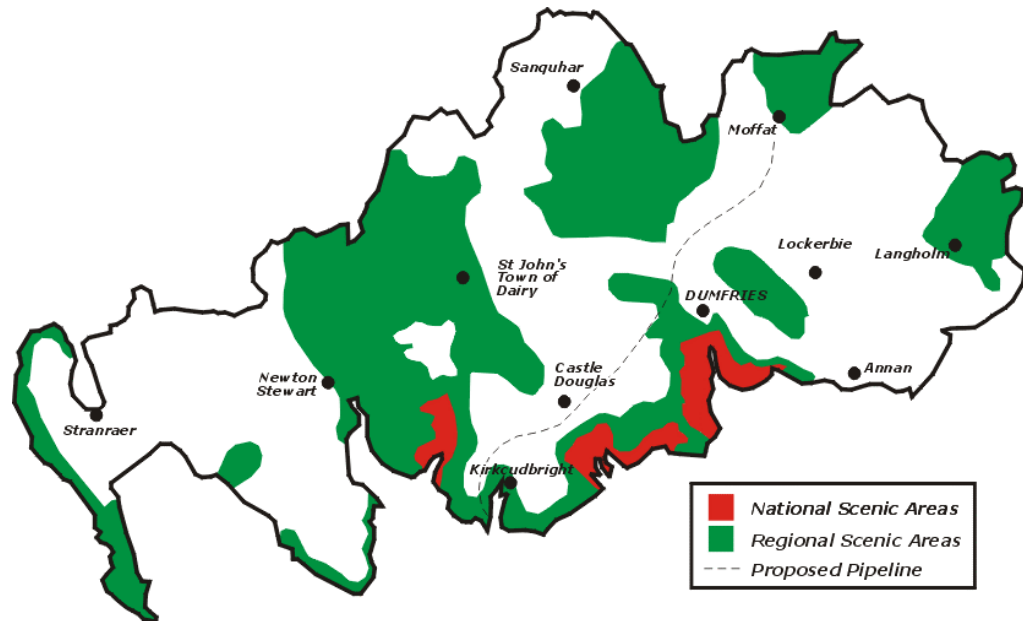
E1 National Scenic Areas

4.23. Policy E1 states, “The siting and design of development should respect the special nature of the area. Development within, or which have a significant impact on National Scenic Areas (NSAs), will only be permitted where it can be demonstrated that either:

- *The proposed development will not compromise the area’s scenic and landscape character, and overall integrity: or*
- *Any significant adverse effects on the scenic interest and integrity of the area are clearly outweighed by social or economic benefits of national importance.”*

4.24. The pipeline route does not impact on any NSAs.

Figure 4.2 – National and Regional Scenic Areas



E2 Regional Scenic Areas

4.25. Policy E2 states, ‘The siting and design of development should respect the special nature of the area. Development within, or which would have a significant impact on Regional Scenic Areas (RSA’s), may be permitted where it can be demonstrated that:

- the landscape character and scenic interest for which the area has been designated would not be adversely affected: or
- there is a specific need for the development at that location which could not be located in a less sensitive area”.

4.26. As Figure 4.2 shows there is a small section of the pipeline route that will unavoidably cross a part of a Regional Scenic Area, as quoted in Policy E2. In this instance, a detour would not be feasible because it would significantly increase the overall length of the pipeline route. However, it should be borne in mind that once the pipeline is buried below ground and reinstatement complete, the agricultural characteristics of the area will revert to normal, thus imposing no long-term impact on the landscape. It is intended that this section of the pipeline along with other areas where the pipeline will be highly visible will be prioritised to minimise the duration the spread is open.

E4 International Sites

4.27. Policy E4 states, “Development proposal likely to have a significant effect on an existing or potential Special Protection Area (SPA), candidate Special Area of Conservation (SAC) or proposed Ramsar Site, including developments outwith the site, will require an appropriate assessment and will only be permitted where:

- *The development does not adversely affect the integrity of the particular habitats or species being protected: or*
- *There are no alternative solutions and there are imperative reasons of overriding public interest including those of a socio-economic nature. In cases involving a priority habitat (listed in the Habitats Directive), the only overriding considerations are those relating to health and safety.”*

4.28. In response to Policy E4, this pipeline project does not impact on any site designated of international or national significance for their wildlife or physiographic interest. As such, no SPAs, SACs nor Ramsar sites are effected by the construction of this proposed pipeline.

E5 Sites of Special Scientific Interest

4.29. Policy E5 states, “*Development affecting Sites of Scientific (SSSI’s) not designated as International Sites will only be permitted where it can be adequately demonstrated that:*

- *it will not compromise the underlying objectives and overall integrity of the site: and*
- *there is a proven national interest in allowing the development to take place, which could not be met, at another more suitable location.*

Where it is proposed to grant planning permission for a development which could affect an SSSI the Council will consider the use of planning conditions or a Section 75 agreement to conserve, as far as possible, the sites’ scientific interest or to create new or replacement habitats where possible”.

4.30. In response to Policy E5, whilst the broader 400m pipeline study corridor may clip two SSSI’s, i.e. Black Loch, and Threave and Carlingwark Loch, the pipeline has been routed so that it avoids impacting on these designated sites.

E6 Conservation of Habitats

4.31. Policy E6 states, “*When assessing development proposals, the Council will seek to ensure the impact on any habitat which is valued for its nature conservation interest is fully considered. Particular attention will be given to those habitats and species which are identified in Circular 6/1995, but which do not fall within the boundaries of national or international nature conservation designations. Where important nature conservation interests would be adversely affected, the Council will consider the use of Section 75 agreements to maintain existing interests or in exceptional circumstances encourage the creation of new or replacement habitats where possible. Where resources are available the Council will continue to give consideration to the establishment of appropriate management measures, including assisting with voluntary management of sites, and where appropriate, the designation of Local Nature Reserves, in conjunction with other agencies, organisations and local communities to ensure nature conservation interests are safeguarded”.*

4.32. In answer to Policy E6, Chapter 9 of this ES provides a detailed account of ecological issues relating to this pipeline corridor. In summary, there is only one significant area of semi-natural habitat that could be potentially affected by the

construction of the pipeline. This site is a degraded valley mire to the south of Black Loch SSSI. The working width will be reduced to a minimum, and preferably geotextile bog-matting or similar temporary covering placed over the working area. Good construction and reinstatement methods will be adopted to ensure there is no lasting environmental impact. Various protected species of mammals are known to inhabit the pipeline corridor. These species may include badger, otter, water vole, red squirrel, bats, wildfowl and waders. Specialists will carry out detailed surveys once permission to enter private land has been obtained. The degree of mitigation required will depend on the requirements of the species and any legal obligations arising. Normal practice is to slightly re-align the pipeline away from such sensitive habitats. Any mitigation measures deemed necessary will be discussed and agreed by SNH prior to work commencing.

E11 Historic Gardens and Designated Landscapes

4.33. Policy E11 states, *“Development in or affecting the setting of a site listed in the Inventory of Gardens and Designated Landscapes or mentioned in the list of non inventory sites will require an evaluation of the proposal’s impact on the site and its setting. There will be a presumption against development which would adversely affect the landscape features, character and setting of these sites and the approaches and environs of Inventory sites”*.

4.34. Policy E11 is unaffected by this planning proposal because there are no Historic Gardens and Designated Landscapes within the pipeline corridor.

E12 Development affecting Archaeological Sites

4.35. Policy E12 states, *“There is a presumption against development that would destroy or adversely affect the appearance, fabric or setting of Scheduled Ancient Monuments, Sites of National Importance and other significant areas of archaeological interest.”*

E13 Archaeologically Sensitive Area

4.36. Policy E13 states, *“The Council will safeguard the character and archaeological interest of ‘Archaeological Sensitive Areas’ the boundaries of which will be defined in the Local Plans.”*

4.37. The proposed pipeline crosses an area of demonstrated archaeological potential but it will not affect any SAMs and SNIs as quoted in Policies E12 and E13. Sixty-three sites of lesser importance lie within the 400m wide study corridor, of this number, 7 sites are assessed as both significant and with any potential for impact from pipeline construction. In most cases the true extent of these 7 sites has not been fully realised. It is proposed to line-walk the pipeline route prior to work commencing in order to identify any known features, and carry out a few evaluation trenches and a geophysical survey if it is deemed appropriate following discussion with the archaeological section of Dumfries and Galloway Council. During construction it is intended to provide a watching brief especially during topsoil stripping and trench digging. Should any “finds” be unearthed then an archaeologist will be given time to excavate, record and sample, without causing delay to the pipeline construction programme.

S2 Development Affecting Ground Water Resources

4.38. Policy S2 states, “*The Council will seek to protect groundwater resources from being adversely affected by development, in consultation with SEPA (Scottish Environment Protection Agency) and other agencies. Local Plans will identify protection zones for public supply boreholes.*”

4.39. In response to Policy S2, the pipeline route crosses two structural basins, i.e. the Dumfries Basin and the Lochmaben Basin. These Permian sandstone basins provide significant groundwater resources. The aquifer produced by this geological formation offers substantially large abstractions. The pipeline will run close to the West of Scotland Water public water supply borehole at Terregles, west of Dumfries. The aquifer is naturally protected from foreign material infiltration by a thick layer of Boulder Clay. The Clay acts as an impermeable protective layer ensuring that pipeline construction works in the upper most 2½m of ground will not impact on the aquifer. During normal operations the pipeline will have no effect on groundwater sources because it will transport dry gas having no liquid/chemical content. Further details on Hydrology can be found in Chapter 8.

S24 Major infrastructure development

4.40. Policy S24 states, “*Proposals for major infrastructure provision on land not allocated for such uses, will be require to satisfy the Council on the following matters:*

- *the reasons for selecting the route;*
- *impact on the landscape and the environment;*
- *discharges to air and water;*
- *traffic impact;*
- *safety security and noise implications; and,*
- *impact on the amenity of the area.*

Large scale infrastructure developments can have significant community and environmental impacts. In some cases such development is outwith Planning control but many operators consult the Council on major schemes and it is therefore appropriate to set out clearly the main areas of concerns to the Council.”

4.41. Policy S24 covers a wide range of planning aspects that are addressed in great detail within this Environmental Statement. It is not possible to provide a simple summary answer here, it is preferable to read the ES as a whole. Also refer to the response given previously to Policy D9 that covers Large Scale Industrial Development.

Local Policies

4.42. Local Plans have three main functions:

- to set out detailed policies and proposals for the development and use of land to guide most decisions for five to seven years;

- to take into account the strategic locational guidance for development set out in the Structure Plan; and
- to provide stable and consistent framework within which investment decisions by the public bodies and private developers can be made.

Annandale and Eskdale

- 4.43. The Local Plan Consultative Draft for Annandale and Eskdale was issued in February 2000 and sets out potential policies and broad development strategies for each of the major towns (including tourism, industry, retail and housing) none of which will be affected by the construction of the pipeline. Policies in the Local Plan for rural areas look specifically at the housing allocation, rural facilities and local environment. Only the proposal to designate Regional Scenic Areas within the Local Plan has the potential to affect the routing of the pipeline. However, the suggested strategy areas outlined in the Structure Plan for designation are outside the pipeline route corridors in Annandale and Eskdale.

Nithsdale

- 4.44. Nithsdale Planning District is an amalgamation of the former Nithsdale and Dumfries Districts. The joint Nithsdale Local Plan Consultative Draft was issued in December 1999 and sets out the principal policies for the main towns within the District but does not deal with some of the rural issues which are more likely to place restrictions on the routing of the pipeline. Dumfries District Plan 1993 provides on the proposals map the location of a number policies which may have a bearing on pipeline routing. These include:
- Areas of Scenic Significance;
 - Dumfries Aquifer;
 - Nature Conservation Areas; and
 - Mineral Protection Areas for sand and gravel.

- 4.45. In each case the Local Plan policy refers to the relevant Structure Plan policy which has been discussed and addressed accordingly, earlier in this chapter.

Stewartry

- 4.46. The Stewartry Local Plan was issued in Consultative Draft form in June 2000, and provides on a proposals map the location of the Areas of Scenic Significance, the areas where these are crossed by the pipeline route corridors are along the coastline at Brighouse and north of Castle Douglas. The policies relating to development in these areas refer to the relevant landscape protection policies in the Structure Plan which are discussed earlier in this chapter.
- 4.47. The groundwater protection area around Castle Douglas is afforded protection in Policy U1 Protection of Groundwater resources, which has a presumption against development which could affect the quality and/or quantity of ground water resources in the area shown on the proposals map. This issue is discussed and

addressed previously in an answer given in response to Dumfries and Galloway Policy S2.

- 4.48. Within the Stewartry Local Plan, there is an area which has been designated by the Secretary of State under the Agriculture Act 1986 as Environmentally Sensitive Areas, farmers within this area are eligible for grant aid in support of the role in maintaining the landscape and national heritage interests. The Stewartry ESA extends along the Dee Valley and has been designated for scenic and nature conservation interests.

Mitigation Proposals

- 4.49. Specific mitigation proposals in respect of individual policies have been addressed above. In general, planning is the key to much of the mitigation. Consultation with the relevant authorities will be on-going during the development of this project. It is equally important to maintain this level of consultation with the agricultural, ecological and archaeological authorities/bodies.

Summary

- The proposed pipeline falls within the local government jurisdiction of Dumfries and Galloway Council. Informally, the Council has not identified any significant difficulties with this proposed pipeline route.
- By their very nature, large diameter gas pipelines are generally built in open countryside to avoid populated settlements. It is therefore unavoidable that the proposed pipeline shall cross agricultural land.
- Pipeline construction is a temporary activity lasting only a few months during the summer season. The pipeline contractor will use good working practices and reinstate the land so that it imposes no lasting impact.
- The pipeline route does not impact on any National Scenic Areas.
- The pipeline crosses through two Regional Scenic Areas. To avoid these areas would increase the pipeline length significantly. Construction through these areas will be given priority to minimise construction time.
- The pipeline study corridor includes two Sites of Special Scientific Interest but the detailed route and construction area will not impact on either site.
- No Historic Gardens and Designated Landscapes lie within the pipeline corridor.
- The proposed pipeline crosses an area of demonstrated archaeological potential but it will not affect any SAMs or SNIs.

References

1. Dumfries and Galloway Structure Plan 1999
2. Annandale and Eskdale (Upper Annandale Interim Planning Guidance 1994)
3. Annandale and Eskdale Local Plan (Consultative Draft) February 2000
4. Nithsdale (Mid and Upper Nithsdale Interim Planning Guidance 1994 and Dumfries and District 1993)
5. Nithsdale Local Plan (Consultative Draft) December 1999
6. Stewartry Final Draft Modifications Local Plan 1991
7. Stewartry Local Plan (Consultative Draft) June 2000

5. GEOLOGY AND LANDSCAPE

Introduction

- 5.1. The function of this Chapter is to consider the impact that geological, mining, mineral extraction, landfill and landscape influences may impose on the pipeline and vice versa.

Geological Baseline Conditions

- 5.2. The nature of the solid and drift geology is considered when routing a pipeline. Solid geology normally has little influence on route selection because the pipe trench does not normally penetrate to such a depth, but it is of importance where as in this case it outcrops to the surface or if deep crossings are required.
- 5.3. Mineral extraction, past and present, can have a significant impact on pipeline route selection as well as influencing construction methods. At the planning stage it is essential to assess the likely influence of these activities so that the pipeline can be routed accordingly.
- 5.4. British Geological Survey mapping and some limited borehole data portrays a generalised view of the Solid and Drift geology along the route of the pipeline. A clearer picture of ground conditions will emerge after a programme of dedicated boreholes and trial pits are dug during later stages of the project.

Solid and Drift Geology

- 5.5. This section describes the solid and drift geology and economic geology. It is important to have an understanding of the physical nature of the ground as this may affect the pipeline in terms of:
- ease of construction and thus costs and logistics;
 - the ease and success of reinstatement; and
 - the safety and integrity of the pipeline.
- 5.6. The pipeline route crosses part of the region of Scotland often referred to as the Southern Uplands named after the major geological fault that forms the northern boundary of the region. The geological formations present within the proposed corridor are as below.

Drift Geology

- 5.7. The majority of the route between Beattock and Brighouse comprises principally till, but also glacial meltwater deposits, peat and alluvium. The drift geology within the proposed pipeline corridor is typically found in isolated pockets preserved from erosion since the last ice age. The range of units is as follows:

Till (Boulder Clay)

- 5.8. An unsorted, unstratified mixture of granular deposits (gravel, cobbles and boulders) set in a matrix of stiff to very stiff sandy clay. The till accounts for approximately 36% of the pipeline route. The nature of the granular material and the colour of the clay matrix is often related to the underlying solid geology e.g. grey over Silurian rocks and red over Permian sandstone rocks.

Glacial meltwater deposits

- 5.9. These are highly variable deposits comprising predominantly granular material ranging from sand to cobble size but with clay found occasionally. The glacial meltwater deposits underlie some 16% of the total route.

Alluvium

- 5.10. Alluvium is associated with present or former river valleys where it often forms a series of terraces. Alluvium covers about 17% of the route. Occasionally deposited as lacustrine deposits in late glacial lakes. It tends to comprise a complex mixture of clays, silts, sands and gravels and the deposit is usually soft when cohesive.

Peat

- 5.11. Peat is a highly compressible organic deposit characterised by its ability to hold water. Possibly up to 10m thick at some locations. Peat covers only about 4% of the route.

Solid Geology

- 5.12. The solid geological sequence that underlies the route comprises the following sequences:

Palaeozoic sediments and volcanics:

Silurian Hawick Group

- 5.13. These comprise the Ross Formation (ROSS) the Carghidown Formation (CGD), the Kirkmaiden Formation (KMN) and the Cairnharrow Formation (CNW).
- 5.14. The Ross Formation comprises medium to thickly bedded greywacke (poorly sorted fine to coarse-grained rocks which consist of rock fragments often in an argillaceous cement) with thinly bedded silty mudstone and flaggy siltstones.
- 5.15. The Kirkmaiden are medium to thinly bedded calcareous greywacke and interbedded silty mudstone with zones of more thickly bedded greywacke.
- 5.16. The Carghidown are medium to thinly bedded calcareous greywacke and interbedded silty mudstone with thin red mudstone beds and zones of more thickly bedded greywacke.

Table 5.1: Summary of Geology along the pipeline route and the implications for construction

Engineering Geological unit	Geological Units Sub Units	Engineering Description	Coverage as km approx. along pipeline corridor	Trafficability	Excavatability	Trench Stability
Superficial Deposits						
Compressible soils	Peat	Highly compressible organic deposit characterised by its ability to hold water	3 km	Poor	Good	Good unless loaded or where groundwater pressures are high
Soft to firm cohesive and loose granular soils	Alluvium,	Predominantly silty fine to medium sand with occasional gravels & soft to firm clay	14 km	Good if granular but mod. poor in clays	Good	Poor below water table and may need some temporary shoring but mod. good above; may need to consider dewatering in floodplain.
Dense, coarse granular soils	Glacial meltwater deposits (sand & gravel)	Loose to dense fine to coarse sand & gravel	13 km	Good	Good	Poor below water table and may need some temporary shoring but mod. good above; may need to consider dewatering in floodplain.
Stiff to hard cohesive soils	Till, Moraine	Stiff to hard brownish grey clay with angular to sub-rounded gravel of greywacke and hard shale.	29 km	Poor in clays when wet	Good to hard	Good

Engineering Geological unit	Geological Units Sub Units	Engineering Description	Coverage as km approx. along pipeline corridor	Trafficability	Excavatability	Trench Stability
Solid Geology						
Strong rock	Permian Sandstone (Appleby Group)	Red sandstone and breccias	Bedrock close to surface or exposed 22 km	Good	Rippable when weathered and if joints favourable to construction direction, but marginal to difficult when fresh and will probably require pre-splitting	Good but bulking may be a problem
	Silurian sediments (Ross Formation)	Medium to thickly bedded greywacke with thinly bedded silty mudstone		Good		
Strong rock	Silurian sediments - Hawick Group (Carghidow & Kirkmaiden Formation)	Medium to thinly bedded calcareous greywacke and interbedded silty mudstone with zones of more thickly bedded greywacke.		Good	Rippable when weathered and if joints favourable to construction direction, but marginal to difficult when fresh and will probably require pre-splitting	Good but bulking may be a problem; will probably require bedding layer

Engineering Geological unit	Geological Units Sub Units	Engineering Description	Coverage as km approx. along pipeline corridor	Trafficability	Excavatability	Trench Stability
Solid Geology cont.						
	Silurian sediments - Gala Group	Medium to thickly bedded greywacke, locally with thin silty mudstone beds, interbedded with and passing laterally into very thick bedded massive greywacke	See previous page	Good	Rippable when weathered and if joints favourable to construction direction, but very difficult if fresh and when thickly bedded, likely to require pre-splitting	Good but bulking may be a problem; will probably require bedding layer
Very strong rock	Silurian to Devonian intrusives	Granitoid rocks; mainly granodiorite, and quartz diorite also porphyritic microdiorite		Good	Very difficult when fresh and likely to require pre-splitting	Good but bulking may be a problem; will probably require bedding layer

Silurian Gala Group

- 5.17. These comprise the Gala 5, 6 and 7 (GALA) strata, and are medium to thickly bedded greywacke, locally with thin silty mudstone beds, interbedded with and passing laterally into very thick bedded massive greywacke. The greywacke is dominantly quartzose and medium to coarse grained.

Silurian to Devonian igneous intrusive rocks

- 5.18. These comprise of granitoid rocks; mainly granodiorite, and quartz diorite as well as porphyritic microdiorite including undifferentiated minor intrusions of the Black Stockarton Moor sub volcanic complex.

Permian sandstone:

Appleby Group

- 5.19. The Appleby Group comprises red sandstone and breccias and split into two Formations in the area. The Doweel Breccia Formation (DBR) comprises a breccia of sandstone dominated turbidite, granitic and felsic rocks in a red sandstone matrix interbedded with red fluviatile sandstone. The Locharbriggs Sandstone Formation (LCH) comprises fine to medium grained, very well sorted red sandstone characterised by large scale cross bedding.
- 5.20. The sandstones have been extensively quarried for building. The breccias include faceted pebbles of greywacke and granite.

Route Summary

- 5.21. From the AGI at Beattock the pipeline route crosses superficial (drift) deposits comprising glacial till with outcrops of peat at Lochwood Moss (Grid Ref. NY 0896). Should the bedrock be encountered in this section it is likely to comprise Gala Group rocks that will potentially be difficult to excavate.
- 5.22. At NY 0891 the route turns south-westwards and the predominance of till is replaced by a large tract of alluvium associated with Kinnel Water and the Water of Ae. The alluvium will probably comprise silt, sand and gravel and is interspersed with glacial meltwater deposits. The latter comprise predominantly sands and gravel's often in ridges, terraces and isolated mounds. If bedrock is encountered here it is likely to be Appleby Group sandstone's and breccias which, if weathered may be rippable but where fresh will probably require pre-splitting.
- 5.23. Southwest of NX 9375 the pipeline route is likely to encounter progressively less cover of superficial sediments and from NX 7760 to the landfall the route will be predominantly over exposed bedrock (Carghidown Formation) which may be rippable, especially if weathered, and in particular if thinly bedded and jointed with the joints lying favourably to the direction of construction. Fresh pre-splitting is likely to be required. In addition between NX 8264 and NX 6854 the route crosses the area intruded by igneous rocks of the Black Stockarton Moor sub volcanic complex. These intrusions will be avoided wherever possible at the detailed route survey stage due to strength of the rock from which they are formed. Locally, there are likely to be infrequent occurrences of superficial sediments along this section of the route. Where these occur they will probably comprise predominantly alluvium or glacial meltwater deposits.

- 5.24. Due to the strength of the bedrock formations that are likely to be encountered along the proposed route it may be necessary to place sand bedding in the base of the trench to provide additional protection to the pipeline. It is also probable that the excavated material will bulk up and therefore some export of excavation material should be allowed for.

Economic Geology

- 5.25. Areas of search for possible mineral extraction (sand and gravel) sites have been identified. The pipeline will cross a site where river gravel extraction has been proposed at The Water of Ae crossing. The planning application for extraction at this site has now expired and the landowner has not indicated whether the proposal is likely to be reactivated. Searches have also established that there are no active quarries within the pipeline corridor, neither are there any known landfill sites nor known sites of contamination.

Landscape Baseline Condition and Description

- 5.26. The proposed pipeline is routed through the Dumfries and Galloway Region where glaciation has been the dominant factor in forming the landscape. This process has moulded landscape into a diverse range of differing characters, including rolling lowlands, wide valley floors containing meandering rivers, and lochs. Other typical geomorphological features, which are important physical features in the landscape include rounded drumlins composed of glacial moraine and numerous distinct rocky outcrops and kettleholes.
- 5.27. The land use throughout the region is dominated by agriculture, being essentially a pastoral landscape. On the lower slopes up to 200m AOD, and along the valley floors, land use is mainly of improved grassland comprised of a patchwork of fields given over to grazing. Dairy farming is prevalent throughout, and lush green grazing is very characteristic of the area.
- 5.28. Scattered throughout the lowland areas, are numerous mixed deciduous woodlands, (many of them remnants of ancient and semi-natural woodlands). The woodlands were planted in the eighteenth and nineteenth centuries to provide shelterbelt and copses usually in association with farm buildings. More extensive 'policy woodlands' (as defined in the Local Plans) are associated with the numerous designated 'Designed Landscapes' throughout the region, such as Castle Kennedy and Threave Castle, close to Castle Douglas.
- 5.29. On higher, more exposed slopes, unimproved semi-natural rough grassland and heather are dominant, interspersed between extensive areas of plantation forestry. Sheep grazing is more characteristic on the higher ground, with the field boundaries largely drystone dykes composed of granite boulders.
- 5.30. The settlement pattern throughout the region is dominated by scattered, sometimes isolated farmsteads, typically large lowland farms and smaller hill farms. The larger settlements are concentrated along the valleys, or close to the coastline. Vernacular architecture, comprising buildings of local stone, dominates the larger towns such as Dumfries, Kirkcudbright and Castle Douglas. Many of the smaller villages are linear settlements, bordering the network of roads throughout the region.

Maps 1 to 4

- 5.31. The pipeline route starts close to the B7020 within the Mid Annandale area of the 'Middle Dale' landscape type. Levels in the valley floor range between 40-70m AOD. The route heads due south through undulating, open agricultural land following the same alignment as the existing gas Interconnector pipeline and the B7020. The route crosses numerous fields and within close proximity to a number of coniferous plantations, and after approximately 8kms turns to the south west towards the Water of Ae river crossing.
- 5.32. Many of the field boundaries comprise ditches draining to the River Annan. A feature of this section is the number of pipeline crossings, mostly of the existing gas Interconnector (4 No) owing to it being close to routing constraints first on one side of the new pipeline, and then the other.
- 5.33. The first significant crossing is that of the Threigills Cleuch Burn to the west of Stockholm Farm. To minimise impact to the landscape, the working width during construction will be reduced from the standard 36m. During detailed design a full topographical survey will be undertaken of the crossing and the approaches. This will allow the designers to route the pipeline through a natural weak point minimising impact on this burn.
- 5.34. Many of the coniferous plantation have been harvested in recent years, and an opportunity has been taken to route the pipeline through the corner of a recently felled plantation at Kilnpot Wood to avoid a 'pinch point' on the existing pipeline. This will result in the permanent loss of about ten trees when the plantation is replanted, but as this corner of the wood is remote from the nearest road, there will be limited visual impact on the landscape.

Maps 4 to 7

- 5.35. To avoid the pipeline breaking through the south-east corner of Heatheryhall Wood the route passes close to Greenbeck Farm. The construction width will be reduced to minimise the impact on existing trees. Heatheryhall Wood has recently been felled and to further reduce traffic through the pinch point there may be a requirement to construct a temporary access road. This will be removed following construction with no residual impact.
- 5.36. To avoid breaking through the Kerse Plantation it is proposed to extend the road crossing adjacent to Kerse Cottage (RDX6). By installing the pipe at this location impact to both Kerse Plantation and woods to the north of Kerse Cottage is eliminated. The Kinnel Water crossing (RVX1) is about 25m wide at the crossing point, with clear approaches and low banks.
- 5.37. Plantations become fewer in this section as the route crosses into land with 'Upland Fringe' character zone, ranging between 120-170m AOD. The pipeline route continues through higher, more exposed rolling pastureland, with numerous minor valleys, ridges and hollows. The route follows along the southern fringes of the extensive coniferous Forest of Ae. On map 7 the route is shown to be crossing Bents Plantation. Since issue of the Ordnance Survey mapping this area has been harvested and returned to agricultural grassland. Immediately north of the village of Parkgate, the route crosses the A701(T). Shelterbelts and lines of beech trees are

common features in this landscape, however, the proposed route avoids most of these prominent features.

Maps 7 to 12

- 5.38. After crossing the A70(T) at Parkgate, the landscape becomes more open and undulating. The river Water of Ae is crossed at Km 18 where it flows through a rocky floodplain, which is land designated for its nature conservation value.
- 5.39. After crossing the Water of Ae, the proposed route continues in a south westerly direction heading towards the north of Dumfries, crossing into land within the Dumfries Coastline Region and into the 'Lower Dale' landscape character sub-zone within the area of Lower Nithsdale.
- 5.40. The route crosses the natural drainage of the country in a series of ridges and valleys. The first ridge, Rorie Hill, Km 19 to 20, is bare and exposed, and the pipeline attains an elevation of 145m AoD. The following ridges are less well defined, and have more wooded valleys between them where the pipeline has been routed through weak spots in the tree lines to avoid visual impact so far as possible, typically at Newlands Linn (Km 23). The trees lining Newlands Linn have suffered severe wind damage in recent years. It is proposed to route the pipeline through the area, which has suffered the greatest impact. Following installation of the pipeline trees will be replanted within the working area but not within 5m of the pipeline. On the southern edge of Newlands Linn new saplings have been planted which incorporate a ride. It is proposed to follow the alignment of this ride through this area, which will eliminate the need to create another break in woodland. A further low but complex undulating ridge near Quarrelwood brings the route to the Nith Valley.

Maps 11 to 15

- 5.41. Lower Nithsdale is characterised by generally flat, or gently undulating relief, the central section, either side of the River Nith, is a flat floodplain, containing wide river meanders. Arable crops and improved pasture within medium to large scale fields are characteristic across the floodplain, and the river is wide and shallow.
- 5.42. Field boundaries are comprised of hawthorn hedges containing frequent mature deciduous trees, including Beech and Sycamore. The outer edges of the floodplain are more irregular in topography, comprising a combination of glacial moraines and fluvio-glacial deposits.
- 5.43. After crossing the floodplain to the north of Dumfries, the proposed route turns due south to pass to the western limits of the town. In this section of the route, the topography continues to be flat or gently undulating, traversed by numerous farm access tracks. The Cluden Water crossing location, although not wide, is fairly deeply incised into its banks, without a significant floodplain. The crossing location is in a natural weak point in the river bank vegetation requiring only minimal clearance.
- 5.44. The route continues across open arable land, gently undulating to the third major river crossing in Nithdale, Cargen Water (Km 34). This has an extensive floodplain, to the A75(T), where the land starts to rise.

Maps 15 to 17

- 5.45. After crossing the A75(T) the proposed route turns south west into land designated as ‘Upland Fringe’, onto steeply rising ground through a prominent section of woodland and pasture landscape designated as an ‘Area of Scenic Significance’.
- 5.46. Castle Hill (Km 36) is ascended by a steep bank that is visible from a large extent of Lower Nithdale. The route continues over Nunland Hill and descends to the north side of the village of Lochfoot. This section will be readily visible from the A75(T). Field boundaries are predominantly stone walls or ‘dykes’.

Maps 17 to 22

- 5.47. A long section of generally open undulating country is crossed, the route running parallel to an overhead power-line and the ‘Old Military Road’ between Dumfries and Castle Douglas.
- 5.48. As the route continues south west, following the alignment of overhead power lines, towards the more low lying topography around Castle Douglas, it crosses an extensive area of landscape characterised as ‘Drumlin Pastures’. This section of the route displays a particularly distinctive landform created by glacial deposition. Drumlins are a series of elongated mounds, smoothly convex in outline, that run parallel but interlock with each other creating a distinctive and undulating landform. The topography ranges between 50-70m AOD and the generally smooth relief is interspersed with occasional rugged rocky knolls.
- 5.49. Other glacial features within the area are ‘kettleholes’ - small lochs between the drumlins. Drystone dyke field boundaries accentuate the rolling topography and lines of deciduous woodland are a particularly distinctive feature within this area. The ‘Drumlin Pastures’ are essentially a lowland landscape.
- 5.50. A notable feature within this extensive area of glacial deposition is the narrow wooded valley of the Urr Water (Km 52.5). Approximately 5kms east of Castle Douglas, and 3kms north of Dalbeattie, the proposed pipeline route will cross this valley. At the proposed crossing point itself, the valley sides are steep and the valley floor is wide and flat, with both the Urr Water and a tributary, the Buittle Burn meandering across it.

Maps 22 to 28

- 5.51. The proposed route continues to the south west, skirting to the south of Castle Douglas, still within the ‘Drumlin Pastures’ character zone. However, the pattern of ‘Drumlins’ and ‘Kettle Holes’ tends to become more complex and the route more undulating.
- 5.52. The alignment of the overhead power cables is left at the Gelston Burn crossing, Km 59, and the route heads due west, over continuing undulations to the River Dee crossing at Km 64.
- 5.53. The Dee is a significant river in a broad valley with extensive arable field on either bank. The banks themselves are extensively wooded and care has been taken in choosing a crossing point where these woods will not be affected.

Maps 28 to 30

- 5.54. Immediately after crossing the River Dee, the route turns south and follows the river for 2km, before turning west and crossing the A711, a rocky ridge near Argrennan Mains (elevation 104m AOD), the A762 and Tarff Water on the northern outskirts of Kirkcudbright.
- 5.55. The ridge has steep slopes on either side of it, those on the west side being particularly exposed. The route then lies in the Tarff Water valley for nearly a kilometre before crossing the river at Km 70.5.

Maps 30 to 34

- 5.56. To the west of Kirkcudbright on the western banks of the River Dee, the proposed route enters an extensive area designated as an Area of Scenic Significance, which continues up to the limit of the proposed route at Brighthouse Compressor station.
- 5.57. Approximately 2kms from the Brighthouse compressor station, the route enters the final landscape character zone - 'Peninsula with Gorse Knolls', which includes the Borgue coastline. The landscape is characterised by local changes in topography, with height ranges between 10-80m AOD within small areas. The resulting topography creates prominent uneven knolls, often with exposed rock. The land cover is predominately pasture, with gorse frequent in the more exposed rocky areas. Trees are seen as isolated groups or infrequent shelterbelts.
- 5.58. The termination of the proposed route within the Brighthouse Compressor Station includes a predominately coniferous plantation along its western boundary. The compressor station is mostly concealed, being located within a natural hollow, which has been reinforced by the construction of additional screen mounds and planting along the north eastern and south western boundaries.

Assessment of Impacts

Geology

- 5.59. British Geology Survey mapping and borehole data provides an overall impression of ground conditions. A clearer picture will develop once a detailed site investigation has been completed. This investigation will comprise of a programme of boreholes and trial pits, specifically at major crossings. This work will be carried out during the detailed engineering design stage and only after access to private land has been permitted.
- 5.60. At pipeline construction stage any ground disturbance is limited to the upper geological layers when topsoil is stripped from the working-width and trench material removed to a depth of approximately 2.5metres. These soils will be separately stored for future backfilling of the trench with subsoil, and reinstatement of the working-width with topsoil only.

Landscape - Pipeline

- 5.61. Direct impacts on existing landscape will be largely confined to the construction phase within the 36 metre working width, and to a much lesser extent after installation, i.e. land permanently occupied by the pipeline. A permanent servitude is required to allow access for future inspection and maintenance purposes. The

potential impacts from the project under this category include :-

- Short-term loss of access, e.g. agricultural, or conserved land and other uses, and
 - Longer term effect on planning and future land-use.
- 5.62. Apart from the block valve sites that will constitute a permanent change in use, normal agricultural production and other ongoing land-use along the route of the pipeline should resume in the season following completion of construction work. The impact of the pipeline on land-use will, for the most part, be short term and confined to the construction phase.
- 5.63. The pipeline will impose long term restrictions on building development of land within the proposed pipeline servitude (approximately 33ft/10m wide), as discussed in Chapter 2. There may also be restrictions on building development within the ‘planning consultation’ or ‘safety protection’ zone, as defined by the Health & Safety Executive (HSE) in conjunction with the local authorities and usually defined in the Local Plans.
- 5.64. The visual impact of pipeline construction is temporary since the construction process including restoration work is short term and only expected to last a few months during the summer. The only permanent visual impact associated with the pipeline itself will be the presence of marker posts at each boundary and the aerial marker posts at approximately 1km intervals and major changes in direction. These will be in line with industry standards, which apply to all cross-country pipelines in the United Kingdom.
- 5.65. Impacts can arise from the siting of the pipeline contractor’s temporary construction compound and pipe storage yard but the location of this site has yet to be determined. In choosing a site, priority is given to any available “brownfield” sites that lie close to the pipeline route. The selected site will be chosen so that it imposes no significant impacts on the neighbourhood in terms of its unacceptable visual impact, noise and dust emissions, and minimal traffic movement impact onto the local road system.

Landscape - Block Valves

- 5.66. Block valves are required to enable the pipeline to be shut down for operational and maintenance reasons, and required by the relevant codes of practice to be at about 16km intervals, at locations where road access is possible. The four block valve sites chosen and the potential impact on the landscape are:-

BV1

- 5.67. In the corner of a field of rough pasture on the south side of RDX9 near Wester Parkgate (Map 7). Separated from the road by a broad verge and ditch and having on its south side a plantation (currently felled), this site will have good natural screening, particularly once the plantation is re-established.

BV2 (Cross Connection Site)

- 5.68. This site, about 200m before RDX20, the B729 (Map 13) and lies adjacent to the edge of a field, where the new pipeline route crosses the existing Interconnector Pipeline. The site is partially screened from the nearby farmstead of Nether Gribton by vegetation growing along the course of the disused railway, alongside which it is sited.

BV3

- 5.69. This is sited on the north side of RDX31 (Map 20) which is an access road to Little Culmain. The site is in the corner of a field, about 200m from the 'Old Military Road' between Dumfries and Castle Douglas. There is little natural screening at this location and the site will rely on landscaping to provide this. However, there are few inhabited buildings within sight of the location.

BV4

- 5.70. This lies on the east side of RDX42, about 2km south west of Rhonehouse (Map 27). In the corner of pasture field, there are few trees in the immediate vicinity to provide natural screening.

Mitigation Proposals

- 5.71. The proposed pipeline will be buried along its entire length so its impact is largely short term, restricted to the construction phase. This work will be carefully controlled and supervised to ensure that the land is restored to its original condition.

Geology

- 5.72. Ground disturbance during pipeline construction is limited to the upper most 2.5metres and as such this represents an extremely minimal impact upon the geological profile.
- 5.73. The proposed pipeline route does not cross any defined landfill or contaminated unstable areas. However, to comply with the 'Duty of Care' requirements under the Environmental Protection Act 1990 and the Controlled Waste Regulations 1991, if removal and relocation of contaminated waste is necessary, then the analysis of samples will be carried out. Advice from relevant Council departments and the Scottish Environment Protection Agency will also be obtained. In the event of any contaminated materials being encountered, they will be handled in compliance with the Control of Substances Hazardous to Health (COSHH) Regulations and brought to the attention of the authorities.

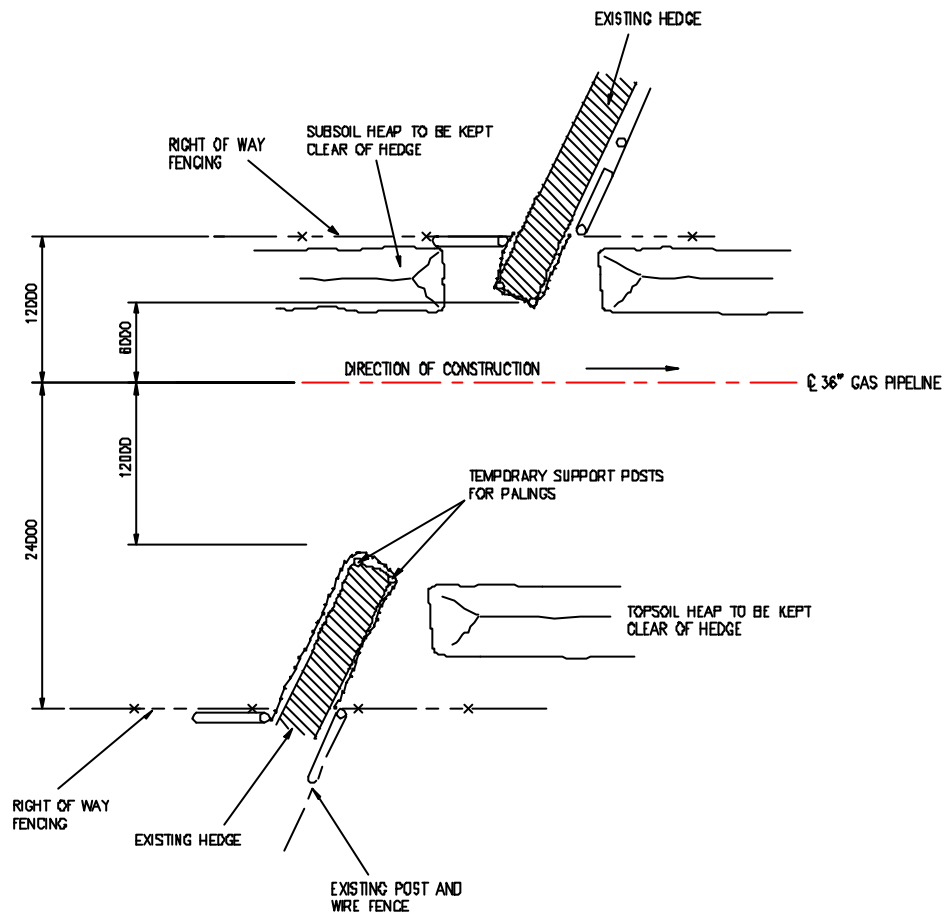
Landscape - Pipeline

- 5.74. Once construction is complete the general landscape will not suffer any significant long-term effects since the pipeline is buried along its entire length and affected hedgerows reinstated.
- 5.75. Hedgerows will be reinstated with similar species of hedging shrubs and bushes as were in place originally and shall be protected with post and wire fences. In

addition, rabbit fencing will be used round all planting areas to protect the early growth of the hedge plants.

- 5.76. Dry stone walls, fences, dykes and other boundaries shall be reinstated to a similar or better condition than originally existing using wherever possible, materials that have been recovered from the original feature and additional materials where required will be sourced to match those originally in place. Suitably skilled labour shall be used for such activities.
- 5.77. Reinstatement shall not be considered complete and ready for final handover until all temporary fencing is removed or otherwise disposed of in agreement with the relevant landowner and/or occupier.
- 5.78. Areas highlighted as being exposed (e.g. Castle Hill alongside A75, Map 15 and Nunland Hill, Map 16) and/or where erosion is a risk shall be given priority for reinstatement and the re-establishment of vegetation.
- 5.79. At locations where continuous tree-belts are crossed (e.g. Kilnpot Rig, Map 3, Newlands Linn, Map 10; Cludden Water, Map 13) the weakest line has been chosen to keep tree loss to a minimum.

Figure 5.1 – Typical Hedge Crossing



Landscape - Block Valves

- 5.80. Where natural screening exists at or close to a block valve site, maximum use has been made of this by incorporating it into the landscaping proposed for each site. (See block-valve site layouts in planning application for relevant block-valves).
- 5.81. Block valve sites are surrounded by a security fence 2.4m high, and, although no pipework is visible, a small kiosk to house control equipment will be incorporated. The colours of the various items will be chosen in consultation with the local planning authority so as to be as inconspicuous as practically possible.
- 5.82. The objective of the landscaping at each site will be to provide a screen of vegetation to obscure the security fence, kiosk and any other items of equipment from nearby habitation or areas of public access such as roads and footpaths, whilst minimising the overall land take.

Summary

- The geological profile below the pipeline route comprises superficial deposits principally of till overlain by deposits of silt and clay with glacial sand and gravel, alluvium and silt. Bedrock is known to outcrop in places within the study corridor but the pipeline is routed to avoid these outcrops wherever possible. As such the pipeline will have not impose any significant impact on the geological strata.
- The local landscape has few distinguishing characteristics that sets it apart from other typical countryside scenes. Once construction is complete the general landscape will not suffer any significant long-term effects since the pipeline is buried along its entire length and affected hedgerows reinstated.
- The block valve sites have been located to minimise their detrimental effects on the environment. Located in the corner of fields wherever possible the effective land take shall be minimised with the disruption to farming of adjacent land being subject to the minimum of disturbance. Once the surrounding hedgerows and screening vegetation have grown and matured the sites will blend into its surroundings with the minimum of visual impact.

References

1. British Regional Geology - The South of Scotland (Third Edition) Institute of Geological Sciences (HMSO).
2. British Geological Survey 1:50,000 series maps
Sheets: 9E Thornhill Solid
5E & Part 6W Dabeattie Solid
5W Kirkcudbright Solid
5W Kirkcudbright Drift
3. Dumfries and Galloway Landscape Assessment Scottish Natural Heritage 1998.

6. SOILS AND AGRICULTURE

Introduction

- 6.1 This chapter considers the impact of pipeline construction on soils and agriculture.
- 6.2 The countryside in the Dumfries and Galloway area is of exceptional quality and is valued highly by residents and visitors alike. Agriculture and forestry are of great importance to the local economy and have significantly influenced its character and appearance.
- 6.3 The pipeline is routed through Dumfries and Galloway Council, which is recognised as a highly productive farming area, centralised on the production of dairy, beef and sheep with limited arable farming.

Baseline Conditions

- 6.4 Six baseline conditions have been examined in the assessment of impacts. These factors are given below:
- Relief
 - Climate
 - Soils
 - Land Quality
 - Plant and Animal Health
 - Land Drainage
- 6.5 This assessment has involved the analysis of the following sources of information:
- i) Study of published material obtained from sources such as the Macaulay Institute for Soil Research, British Geological Survey, Meteorological Office and Ordnance Survey Maps and plans:
 - ii) Discussions and information provided by Scottish Natural Heritage, Scottish Environment Protection Agency and other concerned bodies: and
 - iii) Information obtained from several site visits.

Relief

- 6.6 Relief is important since it affects the soil water regime (i.e. tendency to drain, run-off, etc.); type of soil due to type of glacial parent material deposited; and the type of agricultural activity that can take place. The steeper the slope, the greater the run-off and the smaller the amount of water entering the soil. On flat sites, where water tends to lie, waterlogging and gleying are at a maximum. Conventional agricultural machines are designed for optimum performance on level ground and their ability to cope with sloping surfaces and still produce acceptable quality work varies enormously.
- 6.7 Glaciation processes, has been the dominant factor in forming the landscapes within the region. These processes have moulded the landscape into a diverse range of differing characters, including rolling lowlands, wide valley floors containing meandering rivers, and lochs. Other typical geomorphologic features, which are important physical features in the landscape include, rounded drumlins composed of glacial moraine, and numerous distinct rocky outcrops and kettleholes.
- 6.8 Occasional steep incised valleys running north to south across the region, providing a sharp contrast to the more expansive, wide open valley floors and rolling topography.
- 6.9 The elevations range from 185m above Ordnance Datum (AOD) at the Lochwood (2km south of the offtake site) to a low of 15m AOD at crossing of the Tarff Water. Between these points the relief is generally undulating with only limited change in gradient.

Climate

- 6.10 The various components of climate influence the agricultural activities directly through the effect of weather on stock or on the above-ground parts of plants, and indirectly through an interaction with soil properties affecting water and nutrients supplied to the plant root and cultivation practices. The two most important characteristics of climate are rainfall and temperature since these affect the water supply and energy relationships in plant growth.
- 6.11 January is the coldest month with an average minimum temperature of +0.7°C and maximum temperature of +6.0°C. July is the warmest month with an average minimum temperature of +10.5°C and maximum of +18.5°C.
- 6.12 The average rainfall across the immediate area ranges between 1340mm and 1751mm per annum. The driest period is between April and July when under 75mm of rain falls, with April being the driest month with only 53mm and October being the wettest with 117mm.
- 6.13 Between April and September the average sunshine exceeds 100hours/month, in contrast to December with an average of only 37.9hours/month.

Soils

- 6.14 The character of the soil in any one place is the result of the interaction of climate, parent material (i.e. underlying drift and solid geology), relief, vegetation, time and the influence of man. Climate and relief have been discussed above; and geology is covered in Chapter 5.
- 6.15 Parent material affects the soil formation by the texture, and base-richness. Fine textured parent material, i.e. clayey, are water retentive and less permeable than coarser materials and so tend to drain slower. The soil in many places in this region has been greatly improved through the introduction of drainage and the cultivation of the soil. These actions have improved the yields and quality of crops and harvest.
- 6.16 Rainfall and temperature, as discussed, are the principal climatic influences on soil formation, with the effects of wind having a modifying impact on the effects of temperature. Soil temperatures tend to be high within a low rainfall area such as this, where the breakdown of organic matter is rapid.
- 6.17 The many soil series crossed by the pipeline are listed in Appendix 6A at the end of this chapter. Approximately 90% of soils crossed by the pipeline route comprise Brown Forest Soils associated with the series of Etterick, Holywood, Knockskea, Rhinns and Yarrow/Fleet. The remaining 10% of the route is over alluvial deposits at the river crossings (8%), and peat (2%).
- 6.18 Soils are classified by their soil series name and number, soil sub-group and soil water regime. A general picture is shown in Soil 1 to 3 in the Addendum of Drawings. The data has been extracted from the Ordnance Survey Sheet “Soil Survey of Scotland – South East / West Scotland – Sheets 6 and 7” and the accompanying Macaulay Institute of Soil Research Handbooks.
- 6.19 Soils that are not freely drained, excluding peat, are generally easily recognised by the presence of gleying. They are found over approximately 50% of the route. It is impossible to avoid these areas during construction as they are very widespread, but problems can be minimised by ensuring that construction takes place in relatively dry conditions, ideally in summer, or if necessary in late spring or early autumn. This is particularly important for the area covered by map unit 209 and 233. However, construction in the summer period cannot guarantee the absence of water in the trench and it may still need to be drained in places.
- 6.20 Alluvial soils and soils of the Yarrow/Fleet series, which comprise 10% of the total, may prove unstable when the pipe trench is dug because of their sandy and gravelly nature, and some shoring of the trench sides could be necessary if the unconsolidated material is deep. Soil erosion may be a problem during construction and reinstatement where map unit 306 occurs because it is on sloping ground. The unit does, however, only occur along 1% of the pipeline route and it is not considered a major problem.

Land Quality

Agricultural Use

- 6.21 Assessment of land quality, or rather "*Land Capability for Agriculture*" relies on three key ingredients: relief, climate and soils, as described earlier. This combination provides a capability factor for areas of common land quality. Values are given in numbers ranging from 1 to 7. Put simply, Grade 1 offers "*the capability of producing a very wide range of crops*" while Grade 7 is "*land of very limited agricultural value*". The breakdown of classifications suggests that Grades 1 to 4 are suitable for arable use while Grades 5 to 7 are not. Each of the 7 classes is further sub-divided.
- 6.22 Within Dumfries and Galloway Region agricultural land falls into categories 3, 4, 5 and 6 with no areas of category 1 or 2. The better quality land (Category 3) is associated with the river systems, particularly Water of Ae, River Nith, Cluden Water, Urr Water and the River Dee. The proposed route cuts across these rivers.

Assumptions of the system

- 6.23 In using the classification the following assumptions, as stated by the Macaulay Institute for Research, must be taken into account:
- the classification is designed to assess the value of land for agriculture;
 - land is classified according to the degree to which its physical characteristics affect the flexibility of cropping and its ability to produce certain crops consistently;
 - the classification does not group land according to its most profitable use;
 - the standard of management adopted is the level of input and intensity of soil, crop and grassland management applied successfully by the reasonable and practical farmer within the relevant sector of the farming industry. Such management will retain or improve the land resource;
 - land which has limitations which may be removed or reduced at economic cost by the farmer his/her contractors is classed on the severity of the remaining limitations;
 - land with severe limitations is classified accordingly except where there is clear evidence that a major improvement project (e.g. arterial drainage) will be completed within the next ten years. In such cases the land is classed as if the improvements had occurred;
 - location, farm structure, standard of fixed equipment and access to markets do not influence the grading. They may, however, affect land use decisions; and
 - the interpretations are an expression of current knowledge and revision will be necessary with new experience or technological innovations.

Agricultural land quality

- 6.24 The Agricultural Land Capability map is shown in Figure 6 in the Addendum of Drawings whilst the proportions of the various classification are shown in Table 6.1.

Grade	Beattock to Brighouse (km)
Grade 3	33.2
Grade 4	32.7
Grade 5	13.9
Grade 6	1.1

6.25 The portions of the different agricultural land use found along the proposed pipeline route between Beattock and Brighouse are summarised below:

- 33.2km of the pipeline route is classified as Grade 3 Agricultural Land. This is predominantly in the area east of Castle Douglas associated with the main river crossings. The land has moderate limitations due to soil, relief climate, or some combination of these factors. The land is best suited to grass and cereals and gives reasonable yields under average management. The soil could suffer damage if worked too early in spring or too late in autumn.
- 32.7km of land along the route of the pipeline is of Grade 4 quality. This occurs throughout the length of the route with the exception of an area around Dumfries. Soil characteristics of this grade are shallow depth, wetness and unsuitable texture and structure. The shallow depth of soil may indicate bedrock close to the surface.
- 13.9km of the agricultural land along the pipeline is classified as Grade 5. This is predominantly scattered throughout the southern section of the route.
- 1.1km of the land classification is Grade 6. This, the poorest of the land types, occurs to the south of Milton Loch and can range from land with a high proportion of palatable herbage in the sward to vegetation dominated by plant communities with low grazing values particularly heather moor, bog heather, blanket bog and peat. Construction and subsequent reinstatement in areas of peat should be avoided.

Assessment of Impacts on Soils and Agriculture

6.26 The factors and processes reviewed previously are the baseline conditions of relief, climate, soils, and land capability classification and use. These have been presented as a means to providing the basic data for an assessment of the impacts of pipeline construction. It should be emphasised that because of the complexity of factors and uncertainty of true boundaries the data can only be a strategic tool to indicate generalities. However, these key factors are believed to be valid and offer a useful guide to probable impacts.

6.27 Principal construction activities vary but include the use of plant that will not damage the soil structure, e.g. the use of low-pressure tyres or wide tracks on fragile or poorly drained soils where permanent over-compaction is a risk. Principal construction activities here mean construction traffic, soil stripping and its restoration and trench excavation. Much of the plant needed is of a type similar to that used in everyday agriculture activity and its effect on the land can be similarly benign.

- 6.28 Following installation of the pipeline and the return of the land to normal agricultural activities, deep cultivation within the pipeline servitude (right of way) will be limited to a maximum depth of 12 inches (300mm). If deeper workings, including drainage, within this area are required, it can be undertaken with the permission of BGE (UK) Limited who may wish to inspect and supervise any works. This measure is undertaken to protect the integrity and safety of the pipeline. In addition to this, further restrictions will apply to the planting of trees and deep rooting vegetation within the pipeline servitude.
- 6.29 There will be a permanent change of land use from agricultural to industrial at each of the four Block Valve (BV) sites.

Mitigation on Soils and Agriculture

- 6.30 The predominant effect of pipeline construction on soil quality is likely to arise through changes in soil structure, in particular, modifications due to compaction. Soil compaction reduces the proportion of voids within soil, resulting in reductions of both available water and permeability.
- 6.31 Compaction is expected to occur when a load exerted by machinery or vehicles exceeds the inherent strength of the soil fabric. In general, the stresses exerted on soil during construction of the pipeline can exceed those experienced during normal farm machinery activity. Consequently, an increased risk of compaction exists.
- 6.32 The following measures will be adopted during pipeline construction to reduce compaction :-
- Normal procedure is to strip topsoil with a bulldozer blade or excavator, and to store it to one-side of the working-width. This will ensure separation from any other materials and will protect it from further stress. The forces exerted by this action are comparable with those experienced during normal cultivation activity, and significant compaction to the topsoil is therefore avoided;
 - The storage period of soils is up to a few months, and no significant deterioration in soil fertility due to anaerobiosis (absence of oxygen) is anticipated;
 - Soil resilience generally increases throughout the spring and summer months as soil moisture deficit accumulates, so that even vulnerable soils may be handled with relative safety when dry. In this respect, pipeline construction is scheduled into this period to improve opportunities for phasing of soil handling;
 - In wet areas of higher agricultural or ecological sensitivity additional protection can be achieved by using modified construction techniques. These techniques may include the use of low ground pressure vehicles, or soil protection by means of surface covering with geotextile and bogmats.
 - Rapid return of the area to its former use and careful attention to drainage conditions will facilitate the re-establishment of normal rooting patterns. Should sub-soil compaction be suspected, ripping of subsoil will be undertaken prior to reinstatement of the topsoil. Areas that could be prone to high surface run-off and erosion will be prioritised during the construction and reinstated at the earliest opportunity.

- 6.33 Any damage to soils in agricultural land could have adverse consequences for future crops and therefore special care will be taken during construction to avoid or mitigate such damage by appropriate means.
- 6.34 Following the removal of the vegetation cover and topsoil, run-off rates during wet periods will increase. To minimise this, cut off drains, vegetation strips and low gradients will be utilised where necessary. These measures will reduce run-off velocities and therefore reduce erosion.
- 6.35 Air borne contamination and migration of dust along the pipeline spread during dry summer months may be controlled by water dampening as necessary. In very exceptional circumstances where “wind blow” is a particular problem grass seed can be sewn on the topsoil heap to aid stability.

Short Term Impacts

- 6.36 The short term, temporary impacts associated with pipeline construction include:-
- temporary loss of crop production within, and possibly adjacent to, the working-width;
 - temporary removal of field boundaries along the working-width;
 - increased risk of disease transmission associated with vehicle movements along the working-width; and
 - disruption of land drainage.

Temporary Loss of Crop Production within the Working-width

- 6.37 Construction of the pipeline will be restricted to a 36m working-width, as described in Chapter 2. However, some additional space will be required at the crossings (road/rail/watercourses) to allow for extra vehicle parking and the storage of additional spoil material. Temporary fencing, erected in advance of topsoil removal, will separate this area from surrounding land. This area will remain out of production until the soil is reinstated and the fence removed. The entire procedure will be completed within a single season unless adverse weather prevents reinstatement. In such a case reinstatement would be postponed to the following spring as restoration under wet conditions increases the risk of soil damage.
- 6.38 Intensive agricultural production depends on careful timing of operations, especially on difficult soils and is a seasonally dependent process, which may be disrupted by disturbance at any time up to harvest. It may be assumed that since the construction season coincides roughly with the growing season a loss of one year’s crop is inevitable within the working-width. In some cases, opportunities for landwork for a following crop may be restricted by late soil reinstatement. However, since the cultivation period for most crops includes a measure of flexibility, this effect is regarded as small.
- 6.39 Where land will be returned to grass, it is most likely that agricultural grass mixes and fertilisers and herbicides will be used as soon as soil and weather conditions are judged suitable. It is usual for reinstated grasslands to take longer to be re-established than non-grass crops and temporary fencing may be retained to avoid

damage by grazing animals until re-establishment is advanced. Advice on this issue will be sought at a later date when the route has been finalised and negotiations with landowners and occupiers are further developed.

- 6.40 Crop and grazing loss associated with the working-width is unavoidable, but the extent will depend on site details, including field area, production forecasts and loss of access. Resultant financial loss is a matter for compensation, to be agreed between BGE's land agent and individual landowners and occupiers.
- 6.41 "*Records of Condition*" of land along the pipeline route prior to construction will be agreed with the landowners/occupiers as an aid to assessing compensation. The working-width may create corners inaccessible to farm sprayers, irrigators, large machinery, or uneconomic to farm. This represents an indirect effect on either side of the working-width and loss here will also be compensated.
- 6.42 The provision of water for stock may be interrupted temporarily while the pipeline trench cuts the existing supply. Under these circumstances the pipeline contractor will provide an alternative means of supply, where required.

Temporary Removal of Field Boundaries

- 6.43 Field boundaries within the working-width will be partly removed to facilitate plant movement and to enable a continuous construction procedure. At hedge crossings the width of hedge removal will be sufficient to accommodate the pipe trench, stringing and running track only. The nature of such boundaries and the effect of their removal on ecological interests are described in Chapter 9.
- 6.44 Field boundaries will be reinstated according to a specification to be agreed with the landowners/occupiers and advice provided by SNH. In the event of crossing ancient (species rich) hedgerows, special restoration measures will be adopted. Hedges will be replaced with the required species, within a protective double fence. Ditches, culverts, bridges or tracks will be repaired or reinstated as appropriate.
- 6.45 The form and timing of replacement works will be determined in consultation with individual landowners/occupiers. This will ensure that disruption is minimised and that the replacement is acceptable. Where banks and field verges contain features of acknowledged ecological value, these will be re-seeded/replanted with an appropriate species mix or left to regenerate naturally.

Plant and Animal Health

- 6.46 Preventing the spread of plant and animal diseases is most important. Some diseases that affect plants and animals can be highly infectious. If the disease is in the soil, it can be spread if the contaminated soil is moved from one site to another either by transporting the soil or through contaminated equipment or personnel moving between sites. Since the pipeline is a linear feature and construction will pass through different fields and other land as it progresses it is important that appropriate precautions are taken to guard against this means of transmitting soil-borne diseases.

- 6.47 Matters relating to the spread of plant and animal diseases are the responsibility of the Scottish Executive – Rural Affairs Department (SERAD). At the time of writing SERAD were in the process of checking their database for any areas of notifiable soil-borne diseases and any recorded carcass burial pits in the locality of this pipeline route. This matter will also be discussed with individual farmers prior to construction.
- 6.48 In the unlikely event that any burial pits should be discovered during construction work then the appropriate authorities will be notified at that time. If necessary, the pipeline will be marginally re-routed to avoid the particular obstruction. Prior to pipeline construction further contact will be made to SERAD to ascertain the current status.

Mitigation on Plant and Animal Health

- 6.49 Provided general precautions are maintained, mitigation will be limited to normal good construction practice in the UK, and as stated in the general precaution leaflets issued by MAFF but also considered appropriate for this Scottish project, as below.
- "Preventing the Spread of Plant and Animal Diseases: A Practical Guide"
 - "Precautions to Prevent the Spread of Animal and Plant Diseases"
- 6.50 The general precautions include the following key requirements:-
- "Prevent unauthorised entry"
It is standard practice to fence the working-width with post and wire stockproof or other types of fencing as the need arises, and to erect temporary access gates where the working width crosses roads and public rights of way;
 - "Avoid damage"
It is standard practice to avoid all unnecessary damage and to make good or replace anything accidentally damaged or removed by construction. This includes trees, hedges, fences, walls, ditches and drainage outlets;
 - "Do not pollute"
All watercourses and groundwater are protected from pollution during construction; the measures taken being appropriate to the risk involved. This includes preventing pollution by careful management and control of fuel and oils and ensuring that surface water run-off from the working-width does not reach watercourses;
 - "Do not drop litter"
The pipeline construction contractor will keep the site tidy and collect and dispose of litter and waste construction materials, including packing, to an appropriate disposal location; and
 - "Take out insurance"
This is mandatory on the pipeline construction contractor to cover third party damage including loss of livestock or damage to crops arising from the works.

6.51 It is standard practice during pipeline construction to strip and store topsoil separately from the subsoil (excavated pipe trench material). Retention and restoration of the working-width are again standard practices that will ensure damage is avoided and that discernible permanent changes are absent.

Land Drainage

6.52 The need for and design of agricultural under-drainage is determined by the soil type, topography, climate, cropping practice and available technology with the agricultural system practised. Land drainage is required to enhance rooting conditions and structure in otherwise wet soils, and, on arable land, to extend the period during which soils may be cultivated without risk to soil structure.

Land Drainage Baseline Conditions

6.53 Artificial drainage and agriculture land drains are an essential part of this region's drainage strategy to preserve the land's growing capability. Land drains are present across much of this area and have been for many years.

6.54 A land drainage specialist will carry out a detailed survey, field by field, during the engineering design stage of the project in order to establish the full extent of the existing land drainage system. This matter will be worked out in discussion with individual landowners and occupiers, and in consultation with SEPA and affected Fishery Boards.

Assessment of Impact on Land Drainage

6.55 Drainage may be considered as a two component process:-

- movement of water through the soil into pipe drains by means of natural percolation and/or mole drains; and
- movement away from the soil by means of pipes, drains and ditches.

6.56 Along the line of the proposed route, the excavation of a trench to a depth of approximately 7feet/2.1m will have a localised impact on the existing field land-drainage systems. The minimum depth to the top of the proposed pipeline will typically be 3½/1.1m and therefore close to but generally below the depth expected for the existing drainage systems.

6.57 Where appropriate, replacement with a cut-off "header" drain will precede pipeline construction, in which case the drainage system is maintained independently of pipeline construction.

6.58 During trenching, any land drainage system crossed by the pipeline route will be cut. The immediate effects of disruption on pipes, ditches, or secondary features such as mole drains, and permeable fill, will vary with site conditions. However, the risk of inundation is minimised because excavation will be carried out during the summer period when drainage demand is usually at a minimum. Significant effects are therefore likely to be infrequent, temporary, and limited to the summer period.

6.59 Full restoration of field drainage is standard practice and drainage systems will normally be reinstated within the pipeline construction season. Changes caused by

settlement and siltation within excavated material are avoided by appropriate design and construction methods.

- 6.60 The potential effects on ditch systems include reduced bank stability and restricted flow. These will be minimised by attention to construction methods ensuring that the ditch is reinstated according to appropriate site requirements. Temporary effects on outfalls and flow rates will be minimal, as construction takes place during the drier months of the year.

Mitigation of Disruption to Land Drainage

- 6.61 The effects on land drainage will be minimised by a system of protection and reinstatement. Drainage systems affected by the proposed pipeline will be either restored or replaced, according to an appropriate specification and as agreed with the landowners/occupiers. Details of restoration will be defined on a field-by-field basis, as guided by existing records where available and supplemented by a detailed survey. For each field affected, a land drainage strategy will be prepared to:-

- delineate areas where land drainage is likely to be encountered;
- identify existing drainage systems as far as possible and design appropriate remedial measures; and
- identify areas where existing systems can be diverted to prevent water-logging of ground outside the working-width during construction.

- 6.62 All land drains encountered during construction will be clearly marked on both sides of the working-width. Reinstatement will subsequently involve either:-

- reinstatement of the drain over the trench with a suitable support to prevent settlement; or
- diversion of the drains by installing a new "header" drain above the trench to intercept the drainage pipes and convey water to a new outfall.

- 6.63 Temporary culverts and/or bridges will be installed to allow vehicles to cross watercourses, thereby mitigating disruption to both flow and water quality.

- 6.64 It is proposed that a drainage plan will be implemented to investigate, design and supervise appropriate works. Where necessary, supplementary reinstatement work may be undertaken.

- 6.65 Where there is a perceived risk from the pipeline trench being inundated with water from severed land drainage during construction cut-off drains will be installed to intercept uncontaminated surface water and thereby prevent it from entering the working area. Agreement with SEPA will be reached regarding the satisfactory disposal of this water, and discharge consents where required.

- 6.66 Surface water or groundwater from excavations or other parts of the working area should not be pumped or discharged directly into watercourses or drains but should be treated to ensure the removal of pollutants and sediments in accordance with SEPA requirements prior to discharge.

- 6.67 The pipeline will be laid with a minimum cover of 1100mm below ground level. At least 150mm of clearance over the pipeline will be required for any future field drainage or deep ground cultivation, such as subsoiling or mole drainage. Most field drainage is installed at between 700mm and 900mm depth, so it could cross over the pipeline with no constraints, except that as a precautionary measure no normal drainage trenching machinery will be used over the pipeline itself.
- 6.68 An aftercare programme will be implemented to ensure that any necessary work is carried out to the satisfaction of the landowners/occupiers.

Summary

- Approximately 90% of soil types crossed by the pipeline route comprise Brown Forest Soils associated with the following series: Etterick, Hollywood, Knockskea, Rhinns and Yarrow/Fleet. The remaining 10% of the route is within alluvial deposits at river crossings (8%), and peat (2%).
- Approximately 40% of the pipeline route crosses land of Grade 3 land capability status with a similar amount within Grade 4 land. The remaining 20% of the route crosses Grades 5 and 6 land.
- A range of measures will be employed to minimise the probability of soil compaction. These measures will include the removal and separate storage of topsoil from trench material, use of low-pressure tyres or wide tracks on fragile or poorly drained soils, and the rapid return of the working area to its former use.
- A project management team will oversee construction work and enforce appropriate care and control measures on the pipeline construction contractor. This will ensure that any long-term significant impacts on soil types are prevented.
- There will be a temporary loss of agricultural production within the working-width during construction of the pipeline. Crop production on arable land is normally affected for only one season provided reinstatement is carried out within that season. Productive grassland may require a longer period of aftercare to re-establish a vigorous and stable sward. Any resultant financial loss would be a matter for compensation. This compensation would be in addition to any wayleave payments for rights in land.
- To utilise split fields, animal and vehicular crossing points will be established along with the provision of temporary stock watering points if required.
- Field boundaries within the working width will be partially removed to facilitate plant movements and to enable a continuous construction procedure. Reinstatement of field boundaries will be to a specification agreed with the landowners/occupiers.
- The pipeline construction contractor will adhere to best construction practice and ensure that land is restored quickly to its original condition.
- A land drainage strategy will be prepared to ensure that disruption to drainage systems is minimised, that construction is carried out safely and effectively, and that the drainage system is reinstated satisfactorily.
- The MAFF guidelines outlined in the booklets highlighted in the Reference section of this Chapter are appropriate to this Scottish project, and shall be followed.

APPENDIX 6A

Summary of soils along the pipeline route and the implications for construction

Soil Association	Map Unit	Approx. coverage along proposed route (km)	Location	Characteristics
Alluvial	1	6.3	River valleys	High sand content. Some waterlogging.
Organic	3	0.6	Haugh of Urr	Thick peat waterlogged for most/all of year. Compaction will damage structure. Difficult to reinstate.
Etterick	206	5.3	North of Ringwood, Castle Hill to Nunlands	Brown forest soils and brown forest soils with gleying. Generally free draining.
	207	11.7	South of Castle Douglas, River Dee Valley Floor, Kirkcudbright to Brighthouse	Brown forest soils and brown rankers. Rocky. Well drained.
	208	19.5	Beattock to Springwell, Lochfoot to Culloch Burn	Brown forest soils and brown forest soils with gleying. Drumlins.
	209	0.5	North of Fulton Moor	Brown forest soils with gleying and non-calcareous gleys. Developed on thick till. Poor drainage.
	223	1.3	Lochfoot, Valleyfield	Brown forest soils and brown rankers. Rock outcrops. Well drained.

APPENDIX 6A continued.

Summary of soils along the pipeline route and the implications for construction

Soil Association	Map Unit	Approx. coverage along proposed route (km)	Location	Characteristics
	233	0.6	Fulton Moor	Peaty gleys, noncalcaerous gleys. Rushy pasture and sedge mire.
Hollywood	303	3.4	Valley floors,	Brown forest soils with gleying and brown forest soils. Needs drainage.
	304	2.5	Springwell to Kinnel Water	Brown forest soils with gleying and non-calcareous gleys. Poor drainage.
	305	3.7	North and West of Dumfries in valley floor	Free draining soils. Brown forest soils and brown rankers. Free draining.
	306	0.6	Castle Hill	Brown forest soils and some brown rankers
Knockskea	352	3.2	Park of Tongland to Argrennan Mains	Brown forest soils and brown rankers. Free draining soils. Rock outcrops.
Rhinnis	439	9.5	Haugh of Urr to Urr Water Crossing, Rhonehouse, Twyneholm to Kirkcudbright	Brown forest soils and brown rankers. Rock outcrops. Drumlins. Poor drainage on drumlins.
	440	4.2	Urr Water to Corra Lane	Brown forest soils with gleying, brown forest soils and brown rankers. Rock outcrops. More drumlins than 439 so more poorly drained.

APPENDIX 6A continued.

Summary of soils along the pipeline route and the implications for construction

Soil Association	Map Unit	Approx. coverage along proposed route (km)	Location	Characteristics
Yarrow/Fleet	576	2.8	Valley of Kinnel Water, Water of Ae, River Nith	Brown forest soils on gravel. Freely/excessively drained.
	578	3.3	Valley floor near Parkgate, Cargen Water	Brown forest Soils and peat and peaty alluvial soils.
	579	1.9	River Valley Floors	Brown forest soils on gravels and alluvium. Well drained.

References

Soil Survey of Scotland, Sheet 6 – South West Scotland
Soil Map 1:250 000

Soil Survey of Scotland, Sheet 7 – South East Scotland
Soil Map 1:250 000

Soil Survey of Scotland, Sheet 6 – South West Scotland
Land Capability for Agriculture Map 1:250 000

Soil Survey of Scotland, Sheet 7 – South East Scotland
Land Capability for Agriculture Map 1:250 000

Soil Survey of Scotland, Sheet 6 – South West Scotland
Soil and Land Capability for Agriculture Handbook

Soil Survey of Scotland, Sheet 7 – South East Scotland
Soil and Land Capability for Agriculture Handbook

Sustainable Urban Drainage Systems (SUDS)
Design Manual for Scotland and Northern Ireland – Report C521 CIRIA.

MAFF Booklets to be followed:

Preventing the Spread of Animal and Plant Diseases: A Practical Guide

Precautions to Prevent the Spread of Animal and Plant Diseases

**Code for Good Agricultural Practice for the Protection of Soil
The Soil Code – Revised 1998**

Code for Good Agricultural Practice for the Protection of Air

Code for Good Agricultural Practice for the Protection of Water

Controlling Soil Erosion

7. ARCHAEOLOGY

Introduction

- 7.1 This study seeks to collect all available evidence from a number of sources and present it in a form that will assist in minimising the effect the proposed pipeline may have on the archaeological resource. Also, recommendations are made to reduce the impact upon known archaeological features and to determine the presence of sites at present, unknown.
- 7.2 It should be borne in mind that this report can only deal with those areas that have been recognised from previous fieldwork and chance finds. There are many archaeological features whose presence cannot be detected without detailed survey and there is a risk that even then further unknown sites may be encountered

Method of Assessment

- 7.3 This assessment has been conducted in accordance with the Institute of Field Archaeologists (IFA) Standard for Desktop Assessments.
- 7.4 The study was carried out using all accessible desk based information from a variety of sources. This included county based Sites and Monuments Records (SMR) nationally held records, aerial photographs and historic maps.
- 7.5 The study area consists of a 400m wide corridor centred on the proposed pipeline route. Areas of large features or important sites outside the corridor were noted in order to set the study within a broader context.
- 7.6 The following sources of information were examined.
- National Monuments Record of Scotland (NMRS) run by the Royal Commission on Archaeological and Historical Monument Scotland (RCAHMS) in Edinburgh. Information was collected both through a visit to Edinburgh and via the CANMORE database.
 - Dumfries and Galloway Sites and Monuments Record, Dumfries
 - Reports prepared through the archaeological work on the BGE (UK) Ltd Interconnector Pipeline.
 - Digital vertical aerial photographs taken by BGE of the route in March 2000. These were most useful for defining the extent of upstanding ridge and furrow and showing the modern land-use.

Consultation

- 7.7 Historic Scotland and the Regional Archaeologist were consulted during the preparation of the report.

Field Inspection

- 7.8 A site visit was made to all principal road crossings in early September 2000. Areas of significant archaeology were visited to assess the local topography of the sites.

Statutory Protection of Archaeological Sites

Scheduled Ancient Monuments

- 7.9 Under the Ancient Monuments and Archaeological Areas Act 1979, a schedule of monuments deemed to be of national importance is maintained. Historic Scotland is consulted on the choice of individual monuments. The criteria for scheduling have been published but there are many sites of schedulable quality, which have not yet received this status.
- 7.10 No work which effects the physical nature of the monument may be carried out without the consent of the Secretary of State. Consent may be granted after a detailed application to the Secretary of State.

Listed Buildings

- 7.11 Listed Buildings that lie within or close to the study corridor are listed in Appendix A. None of these Listed Buildings is effected by the proposed pipeline route.

Other Archaeological Sites

- 7.12 The County Sites and Monuments Record is used by National Planning Guideline 5 (NPPG 5): Archaeology and Planning (Scottish Office Development Department, 1994), as the basis upon which decisions on the archaeological impact of development are made. The basic premise of NPPG 5 is that archaeological deposits are a finite non-renewable resource that must be protected. It also points out the unknown nature of archaeological deposits and allows Planning Authorities to include within planning conditions, archaeological evaluation, to determine the full impact on the archaeological resource. The evaluation can be required prior to determination of the planning decision. This evaluation may detail any measures that can be implemented to mitigate the damage and help to decide whether excavation is required of the threatened archaeological features.

Baseline Conditions

General Nature of Archaeology in Study Corridor

Early Prehistoric 8000BC-1000BC

- 7.13 The most common site recognised in the record for this area is the burnt mound. These are regarded as the remains of cooking sites and usually date to the Bronze Age. The results from the BGE (UK) Ltd Interconnector Pipeline studies in 1993-4 accounts for the majority of the site noted on the list. Any further large-scale linear project is likely to encounter further sites of this type. The burnt mounds indicate the presence of settlement; an example of this was the discovery on the route of the BGE pipeline of the Blairhall Burn settlement. This consisted of several roundhouses with a metal working area of Bronze Age date.
- 7.14 Cropmark sites of enclosures represent other sites of the same period. There are also stone circles and cursuses known from the region which have their origins in the period. A further common feature of the early prehistoric is the distribution of cup and ring marked stones, such as those around Clauchendolly. Recent work has suggested that simple decorated stones on upland areas represent summer time use by pastoralists, with more complicated patterns on stones in lower lying valleys representing the permanent year round settlement.

Late Prehistoric 1000 BC-500AD

- 7.15 Earthwork forts or enclosures represent nearly all the sites of this period. Other occupation from this period is likely to be found within the cropmark enclosures that have not yet been dated. Little artefactual evidence is known, except for the well known discovery of material from Torrs Hill. This consisted of a metalwork pony cap and drinking horns.

Roman 100AD-400 AD

- 7.16 Military sites represent much of the evidence of this period. Various routeways have been suggested as Roman roads, although there is little evidence to support this. The BGE pipeline made several notable finds from the period in sand dunes at Brighthouse Bay. These were an iron spearhead and a coin mould for producing forged coins discovered in a soil horizon covered by wind blown sand.

Medieval 500AD-1600 AD

- 7.17 The largest proportion of the sites in this period is fortifications and ecclesiastical sites. There is scant information for domestic occupation, both due to an absence of research in the area and the limited range of artefacts used. An area of medieval occupation was recorded on the BGE pipeline at Chapleton beside the A75, which was possibly associated with documentary evidence for a chapel on the site.

It is likely that much of the rural settlement was located in the present day farmsteadings.

Post Medieval 1600 AD-Present Day

7.18 In recent years, many sites of this period have been added to the record by systematic surveys. The addition of farmsteadings and other sites associated with agriculture has greatly increased the numbers added to the archaeological record. This period saw a great development of the landscape with the planting of shelter belts and other features for the large estates.

Sites of Unknown Date

7.19 This is a broad category, which includes many non-archaeological sites, as well as those for which there is no direct evidence of date. It is likely that many of the cropmark sites represent Late Prehistoric or Roman period native settlements.

Gazetteer Listing

7.20 Table 7.1 below is a gazetteer of all sites listed in the various sources, together with information shown on historic maps. The archaeological drawings (Drawing numbers ARC1 to ARC34) bound in the Addendum of Drawings, show the sites and their known extents.

Grading

7.21 The sites have been graded according to their degree of significance and importance. This can be a very subjective process, the outcome of which can reflect many different processes. The interests of those categorising the site, and the available information may all have a bearing on the eventual result. It should therefore be remembered that this grading is purely an arbitrary classification designed to allow choice over the relative importance of sites in the pipeline corridor.

Table 7.1 – Archaeological Classification Methodology

Grade	A	B	C	D	E
Description	Legally protected	Known archaeological sites, historic buildings	Archaeological sites of uncertain character or date	Historic landscape components and possible sites	Single find spots, modern landscape components
Examples	Scheduled Ancient Monuments, Listed Buildings	Burial sites, Deserted Medieval Villages, Roman roads	Field systems, former buildings, courses of Roman roads, dense find scatters	Ridge and furrow, old field boundaries, unidentified features on aerial photographs	Single find spots, modern field boundaries, drains and ponds
Mitigation	To be avoided	To be avoided	Avoidance recommended	Avoidance not envisaged	Avoidance unnecessary

Map	No.	Source	E'ng	N'ng	Name	Type	Date	Category	Impact
NY09NE	8	DGSMR	308400	596800	The Mount Lochwood	Tower house SAM	M	A	
NY08NW	31	DGSMR	302300	588300	Parkgate	House	PM	C	
NY08NW	20	DGSMR	301930	587940	Ashbank	Ring ditch Cropmark	EPreH	C	
NY08NW	12	DGSMR	301500	587640	Kirkmichael Mains Cottages	Enclosure Cropmark (Possible)	LPreH	C	
NY08NW	9	DGSMR	300000	586900	Fulton	Cairns	U	D	
NX98NE		DGSMR	298890	586200	Annfield Moor	Burnt Mound and Scoop	EPreH	C	
NX98NE		DGSMR	298810	586090	Annfield Moor	Burnt Mound	EPreH	C	
NX98NE	35	NMRS	297600	585350	Ellerlee	Farmsteading	PM	D	
NX98NE	36	NMRS	297970	585600	Ellerlee	Farmsteading	PM	D	
NX98NE	11	DGSMR	297560	585210	Ellerlee	Field Clearance Cairns	U	D	
NX98SE	47	DGSMR	296100	583600	Gateside Bridge	Linear Cropmarks	U	D	
NX98SE	31	DGSMR	29532	58366	Foregirth Farm	Possible stone circle	EPreH	C	
NX98SW	58	DGSMR	294600	583600	Sandbed	Linear Cropmarks	U	D	
NX98SW	45	DGSMR	294050	583190	Portrack House	Enclosure Cropmark	U	C	
NX98SW	56	DGSMR	294120	583170	Portrack House	Roman Temporary Camp (possible)	R	B	
NX98SW	90	DGSMR	294130	582665	Hulton	Enclosure Cropmark	U	B	
NX98SW	47	DGSMR	293270	581420	Williamsfield	?Burnt Mound	EPreH	C	Unc.
NX97NW	24	DGSMR	293300	579700	Fiddlers Ford	Enclosure Cropmark	LPreH	C	Unc.
NX97NW	52	DGSMR	293900	577300	Stud Farm	Enclosure	U	B	
NX97NW	51	DGSMR	294000	577200	Stud Farm	Ring-Ditch	EPreH	C	Unc.
NX97NW	18	DGSMR	294280	576780	Terregles	Deserted Medieval Village	M	C	
NX97NW	30	NMRS	293979	576516	Terregles	Manse	PM	C	

Map	No.	Source	E'ng	N'ng	Name	Type	Date	Category	Impact
NX97NW	31	NMRS	293892	576523	Halmyre	House	PM	C	
NX97NW	55	NMRS	293670	575443	Terraughtie Wood	Field bank	PM	D	
NX97SW	2	DGSMR	292790	574960	Castlehill	Fort	LPreH	B	
NX97SW	22	NMRS	291222	573642	Kirkbrae	House	PM	C	
NX87SE	10	NMRS	289939	574062	Moat Hill	Earthwork	U	C	
NX87SE	2	DGSMR	289630	574460	Drummore Farm	Enclosure	U	D	
NX87SE	32	DGSMR	288600	573500	Bridge of Sark-Portpatrick	Military road	PM	D	Minor
NX87SE	29	NMRS	288600	573400		Building	PM	D	Unc.
NX86NW	31	DGSMR	283420	569560	Meikle Culmain	Burnt Mound	EPreH	D	
NX86NW	5	DGSMR	282430	565290	Redcastle	Standing Stone SAM	EPreH	A	
NX86NW	4	DGSMR	280850	563750	West Logan	Palisaded Enclosure	EPreH	B	
NX86SW	5	DGSMR	280560	563240	West Logan	Barrow, Enclosures Cropmarks	EPreH	B	
NX65SE	18	DGSMR	279890	562670	Camp Hill	Fort	LPreH	C	
NX75NW	37	DGSMR	274800	558670	Slagnaw	Cup and Ring-Markings	EPreH	C	
NX75NW	4	DGSMR	274130	558390	Auchlane	Moat	M	B	
NX75NW	10	DGSMR	271650	557460	Kirkcormack mote	Motte, SAM	M	A	
NX75NW	11	DGSMR	271600	557460	Kirkcormack	Church	M	A	
NX75NW	30	DGSMR	270400	556800	Park of Tongland	Cup and Ring-Markings	EPreH	C	
NX65NE	6	DGSMR	269960	556090	Park, Tongland	Caim, SAM	EPreH	A	
NX65SE	58	DGSMR	268334	554600	Kempleton	Linear Cropmarks	U	D	
NX65SE	100	DGSMR	267200	553000	Sour Hill	Enclosure Cropmark	U	B	Unc.
NX65SE	108	DGSMR	266710	552790	Sour Hill	Burnt Mound	EPreH	C	
NX65SE	24	DGSMR	266270	552080	Compstonend	Fort, SAM	LPreH	A	
NX64NW	19	DGSMR	264940	548950	Witches's Thorn	Caim	EPreH	B	
NX64NW	2	DGSMR	264870	549150	Luskie Burn	Tower	M	D	

Map	No.	Source	E'ng	N'ng	Name	Type	Date	Category	Impact
NX64NW	51	DGSMR	264850	546840	Clauchendolly	Cup and Ring-Markings	EPreH	C	Unc.
NX64NW		DGSMR	264880	547540	Clauchendolly	Burnt Mound	EPreH	C	
NX64NW		DGSMR	264910	547550	Clauchendolly	Burnt mound	EPreH	C	
NX64NW	50	DGSMR	264670	547410	Clauchendolly	Cup-marks (4)	EPreH	C	
NX64NW	60	DGSMR	264490	547290	Clauchendolly	Cup and Ring-Markings	EPreH	C	
NX64NW	22	DGSMR	264500	547200	Clauchendolly	Cup-markings	EPreH	C	
NX64NW	23	DGSMR	264500	547200	Clauchendolly	Cup and Ring-Markings	EPreH	C	
NX64NW	62	DGSMR	264400	247000	Clauchendolly	Cup and Ring-Markings	EPreH	C	
NX64NW	26	DGSMR	264720	546680	Clauchendolly	Cup and Ring-Markings	EPreH	C	
NX64NW	63	DGSMR	264460	546230	Clauchendolly	Cup-markings	EPreH	C	
NX64NW	64	DGSMR	264440	546210	Clauchendolly	Cup-markings	EPreH	C	
NX64NW	27	DGSMR	264460	546200	Clauchendolly	Cup-markings	EPreH	C	
NX64NW	56	DGSMR	264720	546200	Clash Cottage	Burnt Mound	EPreH	C	
NX64NW	25	DGSMR	264400	545900	Brighthouse Plantation	Cup and Ring-Markings	EPreH	C	
NX64NW	57	NMRS	264580	545840	Brighthouse Plantation	Cremation	EPreH	C	
NX64SE	1	DGSMR	265410	544360	Manor Castle	Castle	M	C	

Key to Table 7.2

DGSMR	Dumfries and Galloway Sites and Monuments Records
NMRS	National Monuments Record Scotland
SAM	Scheduled Ancient Monument
LB	Listed Building
EPreH	Early Prehistoric
LPreH	Later Prehistoric
R	Roman
M	Medieval
PM	Post Medieval
U	Undated

Assessment of Impact

General

- 7.22 All the sites have been rated according to the damage that may be inflicted upon them by the construction of the pipeline assuming a 36m working width and using the route as supplied on the strip maps of June 2000. A number of changes to the proposed route have been incorporated in this study during the course of the study.
- 7.23 The impact on sites that are found during construction cannot be determined, even if the affected parts are fully excavated. It is true that for the parts of the site within the working width, the impact is major or severe, but without information on the full extent of these sites, the level of the impact on a site as a whole, is uncertain.
- 7.24 Impact on the archaeology at each site is graded as:
- Severe: Complete or almost complete destruction of deposits.
 - Major: A high proportion of deposits damaged or destroyed.
 - Minor: A small proportion of the surviving deposits damaged or destroyed.
 - None: Deposits will not be affected, because of distance from the pipeline, or method of construction
 - Uncertain: The extent or nature of the deposits is unknown, or construction techniques have not yet been determined.

Site Specific Assessment and Recommendations

- 7.25 The sites identified in the study area are listed in table 7.3 below. This ranks those sites, which have some potential impact from the pipeline against their order of importance. This listing excludes those minor features such as removed field boundaries and areas of rig and furrow.

Table 7.3 – Sites ranked for archaeological potential

Category	Impact	Sites with no Impact	Total
A	0	6	6
B	1	8	9
C	4	31	35
D	2	11	13
E	0	0	0
Total	7	56	63

Category A Sites

- 7.26 No Category A sites are affected by the proposed pipeline route.

Recommendations for Category A sites: None

Category B Sites

7.27 One Category B site is possibly affected by the pipeline, as below:

- NX65SE 100 Sour Hill Enclosure cropmark. This site appears to be sufficiently far from the pipeline not to be directly affected, although there may be some unknown associated features that could be affected.

Recommendations for Category B sites: as below

7.28 The positions of the cropmark features should be “accurately” plotted and the pipeline route realigned to avoid the features, if possible. Evaluation of the pipeline route by means of geophysical survey or trial trenching should be undertaken in the vicinity of the feature.

Category C Sites

7.29 Four Category C sites are either affected by the pipeline or lie relatively close to the pipeline working width, as below:

- NX97NW 51 Stud Farm ring ditch appears to be sufficiently far from the pipeline not to be affected, there are some uncertain cropmark features within the pipeline corridor which may be affected. A provisional response discussed with the Regional Archaeologist is to strip this area of the pipeline in advance and excavate any archaeological features prior to further pipeline operations
- NX97NW 24 Fiddlers Ford Enclosure cropmark is shown as lying in a field outside the pipeline route, so should be completely isolated from an impact, although it is rather close.
- NX98SW 47 Williamsfield burnt mound, is relatively close to the pipeline route, the feature itself will not be an extensive one, but may indicate the presence of other similar features.
- NX64NW 51 Clauchendolly cup and ring-marked stone, this appears to be an outlier of the Clauchendolly group of cup and ring-marked stones. It lies relatively close to the pipeline route, but should not be impacted upon it. The feature has only recently been discovered so should be easily relocated. It should be identified and marked so that it is not affected by construction of the pipeline. This technique should apply to all cup and ring-marked stones in the Clauchendolly/Brighouse area.

Recommendations for Category C sites: as below

7.30 The positions of the features quoted above should be “accurately” plotted. The extent and location of the features should be marked out so that they will not be affected by construction. Evaluation of the pipeline route by means of geophysical survey or trial trenching should be undertaken in the vicinity of the features.

Category D Sites

7.31 Two Category D sites have been identified as having a potential impact from construction of the pipeline, they are as below:

- NX87SE 29 a building, a minor deviation of the pipeline may be required to avoid this feature if appropriate. A re-examination of the 6" First Edition Ordnance Survey of 1850 shows the building and enclosure of Loaninghead as lying to the east of the road junction, rather than the location of the grid reference given by NMRS (to the west of the road junction). There should therefore be no impact upon this feature.
- NX87SE 32 the Old Military Road, there will be little impact on this crossing of the road.

Recommendations on the Category D sites: as below

7.32 A watching brief during construction at NX87SE 29 would record any further extent of the site than is currently known.

Category E Sites

7.33 No Category E sites have been identified in this study.

Recommendations for Category E sites: None

Mitigation

7.34 There are a small number of areas along the proposed pipeline route, as detailed in the recommendations above, where specific actions are required in order to minimise or prevent damage to archaeological sites. After the extents of any significant archaeological sites have been determined on the ground then the pipeline route can be marginally moved to avoid or minimise encroachment.

7.35 The following actions are recommended to assist in the determination of the wider impact that the pipeline would have upon unknown archaeological sites:

1. Detailed plotting of features on aerial photographs to define the extent of features close to the pipeline route.
2. Field walk of the route at a suitable time of the year (during the winter)
3. The preparation of an Archaeological Management Plan (AMP) that will be incorporated into an overall Environmental Management Plan (EMP). The EMP will form a part of the Pipeline Construction Contract. The AMP will detail areas where archaeological mitigation is proposed and the type of mitigation envisaged. The AMP will be developed in consultation with the archaeological section of Dumfries and Galloway Council and shall highlight where the following items are required:

- geophysical survey or trial trenching within the pipeline working width to check for any potential archaeological areas, to be dug ahead of construction,
- areas where the working width should be reduced
- other protective measures to prevent damage to archaeological remains during construction.

7.36

This assessment has identified a few sites of confirmed and possible archaeological potential. It should however be realised that the proposed line of the pipeline may contain hitherto unrecognised sites and that such sites may be affected by the construction of the pipeline. It is therefore recommended that an archaeological watching brief be maintained during topsoil stripping along the entire length of the pipeline working width in advance of digging the pipe trench. Such mitigation measures undertaken early on will allow any archaeological sites encountered to be excavated, recorded and sampled without causing undue delay to the pipeline construction programme.

Summary

- The proposed pipeline crosses an area of demonstrated archaeological potential but it will not affect any sites of national importance.
- There are 63 recognised sites of archaeological importance within the 400 metre wide study area. Of that number 7 sites are identified as having potential for impact from construction of the pipeline. In many cases, the full extent may not have been fully determined by archaeological study. There is a high potential that other unknown sites will be affected by the pipeline.
- It is proposed that mitigation will consist of: a line walk of the route to identify any unknown features; some archaeological evaluation trenches and a geophysical survey if appropriate. The results of this pre-construction work will be discussed with Dumfries and Galloway Council Archaeological Section prior to construction to establish an appropriate strategy. It is intended to maintain a watching brief during pipeline construction, paying particular attention during topsoil stripping and pipe trenching.
- As part of the Environmental Management Plan, an Archaeological Management Plan (AMP) shall be incorporated. The AMP will detail where archaeological mitigation is required within the construction contract.
- Provision will be made for the analysis, publication, storage and display of archaeological material found on the pipeline route. Any findings shall be recorded and distributed to interested parties.

References

1. Maynard DJ 1993 Burnt Mounds around a pipeline in Dumfries and Galloway, Dumfries and Galloway History and Antiquarian Society, LXVIII
2. Maynard DJ *et al* 1994 Archaeological discoveries in the Dune System at Brighthouse Bay, Dumfries and Galloway Natural History and Antiquarian Society, LXIX.

Appendix 7-A -Listed Buildings within the Study Area

Name	Grid Reference	No.
Lochwood	NY 084 968	9872
Greenbeck	NY 075 906	9879
Parkgate	NY 022 883	103809
Kirkmichael House	NY 012 878	10368
Sunny Brae	NX 970 844	10270
Terraughtie House	NX 934 752	17171
Argrenan House	NX 585 581	17114
Argrenan Walled Garden	NX 585 579	43477
Kempleton House	NX 681 545	16985
Senwick House	NX 645 466	3404

Appendix 7-B - Ordnance Survey First Edition 6” maps consulted

Sheet XXIV	Surveyed 1857	Dumfriesshire
Sheet XXXIII	Surveyed 1857	Dumfriesshire
Sheet XLI	Surveyed 1855	Dumfriesshire
Sheet XLII	Surveyed 1857	Dumfriesshire
Sheet XLIX	Surveyed 1855	Dumfriesshire
Sheet 26	Surveyed 1850	Kirkcudbrightshire
Sheet 27	Surveyed 1850	Kirkcudbrightshire
Sheet 33	Surveyed 1850	Kirkcudbrightshire
Sheet 39	Surveyed 1852	Kirkcudbrightshire
Sheet 40	Surveyed 1848-51	Kirkcudbrightshire
Sheet 44	Surveyed 1848-50	Kirkcudbrightshire
Sheet 45	Surveyed 1848-49	Kirkcudbrightshire
Sheet 50	Surveyed 1848-50	Kirkcudbrightshire
Sheet 54	Surveyed 1850	Kirkcudbrightshire

Appendix 7-C - Features Identified From the First Edition Ordnance Survey within the Study Area

NY 0880 9662	Gravel pit
NY 0872 9547	Old gravel pit
NY 0851 9374	Old gravel pit
NY 0853 9359	Old gravel pit
NY 0844 9286	Old gravel pit
NY 0841 9231	Old gravel pit
NY 0837 9261	Old gravel pit
NY 0804 9170	Old gravel pit
NY 0454 8930	Buildings 'Old Meikleholm'
NY 0438 8886	Buildings 'Burnfoot'
NX 9888 8647	Gravel pit
NX 9341 7970	Buildings 'Holyn Bush, lies close to the cropmark site NX97NW24
NX 9001 7443	Gravel pit
NX 7400 7494	Mill Dam
NX 8863 7336	Building 'Loaninghead', lies close to grid reference for NX87SE29
NX 8865 7316	Old gravel pit
NX 8858 7314	Old gravel pit
NX 8782 7289	Old quarry
NX 8672 7208	Quarries
NX 8621 7148	Buildings 'Head'
NX 8495 7046	Old quarry
NX 8413 6920	Old quarry
NX 8402 6922	Building 'Coudieknowe'
NX8394 6921	Quarry
NX 7596 5928	Quarry
NX 7505 5875	Mill Dam
NX 7484 5881	Sluice
NX 7486 5925	Mill (bone crushing)
NX 7165 5777	Quarries
NX 7025 5618	Mill Dam
NX 6829 5540	Gravel pit
NX 6792 5424	Sluice
NX 6488 4918	Ruins
NX 6590 4904	Ruin
NX6562 4785	Buildings 'Broadfield'
NX 6489 4728	Quarry
NX 6475 4710	Quarry
NX 6475 4696	Quarry
NX 6436 4505	Sluice
NX 6465 4474	Thrashing mill
NX 6458 4470	Mill Dam

8. HYDROLOGY

Introduction

- 8.1 Watercourses in Dumfries and Galloway tend to run north to south, while the route of the pipeline heads north-east to south-west. This means that the crossing of watercourses will be inevitable.
- 8.2 Scottish Environment Protection Agency (SEPA) is the non governmental agency responsible for, amongst other environmental protection services, promoting the cleanliness of inland waters, groundwater and tidal waters and to licence discharges and issue statutory notices. These powers are used to prevent, minimise, remedy or mitigate the effects of pollution on the environment under the Control of Pollution Act 1974 (as amended) and the Integrated Pollution Control Regime introduced by the Environmental Protection Act 1990.

The aims of this report

- 8.3 The aims of this report are to:
- Carry out a qualitative assessment of the proposed works on the surface and ground water resources, with an emphasis on surface water quality and effect on fisheries; and
 - Prepare mitigation methods.

Issues relating to any important wildlife habitats within the watercourse corridors are addressed in Chapter 9 - Ecology.

Information sources

- 8.4 Information used in this report has been accessed largely from published documentation. In addition Dumfries and Galloway Regional Council, Planning and Environment and Infrastructure Departments, SEPA, the West Galloway Fisheries Trust and the District Fisheries Boards have been consulted.
- 8.5 With SEPA assistance a list of rivers, burns and ditches to be crossed by the pipeline route has been drawn up and included in Appendix 8A.
- 8.6 A vantage point survey was undertaken in late September 2000 following a prolonged period of rain. The survey sought to observe channel form and estimate flow. Information and experience of the river crossings from the previous Interconnector project has been used to determine the potential effects of pipeline construction.

- 8.7 No flow gauging has been carried out during this study. River flows and statistics for permanent gauging stations have been obtained from the Institute of Hydrology (Appendix 8B).

Baseline Conditions

Geology

- 8.8 The solid geology of the river catchments covered in this study consists of Silurian greywackes, shales and mudstones, also Triassic sandstones and occasional granite intrusions. The drift geology consists predominantly of glacial till covering a large percentage of the area and glacial sand and gravel.

Precipitation

- 8.9 Average precipitation measured within the catchments of concern range from 1340mm to 1754mm per annum. This is a high average compared to the UK as a whole and largely reflects the maritime climate of the area, being close to the west coastline and subject to the prevailing, moisture laden, south west winds.

Run off

- 8.10 The shallow geology in this area is predominantly glacial till. Because of the high percentage of clay within this drift deposit the soils are slowly permeable and as a result the percentage of run off following precipitation is higher than average. Additionally, where the drift is thin or absent, which occurs more frequently in the western section of the pipeline route, the underlying solid geology which is exposed consists of Silurian sediments which are also slowly permeable. The result of both the drift and the bedrock being largely impermeable is that run off from the catchment can be expected to be higher than average. This situation may lead to rapid changes in flow along surface watercourses. This can be observed throughout the year and may have a significant impact on construction.
- 8.11 Low flows in the months of July and August are largely a result of high soil moisture deficit (SMD) resulting in much reduced run-off. In September, by contrast, it is apparent that catchment soils can quickly reach field capacity thereby increasing run-off. Large and lasting increases in river flow are experienced in this and subsequent months.

Channel Stability

- 8.12 The geology and soils of the river bed and banks, together with the water flow rate determine the stability of the watercourses. A number of the watercourses along the route may exhibit bank instability to some degree due mainly to the unconsolidated nature of the drift deposits. The Water of Ae in particular is known to have a variable course with unstable banks. This was also true of the Kinnel Water until its course was straightened several years ago.
- 8.13 There are some areas along the pipeline route which are marshy, such as Lochwood Moss, near Beattock, and special construction techniques may have to be employed in the event that pipeline routing cannot avoid these areas.

Flooding

- 8.14 The Urr Water and River Dee crossings include areas of flood plain in adjacent agricultural land, which can often be under water for some time following prolonged or heavy rainfall.
- 8.15 The Whitesands area and surrounding agricultural land north of Dumfries have a history of flooding by the River Nith. High flood banks now line much of the River Nith to prevent flooding of adjacent farmland in the vicinity of the proposed crossing. The River Dee north of Castle Douglas and at Tongland has operable weirs as part of a hydro electricity scheme. An affect of this type of flow management would be to increase, at short notice, the flow in the river that may have the potential to flood land adjacent to river crossings.

River Water Quality

- 8.16 Discussions with SEPA and reference to their State of the Environment Report published in July 1999 indicates that the general quality of the watercourses in the region is of a high standard. Pollution incidents do occur but are generally on a localised scale. The majority of incidents are a result of farm drainage, with a significant number of complaints of pollution by silage effluent received over the winter months.
- 8.17 Legislation pertaining to water quality has been defined in a number of European Community Directives. These aim to standardise all aspects of water quality. Each member state within the EC has to conform to these standards in addition to its own existing legislation.
- 8.18 In 1996, SEPA reviewed the thirty-year-old river classification system and introduced a new Water Quality Classification scheme for rivers that involved an assessment of the chemical, biological, nutrient and aesthetic measures of environmental quality. Chemical components include measures of organic, toxic, and nutrient pollution. The biological aspects relate to the sampling of invertebrates whilst the aesthetic assessment refers to the accumulation of litter. The following table summarises the new classes of the River Classification system.

Table 8.1: River Classification classes

Class	Description	Comments
A1	Excellent	Sustainable salmonid fish population. Natural ecosystem.
A2	Good	Sustainable salmonid fish population. Ecosystem may be modified by human activity.
B	Fair	Sustainable coarse fish population. Salmonids may be present. Impacted ecosystem.
C	Poor	Fish sporadically present. Impoverished ecosystem.
D	Seriously Polluted	Cause of nuisance. Fauna absent or seriously restricted

- 8.19 The major watercourses within the pipeline route corridor fall into the following classifications, as shown in Table 8.2. The classifications are based on the 1996 data which is the most recent information readily available from SEPA.

Table 8.2: Classification of rivers crossed by the pipeline

River	Classification
Kinnel Water	A2
Water of Ae	A2
River Nith	A2
Cluden Water	A1
Urr Water	A2
River Dee	A2
Tarff Water	A2

- 8.20 Although there has been a general water quality improvement since the 1980's, there are still problems with respect to acidification particularly to the west of the Dumfries and Galloway Region where low pH values are due to the combination of acidic rainfall and the underlying rocks and soils. Average pH values of the acidified rivers have not changed since the early 1980's and under these circumstances it is envisaged that some parts of the main rivers in the region will continue to fail the pH requirements of the EC Freshwater Fish Directive (78/659/EEC).

Fisheries

- 8.21 The Scottish Office has designated 36,658km of rivers in Scotland as salmonid waters and a further 73km as cyprinid waters (Forth and Clyde Canals) under the EC Freshwater Fish Directive (78/659/EEC). This directive specifies chemical water quality standards that will ensure that the waters will continue to support healthy fisheries. SEPA is responsible for setting achievable targets for water quality improvement.
- 8.22 Angling is the greatest single participation sport in Britain. The rivers of this area attract anglers from all over Britain throughout the fishing season. The coarse fishing season is between June and March and the trout and/or salmon season is from February until November; dates vary according to the specific river. Many of the watercourses along the route are likely to be crossed during the fishing season so anglers shall be notified and consulted. The District Salmon Fisheries, landowners and identified fisheries downstream will be notified in advance of construction occurring within fishing areas.
- 8.23 The Rivers Dee, Urr, Nith, Water of Ae and Kinnel Water all sustain valuable salmon and sea trout fisheries. Also, many of the smaller watercourses along the route are the spawning tributaries of these species. In addition to the salmonid populations many of these watercourses support healthy eel, stickleback, minnow, stone loach and brook lamprey populations.
- 8.24 District Salmon Fisheries Boards, which have been formed under the Salmon Act 1986, as non profit making organisations to safeguard and promote the salmon fisheries, have been consulted for the following catchments:

- Dee;

- Annan;
- Nith; and,
- Urr.

- 8.25 The construction of the pipeline has the potential to effect these populations and the local fishing interests. The main concern relates to increased sediment loading from the construction of watercourse crossings and from run-off from nearby construction works. The immediate effects of sediment loading are to damage gills through abrasion and may cause infection and mucus build up, which in severe cases can kill fish. The silting of spawning gravels can result in mortality of eggs through a lack of oxygen and in the longer term, compaction of these gravels may result in spawning fish being unable to dig redds successfully. Coloured (turbid) water can also impact on fishery interests through a loss of fishing days.
- 8.26 To reduce these possible impacts, it is essential that construction work be undertaken sympathetically in relation to timing and techniques. Excavation of sensitive watercourses will only be undertaken between June and September when flows are lower. At that time of year there are no eggs in the gravel's, fry are past their most sensitive stage and if flows are low, then any sediments that have been mobilised will quickly settle limiting the length of the affected area.
- 8.27 It is acknowledged that SEPA is responsible for water quality and consultation will be actively perused in the development of suitable method statements for pipeline construction. All method statements will be submitted to SEPA for review prior to commencement of the works.
- 8.28 Trenchless crossing methods are desirable as they would eliminate work in the river bed. The final crossing methods will be considered during detailed design and will be dependent on the ground conditions. Site investigation works including bore holes and trial pits are programmed to start early in 2001. However, it is most likely that because of the cobbly nature of the beds of the major river crossings, it may not be possible to utilise trenchless pipeline installation methods (i.e. thrust bore or horizontal directional drilling).

Surface water abstraction

- 8.29 There is no requirement to obtain licences for abstraction of water from rivers and streams in Scotland and subsequently little data is available on abstractors which could be affected by the proposals. Prior to construction, abstractors downstream of the crossings will be identified, as far as possible, through liaison with SEPA, local landowners/occupiers and fisheries boards.

Major Rivers

- 8.30 The pipeline corridor lies within the drainage basins of the following primary catchment rivers: Annan, Nith, Urr and Dee. A list of all the river crossings and their locations are provided in Appendix 8A and shown on the route maps in the Addendum of Drawings. The major rivers are summarised in Table 8.3.

Table 8.3: Summary of Major River Crossings

Primary catchment	Sub catchment (River Crossing)	Brief description	Approx. channel width (m) - July 2000 / Spate flow width (m)
Annan	Kinnel Water (RVX1)	Wide channel that has been straightened in recent years, large semi-rounded cobbles / boulders in full bank area. Incised meander, fast flow in channel	5m / 25m
	Water of Ae (RVX 2)	Like the Nith with rocky outcrop and cobble bed. Channel narrowed by accretionary wedge. Large boulder revetment on outer meander, steeply cut bank.	3m / 25m
Nith	River Nith (RVX 3)	Wide channel, shallow and slow moving river, steep banks with adjacent pasture land. Down stream channel narrows to get around accretionary wedge. Fast moving in this section.	12m / 35m
	Cluden Water (RVX 4)	Rocky with bedding planes exposed. Fast flow in channel. Channel widens upstream. Deeper upstream with abundant <i>rannunculus sp.</i>	12m / 22m
	Cargen Water (RVX 5)	Narrow slow moving river, deep channel. Well vegetated banks. Stony riffles.	5m / 8m
Urr	Urr Water (RVX 6)	Shallow, fast flowing. Cobbly, non-vegetated banks	8m / 25m
Dee	River Dee (RVX 7)	Wide low bank, rocky and muddy bank. Rocky pools. Adjacent pasture and arable land.	15m / 40m
	Tarff Water (RVX 8)	Deep channel, engineered trapezoidal channel with block revetment. Fast flow. Arable land adjacent	5m / 10m

- 8.31 The construction of the 1st Interconnector pipeline saw a range of crossing types with banks of earth and shingle, some crossings such as the River Dee presented construction problems with rock being encountered. By targeting more detailed ground investigation works during the detailed design phase of the project, an in-depth knowledge of the actual ground conditions will be utilised in the development of suitable method statements for watercourse crossings.

Major river flow data

- 8.32 Where available, river flow data was obtained from the Institute of Hydrology (Appendix 8B) for rivers crossed by the proposed pipeline. This information is

collected by SEPA from permanent gauging stations on the following rivers:

- Kinnel Water;
- River Nith;
- Cluden Water;
- Urr Water; and,
- River Dee.

8.33 Continuous flow data was not available for the following major rivers which are also crossed by the proposed pipeline:

- Water of Ae;
- Cargen Water; and
- Tarff Water.

8.34 Data from gauging stations is displayed below along with significant statistics. The following statistics are given:

- **Average flow:** This is the mean average flow compiled from the complete record;
- **Low flow (or Q₉₅):** Referred to herein as the Q₉₅ flow, this is the flow which is exceeded for 95% of the record;
- **High flow / spate flow (or Q₁₀):** Referred to herein as the Q₁₀ flow, this flow is only exceeded for 10% of the record; and,
- **Rank** the rivers are ranked according to their flows, 1 being highest and 8 being lowest.

Table 8.4: Major river crossings from east to west

Primary catchment	Sub catchment (River Crossing)	Gauging station	Mean Q	Q ₉₅	Q ₁₀	Rank
Annan	Kinnel Water	Redhall NY 077868	2.74	0.13	7.01	6
	Water of Ae	none	3.1	0.21	8.3	5
Nith	River Nith	Friars Carse NX 923 851	27.37	2.76		2
	Cluden Water	Fiddlers Ford NX 928 795	7.90	0.52	19.33	3
	Cargen Water	none	1.4	0.1	3.6	8
Urr	Urr Water	Dalbeattie NX 822 610	5.88	0.25	14.92	4
Dee	River Dee	Glenlochar NX 733 641	41.67	3.58	103.10	1
	Tarff Water	none	1.7	0.1	4.6	7



Figures have been estimated using catchment areas calculated from OS 1:50,000

mapping.

8.35 In addition to the above statistics for each of the gauging stations a **hydrograph** and a **flow duration curve** have been provided in Appendix 8B. The hydrograph illustrates the pattern of flow throughout the year (1999). In addition to the single years flow statistics a maximum and minimum for the record for every day in the calendar year is given.

8.36 The flow duration curves provide a useful summary of the complete flow record. Reference to a flow duration curve enables a probability to be assigned to a certain flow. The flow duration curves provided in Appendix 8B show flow statistics for the whole data set as well as for the dry (June-Sept) and wet (Dec-March) seasons.

Other Watercourse Crossings

Significant Watercourse crossings

8.37 There are nine ‘significant watercourses’ along the pipeline route having a total tributary channel length equal to or greater than 10km. The selection of the ‘significance’ has been determined by calculating average flows, using data for a gauging station in the catchment, measurement of the catchment upstream and field observation. Table 8.5 gives details of these significant watercourse crossings.

Table 8.5: Significant Watercourse Crossings

Ref No.	Name	Catchment	Gauging station (GS) (for comparison)	GS catchment area (km ²)/ average flow (cumecs)	Location	NGR	Total Tributary channel length (km)	Area upstream of crossing (km ²)	Av. flow (cu. mec) est.
DX8-1	Garrel Water	Annan	Redhall (NY 077 868)	28	S of Meikleholm	NY 04 88	25	7.8	0.28
DX8-3	Kirkland Burn	Annan	Redhall (NY 077 868)	28	SW of Meikleholm	NY 03 88	12	4.1	0.15
DX16-1	Newlands Linn	Nith	Friars Carse (NX 923 851)	29	N of Duncow	NX 96 84	15.5	7.6	0.26
DX17-1	Pennyland Burn	Nith	Friars Carse (NX 923 851)	29	W of Kerricks	NX 95 83	26	12.0	0.41
DX26-2	Lochfoot Burn	Nith	Friars Carse (NX 923 851)	29	N of Lochfoot	NX 90 74	28	18.0	0.62
DX30-1	Milton Burn	Urr	Dalbeattie (NX 822 610)	33	Sth of Milton Schoolhouse	NX 84 70	11	6.8 (includes Milton Loch)	0.21
DX33-2	Buittle Burn	Urr	Dalbeattie (NX 822 610)	33	South of Milton of Buittle	NX 81 64	12	12.0	0.17
DX38-1	Gelston Burn	Dee	Glenlocharr (NX 733 641)	19*	Next to B736 SSW of Cuil	NX 77 59	10	7.0	0.21
RDX4 1-1	Auchlane Burn	Dee	Glenlocharr (NX 733 641)	19*	NNW of Auchlane	NX 73 58	15	8.5	0.26

NGR – National Grid Reference

*The Dee at Glenlocharr is not considered representative of the much smaller catchment in question near the pipeline. For the purposes of estimating flow in these catchments the River Urr gauging station at Dalbeattie has been utilised.

Other watercourse crossings

8.38 There are eighty-one ‘other’ watercourse crossings along the route. Table 8.6 further categorises these by the total upstream channel lengths.

Table 8.6: Upstream channel lengths of other watercourse crossings

Upstream channel length (m)	Frequency
5000 - 9999	13
1000 - 4999	28
<1000	40

8.39 From the above table it is possible to see that of all the other watercourse crossings, half have an upstream channel length of less than 1km. These are mostly local drainage ‘ditches’, which are likely to be ephemeral and are expected to be mostly dry during the installation of the pipeline. The pipeline will typically be installation using the ‘Dry Open Cut – Watercourse Crossing’ method as described in Section 2 (2.45-2.46).

8.40 Those streams whose upstream length are greater than 1km are likely to have the potential for disturbed sediment to smother fauna for a short downstream length. Also after a siltation event the deposited silt is often resuspended during high flows and so impact can last for a much longer duration than the actual construction period. Again it is proposed to utilise ‘Dry Open Cut – Watercourse Crossing’ methods.

Groundwater

Aquifers and aquifer protection

8.41 The pipeline route crosses two important structural basins containing significant deposits of Permian sandstone and conglomerate. The two basins are the Dumfries Basin (crossed north of Dumfries) and the Lochmaben Basin (crossed south of Castle Douglas). The sandstone in these basins provides significant ground water resources for the area. These aquifers have dual porosity, that is to say they retain some intergranular porosity, but also they have secondary porosity as a result of fracturing through the rock. It is largely because of these fractures that the permeability of the formations are typically high and that boreholes in the sandstone or conglomerate are able to yield significant volumes of water. Borehole yields of up to 53 litres per second have been recorded. Mineralisation of ground water is low with dissolved mineral content of between 70 and 280 mg/l. The Permian aquifer is used for several large abstractions including for public water supply. Artesian ground water conditions exist south of Dumfries. The Permian deposits comprise an important aquifer for this area and special consideration should be given to the protection of groundwater resources during pipeline construction and operation.

- 8.42 SEPA has a duty under the Control of Pollution Act 1974 (as amended) to protect the quality of groundwater and as such will be consulted with respect to the effects of construction on the aquifer.

Water abstraction

Public water supply

- 8.43 The proposed pipeline passes very close to a West of Scotland Water public water supply borehole known as Terregles, west of Dumfries (Nat Grid Ref: NZ 940 767).

Other surface water abstraction

- 8.44 SEPA has identified four “other” surface water abstractions in the wider area, as listed below, none of which are within influencing distance of the pipeline route. Furthermore, discussions with landowners and occupiers will reveal any other minor private water supplies that may be affected by this proposal.

Table 8.7: Other Surface Water Abstractions

Name of Abstractor	Distance from pipeline route	Nat Grid Ref:
Carse of Ae Fish Farm, Barony College, Parkgate, Dumfries, DG1 3NE	1.4kms	NY 021 864
Glanbia Foods, Lockerbie Creamery, Lockerbie, DG11 1LW.	9.4kms	NY 106 816
BNFL Ltd, Chapelcross, Annan, DG12 6RF	24.9kms	NY 192 687
Chirex, Three Trees Road, Newbie, Annan DG12 5QH	24.9kms	NY 192 687

Diversion of surface water following pipeline installation

- 8.45 There is a potential for water to be diverted along the excavated pipeline trench in particular for small springs and streams lying in close proximity, or running parallel with hydraulic interface (particularly in gravel or moraine substrates). In order to prevent this occurring clay or other impervious medium will be used to seal the pipeline trench either side of crossings and at any other locations where this is considered likely to occur.

Assessment of impact and mitigation

Surface Water

- 8.46 The initial study has sought to establish the likely character of a large number of river crossings along the Beattock to Brighouse pipeline route. A total of eight principal river crossings have been identified along with nine significant watercourses. A further eighty-one other watercourse have been identified, of which forty-one have an upstream length of greater than 1km.
- 8.47 Field assessment of each watercourse crossing will be undertaken by the West Galloway Fisheries Trust during detailed design and following access permission from landowners along the pipeline route. This survey will examine each of the

water crossings in detail and will record dimensions and an assessment of its suitability to support fish populations' especially juvenile salmonids. Possible downstream affects will also be assessed. In addition any other relevant fish data available on the watercourses will be assessed.

- 8.48 The information provided by this survey will allow recommendations to be made for the types of water crossings required, which would assist in future discussions with SEPA. In addition electrofishing surveys of the watercourses highlighted in the survey as potentially supporting important fish populations would be essential to allow the sensitivity of the required works to be considered fully.
- 8.49 Geo-technical surveys will be undertaken at the major crossings and at other significant crossings. The information gathered from the above surveys will, in consultation with SEPA and the Fisheries Boards, allow for development of detailed method statements and mitigation measures that will be included in the subsequent construction contract. The appointed construction contractor shall comply with those methods and mitigation agreements during the course of the works.
- 8.50 Further consultation will be carried out with ScottishPower, who operates the hydro-electric scheme on the River Dee to determine the most appropriate time for the installation of the crossing.
- 8.51 Watercourse crossings within Dumfries and Galloway are unlikely to lend themselves to the non-intrusive methods, such as auger boring or horizontal directional drilling owing to the unstable and difficult ground conditions. This is subject to confirmation through geo-technical investigation and detailed design. Method statements will be prepared for all major and significant watercourse crossings, and sensitive crossings identified from the site survey and consultations. Method statement will be agreed with SEPA prior to construction.
- 8.52 Prior to construction across watercourses three principal strategies will be followed to minimise, if not eliminate any possible impact on watercourses. These are:
- Pre-construction drainage will be installed where appropriate. This may entail the installation of new header drains to intercept the existing land drainage, which will be cut by the pipeline trench. This serves to maintain the existing drainage system during the construction period whilst minimising the surface water entering the working area;
 - At selected watercourse crossings temporary flume pipes or bridges will be installed, to allow the creation of a continuous running track. This will eliminate the risk of vehicles fording running water, thereby damaging the river bed and increasing pollution; and,
 - Installation of the pipeline at watercourse crossings will utilise the 'Dry Open Cut' method where appropriate. Detailed specific method statements will be produced for water crossings where required. It is the aim to minimise if not eliminate any works in running water.
- 8.53 Methods to alleviate sediment transport downstream will be provided in generic and site specific method statements. Mitigation measures are likely to include all or some of the following:
- all major and significant watercourse crossings (and any other crossings deemed to be sensitive following consultation and further field work) to be

- carried out in the period between June and September when water levels are typically at their lowest and spawning beds at their least vulnerable;
- flume pipes or over pumping to carry the water over the pipe trench excavations, to be utilised when water flows and channel width allow;
 - temporary watercourse diversions within the existing river alignment to eliminate work in running water;
 - pumps to utilise break tanks and suction filters to minimise sediment load;
 - downstream visual assessment and monitoring during construction;
 - pre-notification of landowners, fisheries boards and downstream users;
 - pre-construction and post-construction monitoring of fish species and estimation of stocks using electro fishing techniques; and
 - further consultation with District Salmon Fisheries Boards, landowners and SEPA to determine tributaries that are significant for spawning.
- 8.54 In order to ensure that the crossing points are not visible in the long term the following mitigation measures are proposed:
- selection of river crossings to utilise existing breaks in vegetation to minimise the requirement to fell mature trees;
 - bank topsoil to be stripped and stored separately from river bed material;
 - sympathetic reinstatement of river banks using degradable materials; and,
 - installation of impermeable berms either side of river crossings to prevent movement of water along the excavated trench.
- 8.55 If there are areas of high water table, the contractor may have to de-water the trench before pipe laying. Suitable discharge methods and licences will be approved by the SEPA in advance of this activity and a strategy established to ensure that there are no adverse environmental impacts.
- 8.56 During cleaning and hydrotest of the pipeline, it may be necessary to abstract water from a local watercourse. Following hydrotest, it may be necessary to drain water to local watercourses, though as the pipeline is internally coated and will have been cleaned prior to the hydrotest, the disposed water should run clean and clear. Discharge consent shall be applied for, and conducted in accordance with SEPA requirements under the Control of Pollution Act 1974, as amended.
- 8.57 Impacts can also arise through surface run off and aquifer pollution due to accidental spillage of fuel or lubricants onto the ground and into watercourses during the construction work. Good site management practices, use of well maintained equipment and adequate supervision of the construction activities will considerably reduce the probability of such incidents.
- 8.58 No re-fuelling will be undertaken within 30m of watercourses. Pumps and other mechanical plant will be fitted with drip trays and absorbent material will be available to mop up any spillage.
- 8.59 The contractor will have suitable supplies of oil spill clean up material and a contingency plan to deal with any accidental spillage, which will be tested periodically. This is in addition to the construction contractors normal obligations under Section 34 (Duty of Care) of the Environmental Protection Act 1990.

Aquifers and groundwater abstraction

- 8.60 The Permian aquifer is overlain by a thick layer of Boulder Clay that acts as an impermeable layer protecting the aquifer from infiltration of foreign material. As such, pipeline construction works in the upper most 2½ metres of ground will not impose any impact on the aquifer. During normal operations the pipeline will have no effect on groundwater sources because it will transport dry gas having no liquid/chemical content.
- 8.61 The pipeline will run close to the Terregles public water supply borehole to the west of Dumfries. West of Scotland Water will be consulted to identify the location of the proposed pipeline. Details of private water supplies will be obtained during landowner liaison and suitable individual mitigation measures agreed.

Summary

- Four catchments are traversed by the pipeline with a total of ninety-eight watercourse crossings. Of these there are 8 major crossings, 9 significant crossings, and 81 other crossings, of which half have an upstream length of over 1km. They have been assessed according to their flows, catchments area, upstream length and field observation.
- SEPA, SNH, Dumfries and Galloway Planning and Environment and Infrastructure Departments, the District Salmon Fisheries Boards and the West Galloway Fisheries Trust have been consulted and initial information included. The consultation will be ongoing through the detailed design stages of the project through to completion of construction and reinstatement.
- Further fieldwork, landowner liaison and assessment of the fisheries and geo-technical aspects of the river crossings will be undertaken once access is possible along the whole pipeline route.
- Detailed site specific crossing method statements will be developed for all watercourses deemed to be major or significant minor (and any others which are subsequently considered to be sensitive of difficult crossings) for approval by SEPA and bound into the Construction contract for implementation by the appointed contractor. Generic method statements will also be provided for the minor river crossings for approval by SEPA. The chief objective will be to minimise the downstream effects of sediment from construction activity and ensure that the pipeline is installed in a safe and efficient manner. Particular care will be given to bank and bed reinstatement to ensure that the crossing point is in keeping with the existing river banks and not subject to erosion.
- Pre-construction drainage will be installed where appropriate. This may entail the installation of new header drains to intercept the existing land drainage, which will be cut by the pipeline trench. This serves to maintain the existing drainage system during the construction period whilst minimising the surface water entering the working area.
- Installation of the pipeline at watercourse crossings will utilise the 'Dry Open Cut' methods where appropriate, or follow detailed specific method statements where required. It is the aim to minimise if not eliminate any works in running water
- The pipeline will run close to a West of Scotland Water public water supply borehole at Terregles, west of Dumfries. The aquifer from which abstraction is taken is naturally protected from foreign material infiltration by a thick layer of Boulder Clay. The Clay act as an impermeable protective layer ensuring that pipeline construction works in the upper most 2^{1/2}m of ground will not affect the aquifer.
- During normal operations the pipeline will have no effect on groundwater sources since there are no emissions.

Appendix 8A: Schedule of Crossings

Crossing No: *1	Name of Watercourse	Catchment *2	Location	N.G.R.	Tributary Channel Length *3
DX1-1	Minor Trib Dead Burn	RA	Tathhill	NY 08 99	200
DX2-1	Minor Trib Dead Burn	RA	Shiel Knowe	NY 08 99	250
DX2-2	Minor Trib Cogie Burn	RA	Nr Tappit Knowes	NY 08 98	900
DX2-3	Minor Trib Cogie Burn Threegill Cleuch	RA	NW of Stockholm	NY 08 98	2400
DX2-4	Minor Trib Cogie Burn	RA	SW of Stockholm	NY 08 97	600
DX2-5	Minor Trib Cogie Burn	RA	Thrummyrig	NY 08 97	1300
DX2-6	Minor Trib Cogie Burn	RA	Oakbank	NY 08 97	50
DX3-1	Drain Trib Greigsland Burn	RA	SE Hazelbank	NY 08 94	2500
DX3-2	Drain Trib Greigsland Burn	RA	SE Hazelbank	NY 08 93	300
RDX3-3	Drain Trib Greigsland Burn	RA	SE Hazelbank	NY 08 93	200
DX5-1	White Sike	RA	Springwells	NY 08 91	2400
DX5-2	Drain Trib of White Sike	RA	NW of Greenbeck Wood	NY 07 91	300
DX5-3	Black Burn	RA	N of Greenbeck	NY 07 90	7500
DX5-4	Drain Trib of Kinnel Water	RA	W of Greenbeck	NY 07 90	300
DX5-5	Drain Trib of Kinnel Water	RA	W of Greenbeck	NY 06 90	100
DX5-6	Drain Trib of Kinnel Water	RA	E of Kerse Cottage	NY 06 90	1000
RVX1	KINNEL WATER	RA	N Castlehills	NY 05 89	n/a
DX7-1	Garrel Burn	RA	N of Nether Garrel	NY 05 89	6000
DX7-2	Drain Trib of Garrel Burn	RA	N of Nether Garrel	NY 05 89	1300
DX8-1	Garrel Water	RA	S of Meikleholm	NY 04 88	25000
DX8-2	Drain Trib of Garrel Water	RA	SW of Meikleholm	NY 04 88	400
DX8-3	Kirkland Burn	RA	SW of Meikleholm	NY 03 88	12000

Crossing No: *1	Name of Watercourse	Catchment *2	Location	N.G.R.	Tributary Channel Length *3
DX8-4	Drain Trib of Kirkland Burn	RA	E of Wester Parkgate	NY 02 88	500
DX8-5	Drain Trib of Kirkland Burn	RA	E of Wester Parkgate	NY 02 88	200
DX8-6	Clatterstanes Burn	RA	E of Wester Parkgate	NY 02 88	2500
DX9-1	Trib of Clatterstanes Burn	RA	E of Wester Parkgate	NY 02 88	800
DX10-1	Parkgate Burn	RA	Ashbank	NY 01 88	6800
DX11-1	Minor Trib of Water of Ae	RA	NW of Ae Bridgend	NY 00 87	800
RVX2	WATER OF AE	RA	Nr A701 (T)	NY 00 86	n/a
DX12-1	Minor Trib of Water of Ae	RA	N of Fulton	NY 00 86	100
DX12-2	Minor Trib of Water of Ae	RA	W of Fulton	NX 99 86	400
DX12-3	Trib of Park Burn	LW	E of Lanrick Hall	NX 98 86	1500
DX13-1	Park Burn	LW	SE of Lanrick Hall	NX 98 86	7500
DX13-2	Trib of Park Burn	LW	S of Lanrick Hall	NX 98 86	200
DX13-3	Trib of Park Burn	LW	Nr Tomsland Cleuh	NX 98 85	500
DX13-4	Trib of Park Burn	LW	Nr Tomsland Cleuh	NX 98 85	2500
DX14-1	Trib of Park Burn	LW	S of Gillyburn	NX 97 85	800
DX15-1	Trib of Park Burn	LW	W of Auchenrath	NX 97 84	2400
DX16-1	Newlands Linn	RN	N of Duncow	NX 96 84	15500
DX16-2	Minor Trib Duncow Burn	RN	N of Duncow	NX 96 84	300
DX16-3	Minor Trib of Pennyland Burn	RN	Ryecroft	NX 96 83	8000
DX17-1	Pennyland Burn	RN	W of Kerricks	NX 95 83	26000
RVX3	RIVER NITH	RN	S of Sandbed	NX 94 83	N/a
DX17-2	The Lake	RN	W of Lower Portrack	NX 94 82	1000
DX18-1	Drain Trib – Trynland Loch	RN	Glengower Strip	NX 93 82	200
DX19-1	Trib Loch Foot Burn	RN	S of Glengower	NX 93 82	1800
DX19-2	Loch Foot Burn	RN	S of McWhanrick	NX 93 81	2000
DX19-3	Minor Trib Cluden	RN	Moss side	NX 93 80	200
RVX4	CLUDEN WATER	RN	W of West Cluden	NX 93 79	n/a

Crossing No: *1	Name of Watercourse	Catchment *2	Location	N.G.R.	Tributary Channel Length *3
DX23-1	Trib of Cargen Water	RN	NE of Terregles	NX 93 77	5000
DX24-1	Ditch Trib Cargen Water	RN	S of Gallow Hill	NX 94 76	6400
DX24-2	Ditch Trib Cargen Water	RN	S of Gallow Hill	NX 96 76	6600
DX24-3	Ditch Trib Cargen Water	RN	S of Gallow Hill	NX 94 76	6800
DX24-4	Ditch Trib Cargen Water	RN	S of Gallows Hill	NX 94 76	7000
RVX5	CARGEN WATER	RN	W of Frairs Island	NX 94 76	n/a
DX26-1	Nunland Burn	RN	S of Glenview	NX 91 74	1000
DX26-2	Lochfoot Burn	RN	N of Lochfoot	NX 90 74	28000
DX27-1	Ditch Trib Lochfoot Burn	RN	N of Lochfoot	NX 89 74	5500
DX28-1	Ditch Trib Lochrutton Loch	RN	NE of Whiteyard	NX 88 73	500
DX28-2	Trib Merkland Burn	RN	W of Whiteyard	NX 87 72	300
DX28-3	Trib of Deanston Burn	RN	S of Barnbauchle Bridge	NX 86 71	2000
DX28-4	Deanston Burn	RN	Rigfoot Bridge	NX 86 71	4000
DX28-5	Drain Trib Crochmore Burn	UW	Nr Courthill	NX 85 71	200
DX28-6	Drain Trib Crochmore Burn	UW	S of Courthill	NX 8570	150
DX30-1	Milton Burn	UW	Sth of Milton Schoolhouse	NX 84 70	11000
DX30-2	Trib Culmain Burn	UW	S of Burnside of Urr	NX 84 69	300
DX31-1	Drain Trib of Cocklick Lane	UW	S of Culmain Bridge on Milton Road	NX 83 68	3500
DX31-2	Drain Trib of Cocklick Lane	UW	SSW of Culmain Bridge	NX 83 68	700
DX31-3	Drain Trib of Cocklick Lane	UW	SE of Blaiket Mains	NX 83 67	500
DX31-4	Drain Trib of Cocklick Lane	UW	SSE of Blaiket Mains	NX 82 67	7500
DX31-5	Drain Trib of Cocklick Lane	UW	W of Broadlea	NX 82 66	500
DX32-1	Drain Trib of Redcastle Burn	UW	SSE of Redcastle	NX 82 65	500

Crossing No: *1	Name of Watercourse	Catchment *2	Location	N.G.R.	Tributary Channel Length *3
RVX6	URR WATER	UW	S of Stepend Herriesdale	NX 81 64	n/a
DX33-1	Drain Trib of Buittle Burn	UW	SE of Milton of Buittle	NX 81 64	100
DX33-2	Buittle Burn	UW	S of Milton of Buittle	NX 81 64	12000
DX34-1	Drain Trib of Buittle Burn	UW	SW of West Logan	NX 80 63	2000
DX34-2	Drain Trib of Buittle Burn	UW	S of Halketleaths Bridge	NX 80 62	2000
DX36-1	Trib of Buittle Burn (Birkland Burn)	UW	NE of Allan Bank	NX 79 61	2000
DX37-1	Corra Lane (Buittle Burn)	UW	SW of Corra	NX 78 61	2000
DX38-1	Gelston Burn	RD	Next to B736 SSW of Cuil	NX 77 59	10000
DX38-2	Drain Trib of Gelston Burn	RD	W of B736	NX 77 59	500
DX39-1	Drain Trib of Slack Burn	RD	ESE of Longsheds	NX 75 59	500
DX39-2	Slack Burn	RD	NNE of Slagnaw	NX 74 58	2000
DX41-1	Auchlane Burn	RD	NNW of Auchlane	NX 73 58	15000
DX42-1	Stranshankie Burn	RD	N of Low Arkland	NX 72 58	2800
RVX7	RIVER DEE	RD	NW of Low Arkland	NX 72 58	n/a
DX42-2	Drain Trib of Dee	RD	SW of Argrennan Ho	NX 71 57	200
DX42-3	Drain Trib of Dee	RD	SW of Argrennan Ho	NX 71 57	300
DX42-4	Drain Trib of Dee	RD	W of Mayfield	NX 71 57	500
DX43-1	Drain Trib of Dee	RD	SE of Argrennan Mains	NX 70 56	1000
DX44-1	Drain Trib of Tarff Water	RD	SW of Argrennan Mains	NX 69 55	1000
DX45-1	Drain Trib of Tarff Water	RD	W of Underwood	NX 68 55	1000
RVX8	TARFF WATER	RD	NE of Kempton	NX 68 54	n/a
DX48-1	Minor Drain Trib of Tarff	RD	W of Cumstoun Mains	NX 67 53	1000

Crossing No: *1	Name of Watercourse	Catchment *2	Location	N.G.R.	Tributary Channel Length *3
DX48-2	Minor Drain Trib of Dee	RD	SW of Sourhill	NX 66 52	100
DX50-1	Corraford Burn	RD	SSW of Black Newton	NX 65 50	7000
DX50-2	Mill Hall Burn	RD	W of Dambog Plantation	NX 64 48	2000
DX51-1	Minor Trib Brighthouse Burn	SC	S of Clauchendolly	NX 65 47	100

Key

Ref*1 - Crossing No.

Watercourses have be numbered from north to south between each road crossing (RDX) DX2-1 being the first watercourse after road crossing 2 etc.

Ref*2 - Catchment

RA River Annan
 LW Lochar Water
 RN River Nith
 UW Urr Water
 RD River Dee
 SC Stewartry Coast

Ref*3 - All lengths in METERS

MAJOR CROSSINGS ARE DENOTED IN UPPER CASE BOLD

Significant Minor crossings are denoted in lower case bold

Appendix 8B: Major River Flow data

Hydrographs for Major River Crossings

Kinnel Water at Redhall (NY 077868)

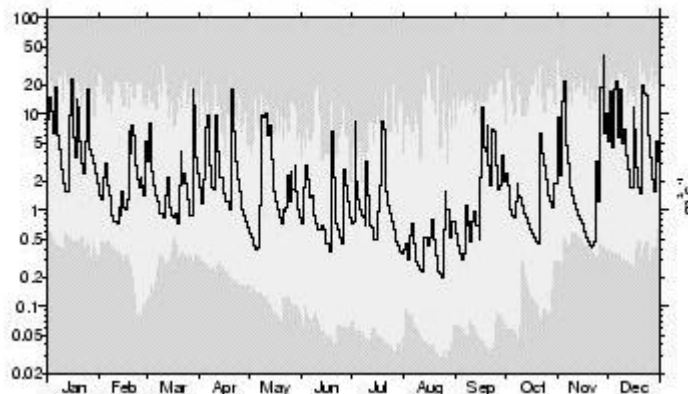
8.62 This gauging station is located 4 km downstream of the proposed crossing of Kinnel Water. The catchment of Kinnel Water is composed of Silurian Shales in the upper catchment with Triassic sandstone in the lower catchment. The land use is predominantly hill pasture.

Table A: Kinnel Water at Redhall - Statistics

Catchment area:	76.1 km ²
Mean flow	2.74 m ³ /s
Q ₉₅	0.13 m ³ /s
Q ₁₀	7.01 m ³ /s
Period of record	1963 - 1999
Av. ann. rainfall	1467mm

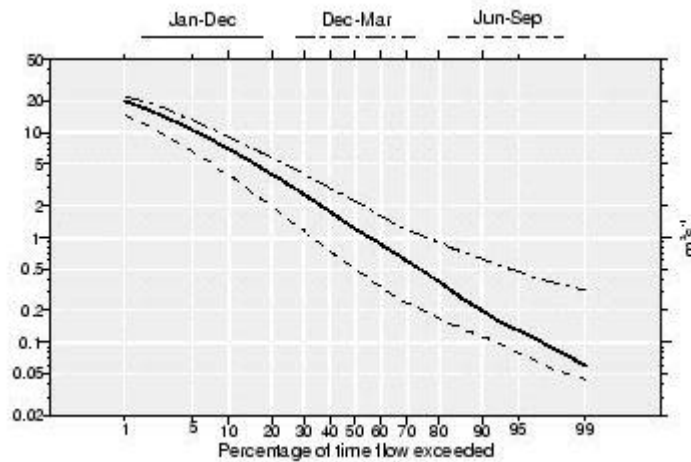
Figure A: Kinnel Water at Redhall - Hydrograph

Max. and min. daily mean flows from 1963 to 1999 excluding those for the featured year (1999; mean flow: 3.20 m³s⁻¹)



8.63 This hydrograph indicates a catchment with a baseflow recession from December to August. Peak flows can be experienced anytime between August and March. However, between April and July significant peaks can still be encountered. The very peaky nature of run-off and thus river flow is a direct result of a catchment composed largely of slowly permeable bedrock and drift deposits.

Figure B: Kinnel Water at Redhall



Kinnel Water at Bridgemuir

8.64 Kinnel Water drains an area composed of Silurian Shales in the upper catchment and Triassic sandstone in the lower catchment. The gauging station at Bridgemuir is some 8 km downstream of the proposed pipeline crossing and downstream of the confluence of the Kinnel Water with the Water of Ae. Using the data from the gauging station at Bridgemuir along with that from the Kinnel water at Redhall (upstream of the confluence) it is possible to approximate some basic flow statistics for the mouth of the Water of Ae (which has no permanent gauging station). The mouth of the Water of Ae is also 8km downstream from the proposed pipeline route.

Table B: Water of Ae - Statistics

Watercourse	Q ₁₀ * (m ³ /sec)	Q ₅₀ * (m ³ /sec)	Q ₉₅ * (m ³ /sec)
Water of Ae	12.11	2.90	0.55

* calculated by taking the difference in these statistics between the Bridgemuir and the Redhall gauging stations.

8.65 These statistics indicate the Water of Ae to be a more significant river in terms of discharge volume compared with the Kinnel Water. However, this simple calculation does not take into account the probably significant inputs of ground water into Kinnel Water as it flows over the important Permian sandstone aquifer outcrop between the two gauging stations.

The Dee at Glenlocharr (NX 733 641)

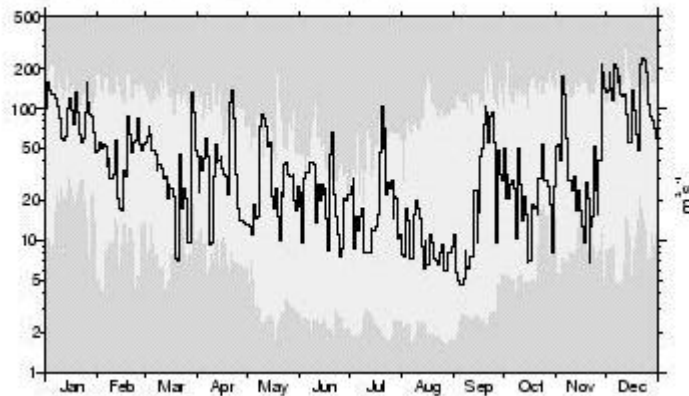
8.66 This gauging station is located 8 km upstream of the proposed crossing of The Dee. The catchment of The Dee is comprised of Ordovician and Silurian shales and greywackes, with two major granitic intrusions. There are extensive glacial drift deposits in the lower catchment. It is a scenic catchment with rugged peaks and extensive afforestation giving way downstream to rolling lowland pasture. The river is regulated upstream of the gauging station for hydro-electric power generation.

Table C: The Dee at Glenlocharr - Statistics

Catchment area:	809.0 km ²
Mean flow	41.67 m ³ /s
Q ₉₅	03.581 m ³ /s
Q ₁₀	103.1 m ³ /s
Period of record	1977 - 1999
Av. ann. rainfall	1754mm

Figure C: The Dee at Glenlocharr - Hydrograph

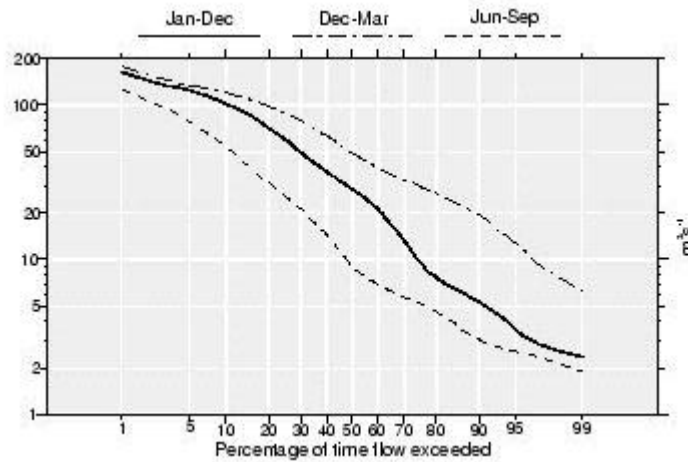
Max. and min. daily mean flows from 1977 to 1999 excluding those for the featured year (1999; mean flow: 45.50 m³s⁻¹)



8.67

This hydrograph indicates a catchment with a baseflow recession from December to September. Peak flows can be experienced anytime between November and March. However, between April and October significant peaks can still be encountered. The gauging station is situated downstream of Loch Ken which results in a general smoothing of the hydrograph as the Loch provides a very significant amount of water storage during surge events, following heavy rainfall. The hydrograph may also be affected by controlled release of impounded water, for the purposes of hydro-electric power generation. The unusual baseflow recession (a steepening in the months of July and August) in 1999 (the featured year in the above hydrograph) suggests perhaps that there is some external influence overriding natural recession in late summer. At the time of writing no information had been received about the time and volume of controlled releases.

Figure D: The Dee at Glenlocharr - Flow Duration Curve



River Nith at Friars Carse (NX 923 851)

8.68

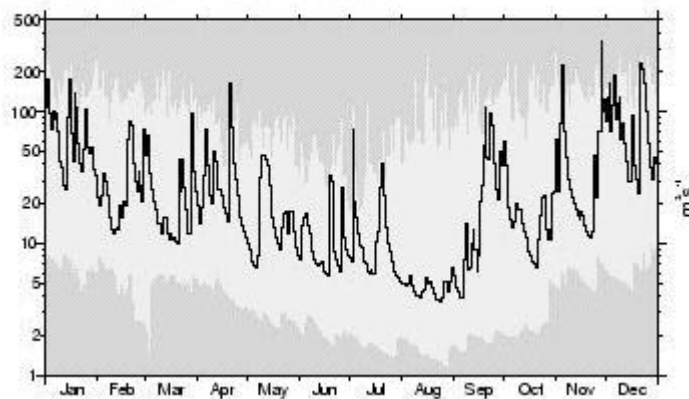
This gauging station is located 3 km upstream of the proposed crossing of River Nith. The catchment of the Nith is comprised of Silurian Shales and mudstones. The land use is hill pasture, with mixed pasture in the valley bottom.

Table D: The Nith at Friars Carse - Statistics

Catchment area:	799.0 km ²
Mean flow	27.37 m ³ /s
Q ₉₅	2.758 m ³ /s
Q ₁₀	67.11 m ³ /s
Period of record	1957 - 2000
Av. ann. rainfall	1460mm

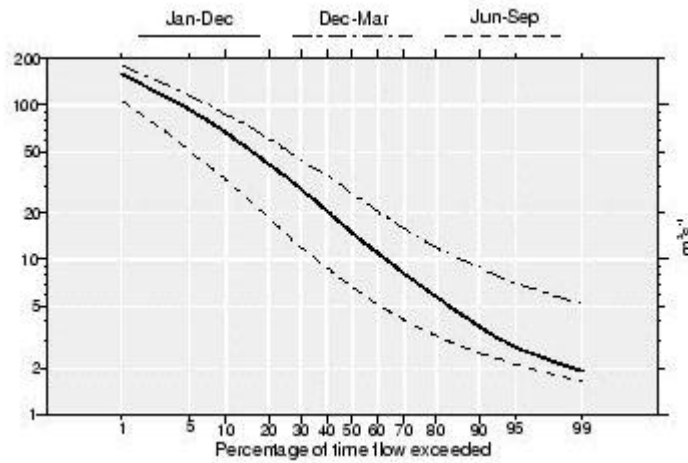
Figure E: Nith at Friars Carse - Hydrograph

Max. and min. daily mean flows from 1957 to 2000 excluding those for the featured year (1999; mean flow: 32.80 m³s⁻¹)



8.69 This hydrograph indicates a catchment with a baseflow recession from December to August. Peak flows can be experienced anytime between August and March. However, between April and July significant peaks can still be encountered. The very peaky nature of run-off and thus river flow is a direct result of a catchment composed largely of slowly permeable bedrock and drift deposits.

Figure F: Nith at Friars Carse - Flow Duration Curve



Cluden Water at Fiddlers Ford (NX 928 795)

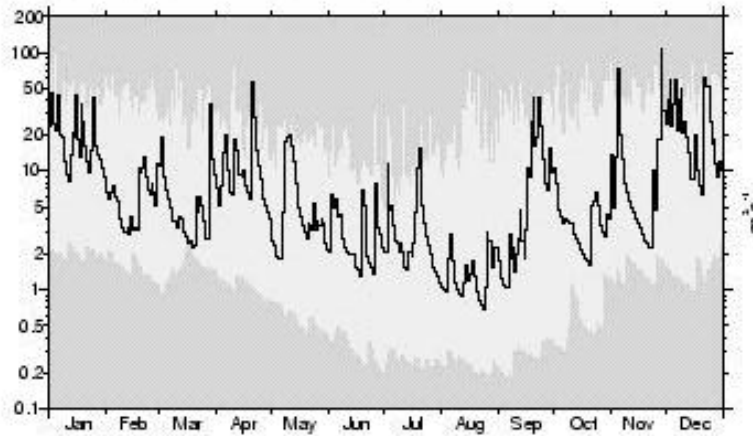
8.70 This gauging station is located 700m km upstream of the proposed crossing of River Cluden. The catchment of the Cluden is comprised of Silurian shales and mudstones in the upper catchment and Permian breccias sandstone on the lower catchment, mostly below the crossing point. The land use is pasture in the lower valley with rough grazing and forestry in the upper catchment.

Table E: Cluden Water at Fiddlers Ford - Statistics

Catchment area:	238.0 km ²
Mean flow	7.90 m ³ /s
Q ₉₅	0.52 m ³ /s
Q ₁₀	19.33 m ³ /s
Period of record	1963 - 2000
Av. ann. rainfall	1422mm

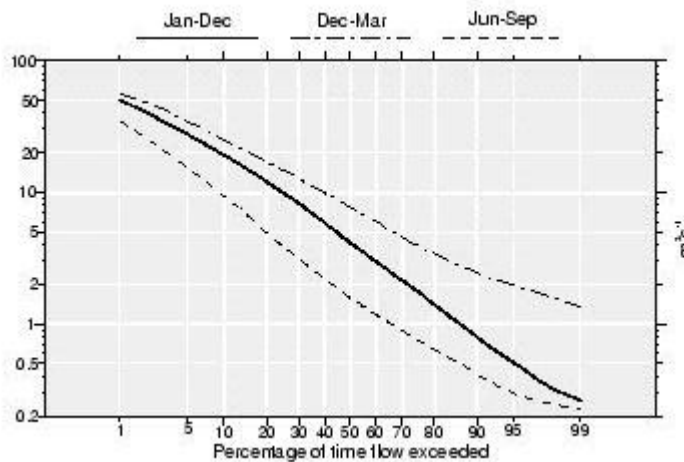
Figure G: Cluden Water at Fiddlers Ford - Hydrograph

Max. and min. daily mean flows from 1963 to 1999 excluding those for the featured year (1999; mean flow: $9.46 \text{ m}^3\text{s}^{-1}$)



8.71 This hydrograph indicates a catchment with a baseflow recession from December to August. Peak flows can be experienced anytime between August and March. However, between April and July significant peaks can still be encountered. The very peaky nature of run-off and thus river flow is a direct result of a catchment composed largely of slowly permeable bedrock and drift deposits.

Figure H: Cluden Water at Fiddlers Ford - Flow Duration Curve



[The Urr at Dalbeattie \(NX 822 610\)](#)

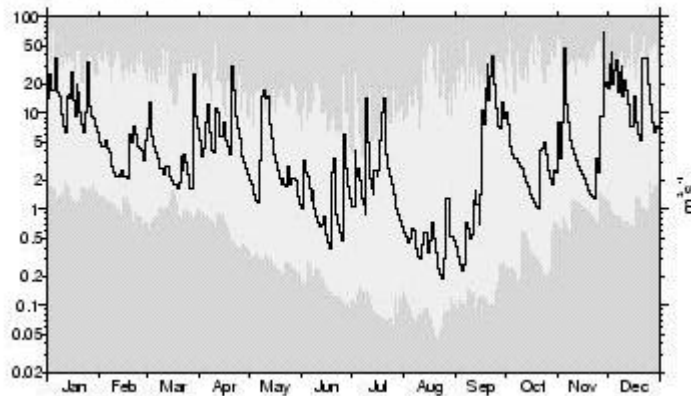
8.72 This gauging station is located 4km upstream of the proposed crossing of River Urr. The catchment of the Urr is comprised of Silurian shales and greywackes with granite intrusion in the Dalbeattie area. The catchment is extensively covered by boulder clay. The land use is pasture, rough grazing and forestry.

Table F: The Urr at Dalbeattie - Statistics

Catchment area:	199.0 km ²
Mean flow	5.88 m ³ /s
Q ₉₅	0.25 m ³ /s
Q ₁₀	14.92 m ³ /s
Period of record	1963 - 1999
Av. ann. Rainfall	1340mm

Figure I: The Urr at Dalbeattie - Hydrograph

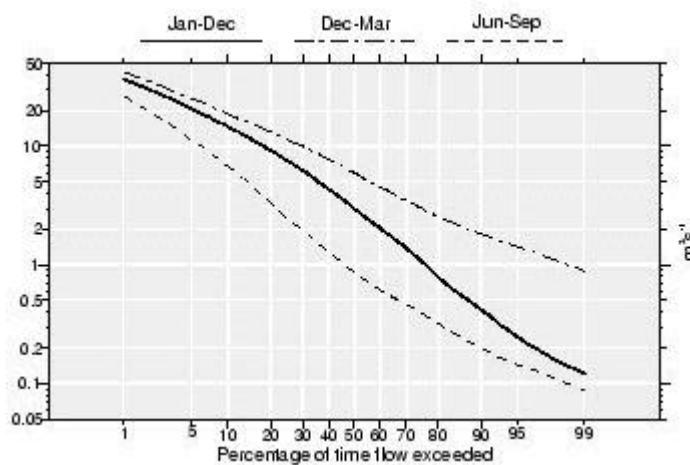
Max. and min. daily mean flows from 1963 to 1999 excluding those for the featured year (1999; mean flow: 6.54 m³s⁻¹)



8.73

This hydrograph indicates a catchment with a baseflow recession from December to August. Peak flows can be experienced anytime between August and March. However, between April and July significant peaks can still be encountered. The very peaky nature of run-off and thus river flow is a direct result of a catchment composed largely of slowly permeable bedrock and drift deposits.

Figure J: The Urr at Dalbeattie - Flow duration curve



Appendix 8C: Volumetric Equivalents

Volumetric Equivalents

Metric

1 m³/s (cubic metres per second - cumec)

1000 l/s (litres per second)

86400 m³/d (cubic metres per day)

ML/d (Megalitres per day)

tcmd (thousand cubic metres per day)

Imperial

220 gallons/sec

19 mgd (million gallons per day)

References

1. Environmental Protection Act 1990
2. Control of Pollution Act 1974 (as amended)
3. Waste Management Licensing Regulations 1994
4. Special Waste Regulations 1996
5. Land Drainage Act 1991
6. Waste Management – Duty of Care – A code of Practice. The Stationery Office
7. Sustainable urban drainage systems – Design Manual for Scotland and Northern Ireland Report C521 CIRIA.
8. Managing materials and components on site – Report SP146 CIRIA.
9. Use of industrial by-products in road construction – water quality effects. Report 167 CIRIA.
10. General guide to the prevention of water pollution – PPG1 SEPA.
11. Above ground oil storage tanks – PPG2 SEPA.
12. Disposal of sewage where no mains drainage is available – PPG 4 SEPA.
13. Working in or near rivers – PPG5 SEPA.
14. Working at construction and demolition sites – PPG 6 SEPA.
15. High-pressure water and steam cleaners – PPG13 SEPA.
16. Control of spillages and fire fighting run-off – PPG18 SEPA.
17. A guide to Sustainable Urban Drainage – SEPA.

9. ECOLOGY

Introduction

Background to the Study

- 9.1. An ecological assessment conforming to a standard "Phase 1 Habitat Survey" has been undertaken for a 400m wide corridor of land that has the proposed pipeline route at its centre. A desktop study was based on the interpretation of aerial photography and supported by consultations with relevant bodies and a field study. The findings are the subjects of this chapter.
- 9.2. The purpose of this study was to assess the baseline ecological conditions within the pipeline route corridor. The survey results have been used to identify any potential impacts on flora and fauna attributable to the proposed pipeline and recommend ways of minimising adverse impact.

Legislation and Policies for Environmental Conservation

- 9.3. In recent years a number of international, European, national and local laws that recognise the need to protect and conserve wildlife and habitats have come into being. Designations that are potentially relevant to this pipeline project are discussed below. Published regulations and/or statutory guidelines are also addressed in this section and taken into account as appropriate. Further details may be found in *NPPG14 Natural Heritage* (Scottish Office 1999) and in reviews such as by the RSPB (Brooke 1996) or the Royal Town Planning Institute (RTPI 1999).

International legislation

- 9.4. The United Kingdom is a contracting party to the Convention on Wetlands of International Importance (known as the Ramsar Convention) which came into force in December 1975. The proposed pipeline does not impinge on any site designated by the British Government under this convention. The Loch Ken & River Dee Marshes, to the north-west of Castle Douglas, is the nearest such site.

European Union Directives and Designations

- 9.5. The Directive on the Conservation of Wild Birds (Directive 79/409/EEC) came into force in April 1982 and requires all member states to maintain populations of naturally occurring wild birds and to preserve a sufficient diversity and area of habitats for their conservation. A list of 144 bird species, which require special conservation by means of protecting their habitat, was compiled in Annex 1 of this Directive. Member states are required to protect their most important ornithological sites as Special Protection Areas (SPAs).
- 9.6. Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the Habitats and Species Directive) adopted in May 1992 provides for the establishment of a network of sites of European importance called Natura 2000. These include SPAs notified under the Birds Directive and sites of other types of interest to be called Special Areas of Conservation (SACs). The Articles of this Directive extend and (in some instances) supersede those of the Birds Directive.
- 9.7. The proposed route does not pass through or close to any potential or designated SPAs or SACs. The Loch Ken & River Dee Marshes SPA (also a Ramsar site), to the north-west of Castle Douglas, is the nearest.

National Designations and Legislation

National Nature Reserves

- 9.8. National Nature Reserves (NNRs) are designated by Scottish Natural Heritage (SNH), a government body responsible for nature conservation in Scotland, under the terms of the National Parks and Access to the Countryside Act 1949. The network of NNRs has been chosen to represent the best examples of the wildlife and physiography present in Britain.

Sites of Special Scientific Interest (SSSI)

- 9.9. In Great Britain, areas of national or regional nature conservation value can be designated as Sites of Special Scientific Interest (SSSIs) under the terms of the Wildlife and Countryside Act 1981. All NNRs carry SSSI status, as do sites of International Importance such as SPAs and SACs. In Scotland the designation of SSSIs is the responsibility of SNH.
- 9.10. The proposed pipeline corridor does not affect any NNR. The pipeline itself does not cross any SSSI. Small parts of three SSSIs lie within the edge of the 400m wide pipeline route corridor. These are Lochwood Wood (NY 084 972), Black Loch (NX 991 875), and Threave and Carlingwark Loch (NX 763 609). The SSSI at Torrs Moss (NX 781 618) is 150m from the pipeline corridor

Protected Species

- 9.11. The Wildlife and Countryside Act contains a number of Schedules on which are listed species in need of special protection. Species may be included because of restricted distribution, or because numbers have declined drastically in the recent past through persecution and/or habitat loss. Schedule 1 of the Wildlife and

Countryside Act covers birds with special protection, Schedules 5 and 6 cover animals, both vertebrate and invertebrate, and Schedule 8 covers plants.

- 9.12. Animals on the lists, depending on the specifications of the Schedule on which they appear, are variously protected against intentional killing, injuring or taking, while their homes may also have legal protection. Badgers and their setts in particular are given additional protection consolidated in the Protection of Badgers Act 1992. It is an offence to dig up, take or sell any part of any plant on Schedule 8.
- 9.13. Not all protected species could be detected due to access constraints of the field survey. This study seeks to compensate for these constraints by assessing the probability of occurrence as accurately as possible from existing data, provided by the consultees and habitat suitability.

Statutory local designations

Local Nature Reserves

- 9.14. Local Nature Reserves (LNRs) are designated by Local Authorities under the terms of the National Parks and Access to the Countryside Act 1949.
- 9.15. The proposed pipeline route affects no LNRs.

Non-Statutory Conservation Designations

- 9.16. In addition to sites and species designated under legislation, other nature conservation designations have been devised by Local Authorities and other interested bodies, including statutory and non-statutory organisations.

Ancient Woodland

- 9.17. It is generally considered that woodland would be the predominant type of vegetation over most of Britain. That this is not the case is the result of historic and continuing intervention by man. The Ancient Woodland Inventory (AWI) is a desktop study carried out by the former nature Conservancy Council (now SNH in Scotland). The AWI seeks to identify areas that carried woodland cover of at least 0.25ha at the time of the first editions the Ordnance Survey maps. The AWI thus identifies present day areas that carried woodland in the seventeenth century (and probably before that). The AWI sub-divides these sites into those which have remained wooded since that time and those which have been cleared and/or replanted.
- 9.18. In many parts of Britain ancient woodland sites have remained intact only where the land has been unsuitable for agricultural improvement or other development. This might include areas where the ground is rocky and uneven; or along steep and sometimes unstable land on the sides of valleys and along river terraces. Many AWI sites carry a suite of species typical of sites that have remained free of disturbance for a long period, though grazing or other subsequent intervention means this is not always the case.

- 9.19. The Lochwood Wood SSSI is an AWI site, as is the non-SSSI field on its south-eastern flank. The latter is within the pipeline corridor but the pipeline itself will not cross the site.

Second Tier Sites

- 9.20. Local Authorities and/or organisations working on their behalf may produce an inventory of sites considered to be of importance within an administrative area. This would include all sites with statutory designations at international and national level plus areas considered being of significance and importance within the area of remit of the Local Authority. Sites important at District or even Parish level may be included. NPPG14 notes that regional and local non-statutory designations should be taken into consideration during the course of the planning process.
- 9.21. Non-statutory wildlife sites are given a variety of titles, though the preferred name is Sites of Importance for Nature Conservation (SINC). Non-statutory sites containing features of physiographic interest are known as Regionally Important Geological Sites (RIGS).
- 9.22. The Dumfries & Galloway Local Biodiversity Action Plan (LBAP) refers to SINC's as "Local Wildlife Sites" and notes that a complete network for Dumfries & Galloway has not yet been identified. The same is known to be the case for RIGS in Dumfries & Galloway.
- 9.23. The LBAP is a comprehensive document that reviews the past, present and possible future condition of habitats and species within the administrative area. The LBAP focuses on Dumfries & Galloway as whole, rather than specific sites, and establishes priorities for maintaining and enhancing all of the present wildlife resource.

Species of nature conservation importance not legally protected

- 9.24. The distribution status of a plant or animal species in a national context is usually ascertained by plotting its presence or absence in each of the 10km x 10km squares of the National Grid (there are over 3,500 of these grid squares in total). The data may be plotted as a dot map to show the national or regional distribution. Locally based distribution studies may use a finer grain, such as 2km x 2km grid squares.
- 9.25. Scarce species are those found in not more than 100 different 10km x 10km grid squares. Rare species are those found in not more than 15 different 10km x 10km grid squares. In the case of some animal groups, the "Scarce" category is also known as "Notable" and may be sub-divided.
- 9.26. Plotting the presence or absence in the 10km x 10km grid squares tells us the distribution of a species but does not tell us of the abundance of that species within each grid square. A species may be present in only two grid squares but have ten thousand individuals in each. Another species may be present in a considerable number of grid squares but with only a few individuals present in each of these. There is obviously a need for further criteria to establish whether a species should be considered as threatened in any way.

- 9.27. The “Red Data Book” (RDB) system, developed by the International Union for the Conservation of Nature and Natural Resources (IUCN) focuses attention on the plants and animals most in need of conservation. The various RDBs assign a species to a status category according a number of criteria. In IUCN terms the key categories are “Critically Endangered” and “Endangered”. In broad terms this would include those species in danger of extinction in Great Britain and whose survival is unlikely if causal factors continue, plus species likely to become thus in the absence of intervention. The IUCN category of Vulnerable would include other species whose distribution status is rare, plus other species of scarce status that occupy small areas of especially vulnerable habitat. As an example, the plant Pennyroyal (*Mentha pulegium*) is recorded from twenty 10km x 10km grid squares and so is scarce not rare in terms of its distribution. Pennyroyal occurs at low abundance in a very rare type of grassland and as such is given RDB status as Vulnerable.
- 9.28. Other RDB categories are given to species that are considered to be no longer under threat and to those endemic to Britain.
- 9.29. Many of the species with a high status RDB category are included in the species schedules of the Wildlife & Countryside Act 1981 and its subsequent amendments.
- 9.30. Other RDB, rare and scarce species may receive no statutory protection as an individual species but may be mentioned in national or regional Biodiversity Action Plans (BAP). A BAP may include Species Action Plans for plants and animals that are considered to be of national, regional or local significance. NPPG14 indicates that these should be taken into consideration during the course of the planning process.
- 9.31. The Dumfries & Galloway LBAP lists a number of Local Priority Species of plant and animal, and also includes twenty-one Local Species Action Plans.
- 9.32. Plants or animals of rare or scarce status should be considered of importance even if not listed in such as a BAP. Also significant are species that are common in a national context but are at or near the edges of their distribution range in the area under consideration. As an example, several plants that are relatively widespread in England are at or near the north-western limits of their range in Dumfries and Galloway.

Survey and Mapping Methodology

- 9.33. The pipeline corridor has been mapped at 1:10,000 scale using the standard methodology of phase 1 habitat survey. The baseline information was gathered from aerial photography flown in February 2000.
- 9.34. The major vegetation types in and around the pipeline corridor are pasture (sheep and cattle) and woodland. These are readily identifiable from aerial photography, and some degree of classification is also possible. Certain areas on the photographs appear as “obviously different” and these were noted, with a view to ground inspection during the course of field survey.

- 9.35. Before the field survey commenced, a literature search was undertaken and consultees approached to obtain any existing data, and to ascertain the views of those with a legitimate interest and/or statutory responsibility for nature conservation and other environmental matters. Areas used by animals cannot really be determined from aerial photographs, and any site visits may not coincide with animal usage, so consultation is vital for this aspect of the project work.
- 9.36. Fieldwork was carried out in the first week of July 2000. The primary purpose was to carry out detailed surveys of the watercourse crossings and carry out a vantage point survey of the pipeline route. Areas noted from aerial photographs were viewed from the public highways and access tracks. Areas that could not be seen have been mapped by extrapolation.
- 9.37. Although the survey concentrated on the 36m Working Width of the pipeline, habitats within the full 400m corridor were mapped.
- 9.38. The system used has a few limitations. Aerial photography carried out in February would be unlikely to detect patches of Bracken or Tall Herb vegetation. Bracken was not seen during the field survey and any other possible occurrence is not mapped. Tall herbaceous vegetation (nettles, willowherb, etc) was usually encountered in conjunction with unmanaged grassland near the watercourses and is mapped with the coarse grassland as “poor semi-improved grassland” (map symbol = uncoloured SI).
- 9.39. Most of the grassland in the survey area is under pasture. The term “improved pasture” in the site descriptions is used for agricultural grasslands used for sheep or cattle or the production of silage. Improved pasture is predominantly grassy, though White Clover may be present at moderately high cover. Patches of vigorous weeds such as thistles and nettles may also be present. Improved pasture is indicated on the maps by an “I”. Ranker vegetation dominated by grasses may be referred to as “poor semi-improved grassland” (map notation = “SI”). This may arise spontaneously or as a result of the (possibly temporary) abandonment of grazing.
- 9.40. Areas with dense cover of rushes are mapped as marshy grassland or, rarely, fen or flush, as appropriate. Areas of heavily grazed pasture with a scattering of rushes are mapped as improved grassland and have the symbol “Je” added to indicate the presence of rushes. Similarly, improved pasture with a high cover of thistles has the addition of “Cirs”.
- 9.41. Some areas noted on the aerial photographs appear to have been prepared for the planting of trees. In this case “grips” is noted on the appropriate part of the map.
- 9.42. The combined process of consultation, examination of aerial photographs and ground inspection has enabled identification along the route of habitat types and areas likely to contain important species.

Evaluation of Wildlife Interest

- 9.43. The Nature Conservancy Council and its successor bodies have produced a set of guidelines for assessing the nature conservation importance of a wildlife site, *Guidelines for the selection of biological SSSIs* (NCC 1989). This takes as a

basis the seminal work of Ratcliffe (1977) but is updated in the light of more recent studies and changing perceptions of nature conservation and the environment. The guidelines continue to be updated, as new information becomes available, for example on the significance of mosses and other lower plants.

- 9.44. The NCC 1989 work and its updates are intended as a means of assessing whether a site is worthy of consideration for designation as Site of Special Scientific Interest (SSSI). These are referred to as the “jewels in the crown” and represent examples of the very best of the wildlife (and physiography) of Britain.
- 9.45. Across Britain there is great variation in solid and superficial geology, topography, climate and other physical factors. This affects the distribution of plant and animal species and the location of the human population. The interactions between these give us the vegetation we have today. The variations mean that some administrative areas of Britain are rich in SSSI-quality habitats while others are not.
- 9.46. The NCC 1989 SSSI guidelines may be adapted to evaluate the “wider countryside” and used in the context of an administrative area. But there is a need for local guidelines when working at a local level. In the past this was the work of “local experts”, people familiar with the nature and distribution of habitats in an area. The increased public awareness of environmental matters means that local authorities and other interested parties are now producing guidelines and other information that is relevant and applicable at the local scale.
- 9.47. The Dumfries & Galloway Local Biodiversity Action Plan (LBAP) is a document which presents a comprehensive review of the wildlife resource of the area. The LBAP describes and discusses habitats and species of international and national importance, and also those that have a regional or local significance. The LBAP reviews the past, present and possible future condition of these habitats and species, and establishes priorities for maintaining and enhancing all of the present wildlife resource. Conifer plantations are abundant across the landscape of Dumfries & Galloway. They would probably be dismissed, as of low wildlife significance should a NCC 1989-style evaluation be carried out. An example of the LBAP’s dealing with local priorities is the inclusion of a section describing and discussing the value of areas of long-established coniferous plantation woodland.
- 9.48. The evaluation of the wildlife significance of the pipeline route corridor considers the national principles defined in the NCC 1989 guidelines but is strongly influenced by the local principles as set out in the LBAP.

Baseline Conditions

Description of habitats and features in the 400m pipeline corridor

- 9.49. The following paragraphs detail the habitats within the 400m pipeline route corridor with reference to Drawings ECO1 to ECO34 that are bound in the Addendum of Drawings. The description runs in a north-east/south-west direction from the Beattock Compressor Station to the Brighouse Bay Compressor Station. The pipeline is routed across seven major watercourses that are explained in more detail from page 19.

Map ECO1

- 9.50. Here the pipeline and its corridor are across pasture. The tree-lined stream of Threegill Cleuch is crossed near to Stockholm farm.

Map ECO2

- 9.51. The corridor at the north end of this sheet includes part of the Lochwood Wood SSSI (NY 084 972). Lochwood Wood that lies on the western edge of the corridor is a SSSI. This pasture woodland consists of ancient Oak trees with important epiphytes (plants growing on the boles and branches, notably lichens). A block of coniferous plantation woodland separates the SSSI from the pipeline route. Lochwood Wood was formerly more extensive and a field adjacent to the SSSI, now largely under improved pasture, contains several ancient oaks and is included within the Ancient Woodland Inventory (AWI). This AWI/non-SSSI field lies across the road from Lochwood Tower and Lochwood Farm. The pipeline route runs outside the eastern edge of the AWI field and adverse impact would appear to be unlikely. Ditched streams are crossed at Thrummyrig and Royal Oak.
- 9.52. There is a small patch of broadleaved trees beside Lochwood Cottage and an area of conifers adjacent to Ross Cottage. The fields' south-west of Ross Cottage were inspected and found to be heavily grazed pastures with patches of rushes.

Map ECO3

- 9.53. The rushy fields continue onto this sheet followed by a conifer strip plantation and into fields of pasture. Near Lochwood Cottage the route crosses a very small block of relatively new conifers. The route runs parallel to a stream, crossing it to the west of Beattock Rigg. Areas of conifer plantation, generally parallel to valley sides, are frequent within the corridor on this sheet. Most of these blocks of conifers are relatively small, but at the south end of the sheet the route runs parallel to the south-western end of the extensive Hazelbank Plantation. The route crosses the north-western corner of Kilnpot Wood on the eastern side of Hazelbank Plantation. This wood has recently been felled and is ready for re-planting.

Map ECO4

- 9.54. The pipeline continues across pasture. The route passes close to the western edge of Springwells and Greiglandsburn Plantations (conifers), and close to the tip of an unnamed plantation west of road crossing RDX5. Here the route crosses the ditched stream of White Syke. To the south-west, the route passes to the north of the formerly mixed plantation of Greenbeck Wood – from the aerial photographs this appears to have been prepared for re-planting. West of Greenbeck Wood the route passes to the south of an unnamed block also prepared for re-planting, here crossing a ditched stream. North-east of Greenbeck farm the route crosses a stream running south from Edgemoor Wood and then passes between the south-eastern tip of Heatheryhall Wood and Greenbeck farm. Heatheryhall Wood is a conifer plantation, but the aerial pictures indicate the area crossed is another that has been prepared for re-planting.

Map ECO5

- 9.55. The pipeline route is largely through pasture grassland. On entering the map the route initially crosses a stream emitting from the south-western end of Heatheryhall Wood and then two small streams which run between the conifer plantations of Kersemoor Wood and Kerse Plantation.
- 9.56. The pipeline crosses its first major watercourse, Kinnel Water. This river has significantly altered its course since publication of the Ordnance Survey 1:10,000 sheet. The upstream area of the river within the pipeline corridor has broad-leaved woodland along its eastern flank (described in more detail from page 19). Broad-leaved trees occur near to the river crossing, and just to the south there are contiguous blocks of coniferous and broad-leaved plantation woodland.

Map ECO6

- 9.57. The pipeline crosses two ditched-streams through pasture fields and then Garrel Water, just after RDX8. Garrel Water is a moderately large stream that has been straightened over much of its course. Much of the pipeline route on this map is across pasture, some of which is a little rougher and damper than previously encountered, with rushes quite frequent in places. The sheet finishes with the pipeline crossing the straightened course of Kirkland Burn

Map ECO7

- 9.58. This sheet commences by the traversing of a plot of land shown as Bents Plantation which is in fact an area of rushy grassland. At the western end of this grassland the route passes between the conifers of Stenmuir Moss and an unnamed adjacent block.
- 9.59. The pipeline then encounters the ditched Clatterstanes Burn and its tributary drain beside RDX9. The route initially runs parallel to Parkgate Burn. The area of Big Wood on the south side of the burn has been prepared for re-planting. The north-western flank of Big Wood has broad-leaved trees, though overall the plantation would be considered to be coniferous. The ditched Parkgate Burn is crossed after RDX10.

Map ECO8

- 9.60. The route crosses Water of Ae. The river has areas of shingle and is flanked with areas of broadleaved trees and scrub. Further west the pipeline route runs onto Fulton Moor (also on Map ECO9).

Map ECO9

- 9.61. A few rushes occur near the stream access to the road RDX13. The view from this road did not afford a good sight of beyond the brow of the hill – the plateau here may be rushy grassland or possibly some peaty pasture. The slopes down to the lower ground by the road are heavily grazed pasture. The aerial photographs indicate a relatively new block of conifers on the north-eastern slopes of Rorie Hill.

- 9.62. Black Loch SSSI (NX 991 875) is an area of valley mire that lies to the north of RDX13. The pipeline route passes to the south of the designated area with just its southernmost tip within the pipeline corridor. The land immediately south of the SSSI is more heavily grazed. Dry hummocks and lawns of *Sphagnum* moss are frequent and Heath Spotted-orchids are quite common. There are various other mire species present including Lousewort, Carnation Sedge, Star Sedge, Common Sedge, Bog Asphodel, Common Cottongrass, Hare's-tail Cottongrass and Cross-leaved Heath. Species of upland grassland or mire include Purple Moor-grass, Heather, Bilberry, Wavy Hair-grass, Sweet Vernal-grass, Yorkshire Fog, Creeping Soft-grass, Tormentil and Heath Rush. The lowest area has abundant Sharp-flowered Rush.
- 9.63. To the west of RDX13 is Annfield Moor. Cottongrass is present at the north end, by Moor Park Plantation. This suggests peat, but further south the Moor is on mineral soils. The heavily grazed rush pasture has abundant tussocks of Soft-rush, with Marsh Thistle, White Clover and both species of Buttercup frequent in the surrounding grassland. South of the pipeline area Annfield Moor becomes more improved grassland containing rushes, thistles and nettles. The apparently unconstrained stream of Park Burn runs along the western edge of Annfield Moor and is crossed by the proposed pipeline route.
- 9.64. Westwards the route is over improved pasture, crossing a number of north/south wet ditches. One of these ditches is the channelled section of the course of Threegill Cleuch. Threegill Cleuch carries a small area of broad-leaved woodland a little to the east of the pipeline crossing.

Map ECO10

- 9.65. An unnamed stream, possibly Guillyburn, is crossed at the edge of RDX14 that runs down to Townhead. There are various strips of trees on or adjacent to streams in the northern part of the corridor, which are avoided by the pipeline route. All fields are in pasture. An apparently unconstrained stream is crossed west of Auchenrath and another at Newlands Linn. At the latter there are coniferous trees along the watercourse. One of the tributaries of Duncow Burn is crossed a little to the west. This is dammed downstream to form a moderately sized water body associated with the nearby Duncow Mill. Kilndub Plantation is a small area of woodland at the western edge of the corridor.

Map ECO11

- 9.66. A ditched stream is crossed north of RDX17 and southwest of this the pipeline crosses the straightened course of Pennyland Burn. Flat pasture fields are crossed before reaching the River Nith (described in more detail from page 19).

Map ECO12

- 9.67. To the west of the River Nith the route passes through the western end of recently planted broadleaved woodland. At the end of the next field the pipeline crosses the tree-lined stream called The Lake near to the Dumfries to Ayr railway. Land use is generally pasture, with scattered areas of trees. The route crosses wet ditches on either side of RDX19, with some rushy grassland on the west side of the road. The

pipeline route bends to the south to pass around a block of mixed plantation woodland near McWhanrick.

Map ECO13

- 9.68. The pipeline continues south across improved pasture grassland, with a few areas of broadleaved trees within or close to the corridor. A wet ditch is crossed at the top of the sheet, with another just before the crossing of the disused railway. The old railway line is lined with broadleaved trees, but cover is more open in the area of the pipeline crossing. To the south the route crosses Cluden Water, described in more detail from page 19. The Cluden in this area has broadleaved trees and woodland along both banks.

Map ECO14

- 9.69. The landscape here is relatively featureless improved pasture. The ditched stream running south-eastwards from Maryfield is crossed north of RDX24. Beyond RDX24 the route crosses several ditched streams, with some trees along the field boundaries.

Map ECO15

- 9.70. The route continues across ditched flat pasture land and crosses Cargen Water, as described in more detail from page 19. Some trees and scrub occur just upstream of the crossing, and Friars Island, a grassy mound with scattered trees, breaks up the flat landscape here. The pipeline route curves around the edge of the relatively new plantation of Terraughtie Wood. South of the A75(T) the ground reverts to an undulating terrain. Trees occur in the grounds at Terraughtie and along the track south-west of this.

Map ECO16

- 9.71. A feature of the pastures here is patches of scrub and sometimes trees along the edges and in the corners of some of the fields. The route crosses the stream of Nunland Burn and passes to the north of a small block of conifers on the flank of Nunland Hill.

Map ECO17

- 9.72. The ditched stream of Lochfoot Burn and its similar tributary are crossed on either side of Lochfoot Filter Station. Lines of trees occur along the boundaries of some of the pastures.

Map ECO18

- 9.73. The pipeline continues across improved pasture. Various small blocks of woodland occur within the corridor, particularly after RDX28. This section also includes four crossings of north-south ditched streams. A relatively new large pond/small lake lies within the corridor to the south of Three Crofts.

Map ECO19

- 9.74. The pastures here appear quite rocky in places, particularly to the south-east. A few of the field boundaries have trees. There appears to be some damp rushy ground beside the stream crossing to the north of road crossing RDX29.

Map ECO20

- 9.75. The pipeline passes by a patch of scattered conifers as it crosses the ditched stream of Milton Burn. The route then turns south at Hawthorn Hill and towards Round Hill of Burnside before turning south-westerly and parallel to an overhead powerline.

Map ECO21

- 9.76. Drains are quite frequent in the pasture fields here. The pipeline crosses at least five of these north of RDX32.

Map ECO22

- 9.77. The tip of the irregularly shaped Holehouse Wood is within the corridor at the northern end of the sheet. Some small patches of broadleaved woodland occur in or near the corridor. The route crosses a ditched stream and later runs parallel to tree-lined field boundaries to approach RDX33. This is followed by the crossing of Urr Water, described in more detail from page 19. Some scrub and small trees occur around the crossing, with trees on both sides of the river to the downstream. West of the Urr the pipeline crosses the tree-lined Buittle Burn, a partially straightened tributary of the Urr. The crossing of a disused railway (lined with trees) follows this. Improved pasture is the predominant use of the fields here.

Map ECO23

- 9.78. Some small blocks of broadleaved woodland occur within the corridor. The ground is rougher in places, and there is scattered scrub in some of the pastures. The route passes to the north of Shielyhill Plantation before crossing the hedge lined tributary stream of Birkland Burn to the south of West Logan.

Map ECO24

- 9.79. The route follows the electricity lines avoiding the rocky outcrops and areas of damp pasture. The pipeline crosses to the south of the wood lying on the west of Kenmore Hill. The fields along the route are heavily grazed pastures with patches of rushes. The straightened Corra Lane stream is crossed to the west of Craigton Cottages. Some trees occur along the banks of the Corra Lane but these non-shall not be affected by pipeline construction. Torrs Moss SSSI (NX 781 618) lies 450m from the pipeline corridor.

Map ECO25

- 9.80. The sheet includes the southern tip of Threave and Carlingwark Loch SSSI (NX 763 609). This SSSI lies at sufficient distance outside the corridor not to be

influenced in any way by the presence of the pipeline. This designated site is an extensive area of wetlands and associated habitats, of particular importance for its bird populations but also containing uncommon plants. The non-SSSI part of the site continues southward alongside Gelston Burn and the B736 road and is crossed by the pipeline. The northern part of the corridor here consists of rather open woodland, becoming pasture to the south. As well as the straightened Gelston Burn the pipeline also crosses a wet ditch along the western perimeter of the site. The pipeline crosses a line of trees along the track running north from Halmyre.

Map ECO26

- 9.81. Some small patches and blocks of trees occur within the corridor west of RDX39. Two wet ditches are crossed to the south of Longsheds, with some damp areas now appearing in the pasture fields. The tree-lined Slack Burn is crossed towards the western edge of this sheet.

Map ECO27

- 9.82. There are trees and scrub in the grounds of Auchlane close to the pipeline crossing of a tree-lined stream at the side of RDX41. Another wet ditch is crossed just north of Crockmore Wood. Here the pasture is rushy in places. Scrub and sometimes trees are found in corners and along the edges of some of the other fields in this section.

Map ECO28

- 9.83. After RDX42 the route crosses the hedge-lined ditch of Stranshankie Burn and heads west to the River Dee (described in more detail from page 19). Trees occur along the banks of the Dee, and there is a tree-covered island in midstream to the north of the crossing. West of the Dee the route passes the linear strip of Long Plantation and alongside the extensive wooded grounds of Argrennan House. Two small streams are crossed south of this.

Map ECO29

- 9.84. Two wet drains are crossed west of RDX43. The ground is rougher in places, and there is scattered scrub in some of the pastures. Trees occur in the grounds of Argrennan Mains and Park of Tongland, and there is some damper ground to the west.

Map ECO30

- 9.85. The route passes north of a strip of broad-leaved woodland and crosses the tree-lined disused railway parallel to the eastside of the A762 road. The pipeline crosses the A762 at RDX45 and then bends southwards, crossing a ditched stream and then Tarff Water, described in more detail from page 19. The westside of the Tarff has thick cover of trees on the steep bank just downstream of the crossing area. Tree and scrub cover also occurs along the upstream stretch of the river. West of RDX46 the pipeline route passes the southeastern corner of the extensive Kempleton Plantation. The mixed plantations at Hilltop and Foresthill touch the

edge of the corridor, and some small areas of trees occur closer to the pipeline route.

Map ECO31

- 9.86. The pipeline route crosses two wet ditches on the west side of Cumstoun Mains and another to the south-west. The map shows areas of conifers on either side of RDX49 and some damp ground on the north side of the road are within the eastern part of the corridor.

Map ECO32

- 9.87. Between RDX49 and RDX50 the pipeline passes south of an area of trees and scrub on rocky ground. Two small patches of conifers occur in the west of the corridor and the ditched stream of Corraford Burn is crossed at the south.

Map ECO33

- 9.88. The pipeline passes to the west of High Nunton Plantation. There is a small block of relatively new plantation on the west of the route, occupying the former site of a small lake. The pasture to the west of this has scattered scrub. To the south the route continues across rocky pasture then west of the conifers of Dambog Plantation. The field boundary here has scattered trees, as does the next one to the south.

Map ECO34

- 9.89. After RDX51 the pipeline passes to the west of Smithy Plantation and crosses the ditched stream emitting from it. There are scattered trees in the grounds of a hotel, and some trees along the field boundary that runs south from Clash Cottage to the compressor station. The hedgerow from Clash Cottage becomes a linear area of woodland and scrub, wet at the southern end. Woodland or scrub on usually permanently wet ground is known as carr. Rusty Willow is the dominant woody species in the carr. The willows are quite old and their cover is often open, giving a rich ground flora. Herbaceous species found in the carr include Yellow Iris, Ragged-Robin and Common Spotted-orchid. Various sedges occur, including Greater Pond-sedge (uncommon in Scotland and first record for Kirkcudbright). Other species uncommon in Scotland include Lesser Water-parsnip, Fool's Water-cress and Nodding Bur-marigold.
- 9.90. The area between the carr and the parking area has a strip of fen vegetation. This is disturbed but has a rich mix of grasses, sedges, rushes and broad-leaved herbs. Common Spotted-orchid is particularly prominent, and a few specimens of Northern Marsh-orchid occur with the reeds at the southern end.
- 9.91. The rubble embankment to the parking area has mixed species False Oat-grass grassland. The disturbed nature of the fen is perhaps indicated by the fact that patches of dry grassland species are also quite frequent in the wetland vegetation.

Assessment of Habitats and Species in the pipeline corridorAssessment of habitats

- 9.92. The habitat most abundant within and adjacent to the route corridor is heavily grazed pasture. The pastures are predominantly grassy, generally with even the grass species present at low diversity, and they would not be considered of significance in a botanical context. But agricultural grasslands are often important sites for birds, particularly in winter. Large flocks of geese may graze in the fields. The invertebrates in the grass, litter and soil are fed on by a large variety of birds, often present in great numbers. These include lapwing, curlew, gulls, crows, starling and wintering thrushes. The presence of areas of weeds such as thistles or chickweed may attract finches and sparrows. The hedges and hedgerow trees associated with some of the pastures provide further bird habitat, as do ditches and the very occasional pond. Birds may also use agricultural pasture to breed. The most likely breeding bird is meadow pipit, but there may also be skylark and lapwing. The associated field boundary habitats provide nesting and display sites for songbirds. They are also used by predators such as the buzzard. Many of these species or groups of species are showing declines in a national context and extant areas of usage should be conserved.
- 9.93. Various types of woodland form the next most abundant type of habitat within the pipeline corridor. Semi-natural woodland appears to be rather scarce. Linear areas of woodland have developed along many of the larger watercourses and on disused railway lines. The only non-linear area of semi-natural woodland is the Lochwood Wood SSSI at the northern end of the route (Map ECO2). This SSSI consists of ancient parkland oaks. The great age of the site and its relatively undisturbed nature means that it has developed an important flora of epiphytes (plants that grow on the boles and branches of the trees). The great diversity of epiphytic lichens in Lochwood Wood is a testimony both to the age of the site and also the relatively high quality of the air chemistry. That Lochwood Wood was formerly more extensive is indicated by the presence of ancient oaks in an adjacent pasture field, included within the Ancient Woodland Inventory. Lochwood Wood is avoided by the pipeline route.
- 9.94. Recent semi-natural woodland and scrub appears to have developed on areas of disused railway line, such as on Maps ECO22 and ECO30, and along rivers such as Water of Ae (Map ECO8) and Cluden Water (Map ECO13). Patches of Gorse scrub occur along the edges and in the corners of some fields, particularly in the rockier southern parts of the pipeline route.
- 9.95. Consultations revealed that a few of the areas of broadleaved plantation woodland within the corridor are what is described as “long established”. This is likely to mean that there has been some development of diversity of woodland structure and of herbaceous and shrubby plant species, with a consequent increase in niche space available to animal life. Four areas of long established broadleaved plantation woodland have some part of them within the pipeline corridor. These are the strip of woodland along The Lake, a tributary of the River Nith (Map ECO11); the trees around Argrennan House on the west side of the River Dee (Map ECO28) and, further south, High Nunton Plantation and the woodland at Mill Hall Burn (Map ECO33).

- 9.96. More recently established areas of plantation woodland may lack structural diversity and may have a poor range of associated shrubs and herbaceous plants. The edges of these sites can still act as roosting and shelter sites for a range of bird species, and may perform a similar function for some invertebrates and mammals. This “edge effect” may be enhanced at the larger plantation woodland sites, where access roads (rides) may have been incorporated into the woodland design. Woodland rides and their associated ditches often also provide important refuge sites for plants and invertebrates. These in turn may attract other mammal and bird species into the woodland.
- 9.97. Wetlands is a rather broad term which covers a range of habitats including rivers, lakes and ponds, swamp, fen, bog and marsh. These habitat types may occur singly or as a mosaic, and there is also a crossover into other habitats, with wetlands perhaps being grazed or carrying tree cover.
- 9.98. The pipeline corridor includes parts of two wetland SSSIs. Black Loch SSSI (Map ECO9) is an area of valley mire to the south of Ae village. Valley mire is considered to be fen rather than bog as it is, in its early stages at least, fed by ground water. In practice it is found that valley mire and bog often have similar suites of plant species. The route passes to the south and thus avoids this designated area, with just its southernmost tip within the pipeline corridor. The land immediately south of the SSSI appears also to have originated as a valley-mire and is shown on Map ECO9 as such. This site is now quite heavily grazed and may have undergone some drainage, but close inspection reveals that there is still a large number of mire species present, as well as intact areas of *Sphagnum* moss. The Dumfries & Galloway LBAP does recognise the importance of degraded peatlands and other mires, with restoration of these as a high priority. This site would be relatively easy to restore by adjusting the grazing and drainage regimes.
- 9.99. The second SSSI is Threave and Carlingwark Loch that just creeps into the northern edge of the pipeline corridor (Map ECO25). This is an extensive network of open water and associated habitats running northwest along the Dee and the western side of Castle Douglas. Some parts of the SSSI are included within the Loch Ken & Dee Marshes Ramsar Site and SPA. The open water areas end some distance away from the pipeline corridor. The parts of the SSSI on the north side of the corridor contain woodland and grassland, with more open woodland cover continuing onto the non-SSSI land to the south. This then becomes unwooded pasture.
- 9.100. The pipeline route crosses seven main rivers: Kinnel Water, Water of Ae, the River Nith, Cluden Water, Water of Urr, the River Dee, and Tarff Water. None of these has any statutory designation but their importance on a regional and local scale is acknowledged. The physiography and wildlife interest of the river crossings is described in detail from page 19, along with the smaller Cargen Water crossing. Rivers and the land marginal to them are important for invertebrates, fish, amphibians, birds and mammals, as well as a variety of flowering and non-flowering plants. Rivers also create and reveal features of physiographic interest such as exposures in rock and till and areas of shingle. The pipeline crossings of the Kinnel, Ae and Cluden would seem to be of particular biological and physiographic interest.

- 9.101. It has been man's way to attempt to regulate and control watercourses. The size of larger watercourses means that these frequently retain at least some degree of wildlife interest in spite of this. Smaller streams and the land around them may fare less well. A good example of this would be the land around the Cargen Water crossing, where aerial photography reveals there once existed a network of streams meandering across what was presumably a wetland complex of some biological interest. The land is now a rather less interesting set of heavily grazed pastures, with one small area of trees at a stream confluence. Ditched and straightened streams vary greatly in their structure. Deeper and wider ditches may be inaccessible to grazing animals and are thus able perhaps to develop some aquatic and marginal vegetation and thus create niche space for animals. The presence of dung and other agricultural material may mean that any ditch vegetation is comprised of only a few vigorous species, but these tall plants often support a rich variety of insects and other invertebrates. Ditches, which run along the base of a hedge or wall, would have one bank protected from grazing and may develop some floristic interest, particularly where the hedge or wall is banked.
- 9.102. The pipeline crosses a number of ditched streams, these occurring along most areas of the route. It will be possible to assess the wildlife interest of these streams when access is gained to survey the entire route of the pipeline.
- 9.103. Wet woodland, known as carr, occurs by the Brighthouse compressor station, on Map ECO34. The willows in the carr are quite old and the open cover means that a rich ground flora is present. At least four plant species uncommon in Scotland occur in the carr. Associated with the carr is a strip of fen vegetation. Orchids are present in both carr and fen. The land to the north of the fen is heavily grazed damp grassland, becoming drier with distance. A few of the fen species occur in the grazed area. Apparently the fen area was once also heavily grazed and has developed into its present condition since stock was excluded. This illustrates the benefit of management sympathetic to nature conservation.
- 9.104. The pipeline crosses Annfield Moor on Map ECO9. Cottongrass occurs at the extreme north end, suggesting that part of the site to be on peat. Further south, there is mineral soil at the surface – it is not clear if there was formerly a more extensive covering of peat. The vegetation of Annfield Moor in the pipeline corridor is heavily grazed pasture with rushes frequent (and also thistles). The NCC 1989 guidelines do not consider rushy grasslands to be a high priority in a national context. This is in contrast to the LBAP, which notes that, the greater proportion of Europe's rush pasture lies within Britain and also that Dumfries & Galloway is the stronghold within Scotland. Flushed areas of rush pasture may contain a good diversity of flowering plants and mosses. The Annfield Moor site, though of some extent, is rather "dry" and also heavily grazed and is probably not one of the better examples of its type. This evaluation is based on observations made from the road: a fuller survey may reveal that better areas are also present. Botanical poor rush pastures may still provide feeding areas for the variety of birds associated with agricultural grasslands. The presence of rush tussocks provides additional cover for birds such as waders and snipe and redshank may be present, as well as lapwing.
- 9.105. Another area of heavily grazed pasture with high cover of rushes was recorded on the western side of the pipeline corridor to the southeast of Lochwood Moss (Map ECO2).

- 9.106. Various sites have been identified from the aerial photographs as likely to be wet areas with rushes (mapped as “marshy grassland”). These are usually of small extent: the cover may be Soft-rush or Sharp-flowered Rush; there may even be Purple Moor-grass present. Each of these is considered important in the context of the LBAP. The exact nature of these sites and the possible presence of flushes or peat would be determined when access allows a full survey of the pipeline route. A caveat would be that a few sites, which looked “interesting” on the aerial photographs, were viewed from the road and found to be heavily grazed pasture. These apparent anomalies are probably explained by seasonal changes in land use patterns, with a lack of winter grazing making these particular sites appear “rougher”.
- 9.107. A few ponds and small lakes are present within the pipeline corridor. The interest of these will be assessed when access allows a full survey of the pipeline route. Some of these sites are not indicated on the Ordnance Survey maps and are thus of relatively recent origin. These new water bodies may have been planted and stocked or colonisation may have been allowed to proceed naturally. Ponds stocked with fish are unsuitable habitats for amphibians. Small areas of standing water are a relatively uncommon habitat in Dumfries & Galloway.

Assessment of species

- 9.108. Various protected species are known to occur in the vicinity of the pipeline corridor. These include badger, otter, water vole, red squirrel, bats, and wildfowl and waders.
- 9.109. Badgers are typically associated with broadleaved woodlands, particularly where there is bracken or other tall ground layer vegetation as cover. The shelters (setts) are quite extensive excavations, with the entrance often concealed by vegetation. Badgers tend to prefer soils with a high proportion of sand or silt as these are lighter and make for easier digging, both for setts and for earthworms (their preferred food). Badgers tend to be nocturnal. Though the setts are usually in or next to a wood the adjacent open fields will be often be used for forage and recreation. In some areas badgers may actually be completely non-woodland.
- 9.110. Badgers are reasonably well distributed across Dumfries & Galloway. Information on locations of setts and foraging areas will be obtained by further consultation and detailed surveys when access allows a full survey of the pipeline route.
- 9.111. Otters are found on rivers and larger streams where eels and other prey species can be found. They are also found on lakes and on other suitable bodies of standing water, and on parts of the coast. At inland sites otter shelters (holts) are made in the marginal earth bank, usually in the shelter of trees such as alder. In rockier areas the otter may use fissures or small caves. Male otters have a wide range, usually taking in the territory of more than one female.
- 9.112. The otter population of Dumfries & Galloway is widely distributed and is considered to be thriving. The possible presence of otters along the pipeline route will be assessed by detailed survey of the larger watercourses.

- 9.113. Water voles, as their name suggests, are found alongside rivers and streams, flowing ditches of relatively small size, and also on areas of standing water. Populations may also occur in farmland away from watercourses. The waterside populations nest in earth banks and develop an extensive network of tunnels. Water voles are not widely recorded in Dumfries & Galloway but the abundant presence of suitable habitat means that they could be present almost anywhere. This will require detailed specialist survey work when access is obtained to the pipeline route.
- 9.114. The red squirrel is widespread and relatively common in Dumfries & Galloway, a situation in contrast to most of the rest of Britain. A factor may be its ability to adapt to living in the conifer plantation widespread through Dumfries & Galloway. The pipeline does not cross any significant area of conifer plantation and it is unlikely there would be any impact on red squirrel numbers.
- 9.115. Only a few species of the British bat fauna are found in Scotland. Bats roost in cracks in old trees, in caves, in the roofs of old houses (and sometimes in new ones), and in bat boxes. Bat boxes can be put almost anywhere, but a favoured site is woodland, including recent plantings of broadleaves and in conifer plantations. It is likely that the pipeline route will not impact on any bat roost area.
- 9.116. Large numbers of wildfowl and waders occur in Britain, with winter populations reaching international significance in some areas. The main centres for waterfowl are well known to nature conservation bodies, with the key sites carrying national or even international designation.
- 9.117. Some waterfowl maintain resident populations, often on sites without designation. In winter numbers on the key sites may be so great that birds spill out onto suitable land in the surrounding countryside. The flat land alongside the major rivers is often an important overspill site, but swans, geese, ducks and waders may appear on any suitable piece of arable land or wet or dry pasture. Populations that remain resident, such as some of the oystercatcher and lapwing may use shingle and associated flat areas along rivers as breeding sites.
- 9.118. The pipeline route does not impact on any known waterfowl site. Every effort will be made to avoid disturbance to sites used for feeding. Breeding areas will be avoided.
- 9.119. Many types of bird use woodland, hedges and single trees for display, feeding, roosting and nesting. It is inevitable that construction of the pipeline will entail some management and modification to sections of hedges and to individual trees. The section of hedge to be removed will be minimised to reduce the effects on bird nesting sites. Netting / bunting will be mounted in the hedgerows that will require removal in the winter prior to construction. This will dissuade birds from nesting in the first instance. All works will be undertaken after consultation with SHN and the RSPB.
- 9.120. No protected species of plant is known to occur within the pipeline corridor. Some plant species that are rare or uncommon in Scotland have been recorded.
- 9.121. A key site is the willow carr near the Brighthouse compressor (Map ECO34). At least four species rare or uncommon in Scotland were recorded on the July survey

visit. Three of these are associated with pool areas in the carr, particularly towards the edges. The pipeline route passes around the edges of the willow carr and it is important that there is no adverse impact upon the carr pools or their vegetation.

- 9.122. Another site known to have a plant species rare in Scotland is Cluden Water (Map ECO13). There is abundant growth of the aquatic species Stream Water-crowfoot. The plant is present in great abundance in this stretch of the Cluden and survived the 1993 construction of the BGE Interconnector pipeline crossing 450m upstream of the proposed crossing location. The population appears to be resilient but care will be taken during construction of this pipeline

Watercourse surveys

Introduction

- 9.123. The proposed route crosses seven major rivers: Kinnel Water, Water of Ae, River Nith, Cluden Water, Urr Water, River Dee and Tarff Water. As well as the seven major rivers a minor river, Cargen Water, was included in the survey work.
- 9.124. These major river crossings were surveyed and assessed using a methodology based around that described by the former National Rivers Authority (NRA). This records ecological and physiographic features within four zones of the river “corridor”. These four zones are Aquatic, Marginal, Bank, and Adjacent Land. It is felt that this method of survey, with interpretative notes and discussion, would provide the information necessary to evaluate the impact of an engineering scheme on a watercourse and its immediate environs.
- 9.125. NRA-style river corridor surveys are generally designed to cover the length of a river, and surveys are divided into sections of about 500 metres. The present work is only concerned with that part of the river to be crossed by the pipeline, and so the survey was confined to as large an area as was felt necessary to provide the information required. This was generally a 200 metre section, 100 metres either side of the crossing point.

Baseline Conditions and Assessment of Impact for Watercourse Crossings

Kinnel Water

- 9.126. Kinnel Water is to be crossed a little to the south of Courance and Kerse, just over 3.5km to the south of St Anns. The river is actively meandering across a fairly small flood plain area. The historic meandering can be seen from the fact that the district boundary follows a former course of the river and, more recently that the course of the river has changed since the last edition of the Ordnance Survey 1:10,000 sheet.
- 9.127. The route approaches from RDX6 by crossing improved pasture, initially on slightly higher ground. The higher ground terminates about 100m from the river, as a ridge with a few scattered trees and bushes. The improved pasture continues across the flatter ground towards the river. For some reason a fence has been erected a short distance from the river edge and the grass in the enclosure has been allowed to grow rank.

- 9.128. Upstream of the crossing area the west bank has a line of Alder trees. Downstream to and around the curve of the river are two contiguous areas of woodland, with the larger block along the river mainly of broadleaved trees and a smaller block of conifers to the rear.
- 9.129. The steep west bank of the river is around the outer edge of a meander. Some vegetation occurs on partially slipped blocks. The bank is up to 2m high and consists of reddish stony till, similar to that noted upstream of the crossing area on the Ae (see below). The lighter-coloured subsoil layer is much thicker here than at the Ae. The highest parts of the Kinnel cliff are in the central part of the section and here sand martin holes are abundant in the soil horizon.
- 9.130. During construction of the Interconnector pipeline in 1993, it was found that fording of the Kinnel was easy even in late winter and so installation of the pipeline without the requirement to work in running water should presented no problem. The bed is of cobbles and large stones, with smaller stones in the interstices. There is no aquatic vegetation. The cobbles and stones do have a rather greasy coating of micro-flora, suggesting the water may be a little polluted here, presumably by agricultural runoff.
- 9.131. An apron of coarse shingle fronts the eastern bank of the river in the crossing area. This has a scattering of plants across the lower areas, and a more continuous cover of grassland along the upper area adjoining the bank. The flora present includes expected species such as Reed Canary-grass, plants of False Oat-grass grassland, and ephemerals and opportunists of wet or bare ground. Of some slight interest is the occasional presence of “better” grassland species such as Harebell, Lady’s Bedstraw and Common Dog-violet.
- 9.132. The shingle laps onto the base of the till cliff on the eastern side, giving only a short rise to the fenced improved pasture behind. Downstream of the crossing line the east bank (still with shingle below) has a line of Alder trees. Upstream the east bank top remains grassy.
- 9.133. The river crossing point has been carefully chosen to minimise disturbance to a colony of sand martins that occupy holes in the western cliff.

Water of Ae

- 9.134. Water of Ae is to be crossed a little upstream of Ae Bridgend on the A701(T) road. The river follows a more-or-less unconstrained course through a relatively narrow floodplain. The movements of the Ae and its deposits are quite complex (see Brown 1998).
- 9.135. The field between RDX11 and the river is a mixed species improved pasture, part cut at the time of survey. Upstream the pasture is up to the edge of the relatively high vertical river cliff, but the land loses height and a cover of shrubs and small trees appears as the crossing area is approached. Where the land area is at its lowest there is a small extent of Alder woodland, mainly as young trees. The tree cover is above a very low cliff in the till. In front of this is a broad apron of shingle. The shingle extends for some distance upstream, though in its distal portion a blind

inlet of the river channel separates it from the higher cliff. The shingle apron is at its highest in front of the wooded area, and here the cover of vegetation is at its most luxuriant. Creeping Soft-grass provides the main cover in the crossing area, but False Oat-grass is common and tussocks of Tall Fescue are prominent, as are occasional bushes of Willow. Cover is patchier away from this, with the upstream section and shingle by the river generally without plant cover. Downstream the shingle vegetation becomes rather scrubby.

- 9.136. The upstream shingle provides a closer view of the cliffed area around the outside of the meander. This is very stony reddish till, with occasional grassy clumps on slipped material at the base. A shallow soil has developed on the surface, and close examination of photographs reveals that a few sand martin burrows are present in the lighter-coloured subsoil layer (no martin activity had been observed during the survey visit).
- 9.137. The river curves back around the apron of shingle. The water is shallow and relatively fast flowing over a bed of cobbles and stones. There is no aquatic vegetation.
- 9.138. Upstream of the crossing area the intra-meander part of the east bank has a raised flat area with a cover of Gorse and Broom scrub. This platform has about 1m of silt and clay on top of a layer of shingle. The river straightens as the shingle apron of the west side reaches its maximum extent. The east bank becomes higher, again consisting of soil upon a layer of shingle. There has obviously been past erosion and slippage as this section of the bank is toed with rocks and stones and in fact all sorts of other material, including bits of wood and metal. On the bank top the gorse scrub gives way to some Willow and then Alder, then becoming grassy with an occasional bush towards the bank top. This grassy area is part of the improved pasture field extending away from the river edge.

River Nith

- 9.139. The crossing of the River Nith is some 500m downstream of the railway viaduct, near the farm at Sandbed. The Nith here runs over a broad floodplain (generally over 1km in width), but is constrained within it by flood banks. At the crossing point the distance between the flood banks is about 150m.
- 9.140. The route approaches the western flood bank by crossing improved pasture on flat land. The embankment and the flat area to the river are grassy – the colours on the aerial photographs indicate this is less “high quality” pasture than that behind the bank. There is no fence along the top of the embankment and it may be that cattle are able to walk across the bank to access the river edge pasture. Patches of thistles are rather frequent.
- 9.141. The short steep bank on the western side appears to be comprised of reddish silt and other redeposited till, with some stones in it. The bank edge has slumped in places, possibly as a result of cattle usage. Areas inaccessible to stock have coarser grass cover. Low water at the time of survey showed a gently sloping beach at the base of the bank.

- 9.142. In the area of the crossing the Nith is meandering towards the eastern side at this point, which means the deeper part of the channel is on that side. Survey access was from the east and the combination of steep bank and deep water meant it was not possible to access the riverbed. The deposits at the foot of the western bank suggest that the bed would be a mix of silt and sand, with stones and possibly boulders more frequent in the deeper part of the channel. No aquatic vegetation could be seen.
- 9.143. A shingle bank occurs downstream of the crossing area where the Nith is met by its western tributary The Lake. The upper parts of this shingle have developed a grassy cover.
- 9.144. The eastern bank of the Nith is relatively steep and appears to be a little higher than that on the opposite side. The bank carries coarse grass and tall herbs. Some rock armour could be seen in one spot. The size and structure of the riverbank make it less accessible to stock and Gorse and small specimens of Alder, Ash, Sycamore, Wych Elm and Rusty Willow have become established. In places there is also some Gorse and Willow on the bank top.
- 9.145. The flat area between the river and the flood bank carries improved pasture. This appears to be subjected to periods of heavy usage by cattle, with dung patches and trampled areas of bare red soil in places. Patches of Creeping Thistle and Common Nettle are frequent in this vicinity.
- 9.146. The eastern flood bank is fenced and has False Oat-grass grassland with patches of Gorse and Creeping Thistle. The field beyond the flood bank is improved pasture.
- 9.147. The 1993 survey of the Nith at the Interconnector pipeline crossing 2km downstream found areas of bare shingle and grass on shallow soils over shingle. The present crossing appears to be over an area where the soil cover is deeper, but trenching through this may reveal some shingle at depth.
- 9.148. The crossing of the Nith appears relatively straightforward, allowing for the size and capacity of the river.

Cluden Water

- 9.149. Cluden Water is to be crossed to the north-west of the Lochside area of Dumfries, between Fiddler's Ford and Cluden Lodge, a little to the east of where Irongray Road leaves the edge of the river.
- 9.150. The land on either side of the river is under improved pasture. The Cluden has cut itself a gorge through the till deposits and the banks on both sides carry a dense cover of broadleaved semi-natural woodland. The crossing location has been selected to allow the pipeline to be routed through a point where there is a break in the woodland cover on both north and south sides of the river.
- 9.151. As the route approaches the river it enters a depressed area of wetter grassland along the area adjacent to the woodland cover. The heavy grazing pressure in the field means this area is grassy and of no great botanical interest. The crossing is via a more open section of the tree cover.

- 9.152. Access to the river was difficult at the crossing point, other than to observe dense growth of Water-crowfoot in the channel. It was however possible to accessed via the steps down from Cluden Lodge on the north side (350m downstream of the crossing location). This is immediately upstream of a weir (indicated on the 1:25,000 and larger scale maps). Water level was sufficiently low that a large amount of rock (Permian – Doweel Breccia) was exposed upstream of the weir. The river was effectively running as a series of interconnecting streams around the rocks. Flow was also impeded by the considerable abundance of Stream Water-crowfoot trailing along the river. The differentially eroded nature of the rocky bed means there are likely to be pockets where gravel, sand and perhaps silt may lodge.
- 9.153. Water depth appears to be a little greater at the proposed crossing. Restoration of the pipeline trench at a downstream location would possibly have created changes in the low flow regime. The somewhat deeper water at the site of the proposed route would hopefully mean this would be less of a problem. The crossing area also has the advantage of the bank on the north side being considerably less steep.
- 9.154. Trees on the banks in the crossing area are largely of Alder. It is obviously important that minimal damage be done to the tree cover along the river edges.
- 9.155. Stream Water-crowfoot is only widespread in the Hampshire Basin of England. It is scattered over the rest of England and Wales and in Scotland is sufficiently uncommon that it could be considered “rare” there. The plant is present in great abundance in this stretch of the Cluden and was obviously able to survive the 1993 Interconnector pipeline crossing a little upstream. Normal construction standards of care shall be observed to ensure that environmental impacts are kept to a minimum during pipeline construction at this river crossing thus presenting no significant long term impact.

Cargen Water (minor watercourse crossing)

- 9.156. The route crosses Cargen Water west of Dumfries, between Terraughtie and Terregles. Cargen Water and the other streams in the vicinity have been heavily ditched and canalised. Recent aerial photographs indicate a considerable number of meandering streams were formerly present in the adjacent fields.
- 9.157. The sinuous upstream course ends where a small tributary joins Cargen Water, the river thence running in a straight line. Alder, Hawthorn and Willow occur along the edge here, and the Cargen has a small beach of shingle just upstream of the confluence. The flat land on all sides is generally under improved pasture, though patches of Common Nettle and of False Oat-grass occur.
- 9.158. Downstream of the confluence the western bank of the Cargen has stone reinforcements, in places supported by stakes. This side of the river is fenced, and nettles, tall grasses and other rank plants are frequent above the river edge. The unfenced eastern side has an area of Reed Canary-grass and then a patch of Rusty Willow, these and other shrubs and trees being enclosed by a small fence across the field. The fence here also crosses the Cargen to prevent stock access upstream.

- 9.159. Downstream of the enclosure cattle trampling has led to bank collapse on the eastern side, though the collapse has since grassed over and also has clumps of Common Nettle.
- 9.160. The narrow stream has a bed of firm stones with gravel and some sand. There is no aquatic vegetation, though some Reed Canary-grass occurs along the base of the banks. Some shingle bars were exposed in mid-channel to the downstream of the likely crossing area.
- 9.161. The pasture on the eastern side has an elongated grassy mound with several rather spindly trees on it. This mound is some distance away from the pipeline route.
- 9.162. The bank protection and shingle areas suggest that this stream may at times be less innocuous than it initially appears and prolonged heavy rainfall may be more of a problem here than at the crossing of the larger watercourses.
- 9.163. Good construction methods will ensure no significant environmental impact effect this watercourse crossing.

Urr Water

- 9.164. The Urr is crossed just south of the mound of Mote of Urr, between Milton of Buittle and Herriesdale. The river here is towards the eastern side of what is a relatively narrow floodplain between areas of higher land to the east and west. The 1:25 000 Ordnance Survey map indicates the pipeline route in fact crosses the floodplain on a low ridge.
- 9.165. The pipeline route approaches the river across improved pasture, crossing a low hedge to access the riverside area. This is flat and largely grassy, but there is an area of shrubs and small trees around the route line. There is an area of slightly damper grassland within the shrubby area. The grass cover is relatively short, being grazed by cattle that wander across from the eastern side of the river. Soil and patches of pebbles are exposed in places. Inspection of the low bank of the river reveals alternating laminae of pebbles and soil, reflecting past flood deposition events.
- 9.166. At the crossing point the river is broad and shallow with a bed of cobbles and large stones, but there was no aquatic vegetation present.
- 9.167. The eastern edge of the river is grassy and grazed by cattle. The ground is initially flat, but slopes up to the hedge along the road of RDX33, with more steeply sloping land beyond this. Occasional patches of longer grass occur, particularly up towards the road hedge. A wet ditch runs along part of the flat ground, with small specimens of Alder and Willow along it. The slope behind the ditch has a line of Hawthorn along its lower part.
- 9.168. Ash and other trees occur along both edges of the river a distance downstream of the crossing area.

9.169. The pipeline will avoid the line of Hawthorn on the eastern side. The route may pass through the shrubby area on the western side but these are largely young specimens and with care impacts can be minimalised.

9.170. This crossing will present no long term significant environmental impact to this watercourse.

River Dee

9.171. The Dee is the largest of the watercourses to be crossed by the pipeline, being almost 50m width at the site chosen. The crossing point is to the west of Arkland.

9.172. The route runs north-east across improved pasture, running broadly parallel to the course of the river. The long-established plantation woodland in the grounds of Argrennan House lies to the west of the route here.

9.173. The route angles more eastwards and approaches the river, with the linear woodland of Long Plantation to the north. The route bends again so that the Dee is crossed in a more-or-less west-east direction. The eastern bank has a cover of shrubs whilst pasture on the western bank extends down to the waters edge.

9.174. There is a small rocky promontory to the immediate south of the pipeline crossing of the west bank of the Dee. Low water conditions at the edges revealed that the river crosses eroded folded Silurian rocks. These are likely to be present across the whole width of the channel. No aquatic vegetation could be seen. An island with tree cover occurs in midstream to the north of the crossing.

9.175. The eastern bank is higher than that on the western bank, and till cover may be thicker on this side. Some scrubby vegetation occurs along the edges of a small stream a little to the north of the route.

9.176. From the east bank the route crosses a gently sloping improved pasture to cross the hedged ditch of Stranshankie Burn. The route continues to rise across improved pasture to RDX43.

Tarff Water

9.177. The Tarff crossing is situated to the south of Kempleton Mill. Here the river lies towards the western edge of its flood plain.

9.178. At RDX46 the pipeline route enters an improved pasture. The field contains a large undulating depression. Where the depression meets the river edge there has been past slippage, now vegetated and apparently stable. Downstream of the slippage the west bank of the river consists of a relatively tall and steep cliff, presumably in till. The cliff carries a dense cover of trees and scrub, this cover extending downstream around the bend in the river. At the top of the cliff the tree cover ends at the break of slope to the pasture above.

- 9.179. Approaching the slipped area from above the tree line can be seen to thin out, with only occasional specimens present towards the route line. The slipped area marks the end of the steep cliff, and with it also the end of the tree cover there.
- 9.180. The upper part of the slipped area carries ungrazed Creeping Soft-grass grassland. Over the old wall this becomes a dense and quite extensive cover of ungrazed False Oat-grass grassland. The presence of occasional Meadowsweet suggests dampness, and there is in fact a small patch of Meadowsweet/Yellow Iris wetland vegetation.
- 9.181. The dense tall grass growth continues to the edge of the river, where the vegetation becomes a strip of Reed Canary-grass, with occasional clumps of Hemlock Water-dropwort. Growth is sufficiently tall and dense that caution is required in order to ascertain where the vegetated bank stops and the river begins.
- 9.182. The upstream edges of the slipped area have some occasional bushes, and cover eventually becomes denser to give continuous trees further upstream along the river edge.
- 9.183. The upstream edges of the slipped area have some occasional bushes, and cover eventually becomes denser to give continuous trees further upstream along the river edge.
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- 9.185. The upstream edges of the slipped area have some occasional bushes, and cover eventually becomes denser to give continuous trees further upstream along the river edge.
- 9.186. Water in the river was deeper than in the other “smaller” main watercourses (i.e. all those bar the Nith and Dee), perhaps to a depth of 0.5m. The bed is of cobbles, larger and smaller stones, gravel and sand. Trailing plants of Common Water-crowfoot are quite frequent in the water. Occasional clumps of Reed Canary-grass occur just below the banks, possibly resulting from erosion of the vegetated bank.
- 9.187. The far (northeastern) bank is perhaps a little lower. All of this edge is faced with an armour of boulders and small rocks, extending at least as far as opposite the start of the cliff area. The rocks have a scattered cover of clumps of Reed Canary-grass, with these continuous in one or two places. Above this is a narrow line of ungrazed rough grass, soon to become the improved pasture of the field. To the west the field slopes upwards towards the road (the latter crossed further north at RDX45).
- 9.188. Crossing the Tarff via the slipped area will not impose long term significant impact on this watercourse.

General assessment for the river crossings

- 9.189. The July 2000 river crossing surveys recorded a variety of landform and vegetation types. Riverbeds were found to be rocky or stony, with the margins comprised of floodplain deposits or till. Shingle was sometimes also present at sites with banks in till.
- 9.190. Improved pasture is by far the predominant use of marginal land. This often extends to the edge of the river, but at some sites there are patches or continuous areas of woodland or scrub vegetation.
- 9.191. Consultation prior to survey suggested that marginal areas of shingle might be of importance to nesting birds, notably oystercatcher. The 1993 Interconnector surveys had observed that oystercatcher were nesting on the extensive shingle areas on the eastern side of that year's crossing of the Nith. The July 2000 surveys were not at a time when oystercatcher would be nesting. Potential sites might be present at the Urr and Nith, though grazing pressure at these sites may affect any breeding success rate. The shingle on the Ae and Kinnel crossings would certainly be used by oystercatcher in winter, and some might use these or adjacent land in the breeding season. Pipeline construction at river crossings will be programmed to avoid the breeding season.
- 9.192. The pipeline route at the Kinnel Water crossing has taken account of a colony of sand martins that occupy holes in the western cliff. This action will ensure that any disturbance to the birds is kept to a minimum. There are also a few nest holes at the Ae, but again the proposed line is slightly to the south causing insignificant impact
- 9.193. Water vole may be present on some or all of the surveyed watercourses. Water vole may also use the smaller streams that were not included in this survey. Otters may also be present along the watercourses. A full survey of potential water vole and otter habitats may be carried out when access to private land allows.

Mitigation of Impacts

Habitats

- 9.194. The pipeline route avoids any statutory designated sites and large areas of woodland. Apart from the main watercourses the pipeline route crosses only one significant area of semi-natural habitat, a degraded valley mire to the south of Black Loch SSSI (Map ECO9). Good construction and reinstatement methods will ensure no long term environmental impact.
- 9.195. The working width will be kept to the minimum necessary to carry out construction work in a safe and efficient manner whilst minimising impact on any sensitive environmental areas.
- 9.196. The pipeline route occasionally passes close to the corner of woodlands or individual trees in field boundaries. It may be necessary to lop a few overhanging branches from one or more tree specimens.

- 9.197. The pipeline route will sometimes pass through a hedgerow or through a weak point in a line of trees. The pipeline has generally been routed through areas of poor structure (dead or damaged specimens, gaps) but occasionally a healthy tree or shrub may have to be removed. Species the same as those present elsewhere in the hedgerow or line of trees will be planted after construction has been completed.
- 9.198. The crossing of degraded valley mire (Map ECO9) is unavoidable but here the working width can be reduced where necessary. Preferably, a protective geotextile bog-matting or similar temporary covering could be laid over the ground to leave the topsoil undisturbed. Care in removing and replacing soil and vegetation is important to ensure there is no spread of rushes from the lowest area onto the rest of the route across the site. Rush spread on mire sites is particularly undesirable. The final method of construction will be discussed with SNH prior to work commencing.

Species

- 9.199. Paragraphs 9.108 to 9.122 include some discussion of measures that can be taken to mitigate against impacts on individual species.
- 9.200. The presence of protected mammals such as badger, otter and water vole will be determined by specialist detailed survey. Should these species be present the measures to be taken would depend on where and how the species occurs in relation to the route. Obviously the presence of a nest site on the route line is of considerable significance. The degree of mitigation required will depend on the requirements of the species and any legal obligations arising. Mitigation for a single species may even vary between two different sites containing it. All such occurrences will be discussed and agreed with SNH and other appropriate bodies as and when they occur.
- 9.201. Best practice methods of pipeline construction will be adopted to prevent or minimise impacts such pollution or contamination of soils and water bodies.
- 9.202. Wherever possible a reduced working width will be utilised when crossing or passing near to areas of important or sensitive vegetation.
- 9.203. There will be minimal possible disturbance to vegetation when crossing hedgerows or lines of trees/shrubs, with the route line utilising gaps or areas of poor structure whenever possible. Any areas where trees or shrubs are removed will be subsequently replanted with native species similar to those present prior to construction.
- 9.204. A walk of the complete route of the pipeline will identify any points of interest not as yet known. This will also enable such as identification of woody species in the crossing areas of hedgerows and other linear features.

Summary

- The pipeline route and its working width will not impact on any sites designated of international or national significance for their wildlife or physiographic interest. Three Sites of Special Scientific Interest (SSSI) have a small area within the pipeline corridor but none will suffer any adverse impact. A fourth SSSI lies some 450m outside the corridor.
- The most significant habitat potentially affected by the pipeline is the area of valley mire crossed to the south of the Black Loch SSSI. This is a peatland that has been affected by grazing and drainage but still carries the assemblages of plant species characteristic of an undisturbed habitat of this type. The peatland area will be crossed by a method that will ensure that the vegetation suffers minimal disturbance and is subsequently safely and correctly restored.
- The pipeline route also passes very close to an area of wet woodland (carr). In this case every care will be taken to ensure there is no impact upon the hydrology or botanical interest of the site.
- The pipeline will cross seven major watercourses. These have a variety of physical characteristics. Improved pasture is the predominant marginal vegetation, but several of the watercourses have patches or strips of tree or shrub cover in or around the line of the route. Rough grassland may sometimes also occur. Small or medium scale shingle beds are found at some of the sites. The pipeline crossings will have a minimal impact on the wildlife, physiography and physical characteristics of the rivers..
- The only other habitats to be affected are predominantly improved grasslands, used for the pasturing of sheep or cattle. These habitats tend to be species-poor and are considered to be of relatively low wildlife interest. Adherence to standard best practices will be sufficient to ensure there are no significant impacts to nature conservation.

Legislation and Conventions

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.

The Conservation (Natural Habitats & c) Regulations 1994 No 2716.

Council Directive (79/409/EEC) on the conservation of Wild Birds.

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

Convention on Biological Diversity 1991 (emanating from the Rio Summit, 1992)

The National Parks and Access to the Countryside Act 1949.

The Countryside (Scotland) Act 1967.

The Wildlife and Countryside Act 1981.

The Natural Heritage (Scotland) Act 1991.

The Protection of Badgers Act 1992.

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10. SOCIO-ECONOMICS

Introduction

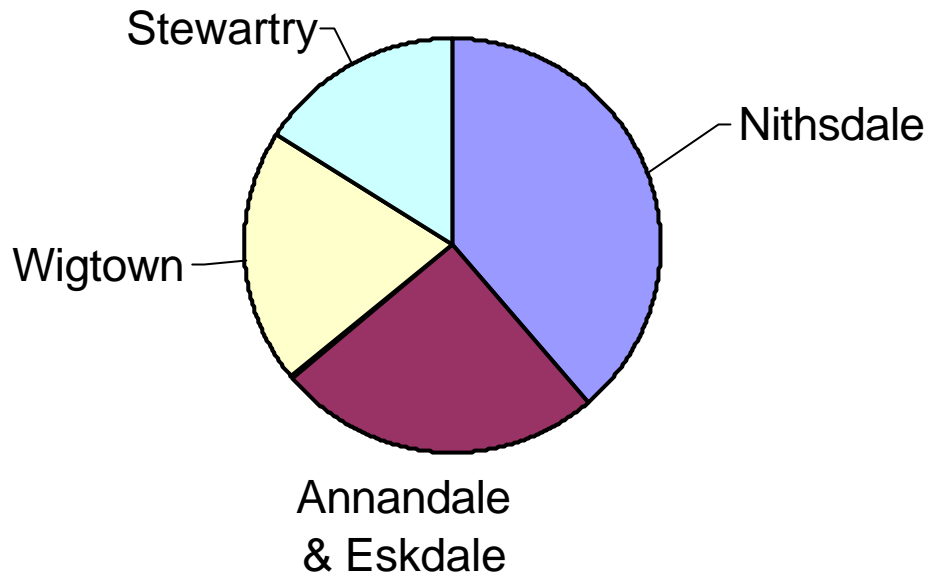
- 10.1. This chapter deals with the human and community aspects of the proposed pipeline.
- 10.2. Acceptance of the project by the community is vital for its successful implementation. Local communities are directly or indirectly affected and may wish to be consulted. Other issues of equal importance are:
- Compensation - in regards to farmers' claims for crop loss and other matters;
 - Timing - of the various project phases;
 - Construction programme; and
 - Planning and management of implementation.
- 10.3. Employment opportunities, however modest, are also evaluated.

Baseline Conditions

Settlement and Places of Recreational Interest

- 10.4. The pipeline is routed largely through agricultural land that is accessible to the public from roads, footpaths and other rights-of-way. Route selection has also considered places of particular interest to the local community and the public at large, especially those areas used for leisure activities and recreation. The entire pipeline route lies within the boundaries of Dumfries and Galloway Council.
- 10.5. Dumfries and Galloway is Scotland's most southerly region, covering an area of 6,370 square kilometres, with a population of around 147,000 people. The region is divided into four districts Nithsdale, Stewartry, Wigtown, and Annandale & Eskdale. The distribution of population between these regions is given in Figure 10.1.
- 10.6. Nithsdale accounts for nearly forty percent of the total population. This is due to Dumfries being the regional centre and itself being responsible for over one quarter of the area population.
- 10.7. Some towns and villages and a number of places of recreational interest located in the general vicinity of the pipeline route are listed in Tables 10.1 and 10.2, respectively.

Figure 10.1 – Population distribution in Dumfries and Galloway



10.8. Some towns and villages and a number of places of recreational interest located in the general vicinity of the pipeline route are listed in Tables 10.1 and 10.2, respectively.

Table 10.1 – Local Populated Settlements

City/Town/Village Name	Distance to Pipeline	Description of Settlement	Local Facilities	Impact
Moffat	6.0km	District Centre	PSC	Nil
Beattock	2.7km	Village	Sc, PF, H	Nil
Johnstonebridge	1.8km	Village	Sc, S	Nil
Lochmaben	7.0km	Local Centre	PSC	Nil
Parkgate	250m	Village	PF, H, PH	Indirect
Ae	3.2km	Village	PO, S, Sc, PF	Nil
Dalswinton	2.4km	Village	PO, S, H	Nil
Amisfield	3.4km	Village	Sc, H	Nil
Kirkton	2.7km	Village	PO, S, H, PF	Nil
Hollywood	1.0km	Village	Sc, S, H	Indirect
Dumfries	2.5km	District Centre	PSC	Indirect
Terregles	1.2km	Village	H, PF	Indirect

Table 10.1 – Local Populated Settlements cont.

City/Town/Village Name	Distance to Pipeline	Description of Settlement	Local Facilities	Impact
Lochfoot	500m	Village	Sc, H, PO, S, PH	Indirect
Crocketford	3.0km	Village	H, PO, S, PF, PS, PH	Nil
Milton	300m	Hamlet		Indirect
Springholm	3.2km	Village	Sc, H, PF, S, PH, PS	Nil
Haugh of Urr / Hardgate	1.5km	Village	Sc, S, H, PH	Indirect
Castle Douglas	2.0km	District Centre	PSC	Indirect
Dalbeattie	3.3km	Local District Centre	PSC	Nil
Gelston	1.0km	Village	Sc, H	Indirect
Rhonehouse	1.0km	Village		Indirect
Ringford	1.7km	Village	H	Nil
Tongland	1.7km	Hamlet		Nil
Twynholm	1.3km	Village	Sc, S, PH	Nil
Kirkcudbright	2.2km	Local District Centre	PSC	Indirect
Borgue	2.0km	Village	Sc, S, H, PH	Indirect

Key to Local Facilities

H	Hall	S	Shop
Sc	School	PF	Playing Field
PH	Public House	PO	Post Office
PS	Petrol Station	PSC	Principal Service Centre

- 10.9. Table 10.1 indicates that there are no populated settlements directly affected by the pipeline. The indirect impact refers to the minor traffic disruption caused by additional traffic and open cutting minor roads for a short time whilst a section of pipe is laid in the trench.

Table 10.2 - Local Places of Recreational Interest

Place of Interest	Description of Site and/or use	Distance to Pipeline	Impact
Forest of Ae	Picnic Sites, Forest Walks, Cycle Routes, Outdoor Centre, Museum, bird watching and Motor sports	3km	Indirect
Barony College	Access to farmland, riverside, parkland and wooded grounds	1km	Nil
River Nith	Fishing	0m	Direct
Dumfries	Golf Courses, Museums	2.5km	Nil
Mabie Forest	Picnic Sites, Forest Walks, Cycle Routes, and bird watching	2.5km	Nil
Milton Loch	Picnic Sites, Walks, Cycle Routes, and bird watching	1.5km	Nil
Drumcoltan Tower	16 th Century Tower House	2.2km	Nil
Motte of Urr	12 th Century motte and bailey earthwork castle	500m	Nil
Castle Douglas	Art Galleries, Theatre, Golf Course, Swimming pool	2.0km	Nil
Loch Ken, Glenlochar Barrage	Nature Trails, Watersports, Fishing, Hiking, Camping, bird watching, etc.	8.5km	Nil
Carlingwark Loch	Nature Trails, Boating, Fishing, Hiking, Camping, etc	1.5km	Nil
Threave Gardens	Ornamental Gardens	1.5km	Nil
Doach Woods	Waymarked trails, Bird Watching	2.8km	Nil
River Dee	Fishing	0m	Direct
Tongland Power Station	Visitors Centre at Power Station and Dam	1.8km	Nil
Wildlife Park, Kirkcudbright	Wildlife Park	2.8km	Nil
Gull Craig	Car Park for foreshore access	600m	Nil
Brighouse Bay Holiday Park	Holiday Home Village, Campsite, Pony Trekking, swimming pool and golf facilities	2.0km	Indirect

- 10.10. In Table 10.2 it can be seen that the only recreational pursuit directly affected by the pipeline will be fishing, walking and horse riding along public footpaths or bridleways. The pipeline contractor will ensure that a safe means of crossing the working-width is in place to allow walkers and riders access at most times during the construction period.

Economic Activities and Employment

- 10.11. The area is predominantly rural and as such there is a slightly higher dependence on primary industries (agriculture, fisheries and forestry) although the relative importance of these has been declining. The distribution of employment between specific sectors is illustrated in Figure 10.2.

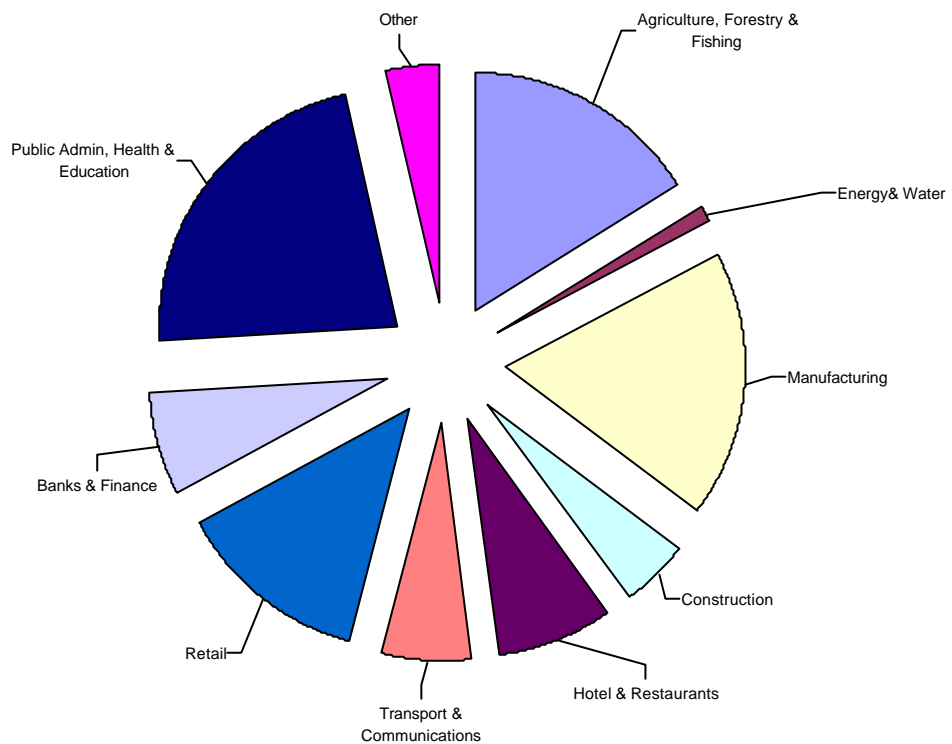


Figure 10.2 – Employment Structure

Note: Workforce percentages are for 1997, and therefore only a guide to today's true figures.

- 10.12. The figures related to Agriculture, Forestry and Fishing are seen as of vital importance to the area.
- 10.13. Over 45% of the land is actually rough grazing, and forestry covers more than a quarter of the region. The area has an increasing concentration of dairy farms, larger than average herds and flocks, and a substantial milk-processing sector.

- 10.14. Over 7,000 people are employed in Agriculture in Dumfries and Galloway, this however is declining due to the high dependence on milk, beef, lamb and other products, which have fared badly in recent times. Nevertheless, agricultural activities account for over 10% of the total workforce. A further 8% of the workforce employed in industries that are directly dependent on agriculture.
- 10.15. The proportion of the total workforce in manufacturing is higher than for Scotland as a whole but is very dependant on a few key industries and employment sectors some of which are unlikely to provide significant new employment opportunities.
- 10.16. Population trends show an expected decrease in the population of the region but a significant shift in the age groups with an increase in the population above retirement age (in particular in Wigtown), a decrease in numbers of people of working age and a decline in the numbers of school age children. Dumfries and Galloway Council expect that by encouraging new business enterprises the resultant in-migration of working age people and their families could assist in stabilising the population
- 10.17. Tourism is of vital importance to Dumfries and Galloway. It is estimated to have generated £195million of direct revenue for the area in 1998. Tourism directly employs some 4,500 people, or 10% of the workforce. Over 600,000 people visited Dumfries and Galloway in 1998, resulting in 2,400,000 nights accommodation being provided.
- 10.18. Within Dumfries and Galloway it is estimated that there are:
- Over 150 full time businesses involved in visual arts and crafts;
 - Most arts related businesses are small with less than 5 employees;
 - Annual visitor spend related to music performances alone was estimated in a recent study at £4,700,000 and the music sector alone is thought to support around 208 full-time earning jobs in the region.
- 10.19. Unemployment in Dumfries and Galloway has reduced in recent years from 9.8% in May 1990 down to 5.3% in Sept 1999, which is below the average of Scotland at 5.7% but above the UK average of 4.5%. Unemployment rates compare well with those elsewhere, but significant pockets of unemployment exist in specific parts of the area.
- 10.20. The rural area surrounding Dumfries is less prone to employment problems as this is made up mainly of residential villages that rely on Dumfries for their economic prosperity. Nonetheless many people still work in agriculture which continues to decline as a major employer. Dumfries still remains the main focus for employment growth.
- 10.21. The socio-economic activity along the pipeline corridors and the resultant impacts of construction and operation are particularly important in the Dumfries and Galloway Region due to the high degree of dependence on tourism, which may be affected during construction in the summer months. However this is likely to be short term and limited in extent with the major negative effects being an increase in noise levels and perhaps minor disturbance from traffic for a limited period.
- 10.22. Economic effects will largely be beneficial with an increase in demand for goods and services. In particular hotels, guest houses and bed and breakfast accommodation

that will benefit from the increase in trade from contractors working on the pipeline. Employment will increase slightly on a temporary basis, although most of the workers will be specialist, in the long term there may be limited employment opportunities at the compressor stations.

- 10.23. The farmers who own the land crossed by the pipeline will feel short-term adverse effects and there could be some minor delays on the roads.
- 10.24. BGE propose to work with the Dumfries and Galloway Council to identify the potential for negative socio-economic effects and mitigate these where possible.
- 10.25. Where there is the opportunity for the development of large scale commercial use for gas, in close proximity to the proposed pipeline route, BGE may be able to provide a suitable gas supply with the potential for local employment. BGE would work with Dumfries and Galloway Council to identify potential users who could benefit from such a scheme.

Pipeline Labour Force

- 10.26. The labour force required to construct a pipeline is fairly standard. It consists of a combination of specialised workers and semi-skilled staff. The skilled staff will include welders and plant operators, inspectors and supervisors, and management staff. At the peak of pipeline construction this team could total 250 people. It is usual on such projects that a number of local semi-skilled staff and labourers will be required to supplement the normal project staff and those of any specialist subcontractors particularly in service support. A typical workforce is given in Table 10.3.

Table 10.3 – Typical Direct Pipeline Construction Workforce Levels

Direct Workforce	Job Descriptions	No:
BGE (UK) Ltd Management Team	Construction Manager, assistants and inspectors	10
Pipeline Contractor’s Management Team	Site Manager, Construction Manager, Engineering Manager, and departmental staff	25
Contractor Workforce	Fencing crew, operators, and supervisor	19
	Top-soil stripping team, banksmen & foreman	10
	Stringing team and supervisor	12
	Pipe Bending and supervisor	12
	Crossing team, sheet piling, boring etc	15
	Welding team and supervision	35
	Pipe coating team and supervisor	12
	ND testing team and supervisor	12
	Pipe trenching team, banksmen and supervisor	15
	Pipe laying team, tie-in crew, banksmen and supervision	20

Direct Workforce	Job Descriptions	No:
	Land drainage team and supervisor	20
	Reinstatement team, fencing, hedging, wall building, etc	25
	General delivery, fuel, materials etc	8

Assessment of Impact and Mitigation Measures

10.27. The route of the proposed pipeline will not impose any significant impact on nearby towns and villages listed in table 10.1. The only exception may come from some localised/short term construction noise across open fields.

10.28. The potential socio-economic impact of the pipeline project will be felt in the following areas:-

- Land take;
- Procurement;
- Labour force;
- Nuisance and disruption; and
- Public perception.

Land Take

10.29. Land take for the pipeline will affect the following:-

- Farmers, through direct or indirect effects on land during the construction of the pipeline. This will be a temporary activity lasting one summer season, but if for example there are adverse weather conditions then this period may be extended in order to complete reinstatement;
- The landowner/occupier of the proposed Block Valve Station sites through the direct effect of the loss of a small area of land-take. Land-use here will be a permanent change from agricultural to industrial; and
- Local residents and passing traffic may be marginally affected during pipeline construction. Traffic management will be planned and implemented in conjunction with the requirements of the local authorities. In mitigation further details relating to Traffic and Transportation are discussed in Chapter 12.

10.30. Land is required to support a temporary construction compound and pipe storage yard. BGE or its pipeline contractor will acquire space for this purpose, a matter that will be finalised during the detailed engineering stage. Consequently, a local planning application will be submitted to Dumfries and Galloway Council for approval.

Procurement

- 10.31. Specialist material such as steel linepipe, and plant and equipment for the Block Valve Stations will be sought from qualified suppliers to match the high specification demanded for this project. Fencing, re-instatement materials, fuel, consumables, aggregates, seed etc, may be obtained locally, provided such markets are available and prices are competitive. It is quite possible that some plant may be hired from local farmers and plant companies.

Labour Force

- 10.32. The majority of the skilled workforce such as welders and inspectors are likely to be drawn as an experienced team from outside the immediate area. Positions such as drivers, plant operators and labourers will be sourced where possible from local contractors and companies.
- 10.33. Temporary living accommodation will be required locally, such as B&Bs and hotels, and self-catering facilities. This will inject money into the local economy. Table 10.4 gives details of the accommodation available and the occupancy rates.

Table 10.4 – Accommodation available and Occupancy Rates in Dumfries and Galloway

Accommodation	Number	3Star + (%)	Occupancy (%)
Hotels	124	45	49
Guest Houses	59	34	31
B&Bs	195	59	45
Self Catering	192	62	47
Caravan Parks	52	83	34

Sources: DGTB 1998 & STB 1998/9 Accommodation Occupancy figures

- 10.34. Accommodation occupancy rates are below the national average. This reflects a combination of the seasonality of the sector, and the relatively short length of staying visitors.

Nuisance and Disruption

- 10.35. Farmers, residents and others near the pipeline route may intermittently be affected by construction activities.
- 10.36. To minimise disruption works at road crossings will be carried out according to the statutory requirements of the New Road and Street Works Act, 1991 and any conditions imposed by the local authority. Trenchless crossing of main roads will allow the works to be completed with minimal disruption or nuisance. Possible nuisance will be minimised by the high quality of management and working practices that BGE will demand from its pipeline construction contractor. A project management team will oversee the works.

- 10.37. BGE wishes to avoid any adverse reactions from landowners/occupiers, the public and the local authority, and will therefore ensure adequate control of all construction operations so as to minimise nuisance and disruption. Possible causes of nuisance include :
- Disregard for boundaries of land take, so that adjacent land is damaged;
 - Spoil dumping off-site;
 - Noise caused by construction activities during working hours;
 - Dust from plant movement including lorries on the unsurfaced access road along the pipeline route or from stripping and replacing topsoil and trench excavation under dry conditions;
 - Interrupted use of facilities, e.g. when traffic management restricts the normal free flow of vehicles;
 - Additional congestion from contractor's traffic;
 - Construction activities that could affect the safety of the public and livestock; and
 - Pollution of land or watercourses due to inadequate preventative measures.
- 10.38. These possible nuisances will be mitigated by strict control of construction operation and by monitoring of practice by the project management team.

Public Perception

- 10.39. Positive public perception of the pipeline project is important for successful completion and implementation of the works. The success of the project will require support from landowners/occupiers and other directly affected parties. It is also desirable that the project has the tacit support of those living close to the route and other users of the area.
- 10.40. Communities are naturally concerned when they hear of a new development that may or may not impose an impact on their locality. Their fears and initial opposition to any form of change are normally based on inadequate information. These misconceptions can be dispelled by a well presented and clearly explained public relations exercise.

Public Awareness and Participation

- 10.41. Following submission of the PCA to the Scottish Executive – Energy Department, consultation will continue to take place with key bodies such as Dumfries and Galloway Council, SEPA and SNH. A public notice will be placed in a local newspaper seeking the views of the local community. At that time BGE will also serve formal notice on all affected landowners/occupiers along the route of the

pipeline. Notices will also be issued to the statutory authorities and statutory undertakers, and a number of other interested bodies and agencies.

Evaluation of Employment and Economic Benefits

- 10.42. Employment prospects associated with this gas pipeline are as follows:
- Direct employment - comprises skilled and semi-skilled construction workers for several months, as itemised in Table 10.3. Long-term operational staff will be few, employed in care and maintenance duties;
 - Indirect employment - comprises local firms providing services, and goods and materials (other than specialised steel linepipe and fittings) for the construction phase, whilst long term needs will involve local firms in the supply of some goods and in carrying out specialised maintenance work; and
 - Induced employment - employment supported by persons employed directly and indirectly because of the gas pipeline and above ground installations, who would spend part of their income in the local area.
- 10.43. A marginal increase in traffic in the area during the construction period will have some slight economic benefits to the community because of the requirement for fuel, food and accommodation along the main access routes. Trips will either start directly from the construction base camp in the normal day to day activities of workers and supervisory staff, or as a result of transient trips from suppliers or head office based project management site visits.
- 10.44. Generally, pipeline construction is only of short-term benefit to the immediate area. However, this pipeline system is an important part of BGE's long term development proposals providing an important contribution to sustaining and improving the natural gas infrastructure in Ireland.

Summary

- The pipeline will not impose any direct impact on local populated settlements or major recreational pursuits.
- The pipeline labour force will consist of specialised workers and semi-skilled staff. The majority of these workers are likely to be drawn as a single experienced team from outside the immediate area. Therefore, local labour required to build and to operate the pipeline will be modest. Some materials are likely to be purchased locally.
- Although no significant long-term employment benefits will arise directly from this pipeline, the pipeline system is an important part of BGE's long term development proposals providing an important contribution to sustaining and improving the natural gas infrastructure in Ireland.

References

1. South of Scotland Objective II Programme 2000-2006; - April 2000
2. Dumfries and Galloway Structure Plan 1999
3. Annandale and Eskdale Local Plan (Consultative Draft) February 2000
4. Nithsdale Local Plan (Consultative Draft) December 1999
5. Stewartry Local Plan (Consultative Draft) June 2000

11. EMISSIONS

Introduction

- 11.1. During the construction, operation and eventual decommissioning of the pipeline, various emissions of air, soil, water pollutants and noise may arise. The significance of these emissions depends on their nature, quantity and location. This chapter reviews the environmental impact associated with these emissions.

Baseline Conditions

Noise

- 11.2. Environmental noise can be defined in terms of the background or the ambient noise level. The background noise level is usually defined as the L_{A90} in dB(A), which is described as the noise level exceeded for 90% of the measurement period. The ambient noise level is usually defined as the L_{Aeq} in dB(A) and is the notional steady noise level, which would provide over a period the same energy as the intermittent noise. Put in more simple terms, this represents a measure of the energy average noise level.
- 11.3. Table 11.1 provides a list of typical everyday ambient L_{Aeq} noise levels from an unacceptably high figure of 130dB(A) defining the threshold of pain to a low of 30dB(A) in the remoteness of the countryside at night.

Table 11.1 – Typical Noise Level Range in dB (A) for Everyday Activities (logarithmic scale)

Noise Level	Location
130dB(A)	Threshold of Pain
120dB(A)	Jet Plane Take-off at 100m
110dB(A)	Chainsaw at 1m
90dB(A)	Heavy lorries at 5m
80dB(A)	Kerbside of busy street
70dB(A)	In urban or rural properties set back from the kerb of a busy street
60dB(A)	In back streets, dwelling near main road or quieter rural road
40dB(A)	Unusually quiet rural area away from main roads with little traffic
30dB(A)	Remote countryside on still night

11.4. These figures provide a basis with which to compare typical everyday ambient noise levels with those associated with machinery and vehicles used in the construction of a pipeline. Although no specific noise levels were taken for the route of this pipeline the figures would imply that noise levels across much of the open agricultural land would be in the range of 40dB(A) to 60 dB (A).

Vibration

11.5. Ambient vibration levels are not usually of concern in either urban or rural residential areas. Sources are usually localised and consist mostly of excavators, bull-dozers, pile-driving, HGV traffic and some industrial activity.

Air Pollution

11.6. The principal air pollution issues that are of concern with regards to pipelines are typically:

- Dust produced during the construction works; and
- Leakage of product during commissioning, operating and decommissioning.

11.7. No site specific data on background air quality have been collected exclusively for this environmental assessment, and no site-specific data has been collected for dustfall, i.e. settlement, which is the most applicable index with regard to assessing construction activity dust emissions. Nonetheless, typical dustfall levels measured in the UK for different sites are given for illustrative purposes in Table 11.2.

**Table 11.2 – Dust Deposition Rates for Various UK Sites
(milligrams per sq. metre per day)**

Type of Site	Deposition Rate mg.m ⁻² .d ⁻¹
Industrial Area	208
Commercial Town Centre	120
Outskirts of Town	77
Open Country	71

Data sources from Warren Spring Laboratory

11.8. The nuisance effect of dust is related to its deposition rate. There are no universally applicable standards relating nuisance effect to deposition rate. Germany has a standard of 350 mg.m⁻².d⁻¹ for general areas and 650 mg.m⁻².d⁻¹ for industrial areas. In the UK, a level of 200 mg.m⁻².d⁻¹ is commonly used to define a level above which nuisance is likely to arise.

Water Pollution.

11.9. Water pollution during pipeline construction may occur due to:

- Surface run-off from the working width into local watercourses;
- Permeation of pollutants through local aquifers;

- Increased sedimentation from crossings of streams and rivers; and
 - Drainage of the pipeline, its trenches and the working width to local watercourses or land for natural soak away.
- 11.10. There is also the potential for water to be diverted along the excavated pipeline trench, particularly from springs and watercourses lying in close proximity.
- 11.11. An assessment of the likely conditions to be encountered at individual water crossings during pipeline construction, a qualitative assessment of the proposed works on the surface and ground water resource and proposed mitigation measures are considered fully in Chapter 8 of this Environmental Statement.

Assessment of Impacts - Noise and Vibration

Construction Noise

- 11.12. The Control of Pollution Act 1974 (as amended) and Noise and Statutory Nuisance Act 1993 contain powers to control noise emission and to require the employment of the best practicable means for preventing, or counteracting the effect of noise. Under the Noise at Work Regulations 1989, employers must ensure that workers' hearing is protected. In addition, advice and guidance given by the Noise Review Working Party 1990 and by British Standard BS4142 (1990) will be taken into account.
- 11.13. The objective of these documents, to minimise the possibility of public complaint and of employee injury, will be achieved by the implementation of well defined noise control specifications for all construction activities and plant equipment.
- 11.14. Noise levels will rise and fall during the construction period depending on site activity. The construction of the pipeline will involve various activities, principally topsoil stripping within the working-width, also trench excavation in subsoil, sheet pile driving and/or drilling at crossings, the welding together and lowering of the pipe into the trench and finally backfilling and topsoil restoration. These activities will not occur continuously but in stages with peaks of activity, separated by longer periods of relative inactivity. Continuous 24-hour operation at a limited number of locations may be necessary over a few days when cleaning and purging the completed pipeline and during commissioning.
- 11.15. Occupied dwellings within 200m of the proposed pipeline route are identified in Table 11.3. It is likely that these properties will be influenced by some level of emissions from construction activity. Measures will be taken to ensure that occupiers of affected properties are not subject to unreasonable noise and discomfort. Careful planning and additional precautions will be proposed to counter areas partial to potential noise nuisance.

Name/Location		Type of Property	Distance to Pipeline and Potential Impact		
			101/200m Low	51/100m Medium	50m/less High
Sunnybrae	NY085996	Residence			✓
Tatthill	NY083995	Farmstead	✓		
Dunsley House	NY082992	Residence	✓		
Ardlui	NY083992	Residence	✓		
Tatthill Cottage	NY086988	Residence	✓		
Stockholm	NY087981	Farmstead		✓	
Thrummyrig	NY087972	Farmstead		✓	
Oakbank	NY087970	Residence		✓	
Royal Oak	NY087969	Residence	✓		
Lochwood	NY084966	Farmstead	✓		
Lochwood Hall	NY088965	Hall	✓		
Lochwood Cottage	NY087958	Residence	✓		
Rose Cottage	NY087957	Residence	✓		
Williamson Cottage	NY085935	Residence	✓		
Williamson	NY086934	Farmstead	✓		
Springwells	NY082919	Farmstead		✓	
Springwellsgate	NY080918	Residence	✓		
Cairnsmore	NY083916	Residence	✓		
Johnstonecleugh	NY083913	Residence	✓		
Chapelhill	NY083912	Residence	✓		
Greenbeck	NY075906	Farmstead	✓		
Kerse Cottage	NY064902	Residence			✓
Wester Packgate	NY022882	Farmstead	✓		
Parkgate Cottages	NY022882	Residence	✓		
Ashbank	NY020880	Residence	✓		
West Lodge	NY020879	Residence	✓		
Kirkmichael House	NY012878	Residence	✓		
Auchenrath	NX975847	Farmstead	✓		
Carrickrigg	NX970848	Residence	✓		
Quarryknowe	NX961842	Residence	✓		

Name/Location	Type of Property	Distance to Pipeline and Potential Impact		
		101/200m Low	51/100m Medium	50m/less High
Ryecroft NX961838	Residence	✓		
Kerricks Gate NX959838	Residence	✓		
Kerricks NX959835	Farmstead	✓		
Sandbed NX945835	Farmstead	✓		
Portack Cottages NX940828	Residences	✓		
Hulton NX941826	Residence		✓	
Glengover NX946823	Farmstead	✓		
McWhanrick NX935820	Farmstead	✓		
Gribton Cottages NX935781	Residences	✓		
Maryfield NX935781	Residences	✓		
Hardthorn NX938781	Residences	✓		
Terregles Manse Road NX971769	Residences	✓		
Terreglestown Cottages NX943797	Residences	✓		
Halmyre NX940764 Lochrutton&Terregles Manse	Residences	✓		
Afton Wai NX931753	Residence	✓		
Terraughtie NX934751	Residence	✓		
Terraughtie Cottages NX938753	Residence	✓		
Nunland NX910748	Farm & Holiday Cottages	✓		
Cargenbank NX906748	Residence	✓		
Barr Farm NX891741	Farmstead	✓		
Merkland Bridge Lane NX887731	Farmstead	✓		
Whiteyard NX880702	Farmstead	✓		
Whinnyhill NX879729	Residences	✓		
Three Crofts NX872723	Farmstead		✓	
Gateside NX869723	Farmstead	✓		
The Heads NX858714	Farmstead			✓
Courthill NX855713	Farmstead	✓		
Hillview NX852707	Residences	✓		

Name/Location	Type of Property	Distance to Pipeline and Potential Impact		
		101/200m Low	51/100m Medium	50m/less High
Milton NX847702	Residences	✓		
Burnside of Urr NX844697	Farmstead	✓		
Midlogan NX810637	Residences	✓		
Logan Brae NX810637	Residences	✓		
West Logan NX807634	Farmstead	✓		
Bungalow NX801627	Residence	✓		
Meikle Knox NX797623	Farmstead	✓		
Cuil Cottages NX779607	Residence	✓		
Halmyre NX766593	Farmstead	✓		
Linnett Lodge NX763595	Residence	✓		
Slagnaw NX747586	Farmstead	✓		
Auchlane NX740583	Farmstead	✓		
Arkland Cottage NX729586	Residence	✓		
Argennam Mains NX700565	Farmstead	✓		
Chapel NX658557	Farmstead	✓		
Underwood NX686551	Farmstead	✓		
Kempleton Cottage NX681548	Residence	✓		
Kempleton NX681544	Farmstead		✓	
Hilltop NX679541	Residence	✓		
Cumstoun Mains NX676533	Farmstead	✓		
Sourhill NX674532	Residence	✓		
South Lodge NX674531	Residence	✓		
Back Newton Cottage NX659511	Residence		✓	
Back Newton NX657510	Farmstead	✓		
Clauchendally NX646473	Residence	✓		
Senwick NX646473	Residence	✓		
Senwick Anchorage NX646467	Residence	✓		
Gardener's Cottage NX646466	Residence	✓		
Keepers Cottage NX645463	Residence	✓		
Clash Cottage NX648469	Residence	✓		

- 11.16. Pipeline construction will be undertaken as one "spread". For the purposes of assessing noise impacts, it has been assumed that the working spread length will include the following:
- Topsoil stripping;
 - Pipe stringing;
 - Welding, inspection and joint coating;
 - Trench excavation;
 - Lowering pipe into trench;
 - Backfilling; and
 - Reinstatement.
- 11.17. Noise from standard construction plant is of a short duration, therefore impact is minimised. Typically, there will be a few days between each of these activities at any one location but this will vary. Noise levels can be predicted from knowledge of the type and number of plant to be used for the various activities.
- 11.18. Information on the type of plant likely to be utilised for construction of the pipeline has been assumed for the benefit of this assessment and should be reasonably representative, although in practice smaller plant may be used where working is restricted. Plant noise levels for the various items have been taken from typical noise levels given in British Standard BS 5228.
- 11.19. Predicted daytime noise levels from each activity at various distances from the pipeline are given in Table 11.4. The predicted noise levels are in terms of the 1 hour L_{Aeq} which is an energy average noise level. However, these can be taken as an indication of maximum L_{Aeq} noise levels as the calculations have assumed that the plant is working for 100% of the time and excess attenuation from different ground types has not been included. This, therefore, gives a worst case assessment. These noise levels will occur during the peaks of activity. Noise levels in between peaks will be much lower and depend on the proximity of access roads and other localised construction associated sources.

Table 11.4 – Predicted Daytime Noise Levels from Pipeline Construction Activities

Operation	Noise Level in L_{Aeq} dB(A) Freefield at Distance (metres)				
	50m	100m	200m	300m	400m
Topsoil Stripping	75	69	63	60	57
Pipe Stringing	76	70	64	61	58
Welding	71	65	59	56	53
Trench Excavation	70	64	58	55	52
Lowering pipe	75	69	63	60	57
Backfilling	68	62	56	53	50
Reinstatement	75	69	63	60	57

Notes:

- i. Estimates based on sound power levels given in British Standard 5228;
- ii. Sound levels assume flat open ground with no barriers, calculations as per methodology in British Standard BS 5228, assuming working 100% of time.

- 11.20. The significance of the predicted noise levels is dependent upon the background noise level, and the L_{A90} along the construction corridor. In urban areas with relatively high noise levels, the corridor of construction noise audibility will be relatively narrow. In quiet rural areas, noise levels from construction activity will be audible along a much wider corridor, dependent upon landform, weather conditions and the types of activity. In both situations, these activities are of relatively short duration and therefore impact is minimised.
- 11.21. Even though the proposed pipeline is deliberately routed away from any known sites of significant ecological importance, the effect noise may have on wildlife needs to be considered. However, studies in this field are fairly scarce, although there has been some studies involving sonic booms from jet aircraft. This research concluded that the response of birds is greater than that of other animals and that all species adapt fairly rapidly to these noises. The results indicated that most species exhibited a rapid startle reflex, but which soon abated without any other sign of distress. The noise from sonic booms is clearly different from that of all types of construction activity, which is at a much lower level.
- 11.22. The reaction of animal and avian species to construction noise will be less than that for sonic booms. Any disturbance due to sudden noises is further reduced because of the slow build up of noise as the spread encroaches into an area. However, apart from the startle reflex it is not considered that other detrimental reactions will occur.
- 11.23. Specialist construction techniques will be required for certain sections of the pipeline in order to cross roads, watercourses and any significant archaeological features. These crossings can be undertaken in a number of ways; all of which have different associated noise levels. A preliminary list of the principle crossings is presented in Chapter 2, Table 2.2.
- 11.24. Affects of the common crossing techniques are:
- a) Thrust Boring
- Thrust-boring requires thrust and reception pits on either side of the obstacle to be crossed. In stable ground conditions it may be possible to excavate these pits with battered sides, if so, noise will only arise from the use of an excavator. If however, ground conditions are poor or space is limited, then temporary sheet piling may be installed. Piling is usually of short duration, i.e. 2-3 days per pit and not more than 4-6 days per crossing. Following completion of the piling, the excavation and boring activities will be the main source of noise. Noise levels associated with these activities are presented in Table 11.5. The degree of disturbance from this activity is mostly dependent upon the noise from piling. The noise level, due to its impact nature, is fairly high and can travel some distance. However, this activity is of short duration and normally undertaken during daytime hours only. Appropriate methods such as "silent piling" are now common practice and will be employed where necessary to reduce piling noise levels substantially. Noise levels from other activities associated with this construction technique are much lower than those from conventional piling and are unlikely to cause any significant disturbance. It is intended to use this trenchless method of construction to cross beneath the railway, all trunk roads and some of the busier secondary roads.

b) Open Cut

This technique, the most common of all methods, is reasonably simple and involves the excavation of a trench across a road or track. It can be undertaken by motorised trenching machine, normal backactor, backactor with clam-shell attachment or a dragline. The noise levels associated with either of these plant are likely to be similar and are presented in Table 11.5. The noise levels associated with this activity with distance are similar to those from standard pipeline construction and are unlikely to cause undue disturbance to any nearby properties. It is most likely that this method will be used across minor roads.

c) Dry Open Cut Technique

This adapted open cut method will be used at watercourses to minimise sedimentary disturbance whilst maintaining water flow. The noise levels associated with this activity are typically comparable to those from the standard open cut technique. At larger watercourses, or where soil conditions are poor, sheet piling may also be required. Piling that may be required is similar in its duration and degree of disturbance to that at thrust bore crossings, with similar mitigation measures also.

11.25. The predicted noise level estimates associated with typical plant used for these methods of pipeline construction activity have been interpolated from British Standard 5228 as listed in Table 11.5.

Table 11.5 – Predicted Noise Levels form Crossing Activities.

		Noise Level in L_{Aeq} dB(A), Freefield at a Distance of				
Operation	Plant	50m	100m	200m	300m	400m
Sheet Piling	Conventional Sheet Piling	92	86	80	77	74
Auger Boring	Boring	72	66	60	57	54
Open Cut	Excavator	70	64	58	55	52

Notes:

- i) Estimates based on sound power levels given in British Standard 5228.
- ii) Sound levels assume flat open ground with no barriers, calculations as per methodology in British Standard 5228, assuming working 100% of time.

Road Traffic Noise

11.26. Traffic flows on public roads around the route of the proposed pipeline will increase marginally during the time when lengths of steel pipe are delivered to site. This process is explained in the Traffic and Transportation - Chapter 12. Generally, the increase in traffic movements is unlikely to cause a significant increase in noise levels.

Operational Noise

11.27. There are very few sources of noise associated with normal pipeline operations. There is the possibility of some very localised noise at very infrequent intervals (up to several years) at the proposed Block Valve Stations but the design of these facility together with the planting of a perimeter landscaping will ensure that noise levels at the boundary fence do not exceed 5dB(A) above normal background levels and are expected to be in line with No: 4, as in table 11.6.

Table 11.6 – Permissible Noise Level Limits

No:	Category	At Day	At Night
1	Purely Industrial Areas	70 dB(A)	70 dB(A)
2	Areas with Industrial Installations Prevailing	65 dB(A)	50 dB(A)
3	Areas with Industrial Installations and Residential Districts	60 dB(A)	45 dB(A)
4	Areas with Residential Districts Prevailing	55 dB(A)	40 dB(A)
5	Purely Residential Districts	50 dB(A)	40 dB(A)
6	Health Resort Districts, Hospitals, etc	45 dB(A)	40 dB(A)

11.28. The nearest occupied dwelling to the proposed Block Valve Station sites is over 150 metres away. At this distance dwellings will not be subject to any significant levels of emissions.

Assessment of Impacts – Air and Water Pollution

11.29. Construction activity involving earthmoving operations has the potential to cause dust. Whether or not dust is generated depends upon the nature of the soil conditions (i.e. moisture content), the quantities of material being moved, the weather conditions, season of the year and the type of plant and machinery used for work.

11.30. The activities involved in the construction of a pipeline which have the potential to create dust are:

- Topsoil stripping;
- Trench excavation;
- Backfilling;
- Reinstatement; and
- Movement of vehicles over temporary access roads along the pipeline working-width.

11.31. These activities will take place over a period of a few months during the summer season. The tendency for dust generation will vary according to type of work and the nature of the weather. However, at any one location, these activities will only occur for a short period of time as the spread moves along the pipeline route.

11.32. Conditions most likely to cause dust formation will arise in dry ground conditions during the summer period. Prolonged dry weather coupled with windy conditions is

most favourable to dust formation. However, this is not a significant problem because the UK generally does not experience any long periods of arid conditions.

- 11.33. The nature of the construction procedures (Chapter 2, Project Description) means that any dust created will be extremely localised. Furthermore, it is probable that the significant potential source of dust, if it arises, will be from topsoil stripping, trench excavation, restoration operations and from movement of vehicles over unsurfaced access roads during dry weather. Localised dust formation and deposition is unlikely to give cause for concern because of the very nature of open countryside.
- 11.34. Precautionary measures will be taken to control dust in certain weather conditions if nuisance seems possible. Control is by application of fine water sprays to soil surfaces, to prevent mobilisation of dust particles. It will be important to avoid saturating the soil as this can affect successful restoration.
- 11.35. During commissioning, nitrogen (an inert gas) will be injected into the pipeline. This is used to purge the system of any air. The nitrogen will be harmlessly vented to atmosphere at the time the pipeline is filled with natural gas. This operation will probably occur at the proposed Brighthouse Bay terminal.
- 11.36. The majority of watercourses crossed by the pipeline do not lend themselves to non-disruptive methods. It is therefore likely that dry open-cut techniques will need to be used, whereby construction works will be required within the watercourses over a short period of time. Impact on watercourses will be minimised by using this method as working in running water is eliminated, whereby sedimentary disturbance and siltation is minimised, whilst still maintaining water flow along the watercourse.
- 11.37. Site specific method statements will be prepared for all significant and sensitive watercourse crossings, along with generic method statements for the remainder. All of these will be submitted for approved by SEPA prior to construction.
- 11.38. If there are areas of high water table, the contractor may have to de-water the trench before pipe laying. Suitable discharge methods and licences will be approved by the SEPA in advance of this activity and a strategy established to ensure that there are no adverse environmental impacts.
- 11.39. During cleaning and hydrotest of the pipeline, it may be necessary to abstract water from a local watercourse. Following hydrotest, it may be necessary to drain water to local watercourses, though as the pipeline is internally coated and will have been cleaned prior to the hydrotest, the disposed water should run clean and clear. Discharge consent shall be applied for, and conducted in accordance with SEPA requirements under the Control of Pollution Act 1974, as amended.
- 11.40. Impacts can also arise through surface run off and aquifer pollution due to accidental spillage of fuel or lubricants onto the ground and into watercourses during the construction work. Good site management practices, use of well maintained equipment and adequate supervision of the construction activities will considerably reduce the probability of such incidents.

Operation Phase

- 11.41. Natural gas conveyed through the proposed pipeline will be the same as that in the rest of the Transco National Transmission System. It is primarily composed of

methane (typically 83%) with proportions of ethane and higher derivatives (12%); and Nitrogen and Helium and Carbon Dioxide (together 5%), it is therefore non-toxic. It acts as a simple asphyxiate at high concentration levels. It has no irritating effects to the skin and eyes and is not accumulated in the body. Its wide domestic use in central heating boilers and for cooking confirms its safe properties in this respect.

- 11.42. There will be no emissions to atmosphere during normal pipeline operations. Accidental leakage of gas is highly unlikely to occur due to the exacting requirements of the construction process and a programme of on-going inspection, maintenance and ground patrols carried out during the operational life of the pipeline.
- 11.43. Pigging, part of the standard pipeline inspection and maintenance procedure is carried out at approximately 7 year intervals. When this occurs the pig trap at the Offtake will be depressurised to atmosphere. This will involve the release of a small quantity of gas and can be regarded as a controlled emission of no adverse consequence.
- 11.44. During maintenance it may be necessary to isolate sections of pipework along the pipeline route. This is normal practice and involves the controlled let-down of pressure through the valves at the block valve sites. This action will result in the release of a small amount of gas to atmosphere, but the volume involved is insignificant.
- 11.45. At the decommissioning stage a residual amount of gas will remain in the pipeline after depressurisation. On decommissioning, the pipeline might be purged with nitrogen, but no final decision will be made on the method to be used until the pipeline is near the end of its useful life.
- 11.46. There will be no effect on watercourses during normal operation of the pipeline.

Mitigation

Construction

- 11.47. Pipeline construction could have environmental impact through emission of noise, dust or liquid effluent and through pollution of watercourses and aquifers. By implementing suitable mitigation and through careful management of pipeline construction activities these impacts may be minimised or removed.
- 11.48. Where site conditions and surrounding land-use dictate, certain mitigation measures may have to be incorporated. These will normally comprise the following:
- i) Dust Control
 - a) limiting the speed of vehicles on the unsurfaced pipeline working-width access;
 - b) use of water sprays in dry weather to damp down soil surfaces prior to construction work; and
 - c) Road sweeping vehicles will keep spread entrances clean.
 - ii) Noise
 - a) Limiting of working hours in the vicinity of occupied buildings and any sensitive areas;

- b) Restrictions on working outside normal hours and general holidays;
 - c) Use of temporary acoustic screening in areas of particular sensitivity;
 - d) Provide local residents with adequate warning of activities;
 - e) Plant and machinery will run cleanly and have correctly fitted silencers.
- iii) Waste Management
- a) The pipeline construction contractor will ensure that any waste material and litter is removed from site on a regular basis and disposed of in an approved site.
 - b) The Contractor will develop a Waste Management Plan in line with the Waste Management Duty of Care – Code of Practice for waste minimisation and recycling in construction – A site handbook SP133. Consideration also to be paid to waste source, methods for recycling quantities, on site storage and disposal methods for all wastes.
- iv) Water Pollution and Liquid Effluents.
- a) Construction in the vicinity of watercourses and aquifers shall be conducted in accordance with Pollution Prevention Guidelines (PPG's) and method statements, which will be agreed with SEPA prior to construction. Of particular relevance are PPG's 1, 5 and 6 which cover: the prevention of water pollution; work in, near or liable to affect watercourses; and, working at construction and demolition sites.
 - b) All watercourse crossings to be carried out between June and September when water levels are at their lowest. At this time of year there are no eggs in the gravel beds and fry are past their most sensitive stage.
 - c) By using thrust bore or dry open cut crossing techniques at watercourses, sediment loading may be minimised.
 - d) Water flow will be maintained during construction.
 - e) Landowners, fisheries boards and downstream users shall be notified prior to construction.
 - f) Wherever practicable, the use of drip trays, oil traps or similar shall be used on plant throughout the construction site;
 - g) Areas highlighted as being of high vulnerability to soil erosion and run off will be prioritised during the construction phase and reinstated at the earliest opportunity;
 - h) Refilling of bowsers on the spread will not be permitted; and
 - i) Screening, settling ponds or similar techniques shall be used for treating water pumped from trenches prior to discharge to watercourses.

11.49. It may be necessary to control noise levels at, or in the vicinity of, ecologically sensitive sites if the construction programme dictates working during periods when migratory species may be affected. This will require further consideration once the contractors work plan is more precisely defined but, at present, active mitigation seems unlikely to be required.

Operation

- 11.50. The only parts of the operational pipeline system capable of producing raised levels of emissions are valves at the Block Valve Stations. To comply with standard codes of practice, low noise trim valves will be fitted if found necessary. The cross-country pipeline has no means of producing any emissions during normal operations. With these measures in place there will be no significant levels of emissions from the whole pipeline system.

Summary

- The construction phase of the pipeline is a time when transient emissions of noise, dust and liquid effluent are more likely to be of environmental significance.
- Above average noise levels could arise from pipeline construction at major crossings. To minimise the impact of noise at these locations a strategy of mitigation will be developed.
- Measures will be enforced to ensure that occupiers are not subjected to unreasonable noise and discomfort.
- Construction across watercourses and in vicinity of aquifers will be conducted in accordance with SEPA requirements. Dry pipeline installation techniques will be used at watercourse crossings to minimise any increase in sediment loading from the construction and from run off from nearby construction works.
- The cross-country pipeline has no means of producing any emissions during normal operations other than at the block valves.

References

1. British Standard BS 5228 - Noise Control on Construction and Open Sites.
2. Williamson, R. H. Dustfall from Industrial Sources and Residential Planning.
3. The Control of Pollution Act (1974).
4. EC Directive 86/188/EEC on The Protection of Workers from Risks Related to Exposure to Noise at Work.
5. Statutory Nuisance Act (1973).
6. Noise at Work Regulations (1989).
7. British Standard BS 4142 - Method for Rating Industrial Noise Affecting Mixed Residences and Industrial Areas (1990).
8. Cottreau, P. H. Effect of Sonic Boom from Aircraft on Wildlife and Animal Husbandry.
9. SEPA Guidelines for Water Pollution Prevention from Civil Engineering Contracts.
10. Prevention of water pollution –PPG1 SEPA
11. Works in, near or liable to affect watercourses – PPG5 SEPA
12. Working at construction and demolition sites – PPG6 SEPA

12. TRAFFIC AND TRANSPORTATION

Introduction

- 12.1 During pipeline construction a certain amount of plant, materials and personnel will be moved to and from the working-width, the construction base and pipe storage yard.
- 12.2 The logistics will be carefully planned to determine actual transport requirements. This will include the availability of traffic routes and the identification of suitable access points onto the working-width. This exercise is an essential part of the planning stage to ensure that disturbance to road users and to local residents is kept to an absolute minimum.
- 12.3 Therefore, the objective of this chapter is to make an assessment of which pipeline construction activities will generate traffic movements and provide mitigation measures where they are considered necessary.

Baseline Conditions

Existing Transport Network

- 12.4 The A74(M), A75(T), A76(T) and the A701(T) form the trunk road network serving the pipeline route area and are the responsibility of the Scottish Executive. These roads are supplemented by a network of A and B class roads, including the A711, A745, A755, A762, B727, B763, B794, and the B7020. In addition to these there is a comprehensive network of minor roads, farm access roads and tracks along the pipeline route.
- 12.5 Both local network and main line rail services operate in the area. The West Coast Main Line (WCML) service runs between Glasgow and London, with the local network linking Dumfries and Ayr with main line stations.

Construction Yard and Pipe Dump

- 12.6 It is envisaged that a pipeline construction yard will be established on a brown-field site adjacent to the Dumfries by-pass [A75(T)]. This yard will be subject to planning application for temporary change of use. The construction yard will contain site offices for management and supervisory staff relating to the pipeline construction, and storage areas for both equipment and line-pipe.

- 12.7 Steel line-pipe will be delivered from the steel mills/pipe coaters to the pipe dump in the first quarter of 2002. Dependant on the source of the line-pipe, transport would be either:
- by road from another part of the UK;
 - by boat to an appropriate port, then by road; or,
 - by rail.

Site Access

- 12.8 Site access will be by public roads utilising wherever possible the A and B classified road networks. The A75 and A701 trunk roads will form the backbone of the traffic routes. Both of these routes will provide good access onto the local road network within the vicinity of the pipeline route. The proposed primary access points along the pipeline route are identified in Table 12.1.

Table 12.1 – Primary Access Points along pipeline route

Crossing Number	Route Number	Chainage (km)	Comments
RDX1	B7020	0.1	Access from A701
RDX 3		3.3	Access via B7020 north ONLY
RDX 5	U324	8.4	Access via A701 and C98
RDX 10	A701(T)	15.6	
RDX 19	A76(T)	26.8	
RDX 26	A75 spur	34.5	
RDX 27	C28	38.4	Access via A75 ONLY
RDX 33	B794	51.9	
RDX 36	A745	55.5	
RDX 38	B736	58.6	Limited access through Castle Douglas
RDX 43	A711	66.4	
RDX 45	A762	69.0	
RDX 49	A755	73.1	Access via Glenterry
RDX 51	B727	78.3	Access via C16 and A755 to Glenterry

Installation Disruption

- 12.9 It is intended to cross beneath all A and B classified roads by utilising non-disruptive crossing techniques. The use of such trenchless crossing methods will ensure that general traffic movement along these major routes will not be hindered.
- 12.10 Any street works that are considered necessary will be carried out in accordance with the statutory requirements of the New Road and Street Works Act, 1991 and the conditions called for by the Highways Departments' of Dumfries and Galloway Council.
- 12.11 The crossing of railway property will require the consent of the Railtrack Property department and the approval of their engineering department. By utilising a

trenchless crossing method for the installation of the pipeline beneath the Nith Valley Railway Line, no significant disruption to services is envisaged.

12.12 Where watercourses are concerned it will be necessary to seek the approval of the Scottish Environment Protection Agency and Fishery Boards (where applicable). These arrangements and approvals must be in place before construction can commence. Classification of all watercourse crossings is given in Chapter 8 of this Environmental Statement. This identifies possible construction methods for the installation of the pipeline, and will form the basis of method statements to be submitted to the relevant bodies for their approval prior to construction. It is intended that all watercourses will be either temporarily bridged or culverted to allow vehicles to run along the working width. It is not intended to ford any water courses.

Construction Traffic

12.13 Several types of vehicle will need daily access to the working-width, i.e.

- to ferry construction workers to and from the working width from the construction base or local accommodation;
- to move inspection equipment to site by 4-wheel drive vehicles; and
- to transport construction plant, pipes and other materials by heavy goods vehicles and low loaders.

12.14 Table 12.2 is indicative of the type and approximate number of vehicles that the construction contractor is likely to utilise in the construction of the pipeline.

Table 12.2 – Preliminary List of Pipeline Construction Vehicles and Plant

Plant/Vehicle	Approx Number	Type	Use
Agricultural Tractor / Trailer	8	HGV	Fencing, general haulage along the working width & reinstatement.
Bulldozer * (D6)	5	HGV	Top-soil stripping & reinstatement.
Rock Drills	4		
Pipe Bending Machine	1	HGV	Bending of line-pipe
Tracked Excavator * (Cat 350)	9	HGV	Trench digging, backfill & general use.
Fuel bowser	1	HGV	Fuel filling of site-vehicles.
Land drainage unit *	2	HGV	Laying land drainage pipes.

Plant/Vehicle	Approx Number	Type	Use
Articulated flat-bed lorry	4	HGV	Delivery of pipe to storage & then to the working-width.
Articulated low-loader	4	HGV	Delivery of heavy plant* to the working-width.
Side-boom tractor *	6	HGV	Lowering in of pipe.
Welding Sets * (inc. D4 Tour Tug)	8	HGV	Pipeline welding.
8 wheel Wagon	4	HGV	Delivery of gravel for drainage purposes and sand for pipe trench packing.
Pickups Trucks (Crew Cab)	10	LV	General haulage use.
Minibus	4	LV	Personnel Transport
4 wheel drive (Land Rover)	6	LV	Personnel carriers.

Notes on Table 12.2:

- * These items of heavy plant will be delivered to the working-width by articulated HGV low-loader and shall only be moved by public road when movement along the working width is not possible.
- HGV = Heavy Goods Vehicle, LV = Light Vehicle.

12.15 Approximately 80 vehicles and/or pieces of plant will be used during the construction of this pipeline, ranging from bulldozers to 4-wheel drive cars. Not all the heavy goods vehicles (approximately 50) will be required at any one time nor will they require access to the working-width from only one entrance. Once the pipeline contractor has completed the works and demobilised from site then traffic levels will revert to original levels.

Operational Traffic

12.16 During normal operations the traffic generated by the pipeline will be insignificant with light vehicle attendance being required to carry out the following tasks:

- general surveillance checks along the line of the pipeline from public roads only, about 24 times a year;
- maintenance checks at the proposed Block Valve Station sites on a fortnightly cycle;
- Cathodic Protection (CP) measurements at roadside test posts, about twice a year;

- Close interval potential survey within the first year of installation and then approximately every four years; and
- Pipeline monitoring checks using an “intelligent pigging device”, approximately once every seven years.

Assessment of Impact

Movement of Materials

- 12.17 The proximity of rail freight terminals and main roads is an important factor both for receipt and onward distribution of pipeline materials and rapid access to different sections of the pipeline route for the workforce and project supervisory staff alike.
- 12.18 Transportation requirements will be higher during the early part of the construction programme when approximately 6,400 lengths of 36”(914mm) diameter steel linepipe will be delivered from a coating mill outside the immediate area to a temporary pipe storage yard in the vicinity of the Dumfries by-pass. Thirty-eight tonne gross weight articulated lorries are capable of carrying between 4 and 5 lengths of 36” diameter pipe per journey. The actual quantity is dependent on the wall thickness of pipe (standard wall or heavy wall pipe) and the corresponding overall weight of the load. This translates to approximately 1300 return journeys spread over about 65 working days (i.e. 20 loads/day). These vehicle movements will be restricted almost entirely to the trunk and motorway network of roads.
- 12.19 The principal transport route for access to the pipe dump would either be via the A701(T) from the north or the A75(T) from the south and east. Table 12.3 below gives the expected increase in HGV traffic movements during this period.

Table 12.3 – Traffic Increase During Pipe Delivery to Pipe Dump

Route Number / Location	AADF (all vehicles)	AADF (HGV's)	Construction Traffic ADF (HGV's)	% increase all vehicles	% increase HGV's
A75(T) East Riggs (Core 703 & SSCP)	8932	1965	50 (45)	0.5	2.3
A701(T) Locharbriggs (SSCP)	5854	820	50 (45)	0.8	5.5

Traffic Data provided by Dumfries & Galloway Council, Environment & Infrastructure Department.

ADF –Average Daily Flow

AADF – Annual Average Daily Flow

HGV – Heavy Goods Vehicle

- 12.20 Once the lengths of pipe have been off-loaded and inspected they will be moved from storage to the working-width. Public roads will be used wherever possible for

moving materials and construction machinery, but where necessary, the working-width itself will be used to transport materials from the approved site access locations to their final destination.

- 12.21 During normal pipeline construction it is anticipated that heavy goods (HGVs) traffic will generate about 36 vehicle movements a day along the A75 / A701 from the construction base to the various access points spread along the pipeline route. These entrances to the working-width will be reached along a select number of classified roads. Light vehicle (LVs) movements will apply throughout the working day with peaks of about 40 vehicle movements at the start and finish of the day. These figures are approximate and will fluctuate depending on the programme of pipeline activities and the rate of progress along the pipeline route. This estimate suggests that construction traffic will generate a modest amount of traffic along roads in the general vicinity of the pipeline route, but of minimal significance along the A75 and A701. Table 12.4 gives an indication of current traffic flows and the expected increases during the construction period.

Table 12.4 – Traffic Increase During Construction

Route Number / Location	AADF (all vehicles)	AADF (HGV's)	Construction Traffic ADF (HGV's)	% increase all vehicles	% increase HGV's
A701(T) Locharbriggs (SSCP)	5854	820	150 (70)	2.6	8.5
A75(T) Castle Douglas (Core 870)	7268	1236	150 (70)	2.0	5.7

Traffic Data provided by Dumfries & Galloway Council, Environment & Infrastructure Department.

Note: Construction traffic is assumed to be starting from the pipe dump. In practice deliveries of material other than line-pipe will be direct to site.

- 12.22 In addition, an assortment of pipework, and other gas equipment plus fencing and building materials will be delivered by HGVs to the four Block Valve Station sites along the pipeline route, but not until much later in the programme. These activities will impose only a marginal impact on local traffic flows and only for a short duration of time.
- 12.23 Traffic entering the pipeline spread, may do so only from the approved access locations. It will be necessary to ensure that heavy lorries are directed away from the residential centres along the pipeline route. It may also be necessary to establish a one way system in order to minimise traffic movements close to local villages.
- 12.24 In constructing a linear feature such as this, it is inevitable that some public rights of way will have to be crossed by the pipeline. This could lead to some temporary traffic disruption and some footpaths may have to be temporarily diverted.

Operation Traffic

- 12.25 Once operational, traffic generated by the pipeline will be negligible and therefore of no consequence.

Mitigation

Traffic Management

- 12.26 To minimise disturbance to residents and everyday traffic volumes, and to avoid damage to verges, trees and other features, a Traffic Management Plan (TMP) will be prepared. Before pipeline construction can start, the TMP will be submitted to the highways' departments of Dumfries and Galloway Council for discussion and final approval. The TMP will specify conditions such as:
- Public highways that can and cannot be used for journeys to and from the working-width by HGVs and/or LVs;
 - Requirements to keep roads clear of mud and other debris;
 - Any restrictions placed on the timing of vehicle movements to minimise noise disturbance to residents outside normal working hours, and minimise any potential traffic congestion caused by construction traffic on busy roads during peak-hours; and
 - During the highest traffic activity when pipe is being delivered to the working-width it may be useful to use two-way radios to control and coordinate the movement of HGVs.
- 12.27 It will be a condition of the pipeline construction contract that the contractor complies with the Traffic Management Plan. Compliance will be monitored closely by the project management team.

Road Crossings

- 12.28 Major roads will be crossed by trenchless methods to avoid closure and minimise disruption to the traffic using these busy routes.

Public Access

- 12.29 Access across the working-width along footpaths and other public rights-of-way will be maintained wherever possible, but there may be some temporary diversions or alternative routes that will be agreed with the local authority before construction starts.

Residual Impacts

- 12.30 Impacts on the local road network are inevitable as a result of pipeline construction. Modest disruption is likely to occur during the delivery and movement of pipe sections to the pipe storage yard and consequently to the working-width. With

careful planning and management controls the effects of this temporary disruption can be minimised.

Further Studies

- 12.31 Once a pipe storage yard and construction base has been established then a further traffic assessment will be undertaken and discussed with the local authorities. Any findings and restraints will be incorporated in the Traffic Management Plan before it is submitted for local authority approval.

Summary

- Approximately 80 vehicles that range from bulldozers to 4-wheel-drive cars will be required during construction of the pipeline.
- There will be a modest increase in traffic levels along “A” roads within close proximity to the pipeline route at the beginning and end of each day at the early stages of the construction programme, but once the works are complete traffic levels will revert to normal.
- To allow vehicles to travel along the working width temporary bridges or culvert pipes will be installed at watercourse crossings. No vehicles will work in running water.
- A Traffic Management Plan (TMP) will be prepared to comply with Dumfries and Galloway Highways requirements and determine feasible delivery routes for materials and construction plant to and from the working-width. The TMP will require Dumfries and Galloway Highways approval before pipeline construction can begin.

13. SAFETY

Introduction

- 13.1. Safety is of fundamental importance during every stage of the planning, routing, design, construction and subsequent operation of a high pressure gas pipeline. This chapter provides a brief description of appropriate safety considerations.

Routing and Design Criteria

- 13.2. Safety is one of the key factors considered in the choice of route for the pipeline. From an operations and safety point of view it is clearly important that the pipeline is designed, built and tested in such ways that its integrity is not compromised throughout its life time. The objective is to ensure that if a failure were to occur then the consequences would be within set parameters which the Health and Safety Executive (HSE) define in its "*broadly acceptable category*". HSE will be notified about this proposed pipeline and issued with a list of technical data and a Safety Evaluation report.
- 13.3. The pipeline will be designed and constructed in accordance with the following principal Codes of Practice, Standards, Recommendations, and Regulations, where appropriate:
- Institute of Gas Engineers Code IGE/TD1: *Steel Pipelines for High Pressure Gas Transmission*;
and also:
 - British Standard 8010, Section 2.8: 1992. Code of Practice for Pipelines, Part 2, *Pipelines on land: design, construction and installation*. This is the code that governs engineering practice for pipeline works in the UK;
 - Health and Safety Executive guidelines: *The Pipelines Safety Regulations*, 1996;
 - Health and Safety Executive guidelines: *The Construction (Design and Management) Regulations*, 1994;
 - Health and Safety Executive guidelines: *The Construction (Health, Safety and Welfare) Regulations*, 1996;
 - Control of Substances Hazardous to Health Regulations (COSHH): *Approved Codes of Practice*, 1988;
 - Control of Substances Hazardous to Health Regulations (COSHH): *The New Guide for Employers*, 1994;

- Noise at Work Regulations 1989
 - Manual Handling – Guidance on Regulations 1992.
 - Institution of Gas Engineers Code IGE/TD/9: *Offtakes and pressure-regulating installations for inlet pressures between 7 and 100 bar.*
- 13.4. All measures will be taken to ensure the long-term safety of the gas pipeline. During manufacture all pipeline components will be subjected to rigorous testing before being certified fit for use. At road, rail and watercourse crossings and any other areas where additional protection might be required heavier walled pipe will be installed.
- 13.5. Typical safety measures employed during and after construction of a gas pipeline consist of:
- a 100% radiographic inspection of all field welds;
 - hydrostatic pressure testing of the completed pipeline to 150% of the design pressure; and
 - an impressed current cathodic protection system, which together with the factory applied anti-corrosion pipe coating, will ensure that no external corrosion takes place.
- 13.6. During the operational life of the pipeline system, routine maintenance will be carried out to ensure its continued fitness for purpose. Typical maintenance measures consist of:
- routine pipe to soil potential checks to ensure the cathodic protection system, which prevents external corrosion, is operating satisfactorily;
 - frequent routine surveillance to prevent inadvertent damage from third parties;
 - close interval potential survey to verify the coating integrity; and
 - intelligent pigging to monitor the wall thickness of the pipe.
- 13.7. These measures are designed to ensure the pipeline is designed, built and maintained to the highest of standards, thereby affording a safe and efficient means of meeting the requirements of transporting natural gas safely from the existing Transco NTS pipeline network through Dumfries and Galloway and on to Ireland.

Risk Assessment

- 13.8. As a result of the inherent in-built safety measures as described above, high pressure gas pipelines have been demonstrated to provide an acceptably safe means of transporting gas, although there is inevitably a small residual risk attached to the operation of such a pipeline.
- 13.9. Transco and other authorities have carried out studies of pipeline system in order to assess the risks involved and the consequences of a variety of failure scenarios. Since this pipeline equals or betters the standard used by Transco (IGE/TD/1) the

same low failure rates can be applied. As a result of these studies this pipeline will meet the levels of risk, which are generally acceptable to society and safety measures taken will equal or exceed those prescribed by the HSE.

Summary

- The welded steel pipeline will be designed and constructed in accordance with relevant codes of practice and safety regulations, and built and maintained to the highest standards.
- The Health and Safety Executive (HSE) will receive notification and be given the necessary technical data to demonstrate that the pipeline provides a safe and efficient means of transporting natural gas.
- As a result of judicious routing, pipeline design and the use of heavier walled pipe in key areas the level of risk to any individual is very low indeed and is well within the accepted criteria.

14. ENVIRONMENTAL MANAGEMENT

Introduction

- 14.1. The environmental assessment of a pipeline project is a continuing process. It starts with initial planning of the route and passes through the following stages:
- Initial identification of impacts;
 - Development of appropriate mitigation measures;
 - Establishment of criteria for crossing sensitive sites;
 - Effective management and control of the construction activities; and
 - Post project auditing.
- 14.2. To ensure that the environmental assessment process is fully integrated into the overall pipeline project, development of an Environmental Management Plan (EMP) will be undertaken. This will enable any unidentified or unforeseen environmental impacts to be adequately mitigated, as well as ensuring that all environmental controls identified during the environmental assessment process are incorporated in practice. Details of this projects intended EMP are given in section 14.11.
- 14.3. This Environmental Statement (ES) reports on the principal findings of the environmental assessment up to the point where the planning application package is submitted. This chapter provides a summary of impacts, a preliminary risk assessment of abnormal and accidental conditions, intended environmental monitoring and reporting and details of the Environmental Management Plan. The assessment will be under continual development throughout the each phase of the pipeline's evolution.

Summary of Impacts

- 14.4. Table 14.2 defines each of the key aspects of pipeline design, construction and operation that have been identified in the Environmental Statement that have the potential to affect the environment. A brief description of the source and magnitude of key aspects is followed by mitigation measures which will be invoked during the detail design, construction and operation phases, with a summary of resulting residual effects. The individual components of the assessment of effects table is summarised below:
- **source/magnitude/effect:** identifies the source of the potential impact, the potential pathways which it may affect (earth, water, air) and the magnitude of the effect (duration and quantity);

- **mitigation:** provides mitigation measures to reduce the effect. The mitigation measures are divided into design, construction and operation. Overall responsibility for mitigation lies with BGE (UK) Ltd, though day to day responsibilities during planning and construction will be delegated for implementation to the construction contractor and other appointed consultants/specialists during the tender stage.
- **residual impact:** the residual impact is that remaining following mitigation. The residual effect is described in terms, major, minor, long or short term; and
- **significance:** the significance is determined using a risk assessment technique and is a qualitative assessment of magnitude of the residual impact following mitigation.

Table 14.1: Typical Classification of Residual Effects

Category	Severity of Impact (after implementation of appropriate mitigation measures/actions)
Significant	Substantial adverse changes in an ecosystem, society, or economy. Changes are well outside the range of natural variation and unassisted recovery could be protracted.
Moderate	Moderate adverse changes in an ecosystem, society, or economy. Changes may exceed the range of natural variation. Potential for recovery within several years without intervention is good; however, it is recognised that a low level of impact may remain.
Minor	Minor adverse changes in an ecosystem, society or economy. Changes might be noticeable, but fall within the range of normal variation. Effects are short-lived, with unassisted recovery occurring in the near term; however, it is recognised that a low level of impact may remain.
Negligible	Changes in an ecosystem, society, or economy that are unlikely to be noticeable (i.e., well within the scope of natural variation).
Beneficial	Changes resulting in positive, desirable, or beneficial effects on an ecosystem, society, or economy.
<p>Notes: The definitions are intended to categorise residual impacts-that is, impacts expected following the implementation of mitigation measures or controls.</p> <p>The term ‘society’ in the above can be taken to mean the quality and way of life of a village town or city.</p> <p>The term ‘ecosystem’ in the above can be taken to mean the physical environment and the biological communities that live within that environment. Typically impacts to populations and communities are considered rather than impacts to individuals. However, in certain cases involving threatened or endangered species, impacts to individuals may be of greater concern.</p>	

Table 14.2: Assessment of Potential Effects, Proposed Mitigation Measures and Residual Significance

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
<p>Pipeline Purpose.</p> <p>The pipeline allows storage and transportation of gas so increasing the capacity of the existing gas infrastructure of Ireland. The pipeline will accommodate Ireland's future natural gas energy requirements and compensate for the depletion of the Kinsale Head Gas Field.</p> <p>Pipelines are considered to be the best available technique for transportation of gas compared to other forms of transport (LPG shipping, freight train and lorry).</p>	<p>Design: Optimum routing of the pipeline keeps to a minimum practicable the overall length of the pipeline and the quantity of materials and consumables required for installation and operation.</p> <p>Construction:</p> <p>Efficient planning of vehicle movements will minimise fuel usage.</p> <p>Maintain engines to ensure optimal operation and use 'greener' fuels where practicable.</p> <p>Operation: Reduce Irish use of peat and coal resources and reduces Irelands CO² emissions in line with Kyoto Protocol</p>	<p>Natural gas is the cleaner burning of the fossil fuels, with lower emissions of gases that contribute to global warming and acid rain.</p>	<p>Benefit</p>
<p>Planning Constraints.</p> <p>Requires compliance with the conditions of council and statutory authorities. Following installation and reinstatement of the land, normal agricultural operations may resume over the line, though the pipeline will restrict certain activities involving excavation within the easement and construction within 'proximity distance' of the pipe.</p> <p>The buried pipeline transports natural gas between Beattock and Brighthouse Bay with block valves at approximately 16km intervals to allow isolation.</p> <p>Safety, Environment, Feasibility, Land Use and Cost have been key considerations in the routing</p>	<p>Design: During routing of the pipeline and location of block valves careful consideration has been given to environmental and land use policies as set out in the Dumfries and Galloway Council Structure Plan and relevant Local Plans. Council Officers and Statutory consultees such as SEPA, SNH, SERAD and Historic Scotland have been consulted.</p> <p>The above ground block valve facilities are located where possible so they're easily accessible, close to existing electrical and telecom lines, visually protected, of minimum land-take and away from occupied properties. Separate planning applications shall be submitted to Dumfries and Galloway Council for the above ground block valve sites.</p> <p>Heavy wall pipe will be installed when passing within proximity of currently occupied properties or within proximity of planned developments.</p>	<p>Some restrictions on future land use.</p>	<p>Minor.</p>

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
exercise.	<p>Construction: Consultation will be maintained during the detail design stages though to completion of construction.</p> <p>The impacts of construction will be mitigated by careful routing of the pipeline during the design phase. Adhering to method statements with construction supervision by a project management team, the impacts of pipeline construction will be controlled and mitigated.</p>		
<p>Effects on landscape, with temporary visual impact from stripped and fenced working widths, hedge and wall removal and temporary construction compound and pipe storage yard.</p> <p>Medium term visual impact following reinstatement prior to growth of hedges.</p> <p>Permanent visual impact from block valve sites and aerial markers along pipeline route.</p> <p>The pipeline will impose long term restrictions on building development within proximity to the pipe and tree planting within the proposed pipeline easement.</p> <p>Pipeline marker posts will be installed at field boundaries and road/rail crossings. Aerial markers will be placed in boundaries at approximately 1km intervals and also at major changes of direction.</p>	<p>Design: The pipeline has been routed to minimise extent through areas of landscape sensitivity.</p> <p>The block valves are located so their landtake and visual impact on the landscape is minimised. By planting a screening strip around the sites perimeter the block valve sites visual impact will be minimised.</p> <p>Construction: During construction, impacts on landscape are largely confined to the 36m working width, with larger working areas close to road crossings.</p> <p>Areas highlighted as being of landscape sensitivity will be prioritised during construction thereby minimising the duration the ‘spread’ is operational.</p> <p>The impact of the pipeline contractors temporary construction compound and pipe storage yard will be mitigated by locating on a ‘brown field’ site.</p> <p>The Contractor will make provisions for the collection of litter and to maintain the working site in a tidy condition.</p> <p>The Contractor will provide a method statement for the reinstatement of sensitive areas, walls and hedges to ensure no long term visual effect.</p> <p>Operation: Once the reinstated hedgerows along the pipeline route and</p>	<p>Construction</p> <p>Temporary visual effects of site facilities and working width during construction period.</p> <p>Short term effect whilst reinstated land and hedgerows grow back.</p> <p>Operation</p> <p>Long term minor</p>	<p>Moderate</p> <p>Minor</p>

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
	screening vegetation planted around the block valve sites have grown and matured the pipeline and Block Valve sites will blend into the surroundings with the minimum of impact.	effect on landscape of block valve sites and aerial markers	
<p>Effects on agriculture and land drainage, due to temporary loss of agricultural land during construction period to accommodate working width.</p> <p>Farm water supply lines and water pipes crossed by pipeline.</p> <p>Interference with normal farming operations during construction.</p> <p>A pre-construction survey will be undertaken to record the existing condition of the land, road crossing, hedges, walls, drainage and water supply lines.</p> <p>Temporary short term effects over construction period. Agricultural land reinstated to original condition within one growing season. No long term effects.</p> <p>Restrictions on deep cultivation within proximity of pipeline.</p> <p>Permanent easement over pipeline with rights of access and development restrictions.</p> <p>The block valve sites represent a permanent land-take where there will be a permanent change from agricultural to industrial use.</p> <p>Once reinstatement is complete the land may revert</p>	<p>Design: A land drainage specialist will carry out a detailed survey and consultation during the design phase in order to establish the full extent of the land drainage systems and reach agreement on proposed pre and post construction drainage schemes.</p> <p>Notifiable soil borne diseases and any recorded burial pits in the location of the pipeline route advised by SERAD will be avoided.</p> <p>Landowner compensated for temporary loss of land and permanent easement rights.</p> <p>Construction: Construction will be in accordance with the MAFF “Code of Good Agricultural Practice for the Protection of Soil”, the “Code of Good Agricultural Practice for the Protection of Water”, and the “Code of Good Agricultural Practice for the Protection of Air”. Also the SUDS “Design Manual for Scotland and Northern Ireland”.</p> <p>It will be necessary to advise the local office of the Scottish Executive – Rural Affairs Department (SERAD) when construction will be taking place and reconfirm the absence of statutory restrictions, ascertain the presence of soil-borne diseases and requirements for special precautions.</p> <p>Contractors procedures will include measures to be taken to prevent transport of agricultural diseases, stock control, access, weed control, soil handling, drainage reinstatement, wall and hedgerow reinstatement and temporary water supplies.</p> <p>In addition to any wayleave payments for rights in the land, any loss of agricultural production and associated financial loss will be a matter for compensation.</p>	<p>Construction</p> <p>Temporary loss of land during construction period prior to reinstatement</p>	<p>Significant</p>

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
<p>to its original agricultural use, though there will be restrictions on deep working within the wayleave.</p>	<p>To avoid soil compaction the working width will be stripped of topsoil during construction, with the use of low-pressure tyres or wide tracks on fragile or poorly drained soils. By constructing during the spring and summer months when the soil is typically dry, even vulnerable soils may be handled without detriment.</p> <p>Having buried the pipeline the subsoil within the working width will be ripped if compacted and the topsoil spread back over the working width followed by rapid return to its former use. By adhering to best construction practice the pipeline construction contractor and project management team will ensure that land is restored to its original condition.</p> <p>The drainage system will be reinstated in accordance with the drainage strategy and agreements achieved during the planning stage.</p> <p>Where necessary access across the working width will be maintained for the occupier and stock watering points provided where fields divided.</p> <p>Operation: An aftercare programme will be implemented to ensure that reinstatement of the working width has been carried out to the satisfaction of the landowners/occupiers. Contact will be maintained with landowners and occupiers to ensure pipeline is not damaged and a post construction survey will be carried out with landowners to ensure satisfactory reinstatement. Defects found will be made good to the landowners/occupiers satisfaction.</p>	<p>Operation Loss of agricultural land at block valve sites.</p>	<p>Minor</p>
<p>Impact on Archaeology.</p> <p>The pipeline crosses an area of demonstrated archaeological importance but it will not affect any sites of national importance.</p> <p>An Archaeological Management Plan (AMP) will be prepared and incorporated into the overall</p>	<p>Design: A line walk through along the pipeline route during the design phase will allow identification of any unknown features. Some archaeological evaluation trenches and a geophysical survey may be appropriate.</p> <p>Consideration will be given to mitigation or re-routes for significant sites or of a type likely to add to the archaeological understanding of the area. Moving the pipeline on the basis of inadequate information could be</p>	<p>Significant archaeology avoided through routing and mitigation.</p>	<p>Minor</p>

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
<p>Environmental Management Plan (EMP). The AMP will detail areas where archaeological mitigation is proposed and the type of mitigation envisaged. It will be developed in consultation with the archaeological section of Dumfries and Galloway Council. Liaison will also be maintained with Scottish Natural Heritage, Historic Scotland, and others as appropriate.</p>	<p>counter-productive. In considering the need for minor re-routes, attention will be paid to assessing the archaeological potential of any new area, which may be disturbed. Any known archaeological site lying on the pipeline route will be assessed to evaluate its extent and character.</p> <p>Construction: A watching brief will be maintained during pipeline construction, with particular attention paid during topsoil stripping and pipe-trenching.</p> <p>Provision will be made for the analysis, publication, storage and display of archaeological material found on the pipeline route</p> <p>Operation: Any findings recorded and distributed to interested parties.</p>		
<p>Impact on watercourses.</p> <p>Four catchment areas are crossed by the pipeline, with a total of 98 watercourse crossings.</p> <p>Hydrotest of pipeline and pipework will require a plentiful supply of water. A drainage point will also be required for subsequent draining of the water from the pipe.</p> <p>Discolouration of the water (by rust or otherwise) will be minimal since the pipeline is internally coated.</p>	<p>Design: Consultation with SEPA, SNH, Dumfries and Galloway Council, the District Salmon Fisheries Board and the West Galloway Fisheries Trust during the planning stage will enable development of site specific crossing method statements for all watercourses deemed to be major or significant minor. Generic method statements will be provided to cover all the minor river crossings for approval by SEPA prior to construction.</p> <p>Construction: The construction contractor will comply with the requirements of the agreed method statements.</p> <p>Construction will also be in accordance with the requirements of the following SEPA documents: Guidelines for Water Pollution Prevention from Civil Engineering Contracts; PPG5, Works in, near or liable to affect watercourses; PPG6, Working at construction and demolition sites.</p> <p>No re-fuelling will be undertaken within 30m of watercourses. Pumps and other mechanical plant will be fitted with drip trays and absorbent material will be available to mop up any spillage. The contractor will have a suitable contingency plan together with oil spill clean up material.</p> <p>Following consultation the contractor will submit method statement for water abstraction and discharge for approval by SEPA, and for the</p>	<p>Construction Extraction and drainage of water from watercourses during construction and testing,</p> <p>Crossing of minor watercourses using dry open cut techniques affecting normal</p>	<p>Negligible.</p> <p>Minor.</p>

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
	<p>required discharge licence.</p> <p>Operation: During normal operations the pipeline will have no effect on groundwater sources because it will transport dry gas having no liquid/chemical content.</p>	flow.	
<p>Impact on natural habitats, principally hedgerows removed and feeding grounds stripped within working width.</p> <p>Neither the pipeline or working width impacts on any environmental sites designated of international or national significance.</p>	<p>Design: By preparing method statements for the crossing of sensitive areas minimal disturbance may be imposed and subsequently the areas may be safely and correctly restored. These method statements will be prepared through consultation with interested and statutory parties. Trees and species rich hedgerows have been avoided where possible during pipeline routing with naturally weak points in hedgerows being utilised for the working width where possible.</p> <p>Construction: Best practice methods of pipeline construction will be adopted to prevent or minimise impacts such as pollution or contamination of soil and water.</p> <p>The extent of hedgerows, which will be removed, will be minimised to reduce the effects on bird nesting sites.</p> <p>Wherever possible a reduced working width will be utilised when crossing or passing near to areas of important or sensitive vegetation. When crossing sensitive and boggy areas, bog mats will be used to minimise impacts on the soils.</p> <p>As part of the reinstatement along the working width, hedgerows which have been removed will be replaced with species the same as those present elsewhere in the hedgerow or line of trees.</p> <p>Operation: Following reinstatement the working width should revert in time to its original condition.</p>	<p>Construction:</p> <p>Hedgerows removed during construction.</p> <p>Operation:</p> <p>Habitats reinstated following construction.</p>	<p>Minor</p> <p>Negligible</p>

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
<p>Use of local services/labour. Impact on recreational activities.</p> <p>The pipeline is routed largely through agricultural land away from occupied properties, though much of the agricultural land is accessible to the public from roads, footpaths and other rights of way, which are used for recreational activities.</p> <p>Economic effects will largely be beneficial with an increase in demand for goods and services. Hotels, guesthouses and Bed and Breakfasts will benefit from the increase in trade from contractors working on the pipeline. Employment will increase slightly on a temporary basis, with a number of local semi-skilled staff and labourers required to supplement the normal project staff and specialist subcontractors, particularly in service supports.</p>	<p>Design: The pipeline is routed largely through agricultural land away from occupied properties.</p> <p>The public shall be made aware and kept informed of the proposed development through public relation exercises.</p> <p>The pipeline is routed so that no populated settlements are directly affected by the pipeline.</p> <p>Recreational users consulted on proposals. Where the working width crosses public rights of way, access shall be maintained where possible, with mitigation measures implemented in agreement with affected parties. Fishing courses crossed using dry crossing methods wherever possible, so negating impact.</p> <p>Construction: Contractor will notify and erect signage to inform recreational users of construction works and access or other restrictions.</p> <p>Contractor to employ local people with the appropriate skills and use local suppliers where possible.</p> <p>By strict control of construction operation and monitoring of practice by the project management team possible nuisances will be mitigated.</p> <p>Operation: Negligible local effect, though the pipeline is required to maintain and improve the natural gas infrastructure capacity of Ireland.</p>	<p>Construction</p> <p>Short term temporary effects on recreational users during construction period.</p> <p>Increase in trade for local suppliers and services over the construction period, Some temporary local labour opportunities.</p>	<p>Negligible</p> <p>Beneficial</p>

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
<p>Emissions, of noise, dust, mud and waste.</p> <p>During construction emissions of noise, air pollutants and liquid effluent may arise. The significance of these emissions depends upon their nature and location.</p> <p>Noise levels will rise and fall during the construction period depending on site activity. The activities will not occur continuously but in stages with peaks of activity separated by longer periods of relative inactivity.</p> <p>Continuous 24 hour operation at a limited number of locations may be necessary over a few days when cleaning, testing and drying the pipeline.</p> <p>Construction activities may create localised dust and mud on roads.</p> <p>Nitrogen will be harmlessly vented to atmosphere during the commissioning of the pipeline.</p> <p>There are very few sources of noise associated with normal pipeline operations. Possibility of very localised noise at very infrequent intervals (every several years) at the proposed block valve sites during pigging and maintenance operations,</p>	<p>Design: Pipeline routed where possible away from occupied properties. Only 3 properties lie within 50m of pipeline.</p> <p>Re-use of excavated material subject to waste management licensing regulations and will be agreed with SEPA.</p> <p>Construction: Contractor will provide a Method Statement for noise control for acceptance by the Dumfries and Galloway Environmental Health Officer. To include provisions for out-of-hours working, notification of residents, location of equipment and acoustic screening bunds and monitoring requirements in line with BS5228 and the guidance therein minimising noise emissions from site.</p> <p>Measures will be taken to ensure occupiers of affected properties are not subject to unreasonable noise and discomfort. Working hours in vicinity of occupied buildings and sensitive areas will be restricted, and temporary acoustic screening will be used where necessary.</p> <p>Above average noise levels could arise from pipeline construction activities at major crossings. To minimise impact of noise at these locations a strategy of mitigation will be developed.</p> <p>Plant and machinery will be maintained in good working order with effective exhaust silencers and sound insulation around engines.</p> <p>In dry ground conditions vehicle movements have the potential to cause localised dust. Where control is necessary, a fine water spray may be applied and vehicle speeds restricted.</p> <p>Road sweeping vehicles will be used to ensure that approach roads and entrances to the spread are kept clean.</p> <p>Contractor to develop a waste management plan in line with the Waste Management Duty of Care – Code of practice and waste minimisation and</p>	<p>Construction</p> <p>Temporary, short term effects.</p>	<p>Moderate</p>

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
	<p>recycling in construction - Site handbook SP133. The plan shall determine the source, methods for recording quantities and the on site storage and disposal method for all wastes. Consideration to be given to the segregation of waste, re-use and recycling.</p> <p>Main Construction Contractor to be responsible for the audit of waste disposal contractors to ensure they have the correct licences to carry and dispose of waste.</p> <p>Drip trays and oil trays will be used beneath plant. Refilling of bowsers on the spread will not be permitted.</p> <p>Operation: Effects of infrequent noise at block valve sites mitigated by being far away from occupied properties, the nearest occupied properties being over 250 metres away.</p>	<p>Operation Only occasional emissions through maintenance.</p>	Negligible.
<p>Personnel Movements and Transport of pipe, plant and materials to site, will cause and increase in traffic. Disruption also caused when open cutting road crossings.</p> <p>The logistics will be carefully planned to determine actual transport requirements, including the availability of traffic routes and suitable access points along the working width.</p> <p>Transportation requirements will be highest during the early part of the construction programme during linepipe delivery.</p> <p>Once works are complete traffic levels will revert to normal levels.</p> <p>Temporary Diversions may need to be set up where the pipeline crosses a road or footpath using an open cut technique.</p> <p>Major period of construction over the summer</p>	<p>Design: The A75 and A701 trunk roads will form the backbone of the traffic routes.</p> <p>Detailed Design and Method Statements for Road and Rail Crossings shall be agreed with the Highways Department and Railtrack respectively prior to construction.</p> <p>Primary access points at road crossings along the pipeline route have been identified for access to the working width during construction.</p> <p>To minimise disturbance to residents and local traffic volumes, and to avoid damage to verges, trees and other features by vehicle movements, a Traffic Management Plan (TMP) will be prepared. The TMP will identify access routes, signage, numbers and types of loads, one way systems and haul roads. Provisions for wheel cleaning, cleaning of mud on roads and control of dust from vehicle movements. Plan to be agreed with the DGUA Highways Departments before works commence</p> <p>Construction: Its is intended that all 'A' and 'B' classified roads will be crossed using a trenchless and non-disruptive crossing technique, so ensuring traffic flows are unhindered.</p> <p>Any street works will be carried out in accordance with the New Road and Street Works Act 1991 and the conditions of the Highways Department of Dumfries and Galloway Council.</p>	<p>Construction: Temporary short-term effects of construction traffic over construction period. Cumulative</p>	Minor

Source/ Duration/ Magnitude/ Effect	Mitigation	Residual Consequences	Significance
months when visitor numbers and local traffic are above average. Potential conflict with local road users, with disturbance and noise of traffic movements.	<p>During the highest traffic activity when pipe is delivered to the working width, two-way radios may be used to control and co-ordinate HGV movements.</p> <p>Contractor to ensure that all hauliers comply with the Traffic Plan.</p> <p>Regular checks to be made to ensure hauliers follow the designated routes.</p> <p>Operation: Negligible effect on traffic and transportation during operation.</p>	<p>temporary noise and disturbance effects along working width.</p> <p>Operation: No effect during normal operation.</p>	Negligible
<p>Safety</p> <p>Of fundamental importance at all stages and a key factor in selecting pipeline route. Pipeline to be designed, construction and tested in such ways that the integrity and safety is not compromised.</p> <p>The level of risk during operation of the pipeline is very low indeed and is well within the accepted safety criteria.</p>	<p>Design/Construction: The pipeline shall be designed and constructed in accordance with: IGE/TD/1; BS8010; Health and Safety Executive guidelines - The pipelines safety regulations 1996; The Construction (Design and Management) Regulations - The Construction (Health, Safety and Welfare) Regulations; COSHH – Approved Codes of Practice 1988, and The New Guide for Employers 1994; Noise at Work Regulations 1989 – Manual Handling – Guidance on Regulations 1992; IGE/TD/9</p> <p>Regular meetings held between design consortium, engineers to ensure integrated design, schedules, use of materials, access and assessment of likely effects.</p> <p>The contractor will designate a liaison person to provide an interface with contractors working on the other phases of the complete pipeline and compressor facility.</p> <p>Operation: Mitigation through design.</p>	Safety is of fundamental importance.	
<p>Decommissioning: A range of effects depending on the decommissioning solution adopted, from the low level long term effects of the physical presence of the pipe if left in-situ to more significant short term effects from pipe removal.</p>	Full comparative and environmental assessment of de-commissioning options to be performed.	Dependent on de-commissioning options selected.	Dependant on option selected.

Preliminary Risk Assessment of Abnormal and Accidental Conditions

14.5. Table 14.4 provides an assessment of the preliminary abnormal or accidental conditions, which may occur during construction, and operation of the pipeline, together with a description of the mitigation measures proposed and the likelihood of occurrence. The criteria for abnormal operation and accidental events has used a risk assessment type approach based on the criteria outlined in Table 14.3. Assessment of the significance of residual impact has been carried out as per Table 14.1.

Table 14.3: Environmental Risk Assessment for Abnormal and Accidental Conditions

Criteria	Category
Likelihood of the event occurring	High (less than once a year) Medium Low (unlikely during the lifetime of the development)
Likelihood of detection	Low (no monitoring or detection system) Medium High (continuous monitoring or inspection)
State of preparedness	No provision made or mitigation not possible Some provision Detailed plans, training and exercises in place
Ecological and amenity consequences	Significant Moderate or minor Negligible or beneficial

Table 14.4: Assessment of Abnormal Activities and Upset Conditions, Proposed Mitigation Measures and Residual Significance

Source/Duration/Effect	Mitigation	Residual Consequences	Significance
<p>Use and storage of waste and hazardous material (lubrication fluids, oil, paints, thinners and solvents, biocide) contamination of soil and ground water. Potential for spillage and contamination of ground and surface water and soil.</p>	<p>Construction: Contractor to provide a Pollution Prevention Plan to explain how the Contractor will store and use the hazardous materials in accordance with SEPA PPG 6 guidelines 'Working at construction and demolition sites'. This will minimise the potential for an incident, to include storage of fuel in bunds, use of drip trays, visual inspection of plant etc. Suitable pollution clean up materials will be available to deal with likely incidents. All site personnel will be inducted and given toolbox talks on the use and storage of hazardous substances including the requirements of the pollution prevention plan and the use of clean up materials. Pollution prevention plan will be audited in accordance with the HS&E Specifications to ensure site personnel training is effective and pollution materials are available on site.</p>	<p>Plan to be audited to ensure site personnel training is effective and pollution materials are available on site. Medium to high likelihood of occurrence of spillage. Potential for non-compliance with regulatory controls. Moderate or minor localised effects.</p>	Minor
<p>Vehicle refuelling, storage of hazardous substances and the potential for spillages resulting in contamination of soil and ground water.</p>	<p>Construction: No refuelling will be undertaken within 30m of watercourses. Contractor to have a pollution prevention plan in place with an emergency crew (non-dedicated personal) available at all times. Contingency materials to be available on site appropriate to the likely incidents. Suitable arrangements are to be in place for the disposal of contaminated material. Relevant personnel will be trained and approved in the use and handling of fuel and hazardous substances prior to use.</p>		Minor
<p>Hazards to wildlife falling in to trench and becoming trapped in welded pipeline.</p>	<p>Design: Badger setts and otter holes will be avoided. Construction: Contractor to ensure pipe caps are used to restrict access to welded sections of pipe. Badger and otter runs to be identified and crossings to be provided when trench is open.</p>	<p>Medium likelihood of event occurring. High likelihood of detecting and provisions made for handling situation. Minor ecological effect.</p>	Negligible

Source/Duration/Effect	Mitigation	Residual Consequences	Significance
<p>Presence of pipeline, with potential for incident involving an escape of gas venting to atmosphere.</p>	<p>Design: Wall thickness and depth of burial designed to ensure optimal protection in line with current guidelines. Pipeline buried to provide a minimum depth of cover of 1.1m to top of pipe, with heavy wall pipe installed in proximity to occupied properties and major crossings.</p> <p>Construction: Pipeline, pipework and connection onto the existing 30 inch inter-connector will be constructed in accordance with design specifications.</p> <p>Major Accident Prevention Plan (MAPD) to be maintained and exercised in accordance with PSR Regulations 1996. Risk Assessments to be performed.</p> <p>Operation: Lodge pipeline as-built plans with Dumfries and Galloway Planning Offices, Emergency Planning officer, Scottish Executive, HSE and third party undertakers.</p> <p>Regular aerial surveillance of pipeline for 3rd party interference.</p> <p>Register pipeline with ‘dial before you dig’ system in Scotland.</p>	<p>Potential for failure low (unlikely during lifetime of the project).</p> <p>Onshore temporary damage to wildlife habitats.</p>	Negligible
<p>Proximity to existing services. Potential for damaging 3rd party plant.</p>	<p>Design: Full and complete set of service drawings to be obtained for all 3rd party plant within study/planning application corridor of pipeline. Method Statement for crossing beneath services to be agreed with 3rd party owners.</p> <p>Construction: Work within proximity of 3rd party plant to be conducted in accordance with agreed Method Statement, under supervision of 3rd party representative as required. Work to be in accordance with HSE guidance on ‘avoiding danger from underground services’.</p>	<p>Low likelihood of event occurring during construction.</p> <p>High likelihood of event being detected.</p> <p>Effect depending on service damaged.</p>	Moderate.

Evaluation, Monitoring, Auditing and Reporting

- 14.6. Tables 14.2 and 14.4 show that the activities associated with the construction of the proposed pipeline are likely to have either negligible, minor, moderate or beneficial impacts on the environment.
- 14.7. Table 14.5 considers the plans which are to be put in place to monitor and audit the construction works to ensure that the undertakings made in the environmental statement are carried out and that the effects on the environment are quantified.

Table 14.5: Routine Environmental Monitoring and Reporting

Responsible party	Parameter to be measured	Monitoring location of sensitive receptor	Acceptance criteria
BGE	Reinstatement	Reinstatement monitoring after contractors 2 years liability.	
Contractor	Environmental training	Records to be maintained of personnel induction training and tool box talks.	In accordance with HS&E Specification.
	Access to site	Hauliers complying with the agreed Traffic Management Plan. Compliance and speed restrictions to be checked regularly.	To be included in monthly HS&E Report.
	Waste storage and disposal facilities	Weekly inspections of working areas and waste storage areas.	To be included in monthly HS&E Report.
		Waste transfer quantities to be logged	
	Fuel/chemical spills	Reporting of all accidental spillages. In accordance with HS&E Specification.	To be included in monthly HS&E Report.
		Weekly inspection of vehicles and fuel storage areas for fuel leaks.	
	Disposal of Test Water	Discharge of water to be in accordance with the requirements of the discharge licence from SEPA	Written inspection report
	Liaison with D&G Council	Weekly construction update to be provided to D&G Council.	Weekly report.
	Archaeological impact	Archaeological watching brief during topsoil stripping and trenching.	Written inspection report.
	D&G Council Environmental Health officer	Notification of twenty-four hour working.	Weekly report.
Liaison with other contractors	Monthly meeting.	Minutes of meetings.	

Environmental Management and Monitoring.

- 14.8. The operation of an effective Project Environmental Management System is acknowledged by BGE as being an essential part of the project from preliminary design through to operation.
- 14.9. This section summarises the approach, which BGE will take to the environmental management of the pipeline from planning through to construction and operation. The key elements which will be developed during detailed design continuing through to construction and operation of the pipeline include:
- a process of detailed route alignment and construction methodology designed to minimise the environmental impacts of pipeline projects;
 - the production of a project specific Environmental Management Plan for BGE's activities; and
 - procedures for the selection, management and auditing of the Contractor, including a requirement for the principal contractor to produce his own project Environmental Management Plan (EMP) encompassing a description of environmental constraints and the procedures and method statements to be used to prevent, or if not possible, to minimise and mitigate environmental impacts.
- 14.10. The production of the environmental statement documents a specific stage of the environmental assessment process. Environmental management will continue through construction, reinstatement and into operational phases of the pipeline. This will help to ensure that the environment is appropriately protected before, during and after implementation of the project.

Environmental Management During Detailed Design and Construction

- 14.11. A Project Environmental Management Plan (EMP) will be compiled and updated on a regular basis which:
- sets out how relevant staff will be organised and defines responsibilities for applying HS&E controls in their work;
 - sets out how contractors will be selected and monitored;
 - will be issued to the Contractor to inform him of safety and environmental planning and to form the basis from which he will develop his own project-specific environmental management plan;
 - ensures that commitments for protection of the environment are communicated to contractors and delivered by them;
 - demonstrates to external bodies how environmental matters will be managed for the project; and
 - serves as the basis against which environmental performance will be monitored, audited and reviewed.

- 14.12. During the project management of the works, the EMP will be used to audit the activities of the pipeline construction contractor to ensure compliance with environmental objectives. A Code of Practice or “*Pipeline Construction Environmental Specification*” (PCES) for the construction works will be incorporated as part of the EMP. The PCES will be designed as a manual for use during construction management and should be of an essentially practical nature. It should itemise clearly the key areas of construction activity, which have potential for adverse environmental impact, the mitigation measures appropriate to control impacts and the guidelines to be followed in assessing magnitude of impacts. The PCES will, amongst other things, provide managerial guidelines for the control of impacts identified in this Environmental Statement.
- 14.13. The primary objective of an EMP is to ensure full compliance with all safeguards identified as being necessary during the environmental assessment process, as well as those conditions written into the pipeline contractor's contract and any statutory obligations. To a large extent many of the potential adverse impacts, especially those of concern to parties consulted during the consultation process, have been identified and mitigated. It is therefore only residual potential impacts that remain to be addressed.

The Contractor

- 14.14. The Contractor will be required to produce and maintain its own project specific Environmental Management Plan. This must identify site responsibilities for environmental management and describe how the various environmental management activities required will be undertaken, including consultations, licence and consent applications, communication, training, selection and management of sub-contractors and monitoring and auditing during construction.
- 14.15. In addition, the Contractor will be required to develop project specific environmental management procedures and method statements, detailing how they will prevent or mitigate the environmental impacts identified in the environmental statement, taking into account all aftercare requirements and information from subsequent investigations and surveys. The procedures will include:
- a pollution control plan;
 - a waste management plan;
 - a contingency and emergency response plan;
 - a reinstatement and aftercare plan;
 - environmental training plans;
 - audit schedule and procedures;
 - liaison plan; and

- project / site specific method statements.

14.16. The Contractor will be required to develop these in consultation with the project management team and relevant authorities, prior to agreement. No work will be initiated until the appropriate plans and method statements have been approved.

Environmental Awareness

14.17. Site briefings will be given to all contractors' staff through induction talks before the start of construction, and through tool-box talks setting out key procedures during construction. This will help ensure that site personnel are fully aware of the key environmental issues and management procedures, which have been set in place to mitigate impacts. Appropriate aids, such as SEPA videos and leaflets will be used. A team environmental reward scheme may be run to encourage ideas and commitment. This would be run as part of the health safety and environmental toolbox talks and induction.

Environmental Monitoring

14.18. The identification of monitoring requirements are included in this environmental statement. BGE will ensure that a programme of monitoring during construction will be carried out by the Contractor and after construction by BGE.

Environmental Inspection and Auditing

14.19. The Contractor will be required to carry out weekly site inspections and monthly audits during the construction phase and to demonstrate that remedial action has been taken, as necessary, to ensure that works comply with statutory and contract requirements.

14.20. BGE, or their nominated consultants, will undertake audits before and during construction to verify the Contractor's environmental performance.

14.21. To assist Dumfries and Galloway Council, SEPA and SNH it is proposed that BGE finance the engagement of an independent consultant to act on behalf of the statutory consultees, to ensure that the effects on the environment are kept to a minimum. The Contractor will provide a weekly report to the auditor to provide details of activities completed, and a look ahead to activities scheduled for the next two weeks. The report will include a section identifying any problems, spillages or incidents.

14.22. Effective monitoring and auditing of the works will be accomplished by a project management team that will comprise of expertise in pipeline engineering, agriculture, and archaeological and ecological matters. The archaeological review has identified a need for a watching brief. Further support from field archaeologists may be required in the event of any significant finds. Experienced agricultural liaison

officers will be appointed to cover all stages of the work passing through agricultural land.

Consultation

- 14.23. Continued liaison with statutory consultees, landowners, commercial fisheries and recreational users of the area will be undertaken principally by BGE during construction. However, the Contractor's liaison officer will have certain responsibilities for notifying and liaising with landowners, local residents, utilities and affected third parties.
- 14.24. BGE will continue liaison with statutory consultees during operation of the pipeline to ensure the conditions of the construction and operation consent are maintained.

Environmental Management During Operation

- 14.25. The need for development of suitable restoration techniques for individual sections of the route has already been noted. Following completion of the construction activities, it will be necessary to conduct monitoring to ensure the restoration has been effective. BGE or its appointed specialist consultant will carry out this task. This process may be extended for a period of a few years after completion of the construction work, during which time any remedial measures resulting from problems with restoration can be taken. The actual period will depend on the effectiveness of restoration.
- 14.26. Operation of the pipeline will be in accordance with the Pipeline Safety Regulations 1996 which requires a Major Accident Prevention Document (MAPD) to demonstrate that:
- all hazards relating to the pipeline with the potential to cause a major accident have been identified;
 - the risks arising from those hazards have been identified;
 - the safety management system is adequate; and
 - adequate arrangements have been established for auditing and reporting.
- 14.27. BGE will extend their current MAPD and operating procedures to include the proposed Second Interconnector Project.
- 14.28. Whilst the MAPD does not specifically cover environmental aspects of accidents arising from pipelines, by ensuring pipeline integrity through safe design and construction, the operational risks to the environment are reduced.

Summary

- The preliminary impacts of pipeline construction and operation and the associated abnormal activities and upset conditions that may occur have been summarised. For these mitigation measures have been proposed and the residual significance following mitigation identified.
- The operation of an effective Project Environmental Management System is acknowledged by BGE as being an essential part of the project from preliminary design through to operation. This will allow any unidentified or unforeseen environmental impacts to be adequately mitigated.
- A Project Environmental Management Plan (EMP) will be compiled and updated on a regular basis which will:
 - set out how relevant staff will be organised and define HSE controls responsibilities in their work
 - set out how contractors will be selected and monitored;
 - Advise contractor of safety and environmental planning to form the basis from which to develop his own project-specific environmental management plan;
 - Ensure commitments for protection of the environment are communicated to and delivered by contractors
 - demonstrate to external bodies how environmental matters will be managed for the project
 - serve as the basis against which environmental performance will be monitored, audited and reviewed.
- The Contractors Environmental Management Plan together with the Pipeline Construction Environmental Specification will identify site responsibilities for environmental management and describe how the various working methods will be undertaken with respect to environmental management. This will include consultations, licence and consent applications, monitoring, communication, training, auditing, selection and management of sub-contractors. The Contractor will also develop detailed method statements to prevent or mitigate the environmental impacts identified in the environmental statement.
- It is proposed that an independent consultant be engaged to act in the statutory consultees interests and ensure that the effects on the environment are kept to a minimum. The Contractor will provide a weekly report to the auditor to provide details of completions, problems and incidents and a look ahead to forthcoming activities.

References

1. Environmental Protection Act 1990
2. Control of Pollution Act 1974 (as amended)
3. Waste Management Licensing Regulations 1994
4. Special Waste Regulations 1996
5. Land Drainage Act 1991
6. Waste Management – Duty of Care – A code of Practice. The Stationery Office
7. Sustainable urban drainage systems – Design Manual for Scotland and Northern Ireland Report C521 CIRIA.
8. Waste Minimisation and Recycling in Construction – A site handbook. Report SP133 CIRIA.
9. Managing materials and components on site – Report SP146 CIRIA.
10. Use of industrial by-products in road construction – water quality effects. Report 167 CIRIA.
11. Above ground oil storage tanks – PPG2 SEPA.
12. Disposal of sewage where no mains drainage is available – PPG 4 SEPA.
13. Working in or near rivers – PPG5 SEPA.
14. Working at construction and demolition sites – PPG 6 SEPA.
15. High pressure water and steam cleaners – PPG13 SEPA.
16. Control of spillages and fire fighting run-off – PPG18 SEPA.
17. A guide to Sustainable Urban Drainage – SEPA.
18. MAFF Booklet – Preventing the Spread of Animal and Plant Diseases: A Practical Guide
19. MAFF Booklet – Precautions to Prevent the Spread of Animal and Plant Diseases
20. MAFF Booklet – Code for Good Agricultural Practice for the Protection of Soil The Soil Code – Revised 1998
21. MAFF Booklet – Controlling Soil Erosion

SEPA references are available from the Agencies offices.

CIRIA references are available from CIRIA (Construction Industry Research and Information Association), 6 Storey's Gate, Westminster, London SW1P 3AU. Tel: 020 7222 8891.