4.0 VISUAL BASELINE

The following section details the analysis that was carried out to establish the relative visibility and visual sensitivity of different parts of Fife.

4.1 Visual Receptors

In a study of landscape capacity and cumulative landscape impacts, it is important to consider visibility, and the effects of cumulative impact on visual receptors. This not only feeds into the assessment of landscape sensitivity and capacity (see Section 2.2), but also builds up a picture of how visual receptors in and around Fife would perceive wind turbines within the Fife landscape.

The types of potentially sensitive visual receptors within Fife are broadly categorised into three groups, represented by the locations in brackets:

- Residents (dwellings and settlements)
- Travellers (roads, railway, paths and cycle routes)
- Visitors (visitor destinations and viewpoints)

Whilst there are working receptors in Fife, these have not been included, as it is common practice in LVIA that people at work are considered to be low sensitivity visual receptors

Based on desk study and site analysis, three groups of receptors were identified as follows:

- Settlements, representing concentrations of residential receptors;
- Routes, representing travelling receptors, and including the main motorway and A roads, railways, and long-distance footpaths and cycleways;
- Viewpoints, representing visitors, selected from popular walking destinations, visitor attractions, and viewpoints identified on OS maps, including several viewpoints outside Fife but within the study area. These viewpoints were selected with the agreement of the officers of Fife Council.

The locations of the settlements, routes, and viewpoints are illustrated on Figure 4.1. The assessment includes receptors in the study buffer area of 15km beyond the Fife boundary.

Individual residential properties are not included in the visibility mapping as this is a strategic level study. Nevertheless, the density and distribution of dwellings is noted where appropriate in the broad analysis of landscape character types.

4.2 Visibility Analysis

An assessment of visibility was made from the settlements, routes and viewpoints illustrated in Figure 4.1. This was carried out using a computer based technique in which

the intervisibility between receptors and landforms, or objects of specific heights on the landforms, is determined. Four different heights are used to represent common turbine height ranges. The more intervisibility, the greater the visual sensitivity is likely to be. The method is described in more detail in **Appendix 2**.

The extent of the visibility assessment was limited to a 15km radius from the receptors. In our experience, this is the distance within which the great majority of significant impacts from wind farms are likely to occur. Whilst it is recognised that impacts occur beyond this distance, up to 35km and beyond, as recognised by EIA best practice, this is not an EIA assessment and the results are considered to adequately distinguish between locations of potentially greater or lesser sensitivity.

Results of the visibility analysis are illustrated in Figures 4.2a-e to 4.4a-e (also in Appendix 2). The colours show the differences in visual sensitivity across Fife. Red colours indicate areas that are most visible from the greatest numbers of receptors, grading through orange, yellow and green to blue areas that are seen by fewest receptors and uncoloured areas that would not be seen at all.

4.2.1 Settlements

Figures 4.2a-e to 4.4a-e (see Appendix 2) show that the areas most likely to be seen from settlements are located along the northern and southern coasts of Fife and in the centre. In particular the areas opposite Edinburgh and Dundee are highlighted due to the large receptor numbers. For all heights of turbine the most sensitive location would be the Cullaloe Hills between Aberdour and Kirkcaldy, exposed not only to the view from Edinburgh but also from the main settlements in central Fife. In the northeast, hills above Balmerino and Newport as well as the Tentsmuir forest are visually sensitive for any height of turbine. The least visually sensitive areas stretch across the lowland areas between the M90 near Glenfarg across the Howe of Fife and Cupar towards Fife Ness and the East Neuk. This reflects screening by higher surrounding landforms and the much lower population lying within 15km of these areas.

In terms of landscape character types the most visually sensitive are the Upland landscapes. *Upland Foothills* are often prominently visible to areas of high population, being seen from cities across the Tay and Forth. The most sensitive area of all is southern part of the Cullaloe Hills (*Pronounced Volcanic Hills and Craigs* LCT) which is seen in close proximity to Edinburgh across the Forth, although the part directly north of this is screened for all but the largest turbines. The least visually sensitive are lowland areas lying between the Lomond Hills and Ochils foothills and areas towards Fife Ness including the *Lowland Sloping Farmland*. These areas are low lying and distant from population centres, forming an area of low visual sensitivity across the northern part of Fife.

4.2.2 Routes

The routes (Figures 4.3 a-e) show a similar pattern of visual sensitivity but with other areas being more emphasised. In particular the area lying north of the Forth between Kincardine and the Forth Bridges is highlighted. This is due to visibility from main roads and railways both north and south of the Firth of Forth. The visual sensitivity of the areas to the east of the Forth Bridge reflects the concentration of transport routes through southern and central

Fife as well as the Fife Coastal path. The hills to the south of the Tay are visually sensitive due to the routes heading to Dundee and through Fife across to the Tay Bridge.

The most visually sensitive landscape types are again the uplands, seen prominently from many roads and railway lines. However some of the *Lowland Hills and Valleys* areas are also visually sensitive, particularly towards Kincardine and amongst the settlements of Fife. The least sensitive areas are similar to the settlements, being the lowland areas across the middle of northern Fife. A number of small pockets in the shadow of upland areas are also notable (west of the Cleish Hills; north of the Lomond and Cullaloe Hills) and some of the Dens.

4.2.3 Viewpoints

The viewpoints tell a different story (Figures 4.4 a-e). This is because they relate less to centres of population and more to available views. On the basis of the viewpoints selected, by far the most visually sensitive area is around the M90 corridor between Dunfermline and Cowdenbeath. There are also areas of greater sensitivity around some of the lowland areas in central and northern Fife including around Glenrothes, St Andrews and Cupar. The least sensitive areas are on the periphery, although this may reflect the distribution of viewpoints selected beyond Fife.

The most visually sensitive landscape types are the central lowland areas, both when viewed from key upland viewpoints and also from locations within. The least sensitive types are the valley and coastal landscapes.

4.2.4 Analysis of Visibility

The visibility analysis confirms empirical observations of visual sensitivity across Fife, ie that it is the areas of higher topography and close to population areas that have the highest visual sensitivity. However it gives a more refined and nuanced assessment, determining which geographical areas are the most and least visually sensitive.

Based on the computer assessment and on observation, the following areas are potentially of highest visual sensitivity, a factor that will have a bearing on their capacity for wind turbine development:

- The southern Cullaloe Hills Pronounced Volcanic Hills and Craigs between Aberdour and Kinghorn and Largo Law to the east;
- The Upland Foothills on the north coast opposite Dundee;
- The lowlands and coastal areas between Kincardine and the Forth Bridge, particularly near Kincardine;
- The M90/A92 corridor between Dunfermline and Cowdenbeath including surrounding lowlands, hills and towns;
- The Uplands and Upland Slopes where facing settlements and routes.

Areas with lowest visibility (and therefore potentially less visually sensitive) include:

- Much of north central Fife lowlands between Kinross and Cupar;
- Much of the eastern part of Fife between St Andrews, Fife Ness and the East Neuk;
- Glacial meltwater valleys and Dens;
- Some areas in the lee of uplands.



5.0 WIND TURBINES IN THE STUDY AREA

The following section lists and describes the operating, consented and proposed wind turbine developments in the study area at end of April 2013. Following this there is a discussion of the factors involved in windfarm location, size design and distribution that affect landscape, visual and cumulative impacts.

5.1 Turbine Distribution

The study area, for the purposes of visibility, and landscape and visual impacts of turbines includes Fife, plus a 15km buffer around its boundary, taking in the south of Angus, Dundee, southern Perth and Kinross, the whole of Clackmannanshire, the east edge of Stirling, and parts of Falkirk, West Lothian, Edinburgh, together with small parts of Midlothian and East Lothian.

Consented and proposed wind energy developments within the study area are listed, together with details (where available) of location, number and height of turbines, etc, in Appendix 4. The locations are shown in Figure 5.1 (Fife) and 5.2 (whole study area). The turbines have been listed in four height categories:

- Small Under 25m
- Medium 25 to <50m
- Large 50 to <100m
- Very Large 100m+

The reasoning behind this size categorisation is explained further in 5.3.1 and Table 5.2 of this chapter.

At April 2013 there were within Fife a total of 78 turbines 25m and taller that are consented and 36 that are planning applications pending a decision. This includes the largest turbine at Methil, which is under S36 application and approval.

Of those permitted, 30 turbines are in groups of 2 or more and of those pending consideration/approval 33 turbines are in groups. None of the groupings are larger than 9 in number. The rest of the turbines are single. The pie charts shown opposite show that the vast majority of 25m+ turbines consented are below 50m or over 100m. However in the applications there is a greater proportion of 100m+ turbines, reflected in a number of commercial windfarm applications for new sites or increased turbine heights on consented sites.

Within the 15km buffer area there are a further 11 sites recorded by SNH. This includes 4 operational wind farms or clusters; 3 consented proposals for single and pair of turbines and 3 applications. The greatest concentration within 15km of Fife lies in the Ochil Hills at Burnfoot Hill, Greenknowes and Lochelbank. On the other side of the Tay there are two 120m turbines in Dundee, 8 turbines at Ark Hill and a single turbine at Scotston in the Sidlaw Hills. There are a number of applications including two adjacent windfarms at

Frawney and Govals in the Sidlaws. To the south there are no consented developments within 15km, although there is one windfarm scoping proposal at Callander Estate near Falkirk. There are also a number at scoping/ pre-application stages but these are not counted for the purposes of this study.





Turbines Applications Pending



5.1.1 Operating and Consented Wind Turbines

Fife has a relatively small number of wind farms with large sized turbines, when compared to other areas in Scotland. The groupings are also at the smaller end of the range. In other parts of Scotland wind farms (such as the one at Clyde) can have over 150 x 125m high turbines.

Most of the consented commercial scale windfarms and large or very large turbines within Fife are located in the south, to the east of the M90 between the towns of Methil, Glenrothes, Kirkcaldy and Cowdenbeath. Three have 5 or more turbines: 5×110 m turbines at Westfield OCCS; 8×120 m at Earlseat and 9×125 m at Little Raith. Three turbines over 100m height have been consented at Clentrie farm 2km east of Little Raith since the last assessment was undertaken in November 2012. Mossmorran 1km south of Little Raith has two consented 100m turbines and there is an application to increase the height of these to 125m, with an application for a further turbine of a similar size adjacent to these.

Two single very large turbines (110m), and a large turbine (87m) have been approved in Strathore to the south of Glenrothes and a 196m high turbine, the largest onshore turbine in Scotland, has been consented at Methil Docks.

The only significant consent outside the south Fife area is for three 67m turbines recently consented at Bonerbo in the East Neuk landward area.

The nine turbines at Little Raith and four of the five Westfield turbines have recently been built. A 100m turbine at Pitreavie south of Dunfermline has been in operation for a number of years.

The other consented and operational projects within Fife comprise single or small groups of small, medium or large size turbines located throughout the local authority area.

5.1.2 Windfarm Applications

At 1st April 2013 there are four windfarm proposals at a planning application stage in Fife. None are greater than six in number. Two groups of the taller turbines are located in the south of Fife around Cowdenbeath (including the application for increased height turbines at Mossmorran). The remaining two taller groups are at Kenly and Lingo in the East Neuk, south of St Andrews. These have been refused and are currently being considered at appeal. Fife Council is also aware of emerging proposals for wind farms in the Cleish Hills area at Oath Muir and at Blairadam forest. These developments are still at pre-application stages and have therefore not been considered in the context of this study, Proposals for offshore wind farms have also been submitted to the Scottish Government. These developments are still at an early stage of development and fall outwith the remit of this onshore wind energy study. Therefore they have not been considered in this study and would have to be assessed separately.

5.1.3 Pattern of development

Together with the operational and consented projects, a clear pattern of potential wind power development emerges, with the largest turbines and groups located in the lowland areas around the principal towns and towards the east coast, all south of the Eden Valley. Smaller and single turbines are located in some other upland and lowland areas, but there are very few or no developments in the highest uplands and the coastal areas.

5.2 Landscape Character of Turbine Locations

Within Fife, most of the operating, consented and planning applications for wind farms/ turbines are within lowland landscapes. Many, including the four groups of very large turbines, are located in the *Lowland Hills and Valleys*, with the other largest within the *Lowland River Basin*. One consented development for 3 very large turbines at Clentrie lies just within the neighbouring *Pronounced Volcanic Hills and Craigs*. Table 5.1 below lists the individual developments relative to their locations.

 Table
 5.1:
 Turbine
 Location
 and
 Heights
 in
 Relation
 to
 Landscape
 Character

 (April
 2013)
 (Turbine
 Height:
 pink=very
 large;
 orange=large;
 yellow=medium
 –
 see

 Appendix 4 for more details)

LOWLAND LANDSCAPES	VOLCANIC UPLAND LANDSCAPES	COASTAL LANDSCAPES								
Operating/ Under Construction/ Consented										
Earlseat Farm, Kirkcaldy	Clentrie Farm, Auchtertool									
Land West of Mossmorran, Fife										
Strathore Farm, Strathore										
Skeddoway Farm, Strathore										
Westfield OCCS										
Little Raith Farm, Auchtertool										
Kirkton Farm, Dunfermline	Lumbennie Hill, Pitcairlie									
Bonerbo, Drumrack Farms										
Pitbladdo Farm, North Of Cupar										
Farmhouse Balhouffie, Anstruther	Belliston Farm, Leven	Fliskmillan Farmhouse,								
Kirkmay Farm, Crail	Drumcarro, Cupar	Cupar								
Lacesston Farm, Gateside	Pitmedden Farm, Cupar									
Lordscairnie Farm, Lordscairnie	Higham Farm, Cupar									
Rossie Farm, Newburgh	Kirkton Of Beath Farm,									
Wester Bucklyvie, Crossgates	Cowdenbeath									
Lathrisk, Newton Of Falkland	Raith Estate, Kirkcaldy									
Muirhead Farm, Muirhead	Tank House, Milesmark									
Nethermyres Farm	Langside Farmhouse, Langside									
Newton Of Kingsdale, Leven	Newbigging Farm, Newbigging									
Overton Lodge, Tulliallan	North Baldutho Farm, Anstruther									
Peikie Cottage, West Of Boarhills	Cassingray Farm, Largoward									
Wester Kilwhiss Farm	Pitkinnie Farm									
Westhall, Cupar	Redclouds, North Of Kennoway									
	Steelend Farm, Dunfermline									
	Windmill House, Drumcarro									

LOWLAND LANDSCAPES	VOLCANIC UPLAND LANDSCAPES	COASTAL LANDSCAPES
Planning Application		
Bogside Farm, Alloa		
Goathill Quarry, Easter Bucklyvie		
Kenly Farms, West Of Boarhills		
Land West of Mossmorran, Fife		
Balbeggie Avenue, Balbeggie		
Halbeath Roundabout		
Lingo Farm, Lingo		
Strathore Farm, Strathore		
Skeddoway Farm, Strathore		
Airdrie Farm, Lochton	Carriston Farm Star, Glenrothes	
Cornceres Farm, Cornceres		
Demperston Farmhouse,		
Demperston		
Lower Melville Wood		
Lady Helen Road, Dundonald		
Tulliallan Concrete Works, Alloa		
Balgownie Farm, North Of Culross	Muirhouses, Leven	
Grantsmuir Farmhouse, Balbeggie	Killernie Farm, Killernie	
Lochhead Quarry, Dunfermline	Easter Pitscottie Farm, Cupar	
Wester Balbeggie Farm, Balbeggie	Lathalmond Farm, Dunfermline	

This tendency towards lowland landscapes can be explained by the extent of lowland landscapes within Fife and partly by the existing SPG. In much of Scotland, upland areas offer a larger-scale landscape, which can accommodate larger turbines and it is rational to locate turbines in open, high and prominent areas to take advantage of higher wind speeds. Conversely, upland areas often represent "unspoiled" landscapes, with few overtly man-made features, and the construction of wind turbines could be seen as an unwelcome industrial addition. In Fife the largest scale upland types are limited in extent compared with much of Scotland, and prominently visible from surrounding lowlands and coasts. This means that any significant wind energy development would have a very significant effect.

Coastal landscape areas are often of open, simple character and visible from both inland and from the coastal settlements and areas outwith Fife.

In lowland areas, the scale and pattern of the landscape is generally smaller, meaning that the largest windfarms and turbines can appear incongruous, particularly given the greater array of "reference features" available with which to compare them. Together with the proximity of settlements and properties there are clear sensitivities in such landscapes. Nevertheless, a location within the lowland area better reflects the relationship between energy production and the consumer, as well as generally being easier to service in terms of both access and connection to the electricity grid. None of the consented or proposed windfarms in Fife are of the extent and size often seen in upland areas elsewhere in Scotland.

5.3 Factors Affecting Landscape and Visual Impacts of Wind Turbines

There are a number of overlapping and interacting factors which affect the potential landscape and visual effects of wind turbines. The three main turbine factors are:

- Size of turbine (also type/ design/ colour)
- Numbers of turbines (within groups and/ or single turbines spread across an area)
- Distribution of turbine groupings (spacing between groups and/or single turbines)

The effects of these factors will in turn differ depending on the character of the landscape in which the turbines are located.

5.3.1 Turbine Size

Turbine size is the first factor to consider in assessing the impacts of wind turbines. In particular, smaller turbines are considered to be more appropriate in lowland landscapes, which are usually more complex and varied than uplands, and where there are generally smaller scale features such as trees and buildings that provide a 'scale reference' against a turbine. Conversely, upland landscapes are generally simpler in character, larger in scale and there are fewer human scale reference features, meaning that larger turbines are more easily accommodated (see SNH guidance, 2009).

In this study we have mapped four size categories which would have differing relationships with the scale and character of the landscape and with one another. These are listed in Table 5.2 below.

Table 5.2. Turbine Size Categories

Size Category	Blade Tip Height	Typical Use
Small	Turbines less than 25m in height	Typically used for domestic and farm FiT schemes
Medium	Turbines 25m to <50m in height	Typically used for farm and industrial FiT schemes
Large	Turbines 50m to <100m in height	Single turbine FiT schemes and smaller turbines used in commercial schemes
Very Large	Turbines 100m in height and greater.	Most commercial windfarms

Turbine size for installed or consented commercial windfarms in Scotland varies from ca. 55m to blade tip to a current maximum of 147m. However, considerably smaller turbines are now commonly installed for the non-commercial scale proposals typical of recent Feed in Tariff (FiT) schemes. Current consents within the study area vary from many turbines of under 25m height on various domestic and farm FiT schemes to 125m at Little Raith, with an exceptional 196m for a demonstrator offshore turbine at Methil.

There is a significant range of available commercial turbines sizes. However even the smaller commercial turbines are very much larger than any other common vertical object in the landscape, such as a house or trees, with only electricity pylons (typically 25-50m tall) coming close in size. Even the medium size of turbine falls within this height bracket and is therefore much taller than most trees and buildings. Furthermore, by being kinetic structures, the visual prominence of turbines is increased relative to existing static features.

The small domestic scale turbines (<25m) are however closer to the heights of common visual references such as houses and trees and their landscape and visual impacts tend to be much more localised due to localised screening and backclothing by landforms and trees.

SNH considers that smaller turbines can be used to mitigate landscape impacts in a lowland situation with a smaller scale landscape pattern and scale indicators. As it has to be balanced against losses in output, size reduction should be used in specific cases where a clearly identified benefit can be achieved. The following are criteria by which this may be judged:

- mitigating significant landscape or visual impacts on a highly valued or sensitive receptor;
- avoiding an adverse scale relationship with a landform or other key landscape element or feature;
- allowing an intervening landform and/or forest to screen views of turbines from certain receptors; or
- achieving a significant reduction in overall visibility by virtue of relationship to surrounding landform and trees.

Where reduction in impact would be a matter of degree rather than a clear quantitative change the benefits are less clear cut.

SNH guidance also recommends that where two or more developments are in close proximity to one another, turbines of a similar size should be used. The use of significantly different turbine sizes within a single windfarm or between two windfarms in close proximity can otherwise lead to adverse visual and scale effects which increase the appearance of clutter, or create odd perspectives when seen from certain viewpoints.

5.3.2 Wind Energy Development Scales

There is no current 'accepted' classification of the scale commercial windfarms in Scotland. Existing and proposed wind energy developments vary in turbine numbers and turbine

sizes; from single small turbines to over 200 very large turbines. Individual turbines vary in size from below 25m to more than 140m, with maximum outputs from a few kW to greater than 3MW.

For the purposes of this study, it is worth considering the wider Scottish context of wind energy development. Table 5.3 below refers to small, medium, large etc. scale wind energy developments. For clarity we have adopted wind energy development scale categories related wherever possible to published guidance or planning application procedures. The 20MW size above which SPG/ SPP principally applies is shown in the table.

The wind energy developments in Fife are all at the smaller end of the range. The largest windfarm, consented or proposed, within the study area is Little Raith with 9 x125m turbines at 25MW. This is at the lower end of 'medium' in Table 5.3, and reflects the restrictions inherent in the Fife landscape.

Table 5.3. Wind Energy Development Scale Categories

Scale Category	Scale Criteria	Planning Criteria/ Illustrative Examples										
Small	A development of 3 or fewer turbines.	As defined by SNH guidance on assessment of small scale wind energy development (<i>SNH 2012</i>)										
Small/Medium	A windfarm of more than 3 turbines up to 20MW output	Windfarms above 20MW are required to be covered by SPG in SPP6 Annex A. <i>Eg. Between 4 turbines over 50m and</i> <i>10x2MW turbines or 6x3MW turbines</i>										
SPG 'Cutoff' 20MW												
Medium	A windfarm between 20MW and 50MW output	Windfarms up to 50MW are dealt with as local planning authority applications. <i>Eg. Between 7x3MW and 16x3MW</i> <i>turbines</i>										
Large	Windfarms greater than 50MW output	Windfarms over 50MW are section 36 Applications dealt with by Scottish Ministers. A minimum size of 20x2.5MW or 17x3MW turbines										
Very Large	Windfarms greater than 100MW output	A minimum size of 50 turbines over 100m tall										





- Fife Local Authority Boundary
- Fife Local Authority Boundary 15km Buffer
- Scottish Local Authority Boundaries
- Landscape Character Areas

Status, Height

- △ Existing / Consented, Unknown Height
- ▲ Existing / Consented, Cat 1: 0 to <25m
- ▲ Existing / Consented, Cat 2: 25 to <50m
- ▲ Existing / Consented, Cat 3: 50 to <100m
- ▲ Existing / Consented, Cat 4: 100m+
- O Application, Unknown Height
- Application, Cat 1: 0 to <25m
- Application, Cat 2: 25 to <50m</p>
- Application, Cat 3: 50 to <100m
- Application, Cat 4: 100m+



CODE

LANDSCAPE CHARACTER TYPES

5.3.3 Turbine Numbers and Landscape Impacts

Wind turbines considered out of their landscape context are usually simple, aerodynamic and functional structures that many consider to have a clear aesthetic of 'form following function' in their design. Landscape and visual impact issues relate primarily to their scale and potential incongruity in a landscape rather than to the aesthetics of the turbine design. In this case, the number of turbines in a wind energy development has a bearing on the visual image of the development that extends well beyond the proportion of a landscape area that is covered:

- Small clusters of turbines still express the aesthetics of the individual turbines and the blade movement of each turbine is discernible. The cluster is seen as a discrete item within a landscape, becoming a significant feature but generally not dominating or changing the character of a large area.
- In large groupings of turbines there is area coverage of the landscape, rather than a discrete grouping. The individual turbines usually become lost in a mass, blade movements are perceived across the whole area and there is a more 'cluttered' appearance.
- As turbine numbers increase it is increasingly difficult to design a wind energy development such that overlap and clustered alignments are avoided when seen from surrounding viewpoints. Design mitigation becomes a matter of avoiding excessive clutter, skylining and proximity to sensitive receptors rather than creating aesthetically balanced groupings

It is recognised that these qualities grade into one another depending on the exact size of development (eg. 3, 6, 12, 20, 50, 100+ turbines) and on how the turbines are grouped (eg. in mass groupings or in lines along ridges). Nevertheless, to the extent that they are more easily contained and definable, smaller windfarms would have a disproportionately lesser influence on the landscape than large windfarms and are less likely to dominate areas and blur boundaries between landscape types.

In small groupings, odd numbers of turbines (ie 1, 3 or 5) usually present a more balanced composition than even numbers, unless there is a strong regular pattern or line in the landscape to which the turbines can be related.

In the study area there are predominantly lowland, coastal and distinctively formed upland landscapes to which the larger size of development would be unsuited. To date the pattern of proposals has adhered to this with the largest windfarm containing 9 turbines and many schemes with single turbines.

5.4 Turbine Layout

Another factor to be considered is the layout of turbines within a windfarm. Whilst the optimum layout, including turbine separation distances and position in relation to the prevailing wind will relate to maximising output, there will be other practicalities. Thus turbine layout may vary according to turbine numbers, the availability of land, topography,

access and numerous environmental constraints. Once these factors have been taken into consideration the overall aesthetic of the windfarm can be considered.

Layouts will relate to landforms and patterns in the landscape as well as the need to present a coherent image from the surrounding viewpoints. Thus in lowland landscapes with a strong geometric pattern the turbines may be organised in lines of a grid, whereas in the case of a distinct landform such as a ridge or coastline they may be arranged in a curved line following the landform. In upland landscapes turbines may be arranged in a more organic pattern, following ridgelines or clustered around rounded hilltops. Attention should be paid to the relationship of outer turbines in large groups ensuring that there are no 'outliers' creating an untidy or disorganised appearance.

When two or more developments are in close proximity or a windfarm is being expanded there can be cumulative issues relating to site layout if these are clearly contrasting (eg. a geometric layout adjacent to an organic layout). Such developments should be designed to achieve a harmonious layout and relationship.

5.5 Windfarm Distribution

5.5.1 Pattern of Windfarm Development

When considering cumulative impacts of turbines and windfarms it is not just the number of turbines in the landscape that affects impacts but also the pattern of development. This has an effect on the ability of the landscape to absorb change and on visual receptors. The dispersal of the turbines in small groups has some advantages in that each grouping is less dominant within the landscape and presents a less cluttered visual image. There is also less likelihood of 'swamping' landscapes and blurring the boundaries between different landscape types and features if there are distinct gaps between clusters of wind turbines. However, the increased number of windfarms or turbine and at closer proximity than if the turbines were concentrated into fewer locations.

The emerging trend in Scotland is for the concentration of wind turbines into fewer, larger, windfarms. This arises initially via large windfarm proposals and then through the later extension of many existing windfarms. The pattern may also play out on a wider regional scale or 'clusters and spaces' where groups of windfarms lie within large areas separated by significant areas without turbines.

The cluster and space pattern has become slightly diluted by the recent proliferation of smaller FiT schemes and single turbines which relate more to the location of small scale consumers than to regional landscapes.

The pattern of existing and proposed development in Fife does not so clearly reflect the trend for larger windfarms and clusters prevalent in areas such as South Lanarkshire or Scottish Borders. It does however show a trend towards locating turbines in lowland areas and particularly in south/ central Fife. It also shows the more scattered distribution of smaller turbines typical of FiT projects.

5.5.2 Separation Distances between Turbines and Windfarms

Separation distance between turbines and windfarms has a bearing on how they are perceived together and within the landscape, particularly in relation to defining the limits of cumulative development. Whilst a clear visual separation between two or more windfarms may be achieved by a certain physical distance, this distance would depend on the size and number of the turbines or windfarms, the type of landscape(s) in which they are located and the degree to which they affect the character of the landscape.

Considering this in simple terms, turbines have both a direct effect on the landscape in which they lie and an indirect effect on the surrounding area. Therefore, although two turbines or windfarms may be separated by some distance and seen as clearly separate, the landscape in which they lie may be considered to be dominated by turbines. Only beyond a certain distance would the intervening landscape be considered to retain its original character, separating the two turbine dominated landscapes areas.

Table 2.1 develops this concept further by considering the effects of multiple wind energy developments and describes cumulative development thresholds. Further to a capacity assessment, an acceptable level of development within a landscape area may be agreed (eg. *Landscape with Occasional Wind Turbines* or *Wind Turbine Landscape*). The accepted level of development would then be achieved by a combination of turbine sizes, windfarm sizes and separation distances between groupings, relating to the scale and character of the landscape (ie its capacity for that degree of development).

As an example a large scale upland plateau landscape accommodating a number of windfarms would be considered a *Wind Turbine Landscape* if the windfarms are large or very large, the topography is subordinate in scale to the turbines and the windfarms are separated by distances less than their typical extents. If the topography has a relief that is clearly greater than the turbine heights, and/or the windfarms are smaller and the separation between the windfarms is clearly greater than their extents, the landscape may be considered a *Landscape with Wind Turbines*. Finally a lowland landscape which is small in scale, with many small scale reference features, may easily be dominated by wind turbines. In this case the objective may be to limit development to a *Landscape with Occasional Wind Turbines* by allowing only small clusters of smaller turbines separated by substantial distances and with cumulative visibility reduced by localised tree or landform screening.

In each case different scales and patterns of landscape and development would require different turbine sizes, groupings and separation distances to lead to a particular windfarm landscape type. Such an approach has been adopted in this study and sizes and separation distances are recommended and explained in the following chapter.

5.5.3 Distribution in Relation to Landscape Type

As discussed above, some landscape types have less capacity for development than others. In this case it would be appropriate to consider the relative merits of guiding development to the areas most capable of accommodating development, or to directing different types and scales of development to the areas most suited to each. Subject to the specific impacts of any particular proposal, this would reduce the potential for the most significant and adverse landscape impacts. It would also restrict the wind turbine landscape typologies to a more narrowly defined range of landscapes, thereby reducing the perception of unplanned proliferation of wind farms throughout a local authority area.

In Fife operational and consented developments have largely been located in lowland areas and are mainly of a smaller scale than prevails across Scotland. Further significant proposals are also mainly located in lowland landscapes. The consented and proposed developments in upland areas have single or low numbers of turbines of a significantly smaller size. There are almost no consents or proposals in the coastal areas and highest uplands.

In strategic terms the established and evolving pattern of development should be taken into consideration as it reflects a clear rationale driven partly by landscape, visual and amenity issues (sensitive or valuable landscapes, proximity to settlements and recreational areas) and partly by technical issues (available land, available grid capacity, wind speed). This suggests that the number, size and distribution of further development should be considered very carefully in order to maintain differences in character between the uplands, the coast and the lowlands.

Also, in accordance with guidance *Designing Windfarms in the Landscape* (SNH, 2009), consideration should be given to preserving areas in which no, or negligible, development is currently consented. These can provide significant gaps between clusters of wind turbines in which their visual influence is minimal. This again will reinforce distinctiveness between landscapes.

6.0 ASSESSMENT OF LANDSCAPE CAPACITY AND CUMULATIVE IMPACTS

6.1 Assessment Purpose and Process

The purpose of the following assessment is to determine the capacity of the Fife landscape to accommodate wind turbine development and to determine what levels of cumulative development would be acceptable across Fife. The assessment also takes into account the level of cumulative development that already exists within and around Fife and is based on the premise that current renewable energy policies will lead to an inevitable level of landscape change within Fife that requires careful management.

The assessment involves four stages:

- Firstly assessing the inherent capacity of the Fife landscape to accommodate wind turbine development;
- 2) Secondly, assessing the degree of cumulative change resulting from operating and consented wind turbines in the study area and in Fife;
- Thirdly, assessing the extent to which cumulative consented development has reached the limit of the landscape's capacity to acceptably accommodate wind energy developments.
- 4) Finally, assessing the level of further development that could acceptably be accommodated within areas of Fife. This includes, where appropriate, commentary on the likely acceptability of currently proposed wind turbines.

An assessment methodology is given in Chapter 2 and further detailed in **Appendix 2**. The assessment and its findings are summarised in **Table 6.1** overleaf and **Figures 6.1 to 6.4**.

 Table 6.1 is divided into ten columns which summarise the assessment and guidance. The assessment works from left to right:

- The LCTs (and where necessary the LCUs) are listed in column 1.
- The assessment of sensitivity and value of each LCT/ LCU is summarised in columns 2-5 (derived from the detailed assessment shown in tabulated form in **Appendix 5**).
- Further to the sensitivity/ value assessment the landscape capacity for different turbine size categories is shown in column 6 of the table. This is mapped as a composite landscape capacity map in Figure 6.1. This represents the inherent capacity of the landscape for wind energy development and does not take into account the cumulative effects of existing/ consented wind energy development.
- Column 7 is an assessment of the current level of cumulative change based on the distribution of existing and consented wind energy developments as detailed in chapter 5. The extent of wind turbine landscape types (as described in **Table 2.1** above) is noted in Table 6.1 and shown as a map in **Figure 6.2**.
- Column 8 details proposed limits to future development. This is derived from a consideration of the inherent landscape capacity. The cumulative landscape effects

that would result from this are illustrated in **Figure 6.3** as a map of wind turbine landscape types.

 Guidance on wind turbine sizes, numbers and distribution is given in column 9. The purpose of this is to assist in managing future wind energy development to the proposed acceptable limit.

This assessment is carried out for each of the 15 LCTs in Fife. Where there are significant variations in sensitivity or capacity within the LCT across Fife the relevant LCUs are given a separate assessment. The LCTs are grouped into the three main regional landscape areas of Fife. Table 6.1 is split into these three groupings, each one of which is followed by an overall assessment of capacity and cumulative effects for the relevant regional landscape areas:

- 1) Volcanic Uplands of the Midland Valley;
- 2) Midland Valley Lowland Landscapes;
- 3) Midland Valley Coastal Landscapes.

6.2 Guidance

Table 6.1 gives guidance on turbine sizes, cluster sizes and separation between groups of turbines for each landscape type that would limit cumulative development to the proposed acceptable level. This relates to turbines of medium, large and very large size. As highlighted in 2.7, guidance on small turbines, below 25m to blade tip, applies at a local level and is generic.

Section 5.3 to 5.5 of this report contains detailed discussion of how turbine size, group size and group separation affects perceptions of wind energy and landscape character. Further guidance is given in SNH's *Siting and Designing Windfarms* publication. The following briefly outlines the main considerations in developing the specific guidance for this assessment given in Table 6.1.

6.2.1 Turbine Size

The guidance on turbine sizes generally relates most clearly to the horizontal and vertical scale of the landscape; complexity of landscape pattern and the presence or absence of smaller scale features and elements such as trees and houses.

Medium size turbines are most able to be accommodated in smaller scale landscapes with more complex patterns and smaller scale reference features. Very large turbines are generally more appropriate to larger scale landscapes with simpler landforms and fewer small scale references. Smaller turbine sizes may also be accommodated in such landscape types, although are generally less appropriate, and their proximity to larger size turbines would need to be carefully controlled.

The largest scale upland landscapes in Fife are relatively restricted in extent and other factors restrict their capacity. However many of the lowland types are of medium to large scale with a simple landform and pattern and can accommodate larger turbines.

6.2.2 Turbine Group Size

Turbine group sizes relate to scale and complexity of the landscape, particularly to landform and pattern. In general larger scale more simple landscapes with gentle landforms and simpler patterns can accommodate larger groups of turbines, subject to having the physical capacity (ie. available area). In the case of Fife there are no extensive areas with large scale and simple landform and pattern comparable to the upland in other parts of Scotland which have accommodated the largest windfarms.

6.2.3 Separation between Turbine Groups

Turbine size and group size can be generically related to landscape character when applied to a single turbine or windfarm, or across a number of windfarms. However, separation between groups of turbines is the single most important factor in controlling cumulative effects. This is because of the high prominence and extensive visibility of most turbines leading to effects on landscape character well beyond the turbine, as discussed in detail in 5.5.2. The guidance in Table 6.1 therefore gives approximate separation distances that should be applied between turbine groupings (including single turbines) in order to achieve the desired wind turbine landscape type. The main factors controlling the proposed separation distance are:

- 1) Proposed Wind Turbine Landscape Type: each proposed type detailed in Table 2.1 requires a different separation distance to achieve the landscape and visual criteria described.
- 2) Turbine Size: larger turbines require a greater separation than smaller turbines to achieve the same landscape type.
- 3) Group Size: larger groups of turbines require a greater separation distance to achieve the same landscape type.
- 4) Landscape Character Type: this has an effect on all the above factors. In terms of visibility, more open landscapes with modest landforms are likely to require greater separation distances, whereas landscapes with significant topography and woodland cover give the potential to reduce visibility. Factors such as scale and pattern can have a more subjective effect. The presence of other tall objects and of development also affects the perception of turbine development.

The distances given in Table 6.1 are approximate, relating primarily to (1) and (2) above as large groups are not proposed. Landscape character including topography is also important: where landforms are capable of visually separating turbine groups the distance between landforms is a consideration in setting distances. For example:

 in the Pronounced Volcanic Hills and Craigs where a Landscape with Occasional Turbines is the proposed limit, the separation distances are designed to ensure a degree of screening: a distance of 3-6km is the separation required to ensure that a significant landform separates groups of medium size turbines and 8-12km that the distance that the nearest large turbines, if seen above landforms, will be a minor feature in the view. In contrast the Lowland Hills and Valleys, where a Landscape with Turbines is the proposed limit, has lower landforms and large and very large turbines in larger groups are separated by 5-10km, such that they are likely to be partially inter-visible but nevertheless clearly separated.

In the case of small landscape units the separation distances for larger turbines might mean that, in theory, only one grouping would be comfortably accommodated within the area.

Separation distances also apply between a development in one landscape type and another in an adjacent type, or between turbines of different size categories. In such situations an average of the two recommended distances would be most appropriate.

In all cases the distances are an approximate range intended for guidance. Separation distances between specific proposals should be therefore be considered in more detail on a case by case basis.

6.2.4 Other Factors which Influence Guidance

The capacity assessment for some generic landscape types does not cover the variation found between or even within individual geographical units of that type. This is usually because of one or two key landscape factors which override the characteristics including:

- All or part of the unit is much more prominent and visible than the bulk of the area covered by the landscape type;
- A particularly small area is covered by the unit compared with the main areas of the landscape type;
- Some or all of the unit lies in an area designated to protect a landscape or setting of a town (eg. green belt);
- Close proximity to other more sensitive neighbouring units which would be significantly affected by wind energy proposals otherwise suitable for the type.
- Close proximity to other landscape types, settlements or industry which reduces the sensitivity of a unit or part of a unit compared with the bulk of the area covered by the landscape type.

A combination of any of these factors might alter the ability of a specific unit or part of a unit to accommodate the level of development considered acceptable to the type. The main areas are identified in Table 6.1 and Figures 6.1 to 6.4 but any specific development should be considered in more detail and assessed against local factors where appropriate.

Finally it is emphasised that this assessment is focused on landscape and visual issues. Areas which have been identified as suitable on this basis may be restricted by other unrelated factors such as protection of wildlife, proximity to dwellings, aviation restrictions or lack of grid connection. These potential constraints are not the subject of this assessment and are covered by Fife's wind energy planning guidance.

Table 6.1. Summary of Landscape Capacity, Cumulative Effects and Guidance for Wind Energy Development (See Figures 6.1 to 6.3 for Maps)

LANDSCAPE TYPE / UNIT	Landscape Character Sensitivity	Visual Sensitivity	Landscape Sensitivity	Landscape Value	LANI CAP (Rela turbi	DSCAP ACITY ated to ne size	PE \$)	WIND TURBINE LA	WIND TURBINE LANDSCAPE TYPES		GUIDANCE: Landscape Analysis and Comment on Currently Consented and Proposed Turbines
					М	L	VL	Consented	Proposed Limits to Development	Distances	
Key: No Capa	acity Lov	v Capacity (Medium Ca	apacity 🔵 Hi	gh Ca	pacity	1	Turbine Sizes: M = N	/ledium (25- <50m);	L = Large (50- <100m); V	′L = Very Large (100m+)
Volcanic Uplands o	f the Midland	Valley									
1. The Uplands (FFE1)	Medium/ High	High	High	Medium/ High	0	0	0	Uplands with no Wind Turbines	Uplands with no Wind Turbines	No turbines	Landscape Analysis: Most <i>Uplands</i> are relatively limited in area, open sloped, visually prominent within Fife and visible from distant locations as horizon features. Any turbine development would be prominent. These areas should be retained as a landscape with no turbines to provide spaces between surrounding lower areas with turbine development.
											consented and Proposed Turbines: No current consents or proposed applications in Lomond, Cleish or Benarty Hills.
Pitmedden LCU	Medium	Medium/ High	Medium/ High	Medium	0	0	0	Uplands with Occasional Wind Turbines	Uplands with Occasional Turbines	Turbine Sizes: 25-50m; 50- 100m Group Sizes: 1-3 (medium), 1 (large). Separation Distances: 2- 5km (medium); 4-8km (large)	 Landscape Analysis: Pitmedden is less distinctive than other Upland LCUs, with extensive forestry and is part of the Ochils, a larger range that extends west of Fife into Perth & Kinross. Could accommodate limited further development of medium turbines in clusters of 1-3 or a single large turbine. Turbines should be in association with existing buildings, pylons and backclothed by higher ground and/or trees. Consented and Proposed Turbines: Two existing medium turbines near farm buildings and one large turbine 2km north of this are within capacity. Current proposal for another large turbine to the south of the LCU may exceed capacity.
2. Upland Slopes (FFE2)	Medium/ High	High	High	Medium/ High	0	0	0	Upland Slopes with no Wind Turbines/ Occasional Wind Turbines	Upland Slopes with no Wind Turbines/ Occasional Wind Turbines	No turbines	Landscape Analysis: Most slope LCUs are integral with the landforms and character of the Uplands. Visually prominent and facing out from the hill ranges so very visible. Same guidance as for the Uplands LCU. Consented and Proposed Turbines: Three medium and one small turbine consented on the east side of the Lomond Hills. No further current consents or
3. Upland Foothills (FFE3)	Medium/ High	Medium/ High	Medium/ High	Medium/ High		0	0	Upland Foothills with no Wind Turbines/ Occasional Wind Turbines	Upland Foothills with Occasional Wind Turbines/ No Wind Turbines	Turbine Sizes: 25-50m Group Sizes: 1-3 Separation Distances: 3- 6km	applications Landscape Analysis: Most Upland Foothill LCUs are a visually prominent backdrop to lowland and coastal areas especially in north above Firth of Tay. Potential for very occasional small groups or single medium turbines sited in less prominent areas with landform/ tree backclothing. Discourage development of turbines on prominent ridge/ summit locations, particularly on skyline above Firth of Tay. Consented and Proposed Turbines: Several small and one medium turbine consented within or adjacent to the northern LCUs, which would not exceed capacity. No current applications.

LANDSCAPE TYPE / UNIT	Landscape Character Sensitivity	Visual Sensitivity	Landscape Sensitivity	Landscape Value	LAN CAP (Rela turbi	DSCAP ACITY ated to ine size	¥E €	WIND TURBINE LAN	WIND TURBINE LANDSCAPE TYPES		GUIDANCE: Landscape Analysis and Comment on Currently Consented and Proposed Turbines
					м	L	VL	Consented	Proposed Limits to Development	Distances	
Key: No Capacity Low Capacity Medium Capacity High Capacity Turbine Sizes: M = Medium (25- <50m):										L = Large (50- <100m); V	՝L = Very Large (100m+)
Cleish Foothills LCU	Medium	Medium/ High	Medium	Medium		0	0	Upland Foothills with Wind Turbines	Upland Foothills with Wind Turbines	Turbine Sizes: 25-50m Group Sizes: 1-5 Separation Distances: 2- 5km	Landscape Analysis: Cleish Foothills are backclothed by the main hills and have a more developed character and less sensitive location than the northern foothill areas. This includes current turbine development described below. Cleish Hills Uplands are a sensitive backdrop of relatively modest scale. No capacity for large or very large turbines, and only small turbines should be allowed in close proximity to the Uplands.
											Consented and Proposed Turbines: Several current development clusters of small and medium turbines are noticeable mainly at close proximity. Applications for four medium turbines in or adjacent to the LCU should remain in capacity. Allow adequate separation between turbines of different sizes.
4. Pronounced Volcanic Hills and Craigs (FFE4)	Medium	Medium/ High	Medium/ High	Medium/ High	0	0	0	PVHC with Occasional Wind turbines/ With Wind Turbines/ no Wind Turbines	PVHC with Occasional Wind Turbines/ With Wind Turbines/ no Wind Turbines	Turbine Sizes: 25-50m; 50- 100m Group Sizes: 1-3 (medium) and 1 (large). Separation Distances: 3- 6km (medium); 8-12km (large)	 Landscape Analysis: Very varied landscape with prominent irregularly spaced landforms. Cullaloe Hills unit is a backdrop to coastal settlements opposite Edinburgh. The type should be limited predominantly to a <i>Landscape with Occasional Wind Turbines</i>. Most developments should be medium turbines with only very occasional large turbines. Discourage close proximity of large turbines to the most prominent landforms and any turbines on summits of prominent landforms. Avoid southern part of Cullaloe Hills unit opposite Edinburgh. Consented and Proposed Turbines: Current development across most of this area is limited to occasional single/ paired small or medium turbines, with one large located above Cupar. Predominantly <i>PVHC with Occasional Wind Turbines</i>. Several medium turbines clustered around Largoward in the East Neuk Landward area Very large turbines on the edge of two LCUs adversely affect this type: at Westfield OOCS west of Glenrothes and Clentrie Farm on northern edge of Cullaloe Hills. Current proposals for further turbines may exceed capacity in localised areas such as Largoward. Proximity of very large turbines at Hill of Beath would exceed local capacity due to adverse scale effects in close proximity to this
											modest but prominent landform.
Largo Law, Elie LCUs	Medium	Medium/ High	Medium/ High	Medium/ High	0	0	$ \circ $	PVHC with No Wind turbines	PVHC with No Wind turbines	No turbines	Landscape Analysis: These small isolated units within other landscape types will have no capacity due to limited extent and local prominence.

TYPE / UNIT	Character Sensitivity	Sensitivity	Sensitivity	Value	CAP (Rela turbi	ACITY ated to ne size	:)		NDSCAPE ITPES	Turbine Sizes Max. Numbers in Group Min Group Separation	GUIDANCE: Landscape Analysis and Comment on Currently Consented and Proposed Turbines
					м	L	VL	Consented	Proposed Limits to Development	Distances	
Key: No Capacity Low Capacity Medium Capacity High Capacity Turbine Sizes: M = Medium (25- <50m); L = Large (50- <100m); VL = Very Large (100m+)											

Summary of Capacity and Cumulative Development in the Volcanic Uplands of the Midland Valley

The Volcanic Uplands comprise 4 landscape types: The Uplands; Upland Slopes; Upland Foothills and Pronounced Volcanic Hills and Craigs.

The Volcanic Upland landscape types in Fife have varied but generally limited capacity for wind turbine development. Most of the highest *Uplands* (FFE1) and the *Upland Slopes* (FFE2) have no capacity. This is because they are limited in area within Fife, visually distinctive in landform, with prominent skylines often visible from a distance and surrounded by lowlands with sensitive visual receptors. The Pitmedden area in the north is less distinctive and not prominent and therefore has limited capacity.

The Upland Foothills (FFE3) are more extensive in area and more complex and varied in form and pattern but also highly visually sensitive in places where they form distinctive horizons. These areas have a low capacity for development up to a medium size of turbine. The *Pronounced Volcanic Hills and Craigs* (FFE4) have the lowest elevation but are of a similar medium/large scale with a simpler landform over much of their area. They have the highest landscape capacity of the upland landscape types, although this is still limited.

Current development largely reflects increasing capacity as landform lowers. With the exception of the Pitmedden area and East Lomond slopes area there is no turbine development in the *Uplands* and *Upland Slopes*. There are a few small turbines in the *Upland Foothills* along the northern edge of Fife, but several clusters of small and medium turbines in the Cleish Foothills. There is scattered development of single small or medium turbines through much of the *Pronounced Volcanic Hills and Craigs* but extensive areas remain empty of turbines. Three limited areas within this type are affected by a higher density/size of development.

The very limited capacity in the majority of Uplands and Upland Slopes and on the crests of some Upland Foothills and Pronounced Volcanic Hills and Craigs amounts to significant areas that should not be developed for wind energy. Undeveloped areas would also provide gaps between the surrounding lower landscape areas that have more capacity for development, retaining landscape diversity in Fife. Development in the remaining areas of Uplands, Upland Foothills and Pronounced Volcanic Hills and Craigs should not exceed a Landscape with Occasional Wind Turbines. To stay within this type it would be possible only to accommodate small clusters of medium size and very occasional single larger turbines. The exception to this is the Cleish Foothills where the more developed landscape has the capacity to accommodate a Landscape with Wind Turbines, but with restrictions on turbine size and avoiding close proximity to the modestly elevated Cleish Hills skyline. Much of this capacity has already been taken up by the consented turbines.

There are current proposals for a few turbines are predominantly medium size. These would be largely accommodated in this framework in the *Uplands*, and *Upland Foothills* and across most areas of *Pronounced Volcanic Hills and Craigs*. However there are locations in which additional turbines or windfarms with very large turbines are proposed on the boundaries of these areas and may exceed the capacity.

LANDSCAPE TYPE / UNIT	Landscape Character Sensitivity	Visual Sensitivity	Landscape Sensitivity	Landscape Value	LANE CAP/ (Rela turbi	DSCAP ACITY Ited to ne size	E)	WIND TURBINE LAN	WIND TURBINE LANDSCAPE TYPES		GUIDANCE: Landscape Analysis and Comment on Currently Consented and Proposed Turbines
					М	L	VL	Consented	Proposed Limits to Development	Distances	
Key: ONo Capa	acity Low	/ Capacity	Medium Ca	apacity High	gh Cap	pacity	Т	Turbine Sizes: M = N	ledium (25- <50m);	L = Large (50- <100m); V	L = Very Large (100m+)
Midland Valley Low	/land Landsca	pes									
5. Lowland Hills and Valleys (FFE5) Cowdenbeath, Glenrothes, Kirkcaldy LCU	Medium/ Low	Medium/ High	Medium	Medium/ Low				LHV with Wind Turbines/ Wind Turbines in LHV (Mossmorran area)	LHV with Wind Turbines / Wind Turbines in LHV (Mossmorran area)	Turbine Sizes: 25-50m; 50- 100m; 100m+ Group Sizes: 1-5 (medium, large and very large). Separation Distances: 3- 5km (medium); 5-10km (large and very large)	Landscape Analysis: The most extensive lowland type, with the largest area stretching from Kincardine, through Dunfermline to Glenrothes. Smaller areas to the north and east. These areas merge with other lowland and coastal LCTs and are contained by modest height upland landscapes. Medium/ large scale, simple rolling/ undulating landform and large field pattern can accommodate larger wind turbines but not large windfarms or extended turbine clusters. The LCUs vary in context with these areas having several large towns and industrial infrastructure which gives a logical context to energy generating infrastructure. Consented and Proposed Turbines: Several consented windfarms with very large turbines within Glenrothes/ Cowdenbeath LCU: Little Raith (9x125m); Westfield (5x110m), Mossmorran (3x100m); plus nearby at Clentrie Farm (3x100m) Earlseat Farm in Vale of Leven (8x125m). Two very large consented turbines in this area, large to south of Cardenden and for 3x125m at Hill of Beath. Current consented development has reached cumulative capacity as a <i>With Wind Turbines</i> landscape type between Glenrothes and Kirkcaldy, and around Mossmorran is developing into a <i>Wind Turbine Landscape</i> . Proximity of turbines to one another, to settlements and other more sensitive LCTs need to be considered in any further applications in this LCU.
Dunfermline – Kincardine LCUs	Medium	Medium/ High	Medium	Medium			0	LHV with Occasional Wind Turbines or no Wind Turbines	LHV with Wind Turbines / Occasional Wind Turbines	Turbine Sizes: 25-50m; 50- 100m Group Sizes: 1-5 (medium and large). Separation Distances: 3- 5km (medium); 5-10km (large)	 Landscape Analysis: These LCUs have a higher visual sensitivity being visible from across Firth of Forth between the coast and Cleish Hills. Areas to W of Dunfermline partly in green belt. No further development in green belt to west of Dunfermline in order to protect setting of town. Limit to <i>With Wind Turbines</i> landscape type elsewhere. Very large turbines (100m+) would be too large for these areas. Consented and Proposed Turbines: Currently very few small or medium turbines within or adjacent to this area. One v.large turbine at Pitreavie adjacent to LCU west of Dunfermline.
Auchtermuchty and Cupar	Medium	Medium/ High	Medium	Medium			0	LHV with Occasional Wind Turbines or no Wind Turbines	LHV with Occasional Wind Turbines	Turbine Sizes: 25-50m; 50- 100m Group Sizes: 1-5 (medium and large). Separation Distances: 4- 6km (medium); 6-12km (large)	 Landscape Analysis: LCUs in the north and east are smaller in extent and have a much more rural context, close to areas of higher landscape sensitivity. Should not be developed beyond <i>Occasional Wind Turbines</i> type. Very large turbines (100m+) unsuitable. Part of units to S of St Andrews lie within green belt - should not be developed in order to protect setting of town. Consented and Proposed Turbines: Currently no windfarm proposals but a handful of small and medium size turbines in small clusters or singly. One consented large turbine north of Cupar.

LANDSCAPE TYPE / UNIT	Landscape Character Sensitivity	Visual Sensitivity	Landscape Sensitivity	Landscape Value	LAN CAP (Rela turbi	DSCAP ACITY ated to ine size	РЕ 9)	WIND TURBINE LANDSCAPE TYPES		GUIDANCE: Turbine Sizes Max. Numbers in Group Min Group Separation	GUIDANCE: Landscape Analysis and Comment on Currently Consented and Proposed Turbines	
					М	L	VL	Consented	Proposed Limits to Development	Distances		
Key: ONo Capa	acity	/ Capacity	Medium Ca	apacity Hie	gh Ca	pacity		「urbine Sizes: M = N	ledium (25- <50m);	L = Large (50- <100m); VL = Very Large (100m+)		
Saint Andrews	Medium	Medium/ High	Medium/ High	Medium	\bigcirc		0	LHV with Occasional Wind Turbines / No Wind Turbines	LHV with Occasional Wind Turbines / No Wind Turbines	Turbine Sizes: 25-50m; 50- 100m Group Sizes: 1-3 (medium) and 1 (large). Separation Distances: 3- 6km (medium); 8-12km (large)	 Landscape Analysis: The LCUs to the south of St Andrews are smaller in extent and have a much more rural context, close to areas of higher landscape sensitivity (St Andrews Greenbelt and <i>Lowland Dens</i>). Should not be developed beyond <i>Occasional Wind Turbines</i> type. Very large turbines (100m+) unsuitable. Part of units to S of St Andrews lie within green belt – no turbines should be located in this area in order to protect setting of town. Consented and Proposed Turbines: A few small and medium size turbines in small clusters or singly in or adjacent to this area do not exceed capacity. 	
6. Lowland Open Sloping Farmland (FFE6)	Medium/ Low	Medium	Medium	Medium/ Low			0	LOSF with Occasional Wind Turbines/ with Wind Turbines	LOSF with Wind Turbines	Turbine Sizes: 25-50m; 50- 100m Group Sizes: 1-5(medium and large). Separation Distances: 3- 5km (medium); 5-10km (large)	 Landscape Analysis: Gently undulating/ flat landform and simple landscape pattern would accommodate small clusters of large turbines. Capacity for largest turbines limited by: Proximity to sensitive locations (neighbouring more sensitive LCTs and smaller scale features, residential properties). Effects on skyline seen from sensitive locations. Potential cumulative effects/ capacity issues with turbines in adjacent <i>Volcanic Hills and Craigs</i> area. Consented and Proposed Turbines: Three large (67m) turbines recently consented at Bonerbo in middle of LCU, plus a few small and medium turbines scattered elsewhere, fall within capacity. Current proposals for two windfarms with 100m turbines at Kenly and Lingo on northern edge of LCU are at appeal. They are adjacent to a sensitive Lowland Dens LCU. Two further large turbines proposed east of Bonerbo. 	
7. Lowland Dens (FFE7)	High	Medium/ Low	Medium/ High	Medium/ High	0	0	0	Lowland Dens with no Wind Turbines	Lowland Dens with no Wind Turbines	No Turbines	 Landscape Analysis: small scale enclosed landscapes with no capacity for turbines over 25m and generally unsuitable due to sheltered location. Consented and Proposed Turbines: Currently no development within Dens. Two proposed clusters of very large turbines at Lingo and Kenly adjacent to Dens of Kinnes and Claremount, S of St Andrews. Located in neighbouring <i>Lowland Open Sloping Farmland</i> but would exceed landscape capacity of the Dens. 	
Largo LCU	Medium	Medium	Medium	Medium/ High	\bigcirc	0	0	Lowland Dens with no Wind Turbines	Lowland Dens with Occasional wind Turbines	Turbine Sizes: 25-50m Group Sizes: 1-3 Separation Distances: 4- 6km	Landscape Analysis: The unit N of Largo comprises a mixture of Dens and farmland. Would have capacity for occasional medium turbines in farmland areas, avoiding proximity to Dens and Largo Law. Consented and Proposed Turbines: currently three small and two medium turbines in/ adjacent to this LCU.	
8. Lowland Glacial Meltwater Valleys (FFE8)	Medium/ High	Medium	Medium/ High	Medium	\bigcirc	0	0	LGMV with no Wind Turbines	LGMV with Occasional Wind Turbines	Turbine Sizes: 25-50m Group Sizes: 1-3 Separation Distances: 3- 5km	 Landscape Analysis: Limited capacity mainly in more open areas. Turbine heights should not exceed 50m due to modest height of enclosing Upland Foothills slopes. Narrowest areas should not be developed. Consented and Proposed Turbines: Currently no development. 	

LANDSCAPE TYPE / UNIT	Landscape Character Sensitivity	Visual Sensitivity	Landscape Sensitivity	Landscape Value	LANI CAP (Rela turbi	DSCAP ACITY ated to ne size	E	WIND TURBINE LA	VIND TURBINE LANDSCAPE TYPES		GUIDANCE: Landscape Analysis and Comment on Currently Consented and Proposed Turbines
					м	L	VL	Consented	Proposed Limits to Development	Distances	
Key: No Capa	acity Lov	v Capacity	Medium Ca	apacity 🌑 Hi	igh Ca	pacity	Т	urbine Sizes: M = N	Medium (25- <50m);	L = Large (50- <100m); V	′L = Very Large (100m+)
9. Lowland River Basin (FFE9) Vale of Leven	Medium/ Low	Medium/ High	Medium	Medium/ Low			\bigcirc	LRB with Occasional Wind Turbines	LRB with Wind Turbines	Turbine Sizes: 25-50m, 50- 100m; 100m+ Group Sizes: 1-5 (all sizes). Separation Distances: 3- 5km (medium); 5-10km (large and very large)	 Landscape Analysis: Open lowland landscape with simple sloping/flat landform and large scale fields in simple pattern merging with <i>Coastal Hills</i> and <i>Lowland Hills and Valleys</i> and surrounded on 3 sides by significant settlements. Has a similar capacity for wind energy development to the <i>LHV</i>. Consented and Proposed Turbines: 8 very large turbines at Earlseat Farm, Vale of Leven and one medium size turbine near Kennoway. No further development of large or very large scale turbines in Vale of Leven as capacity in southern part has been reached/ exceeded. Use lower size turbines in areas with close proximity to settlements, conservation areas and Upland landscape types.
Howe of Fife	Medium/ Low	Medium/ High	Medium	Medium/ Low			0	LRB with Occasional Wind Turbines	LRB with Wind Turbines	Turbine Sizes: 25-50m, 50- 100m Group Sizes: 1-5 (all sizes). Separation Distances: 3- 5km (medium); 5-10km (large)	 Landscape Analysis: Flatter than Vale of Leven with less influence of nearby settlement. Merges with surrounding areas of <i>Lowland Hills and Valleys</i> and has a slightly higher capacity for wind energy development than these due to scale and simplicity of the landscape. Turbines should be limited to 100m height due to proximity of sensitive designated landscapes (Lomond Hills) and conservation areas (Falkland, Strathmiglo and Auchtermuchty). Consented and Proposed Turbines: Currently 6 medium size turbines in or near Howe of Fife. Application for one large turbine north of Ladybank has good separation from consented turbines. Further development in Howe of Fife near current consented turbines should respect their medium size.
10. Lowland Loch Basin (FFE10)	Medium	Medium/ High	Medium/ High	Medium/ High	\bigcirc	0	0	LLB with Wind Turbines (Loch Gelly) LLB with no Wind Turbines	LLB with Wind Turbines (Loch Gelly) LLB with Occasional Wind Turbines	Turbine Sizes: 25-50m Group Sizes: 1-3 Separation Distances: 3- 5km	 Landscape Analysis: Limited area focused around loch merging into surrounding more extensive lowland and upland landscapes. Consented and Proposed Turbines: Loch Gelly 9 adjacent very large wind turbines at Little Raith and three at Clentrie Farm within 2km significantly affect this area. No other areas currently affected but all have limited capacity. Further development should be limited to well-separated medium size turbines.

LANDSCAPE TYPE / UNIT	Landscape Character Sensitivity	Visual Sensitivity	Landscape Sensitivity	Landscape Value	LAN CAP (Rela turbi	DSCAF ACITY ated to ine size	PE	WIND TURBINE LAN	NDSCAPE TYPES	GUIDANCE: GUI Turbine Sizes Lan Max. Numbers in Group Turk Min Group Separation	GUIDANCE: Landscape Analysis and Comment on Currently Consented and Proposed Turbines
					м	L	VL	Consented	Proposed Limits to Development	Distances	
Key: No Capacity Low Capacity Medium Capacity High Capacity Turbine Sizes: M = Medium (25- <50m); L = Large (50- <100m); VL = Very Large (100m+)											

Summary of Capacity and Cumulative Development in the Midland Valley Lowland Landscapes

The Midland Valley Lowlands comprise 6 landscape types: The Lowland Hills and Valleys; Lowland Sloping Farmland; Lowland Dens, Lowland Glacial Meltwater Valleys, Lowland River Basin and Lowland Loch Basin.

The lowland landscape types in Fife have the highest capacity for wind turbine development, although this varies across character types. There are no areas with high capacity (as can be found in some areas of Scotland). However the extensive farmland areas of the *Lowland Hills and Valleys, Lowland Sloping Farmland* and *Lowland River Basins* have a medium or medium/high capacity due to their larger scale, simple landform and landscape patterns and in some cases strong influence of existing development. In contrast, the smaller scale valley landscapes of the *Lowland Dens* and parts of *Lowland Glacial Meltwater Valleys* have little or no capacity due to their smaller scale landscapes, enclosure and more complex landform and pattern. *Lowland Loch Basins* have low capacity due to their limited extent and scenic qualities.

Current consented or built developments are concentrated in or adjacent to the Lowland Hills and Valleys and Lowland River Basins between Cowdenbeath, Glenrothes, Kirkcaldy and Leven. There are 27 very large turbines and one large turbine, in groupings of four windfarms (Little Raith, Earlseat, Westfield and Clentrie Farm); one pair and three single turbines, creating an area of Landscape with Wind Turbines and, around Mossmorran, a Wind Turbine Landscape. Elsewhere in these landscape types there are scatterings of predominantly small and medium size turbines creating areas of Landscape with Occasional Wind Turbines.

The current distribution of consented very large turbines is in one of the most developed areas of Fife, with numerous settlements and industry as well as intensive agriculture and mineral extraction past and present. There is a logic to this distribution in that it relates to the location of energy consumers and productive land. However it also brings larger turbines close to settlements and there is potential for cumulative effects with other tall objects in the landscape including electricity pylons and industrial complexes such as Mossmorran. Accepting larger wind energy developments in the lowland areas requires determining an acceptable limit to cumulative development, based on inherent landscape capacity and taking into account existing consented development. The areas with greatest inherent capacity lie between the main towns where the landscape character is less sensitive to development and in the wide, flat *Lowland River Basins*. These areas can accept a *Landscape with Wind Turbines* which would include small groupings of large or very large turbines. However, there are potential limits to further development as some capacity is already taken up by consented developments and areas are adjacent to more sensitive landscapes. The localised pocket of cumulative development around Mossmorran is creating a *Wind Turbine Landscape*, and between Glenrothes and Kirkcaldy further significant development together with the existing consents would exceed capacity by creating an area of *Wind Turbine Landscape*.

The remaining Lowland Hills and Valleys and Lowland River Basins surrounding Dunfermline, Kincardine, Auchtermuchty, Cupar and St Andrews, whilst similar in scale, landform and pattern to their southern counterparts, are more sensitive due to varying factors relating to location. This includes a more rural character, greater visual sensitivity, proximity to sensitive upland and dens landscapes and in the case of St Andrews and Dunfermline, green belts protecting the setting of historic towns. It is recommended that most of these areas are not developed beyond a Landscape with Occasional Wind Turbines and do not take very large turbines over 100m. There should be no further development in green belts.

Lowland Open Sloping Farmland in the East Neuk has similar inherent capacity due to its simple landform and landscape pattern. It could accommodate a Landscape with Wind Turbines. However it is more open and exposed than most of the Lowland Hills and Valleys and Lowland River Basins and is a hinterland to more sensitive coastal landscapes of the East Neuk and Lowland Dens. It is recommended turbine heights are kept below 100m. Two proposals (Kenly and Lingo) lie close to a Lowland Dens LCU and are at appeal having been refused due to potential effects on the setting of St Andrews. However three 67m turbines at Bonerbo in the centre of the area have been approved.

The smaller scale lowland landscapes of limited area should be restricted in further development to a *Landscape with Occasional Wind Turbines* or not developed at all. Due to their smaller scales this would mean no turbines larger than medium. In the case of most of the *Lowland Dens*, which are small scale, sheltered and restricted in area, it is recommended that there is no turbine development of turbines above 25m; although the area to the north of Largo is a wider area of more mixed landscape in which farmland areas between dens are capable of accommodating turbines of medium size.

LANDSCAPE TYPE / UNIT	Landscape Character Sensitivity	Visual Sensitivity	Landscape Sensitivity	Landscape Value	LANE CAPA (Rela turbi	OSCAP ACITY Ited to ne size	E ;)	WIND TURBINE LANDSCAPE TYPES		GUIDANCE: Turbine Sizes Max. Numbers in Group Min Group Separation	GUIDANCE: Landscape Analysis and Comment on Currently Consented and Proposed Turbines
					М	L	VL	Consented	Proposed Limits to Development	Distances	
Key: ONo Capa	acity Low	/ Capacity	Medium Ca	apacity High	gh Car	pacity	Т	Turbine Sizes: M = N	/ledium (25- <50m);	L = Large (50- <100m); V	L = Very Large (100m+)
Midland Valley Coa	stal Landscap	bes									
11. Coastal Hills (FFE11)	Medium	Medium/ High	Medium/ High	Medium/ High		0	0	Coastal Hills with no wind turbines Coastal Hills with Wind Turbines (part of East Wemyss)	Coastal Hills with Occasional Wind Turbines Coastal Hills with Wind Turbines (part of East Wemyss)	Turbine Sizes: 25-50m Group Sizes: 1. Separation Distances: 4- 6km	 Landscape Analysis: LCUs are subject to a number of designations and form backdrop to a number of coastal settlements. Further development should be limited to well-separated single medium turbines. Associated with buildings or in areas backclothed by higher ground and/or trees. No capacity in green belt area overlooking St Andrews. Consented and Proposed Turbines: Only one or two small turbines located in this LCT but 8 very large turbines at Earlseat Farm in adjacent Vale of Leven Lowland River Basin LCU will dominate most of East Wemyss LCU. No current proposals.
12. Coastal Terraces (FFE12)	Medium	Medium/ High	Medium/ High	Medium/ High	0	0	0	Coastal Terraces with no wind turbines	Coastal Terraces with no wind turbines	No Turbines	 Landscape Analysis: In the East Neuk and near St Andrews this type is not suitable for wind turbine development due to its open character and location as a backdrop to coast and towns. Consented and Proposed Turbines: No wind turbines or current proposals located in Coastal Terraces. One medium turbine consented and one large turbine proposed in <i>Lowland Open Sloping Farmland</i> within 1km of Crail-St Monans LCU.
Northeastern LCUs	Medium/ Low	Medium/ High	Medium	Medium		0	0	Coastal Terraces with no Wind Turbines	Coastal Terraces with Occasional Wind Turbines	Turbine Sizes: 25-50m; 50- 100m Group Sizes: 1-5 (medium); 1 (large). Separation Distances: 4- 6km (medium); 6-12km (large)	 Landscape Analysis: In the northeast of Fife this type is less exposed to expansive coastal views and does not have the same importance as a backdrop to key conservation areas. Consented and Proposed Turbines: No wind turbines or current proposals above 25m height
13. Coastal Cliffs (FFE13)	High	Medium/ High	High	Medium/ High	0	0	0	Coastal Cliffs with no wind turbines	Coastal Cliffs with no Wind Turbines	No turbines	Landscape Analysis: The Coastal Cliffs are unsuitable for wind turbines. Consented and Proposed Turbines: No wind turbines or current proposals located in or near Coastal Cliffs.
14. Coastal Braes (FFE14)	High	Medium/ High	Medium/ High	Medium/ High	0	0	0	Coastal Braes with no wind turbines	Coastal Braes with Occasional Wind Turbines	No turbines	 Landscape Analysis: This type is not suitable for wind turbine development due to its small scale and location as a backdrop to the coast. Consented and Proposed Turbines: No wind turbines or current proposals above 25m height located in or near coastal braes.
15. Coastal Flats (FFE15)	Medium	Medium/ High	Medium/ High	High	0	0	0	Coastal Flats with no wind turbines	Coastal Flats with no wind turbines	No turbines	Landscape Analysis: Areas N of St Andrews unsuitable due to higher landscape value based on setting to St Andrews and R&A Golf Courses Consented and Proposed Turbines: No wind turbines or current proposals above 25m height.

LANDSCAPE TYPE / UNIT	Landscape Character Sensitivity	Visual Sensitivity	Landscape Sensitivity	Landscape Value	LANDSCAPE CAPACITY (Related to turbine size)		'E ;)	WIND TURBINE LANDSCAPE TYPES		GUIDANCE: Turbine Sizes Max. Numbers in Group Min Group Separation	GUIDANCE: Landscape Analysis and Comment on Currently Consented and Proposed Turbines
					М	L	VL	Consented	Proposed Limits to Development	Distances	
Key: No Capacity Low Capacity Medium Capacity High Capacity Turbine Sizes: M = Medium (25- <50m); L = Large (50- <100m); VL = Very Large (100m+)											
Northeastern LCUs (Tentsmuir area)	Medium	Medium/ High	Medium/ High	Medium/ High			0	Coastal Flats with no wind turbines	Coastal Flats with Occasional Wind Turbines	Turbine Sizes: 25-50m; 50- 100m Group Sizes: 1-5 (medium); 1 (large). Separation Distances: 4- 6km (medium); 6-12km (large)	Landscape Analysis: Areas around Tentsmuir are less important to setting of St Andrews but have value for recreation and are relatively natural landscapes (seashore and estuary). Also very visible from higher ground and across Firth of Tay. Therefore only suitable for occasional wind turbine development in less sensitive locations. Consented and Proposed Turbines: No wind turbines or current proposals above 25m height
Longannet LCU	Medium/ Low	Medium/ High	Medium	Medium/ Low			0	Coastal Flats with no wind turbines	Coastal Flats with Wind Turbines	Turbine Sizes: 25-50m; 50- 100m; 100m+ Group Sizes: 1-3 (medium, large and very large). Separation Distances: 3- 5km (medium); 5-10km (large and very large)	Landscape Analysis: Larger turbines should only be located in areas associated with industry (eg. Longannet Power Station). Consented and Proposed Turbines: No wind turbines or current proposals above 25m height

Summary of Capacity and Cumulative Development in the Midland Valley Coastal Landscapes

The Coastal Landscapes comprise 5 main landscape types: Coastal Hills; Coastal Terraces; Coastal Cliffs, Coastal Braes and Coastal Flats.

The Coastal landscape types in Fife have a varied capacity for wind turbine development, sometimes within the same landscape character type. Types such as *Coastal Cliffs* and *Coastal Braes* are very limited in extent and scale, have steep landforms and sometimes form the setting to historic settlements and therefore have no capacity. Other more extensive types such as *Coastal Terraces* and *Coastal Flats* have a suitable simple landform and pattern, and cover extensive areas. However, some units form the setting to historic and picturesque coastal settlements, particularly the East Neuk and St Andrews. Furthermore the coastal location renders them visually sensitive, as tall objects are seen starkly contrasted against the sea. This greatly limits the extent and scale of potential development without leading to very significant effects. Nevertheless some units in the northeast are more remote from sensitive settlements and can accommodate a limited number of medium and large turbines. One area of *Coastal Flats* between Kincardine and Longannet power station does however have medium to high capacity due to its much more developed setting. *Coastal Hills* as a type also has some limited capacity for medium size turbines.

Currently there are only two or three small or medium size turbines within the coastal landscape types and only one or two proposed. These are Landscapes with No Turbines. However the consented eight turbine windfarm at Earlseat Farm will lead to a Landscape with Wind Turbines extending into the East Wemyss Coastal Hills.

It is recommended that the coastal landscape types with some capacity for development can accommodate wind energy development to the extent of becoming a Landscape with Occasional Wind Turbines. However the Coastal Flats area adjacent to Longannet would be capable of accommodating a number of large or very large turbines. Smaller scale types and areas forming the setting to East Neuk and St Andrews should not be developed for wind energy.

6.3 Overall Assessment of Capacity and Cumulative Development

6.3.1 Summary of Landscape Character, Sensitivity and Capacity

The landscape of Fife is highly varied compared with similar size areas in many other parts of Scotland. It is a unique and complex blend of lowland, upland and coastal landscapes. Compared with much of Scotland there is a high population density, with significant numbers of moderate or small sized settlements and a well spread rural population. In particular there are no extensive areas of high or remote upland and the coastal areas are nearly all populated to varying degrees.

The combination of a complex and varied landscape with a well spread population and no extensive unpopulated areas limits the capacity for development of larger scale windfarms and the largest turbines. This limitation notwithstanding, there is varied capacity for wind energy development throughout much of the area. In areas suitable for development, the differing landscape characters could accommodate different turbine sizes, groupings and spacings.

In contrast with the current pattern of Scottish wind energy development, the landscape character types with the least capacity in Fife are the higher upland types. Whilst having some suitable characteristics of scale, simplicity of landform and lack of small scale development, the *Uplands* and *Upland Slopes* are limited in extent, visually prominent and viewed by a large resident and travelling population, as well as being locally designated landscapes and popular recreational resources. No wind energy development above 25m height is recommended in these areas.

The lower upland types, *Upland Foothills* and *Pronounced Volcanic Hills and Craigs*, have some scope for limited development with a pattern of occasional small groups or single turbines of mainly medium size that reflects the irregular characteristics of the landscape and avoids the most prominent locations.

Some coastal types (eg. *Coastal Hills, Coastal Terraces* and *Coastal Flats*) have some of the landscape characteristics considered suitable for wind turbine development. However many have visual sensitivities as they are important in the setting of historic coastal towns and villages. No development is recommended in these areas. Other types (*Coastal Braes* and *Coastal Cliffs*) are too steep and limited in area to accommodate development. The remaining areas are able to accommodate a modest amount of development.

In Fife some of the lowland landscape types represent the best opportunity for wind energy development. Some of these (*Lowland Hills and Valleys, Lowland Open Sloping Farmland* and *Lowland River Basin*) cover large areas, with a medium to large scale simple landscape pattern of fields, roads and plantations. The *Lowland Hills and Valleys* and *Lowland River Basin* LCTs are the hinterland for most of the principal towns of Fife and are influenced by urban fringes, industry, mineral extraction and major transport routes. These areas therefore have many of the characteristics that are considered compatible for wind turbine development. However they also have the sensitivities of a substantial local residential and travelling population and domestic scale landscape features such as houses and trees. This restricts the potential size and extent of development compared with other parts of Scotland with extensive moorland plateau areas developed with large

windfarms and turbines. Other lowland landscape types within Fife (*Lowland Dens, Lowland Glacial Meltwater Valleys* and *Lowland Loch Basins*) are smaller in extent and/or scale with more complex patterns of landform, vegetation and settlement and would only be suitable for limited, smaller scale development in some locations.

6.3.2 Existing and Consented Wind Turbines

The current level of operational and consented development is relatively modest compared with some areas in Scotland. Whilst there are a large number of individual schemes, most are small scale, involving single or small clusters of small and medium size turbines. There are nevertheless larger scale projects recently built or consented which will lead to significant cumulative change in the some areas of Fife:

- 1) The main concentration in terms of size and numbers of turbines lies in the lowland areas surrounding the main towns in the south and west, with some turbines associated with the towns themselves. The two largest consented projects are: Little Raith (nine very large turbines located in *Lowland Hills and Valleys* south of Cowdenbeath) and Earlseat Farm (eight very large turbines located in *Lowland River Basin* northeast of Kirkcaldy). Two further very large turbines are consented at Mossmorran near Little Raith. Three very large turbines have also recently been consented at Clentrie Farm just within the neighbouring *Pronounced Volcanic Hills and Craigs* LCU near Mossmorran. Two single very large turbines and a large turbine are located south of Glenrothes and five very large turbines at Westfield OCCS, 3km west. Single very large turbines are located in Pitreavie and Methil Docks, with the latter turbine at 196m height.
- 2) Three large turbines have recently been consented at Bonerbo, in the *Lowland Open Sloping Farmland* of the East Neuk.
- 3) Several clusters of small or medium size turbines lie in the Cleish Foothills north of Dunfermline.

There are no other areas with larger turbines or notable concentrations. Rural locations throughout Fife have scatterings of single or small clusters of predominantly small or medium size turbines. Most are in the *Pronounced Volcanic Hills and Craigs* south of Cupar; the *Lowland River Basin* Howe of Fife and *Lowland Hills and Valleys* around Auchtermuchty and Cupar. All of these are in single figures.

There are currently no, or minimal numbers, of wind turbines in the *Uplands, Upland Slopes; Lowland Dens, Lowland Glacial Meltwater Valleys, Lowland Loch Basins* and all of the Coastal LCUs. However, some limited areas of these are influenced by close proximity of turbines in other LCUs.

In the 15km buffer area beyond Fife there are three main windfarms each with several turbines. All are located in the Ochil Hills, the closest $12 \times 91m$ turbines at Lochelbank lying within 10km of Pitmedden forest. There are also a number of single or paired turbines in the Dundee area across the Firth of Tay and $8 \times 81m$ turbines at Ark Hill in the Sidlaws, just on the edge of the 15km area. There are no consented turbines in Falkirk, Edinburgh

and the Lothians to the south of the Firth of Forth. None of these developments has a significant influence on the landscape character of Fife.

6.3.3 Proposed Wind Turbines

There are several further proposed windfarms and many smaller proposals in and around Fife. All the most significant proposals within Fife are located in or adjacent to lowland areas in the southern part of Fife:

- An increase in height of two very large turbines at Mossmorran in the Lowland Hills and Valleys within 1-2km of Little Raith and four further very large turbines at Halbeath, with two further very large and two medium turbines south of Glenrothes.
- 2) Two windfarms of five and six very large turbines are proposed at in the Lowland Open Sloping Farmland above the East Neuk, but adjacent to the Lowland Den of Kinaldy. Two further large turbines are proposed within this LCU.
- 3) Several medium size turbines are proposed in or near the Cleish Foothills Upland Foothills, in an area already populated by clusters of small turbines and two single (large and very large) turbines are proposed in the Lowland Hills and Valleys to the west.
- 4) A second very large (198m) turbine is proposed for Methil Harbour.

There are no or minimal numbers of proposed turbines in the *Uplands* except at Pitmedden; *Upland Slopes*; *Upland Foothills*; *Lowland Dens, Lowland Glacial Meltwater Valleys, Lowland Loch Basins* and any of the Coastal LCTs.

In the study area beyond Fife the closest applications are for 4 turbines outside Alloa, 3km west of Fife, and further applications for small clusters in the area surrounding Dundee.

6.4 Capacity for Further Development

This assessment has demonstrated that the landscape of Fife has the capacity to accommodate wind energy development of an appropriate type and extent. Appropriate development relates to the varied characteristics of the landscape; the visual sensitivities of the extensive population spread across Fife and the higher value or sensitive context of some areas of landscape. In particular the varied landscape character and lack of extensive large scale, open, unpopulated upland areas means there is no scope for the larger scale of development seen elsewhere in Scotland.

The main capacity for development lies within some of the larger scale more extensive lowland areas which can accommodate larger turbines sizes, but not in large groupings. Other areas have a more limited capacity which would not be appropriate for larger turbines sizes and some areas have very limited or no capacity for wind energy development.

At current levels of development there is capacity for further appropriate wind energy development in Fife, although some areas are reaching or have reached capacity. Future

development in each landscape type or area should follow the guidance given in Table 6.1 in order to remain within the proposed limits to development, expressed as wind turbine landscape typologies set out in Figure 6.3. The aim of the guidance is to ensure that the acceptable capacity for development in terms of turbines sizes, group sizes and spacing between turbines and groups is not exceeded, and that other issues guiding or limiting development are taken into account.

Some of the capacity would be fully used and could be exceeded if all current proposals were implemented. The main opportunities and limitations on capacity are discussed below and the areas concerned are illustrated in schematic form in Figure 6.4.

6.4.1 Areas with Highest Potential Capacity

Figure 6.4 identifies in orange five areas in Fife which have the highest potential capacity for wind energy development (ie. the base landscape not taking current consented development into account). These areas fall almost entirely in LCUs identified in Table 6.1 and Figure 6.2 as having a higher inherent capacity for wind energy development than other areas of Fife (ie. medium or medium/high). This is based on a combination of one or more factors including suitable larger scale simple landforms and landscape patterns; existing development affecting character; lower visual sensitivity and lower landscape value. Not all these factors are present in every area identified. Furthermore some LCUs identified as having a higher capacity due to their type are not included due to local sensitivities, such as limited size, greenbelt designation or proximity to sensitive LCUs restricting the potential capacity. the detailed analysis is given in Table 6.1.

The five areas with highest potential capacity are:

- Extensive areas of Lowland Hills and Valleys in southern between Dunfermline, Glenrothes, Kirkcaldy also including the contiguous area of the Lowland River Basin of the Leven Valley east of Glenrothes. This area is suitable for all sizes of turbines, limited to a Landscape with Turbines type.
- 2) Extensive areas of *Lowland Hills and Valleys* in south western Fife between Kincardine and Dunfermline, also including the contiguous area of the Cleish *Upland Foothills* north of Dunfermline. This area is suitable for turbines up to large size, limited to a *Landscape with Occasional Turbines*. The Cleish Foothills will only accommodate medium turbines as a *Landscape with Turbines*.
- 3) A small area of *Coastal Flats* between Longannet and Kincardine where larger turbines may be developed in association with the power station.
- 4) An extensive area in the north between the M90 and Cupar, comprising Lowland Hills and Valleys of the Eden Valley and Lowland River Basins of the Howe of Fife. These areas would be suitable for development as a Landscape with Occasional Turbines or Landscape with Turbines accommodating a limited number of large turbines.
- 5) The Lowland Open Sloping Farmland area in the east of Fife is capable of accommodating large turbines as a Landscape with Turbines, subject to consideration of skyline effects on St Andrews and proximity to more sensitive Lowland Dens landscapes. The potential development of proposed offshore windfarms may further

limit development in this area and this should be explored by applicants at application stage.

Some of the available development capacity is already utilised by wind turbines consented in some of these areas. The limitations resulting from this are discussed in 6.4.2 below.

6.4.2 Areas Where Cumulative Impact Limits Further Development

As described above, a number of landscape types and units in Fife have the inherent capacity to accommodate wind energy development. However, existing and consented development in some of these areas means that areas have reached capacity, and further significant development may exceed the capacity of the wider landscape. The areas where current cumulative impact limits capacity for further development are shown as hatched areas in Figure 6.4 and described below. They are defined by:

- The developed areas of windfarms and turbines (operational and consented) and the cumulative extent of their impacts on the surrounding landscape;
- 2) The inherent landscape capacity within the landscape units and those surrounding them;
- 3) The extent of area within which further significant development should be carefully assessed and potentially limited; to avoid extending cumulative landscape and visual impacts between the turbines within the area and other turbines outside the area.

The boundaries shown in Figure 6.4 are indicative. They are described in more detail for each area in Table 6.2 below, together with the main objectives for limiting further development. Specific development proposals would require assessment relative to the objectives of the area.

Some parts of these areas have reached capacity and cannot accept any further wind turbines. These are described in 6.4.3 below.

6.4.3 Areas with No Capacity

Significant areas of Fife have no or negligible inherent capacity for wind energy development. These are coloured red in Figure 6.4:

- 1) Most of the *Uplands* and *Upland Slopes* primarily due to their very high visibility and prominence and their limited extent in the Fife context;
- The most prominent ridges, summits and landforms of the Upland Foothills and Pronounced Volcanic Hills and Craigs which form skyline features widely visible from areas both within and outside Fife;
- Some parts of Coastal LCTs due to their context as a backdrop to key settlements and tourism areas; their openness against the backdrop of the sea when seen from inland; or due to their limited extent;
- 4) Most Lowland Dens due to their enclosed, small or intimate scale.

It is recommended that these landscape types and areas remain undeveloped with turbines to protect their character, avoid widespread visibility and to provide spaces between areas of wind energy development.

Green belt areas to the west of Dunfermline and surrounding St Andrews comprise a mixture of landscape types, some of which may have inherent capacity for wind turbines. However, these areas have been defined to protect the setting of historic urban conservation areas and this is the primary consideration limiting wind energy development.

As described in 6.4.2 above, some areas with inherent capacity have been developed to a point where the acceptable limits of cumulative impact have been reached, and therefore have no remaining capacity. These are identified separately from areas with no inherent capacity in Figure 6.4 by a red cross-hatch.

When assessing the acceptability of large and very large turbine proposals in neighbouring landscape character areas, proximity to the areas described above should be taken into account.

6.4.4 Urban Areas and Settlements

All urban areas and some larger rural settlements are not considered strategically for turbine development in this study. Consequently urban areas have been left out of the guidance in Table 6.1 and are coloured grey in all figures. Whilst it is recognised that some parts of urban areas may be able to accommodate wind turbines, and indeed do, they have not been included in this landscape character based assessment. Factors specific to townscape and urban planning are likely to guide location.

6.4.5 Limited Capacity within Other Landscape Areas

Within the remaining landscape types and areas of Fife there is a relatively limited capacity for wind energy development of a modest scale. Currently there are limited numbers of existing, consented and proposed smaller scale developments (mainly single small and medium size turbines). The areas are shown in pink in figure 6.4. Guidance in Table 6.1 is intended to steer future development in these areas to an acceptable level.

6.5 Guidance for Small Turbines

This cumulative assessment and capacity study has detailed the current distribution of all sizes of wind turbines, including the smallest. However, the strategic guidance above applies to turbines 25m and greater in height when determining capacity for further development. This is because the smallest turbines, being of a similar scale to built structures and trees found commonly throughout the landscape, do not have the same eye-catching prominence and extensive visibility of larger turbines. They do not therefore have the same issues of wide scale cumulative effects across extensive landscape areas.

The issues relating to design and siting of small turbines concern mainly their localised effects on the area in which they are sited rather than wider cumulative effects on landscape character. Small wind turbines should be judged on their own merits, assessed

against the criteria that apply to most other domestic or farm scale built structures. Landscape and visual considerations may include the following:

- Effects on designations including landscape quality designations, SAMs, listed buildings, conservation areas;
- Location in relation to scenic viewpoints;
- Relationship to skylines and seascapes;
- Relationship to other structures and buildings;
- Location in relation to approaches to and setting of settlements;
- Proximity to residential properties;
- Localised cumulative effects including potential for visual confusion or cluttering areas with significant numbers of small turbines and/or close proximity to other similar larger structures including taller wind turbines and electricity pylons.

Larger wind turbines are more often than not seen against the sky. The approach to colouring has been to adopt a neutral light grey colour relating to the sky colour most likely to be encountered as a backdrop. Small wind turbines are often fully or partially backclothed against landforms and/or trees, giving a closer relationship to the ground than the larger structures. It may therefore be appropriate to consider colouring small wind turbines a darker grey, green or brown to reduce their visibility when seen against backdrops, or close to buildings.

Further guidance on the siting of small wind turbines is given by SNH in *Siting and Design* of *Small Scale Wind Turbines of between 15 and 50 metres in height (March 2012).*

Table 6.2: Areas Where Cumulative Impact Limits Further Development: Description and Key Objectives (see Figure 6.4 for Map)

Lowland Areas between Kirkcaldy and Dunfermline							
Description	Development Situation and Key Objectives						
The boundaries of this area include:	28 turbines of very large or large size (four windfarms, a pair of turbines and three single turbines) have been consented creating a Landscape with Wind Turbines in the lowland character areas that extends into the Pronounced Volcanic Hills and Craigs. A Wind Turbine Landscape is emerging around Mossmorran. There are proposals for increasing the height of the pair of turbines at Mossmorran; another turbine to the south of these; four further single turbines south of Glenrothes and a four turbine windfarm at						
 The Lowland Hills and Valleys between Leven, Kirkcaldy, Glenrothes, Kelty, Dunfermline and Inverkeithing; 							
The northern edge of the Cullaloe Hills Pronounced Volcanic Hills and Crains between Kirksaldy and Invertigithery	Halbeath. The objectives governing the area are:						
 The southern edges of <i>Pronounced Volcanic Hills and Craigs</i> including Hill of Beath west of Cowdenbeath and the Clatto area west of Glenrothes; 	 To prevent any further turbine development in areas where consented development has reached the acceptable limit cumulative impact: the area surrounding Mossmorran (between Cowdenbeath/ Lochgelly and the Cullaloe Hills) and betw Westfield Opencast Site and East Wemyss, including Strathore between Glenrothes and Kirkcaldy. 						
• The Lowland Loch Basins of Lochs Ore, Gelly and Fitty;	2) Retaining sufficient spacing between individual windfarms and turbines to maintain the <i>Landscape with Wind Turbines</i> character and avoid the <i>Wind Turbine Landscape</i> character in <i>Lowland Hills and Valleys</i> and <i>Lowland River Basins</i> ;						
• The Coastal Hills between Kirkcaldy and Leven;							
The Vale of Leven between Glenrothes and Leven.	 To prevent unacceptable effects of larger wind turbines on landscape character areas with limited capacity including <i>Pronounced</i> Volcanic Hills and Craigs, Lowland Loch Basins and Coastal Hills; 						
	4) To support an organised pattern of development by maintaining sufficient spacing/ screening between groups of larger and smaller turbines;						
	5) To prevent unacceptable proximity of larger turbines to settlements and other visually sensitive locations.						
Cleish Hills and Foothills north of Dunfermline							
Description	Development Situation and Key Objectives						
The boundaries of this area include:	Currently this area has four clusters of operational and consented small turbines, a cluster of medium size turbines and two medium turbines and proposals for further medium size turbines. The objectives governing the area are:						
 The clean optand Pollums in which several existing, consented and proposed turbines are located; 	1) Retaining sufficient spacing between individual groups of turbines to maintain a Landscape with Wind Turbines and avoid a Wind Turbines are character in the Claigh Evolutions.						
• The Cleish Hills Uplands and Upland Slopes to the north, east and west;	 Avoiding close proximity of larger wind turbines to the Cleish Hills ridgeline which forms an important but modestly scaled backdrop to the area; 						
Loch Fitty Lowland Loch Basin to the east;							
• The northern edge of Dunfermline, the Dunfermline green belt and villages to the west of Dunfermline.	 To support an organised pattern of development by maintaining sufficient spacing/ screening between groups of larger and smaller turbines; 						
	4) To prevent unacceptable proximity of larger turbines to settlements and other visually sensitive locations including the Dunfermline conservation area.						
Pitmedden							
Description	Development Situation and Key Objectives						
The boundaries of this area include:	Currently this area has three consented turbines (one each of small, medium and large) and proposals for one large turbine. The objectives governing the area are:						
The Uplands area;	 Preventing the Uplands and Upland Foothills areas from becoming a Landscape with Wind Turbines 						
• The western and northern part of the adjacent Upland Foothills area;	 Avoiding highly visible skyline effects on the crests of Uplands and Upland Foothills areas: 						
The Lowland Hills and Valleys slopes north of Strathmiglo and Auchtermuchty	3) To support an organised pattern of development by maintaining sufficient spacing/ screening between larger and smaller turbines:						
Addition fully.	 To prevent unacceptable proximity of larger turbines to settlements and other visually sensitive locations. 						

East Neuk							
Description			Development Situation and Key Objectives				
The boundaries of this area include:			Currently this area has three consented large turbines at Bonerbo in the Lowland Open Sloping Farmland, two closely spaced medium				
•	The central and western part of the <i>Lowland Sloping Farmlands</i> area between Pitkierie, Beleybridge, Lingo and Kellie Castle;	and small turbines 1km to the south, several medium and one small size turbines 4-7km to the west. There is an applicatio turbines at Lingo on the edge of the Kinaldy Den. The objectives governing the area are:					
•	The western end of the Lowland Dens (Kinaldy) LCU north of Lingo	1)	Preventing a Landscape with Wind Turbines type spreading across the Lowland Open Sloping Farmland into the neighbouring Pronounced Volcanic Hills and Craigs and Lowland Dens areas.				
•	The central part of the adjacent <i>Pronounced Volcanic Hills and Craigs</i> area around Largoward and Kellie Law;	2)	Ensuring that further wind energy developments in the Lowland Open Sloping Farmland do not exceed a Landscape with Wind Turbines;				
		3)	To prevent unacceptable proximity of larger turbines to sensitive landscape or visual receptors such as Kellie Law or Kellie Castle;				









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