Renewable & Low Carbon Energy Topic Paper
Broads Authority Local Plan
July 2016

1. Introduction

The NPPG says that:

'When drawing up a Local Plan local planning authorities should first consider what the local potential is for renewable and low carbon energy generation.'

Planning has an important role in the delivery of new renewable and low carbon energy infrastructure in locations where the local environmental impact is acceptable.

Local planning authorities are responsible for renewable and low carbon energy development of 50 megawatts or less installed capacity (under the Town and Country Planning Act 1990). Renewable and low carbon developments over 50 megawatts capacity are currently considered by the Secretary of State for Energy under the Planning Act 2008, and the local planning authority is a statutory consultee.

Microgeneration is often permitted development and may not require an application for planning permission.

In considering that potential, the matters local planning authorities should think about include:

- *The range of technologies that could be accommodated and the policies needed to encourage their development in the right places;*
- *The costs of many renewable energy technologies are falling, potentially increasing their attractiveness and the number of proposals;*
- *Different technologies have different impacts and the impacts can vary by place;*
- *The UK has legal commitments to cut greenhouse gases and meet increased energy demand from renewable sources.*

Whilst local authorities should design their policies to maximise renewable and low carbon energy development, there is no quota which the Local Plan has to deliver.

This Topic Paper brings together literature on renewable energy in general as well as relating specifically to the Broads Authority Executive Area.

2. Renewable Energy Demands of the Broads

The Broads Authority commissioned a study to review renewable energy solutions in the Broads (Hickey, 2013). The study concluded that:

> *'The most efficient and immediate solution for renewable energy generation in the Broads is a combination of GSHP (Ground Source Heat Pumps), ASHP (Air Source Heat Pumps), SG (Solar Greenhouses) and AD-CHP (Anaerobic Digestion Combined Heat and Power). SG or integrated amorphous technology (thin film a-Si) or Solar Slates offer the best form of domestic electricity generation taking the aesthetic constraints of the Broads into consideration.'*

3. Solar panels and solar farms

The Broads Landscape Sensitivity Study assessed the impact of solar pholtaics on roofs (panels) as well as in fields (farms). The maps have been copied into this report:

- Figure 4.11: Solar PV – overall landscape sensitivity
- Figure 4.12: Sensitivity to roof mounted solar PV requiring planning permission
- Figure 4.13: Sensitivity to roof mounted solar PV of up to 1 hectare area
- Figure 4.14: Sensitivity to small scale field mounted solar PV of up to 1 hectare area
- Figure 4.15: Sensitivity to medium scale field mounted solar PV of 1-5 hectares area

i) Solar PV

It can be seen from the assessment on the maps that the Broads landscape's sensitivity to solar PV tends to be fairly high, both in terms of landscape character and representation of special qualities. Reflecting these attributes, the assessment has found that there are no landscapes in the Broads which score low or moderate-low to the development of solar PV schemes.

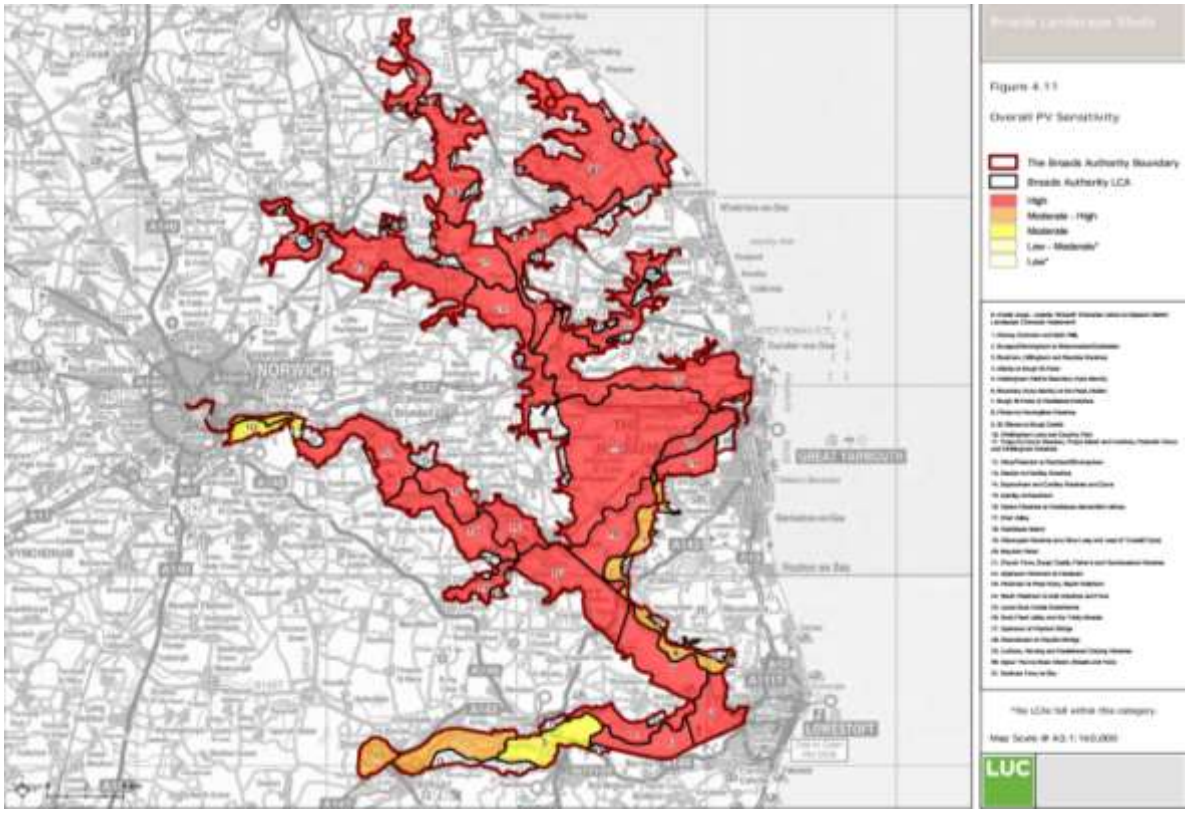


Figure 4.11: Solar PV – overall landscape sensitivity

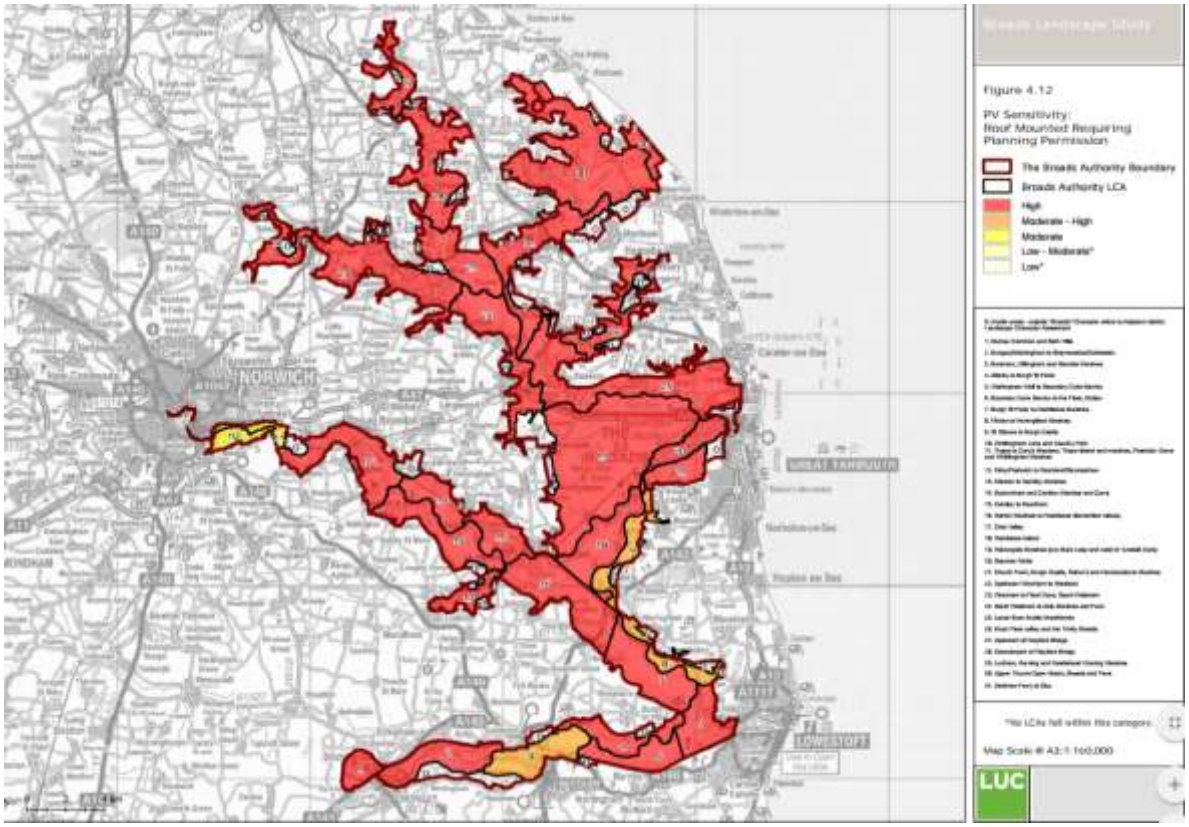


Figure 4.12: Sensitivity to roof mounted solar PV requiring planning permission

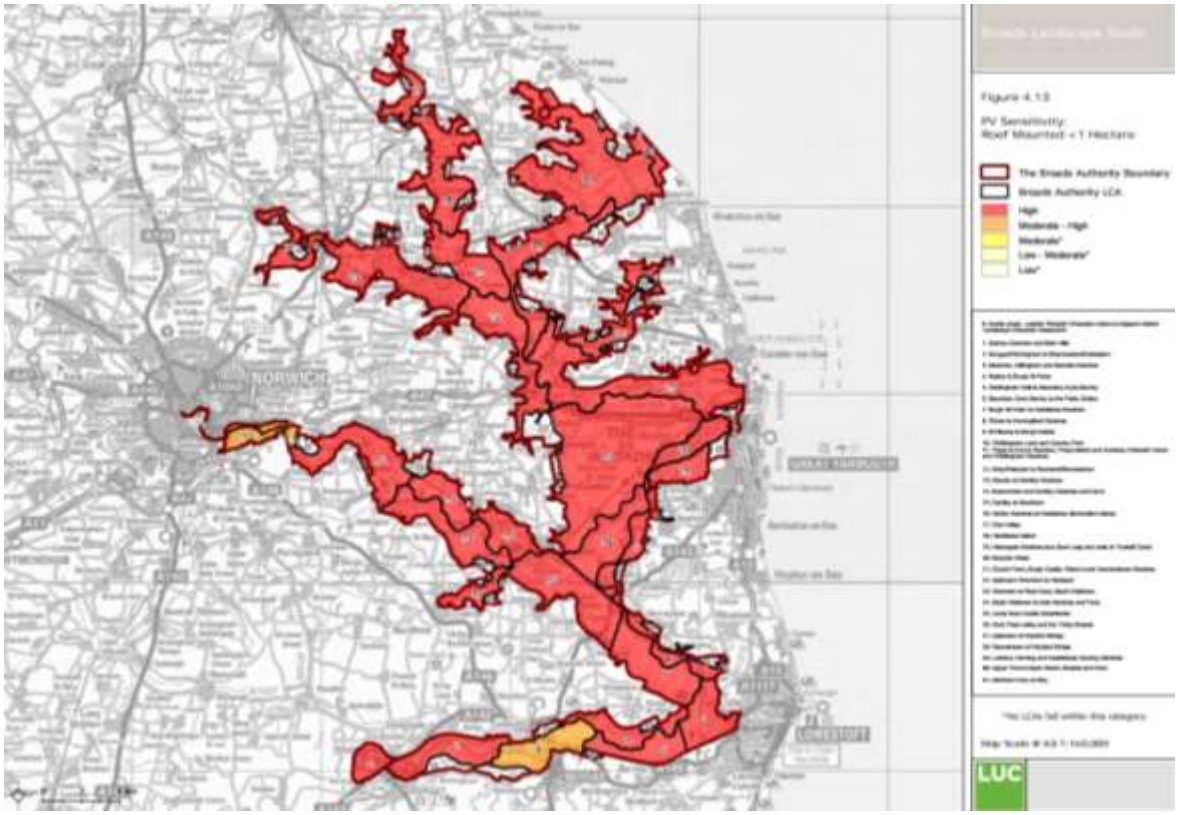


Figure 4.13: Sensitivity to roof mounted solar PV of up to 1 hectare area

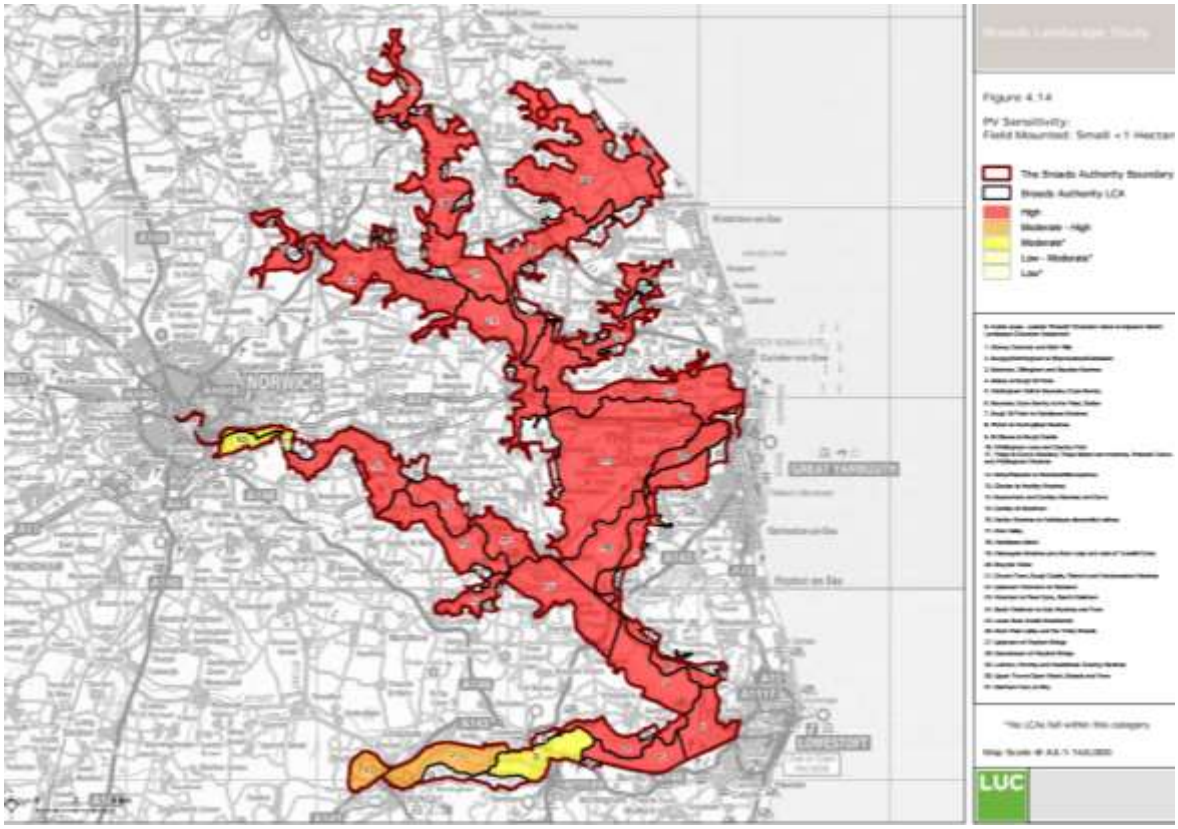


Figure 4.14: Sensitivity to small scale field mounted solar PV of up to 1 hectare area

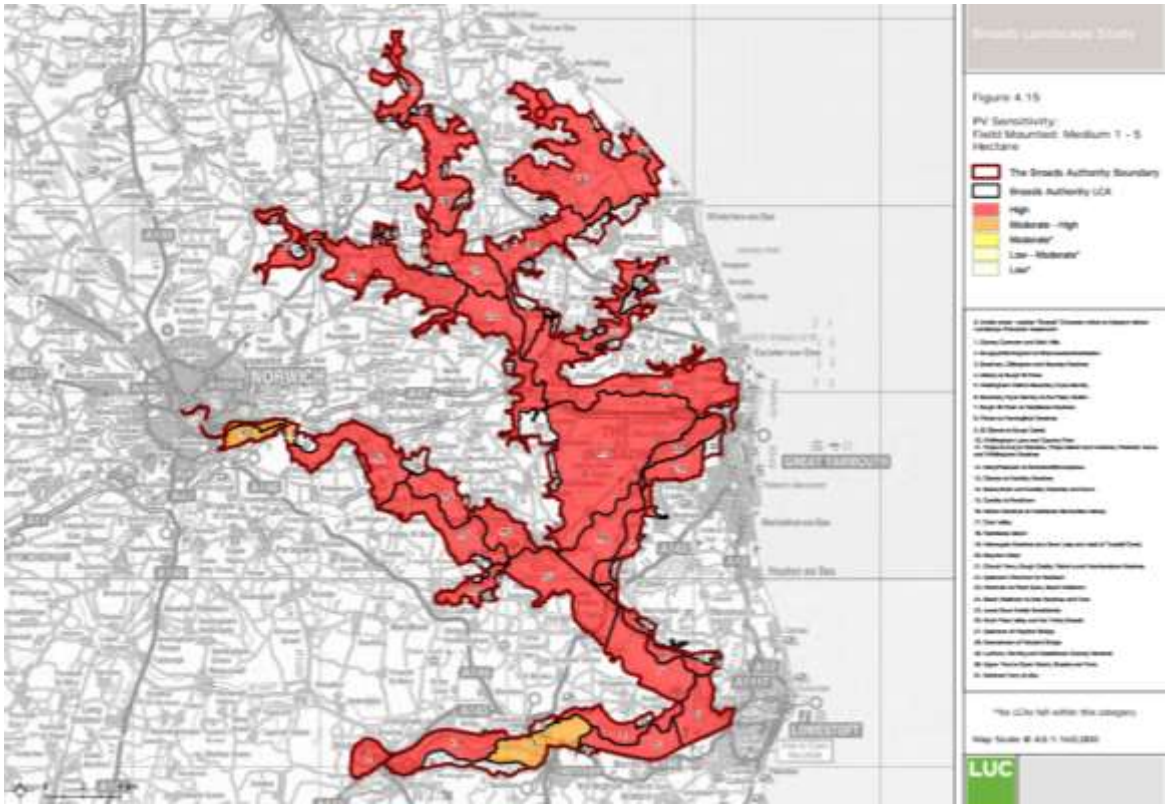


Figure 4.15: Sensitivity to medium scale field mounted solar PV of 1-5 hectares area

ii) Solar panels in the Broads

Solar tiles or solar slates are mounted on the roof, in place of the roof tiles. Being integrated into the roof of buildings, as well as potentially of a similar colour to the roof tiles, they can have less of an impact on the street scene and landscape than larger panels which are mounted on the roof tiles. In comparison to solar panels they may be considered appropriate on Listed Buildings or in Conservation Areas. Solar tiles or solar slates are however less economically viable than solar panels and this could inhibit their use.

4. Battery storage capacity[1]

The application areas discussed here were determined by examining the applications of battery storage most directly related to wind and solar PV power integration. Batteries can be deployed to aid the integration of renewable energy, especially solar and wind power. These are variable renewable energy sources as the energy produced fluctuates depending on the availability of the resource.

Any deployment of battery storage is highly likely to be closely associated with either solar energy systems or wind energy, and therefore the suitability would be restricted to where these technologies would be considered appropriate, please see sections 3 and 7.

5. Heat pumps

There are three types of heat pumps currently available, Air Source Heat Pumps (ASHP), Ground Source Heat Pumps (GSHP) and Water Source Heat Pumps (WSHP).

Air Source Heat Pumps

An ASHP can offer a full central heating solution and domestic hot water up to 60 degrees. They are significantly easier to install than a GSHP, given no excavation or heavy machinery is required. The installation of a microgeneration ASHP benefits from permitted development rights within the curtilage of a dwellinghouse or a block of flats (subject to conditions).

Ground Source Heat Pumps

They utilise the same principle methods as ASHP but require a degree of ground works to lay the necessary cables. The installation, alteration or replacement of a microgeneration ground source heat pump within the curtilage of a dwellinghouse or a block of flats benefits from permitted development rights.

Water source heat pumps

Water source heat pumps at a microgeneration scale would benefit from permitted development rights if they are located within the curtilage of a dwellinghouse. As the required water source is unlikely to be considered as part of the curtilage of a dwelling there would be limited opportunities for permitted development rights to be implemented. It is highly likely that planning permission would be required for WSHP.

[1] Go here for more information: http://www.irena.org/documentdownloads/publications/irena_battery_storage_report_2015.pdf

Water source heat pumps have not been widely adopted and are relatively new form of renewable energy in comparison to solar and wind. Further research would be required into the potential impacts that the required network of piping would have on navigation, dredging and biodiversity.

The Authority is aware that Norwich City Council has recently commissioned a study relating to water source heat pumps and will seek to understand its findings and any potential implications for the Broads.

6. Anaerobic digestion combined heat and power

Constructing an AD-CHP plant would require a 2-3 acre site, which needs to balance minimizing transmission losses to domestic units, and ease of access to raw organic waste. These would be best sited on existing agricultural units.

Biomass renewable energy generation in the Broads can be used in conjunction with the findings of the GHG (Greenhouse Gas) reduction strategy as presented by the University of East Anglia (University of East Anglia, Broads Authority. Towards a GHG Reduction Strategy for the Broads – Identifying and Prioritising Actions - May 2010). This report has highlighted that the primary asset for both electricity generation and GHG reduction is farm waste (N2O). Renewable energy generation reduces the net GHG of the region by displacing emissions that would be produced buy fossil fuel sources. By using the waste assets of the land, GHG is offset and electricity is generated. Biomass assets of the land include –

- Fen, Wetland Vegetation
- Reed Beds
- Scrub
- Mixed Organic Waste
- Slurry
- Woodland

7. Reed as biomass

A 2010 study[2] investigated options for use of harvested fen. The aim of this report was to identify how fen harvesting could be made sustainable by finding a productive and hopefully commercial end-use for the arisings. Two of the most viable options are:

- The products of pyrolysis include biodiesel and biochar. The latter is an almost pure form of carbon with a wide range of uses. All fen products can be pyrolysed, although the technology is currently at an early stage of development.
- Combustion fuels. These include woodchips, bales of scrub, and reed pellets. The first two are well established processes. Consideration of reed pellets formed the majority of the report.

8. Hydro

Although the Broads is largely characterized by low-lying wetland and flood plains, there is a potential to extract energy from hydroelectricity. Some of the hydrodynamic assets of the Broads include –

[2] New Opportunities For The Sustainable Management Of Fens: Reed Pelleting, Composting And The roductive Use Of Fen Harvests.

• Tidal - (River Yare)
• Weirs

The River Yare provides a tidal current, which could accommodate a tidal barrier / energy harvester. As regards potential weirs for small-scale hydro electricity, three potential sites have been identified:
• Bungay - 52°27'23.25"N 1°26'36.95"E
• Pirnhow - 52º27’29.82”N 1º27’26.39”E
• Mill Pool Lane - 52°28'16.95"N 1°28'46.97"E

9. Wind Energy in the Broads

The NPPG says:

‘The Written Ministerial Statement made on 18 June 2015 is quite clear that when considering applications for wind energy development, local planning authorities should (subject to the transitional arrangement) only grant planning permission if:

- *the development site is in an area identified as suitable for wind energy development in a Local or Neighbourhood Plan; and*
- *following consultation, it can be demonstrated that the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing.*

Whether the proposal has the backing of the affected local community is a planning judgement for the local planning authority.’

9.1. Broads Landscape Sensitivity Study (2012)

The Broads Authority has a landscape sensitivity study relating to wind power (and solar farms). This study has identified the sensitivity of the Broads landscape to wind turbines and provides guidance for new development. It concludes that few areas will easily accommodate large turbines.

It is landscape areas 10 and 11 which are assessed as having moderate sensitivity to small and medium single turbines in the Broads Executive Area. All other areas are rated as moderate to high or high sensitivity. Area 10 is Whitlingham Lane and County Park and area 11 is Thorpe to Cary's Meadow, Thorpe Island and Marshes, Postwick Grove and Whitlingham Marshes. The study concludes for these areas:

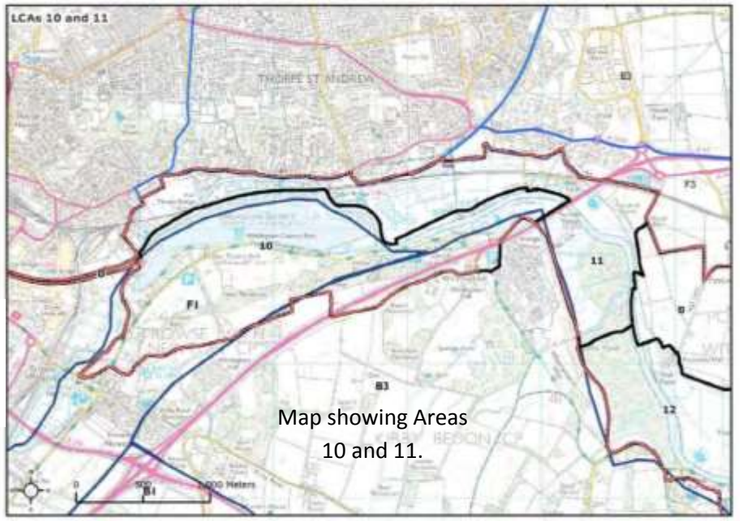
Overall landscape sensitivity of this area group to wind turbines is moderate. This is due to the disjointed landscape pattern and historic character (severances created by large scale settlement edges and by transport corridors such as the Norwich Bypass), the degree of visual containment created by valley sides and woodlands and the presence of large scale settlement edge influences to area 10 in particular. Against this are balanced sensitive features such as relict historic landscape patterns created by parkland as at Whitlingham and Trowse Newton, and the sense of tranquillity within Whitlingham Country Park and the Great Broad.

The following maps show the Landscape Sensitivity Assessment for Wind Turbines for Area 10 and Area 11.

Sensitivity Level	Definition
High	The key characteristics and qualities of the landscape are highly sensitive to change from the type and scale of renewable energy being assessed.
Moderate – High	The key characteristics and qualities of the landscape are sensitive to change from the type and scale of renewable energy being assessed.
Moderate	Some of the key characteristics and qualities of the landscape are sensitive to change from the type and scale of renewable energy being assessed.
Low – Moderate	Few of the key characteristics and qualities of the landscape are sensitive to change from the type and scale of renewable energy being assessed
Low	Key characteristics and qualities of the landscape are robust and are less likely to be adversely affected by the type and scale of renewable energy development being assessed

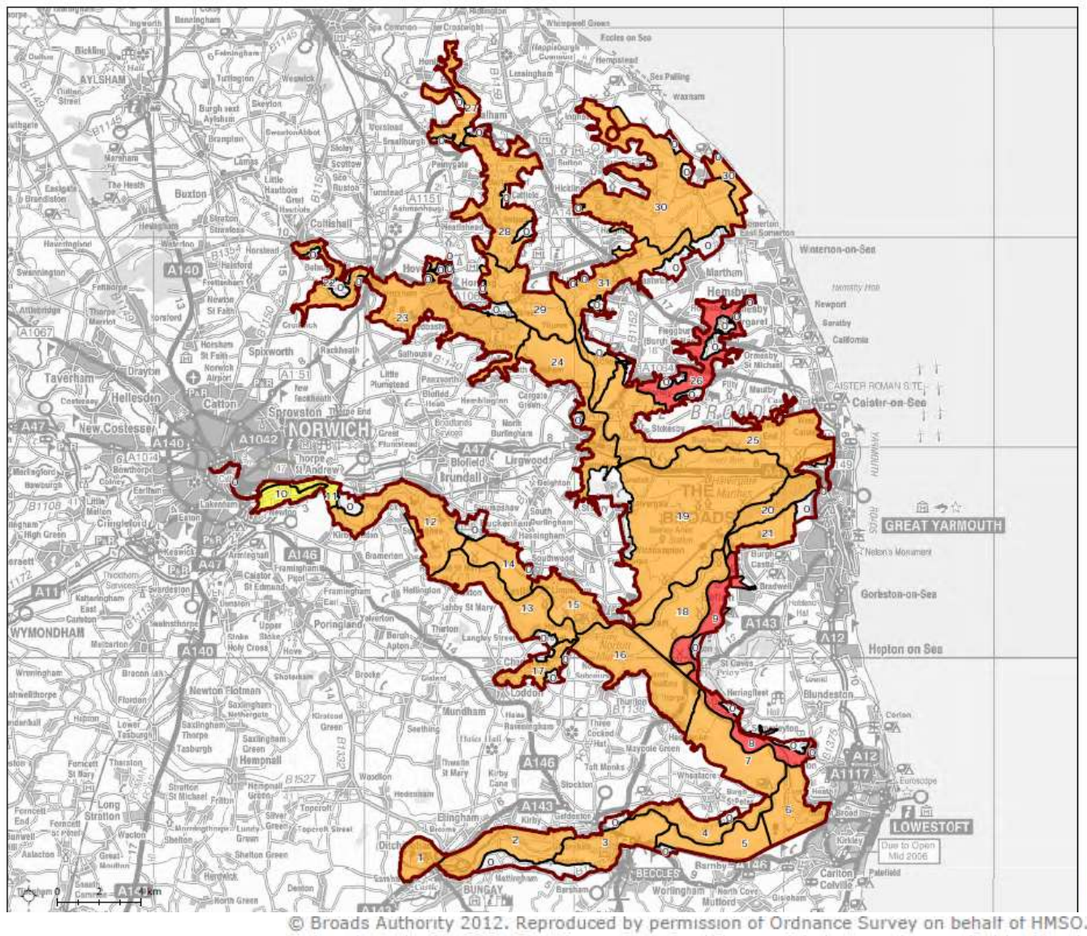
The Landscape Sensitivity Study defines turbine size as

- small turbines - 0-20m height
- medium turbines - 20-50m height

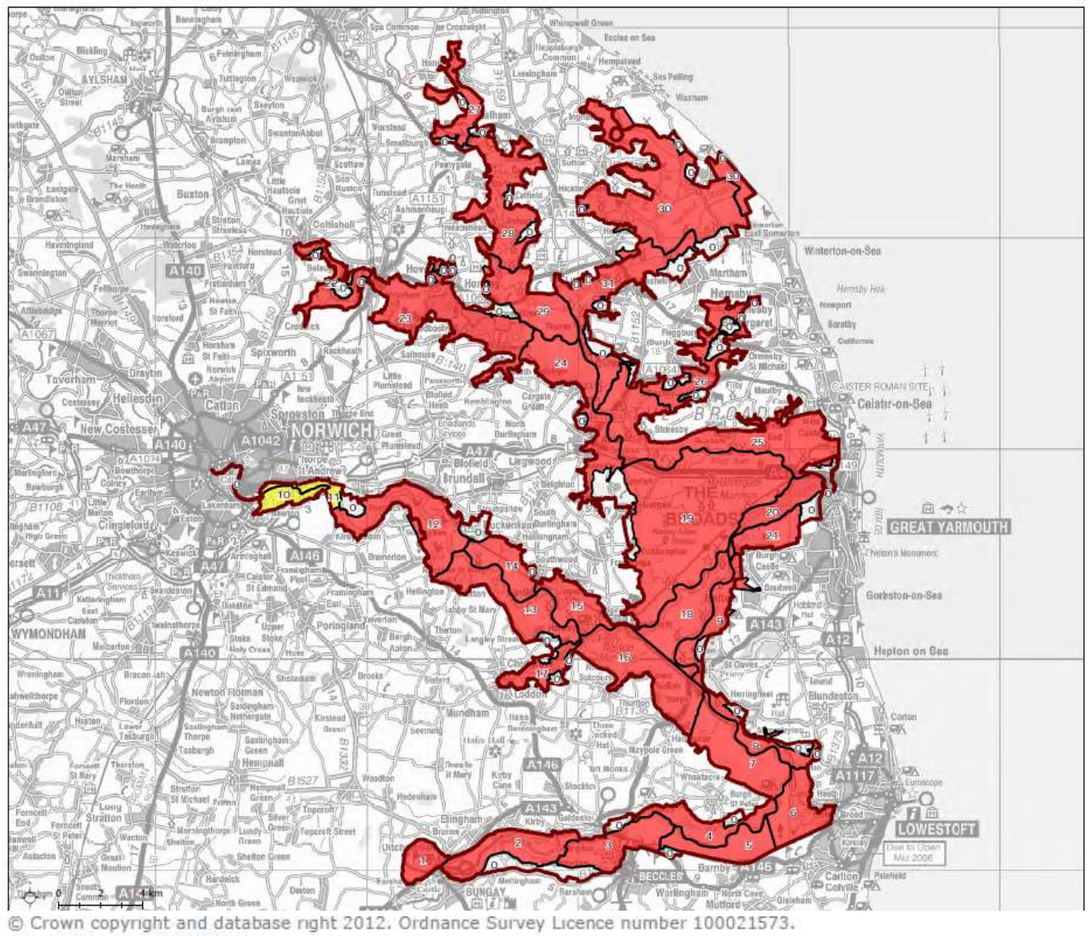


Map showing Areas 10 and 11.

<u>Landscape Sensitivity to Small Turbines</u>



<u>Landscape Sensitivity to Medium Turbines</u>



9.2. Wind Speed

No specific work has been completed to assess wind speed to inform this topic paper. The Rensmart website[3] gives an indication of wind speed. Typical wind speeds for the Whitlingham area (areas 10 and 11 of the landscape sensitivity study) are set out in the table below. The screenshot (from Rensmart website and map data from Google) also shows wind speeds.

Height Above Ground	Wind Speed
At 10 meters	4.9 m/s 11 mph
At 25 meters	5.6 m/s 12.5 mph

It is important to note that a site's suitability for wind turbines reflects the specifics of the site (for example a tree to the south west of the site is likely to impact efficient energy generation) as well as the economics (for example the announcement in July 2015 that the Government intends to cease onshore windfarm subsidies).

9.3. RSPB and Natural England work relating to birds

In 2009 RSPB and Natural England commissioned a GIS map and written guidance to aid the planning process for onshore wind energy development in England. The map is based on distributional data for twelve sensitive bird species, plus statutory SPAs (Special Protection Areas), and sites containing nationally important populations of breeding waders and seabirds, or wintering waders or wildfowl.

The map indicates a greater incidence of bird sensitivities in coastal and estuarine areas and upland areas in the north of England. The Broads Executive Area is generally rated as having a high sensitivity with some areas of medium sensitivity (see inset map, zoomed into the Broads area).

[3] This interactive map gives estimated wind speed for each square kilometre of the UK. The data is taken from the NOABL wind database. The BERR Wind Speed Database is the result of an air flow model that estimates the effect of topography on wind speed. There is no allowance for the effect of local thermally driven winds such as sea breezes or mountain/valley breezes. The model was applied with 1km square resolution and takes no account of topography on a small scale or local surface roughness (such as tall crops, stone walls or trees), both of which may have a considerable effect on the wind speed. The data can only be used as a guide and should be followed by on-site measurements for a proper assessment.

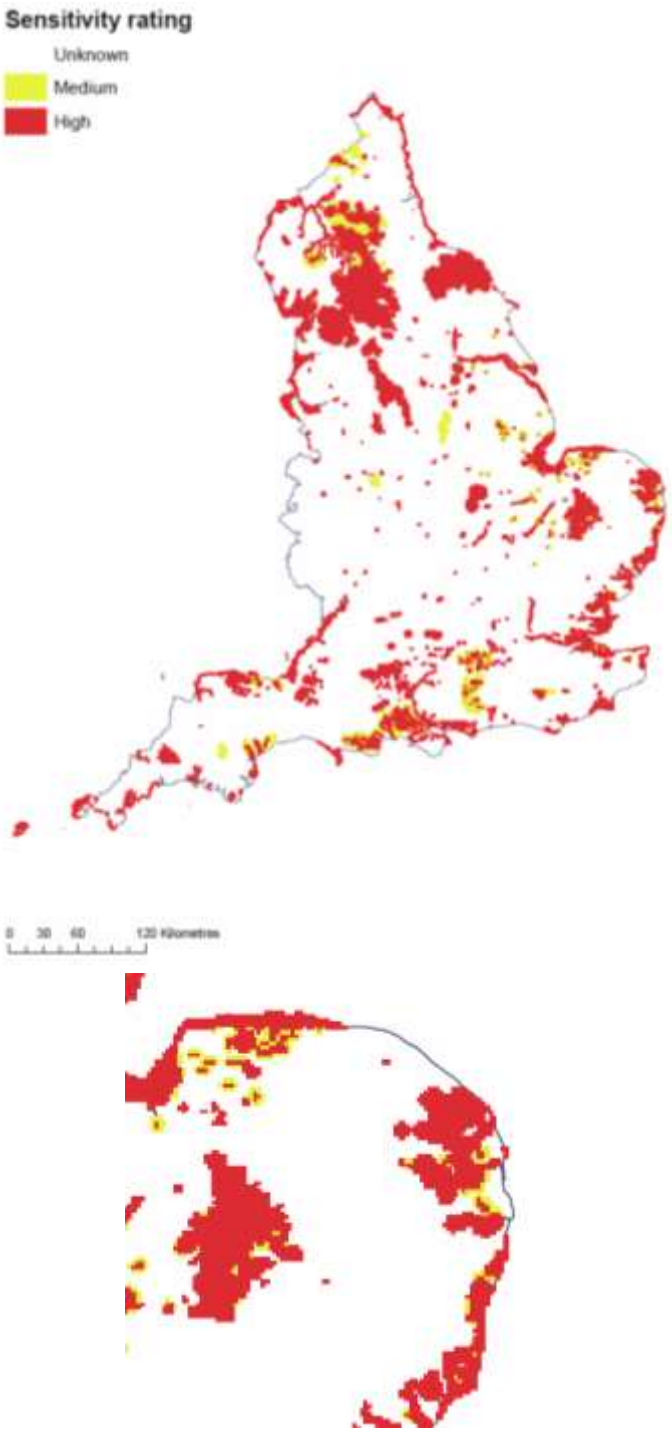


Figure 1. Map of sensitive bird areas in relation to onshore wind farms in England. Based on the highest sensitivity rating, for any of the species or sites included, in each constituent 1-km square.

9.4. Using the Existing Mills in the Broads

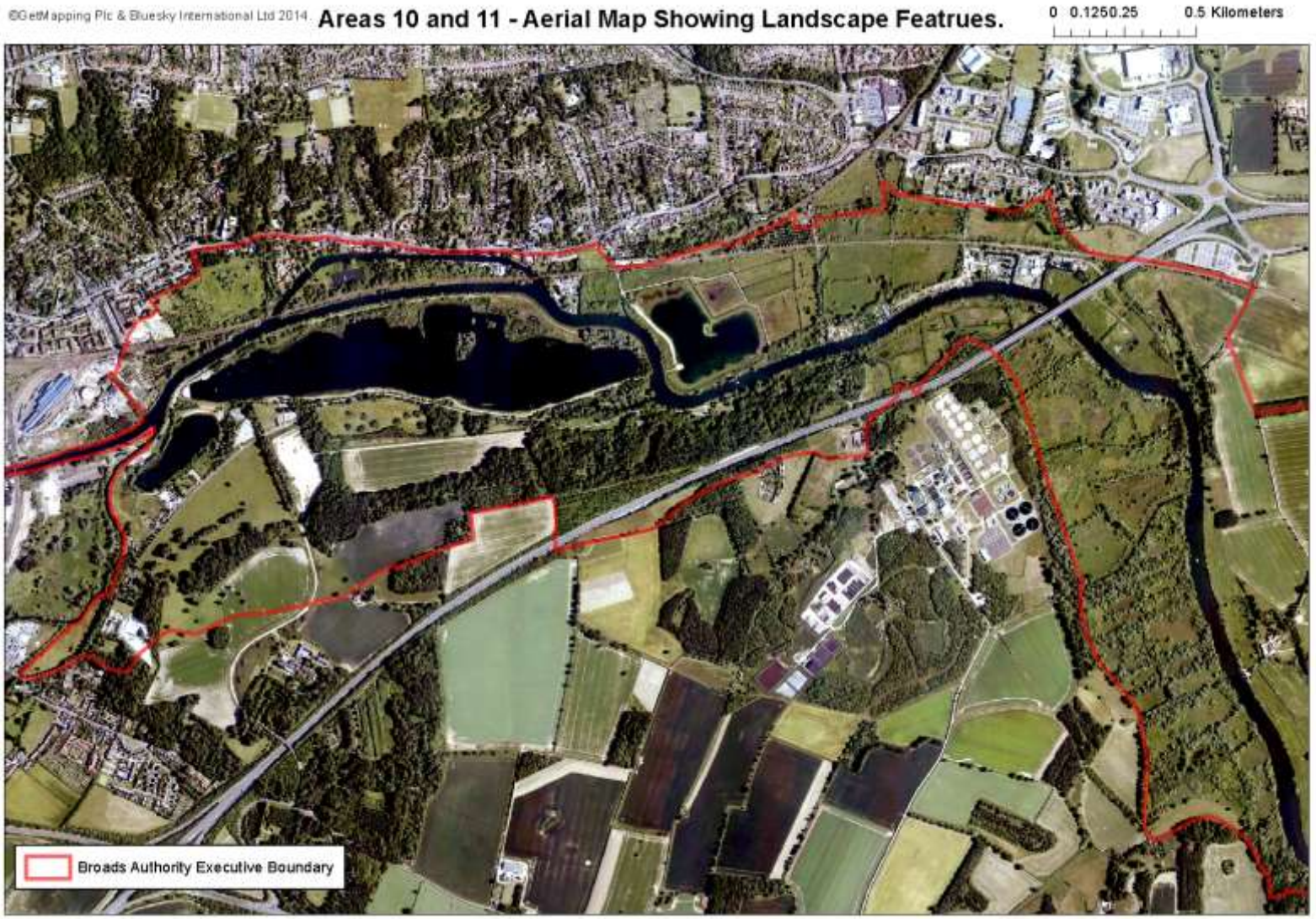
The restoration and re-use of disused mills is likely to be more acceptable in the Broads than modern wind turbines. These features are part of the cultural landscape already and some are redundant and in need of repair. So by improving these mills such heritage assets will be maintained in working

order and will generate renewable energy. That being said, the traditional design of mills is not the most effective for requirements of electricity generation. The existing building would need to be remodelled and adapted. Many buildings do not have electricity near to them thus requiring much infrastructure work to facilitate electricity transfer and the ongoing maintenance is likely to be onerous. Finally many mills would have to be renovated to extract enough electricity to feed a populated area.

Studies conclude that it is approximately 93% more expensive to restore each kWh of wind energy in comparison to generating each kWh of energy from a new anaerobic digestion plant.
(Watson, Thomson, Clayton, Scott May 2014).

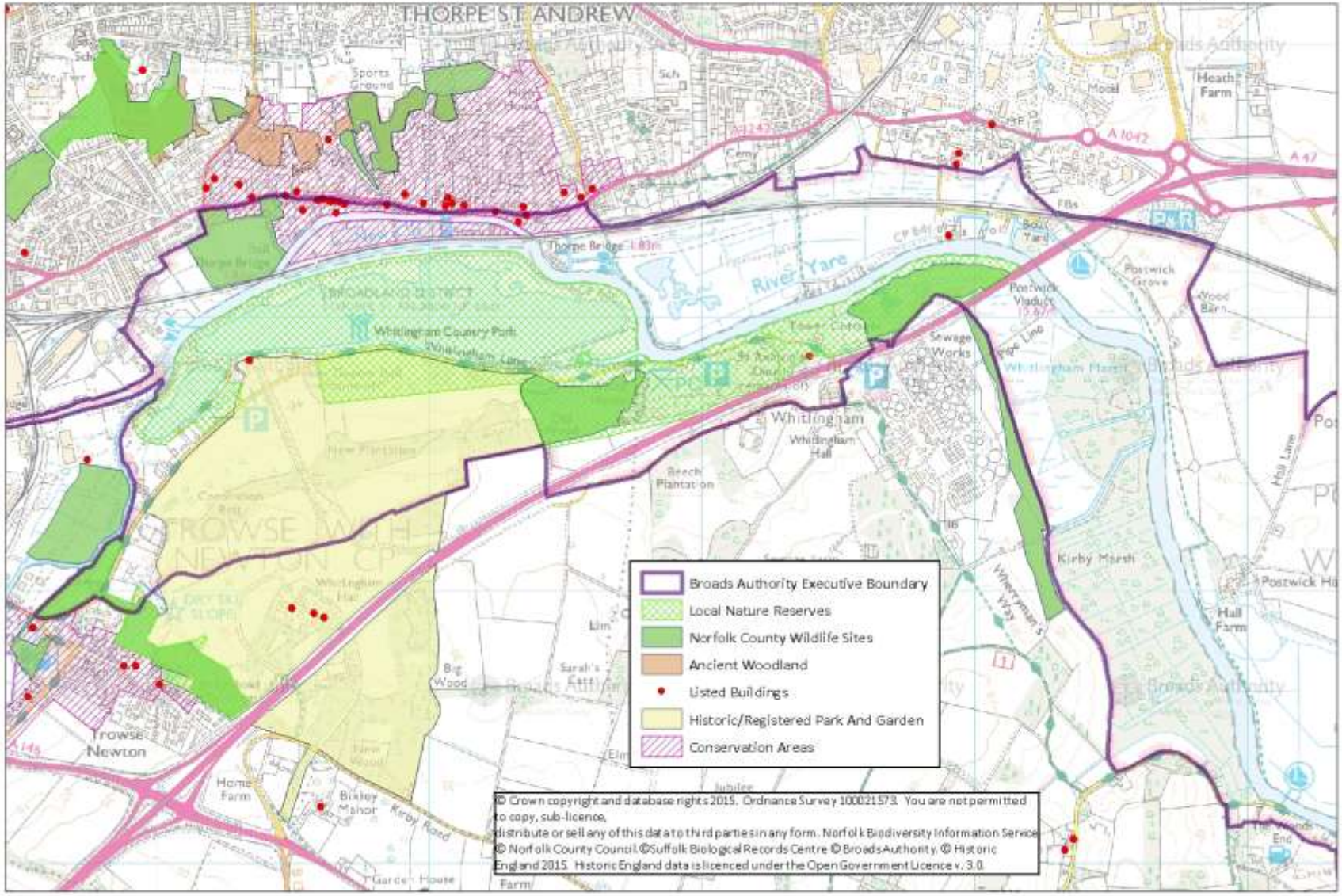
9.5. Constraints in Areas 10 and 11

The following maps show landscape features and designations in Areas 10 and 11.



Areas 10 and 11 - Showing Constraints

0 0.1250.25 0.5 Kilometers



9.6 Conclusions

If single small and medium wind turbines were placed in the Trowse/Thorpe St Andrew area on the outskirts of Norwich, there would be a moderate impact on **landscape sensitivity**. This means that some of the key characteristics and qualities of the landscape are sensitive to change from this scale of wind energy.

Wind speeds in the Trowse/Thorpe St Andrew area could be suitable for wind turbines.

In the Trowse/Thorpe St Andrew area, there are many **existing constraints.** The trees could impact on wind speeds and other constraints, such as the conservation area, nature reserves, water bodies and listed buildings could impact on where wind turbines could be placed in the ground.

The **existing mills** of the Broads theoretically provide an ideal location for generating energy from wind. They are already accepted and treasured features of the landscape, they can be in areas with few objects to impact wind speeds and such a use could bring some mills into a better state of repair. That being said, it could be costly to generate electricity from these mills due to isolation from transmission infrastructure and the cost related to enabling the mills to generate electricity.

In conclusion, whilst being rated as having a moderate sensitivity to single small or medium wind turbines, there will still be an impact on key characteristics and qualities of areas 10 and 11. Coupled with the constraints in the area, allocating area 10 and 11 for wind turbines in the Local Plan is not appropriate.

10. Draft Local Plan Policies

~~DP8~~ Policy x – Renewable Energy

Renewable energy proposals should be of a scale and design appropriate to the locality and should not, either individually or cumulatively, have an unacceptable impact on the distinctive landscape, cultural heritage, biodiversity or recreational experience of the Broads. The impact of ancillary infrastructure, including power lines, sub-stations, storage buildings, wharves and access roads, will form part of the evaluation. Wherever possible, renewable energy proposals should utilise previously developed sites and result in environmental improvements over the current condition of the site.

Reasoned justification

The NPPG says that '*When drawing up a Local Plan local planning authorities should first consider what the local potential is for renewable and low carbon energy generation.'*

It is widely acknowledged that tackling the challenges posed by climate change will necessitate a radical increase in the proportion of energy we use that is generated from renewable sources. The UK Renewable Energy Strategy (2009) includes the UK's legally binding renewable energy target of 15% by 2020. This is part of a wider suite of strategies within the UK Low Carbon Transition Plan. The Authority must ensure that the causes of climate change are addressed at the local level. This will however need to be undertaken within the context of the special circumstances pertaining to the Broads.

A range of renewable energy technologies may be suitable for the Broads, including solar photovoltaic cells, ground and air source heat pumps and wind turbines. However, the sensitivity of the Broads landscape means that large-scale renewable energy developments will generally be inappropriate. In accordance with the NPPF paragraph 97 local planning authorities should 'design their policies to maximise renewable and low carbon energy development while ensuring that adverse impacts are addressed satisfactorily, including cumulative landscape and visual impacts'. The NPPF also states that 'great weight should be given to conserving landscape and scenic beauty in…the Broads…which have the highest status of protection in relation to landscape and scenic beauty.'

Wind turbine developments in particular have the potential to impact significantly on the special character of the Broads. Wind turbines are tall structures that have the potential to detract from the mainly open and low-lying character of the Broads landscape, particularly when they are in large groups or sited in prominent locations. Proposals for wind turbines must therefore be accompanied by a landscape and visual impact assessment, which assesses the impact of the development from a full range of viewpoints, including from the waterways. When considering such proposals, the Authority will take into account: the scale of the wind farm (in terms of turbine groupings and heights); the condition of the landscape; the extent to which topography and/or trees screen the lower part of turbines; the degree of human influence on the landscape; and the presence of strong visual features and focal points. The Authority's Landscape Character Assessment will be used to assist in assessing the impact of individual proposals.

The operation of the turbines can also adversely affect ecological interests, particularly birds and bats. If a proposal is considered likely to have an effect on internationally designated sites, it will need to be considered in the context of the Conservation of Habitats and Species Regulations 2010 (the Habitats Directive) and a project level Appropriate Assessment undertaken. Development that could affect the integrity of a European site would not be in accordance with Policy CS2 of the Core Strategy.

The Authority will not support proposals for renewable energy development sited outside but close to the Broads boundaries that would have a significant adverse impact on the Broads environment and the special landscape setting and character.

11. Evidence that has informed this topic paper

Broads Landscape Sensitivity Study (2012)	http://www.broads-authority.gov.uk/news-and-publications/publications-and-reports/planning-publications-and-reports/landscape-sensitivity-studies
Mapped and written guidance in relation to birds and onshore wind energy development in England, Bright et al (2009)	http://www.rspb.org.uk/Images/EnglishSensitivityMap_tcm9-237359.pdf
New Opportunities For The Sustainable Management Of Fens: Reed Pelleting, Composting And The Productive Use Of Fen Harvests.	http://www.broads-authority.gov.uk/__data/assets/pdf_file/0017/416411/New_Opportunities_For_The_Sustainable_Management_Of_Fens_Reed_Pelleting_Composting_And_The_Productive_Use_Of_Fen_Harvests.pdf
Ren Smart website	http://www.rensmart.com/Weather/BERR.
Broads Landscape Sensitivity Study (2012)	http://www.broads-authority.gov.uk/news-and-publications/publications-and-reports/planning-publications-and-reports/landscape-sensitivity-studies
Areas 10 and 11 summary of Landscape Sensitivity Study	http://www.broads-authority.gov.uk/__data/assets/pdf_file/0005/423797/WindTurbines10,-11-App-3-Part-1.pdf
Watson, S., Thomson, M., CREST, Loughborough University. Feasibility Study: Generating Electricity from Traditional Windmills Final Report – May 2005	
Clayton, K. The Possibility of Converting Unmanned former Wind-Pumps to Produce Electricity with Computer Control: potential visitor interest and income - May 2005	http://www.docstoc.com/docs/28114802/The-possibility-of-converting-unmanned-former-wind-pumps-to
Scott, M. Conserving the Drainage Mills of the Norfolk Broads – Assessing the Appropriateness of Adapting the Historic Machinery to Generate Electricity – May 2005	http://www.docstoc.com/docs/74914883/C_-Conserving-the-Drainage-Mills-of-the-Norfolk-Broads---Assessing-