Sleaford Renewable Energy Plant

Site Selection Process

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1 INTRODUCTION AND OVERVIEW

1.1.1 This report describes the process by which the site for the Sleaford Renewable Energy Plant (REP) development was identified and selected. [The site selection process was carried out over a 6 month period between June 2006 and December 2006]. The findings of the exercise were reviewed and found to be robust immediately prior to the submission of the planning application.

1.1.2 The report is divided into the following sections:

Section 2	explains why North Kesteven was selected as the area of search for the straw-fired renewable energy plant;
Section 3	sets out the principles adopted by Eco2 in the selection of a suitable site for the REP with North Kesteven;
Section 4	describes the criteria used by Eco2 to test the suitability of sites;
Section 5	evaluates sites with appropriate planning designation (Primary Sites) against the site selection criteria;
Section 6	sets out the reasons why a Secondary Site was selected on the basis that no suitable Primary Sites were identified following the exercise described in Section 5; and
Section 7	draws some brief conclusions.

2 SELECTION OF NORTH KESTEVEN

2.1 First Principles

2.1.1 The location of a biomass-fired power station is primarily driven by the availability of fuel. Biomass is a distributed resource and it is relatively expensive to transport, as will be discussed below. As a result, a biomass-fired power station should always be located close to, and preferably lie centrally within, an area that produces large amounts of the resource over a concentrated growing region.

2.1.2 Biomass is a fuel derived from natural resources that are found in the forest or field. Biomass is either grown specifically or it is a by-product of agricultural activities; in either case production is spread over large land areas. This means that it is a much more distributed fuel source when compared to coal, oil or gas which are available in more concentrated forms, accessed via mines or wells. To compound the problem, the area of land devoted to biomass production is usually a small fraction of the total land available. By virtue of its wide distribution at source, the logistics of fuel supply much harder in a biomass-fired renewable energy plant than for a fossil fuelled plant.

2.1.3 The problem of a dispersed resource is compounded by the low energy density of the fuel – in other words, the fuel is bulky and has a relatively low energy value. For example, straw has a lower heating value in the region of 14 MJ/kg and a density when baled of 125 kg/m3; these characteristics result in an energy density of 1,720 MJ/m3. By comparison, coal typically (bearing mind that there are a wide range of different coals) has a lower heating value of 34 MJ/kg and a bulk density of 800 kg/m3, resulting in an energy density of 27,200 MJ/m3.

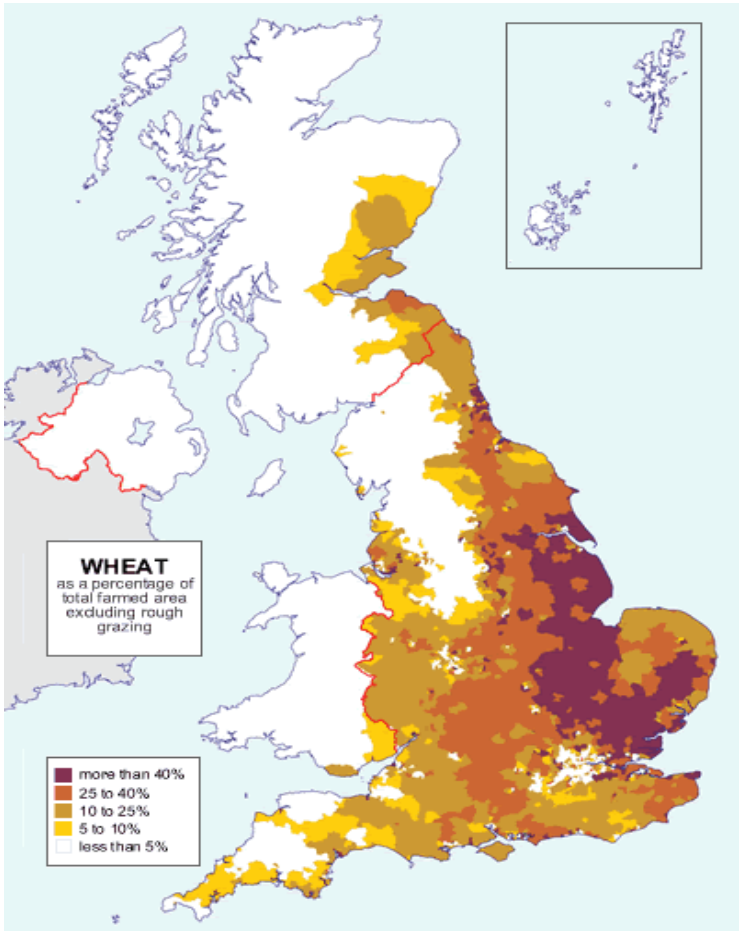
Clearly this disparity makes it more expensive (both in terms of purchase cost and the cost of transportation) to transport straw from its source to the power station.

2.1.4 It must be emphasised that the problems of distributed and bulk density should not be considered as factors against straw-fired power stations per se; the benefits of generating electricity from such a renewable energy source far outweigh logistical complications - as underlined by UK policy. Nevertheless these problems demonstrate that, for sound economic and environmental reasons, it is sensible to locate a straw fired power station within a large area of concentrated wheat production (since straw is a by-product of growing wheat).

2.2 Wheat Production in the UK

2.2.1 Figure 1 shows the areas of the UK that have the highest concentration of wheat farming, indicating the potential for energy from straw in the east midlands of England. The UK Biomass Strategy concurs with this view (as demonstrated in the extract presented in Annex A). The strategy considered the existing uses for straw, acknowledging current uses for livestock and the recycling of nutrients offered by ploughing straw back into the land, and concluded that up to 3 million tonnes of straw could be used for energy from the surplus available in the eastern counties of England.

Figure 1 UK Wheat Farming Concentration



2.3 Maximising Renewable Energy from Straw

2.3.1 If straw's potential as an energy source is to be realised to its maximum, it is essential that plants which use this resource are appropriately positioned within a strategic network that reaps the most benefit from those areas with a straw surplus. The alternative is ad-hoc development that would be fine for the first few plants but could easily bring problems within and at the boundary of concentrated areas of straw production, undermining the principles and objectives outlined in UK policy towards renewable power and biomass.

2.3.2 For example (and with the proviso that the following figures are illustrative only), it could be that, after balancing economies of scale against increasing costs of transport fuel, the optimum size of a plant is 50 MWe and the typical catchment area for supplying such a plant has a radius of 50km. If two such plants are built 150 km apart then each will be able to operate economically and consequently contribute towards UK environmental policy objectives. However, the straw produced in the central band between the two sides would become difficult to use economically since any developer would have to either sacrifice economies of scale to avoid the adjacent straw catchments or accept higher straw costs by virtue of the competition for straw supplies within overlapping 50km catchment areas. Such a situation could easily render a third plant uneconomic and thus reduce the total energy production from straw produced in the region.

2.3.3 Eco2 has conducted its own holistic analysis which has considered at a regional level the best way to distribute a network of straw-fired power stations so that all of the concentrated areas of wheat production in the eastern counties of England are served, while harnessing economies of scale and avoiding competition for fuel supplies. Since this exercise informs Eco2's long term strategy in this sector, the analysis and its conclusions are commercially-sensitive and confidential.

2.3.4 Eco2's analysis shows that the North Kesteven administrative area would be a good host for one straw-fired plant while ensuring in the longer term that the potential for energy production from surplus straw in the wider region is maximised. Broadly speaking, it is far enough away from the existing straw-fired power station at Ely in Cambridgeshire to avoid significant competition for fuel and yet leaves enough space to the north and south for future developments if suitable sites can be found. As a consequence, Eco2 has focussed its site search within the area served by North Kesteven District Council.

3 METHODOLOGY

3.1 Principles

Planning Policy - General

3.1.1 Land use planning policy within the UK requires that planning applications are determined in accordance with the statutory development plan, unless material considerations dictate otherwise. This suggests that it would be preferable (subject to appropriate assessment and certain key technical criteria) for the Sleaford REP to be located on allocated or consented employment / industrial land.

3.1.2 Planning policy also states that preference should be given to the use of previously developed land / brownfield sites.

3.1.3 These two strands of policy are brought together through the adoption of a sequential approach to site selection. This broadly requires that (in accordance with the two preceding principles) a preference be given to developing appropriately allocated and brownfield sites, prior to development in other locations.

Planning Policy - Renewables

3.1.4 A further facet to the site selection process for a renewable energy development is that in the DTI's Energy White Paper (May 2007), in recognising the urgent need to bring such development forward and the difficulties in securing planning permission for this type of development, it is stated (paragraph 5.3.67):

> *Applicants will no longer have to demonstrate either the overall need for renewable energy or for their proposal to be sited in a particular location.*
>
> *Energy White Paper, DTI (May 2007)*

3.1.5 This reinforces earlier advice in Planning Policy Statement 22: Renewable Energy, which states:

> *…local planning authorities should not use a sequential approach to the consideration of renewable energy projects (for example, by giving priority to the re-use of previously developed land for renewable energy development).*
>
> *Planning Policy Statement 22 (2004)*

The Applicant's Approach

3.1.6 Notwithstanding its special status, Eco2 believes that, wherever possible, it is preferable for renewable energy development to be located in accordance with the general land use planning principles outlined previously.

3.1.7 As such, Eco 2 has carried out a structured site selection exercise. The site search is a transparent process that systematically considers the most appropriate allocated sites and only moves on to sites that may be less appropriate or even depart from the Local Plan if this is necessary. The basic steps of the site search are summarise here and described further in the following sections.

3.2 The Process

Definition of Criteria

3.2.1 The first stage in the Applicant's process was to identify a list of criteria that would have to be met by the site, irrespective of its designation in planning terms. These criteria are listed in the following section.

Identification of Primary Sites

3.2.2 Given Eco2's stated aim to comply with recognised planning policies that state a preference putting developments in appropriately designated land, Eco2 began its site search by identifying its Primary Sites that would be evaluated first.

3.2.3 The Primary Sites were identified by examining the proposal map (including all insets) contained within within the Revised Deposit North Kesteven Local Plan. Any sites that were allocated for employment were listed and identified by grid reference; for completeness, inset maps with no employment allocation were also

listed but with the note that they contained housing only. In addition, a search for brownfield sites was undertaken which revealed the presence of several quarries.

3.2.4 This exercise produced a list of 35 sites which are listed in Annex B.

Evaluation of Primary Sites

3.2.5 All of the Primary Sites were then evaluated against the criteria listed in Section 4.

3.2.6 Criterion 1 is considered to be an absolute requirement of the site: it must be big enough to accommodate the site. With this in mind, all of the Primary Sites were evaluated against this criterion first so that more detailed work could be concentrated on sites that passed the Criterion 1. Annex C lists the Primary Sites that passed this first test.

3.2.7 The Primary Sites that passed Criterion 1 were then considered in detail against all the criteria. A summary of each site against the criteria is presented in Section 5.

Identification and Evaluation of Secondary Sites

3.2.8 In the event that no Primary Sites were available (which proved to be the case), potential sites were identified and evaluated using the same criteria used for Primary Sites.

4 CRITERIA FOR THE EVALUATION OF SITES

4.1 Criterion 1 – Plot Size & Geometry

Criterion

4.1.1 The site must be able to accommodate a regular rectangle measuring either 240m by 180m (suitable for a layout with adjacent straw barns) or 300m by 170m (suitable for a layout with straw barns on either side of the central boiler house).

Rationale

4.1.2 These areas are the minimum areas required to house the plant. It should be noted that these dimensions to not allow for perimeter landscaping or screening and therefore if these are required for the sake of local amenity (considered under Criterion 4) then additional space would be required.

4.2 Criterion 2 - Access

Criterion

4.2.1 The site should be well served by the highway network and have a good standard of connection to a major highway.

Rationale

4.2.2 The rationale for this is to ensure the cost-effective delivery of fuel; to minimise local HGV movements on minor highways (i.e. in the immediate environs of the site where HGV movements will be concentrated); and to minimise the environmental effects of transportation.

4.3 Criterion 3 - Grid Connection

Criterion

4.3.1 The connection point of the REP to the electricity supply network should be within 5 kms.

Rationale

4.3.2 This ensures the efficient and economic dispatch of electricity. The 5 km limit is a high limit that would in itself present an expensive connection (especially if underground cable is demanded) and incur system losses. It would be preferable for the site to be much closer to a grid connection point than 5km.

4.4 Criterion 4 – Impact on Local Amenity

Criterion

4.4.1 The development should not cause undue harm to local amenity. Particular issues to be considered are:

(a) Noise, which is best mitigated by distance and as such it is preferable for the plant to be at least 500m away from the nearest substantial housing; and

(b) Visual Impact, which is best mitigated by existing screening.

Rationale

4.4.2 The REP will be a 24h operation and include some substantial buildings; its effect on neighbouring communities must be considered.

4.4.3 Where natural mitigation is not possible, this criterion can still be passed if it is possible to engineer mitigation by, for example, planting or landscaping.

4.5 Criterion 5 - Local Designations

Criterion

4.5.1 The site should be capable of development without:

(a) interfering with neighbouring designations such as land allocated for housing; or

(b) harming any nearby sites with an environmental designation such Sites of Special Scientific Interest (SSSI's), nature reserves, ancient monuments etc.

Rationale

4.5.2 The presence of the REP must not render the neighbouring land less desirable for its designated use nor harm other special designations.

4.6 Criterion 6 – Commercial Availability

Criterion

4.6.1 The site must be:

(a) commercially available for the development of a Renewable Energy Plant; and

(b) the combined costs of purchase (including option arrangements) and site preparation should not be prohibitive.

Rationale

4.6.2 There must be no barriers to commercial use of the land, for example existing use, restrictive covenants or simply the refusal of the landowner to negotiate.

4.6.3 Clearly, there is an argument that states that all land is commercially available; it is simply a matter of how much money it takes to persuade the landowner to part with the land. While this is largely true, the Applicant should not be expected to pay an unreasonable premium over and above other industrial land simply because the landowner possesses land that has been allocated for development. Also, as this project will be funded through a combination of equity and bank debt the landowner must be willing to enter into commercial terms that would be accepted by a prospective funding bank. There is therefore a reasonableness element to this criterion, in that the landowner must be prepared to negotiate at market rates and on a reasonable commercial basis in order to pass.

5 EVALUATION OF PRIMARY SITES

5.1 Bracebridge Heath b

Figure 5.1 Evaluation Results for Bracebridge Heath b

Criterion	Result	Comment
1 – Size/Geometry	Pass	
2 – Access	Pass	Good access to A15
3 – Grid Connection	Pass	HV line 1.5km to north east
4 – Local Amenity	Fail	Substantial housing within 200m of the site boundary
5 – Local Designations	Fail	Immediately adjacent land is allocated for visual amenity
6 – Commercial Availability	N/A	Terms not discussed – site is unsuitable

5.1.2 The presence of a substantial number of houses within 200m of the site boundary to the north and a similar distance to the west (although the latter are beyond some existing industrial buildings). It would be impossible to mitigate noise impact with housing so close.

5.1.3 There is also a small area allocated for visual amenity directly adjacent to the northern boundary of the plot.

5.1.4 Given the proximity of housing, no attempt was made to assess the commercial availability of the land (Criterion 6) and the site was rejected.

5.2 North Hykeham, E1-NHK5

Table 5.1 Evaluation Results for North Hykeham, E1-NHK5

Criterion	Result	Comment
1 – Size/Geometry	Pass	
2 – Access	Pass	Good access to A46
3 – Grid Connection	Pass	HV line 2km to south west
4 – Local Amenity	Pass	
5 – Local Designations	Pass	
6 – Commercial Availability	Fail	Owner would not negotiate

5.2.2 This was a good site on paper and the owners were approached. However, the area is a working sand and gravel quarry; the owners were not prepared to discuss alternative uses for land currently not being worked.

5.2.3 This site was rejected for failure to comply with Criteria 6.

5.3 Skellington Decoy Farm

Table 5.3 Evaluation Results for Skellington Decoy Farm

Criterion	Result	Comment
1 – Size/Geometry	Pass	
2 – Access	Borderline	Access from the A46 will require major works
3 – Grid Connection	Borderline	HV line 5km to west
4 – Local Amenity	Borderline	Visual impact on housing less than 1km to south
5 – Local Designations	Fail	Adjacent to ancient monument
6 – Commercial Availability	N/A	Terms not discussed, land is unsuitable

5.3.1 Skellington Decoy Farm is an unusual site: despite its considerable area, it encompasses a Scheduled Ancient Monument - SAM (The Old Decoy). The presence of the Old Decoy, the footpaths leading to it from the west, and the proximity of housing on the outskirts of Birchwood to the south; all mean that the plant would have to be positioned to north/east of the site.

5.3.2 Locating the plant to the east of the available area would in itself be problematic by virtue of poor access into the area from the A46, which would need to be resolved by either upgrading and extending the access road to Decoy Farm (requiring over 1km of new road) or a new junction with the A46.

5.3.3 The nearest HV line is around 5km away, which is as far away as is reasonable to connect. It is possible that a more local connection may be available given the proximity of the large settlement to the south but this could not be verified without a detailed system study.

5.3.4 There is no screening to the south west between the substantial housing on the outskirts of Birchwood (approximately 600m away), and the plant would therefore impact on the visual amenity of multiple dwellings.

5.3.5 Notwithstanding the possibility of positioning the plant to the east in an effort to minimise the impact upon the setting of the SAM and avoid intrusion on the footpath to the Old Decoy SAM, the plant would still directly abut the monument. This would severely compromise its setting and the amenity for those visiting the Old Decoy.

5.3.6 This site was rejected for failure to fully comply with multiple criteria and in particular the impact upon the setting of a Scheduled Ancient Monument.

5.4 Sleaford, E1-SLE

Table 5.4 Evaluation Results for Sleaford, E1-SLE1

Criterion	Result	Comment
1 – Size/Geometry	Pass	
2 – Access	Pass	Excellent links to A17
3 – Grid Connection	Pass	HV line around 1km to the north east
4 – Local Amenity	Pass	
5 – Local Designations	Pass	
6 – Commercial Availability	Fail	Owner would not negotiate

5.4.1 This was a very good site for the project and negotiations commenced with the landowner. However, the landowner subsequently withdrew from any dialogue with the Applicant for reasons unknown.

5.4.2 This site was rejected for failure to comply with Criteria 6.

5.5 Swinderby Airfield

Table 5.5 Evaluation Results for Swinderby Airfield

Criterion	Result	Comment
1 – Size/Geometry	Pass	Would require significant demolition of existing buildings
2 – Access	Pass	Excellent links to A46
3 – Grid Connection	Borderline	Just within the 5km limit, to the north east
4 – Local Amenity	Borderline	Some housing within 500m to the east and north east
5 – Local Designations	Pass	
6 – Commercial Availability	Fail	Owner would not negotiate

5.5.1 Although this site showed promise, the owners were not prepared to enter into any discussions.

5.5.2 This site was rejected for failure to comply with Criteria 6.

5.6 Norton Disney

Table 5.6 Evaluation Results for Norton Disney

Criterion	Result	Comment
1 – Size/Geometry	Pass	
2 – Access	Pass	
3 – Grid Connection	Borderline	Just within the 5km limit
4 – Local Amenity	Pass	
5 – Local Designations	Pass	
6 – Commercial Availability	Fail	Owner would not negotiate – Working quarry

5.6.1 The quarry is still being worked and was therefore unavailable.

5.6.2 This site was rejected for failure to comply with Criteria 6.

5.7 Whisby Quarry

Table 5.7 Evaluation Results for Whisby Quarry

Criterion	Result	Comment
1 – Size/Geometry	Pass	
2 – Access	Pass	
3 – Grid Connection	Pass	HV line less than 1km away
4 – Local Amenity	Pass	
5 – Local Designations	Pass	
6 – Commercial Availability	Fail	Owner would not negotiate – Working quarry

5.7.1 The quarry is still being worked and was therefore unavailable.

5.7.2 This site was rejected for failure to comply with Criteria 6.

5.8 Metheringham Quarry

Table 5.8 Evaluation Results for Metheringham Quarry

Criterion	Result	Comment
1 – Size/Geometry	Pass	
2 – Access	Pass	
3 – Grid Connection	Pass	HV line 1.5km to the west
4 – Local Amenity	Pass	
5 – Local Designations	Pass	
6 – Commercial Availability	Fail	Owner would not negotiate – Working quarry

5.8.1 The quarry is still being worked and was therefore unavailable.

5.8.2 This site was rejected for failure to comply with Criteria 6.

5.9 Brauncewell Quarry

Table 5.9 Evaluation Results for Brauncewell Quarry

Criterion	Result	Comment
1 – Size/Geometry	Pass	
2 – Access	Pass	
3 – Grid Connection	Pass	HV line 1.5km to north east
4 – Local Amenity	Pass	
5 – Local Designations	Pass	
6 – Commercial Availability	Fail	Owner would not negotiate – Working quarry

5.9.1 The quarry is still being worked and was therefore unavailable.

5.9.2 This site was rejected for failure to comply with Criteria 6.

5.10 Longwood Quarry

Table 5.10 Evaluation Results for Longwood Quarry

Criterion	Result	Comment
1 – Size/Geometry	Pass	
2 – Access	Pass	
3 – Grid Connection	Pass	Directly over site
4 – Local Amenity	Pass	
5 – Local Designations	Pass	
6 – Commercial Availability	Fail	Owner would not negotiate – Working quarry

5.10.1 The quarry is still being worked and was therefore unavailable.

5.10.2 This site was rejected for failure to comply with Criteria 6.

5.11 Conclusions

5.11.1 Of the 35 Primary Sites were suitable for development, 25 were rejected when evaluated against Criterion 1 (Size/Geometry).

5.11.2 A further 5 sites were rejected because they were working quarries and the owners had no intention of selling the sites.

5.11.3 2 of the remaining 5 sites had a number of problems that, in combination, rendered the sites unsuitable.

5.11.4 3 of the Primary Sites were very attractive and passed all of the non-commercial criteria. Unfortunately, these could not be secured because the landowners would not consider offers for the land.

5.11.5 None of the Primary Sites were therefore suitable for the REP.

6 SELECTION OF A SECONDARY SITE

6.1.1 Given the failure to secure a Primary Site for the REP, it was necessary to extend the site search exercise and consider alternative locations (secondary sites). A site was located off Boston Road, on the eastern periphery of the Sleaford settlement, that met all of the criteria required.

6.1.2 The site was judged to meet the criteria for the following reasons.

Criterion 1 – Size and Geometry

6.1.3 The land is larger than required to accommodate the proposed renewable energy facility and there will be no problem in selecting a suitable plot.

Criterion 2 - Access

6.1.4 The site is readily accessible from the A17 offering good transport links with Lincolnshire.

6.1.5 The site abuts a public highway and is located close to Sleaford (within walking and cycling distance of major residential areas). The site is linked to the town, and areas beyond, by a bus service (running along Boston Road past the site) and a footway. This would be an advantage beyond fuelling the REP, it encourages the likelihood that the plant will be staffed locally.

Criterion 3 - Grid Connection

6.1.6 It is located in close proximity to a grid connection with a 132KV line running immediately north of the site;

Criterion 4 – Impact on Local Amenity

6.1.7 The site is located away from residential properties (circa 550 metres from the nearest) and benefits from a degree of existing screening associated with tall, hedgerows and a mature copse of trees. Given these factors the site is capable of development without material adverse impact upon local amenity (confirmed by the findings of the Environmental Statement which accompanies the planning application) ;

6.1.8 The site is capable, by virtue of its size, location and characteristics, of supporting a range of further environmental mitigation measures such as landscaping and planting.

Criterion 5 - Local Designations

6.1.9 The site is not the subject of any environmental designations and is capable of development without material adverse impact upon any designations (confirmed by the findings of the Environmental Statement which accompanies the planning application);

Criterion 6 – Commercial Availability

6.1.10 The site is available on reasonable commercial terms.

7 CONCLUSIONS

7.1.1 Eco2 have established that the administrative area of North Kesteven is ideally located for the development of a biomass based renewable energy project.

7.1.2 The company has carried out a comprehensive site search exercise in order to ensure any such development is located in accordance with accepted planning criteria. This exercise has been completed notwithstanding current Government policy stating that applicants no longer have to demonstrate the need for their renewable energy proposal to be sited in a particular location.

7.1.3 The site search exercise has adopted a sequential approach whereby preference be given to developing appropriately allocated and brownfield sites, prior to development in other locations. The approach Eco2 have followed recognises that where development is not proposed on allocated or brownfield land, the company may need to justify their choice of site.

7.1.4 A series of site search criteria have been developed which reflect the sequential approach. These were applied to a search exercise which encompassed both desk study and fieldwork. This work failed to identify any suitable, available sites on allocated employment land or brownfield land.

7.1.5 Given the failure to identify any suitable primary sites for the renewable energy plant, it was necessary to extend the site search exercise and consider a number of alternatives locations (secondary sites) that best meet the site selection criteria.

7.1.6 Following further evaluation it was concluded, for reasons set out within this report, that a plot of land off Boston Road, on the eastern periphery of the Sleaford settlement, (the site of the current application) best met the relevant criterion.

ANNEX A – EXTRACT FROM UK BIOMASS STRATEGY

ANNEX B – LIST OF PRIMARY SITES

ANNEX C – LIST OF PRIMARY SITES THAT PASSED CRITERION 1