A96 Corridor Capacity

Services Systems

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Rev No	Comments	Approved	Date

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1 Introduction

Faber Maunsell, in conjunction with FG Burnett and Entec, were commissioned by Highland Council to prepare a masterplan for the long term development of the A96 corridor between Inverness and Nairn. This requirement emerges from the Highland Structure Plan (approved 2001) which outlines desires for the development of 10 000 new dwellings by 2017.

Faber Maunsell are responsible for undertaking an assessment of the capacity of the following existing utility services and the implications associated with the new development. This report outlines the key findings of the study in respect of

- Gas
- Water
- Drainage
- Electricity
- Telecommunications

In each case discussions have taken place with the local utility supplier in order to determine the capability of the existing network and what might need to be done to accommodate the increased population. It must be stressed that in each case the utility suppliers were unwilling to carry out detailed analyses of their systems without certainty that the development would proceed or without additional funding. Nevertheless each was able to give a 'broad brush' statement on their current system infrastructure and sufficient advice to enable a 'best option' to be evaluated.

The utility company supply contacts are indicated in Appendix 1

2 Existing Service Infrastructure

2.1 Gas

The existing gas network within the corridor consists of a high pressure (above 7 bar) transmission line which runs from east to west along a route approximately parallel to the A96. Medium and Intermediate pressure network extend from this main transmission line to cover the suburban areas of Nairn and Inverness (as far as Balloch and Tornagrain in the West). There is no other medium/intemediate gas network between these two locations.

Transco have indicated that there is a minimum exclusion zone of 12m around the high pressure transmission main. Hence any development must be coordinated with this exclusion zone or any amendments to it that may result from Transco's reinforcement works on it.

2.2 Water

There is an extensive existing mains water network within the corridor with large size mains running on an east west axis. Sub distribution networks are present in all the current built up areas and intermediate villages and the airport.

Scottish Water advise that the corridor is supplied from two reservoirs and a water treatment plant which are located outside the study area. These reservoirs and the treatment plant also serve the wider Inverness and Nairn area.

2.3 Drainage

Mains drainage exists in the built up areas close to Inverness (Culloden/Balloch, Croy, Newlands, Ardersier and the Airport. There are wastewater treatment works at each of these locations within the study area. There is also an extensive urban drainage network in Nairn with the associated treatment plant outside the corridor area.

Scottish Water have advised that the treatment plant in the Eastern approaches to Inverness is under the administration of a PFI contract. The implication of this is that it is not possible for contractural reasons to use this water treatment plant to handle any increased growth in the corridor study area.

2.4 Electricity

The local electricity network is served from a 132kV supply system from East to West in the southern part of the study area. The HV cables run above ground on overhead pylons between main grid substations located in Inverness and Nairn. These grid substations supply the local urban areas and the corridor study area. The HV network from these substations is concentrated around the Inverness and Nairn areas. The network within the study area is less extensive and is derived ultimately from one or other of the two grid substations mentioned above.

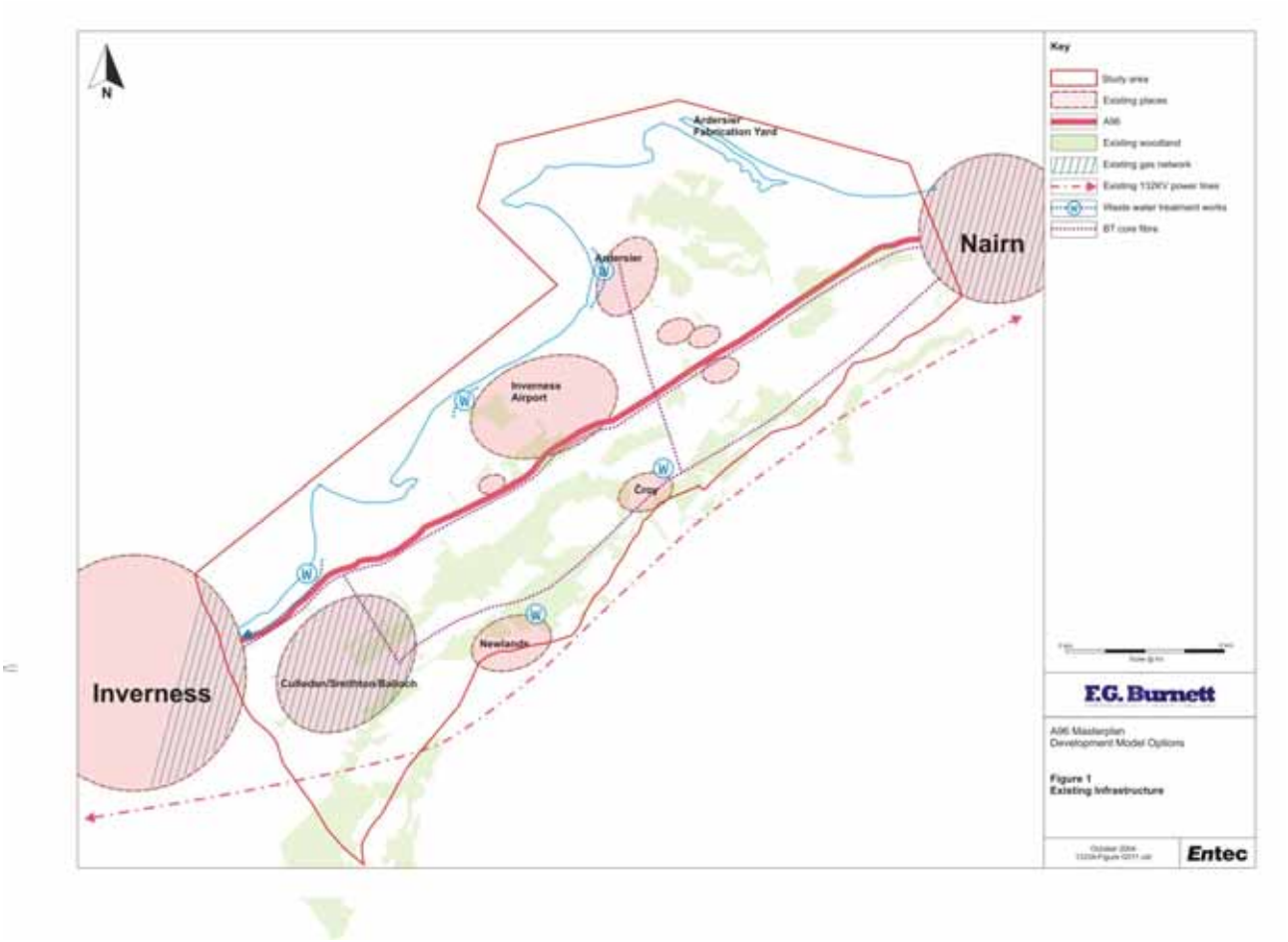
2.5 Telecommunications

BT have a core fibre network which runs parallel to the A96 and also along a southerly route through the Newland/ Croy area. A core fibre also extends into the Ardersier area.

This gives BT extensive coverage of the corridor area at present and allows considerable flexibility for future expansion.

FIGURE 1

EXISTING INFRASTRUCTURE



3 Introduction to Development Options

A number of possible options have been developed for possible growth within the corridor study area. These options show different distribution of the proposed 10 000 additional dwellings taking into account different constraints and drivers. The options which have been developed thus far are indicated on the attached Figures 2-9 as follows

- Eastern Growth
- Polar Growth
- Island Growth
- String of Pearls
- Land Use
- Transport
- Landscape

The primary propose of this report is to add another growth option based on the drivers and constraints of the services infrastructure within the corridor. This additional Infrastructure Option is intended to indicate the distribution of settlements which most suits the available infrastructure and allows comparison with the other options developed previously.

FIGURE 2

EASTERN GROWTH

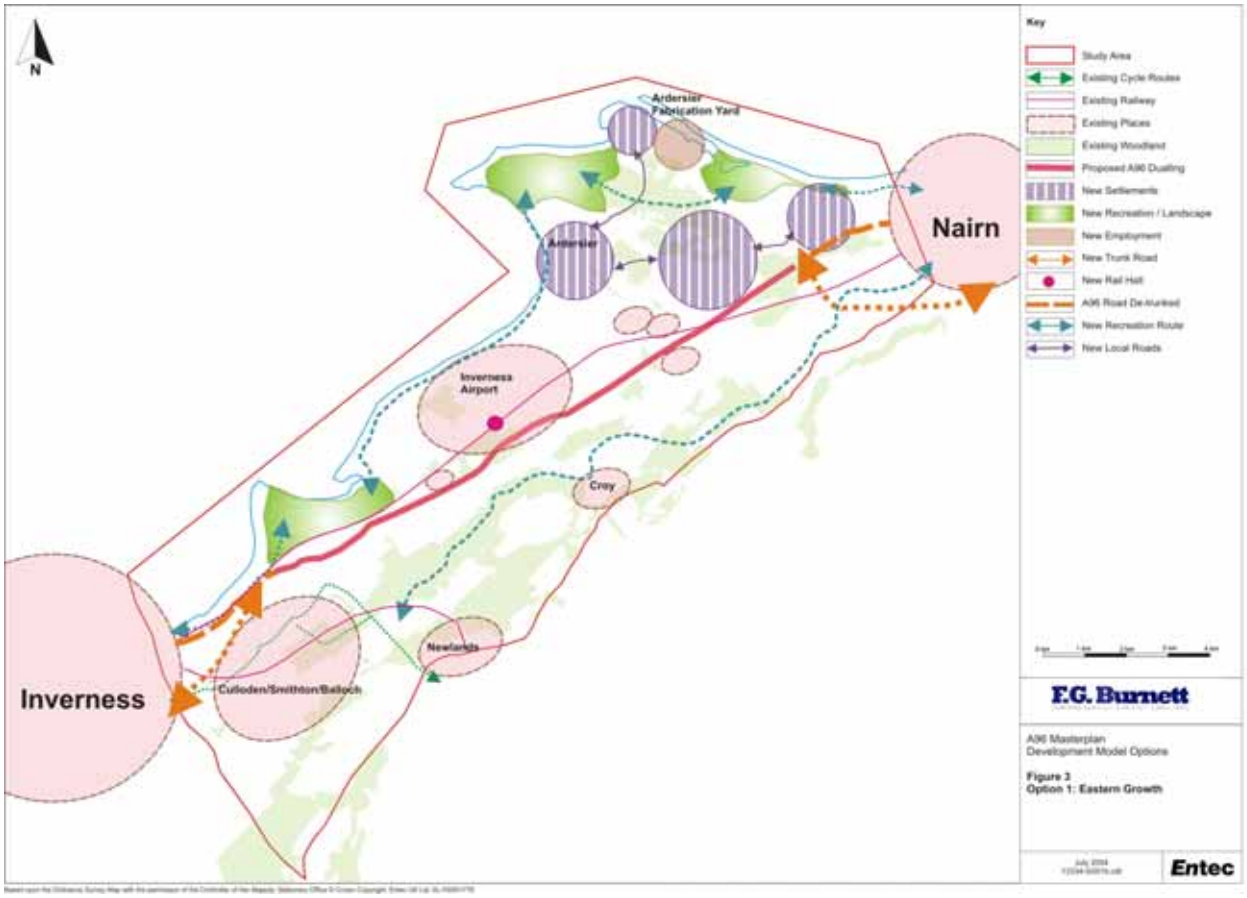


FIGURE 3

POLAR GROWTH

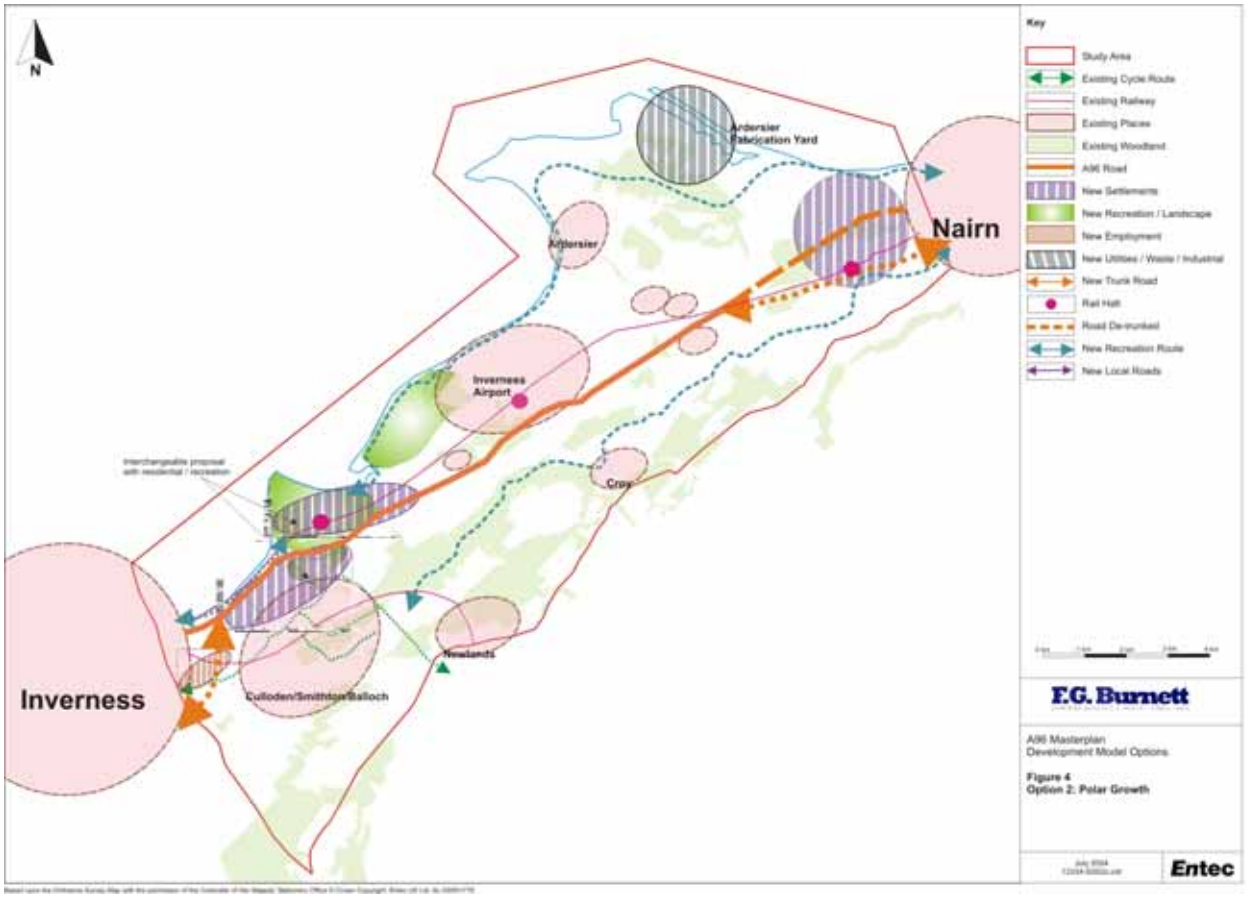


FIGURE 4

ISLAND GROWTH

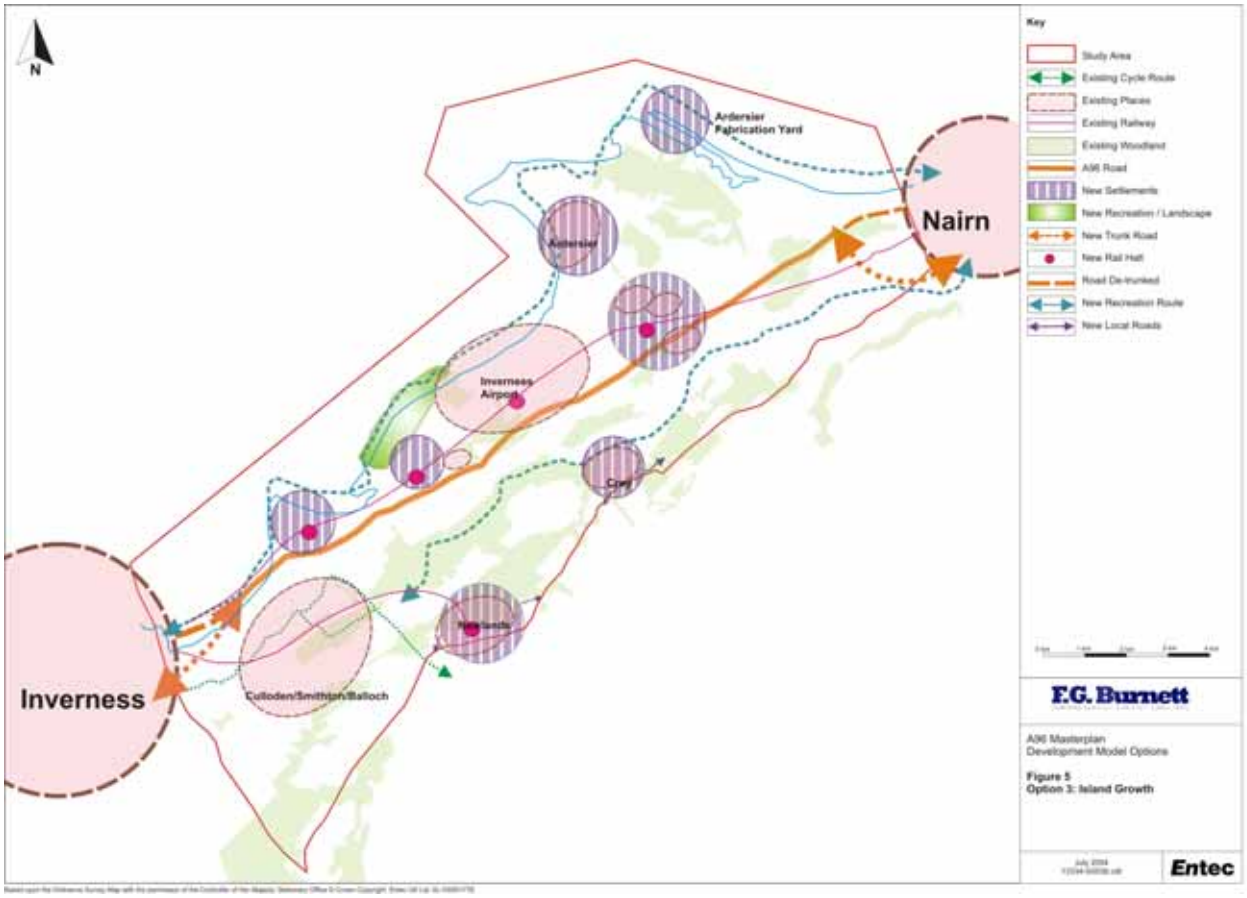


FIGURE 5

STRING OF PEARLS

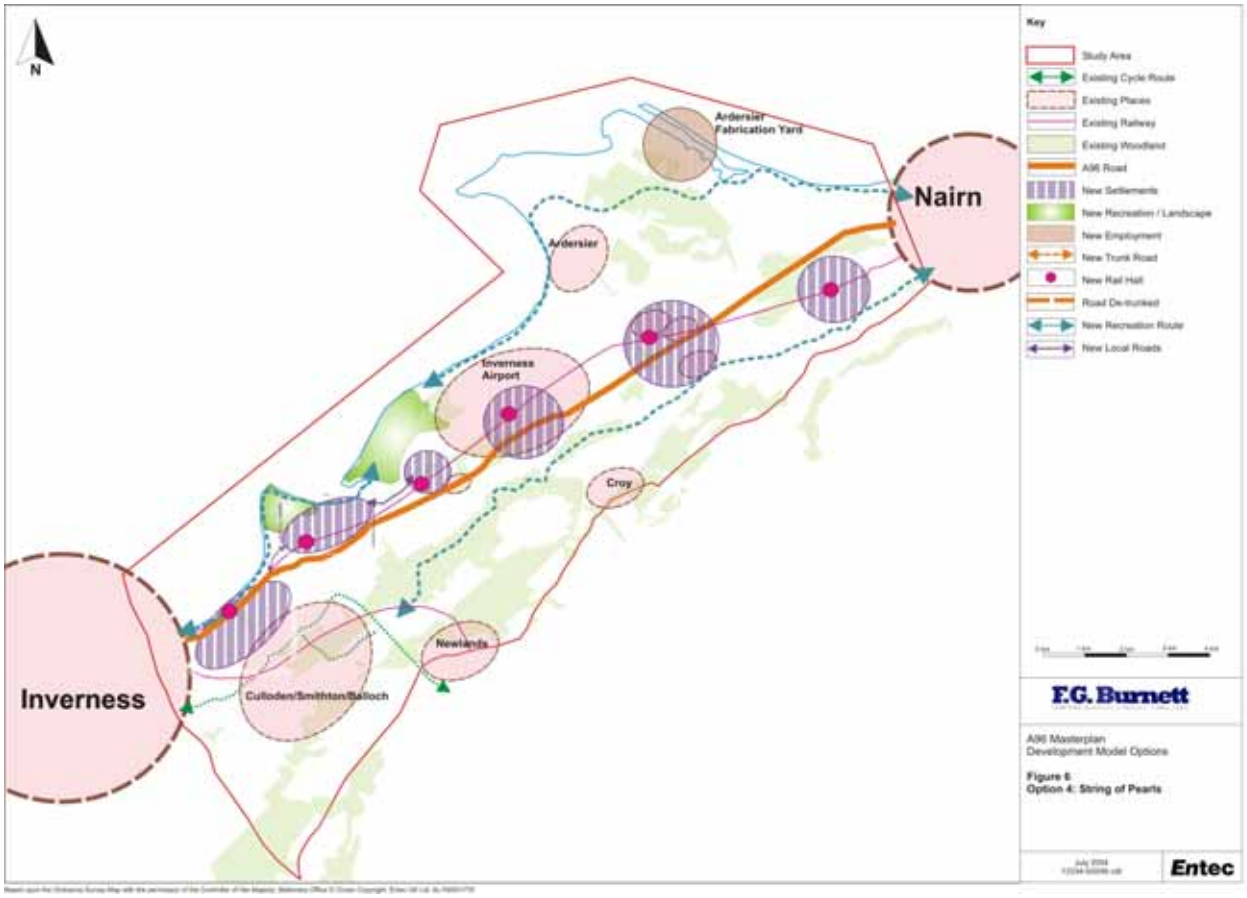


FIGURE 6

LAND USE

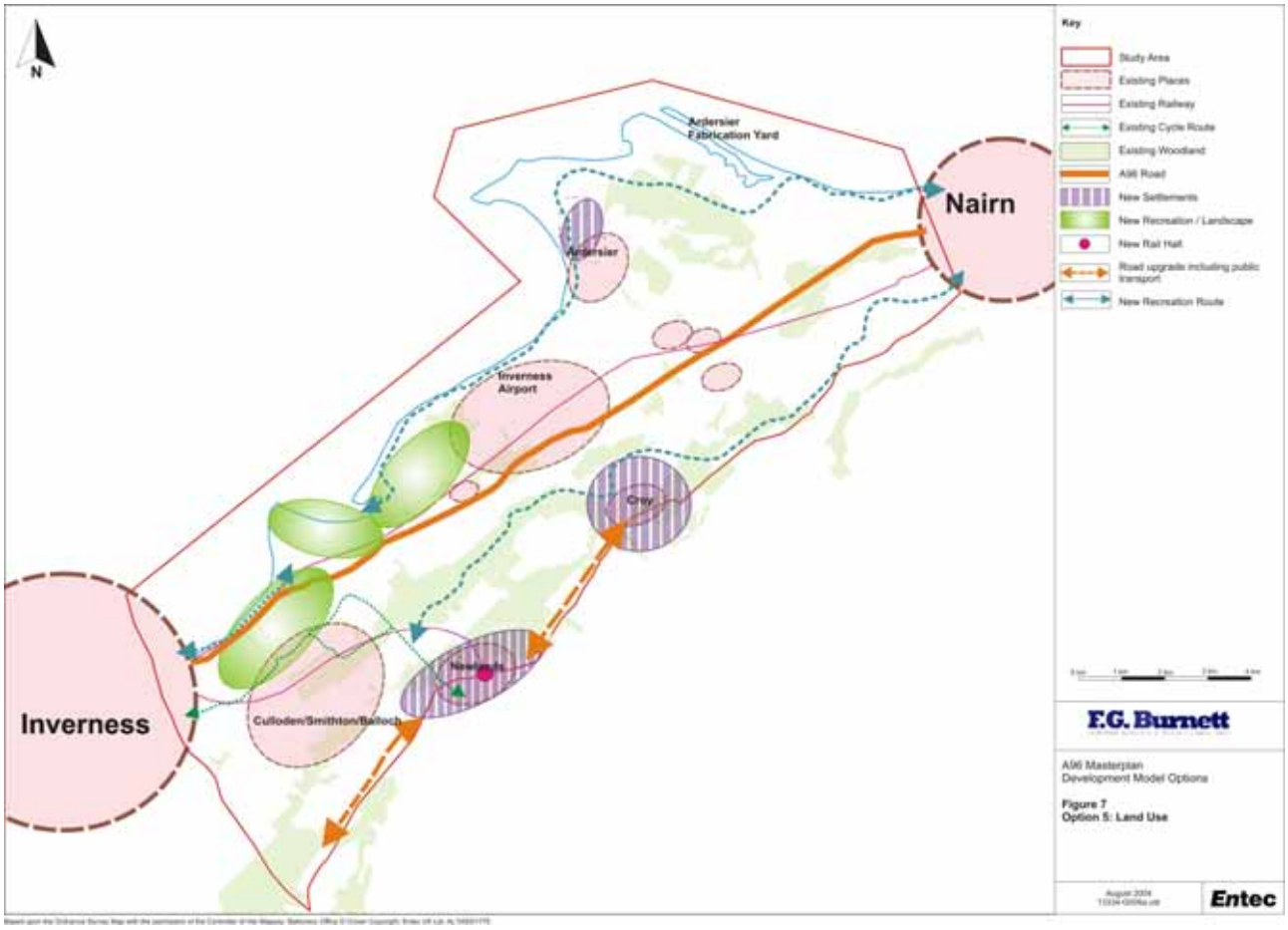


FIGURE 7

TRANSPORT

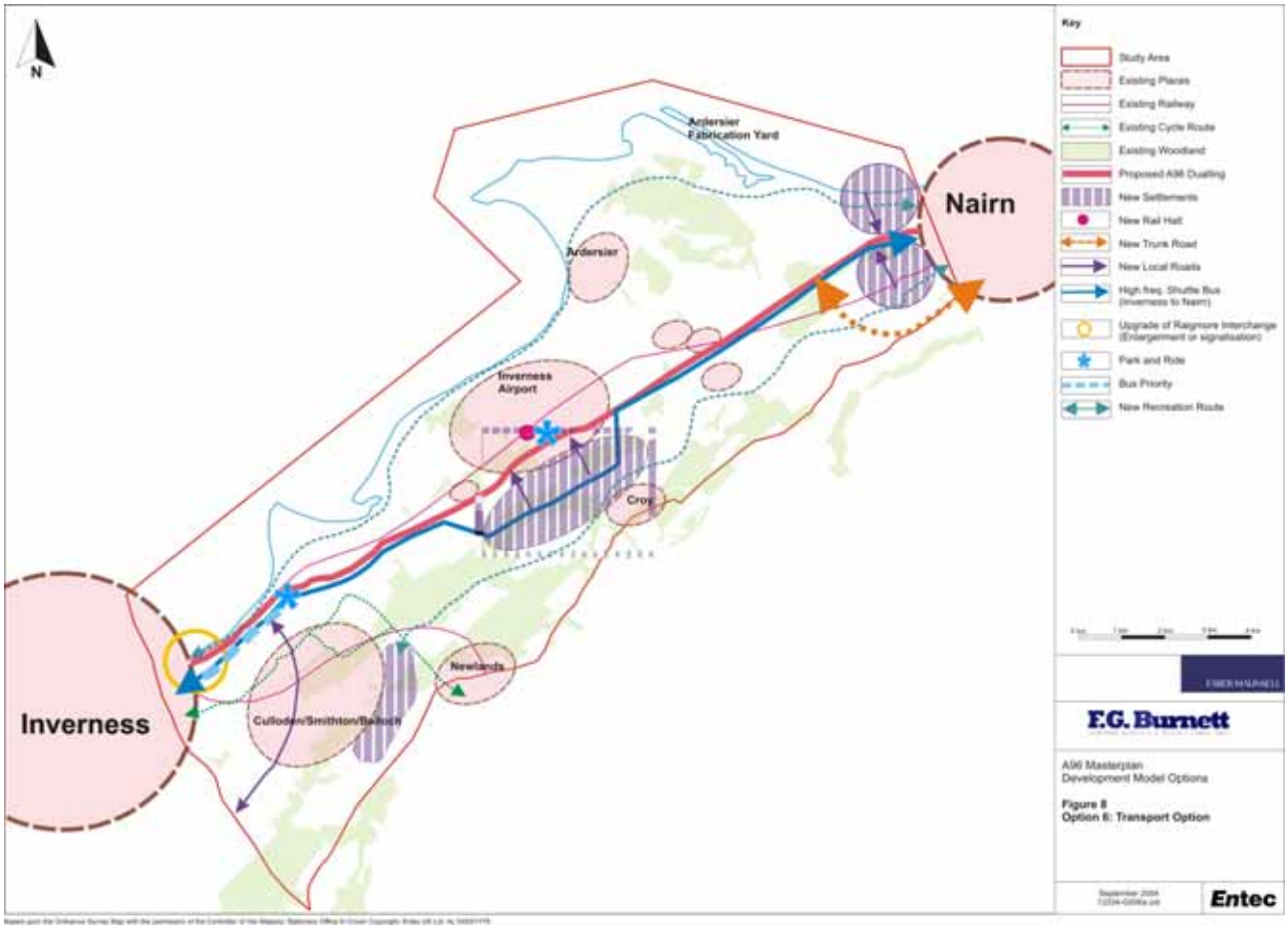
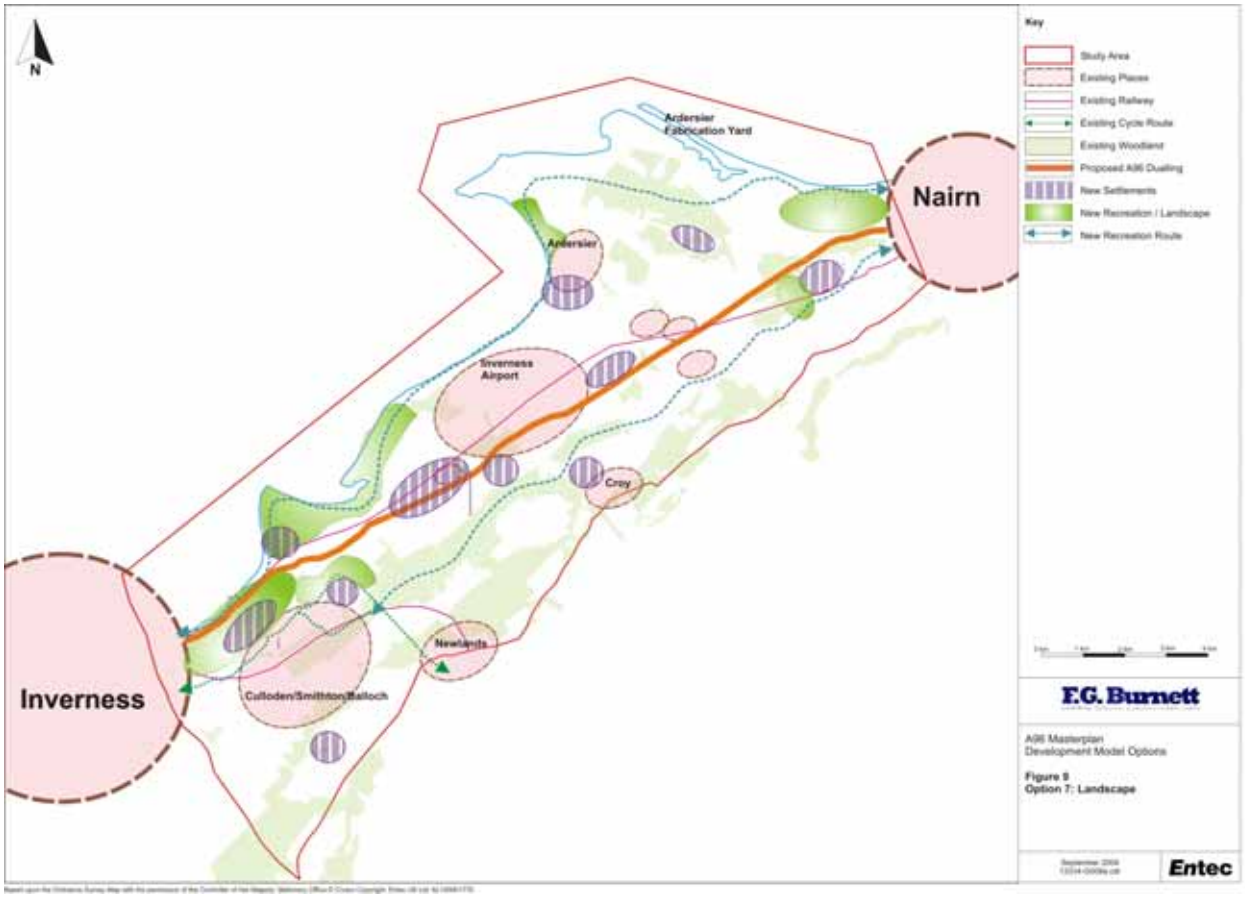


FIGURE 8

LANDSCAPE



3 Utility Infrastructure Capacity

3.1 Gas

A gas capacity assessment has been carried out on the basis that dwellings will use natural gas to provide both heating and hot water. A typical dwelling of about 100m^2 will have a maximum gas demand of approximately 6kW. Thus the ***peak*** gas demand for an additional 10000 dwellings is estimated to be in the order of 60 MW. Transco confim that a typical ***diversified*** load would be in the order of 800 therms per household per annum (equivalent to approximately 30MW)

The high pressure gas main passes from East to West across the corridor (see Section 2.1) but the medium/low pressure distribution network is concentrated in the suburban areas of Inverness and Nairn. There is little low/medium pressure infrastructure in the central zone and while at first sight this would appear to favour the Polar Growth option but Transco confirm that both of the suburban low/medium pressure networks **and** the main transmission line are operating close to full capacity. Transco therefore advise that significant reinforcement of the high pressure trunk main will be necessary to support the long term development plan for the corridor. This would, however, be phased over a long period of time as the settlement growth develops.

None of the options for distribution of the settlements are therefore more advantageous than any other with respect to the gas provision; all the options will require Transco to introduce low/medium pressure networks in the areas of the settlements and reinforce the existing transmission infrastructure. Transco would prefer, if possible to extend their existing network into the central area of the corridor which currently has no low/medium pressure gas distribution, thus giving them a more extensive and flexible network.

This corresponds most closely to the Transport Option ie extend existing settlement at Culloden / Nairn and develop a larger settlement in the central corridor. Polar Growth, which proposes expanding the existing Culloden and West Nairn urban areas is also a possibility.

Transco do not anticipate that any major diversion works to the medium pressure mains would be required due to the developments of the settlements; all localised settlement growth should be developed to avoid the existing medium pressure pipeline. The extensive exclusion zone (12m minimum) must be taken into account when considering the detailed growth plans.

3.2 Water

The increased domestic water loading is estimated on the basis of 200 litres/person/day, thus giving an increased loading in the corridor in the order of 4500-5000 m3/day. The local supply authority, Scottish Water, concur with this figure as typical provision for the quantity of dwellings under discussion.

The corridor area is currently served by an extensive below ground water pipework network and this network could be adapted and reinforced locally to serve any of the proposed settlement options. No distribution of settlement is more favourable than any other in terms of the water pipework infrastructure and phased reinforcement of the existing water network should be able to follow.

The source of the domestic water supply is more problematic; the water supply in the wider Inverness/Nairn area is currently served from two reservoirs and a main water treatment works, all of which are located outside the study area. The capacity of these reservoirs and water treatment works are already causing Scottish Water some concern as current growth in the Inverness area is loading the system close to their current maximum capacity.

The proposed A96 corridor expansion could bring about the need to provide an additional water treatment plant and possibly a new source of water for the network. Scottish Water are extremely cautious about this not only because of the cost and timescale implications but also because the Scottish Environmental Protection Agency (SEPA) have already raised their own concerns with Scottish Water regarding their long term water sources and usage rates.

It should be stressed, however, that this supply issue is not specifically the result of the corridor study but is a historic problem which Scottish Water are currently experiencing across a wide area of Northern Scotland.

There is , therefore a potential water supply problem that will require a full infrastructure modelling exercise to establish the long term supply strategy for the North of Scotland. This will be carried out by Scottish Water at a cost of around £20000. The proposed corridor development will form part of this study.

3.3 Drainage

Domestic mains drainage capacity is assessed on the basis of 0.5m3/dwelling per day. This gives a total additional load of 5000m3/day.

The provision of mains drainage is restricted by the capacity and location of the wastewater treatment plants and as with the domestic water supply, Scottish Water have concerns over the ability of the existing network to accommodate the increased drainage discharge.

The existing mains drainage around the Nairn area is currently operating at maximum capacity and any growth at the East side of the corridor could not be supported from this network.

There is some capacity on the main drainage network at Inverness but the current growth already underway in this area is already loading up the network in this area. The waste treatment plant which serves this area is currently administered under a PFI contract and Scottish Water advise that further settlement in this area could not be accommodated by this treatment plant.

This effectively rules out the Polar Growth option and places restrictions on the Western settlements which are proposed in this area as part of the Island Growth, String of Pearls and Landscape options.

The other existing wastewater treatment plants in the area of the Airport, Newland, Croy and Ardersier will most likely require upgrading to accommodate the additional wastewater loading from settlements in the central zone of the corridor. It may also be necessary to create a completely new water treatment plant within the corridor area.

The Eastern growth and transport option will affect the Ardersier treatment works primarily. The Land Use option mainly affects the small plants at Newland and Croy. The Island growth, String of Pearls and Landscape options distribute the load more evenly around all the available treatment plants.

It is not possible at this stage to identify a most favoured option for drainage. Scottish Water are cautious of any expansion of the existing mains drainage in the area; SEPA have already directly communicated their concerns to Scottish Water that increased drainage demand must be accommodated in an acceptable manner.

The feasibility of upgrading of the existing water treatment plants and the cost implications associated with this will require a detailed drainage modelling exercise to be carried out by Scottish Water. The budget for the modelling exercise is likely to be in order of £20000 (note that this is in addition to the £20000 cost of the modelling exercise for the domestic water supply).

3.4 Electricity

The increased loading on the electricity networks is assessed on the basis of approximately 4kW per dwelling for dwellings when using gas heating. The total increased loading is therefore in the order of 40MW; the local electricity supplier, Scottish & Southern Energy have also confirmed that this figures corresponds to their current supply provision for a similar numbers of dwellings elsewhere.

Although the 132kV tower lines run parallel to the corridor the main grid substations which supply the local infrastructure networks are located West side of Inverness and the East side of Nairn. Scottish & Southern Energy have confirmed that although the overall increase of capacity can be accommodated on the 132kV network, the local HV networks fed from the existing grid substations could not take the increased capacity.

The existing grid substations are poorly placed to allow for increased growth in the A96 corridor. While there is the possibility that small scale development close to Inverness and Nairn could be accommodated in the short term, the long term expansion would require the electricity supplier to create a new grid substation within the corridor. A central location which would allow the supplier flexibility their preferred option.

This would support the Transport option which favours concentration of the new settlements in the central part of the corridor. Island Growth, String of Pearls, Land Use and Landscape are possible but represent more technical challenges in extending the distribution network to the new settlements. Eastern Growth and Polar Growth (where the additional load is concentrated close to Inverness and/or Nairn) are the least favoured by the electricity supplier.

The electricity supplier will carry out a detailed infrastructure analysis, report and costing exercise when the distribution of dwellings within the settlements has been ascertained. The supply company will levy a design fee for this exercise which is likely to be in the order of £10000.

3.5 Telecommunications

The corridor area is served by an extensive BT fibre network with core fibre running along the line of the A96 as well as to the South between Balloch, Croy, Cawdor and Nairn. This

gives BT a great deal of flexibility in their ability to accommodate any proposed expansion.

BT did not therefore anticipate any significant problem in serving the expanded settlement capacity within the corridor area from their existing infrastructure network. The network would require upgrading in a phased manner to accommodate the expansion but none of the growth options was more or less favourable than any other.

3.6 Summary

There are some capacity issues relating to the provision of water and drainage that will require further modelling work to resolve. Based on the assessment above the infrastructure constraints indicate that

- Eastern Growth
- Land Use

can be accommodated alongside phased upgrading of the existing infrastructure, while

- Transport
- Island growth
- String of Pearls
- Landscape

can be accommodated with phased upgrading of the existing infrastructure and monir amendment to the settlement distribution (caused particularly by the drainage difficulties around the Inverness area.

The final option

- Polar growth

where development is concentrated at Inverness and Nairn represents the most challenges in terms of infrastructure provision. The existing systems in these areas are approaching their maximum capacity and physical constraints limit the ability of the utility suppliers to locally expand them to meet the growth pattern. The infrastructure assessment of each option is summarised in Table 1 below

	Gas	Water	Drainage	Electricity	Telecomms
Eastern Growth	✓	✓	✓	✓	✓
Polar Growth	✘	✓	✘	✘	✓
Island Growth	✓*	✓	✓*	✓*	✓
String of Pearls	✓*	✓	✓*	✓*	✓
Land Use	✓*	✓	✓	✓	✓
Transport	✓*	✓	✓*	✓*	✓
Landscape	✓*	✓	✓*	✓*	✓

TABLE 1 : INFRASTRUCTURE ASSESSMENT

KEY
- ✓ can be accommodated with phased upgrade of infrastructure
- ✓* can be accommodated with phased upgrade of infrastructure and minor amendment to settlement distribution
- ✘ not favourable due to infrastructure constraints

4 Infrastructure Option

Having taken into account the physical constraint and the capacity considerations of the existing infrastructure services, a preferred Infrastructure Option has been developed to add to those already under consideration.

Table 1 indicates that most of the existing options can be accommodated although most should incorporate amendments to the settlement distribution in order to avoid areas where the infrastructure cannot be easily upgraded to accommodate them. Only Polar growth represents challenges that are likely to make infrastructure provision either extremely expensive, excessively disruptive or impossible.

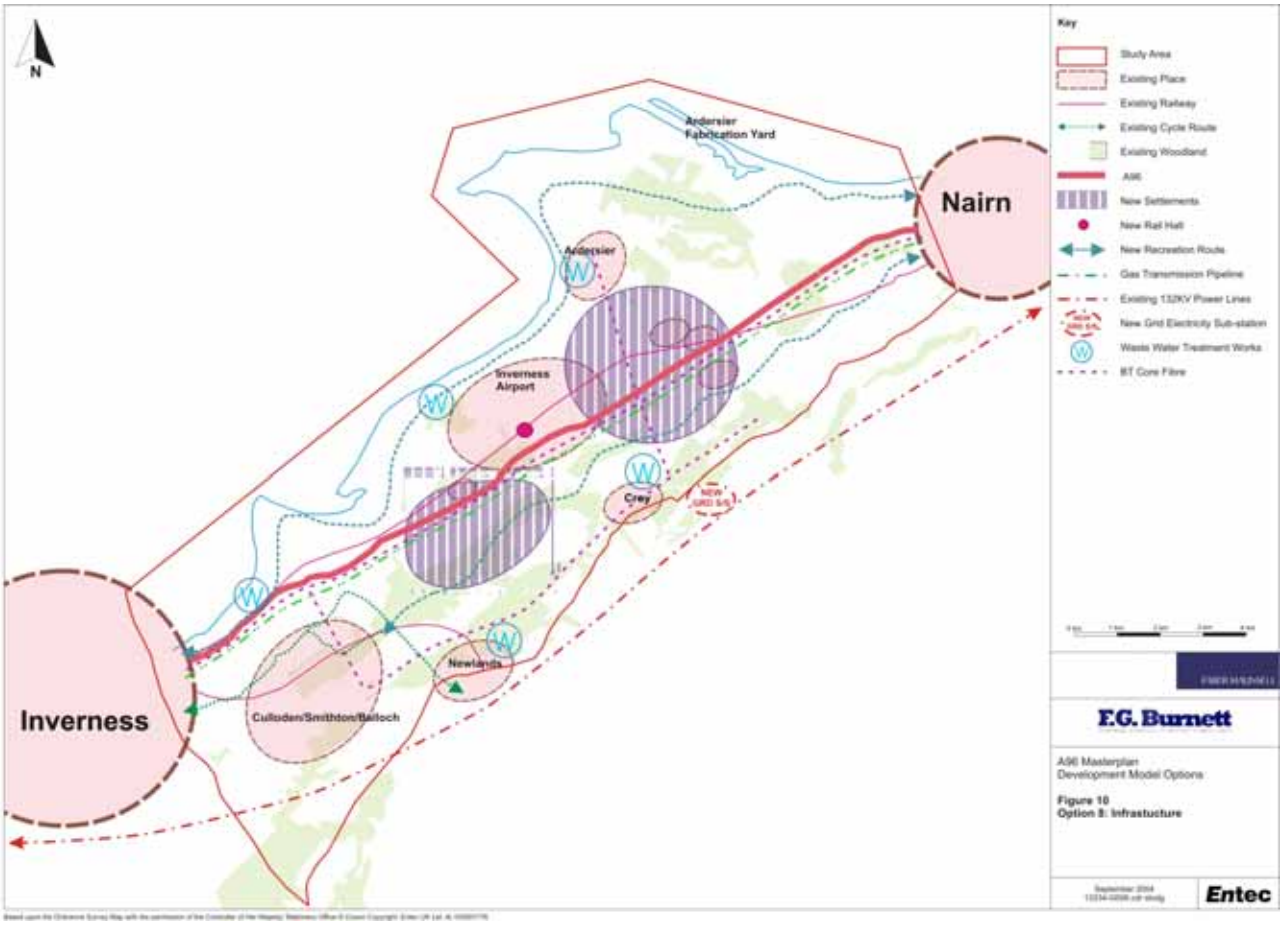
Although most of the existing options can be accommodated with some degree of modification, the Infrastructure option represents the settlement distribution which will be easiest to serve by the utility suppliers in term of physical constraints, thus limiting the cost and disruption of the service provision.

The infrastructure option assumes that the water supply and drainage models which Scottish Water require to confirm the robustness of their service have been carried to a satisfactory conclusion for development within the study area.

The Infrastructure option is shown in Figure 9.

FIGURE 9

INFRASTRUCTURE OPTION



5 Conclusions & Recommendations

5.1 Gas

Transco do not anticipate that the proposed increase in growth with the corridor will present them with any major long term supply problems. The existing transmission line in close to its capacity but would be upgraded by Transco to meet the expansion needs of the corridor.

The existing low/medium pressure networks only exist in the suburban areas of Inverness and Nairn at present. Transco's preference, therefore, would be to develop a new medium pressure network in the central part of the corridor.

The existing transmission line has onerous restrictions on development close to it and this must be taken account of when detailed planning of settlements takes place.

5.2 Water

Scottish Water are concerned about the supply capacity of the whole Inverness/ Nairn area from their existing reservoirs and treatment works. The additional loading of the corridor settlements could result in upgrading of the treatment plant and probably a requirement for a new source of water.

Scottish Water will require a detailed modelling exercise to be carried out and will expect the cost of this (at least in part) to be borne by the corridor development.

The existing below ground water pipework network within the corridor is extensive and phased settlement growth could be matched by reinforcement of the network pipelines. No particular settlement option is preferable to any other in this respect.

5.3 Drainage

Mains drainage presents the most restrictions of all the utility services within the corridor area. Existing treatment plants exist at the Airport, Ardersier and south of the A96 and all will require some degree of upgrading to accommodate the proposed growth. Ther may also be a requirement for a completely new treatment plant.

There is no spare capacity on the drainage network at either Inverness or Nairn and the treatment plant at Inverness cannot be taken into account in the corridor study for contractural reasons. Settlement between Culloden and the Firth should be avoided for this reason.

Scottish Water will require a detailed modelling exercise to be carried out and will expect the cost of this (at least in part) to be borne by the corridor development.

5.4 Electricity

The additional load imposed by the proposed corridor development does not represent an overall capacity problem to the electricity supplier but the existing grid substations in the area are poorly located to permit increased growth. The electricity supplier will be required to provide another grid substation located in the central zone of the corridor in order to accommodate the growth.

The electricity supplier will carry out a detailed analysis of the supply network but will require a fee of approximately £10000 to carry this out.

5.5 Telecommunications

The local telecommunications network is well distributed and should not encounter any difficulty in supporting the phased growth of development in the area.

5.6 Summary

Taking infrastructure constraints and capacity into account Eastern growth and Land Use can be accommodated with phased infrastructure upgrading, Island growth, String of Pearls, Transport and Landscape can be accommodated with phased upgrading of infrastructure and minor amendment of settlement distribution. Polar growth represents the most difficulty in serve infrastructure provision. An infrastructure option has been identified that promotes new settlements in the East, Southwest and Southeast of Inverness Airport, representing the optimum areas for ease of servicing by the utility suppliers.

5.7 Recommendations

The modelling which Scottish Water need to carry out regarding the provision of water and drainage are most critical to the study. The models should be carried out as soon as possible and negotiations with Scottish Water carried forward regarding funding, timescales and so on.

The design fee required by the electricity supplier should also be sought in order to establish the details of the new proposed grid substation and how this might be supplied.

A fixed settlement option with the distribution of dwellings indicated should be agreed at the earliest opportunity since this will allow the gas and telecommunications companies to provide further advice on their proposals to support the growth plans.

APPENDIX 1

UTILITY SUPPLY COMPANY CONTACTS

Utilities Supplier Contacts

Gas

Transco
Inchcolm house
11 West Shore Road
Edinburgh
EH5 1RH
Tel : 0131 559 6039
Contact : Mr Craig Chisholm

Water

Scottish Water
31 Henderson Drive
Longman North
Inverness
IV1 1TR
Tel : 01463 228687
Contact : Mr Kevin Clifton

Drainage

Scottish Water
31 Henderson Drive
Longman North
Inverness
IV1 1TR
Tel : 01463 228687
Contact : Mr Kevin Clifton

Electricity

Scottish & Southern Energy
Docherty Road
Dingwall
IV15 9UG
Tel : 01349 869262
Contact : Mr Rob Broughton

Telecommunications

BT
Fraser House
2-8 Friars Lane
Inverness
IV1 1BA
Tel : 01463 6655338
Contact : Mr John Budge