



Welsh Assembly
Government

**Facilitating Planning
For Renewable Energy
in Wales: Meeting the
Target**

Review of Final Report -
Research Contracts
105/2002 and 269/2003



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June 2005

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1. INTRODUCTION

The Welsh Assembly Government is committed to delivering renewable energy targets published in the Government's Energy White Paper (2003) through the development of an energy programme which contributes to the carbon emission targets. This includes specific renewable energy targets of 4 Terrawatthour (TWh) per annum by 2010 as part of the wider UK national target of generating 10% of electricity consumption from renewable sources, and 7 TWh per annum by 2020. The Welsh Assembly Government has announced the need to plan for between 800 –1000 Megawatts (MW) of installed capacity of onshore wind (some 400-600 additional turbines approximately) by 2010 if there is to be a realistic chance of achieving the 4TWh target.

Original research (Research Contracts 105/2002 and 269/2003¹) was commissioned by the Welsh Assembly Government to assist with the redrafting and implementation of Technical Advice Note 8 (Renewable Energy), published in 1996. Arup and its sub-consultants were appointed in September 2002 to undertake the research.

The brief was to provide a map for Wales identifying 'strategic search areas' capable of delivering the Welsh Assembly Government's Renewable energy target of 4 TWh by 2010. The fundamental objective was to ascertain the most appropriate areas of Wales in which to locate the 800MW of onshore wind turbines minimising direct land take. The area needed to accommodate this scale of development, allowing a margin for local siting, is approximately 140km² or 0.68% of the land area of Wales.

The research employed a land-use sieve approach applicable at an all-Wales level to identify *relatively unconstrained* areas according to nominated criteria. This data was then combined with information on the capacity of the existing and proposed grid network to produce a plan indicating broad strategic search areas for major wind energy developments, together with a strategic assessment of their potential wind energy capacity to 2010. The result of the analysis was the derivation of seven strategic areas for large-scale onshore wind energy development in Wales.

The Draft revised Technical Advice Note (TAN) 8 on Renewable Energy (hereafter referred to as **Draft TAN 8**) issued on 13 July 2004 contains these seven strategic areas. The TAN (when finalised, hereafter referred to as **Final TAN 8**) is aimed primarily at local planning authorities but is also of interest to developers, government agencies, environmental groups and members of the public. It is intended to provide guidance on national planning policy for renewable energy in support of Planning Policy Wales (PPW), as amended by the draft Ministerial Interim Planning Policy Statement (MIPPS), which was issued for consultation at the same time as the TAN².

The Welsh Assembly Government is continuing to develop its approach to the strategic planning for renewable energy in Wales and, following a period of consultation which closed on the 5th November 2004, has revised and updated TAN 8 in response to issues raised by statutory consultees and other respondents. This report details the further technical assessment/research undertaken by Arup to support this work between December 2004 and the issue of the Final TAN 8 in summer 2005.

¹ Facilitating Planning for Renewable Energy in Wales: Meeting the Target (2004), Arup for Welsh Assembly Government, as available on www.wales.gov.uk

² The role of PPW/MIPPS is to set down land use policy for local planning authorities/others to take on board when developing Local Development Plans or submitting/taking decision on applications. Role of TAN is to elaborate on how the policy should be implemented.

1.1 Report structure

This report is structured as follows:

- **Section 2, Context**, contains a review of the issues raised in the consultation on the Draft TAN 8, as far as they pertain to the original Arup work undertaken to inform the TAN. This is followed by the brief for the additional work undertaken by Arup between December 2004 and the issue of a Final TAN 8 in summer 2005 and the project methodology.
- **Section 2, Review of landscape, visual and cumulative impact issues**. In this chapter, the key issues of landscape and visual impact are re-examined again in the light of responses to the Draft TAN 8. This establishes the context for **Appendix A: Advice to Local Planning Authorities**. This provides further information on the means by which local planning authorities, either singularly or in combination, can take the initiative in planning the strategic search areas incorporating landscape and visual issues and considering cumulative impact.
- **Section 3, Review and Implications: spatial extent and capacity**, contains a description of the work undertaken by Arup in order to respond to the issues raised in the consultation. It deals with each issue in turn and outlines the implications for the work undertaken to date.
- **Section 4, Conclusions and Recommendations**, outlines the implications for the Final TAN 8.

2. CONTEXT

2.1 Main issues raised by the TAN 8 Consultation

Approximately 1700 consultation responses were received by the Welsh Assembly Government (WAG) relating to the Draft TAN 8 and the MIPPS. A full analysis of these is contained in a separate report prepared by WAG and this is expected to be published in summer 2005.

Consultation responses were made by a wide range of individuals and organisations, including the public, governmental and non-governmental organisations, and developers of wind turbines. Most sections of the Draft TAN 8 were commented on in some detail and many representations related to issues of Welsh energy policy, which sits largely outside the scope of the TAN and accompanying Arup research. The Draft TAN8 contained a detailed description of the purpose and derivation of the Strategic Search Areas. Many consultees, therefore, commented in some detail on the methodology adopted by Arup and the choice of constraints used in the all-Wales mapping exercise. In particular the following issues were raised:

- the treatment of landscape and visual issues/cumulative impact (in particular the perceived neglect of these); and
- the definition, spatial extent and capacities of Strategic Search Areas (with specific reference to the Geographic Information System (GIS)) established for the research and the weight given to certain factors (e.g. coniferous forestry).

Of particular concern to some industry representatives was whether the areas identified were sufficient in extent and/or had sufficient capacity to allow achievement of the 800MW of onshore wind by 2010. Shortly after the end of the consultation period, therefore, another consultant was appointed to undertake a validation of the technical capacities of the SSAs; their findings are discussed below.

2.2 Energy/Capacity Assessment of TAN 8 Wind Energy Strategic Search Areas:

In winter 2004, Garrad Hassan and Partners Ltd (GH) were commissioned by the Welsh Development Agency to carry out a technical feasibility study³ of the seven proposed wind energy SSAs. This was to provide a 2nd opinion on the installed capacity in MW of the areas, as approximated by Arup. The premise behind the GH study approach was to first establish a "Base Case" to reflect the (potential) capacity of the SSAs in the absence of any constraints. Suitable "Constraint Cases" were established reflecting planning constraints and rational design criteria, namely:

- (1) Noise levels from very large wind turbines;
- (2) National Air Traffic Service ("NATS") concerns; and
- (3) The effect of mature trees on energy production

By quantifying the impact of each of the three constraints in terms of MW capacity these figures could then be subtracted from the original "Base Case" to provide output capacities reflecting the different constraint scenarios (1 to 3).

³ Energy Assessment of TAN 8 wind energy strategic search areas (2005) – unpublished report. Garrad Hassan and Partners Ltd, for Welsh Development Agency

Data generated by GH (and displayed in **Table 1** below) represent the “Base Case” with noise as the only constraining factor. The two remaining constraints were not used to inform the final assessment because of ambiguities surrounding their validity as absolute constraints (see discussion of these issues in Chapter 4, section 4.5).

Table 1. Energy Yields (GH estimates)

Strategic Search Area	Rated Capacity Output (MW) Draft TAN 8	Rated Capacity Output ^A (MW) Garrad Hassan Report
A	200	212
B	200	430
C	100	98
D	100	212
E	100	152
F	350	430
G	150	132
Total	1200	1666

Source: Garrad Hassan Study (2005)

^A Base case + Noise: the Garrad Hassan noise constraint cases introduced an appropriate maximum noise buffer of 700m

Results of the feasibility study (see data in Table 1) confirm the Arup initial assessment that the SSAs have the potential to meet or exceed the Assembly’s target of 800MW used to underpin the revised TAN 8, although there are some variations in the capacity output figures when compared to the Arup data.

2.3 Brief for additional work

The Welsh Assembly government re-appointed Arup in December 2004 in accordance with the following brief:-

- **“Further to assist on issues raised during consultation on the Draft TAN 8 and the draft Strategic Search Areas (SSAs) -To explore [technical] concerns raised by the consultation with respect to the Draft TAN 8 and the SSAs and to include support to Assembly Government (AG) in meetings with various organisations and local authorities affected by SSAs (principally in South Wales).**
- **To assist AG with any technical queries that were raised by respondents to the TAN 8 consultation - To include ad-hoc meetings with Assembly officers and others as appropriate as required to provide an explanation of the methodology used etc.**
- **To develop options for (and modify as required) the current TAN 8 SSAs to reflect points raised by the consultation and other emerging work. - To propose solutions to specific issues in relation to the SSAs as established in summer 2004**
- **To provide modified TAN 8 SSAs to Garrad Hassan and Partners Ltd to aid in a capacity verification exercise -The Welsh Development Agency has commissioned a capacity study of the SSAs (undertaken by Garrad Hassan and Partners Ltd). This work reported in April 05. Arup are to liaise with the consultants concerned/review other developer representations and consider modifications to the SSAs/capacity estimates accordingly. In conjunction with Garrad Hassan a common approach to the absolute and variable constraints should be developed taking account of Garrad Hassan’s work.**
- **Output -Recommendations are to be made to Assembly Government with respect to**

- *whether the SSA boundaries should be altered,*
- *and/or whether extensions to the SSAs or new SSAs are justified. These should be considered in the context of whether the TAN 8 consultation responses cause the use of particular criteria to be reviewed.*
- *an appropriate minimum size of SSA*
- *the weight that LANDMAP should be given in the detailed planning of the SSAs by local planning authorities.*

In association with client, provide a new 'road-atlas' style TAN 8 map of the SSAs for incorporation within the Final TAN 8. A brief report will be needed setting out the reasoned justification for any changes.

2.4 Approach to the Arup work

The review stage was an iterative process, given that a number of the research streams engaged with during earlier phases of the study were revisited. To update existing knowledge involved:

- Consultations with stakeholders, principally Welsh Assembly Government and the Forestry Commission.
- Field visits: - to check/validate, mainly in South Wales
- Further GIS analysis - to assemble and analyse additional data gathered from field visits

The next two chapters of this report review each of the major issues raised in the TAN 8 consultation by others, as far as they relate to the Arup technical assessment work that underpinned the Draft TAN 8 issued on 13 July 2004. Taking each issue in turn, the concerns/queries raised are discussed, any work undertaken to review these concerns/queries is explained and the implications for the original Arup work and final TAN 8 considered.

The issues are considered under two themes:

- The treatment of landscape and visual issues/cumulative impact
- Definition, spatial extent and capacities of strategic search areas

3. REVIEW OF THE TREATMENT OF LANDSCAPE AND VISUAL ISSUES/CUMULATIVE IMPACT

3.1 Overview

During the development of the SSAs, the Welsh Assembly Government consultancy brief indicated:

“This study (Research Contract 269/2003⁴) will exclude non-statutory environmental constraints/factors such as landscape capacity and sensitivity, historic landscapes, National Trails, consideration of landscape quality and character using LANDMAP in the initial identification of ‘strategic search areas’.

In accordance with the brief, the SSAs were therefore defined by the absence of agreed National and International designations, combined with other technical and practical factors.

It was however recommended as an output of Research Contract 269/2003 that

“the Welsh Assembly Government further develops the draft strategic areas[and] they are also reviewed in relation to the local landscape and visual issues, particularly LANDMAP data and/or other county-level landscape data and assessments”.

In response to the consultation on the Draft TAN 8, the treatment of landscape and visual issues has been reviewed. This chapter considers the main points of that review:

- The case for buffers around national landscape designations
- The use of landscape character data, principally LANDMAP
- Cumulative visual and landscape impact.

3.2 Protection of National Landscape Designations

3.2.1 Use of buffer sub-areas

The Draft TAN 8 contains the following statement in criteria used to determine the location and extent of the draft strategic areas:

The edge of the area is greater than 4km from the boundary of a National Park.

This has been queried/challenged by various consultees.

The original Arup research⁵ considered a distance of between 30 and 35km when evaluating whether wind turbines in any of the proposed strategic areas are likely to be visible from the National Parks, Areas of Outstanding Natural Beauty (AONBs) and National Trails. Only broad comments were made, however, on the likely visibility of the various SSAs from the nationally designated areas. The SSAs were not modified to take account of these comments. The report indicated:

“With regard to at what distance (and hence, magnitude of impact) the [landscape and visual] effects become significant, there is a complete lack of statutory guidance. Until such time as robust consensus on significance based on detailed research, can be claimed with confidence, best practice requires that the bases for all judgements made are clear and explicit on a case-

⁴ Facilitating Planning for Renewable Energy in Wales: Meeting the Target (2004), Arup for Welsh Assembly Government, as available on www.wales.gov.uk

⁵ Facilitating Planning for Renewable Energy in Wales: Meeting the Target (2004), Arup for Welsh Assembly Government, as available on www.wales.gov.uk

by-case basis. For this reason no specific distances have been identified as minimum separation buffers between National Parks, AONBs, National Trails and potential strategic areas."

No further research or guidance is available on legitimate buffers, and so this view still holds. It is not appropriate to set standard distance buffers for the Welsh National Parks/AONBs at the national level. Local terrain factors mean that any such buffers would have to be variable and site-specific, and thus defined following considerable study at the local level. For example, in Northern Snowdonia, the land within the park is elevated and separated from the nearest SSA by intervening valleys (suggesting any buffer would have to be considerable to be effective), yet in Southern Snowdonia the land within the Park and the SSA is formed by a ridge (where a smaller buffer is more likely to be sufficient). It is suggested that the reference to 4km, and separation buffers, is removed from the Final TAN 8.

A consideration of the landscape and visual effects upon National Parks/AONBs is best undertaken at a regional/county level where the assessment can be informed by suitable field studies of an SSA and its environs. An outline methodology for this is contained in **Appendix A: Guidance for Local Planning Authorities**.

3.2.2 Size / scale of wind turbines inside sensitive national landscape designations

The consultation Draft TAN 8 currently indicates

"The Welsh Assembly Government does not consider that the siting of large scale (25MW+) wind turbines is appropriate in National Parks and AONBs, recognising their designation as areas of value as a result of the landscape they protect, although smaller scale domestic or community-based turbines may be suitable, subject to local planning considerations."

The definition of large scale as being greater than 25MW was in the Arup brief from the Office of the Chief Technology Officer of the Welsh Assembly Government for Arup Stage 2 work. Published Arup reporting repeats this definition without further clarification; it contains no environmental threshold for the size of developments within National Parks/AONBs.

The use of the 25MW+ criterion has been reviewed, and it is concluded that developments of such a scale would cause landscape and visual impacts (upon the nationally designated landscape areas) that are likely to conflict with their policy protection and reasons for designation.

Small scale wind developments may be appropriate within National Parks and AONBs. No guidance is offered on the scale of such developments, since this falls outside the remit of identifying strategic search areas. LPAs will consider such proposals on their merits and subject to an appropriate level of assessment.

3.3 Use of landscape character data, including LANDMAP

One of the major issues raised in response to the Draft TAN 8 consultation related to the lack of consideration of landscape character issues in the derivation of the seven SSAs.

There were two reasons for this and these are covered separately below.

3.3.1 Geographic coverage of datasets

Firstly there are currently no complete national datasets for Wales that can easily and accurately define the landscape resource. LANDMAP⁶ is the landscape assessment tool, devised by the Countryside Council for Wales to enable information about landscape to be gathered, organised and evaluated into a nationally consistent data set. LANDMAP information is collected in a structured and rigorous way that aims to be as objective as possible. Its database contains both relatively objective information – such as rock type and historical information – and more subjective information, such as sensory responses and cultural interpretation. LANDMAP information can also be combined with contextual socio-economic information. There are 5 Evaluated Aspects of LANDMAP (Geological Landscape, Landscape Habitats, Visual and Sensory, Historic Landscape and Cultural Landscape). The majority of Wales is now covered by some form of LANDMAP assessment commissioned by the appropriate local planning authorities, however some authorities are still without data or have the data in a preliminary form. It is recognised that in time an all-Wales LANDMAP dataset may be available, but the issues outlined below should apply to its use.

3.3.2 Accepted thresholds of change

The second reason for the omission of landscape character data was as indicated in the original Arup research⁷ namely “*there are no currently accepted thresholds of acceptable/unacceptable change in landscape character in the UK, particularly in relation to wind energy developments.*”

This is still understood to be the situation. The case has been made in the consultation responses, however, for the use of LANDMAP data (where available and quality assured) to assist in the strategic planning of wind turbines. It is first necessary to revisit the definitions and concepts of *landscape sensitivity* and *capacity* and how they might affect the planning of wind turbines these are set out below.

“i) Overall landscape sensitivity: *This term should be used to refer primarily to the inherent sensitivity of the landscape itself, irrespective of the type of change that may be under consideration. It is likely to be most relevant in work at the strategic level....*

..Relating it to the definitions used in Landscape and Visual Impact Assessment, landscape sensitivity can be defined as embracing a combination of:

- *the sensitivity of the landscape resource (in terms of both its character as a whole and the individual elements contributing to character);*
- *the visual sensitivity of the landscape, assessed in terms of a combination of factors such as views, visibility, the number and nature of people perceiving the landscape and the scope to mitigate visual impact.*

ii) Landscape sensitivity to a specific type of change: *This term should be used where it is necessary to assess the sensitivity of the landscape to a particular type of change or development. It should be defined in terms of the interactions between the landscape itself, the way that it is perceived and the particular nature of the type of change or development in question.*

iii) Landscape capacity: *This term should be used to describe the ability of a landscape to accommodate different amounts of change or development of a specific type. This should reflect:*

⁶ Countryside Council for Wales (June 2003) The LANDMAP information manual

⁷ Facilitating Planning for Renewable Energy in Wales: Meeting the Target (2004), Arup for Welsh Assembly Government, as available on www.wales.gov.uk

- *the inherent sensitivity of the landscape itself, but more specifically its sensitivity to the particular type of development in question, as in (i) and (ii). This means that capacity will reflect both the sensitivity of the landscape resource and its visual sensitivity;*
- *the value attached to the landscape or to specific elements in it.*⁸

It is considered that LANDMAP can assist with:

- the division of parts of Wales into character areas, although the typical spatial units for a LANDMAP are quite small when compared to the SSAs
- The determination of overall landscape *sensitivity*, via the use of some of the evaluated aspects, such as the visual and sensory layer.

It is considered most appropriate to address landscape *sensitivity* at a local level where the assessment can be informed by site-specific studies of an SSA (based on LANDMAP data) and its environs involving an appropriate level of fieldwork and assessment. An outline methodology for this is contained in **Appendix A: Guidance for Local Planning Authorities**.

It is not considered currently possible to use LANDMAP on its own (whether at a national or local level) to assist in the determination of landscape *capacity* with respect to wind turbines for the following reasons:

“..capacity studies must be specific to a particular type of change or development. At a strategic level, for example in work relating to regional and sub-regional spatial strategies, this means that it might be appropriate to produce a single map of general landscape sensitivity. Maps of landscape capacity, however, need to be specific so that, for example, a map showing an assessment of wind turbine capacity could be produced but would almost certainly be different from a map showing capacity for housing development or for new woodland and forestry planting. Some capacity studies are very specific in their purpose, seeking for example to assess capacity to accommodate a 1000 home settlement at a particular density of development.”

“This is why capacity is such a complex issue and why most capacity studies need to be accompanied by guidelines about the ways in which certain types of change or development can best be accommodated without unacceptable adverse effects.”⁹

It is important to note, therefore, that high or outstanding value in a LANDMAP aspect does not necessarily mean that an area has a lower capacity for the development of wind turbines.

It is considered most appropriate to address landscape *capacity* at a regional/local level where the assessment can be informed by site-specific studies of an SSA and its environs. An outline methodology for this is contained in **Appendix A: Guidance for Local Planning Authorities**.

3.4 Cumulative landscape and visual impact

One of the other major issues raised in response to the Draft TAN 8 consultation related to the lack of consideration of cumulative landscape and visual aspects in the derivation of the seven SSAs. Such cumulative impacts have been defined as:

“35.....those which occur, or may occur, as a result of more than one wind farm project being constructed. The degree of cumulative impact is a product of the number of and

⁸ Scottish Natural Heritage and the Countryside Agency – Landscape Character Assessment: Guidance for England and Scotland: Topic Paper 6: Techniques and Criteria for judging Capacity and Sensitivity.

⁹ Scottish Natural Heritage and the Countryside Agency – Landscape Character Assessment: Guidance for England and Scotland: Topic Paper 6: Techniques and Criteria for judging Capacity and Sensitivity.

distance between individual windfarms, the inter-relationship between their Sub-areas of Visual Influence (ZVI), the overall character of the landscape and its sensitivity to windfarms, and the siting and design of the windfarms themselves. It is important to recognise that cumulative effects consist of both those upon visual amenity as well as effects on the landscape”¹⁰

The *degree of cumulative impact* also gives rise to the notion of thresholds, beyond which impacts may not be acceptable. The Scottish Guidelines, quoted above, refer to an objective-led approach:

“54.....In order to justify a threshold based on natural heritage factors, there needs to be clarity over natural heritage objectives. Without such clarity, there is little value in seeking a cumulative impact assessment in the first place. Thus, for example, in relation to cumulative landscape impacts, one needs to be clear whether the landscape objective in the area is

- to maintain the integrity and quality of the landscape (as may be appropriate within a designated landscape);*
- to maintain the landscape character; or*
- to accept landscape change.”¹¹*

There was an implicit objective in Draft TAN 8 to *maintain the integrity and quality of the landscape* within the National Parks/AONBs of Wales i.e. no change in landscape character from wind turbine development.

In the rest of Wales outside the SSAs, the implicit objective was to *maintain the landscape character* i.e. no significant change in landscape character from wind turbine development.

Within, (and immediately adjacent) to the SSAs, the implicit objective was to *accept landscape change* i.e. a significant change in landscape character from wind turbine development.

The Draft TAN 8 (and the work on which it is based), therefore, considered cumulative landscape and visual impacts at the all-Wales level. The strategy adopted is a means of concentrating the impact of wind turbines in a relatively small proportion of the country in areas that are, on balance, technically, practically and environmentally better able to accommodate such impacts than other parts of Wales.

At the local level, accepted thresholds of change, having regard to nationally developed energy capacity targets, can be established by more detailed assessments (see **Appendix A: Guidance for Local Planning Authorities**).

3.4.1 Size/Scale of developments outside the SSAs

The current Arup reporting¹² makes no recommendations as to what planning controls/policies should be adopted outside the seven defined SSAs. For the wider area beyond the SSAs, not comprising urban/industrial sites¹³, no research has been undertaken on the suitability of different scales of development.

If sites other than urban/industrial locations outside SSAs are to accommodate wind turbines, these developments should be subject to environmental impact assessment in the normal way.

¹⁰ Guidance on the cumulative effect of windfarms (2005), Scottish Natural Heritage

¹¹ Guidance on the cumulative effect of windfarms (2005), Scottish Natural Heritage

¹² Facilitating Planning for Renewable Energy in Wales: Meeting the Target (2004), Arup for Welsh Assembly Government, as available on www.wales.gov.uk

¹³ Powys Energy Agency – The Potential for Wind Power in urban, industrial and commercial sites in Wales – May 2003

Local Planning authorities could be encouraged to set criteria based upon the appropriate physical size and number of turbines in each development.

3.5 Summary

The result of the review of how landscape, visual and cumulative issues were treated in the Draft TAN 8 suggests that the approach adopted by Welsh Assembly Government, in conjunction with Arup, remains robust i.e. that the issues cannot be addressed satisfactorily at the all-Wales level below statutory designations with current data availability, resources and assessment tools. It is considered that to undertake an-all Wales landscape capacity study (building upon LANDMAP data) with respect to wind turbines would be a poor use of resources, given the range of other technical, practical and environmental factors that limit the location of SSAs. As indicated, these issues are best addressed at the local/regional level where knowledge and understanding of the areas can be brought to bear.

4. REVIEW OF THE DEFINITION, SPATIAL EXTENT AND CAPACITY OF SSAs

4.1 Overview

This chapter considers the definition, spatial extent and capacities of strategic search areas and presents the results of the review work.

4.2 Definition of strategic search areas

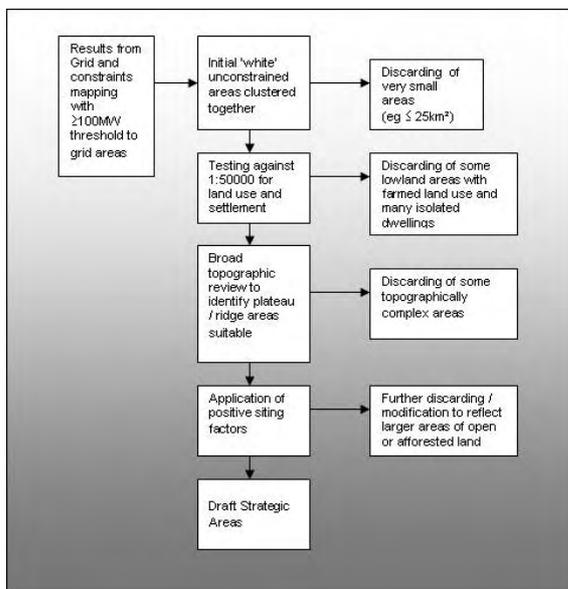
Previous Arup reporting¹⁴ and the Draft TAN contains little or no description of the nature, scope and meaning of what a Strategic Search Area (SSA) is. The SSAs were primarily defined on the absence of various national technical and environmental constraints. It is, therefore, important to identify what constitutes an SSA in terms of its positive characteristics.

In previous Arup reporting the SSAs arose from the areas which came through the national constraints sieve, using judgement and local knowledge of the following factors for refinement:

- Size of area
- Land use, settlement density
- Landform
- Presence or absence of open moor/coniferous forestry.

The process is set out in the Figure below.

Extract from previous Arup Reporting, Figure 5.6, Refinement of strategic areas for onshore wind in Wales.



¹⁴ Facilitating Planning for Renewable Energy in Wales: Meeting the Target (2004), Arup for Welsh Assembly Government, as available on www.wales.gov.uk

An SSA is characterised by:

- a good wind resource (typically >7ms-1)
- predominantly upland (typically over 300m above ordnance datum)
- a dominant landform that is of plateau rather than a series of well-defined ridges (in order to allow any proposed developments to be sited well back from ridge edges to minimise their visual influence and to allow accommodation of proposals of the scale proposed)
- being generally sparsely populated, or having populated areas at its margins or in discrete concentrations (to minimise affects upon visual and aural amenity)
- land use that reflects low biodiversity/agricultural value, typically degraded to some extent (and usually with few landowners), which is most able to offer the scope for land use improvements (e.g. dominated by conifer plantation and/or improved/impoverished moorland)
- a general absence of nature conservation or historic landscape designations (as far as can be determined at the National level based on existing digital data)
- being largely unaffected by broadcast transmission, MOD and aviation radar constraints

The area should be extensive areas (>25km²) to allow a minimum of between 50-100MW capacity.

Implications for SSA boundaries

These criteria are the inverse of the constraint criteria used in the development of the strategic search areas, but were not specified in the previous reporting. The SSAs are considered to be consistent with these criteria.

4.3 Spatial extent of strategic search areas

Various consultees queried whether the existing SSAs should be increased/decreased in size. A review of the spatial extent of SSAs with respect to the following constraint themes was, therefore, carried out in response to consultation comments:

- Ministry of Defence Mid Wales Tactical Training Area (TTA)
- Common land
- Sites of Special Scientific Interest
- Wind Speed distribution using NOABL
- National Air Traffic Service (NATS) constraints
- Isolated properties and the noise generated by wind turbines

A summary of the review findings is presented at the end of this section.

4.3.1 Ministry of Defence (MoD) Mid Wales Tactical Training Area (TTA)

Within the Draft TAN 8 mapping, the boundaries of SSA B (Carno) and C (Llandinam East) were drawn slightly inside the TTA, as it was anticipated that the MoD would be flexible regarding possible extensions to the existing groups of wind turbines at Carno and P&L (Llandinam East). Including part of the TTA within the SSAs was an attempt to deal with

uncertainty at the time regarding the degree to which the TTA should be viewed as an absolute constraint.

The Welsh Assembly Government and the Ministry of Defence have now reached a memorandum of understanding whereby the SSAs as published in the Draft TAN 8 are not considered to be in conflict with the TTA.

Implications for SSA boundaries

None, SSA boundaries can remain as published.

4.3.2 Common land

Consultees have responded that the use of Common Land as a constraint was inconsistent. In particular the “variable constraint” status of Common Land in the original Arup work meant that some SSAs had areas of common land within them. The issue was compounded by the availability of an incomplete dataset of Common Land for Wales which excluded Powys (SSAs B and C).

The issue of common land was considered in the original Arup work a landownership/legal (rather than environmental) matter. In view of the responses to the Draft TAN 8 it is considered that this no longer needs to be the case; developers have been successful in obtaining planning permission to site wind turbines on Common Land in Wales.

Common land areas tend, if appropriately managed, to have some landscape/biodiversity/amenity value, but these issues are covered as constraints elsewhere in the Arup derivation of SSAs. The value of common land and its influence over wind turbines is one that would be dealt with more suitably if it entered the planning debate at the local level where appropriate management benefits could be sought.

Implications for SSA boundaries

None, since common land did not ultimately inform SSA definition. The SSAs were defined on the basis of an absence of other environmental, technical and practical constraints. Common land can remain a local level factor to consider within SSAs.

4.3.3 Sites of Special Scientific Interest

Consultees have queried the ‘variable constraint’ status applied to Sites of Special Scientific Status (SSSI) within the Draft TAN and the associated Arup reporting.

The extent of SSSIs within and adjacent to the SSAs has been reviewed. It is concluded that in almost all cases the SSAs as developed did in fact exclude SSSIs in any event as they tend to co-exist with other absolute constraints. Development within SSSIs is not considered essential to achieve the Welsh Assembly policy aims on renewable energy.

It is therefore suggested that the SSAs can be exclusive of SSSIs and that the Welsh Assembly Government should ensure that the sites are protected from damage and deterioration in accordance with Planning Policy Wales. It is recognised, however, that it may, in exceptional circumstances, be considered appropriate to consider development within SSSIs at a regional/local level where the assessment can be informed by fieldwork.

This should only be considered where it can be demonstrated locally that the SSA would otherwise be unable to deliver the capacities proposed in TAN 8.

Implications for SSA boundaries

None.

4.3.4 Wind Speed distribution using NOABL

Consultees have queried the use of the NOABL wind model and the wind speed thresholds adopted to eliminate parts of Wales.

In the original Arup research, the premise behind the exercise was to (qualitatively) eliminate 'void' areas where development proposals are unlikely to be submitted, reflecting inadequate wind resource. To this end all areas of Wales with a wind speed less than 6ms-1 (based on the NOABL database ¹⁵) were considered as being 'absolutely constrained.'

However, wind energy developers will only pursue development opportunities in locations with a proven wind resource. Practically, an annual mean wind speed figure of 7m/s is regarded as an economic threshold, defining the situation where wind energy development presently becomes commercially feasible. Evidence suggests that frequently wind speeds in excess of 7ms-1 (on the basis of the NOABL model) are required to realise potential developments.

The re-examination of the extent of SSAs with respect to wind speed is discussed below. This takes two forms:

- A review of the distribution of wind speed 7m/s and upwards within the SSA. This tends in all cases to reduce the potentially developable area as would be expected given the threshold used to define the SSAs originally
- A review of whether there are areas of wind speed 7m/s and upwards adjacent to the Draft TAN 8 SSA boundaries, which should have been included in the original research but were omitted accidentally or which now should be included following a re-examination of the status of various constraints (such as common land).

¹⁵ **NOABL -UK Wind Speed Database -Background Information** -The data 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 has a 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. Each value stored in the database is the estimated average for a 1km square at either 10m, 25m or 45m above ground level (agl). Available via www.britishwindenergy.co.uk

Implications for SSA boundaries

Strategic Search Area A: the existing SSA boundary fails to take full advantage of the potential wind resource on offer in the locale around Denbigh Moors. By redrafting the boundary to incorporate two tranches of land between the A543 and the A458 near Llanrwst and a small 'leg' of land to the south of the existing SSA boundary could have a substantive impact on the feasible maximum capacity within this SSA.

Reason not suggested – SSSI (Hiraethog)

Strategic Search Area B: the implications for the dimensions of this SSA are (potentially) the most radical of all the SSAs. If the SSA boundary was refined to reflect observed mean wind speeds (in the absence of other constraints) then the revised margins would extend south-west as far as SSA D in Ceredigion. This could effectively double the achievable capacity output.

Reason not suggested – MOD TTA.

Strategic Search Area C: extending both the eastern and western margins of this SSA would accord with high values of mean annual wind speed recorded in and around the area published in the Draft TAN 8. Such an enlargement would increase the (potential) maximum capacity output for the SSA.

Suggest minor adjustments could be made at the local level to accommodate these areas.

Strategic Search Area D: the SSA could form part of an extension to SSA B, as detailed above.

Reason not suggested – MOD TTA and SSSI (Plynlimon)

Strategic Search Area E: the SSA could be compressed to concentrate development in areas with the highest wind potential, thus eliminating the southern section of this SSA where topography and the existence of settlement and properties coincide with lower wind resource.

Suggest - reduce size of SSA.

Strategic Search Area F: The SSA could be extended eastwards to include many of the eastern valleys and in particular a large area with high wind resource extending north-south from Brynmawr, via Pontypool to Cwmbran (Coity Mountain and Mynydd Maen). This possible revision was subject to specific field review given its potential.

Reason not suggested – Eastern extension areas do not meet the criteria for SSA

Strategic Search Area G: extending the SSA north-eastwards (to the A482), south of the B4310 and west (to the A484) would accord with high values of mean annual wind speed recorded in and around the area published in the Draft TAN 8. Such an enlargement would increase the (potential) maximum capacity output for the SSA.

Reason not suggested – MOD TTA and isolated properties. However minor adjustments could be made at the local level to accommodate these areas.

4.3.5 National Air Traffic Service (NATS) constraints

Consultees have raised the issue of National Air Traffic Service (NATS) constraints and pointed out that the data was not considered as part of the Draft TAN 8 and original Arup reporting.

Maps produced by NATS (issued in June 2004) provide developers with information about areas where wind turbine developments may be of concern. On the maps, blue notation shows those areas where wind turbine developments are likely to interfere with the operational infrastructure of NATS. Yellow notates areas where there is a potential to interfere with this infrastructure (see www.bwea.com)

A review of the maps indicates that SSAs A, B and G, as published in the Draft Tan 8, coincide with Primary and Secondary Radar Areas identified by NATS. As part of the analysis of consultation responses to the Draft TAN 8, therefore, Welsh Assembly Government (via the Office of the Chief Technology Officer) consulted NATS on the degree of constraint posed by the Primary and Secondary Radar Areas.

In response, National Air Traffic Services (Services Ltd) (NSL) has clearly stated that the boundaries of the Strategic Search Areas (SSAs) do not need to be modified from the standpoint of air traffic control. With regards to specific windfarm developments within the SSAs located in the south east region, NSL have stated that some could proceed (subject to a height restriction of 130 metres) albeit dependent on NATS En-Route Ltd's general requirements for development within ten kilometres of radar sites and other navigational aids. It is only in a limited area outside of the aforementioned restrictions that NSL would wish to consider windfarm applications on a case by case basis.

Implications for SSA boundaries

None, but NATS position should be conveyed to Local Planning Authorities to assist in the planning of SSAs at the local/regional level.

4.3.6 Isolated properties and the noise generated by wind turbines

Noise from wind turbines can be more or less distinguished depending on the difference between noise from the wind turbine and the background noise. The background noise, for example traffic noise, noise from industries and the whistling in bushes and trees, vary from site to site, but also day from night. The local physical circumstances, such as the placing of houses, may shelter the site from wind on the ground, lowering the background noise so that noise from the turbine will be more easily heard.

The majority of wind farm noise assessments are undertaken using the methodology developed for the DTI¹⁶. This document states the procedure to make sure that sites are chosen appropriately, and that noise levels are considered in the overall planning process. This is regarded as the relevant guidance by the planning authorities in the UK and indicates that noise from wind farms should be limited to 5dBA above background noise for both day and night-time.

Developers are obliged to carry out noise predictions to evaluate the likely perception of noise from wind turbines on local residents and those working in the vicinity. They compare the predicted noise levels of turbines with the existing background level. The assessment should

¹⁶ The Working Group on noise from wind turbines (1996) assessment and rating of noise from wind farms' (ETSU-R-97

be able to demonstrate compliance with national noise regulations. Developers generally present their noise predictions as contour maps, with contours joining locations of equal noise level. The site-specific nature of noise assessments makes drawing out “rule of thumb” criteria suitable for a National GIS sieve analysis difficult.

The Draft TAN 8 currently indicates “*It is generally accepted that commercial scale wind turbines should be sited 500m or more from noise-sensitive properties. The sieve mapping exercise therefore excluded land within 500m of cities, towns and villages. However, there are some sites within urban areas (remote from noise sensitive properties) that are appropriate for wind power proposals, these have been the subject of separate examination*”.

Consultees to the TAN have made three main points in relation to this paragraph:

- a) The statement was been interpreted as establishing a policy buffer around properties, rather than simply an explanation of the technical methodology used to eliminate land from the national sieve exercise in the Arup research, as should have been the case.
- b) It was interpreted that isolated properties and/or any clusters of properties below “village” status, were not considered as part of the Arup research.
- c) The technical basis for the 500m buffer is not clear and may not be sufficient.

The treatment of the presence or absence of noise sensitive properties was two-fold in the Arup research:

- a) Using the GIS and available Ordnance Survey digital datasets¹⁷, land within a 500m buffer of the majority of cities, towns, farms and other settlements was treated as an absolute constraint in the *identification* of SSAs. Urban areas appeared in the Draft TAN 8 SSAs (e.g. some of the towns in the South Wales valleys) because of the need to draw together various topographic features into larger planning units. It was not intended that all of the land area within SSAs was to be developed with wind turbines; in fact the figure was less than 50%.
- b) In subsequently defining the *capacities* of SSAs, all residential properties within the SSAs (identifiable at 1:50000 scale on OS Landranger mapping) were buffered by hand to approximately 500m and these areas excluded from the identification of potential turbine sites.

Item b) was not made explicit in the previous Arup reporting.

The 500m buffer was based upon an understanding of technical best practice at the time. Desk-based research has subsequently been undertaken to investigate the noise impact from wind turbines on sensitive receptors (humans) and, in particular, to identify whether a minimum standard for separation distances between residential dwellings and wind turbines is being adhered to in practice. Although wind industry professionals generally accept 500m as a suitable separation distance, in the absence of a legislative standard, reported separation distances vary on a project-by-project basis, ranging between 200 metres and 1000+ metres, see Table 2 below. In practice this will depend on topography and orientation, which can best be judged locally.

¹⁷ OS Strategic at 1:250000 scale and OS place name national gazetteer at 1:50000 scale.

Table 2. Previously recommended separation distances between wind farms and occupied homes

Source of information	Recommended separation distance (metres)
DTI ¹⁸	200-300
De Montfort University ¹⁹	250
World Energy Council ²⁰	300-400
Planning Policy Guidance 22 - Guidance Note	350-400
National Wind Power ²¹	400-600
Hoare LEA Acoustics Consultants	350 → 700
Scottish Parliament ²²	1000 ⁺

The suite of separation distances presented in Table 2 above illustrates the variability of guidance currently available within the public domain. Based upon an analysis of these, a 500m separation distance would still seem to a sensible compromise as a “rule of thumb” for a strategic or regional planning exercise, as long as the results are viewed flexibly. 500m is, therefore, suggested for use at a local level where the assessment can be informed by site-specific studies of an SSA and its environs (see **Appendix A: Guidance for Local Planning Authorities**).

Implications for SSA boundaries

The SSAs, as originally derived (strategic in definition and purpose), included a range of noise sensitive properties both within the SSAs and on their margins. Since these properties effectively prevent the development of wind turbines, it may be said that the present boundaries give a false impression of the spatial extent of likely development within the SSAs.

Having reviewed the extent of the SSAs in the light of the presence or absence of noise sensitive properties, changes in the boundaries of the SSAs are suggested. These changes involve the exclusion of areas, that are not developable for wind turbines due to the presence of noise sensitive properties, where they are contiguous with the SSA boundary. These changes are included within the maps presented in **Appendix B – Updated Strategic Search Areas**.

The effect of the constraint on potential output capacity posed by noise sensitive properties within the SSAs is considered in section 4.5 below.

¹⁸ The Department of Trade and Industry (2005) "Planning: onshore wind" [www] www.dti.gov.uk/renewables/renew_3.5.1.3.htm

¹⁹ De Montfort University (1996) Wind Energy Training Centre: Power from the wind [www] http://www.iesd.dmu.ac.uk/wind_energy/sustainable_dev/wcwind.html

²⁰ World Energy Council (2001) Survey of Energy Resources: Wind Energy [www] <http://www.worldenergy.org/wec-geis/publications/reports/ser/wind/wind.asp>

²¹ National Wind Power (2005) Environmental Studies [www] <http://www.natwindpower.co.uk/search/index.htm>

²² Scottish Parliament (2005) Enterprise and Culture Committee: Evidence Received for Renewable Energy in Scotland inquiry [www] <http://www.scottish.parliament.uk/business/committees/enterprise/inquiries/rei/ec04-reis-craig,david.htm>

4.4 Conclusions: spatial extent of strategic search areas

A review of the extent of SSAs has been carried out in response to consultation comments on:

- Ministry of Defence Mid Wales Tactical Training Area (TTA)
- Common land
- Sites of Special Scientific Interest
- Wind Speed distribution using NOABL
- National Air Traffic Service (NATS) constraints
- Isolated properties and the noise generated by wind turbines

The net results are included within **Appendix B: Updated Strategic Search Areas**. In three cases (Areas C, E and G) the review exercise has identified small areas of unconstrained resource immediately adjacent to the SSA boundaries which LPAs may wish to examine in further detail at the local level. A number of reductions to the SSAs are suggested, comprising land with no discernable potential for wind turbine development due to a combination of topography, the presence of residential properties and marginal wind speeds.

4.5 Capacities of the strategic search areas

As well as consultation responses relating to the spatial extent of the SSAs, consultees (particularly the wind energy industry), have made representations regarding the capacity of the various Strategic Search Areas to deliver the electrical outputs indicated in the Draft TAN 8.

The specific issues raised were

- Isolated properties and the noise generated by wind turbines
- Presence of coniferous Forestry
- Ground conditions (presence of peat)

The result of the re-examination of the capacities is presented at the end of this section.

4.5.1 Isolated properties and the noise generated by wind turbines

This issue is discussed extensively above, regarding impact on the spatial extent of the SSAs. However, it also has an effect upon development potential within an SSA. This was considered during SSA capacity estimation for the Draft TAN 8 but only on the basis of Ordnance Survey mapping. Garrad Hassan has subsequently undertaken more detailed noise modelling of the SSAs, using specialist software and hypothetical wind turbine locations. The results of this detailed modelling are considered in Section 4.6: Assignment of Capacities in Final TAN 8.

4.5.2 Presence of Coniferous Forestry

Consultees have queried the assumptions made regarding the degree of felling associated with development of the coniferous forest areas within the SSAs. In particular, since the Forestry Commission (and hence the Welsh Assembly Government) has a duty to have regard to the national interest in maintaining and expanding the forestry resources of Wales²³ extensive deforestation could be in breach of its legal duties.

²³ under Section 8A of the Forestry Act 1967

In the development of the capacity estimates for the Draft TAN 8, no specific assumptions were made in the Arup research. It was stated “*It is possible to locate major wind energy developments in and around coniferous plantations, either on gaps between forestry blocks, on recently felled or planted land or even within mature plantations if the turbines are large enough (typically 100-130m to blade tip) although examples where the latter has been successfully achieved are presently few. Most areas have access roads that will be suitable for the delivery of wind turbines with only minor modification*”. In reality wind turbines were placed in coniferous forestry for the purposes of estimating the potential capacities of the SSAs, but turbine density was kept low (typically occupying only a third to a half of the forestry area concerned) reflecting a precautionary approach.

Subsequently, two desk-based studies were undertaken to provide commentary on the current state of knowledge vis-à-vis the feasibility of siting wind turbines in areas of forestry. The research was carried out in two phases. The scope for the first piece of research was to evaluate the impact trees have on turbine performance (energy generation). It concluded that the influence of wind shear generated by trees acting as obstacles to wind flow can hinder turbine performance, although raising turbine hub height can sufficiently offset any adverse effect on energy generation.

The objective for the second phase of research was to ascertain the potential for siting turbines within areas of forestry. Particular attention was paid to the physical limitations attributable to the natural fabric (density and structure) of forested areas and how such knowledge could be used to inform developers and (local) planning officials on siting issues. Contact has been made with the Land Agent in Scotland responsible for the overall management of wind turbines developments on Forestry Commission land. At present, the Forestry Commission are dealing with a number of proposed wind turbines throughout Scotland and the solutions to tree felling have their own unique features in each case. These can be:

- No or limited felling, due to turbines being located solely on exposed ridges where planting has not taken place.
- Limited felling because the forest is at a stage where the current crop is young and the developers are prepared to delay felling and address the issue when and if the problem becomes an issue.
- “Key – hole” felling where only a small amount of felling takes place around each turbine.
- Restricted top height management, where the developer agrees that trees will be felled at a defined top height, with compensation being paid at that time.
- More extensive felling, perhaps where the current crop has less commercial value and felling allows a more sustainable and environmentally sensitive management regime to be put in place over the area (typically however still in accordance with any Forestry Design Plan prepared by Forestry Commission).

Further refinement of the above may be required to establish the best strategy at local level. This will require integrated working between developers, local planning authorities and Forestry Commission Wales, with further input potentially required by other stakeholders.

Implications for SSA capacities

Some 50-60% of the parts of SSAs (that are identified as capable of supporting wind turbines) are within areas of coniferous forestry. The installation of wind turbines within forestry however does bring with it a technical and commercial risk. Based upon recent experience of developers in Scotland this risk is considered low. If satisfactory solutions are not developed in Wales to allow developments to proceed in these areas then the Welsh Assembly Target for renewable energy for 2010 will not be met; there are insufficient non-forested areas identified in the strategic sieve exercise.

The presence of forestry has been considered in detail by Garrad Hassan in its validation review of the capacities of the SSAs.

4.5.3 Ground conditions (presence of peat)

Site selection criteria for wind turbines developments must assign adequate attention to the receiving ground conditions and soil stability levels. Some consultees have raised the possibility of poor ground conditions affecting the ability to develop in the SSAs. In particular a recent case for a 60 MW wind farm at Derrybrien; Ireland, granted full planning permission in July 2003 has been cited. In this, a combination of physical contributory factors in the area resulted in a landslide started along a sub-area of weak peat and a natural drainage channel, instigated by activity associated with the construction of the wind turbines.

No extensive areas of peat bog occur in the SSAs, or indeed in other parts of Wales to the same extent as in Ireland and thus this is not seen as an issue warranting further consideration at the strategic level. This was not however made explicit in the original Arup research.

At the local level, it is anticipated that as part of good practice, developers would obtain professional advice from geotechnical consultants to evaluate ground conditions prior to the submission of a planning application. If planning approval is granted monitoring procedures should be enforced and upheld during various stages of construction.

Implications for SSA capacities

None.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The technical basis behind the onshore wind energy aspects of the Draft TAN 8 have been extensively reviewed over a 5 month period. The range of consultation responses, combined with the specific consultations undertaken as part of this study, has provided a robust examination of all the issues associated with the strategic planning of wind turbines in Wales. It can be concluded that:

- the decision to develop SSAs, and the method used to identify them, remains valid.
- excluding landscape and visual issues (to a degree) in the initial identification of the SSAs was the correct approach
- the boundaries of the current SSAs should remain largely unchanged, but assessment suggests modification, as indicated, to better reflect the areas of potentially developable resource
- there are no new SSAs required, and that none of the existing SSAs (as published in the Draft TAN 8) require removal

Having taken all the reviewed factors and suggested boundary modifications into account it is predicted that:

- the SSAs remain capable of delivering the government target (800MW) for renewable energy in Wales; and
- the target capacity for allocation in LPA plans and policies will fall somewhere between the government target (800MW) and the maximum capacity identified in the Garrad Hassan study (1666MW) – to take account of site specific factors limiting availability and LPA consideration of landscape and visibility matters.

5.2 Recommendations

The following actions are recommended:

- the strategic approach to the planning of wind turbines in Wales, involving the identification of several strategic search areas, should continue
- the modified SSAs (and appropriate capacities) should be re-published as part of the Final TAN 8
- local planning authorities which encompass SSAs should be encouraged to undertake further assessment work to refine the SSAs to take account of local factors.

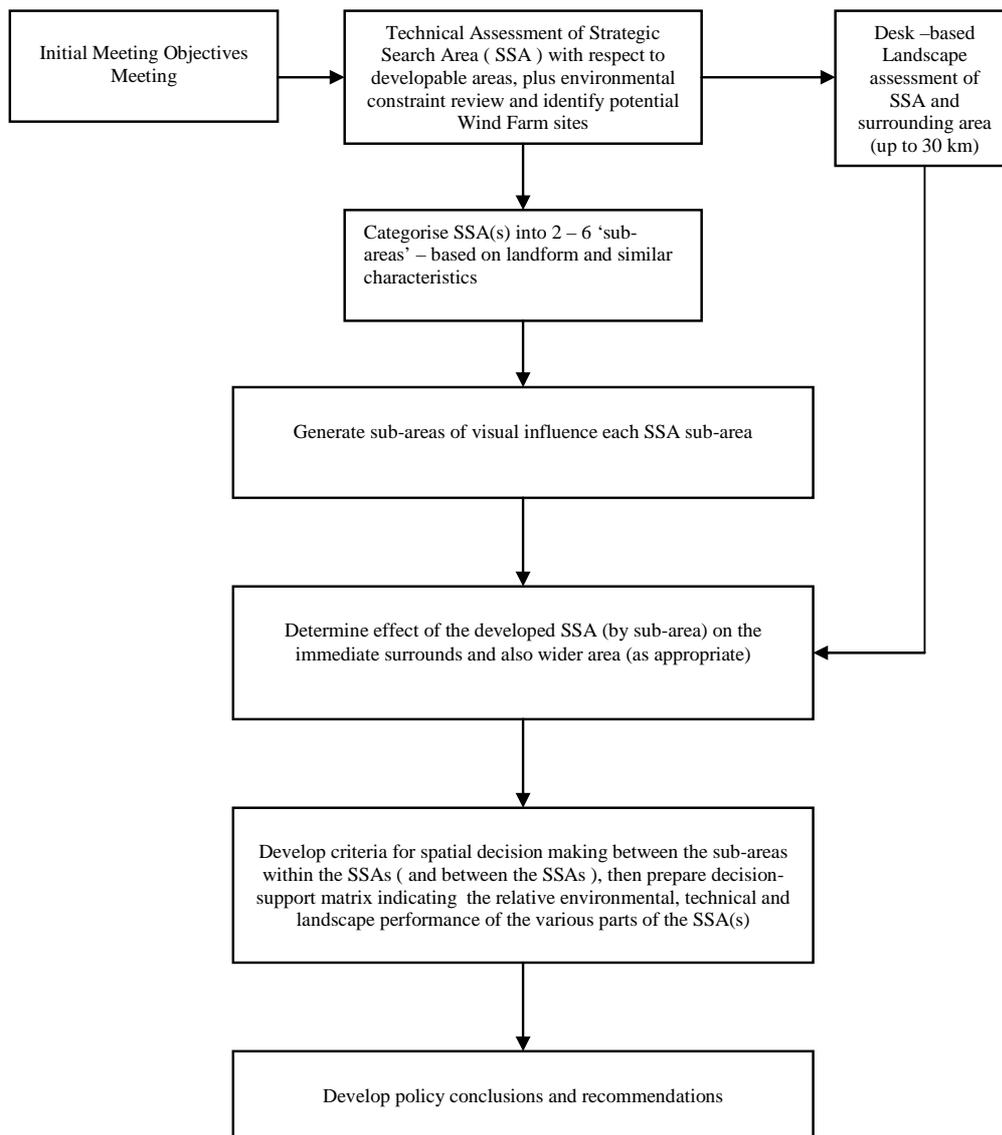
APPENDIX A

**Advice to Local
Planning Authorities**

A1. ADVICE TO LOCAL PLANNING AUTHORITIES

A1.1 Introduction

A typical approach for undertaking a local authority-led study of any of the Strategic Search Areas is set out in the flow chart below and is described in the sections which follow.



The purpose of the local planning exercise is to achieve a finer grain of development allocation within the SSA, taking into account landscape, visual and cumulative impacts. It is not intended for use in the negotiation of the SSA capacities indicated in the Final TAN 8; since this would risk the achievement of renewable energy target delivery.

It is anticipated, however, that the Final TAN 8 will allow the local planning authorities to make minor adjustments to the SSA boundaries when translated into their local planning documents. This will facilitate the inclusion of development on the margins of SSAs where local conditions recommend.

A1.2 Study Area

Visual/landscape and cumulative issues

An overall study area of some 40km radius, from the centre of each SSA is recommended, to allow consideration of cumulative landscape and visual issues associated with development in the SSA and existing or proposed wind turbines in the wider area.

Technically feasible areas

An overall study area of some 5km radius from the margins of each SSA is recommended to allow consideration of technically feasible areas for possible wind turbines.

A1.3 Identify “technically feasible areas”

The following factors should typically be reviewed for the study in order to identify “technically feasible areas” for the development of onshore wind energy schemes, broadly in the order outlined below.

Wind speed / topography

Using the NOABL²⁴ dataset, the distribution of existing wind speeds across the area should be determined. Areas with wind speeds greater or equal to 7ms-1 at 35m above ground level should be considered suitable for taking forward for further analysis. It should be noted however that whilst the distribution of such wind speeds is typically the starting point for developers, some flexibility should be allowed as detailed wind resource modelling would be undertaken of the SSAs by most developers which inevitably will show slightly different results to the NOABL data.

A digital terrain model should be used to identify those areas with slopes steeper than 15 degrees; these should be also eliminated.

Proximity to residential dwellings

Using a Geographic information system established for the project, Ordnance Survey Address –point data should be loaded and displayed for the Strategic Area. Address-point allows the display of any dwelling that currently has a postcode. The data should be buffered by 500 (i.e. a 500 m radius drawn). 500m is currently considered a typical separation distance between a wind turbine and residential property to avoid unacceptable noise impacts, however when applied in a rigid manner it can lead to conservative results and so some flexibility is again advised.

²⁴ **NOABL -UK Wind Speed Database -Background Information** -The data 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 has a 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. Each value stored in the database is the estimated average for a 1km square at either 10m, 25m or 45m above ground level (agl). Available via www.britishwindenergy.co.uk

Cultural Heritage

Digital data representing the locations of scheduled ancient monuments (SAM) should be used. SAMs are represented by point features in the available dataset from Cadw; consultation should therefore be undertaken with the local Archaeological trust if any archaeological features appear to present a particular constraint to any one site.

Land ownership/Forestry

The extent of land in the holdings of the Forestry Commission (FC) or other landowners should be determined via Ordnance survey data or via consultation. A copy of the Design Management plan for the FC estates in the area could be obtained and opportunities explored for the phasing and development of wind turbines in and around forestry clearance operations. If other information is not available the study should assume only 25-50% at maximum of the afforested areas would be available for wind energy development over the next 5 years due to operation and environmental constraints

Existing wind turbines and consented developments

The locations of existing wind turbines/wind turbines within the study area should be mapped, together with locations of consented developments and those proposals currently within the planning system.

A1.4 Review of environmental and landscape constraints/factors

The TAN 8 research and strategic sieve process should have ensured that the SSA is free of a range of International and National environmental constraints. This next exercise should consider a range of environmental data not considered/considered in detail as part of the TAN 8 research, namely local and ecological factors.

Nature conservation

In liaison with the County Wildlife officer, all statutory and non-statutory nature conservation sites should be mapped (and /or digitised for the area if required). Consultation should be undertaken with Countryside Council for Wales and the RSPB and relevant factors noted.

Landscape character and value

The landscape value of an area is an important criterion in judging its suitability for wind turbines development. It is a factor that applies to a particular area rather than a generic landscape type.

Existing information available on the landscape value within the SSA and its surroundings should be collated and mapped. Consultation should be undertaken with the county landscape officers and any existing LANDMAP information obtained and reviewed. If possible, GIS data for the LANDMAP aspect layers should be mapped. Historic Landscape data from the CADW Registers of Landscapes of Special/Outstanding Interest in Wales should also be obtained and mapped

For each existing LANDMAP aspect or character area the criteria of the influence and presence of other conservation interests such special cultural associations, perceptual landscape characteristics such as tranquillity, wildness, sense of remoteness, scenic beauty and the existence of a consensus about importance, either nationally or locally should be applied. These judgements should be kept separate from the more objective criteria of landscape and visual sensitivity (considered below) to present a more transparent assessment.

A1.5 Classify areas within the SSA

The SSAs should be reviewed for major areas with similar landform characteristics and sub-area accordingly. Between 5 and 10 sub-areas per SSA is likely to be a sensible maximum. Any sub-areas not including a “technically feasible area” could be discounted from further analysis.

A1.6 Cumulative landscape and visual assessment

The potential for cumulative landscape and visual effects is recognised as a matter to be included in Environmental Impact Assessment under the terms of the EIA regulations 1999. Consideration of cumulative and synergistic effects is also a requirement under the Strategic Environmental Assessment Directive which is required for development plans.

A cumulative landscape and visual impact assessment (CLVIA) will normally form part of an Environmental Statement for wind turbine proposals. Good practice guidance on how to undertake such as assessments is available (such as a recent publication by Scottish Natural Heritage²⁵). Expertise of such assessments is now also well established amongst developers and their consultants within the UK. However, development-specific assessments are unlikely to consider the effects of a fully developed SSA. In particular:

- a) it would be unreasonable for a developer to consider the effects of other wind turbines within those (as yet) undeveloped parts of an SSA and,
- b) taken in isolation, developer-specific CLVIAs are unlikely to provide the objective data to allow the local planning authority to consider which parts of an SSA can best be developed whilst minimising landscape change.

In order that cumulative landscape and visual issues are appropriately assessed, the SSA and its immediate surroundings should be subjected to a more detailed landscape value and visual sensitivity assessment. The assessment should consider all landscape aspect/character areas adjacent (or likely to be influenced by) development in a technically feasible area.

Visibility Analysis

The visibility assessment should be computer based, using a Geographical Information System (GIS) and an Ordnance Survey Digital Elevation model. The analysis should have two several separate but interlinked elements:-

- The relative visibility from outside the SSA of the different sub-areas within the SSA. The inter-visibility of the area within a 20-30km radius should be mapped using a GIS. The visibility information should be prepared for the likely size of wind turbines rather than be undertaken at ground level; wind turbines of a minimum of 110m in height should be assumed. The visibility of existing and consented proposals should also be considered and mapped.
- The identification of landscape and visual sensitive receptors, typically key viewing points from which visibility of wind turbines will be assessed e.g. roads, National Trails, National Parks/AONBs, areas of settlement, key viewing points or visitor sites. Typically 6 view points would be used, the locations for which would be agreed in conjunction with the appropriate local authority officers.

Landscape and visual sensitivity assessment

A landscape and visual sensitivity assessment should be undertaken of the SSA, its immediate environs and the sub-areas within the SSA. Landscape sensitivity criteria which are particularly relevant to wind turbine development include landform character, scale and

²⁵ Appendix5 -Guidance on the cumulative effect of windfarms (2005), Scottish Natural Heritage

height, skyline character, pattern and grain of landcover, openness/ enclosure, character of vertical elements, manmade features, settlement/circulation patterns, time depth and condition. Some of this should already be in any LANDMAP assessment, but this should be developed further during fieldwork.

Building upon the results of the work above, the results of the visibility analysis should be combined with the boundaries of the aspect areas for the landscape assessment.

A1.7 Overall Analysis and Reporting

There are various methods available for bringing together various spatial datasets to arrive at a picture of cumulative constraints and thus areas most suitable for development for wind turbines. These include multi-criteria analysis, whereby each constraint layer is assigned a score, and the scores are added together to arrive at an overall environmental performance. The scores for each environmental layer can also be weighted, to reflect the differing importance of the factors in the decision-making process. Whilst the rigour of multi-criteria analysis is often desirable, it pre-supposes that:

- a) all the relevant datasets are available digitally
- b) all parties to the decision making agree on any scores/weightings to be used.

It is envisaged that due to the data and resource limitation associated with this study, expert judgement should be used to bring the various factors together.

A matrix should be developed containing details of all the feasible ‘sub-areas’ within the SSAs. The technical, landscape and environmental performance of each of these sub-areas should be assessed and presented in the matrix. Precise criteria for environmental performance should be developed as part of the study in conjunction with the appropriate local authority officers but could include the landscape sensitivity and the degree to which any likely Sub-area of Visual influence from proposals located within such a sub-area would affect sensitive visual receptors.

The areas should be ranked as a result of the matrix analysis.

An example matrix is shown below.

Table A.1 -Example summary matrix: environmental performance of SSA Sub-areas

Sub-area	Nature conservation constraint	Historic landscape constraint	Landscape character sensitivity	Landscape Value *	Visual sensitivity [to settlements /roads etc]	Visual sensitivity [to sensitive landscapes/ recreational receptors]	Overall sensitivity	Overall capacity/ranking	Potential capacity
Sub-area 1									
Sub-area 2									
Sub-area 3									
Sub-area 4									
Sub-area 5									
Sub-area 6									
Sub-area 6									
Sub-area 7									
Sub-area 8									
Sub-area 9									

* Landscape value derived from combined LANDMAP ratings with weighting towards Visual and Sensory scores

The issue of cumulative effects should also be reviewed and consideration given to the effects upon adjacent local authority areas.

Workshop

It is suggested that a stakeholder workshop should be held to test the findings. The exact attendees to the workshop could be determined in conjunction with the appropriate local authority officers but should extend to different officers within the Council, other key stakeholders plus any consultant team.

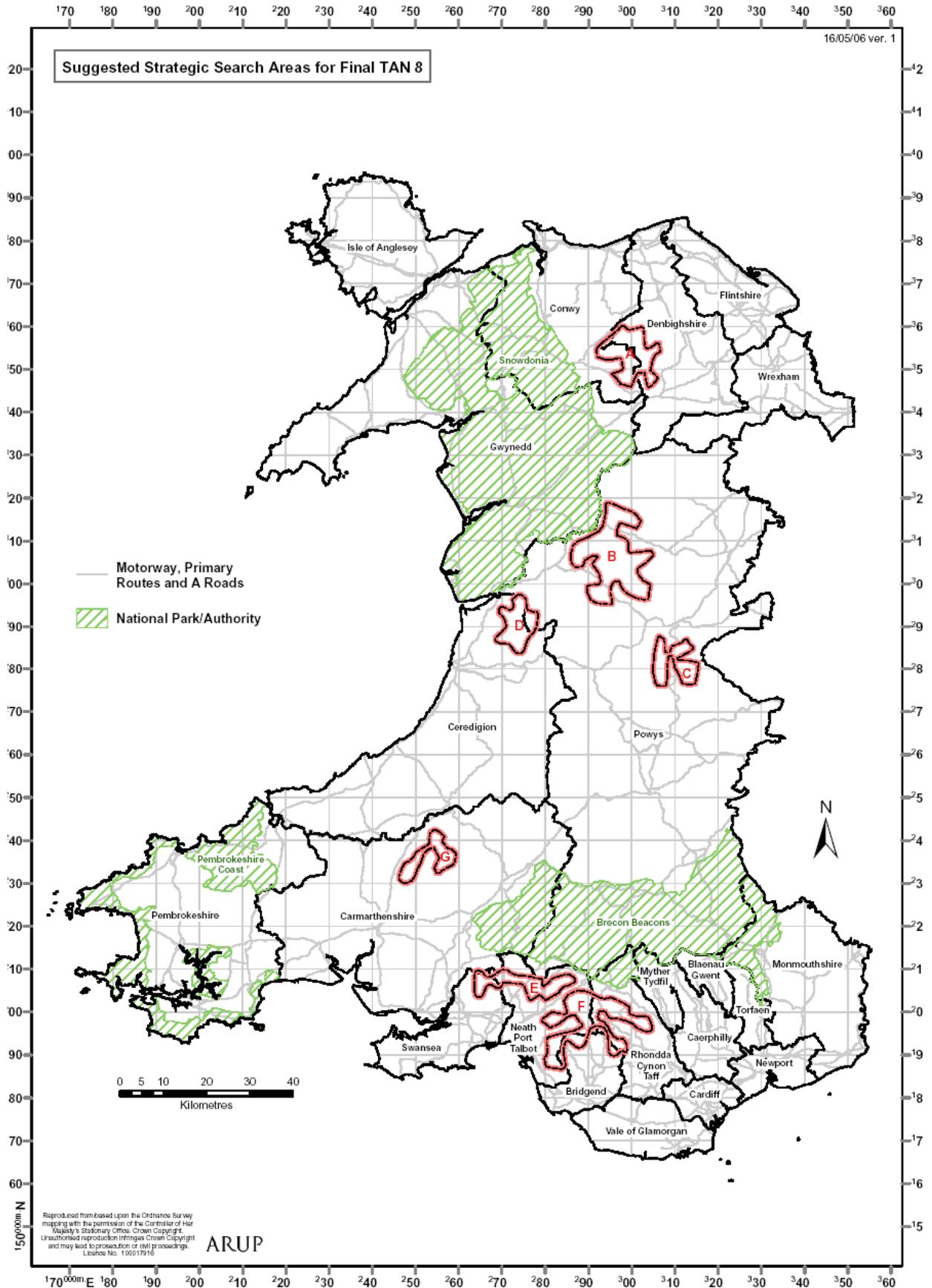
Recommendations

Recommendations could be made with respect to:

- a) Whether adjustments should be made to the Strategic Search Area boundaries when transposed into the appropriate planning documents
- b) Which sub-areas, or part(s) of sub-area, within the SSAs should not be developed or should be developed in certain ways, to minimise environmental impact
- c) What sorts of indicative policy regime might be appropriate for the Local Development Plan and thus development control.

APPENDIX B

**Updated Strategic
Search Areas**



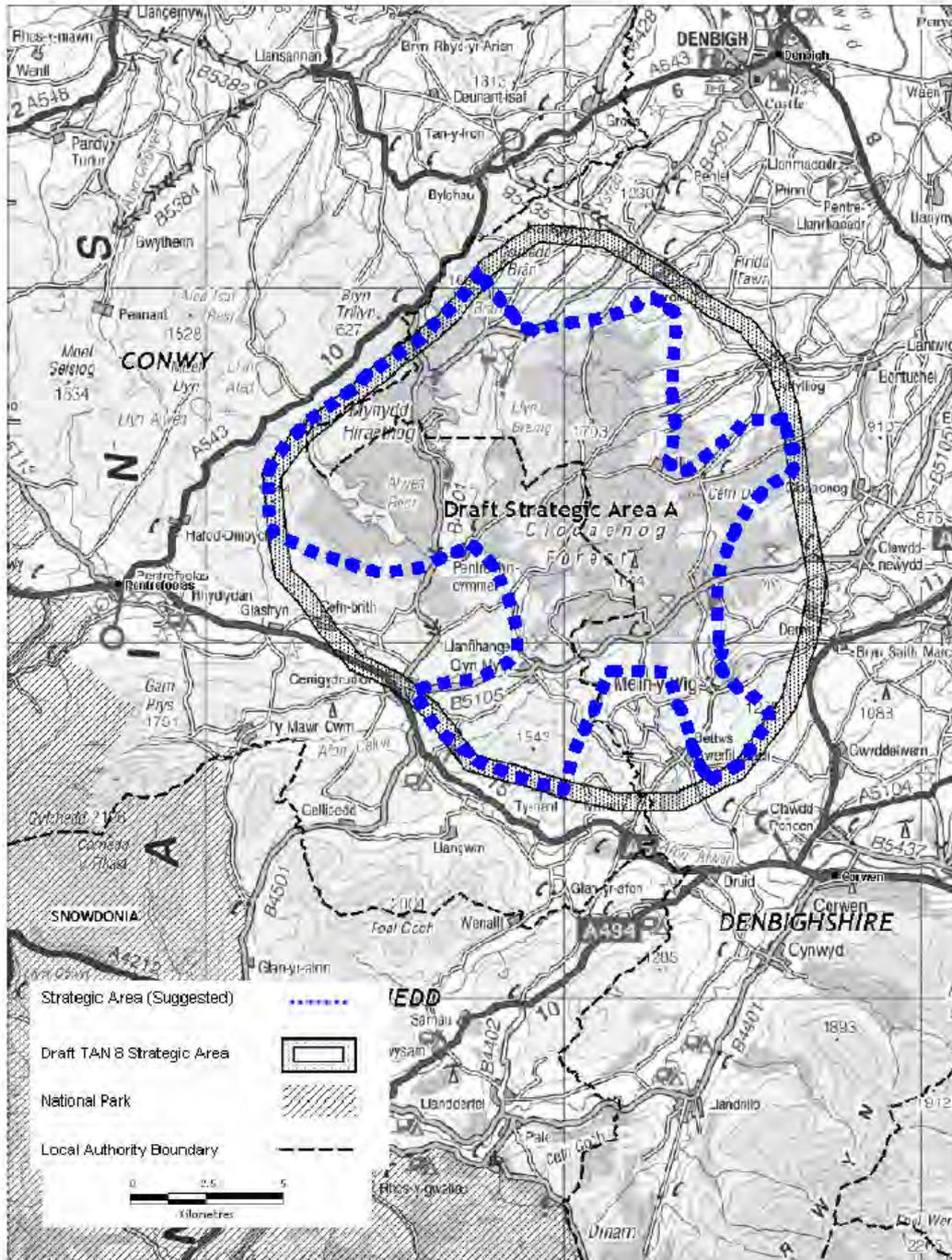
SUGGESTED SSAs FOR FINAL TAN 8 – AREA A CLOCAENOG FOREST



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Area 1 of 7



Boundaries to be refined by Local Planning Authorities

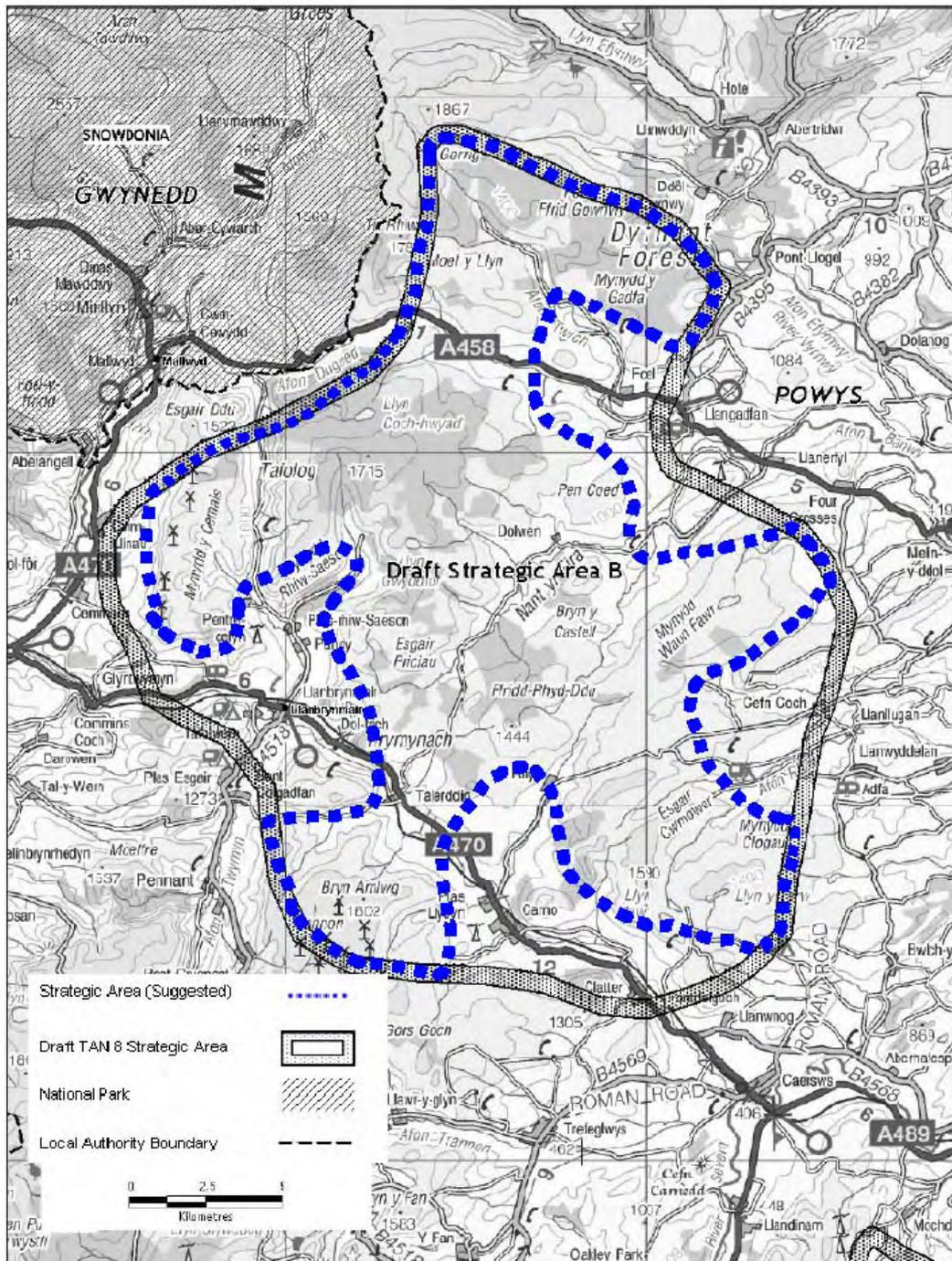
SUGGESTED SSAs FOR FINAL TAN 8 – AREA B CARNO NORTH



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Area 2 of 7



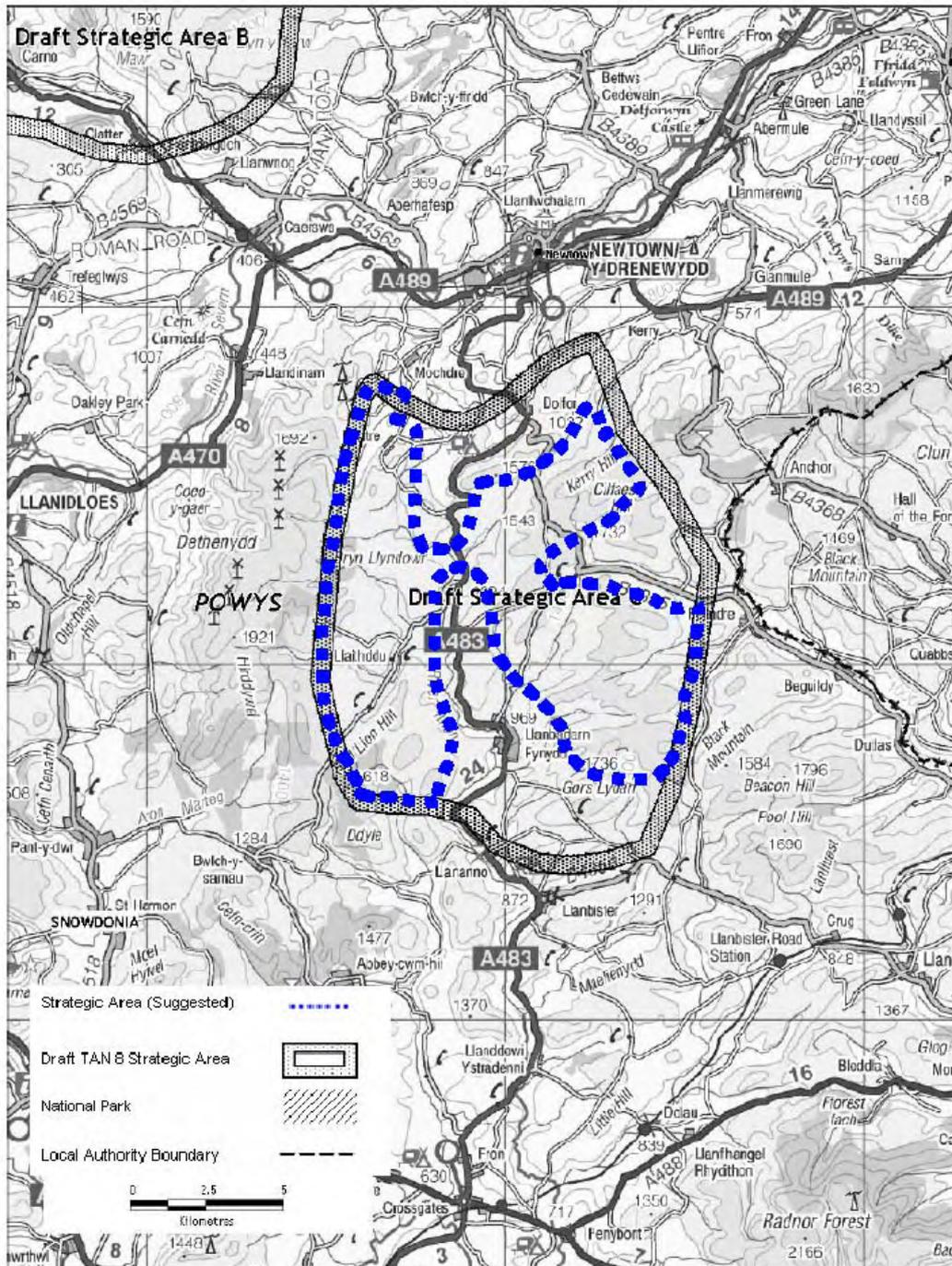
Boundaries to be refined by Local Planning Authorities

SUGGESTED SSAs FOR FINAL TAN 8 – AREA C NEWTOWN SOUTH



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Area 3 of 7



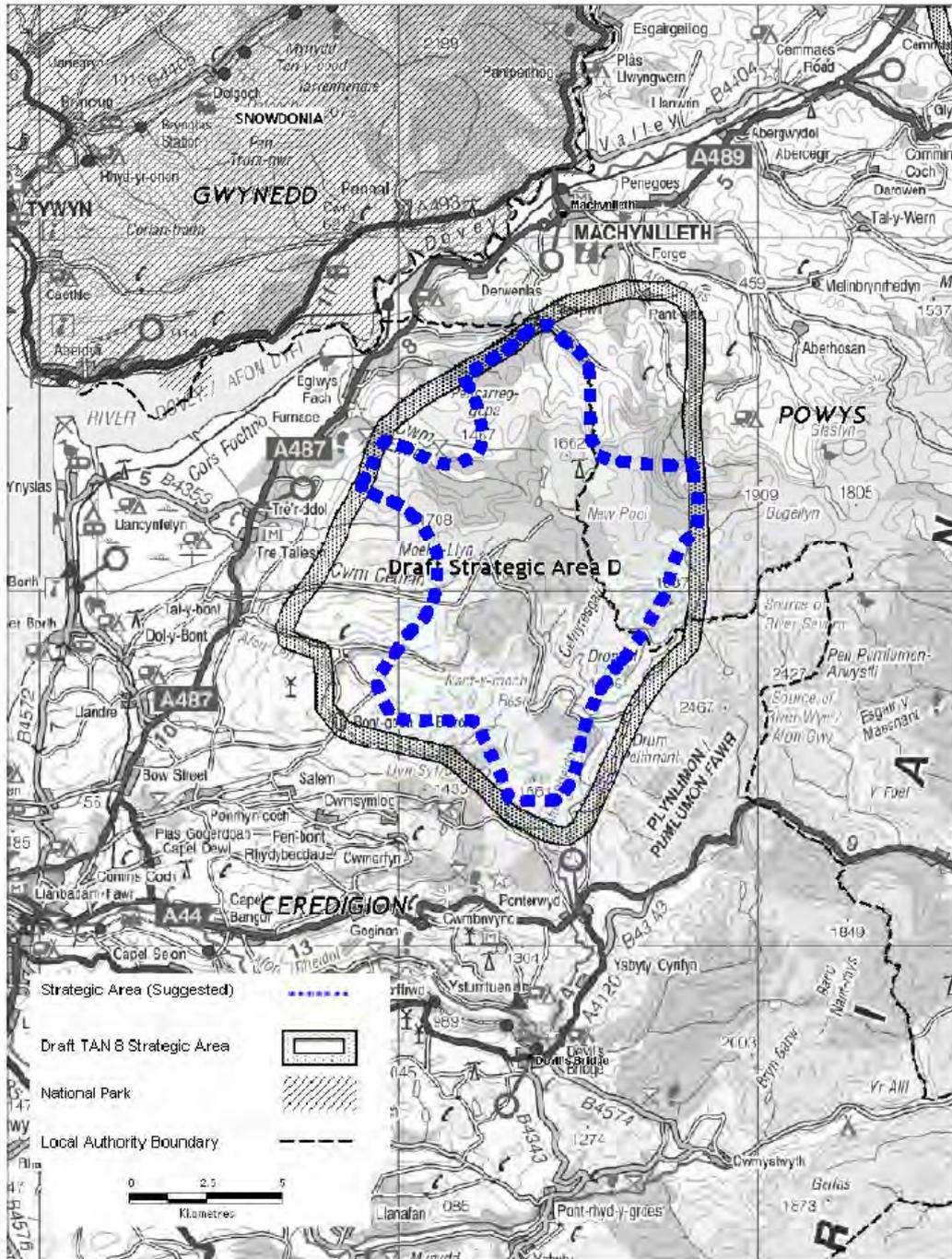
Boundaries to be refined by Local Planning Authorities
Scope to increase SSA has been identified to the south-east and west

SUGGESTED SSAs FOR FINAL TAN 8 – AREA D NANT-Y-MOCH



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Area 4 of 7



Boundaries to be refined by Local Planning Authorities

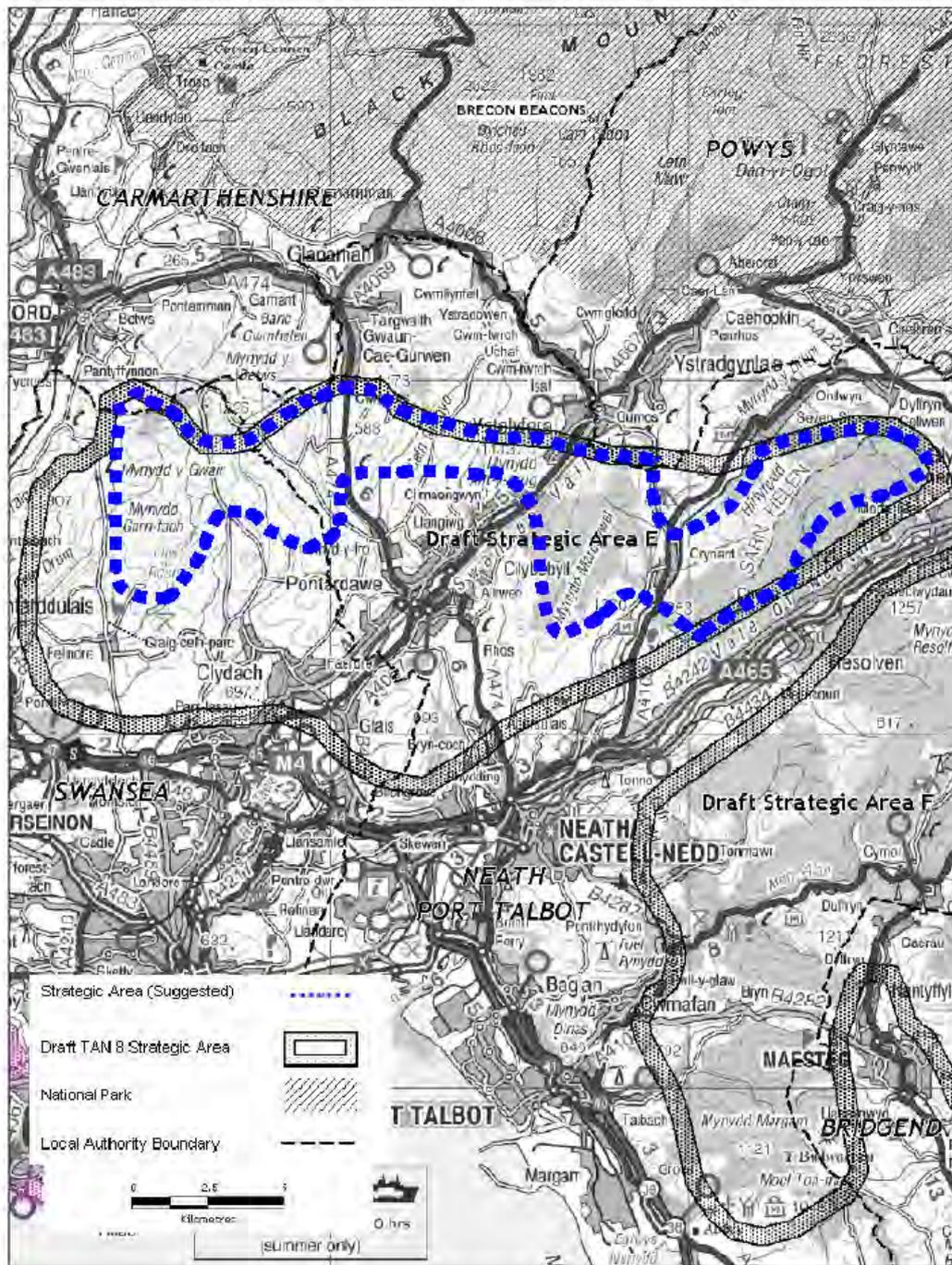
SUGGESTED SSAs FOR FINAL TAN 8 – AREA E PONTADAWE



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Area 5 of 7



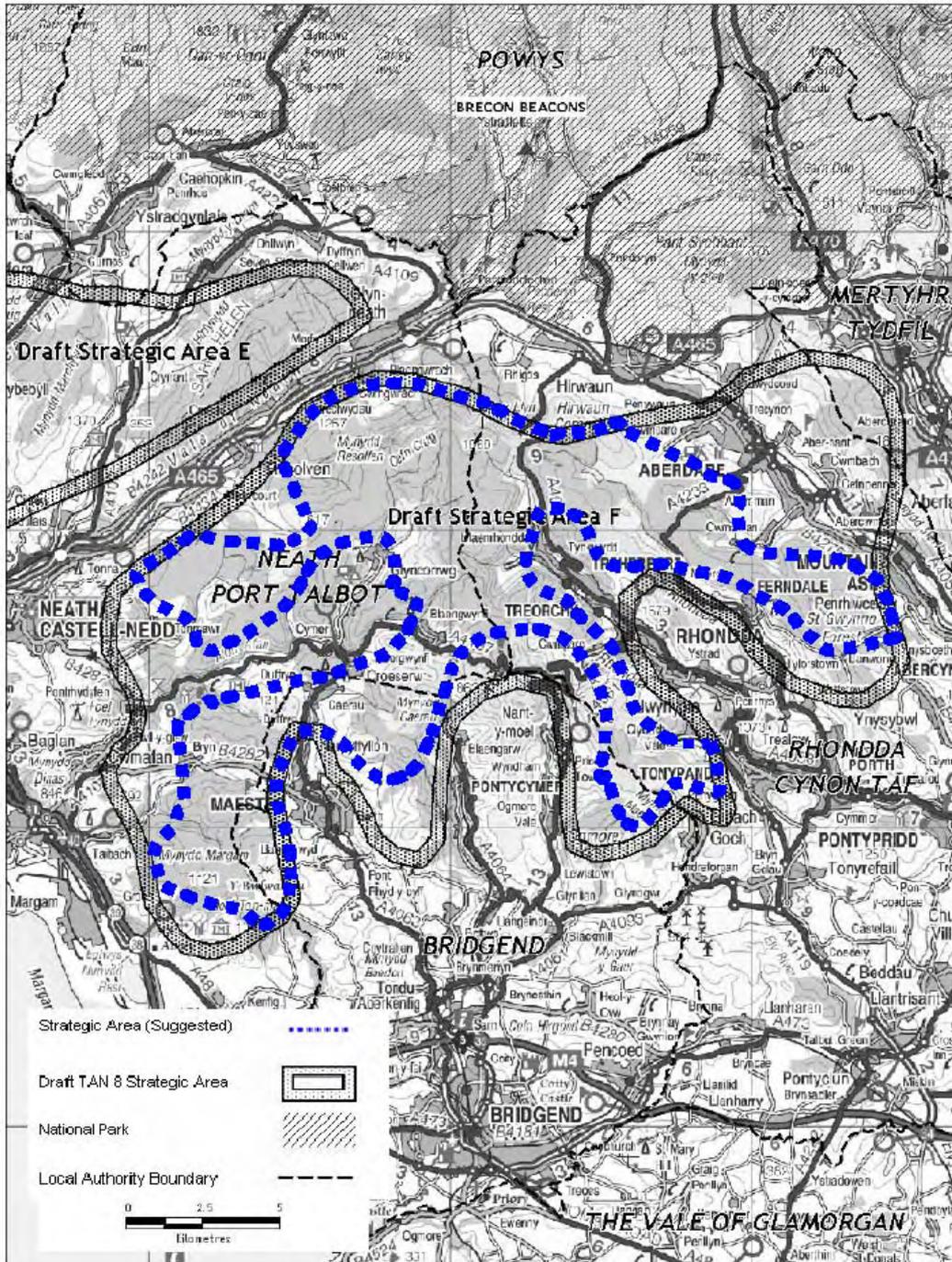
Boundaries to be refined by Local Planning Authorities
Scope to increase SSA has been identified to the north-west

SUGGESTED SSAs FOR FINAL TAN 8 – AREA F COED MORGANNWG



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Area 6 of 7



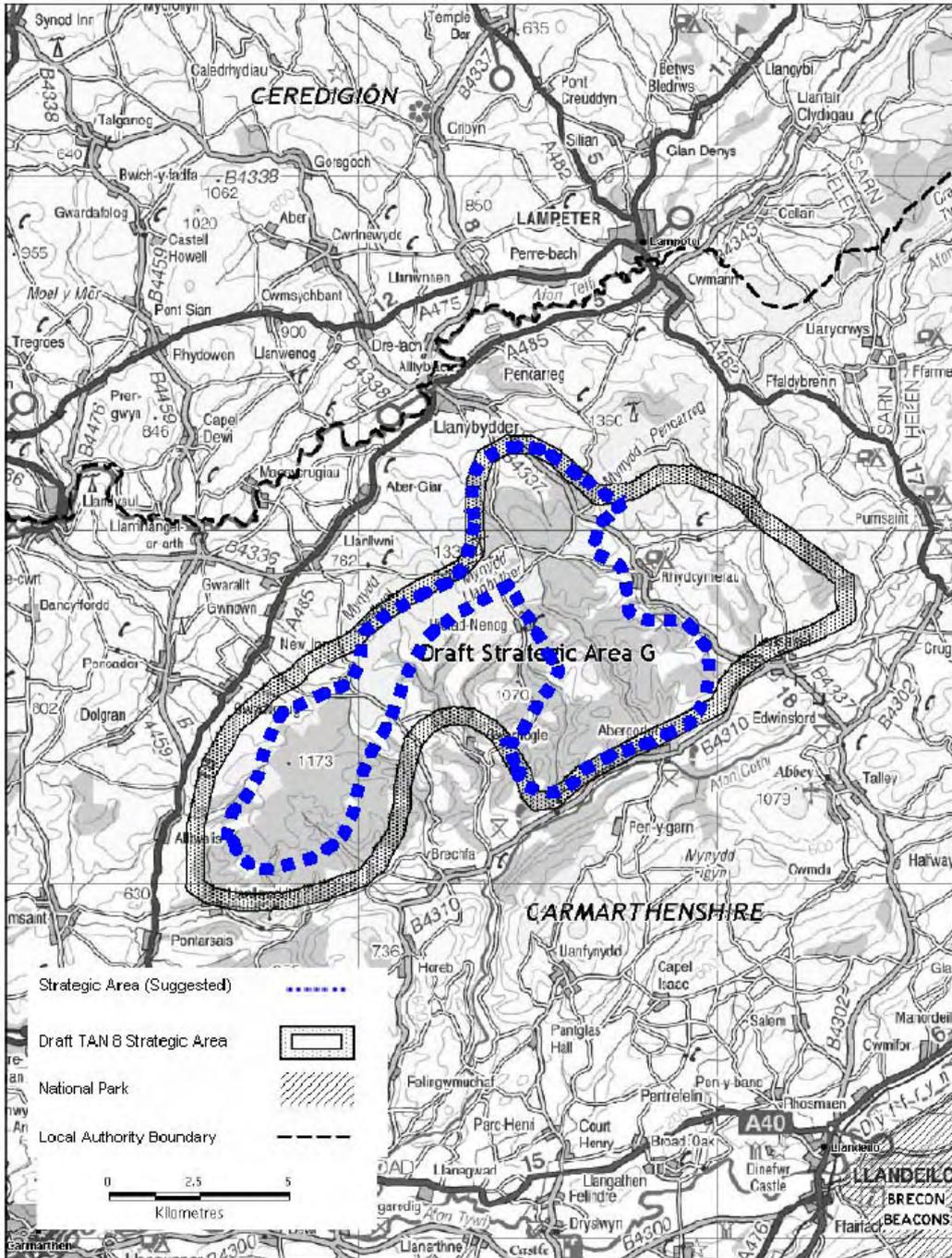
Boundaries to be refined by Local Planning Authorities
Further consultation will be necessary with NATS on developments proposed at the southern margins of SSA F

SUGGESTED SSAs FOR FINAL TAN 8 – AREA G BRECHFA FOREST



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Area 7 of 7



Boundaries to be refined by Local Planning Authorities
Scope to increase SSA has been identified to the north / north-east