Arnside & Silverdale
Area of Outstanding Natural Beauty

Special Qualities Report

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INTRODUCTION

This document has been developed so as to provide a “definitive” list of Special Qualities for and of the Arnside & Silverdale Area of Outstanding Natural Beauty. The ministerial order of December 1972, that established the Arnside & Silverdale Area of Outstanding Natural Beauty under the auspices of the National Parks and Access to the Countryside Act 1949, did not set out a list of features which were considered to be those worthy of protection by the designation of the area. The Special Qualities set out in earlier editions of the AONB Management Plan had arisen in an almost organic way, in part based on the long history of active countryside management in the Arnside & Silverdale AONB, since 1984 or thereabouts, and the existing list was merely reinforced descriptively in the previous AONB Statutory Management Plans, published in 2004 and 2009.

This report is based on the original special qualities report that was commissioned by the Arnside & Silverdale AONB Unit to list and describe the AONB's 'Special Qualities' for inclusion in the AONB Management Plan 2014-19. The report was written and researched by Graeme Skelcher, an Ecological Consultant based in Warton, with great experience of working in the AONB and providing advice and producing management plans for many of the conservation organisations that own or manage sites in the AONB. It has been updated and amended by David Askew, the AONB Officer, to reflect changes made within the AONB Management Plan 2014-19 in light of feedback and comment that has been received in response to the consultation exercises undertaken during the 2013 Management Plan Review.

As the AONB Team began the Management Plan Review it was regarded as an essential task to ask the question as to whether the list of Special Qualities was accurate, complete and up to date. It is recognised that the features that make up the Special Qualities will not change on the five yearly timetable that the review of the Management Plan has to take place under, so it was considered a good opportunity to develop a stand-alone publication that listed the special qualities in an accessible and easily understood way. This report is therefore published as a companion volume to the Arnside/Silverdale AONB Statutory Management Plan 2014-19

Part of the reason that this report has been produced was that it became apparent that National Parks had developed a clear and concise approach to describing the Special Qualities that marked them out from surrounding countryside. In developing their Special Qualities lists, much work had clearly been undertaken by the UK National Park Authorities to present the well presented lists of Special Qualities for each and every national park. The AONB Team carried out a comparative exercise to check the list used locally against the best practise examples adopted by the National Parks and other AONB’s. It was found that while National Parks all had very clear information regarding Special Qualities, following a standard template, the situation for AONBs was more variable, with no uniform style of presentation and often the details were not easily understood by non-specialist audiences.

Following on from that comparative work, a provisional list of Special Qualities was produced by the AONB Team, based on the format of similar lists produced for other AONBs and National Parks. The provisional list was informed using local specialist knowledge and previous AONB Management Plans from 2004 and 2009 and earlier strategies, which had summarised the Special Qualities based on then current evidence. Further discussion to aid determination of the final list was held at a management plan consultation workshop on 12 December 2012.

This report also draws upon the information included within the 2012 State of the AONB - Research and Report Project, and various management plans and reports produced for individual sites within the AONB.

Part One lists the identified Special Qualities and provides a few brief paragraphs highlighting the important features of each. Part Two provides a more detailed description of each Special Quality.

Appendix 1 provides a list of English Priority Biodiversity Habitats with a brief appraisal of their likely occurrence in the AONB. This list requires further verification in order to determine a completely accurate list of the AONB's habitats.

Appendix 2 provides an initial attempt to list notable species which are not already covered in the current Biodiversity Action Plan list of Priority Species (as has been considered in the *State of the AONB habitats, species and biodiversity report*, Hunter 2012).

This was produced by combining lists of notable species included in a number of individual site management plans from around the AONB, in order to obtain a single list of nationally rare and scarce invertebrates, fungi, bryophytes, lichen and vascular plants which have been recorded in the AONB.

The Appendix 2 list is very much a first step in producing a notable species list for the AONB and potential problems need to be resolved:

- While many of the very best sites for biodiversity have been considered (including Gait Barrows, Leighton Moss, Warton Crag and the larger National Trust properties), it is likely that there are other notable species within the AONB which are not found at these sites.
- Some of these records were originally compiled a decade or more ago which presents a number of problems: individual species recorded may have become locally extinct; the national status of individual species may have changed - either having been found to be more widespread than was originally believed or having suffered a population contraction; and the scientific names of some invertebrate species may have changed so that it is conceivable some species may be listed twice under two different names.

Further checking and updating of this data may be required in the future but this report provides an initial indication of notable species occurrence within the Arnside & Silvertdale AONB.

Appendix 3 provides a list of Red and Amber bird species which are known to have bred within the AONB in recent years; mainly based on entries in local bird atlases (Pyefinch & Golborn 2001, Stott *et al* 2002).

Photographs illustrating many of the features of the Special Qualities are included within the report where appropriate.

PART ONE:

SPECIAL QUALITIES SUMMARY

Arnside & Silverdale AONB is an extraordinary place. From the simple beauty of the Lady's-slipper Orchid to the shining sands of Morecambe Bay, the area is simply awe-inspiring - full of natural spectacles, stunning views and a surprise to be discovered around every corner.

We need to be clear about what makes the area particularly special and distinctive from the surrounding countryside. By having an updated, authoratitive and evidenced list of Special Qualities we can develop policies for the AONB as part of the process of reviewing the AONB Management Plan that have those Special Qualities as the reference point and focus. Consequently we can also put in place effective management arrangements to conserve and enhance these qualities for the future, building on past good work and delivering positive environmental objectives in the area.

It is the AONB Partnership's expectation that this list of Special Qualities, underpinned as they are by the evidence presented later in this report, will serve for a much longer period than the five yearly cycle of review for the Management Plan. Indeed we expect that the list will stand the test of time. If the prescriptions set out in the 2014 Plan and subsequent revisions are effective and implemented in a timely manner, we expect that the Special Qualities will still be consistent with the features found in the AONB over the timescale set out in the Vision statement – looking ahead to 2030 and beyond.

The special qualities of Arnside & Silverdale AONB are what makes the area nationally important and give the area a strong 'sense of place', reinforced by the fact that the area's complex mosaic of landscape types and habitats occurs within such a small geographical area.

The special qualities of Arnside & Silverdale AONB include:

1 Outstanding landscape and spectacular views

The landscape is a highly diverse mosaic of low limestone hills, woodlands, wetlands and mosses, pastures, limestone pavements, coastal cliffs and intertidal flats. Thousands of years of interaction between human activity and nature have shaped its character creating a living 'patchwork' of contrasting habitats criss-crossed by limestone field boundaries and hedgerows and interspersed with distinctive buildings and settlements.

Spectacular views over Morecambe Bay and towards the Lake District to the west and north, and towards the Yorkshire Dales and the Forest of Bowland to the east and south, give the area an impressive setting.

The small-scale yet complex nature of the landforms gives an intimate feeling within valleys and woodlands which contrasts with the open nature and expansive views from higher ground and along the coast.

The AONB's landscape is particularly distinguished by is its limestone features, which essentially define the area of designated AONB. These include grasslands and extensive woodlands over the underlying and frequently outcropping limestone rock, as well as areas of sparsely-vegetated limestone pavement, scree and cliff. Limestone is also prominent in the human features throughout the AONB, including field boundaries and buildings.

Wetlands and mosses, which typically cover the flat, lowland areas between the limestone hills, also contribute to the overall quality of the landscape; as do the woodlands, which cover a third of the AONB, across the limestone hills and the intervening valleys. Even the scattered trees and copses of the open fields and parkland add to the area's character.

The changing seasons contribute much to the appearance and visual appeal of the landscape, the woodlands hiding features in summer and then revealing new vistas in winter, when the trees are bare of leaves and undergrowth has died back. The colour of autumn foliage also has a big impact on many of the iconic views within the AONB. The vivid spring greens of almost never ending hues give new live to the landscape as the angle of the sun above the horizon changes month by month playing light and shadow across the land and seascape.

There are also occasions when the wildlife of the AONB provides a startling visual spectacle which contributes to a dramatic living landscape. Murmurations of starling over Leighton Moss provide an autumn highlight as a dancing living cloud of birds searching out their night-time roost in the reedbed.

The AONB's landscape is further enhanced by its coastal setting with extensive views over Morecambe Bay and the Lake District to the west and north, as well as views towards the Yorkshire Dales and the Forest of Bowland to the east and south. The small-scale, but complex nature, of the landforms within the AONB gives a feeling of being enclosed within the valleys which contrasts with the expansive scenery from higher ground and along the coast.

2 Morecambe Bay - a stunning seascape

Morecambe Bay is the largest intertidal area in the UK where five estuaries meet in a horseshoe-shaped bay of spectacular scale and grandeur. Coastal saltmarsh and intertidal flats partly lie within the AONB but also extend westwards over a huge area (310km^2) of mud and sand – a kaleidoscope of water and light; sea and sky; sound, texture and colour.

The coast is dominated by open skies that create an ever-changing backdrop: clear blue skies; swift-blown clouds on a windy day; blackening clouds before a storm; shafts of light shining through a gap in the cloud cover; or vivid sunsets which fill the sky and reflect on the shallow waters of the mudflats. Shining sandbanks, mudflats and constantly changing channels are alive with the evocative calls of curlews and flocks of waders and wildfowl keeping time with the ebb and flow of the tide.

The general landscape of the AONB is considerably enhanced by its proximity to the coastal saltmarsh and mudflats of Morecambe Bay, which partly lie within the AONB but also extend westwards over a huge area of intertidal mud and sand. The tidal influence within the estuary provides a further twice daily dynamic.

Many of the popular viewpoints over the Bay give rise to broad vistas and distant horizon, which emphasise the expensiveness of the sands, whilst those who take to the sands on cross bay walks or who visit by boat on a full tide, experience the wide horizons and “big sky” feel often associated with deserts – locally the Bay is sometimes referred to as the “Wet Sahara”

3 Rare and precious habitats

One of the most striking features of the AONB is its incredible biodiversity; the outstanding number and mix of priority habitats, within a small area, which creates a mosaic which is home to an amazing diversity of wildlife. The variety and importance of wildlife in relation to the small size of the area is a unique quality of this AONB.

Of particular significance, for their extent and value, are:

- ***native woodlands*** which include the fern and moss-rich ash woodlands typically found over limestone outcrops and pavement
- ***lowland calcareous grassland*** usually dominated by blue moor-grass, with a wide range of characteristic herb species
- ***lowland heathland*** which is unusual within a limestone setting but is found here in mosaic with limestone grassland
- ***lowland fen*** and ***reedbeds***, with the reedbed at Leighton Moss being the most extensive area of reedbed in North West England
- ***limestone pavement***, notably at Gait Barrows which has the most botanically rich limestone pavement in England
- ***maritime cliff and slopes*** which, around Morecambe Bay, support rare ledge and limestone grassland communities
- ***coastal saltmarsh*** which is extremely important to roosting and breeding waterfowl and waders
- ***intertidal mudflats*** which stretch across Morecambe Bay creating one of the most important sites in England for wildfowl and wading birds.

The AONB contains almost half of England's 56 Priority habitats. The development of the diversity of habitats is a result of the limestone geology overlain by chemically and physically diverse soils. This leads to the development of acid, neutral and alkali soils of varying character, which in turn provide a diverse range of conditions for the different habitat types to develop.

The woodlands are predominated by Ash, but it is the Yew and coppiced Hazel that makes the AONB woodlands locally special and important. There are many such woodlands that grow on top of extensive limestone pavements and these woodlands have developed a unique and almost mystical character.

4 Internationally and nationally important species

The AONB is home to an amazing diversity of species, many of which are uncommon in a national or international context but thrive within the unique mosaic of habitats. The density of rare and protected species found within this small area is also of note. Over 100 species included on the list of England's priority species are known to occur regularly within the AONB.

The numbers and diversity of butterflies are particularly impressive with 34 species found in most years, including the nationally rare[1] High Brown Fritillary, the nationally scarce[2] Pearl-bordered Fritillary, Duke of Burgundy, White-letter Hairstreak and Northern Brown Argus, and one of only two English populations of Scotch Argus.

Well over half the UK's flowering plant species have been recorded including the Lady's-slipper Orchid, the Lancaster Whitebeam (which is found nowhere else in the world other than around Morecambe Bay), the purple ramping fumitory which has a worldwide distribution restricted to the west of Britain, the east coast of Scotland and the east of Ireland, and the nationally scarce Blue Moor-grass which dominates the AONB's unimproved grasslands.

Notable breeding birds include several reedbed specialists which are found at Leighton Moss such as Bittern, Marsh Harrier and Bearded Tit. Others, such as Marsh Tit are found throughout the limestone and wet woodlands, with the AONB being a stronghold for this Red List species. Internationally significant numbers of Oystercatcher can be found at high tide roosts on the coast each autumn and the intertidal flats are an important feeding station for long distance migrant wading birds such as Black-tailed Godwit, Knot and Dunlin.

It must be remembered that it is the common place that supports the rare. Iconic species are sustained by a multitude of flora and fauna that provide food, rest or shelter. The inter-tidal marine environment of Morecambe Bay provides a crucial source of food in the form of shellfish and estuarine-mud invertebrates, for several hundreds of thousands of migrating waders on way to their northerly breeding grounds. Without this plentiful food source, many birds would fail to make this journey or would arrive in their breeding grounds in too poor a condition to breed successfully.

5 Unique limestone geology

Rare and distinctive Carboniferous limestone geology underpins the landscape of the AONB and unifies its character. The limestone landscape is particularly unusual because its karst features were formed at low altitude and show clear evidence of glacial and post-glacial processes. This combination of attributes makes Arnside & Silverdale AONB a nationally important geological asset.

The Carboniferous limestone bedrock was deposited more than 300 million years ago, when the region was located near the equator. Notable features include:

- distinctive areas of limestone pavement, which are often covered by woodland but are sometimes open with only a scatter of ferns, herbs and stunted trees
- low cliffs, which fringe the coast between the Arnside and Silverdale
- cave systems which have developed through solution-weathering of the limestone
- exposed palaeo-karst formations
- extensive folding and faulting including the 'Silverdale Disturbance'
- notable fossil assemblage sites, particularly along the coastal margin.

Within the sequence of limestone (Dalton, Park and Upper and Lower Urswick) some strata have rich fossil assemblages which can be found at a number of sites around the AONB,

[1] Occurring in 15 or fewer hectads (10km squares) in Great Britain
[2] Taxa which are recorded in 16-100 hectads (10km squares) but not included in one of the Red List Categories

but particularly within the exposed Dalton Beds along the coastal margin. There are several exposure sites around the AONB which are well studied – Trowbarrow LNR (a geological SSSI) is an important site for fossil preservation and is regarded as one of the most important shelf limestone localities in Northern England.

Trowbarrow also exhibits some of the most dramatic effects of the 'Silverdale Disturbance'[3] on the structural geology of the AONB, with its vertically bedded limestone cliff that tower over the quarry floor. A *disturbance* is a zone of disrupted rock strata comprising both significant folding and faulting, stretching for several miles across country as a distinct linear feature. There are three disturbances known in England and a further ten in Wales. These dramatic upheavals express the distortion and displacement of the rock, demonstrating the powerful influence of plate tectonics, which drive mountain-building episodes, followed by a slow collapse caused by weathering and erosion over many millions of years of the geological past.

The geodiversity of the limestone geology is particularly important because of its low altitude, hence accessibility, in the present landscape. It also is intimately related to glacio-karst landforms, the economic geology, coastal landforms, soils and flora. In short, it forms the basis of the ecosystems and landscape of the AONB.

6 Rich Sense of history

The historic heritage of the AONB is integral to its character and quality creating 'time-depth' within the landscape. Field patterns reflect human occupation over several thousand years with significant areas classed as Ancient Enclosure dating back to the Middle Ages. The stone ramparts of an Iron Age hill fort are still visible today on Warton Crag.

Over a third of the AONB's now extensive woodlands are considered to be ancient woodland, where coppice workers produced both fuel and woodland products, with evidence of charcoal burners' pits and later iron workings.

Numerous small abandoned quarries can be found which were worked by individual farmers or local communities, while other quarries developed into large-scale extraction industries that are highly visible reminders of past and current industrial activity. As well as being used for construction of distinctive stone buildings and field-boundary walls, locally quarried limestone was fires in limekilns and used for mortar, lime-wash and as a soil conditioner. There are 36 known lime kiln sites in the AONB, most of which are substantial limestone-built structures and important landscape and industrial heritage features.

Historic designed landscapes at Leighton Hall, Hazelwood Hall, Hyning Park are of significance and the registered parkland at Dallam Park is nationally important.

Most of the AONB's landscape today is the product of a long history of human interaction with the environment from early tribal settlers through manorial landlords and farmers, woodsmen or quarrymen, to the present day. Many features are linked to past pastoral and industrial activity, some of which are interdependent, such as coppice workers making charcoal for burning lime by quarrymen.

The area has a long association with the Quaker movement, particularly with the development of the Meeting House in Yealand Conyers, built in 1692. A number of notable early Quakers have strong associations with the area.

[3] Brenchley PJ & Rawson PF (eds) 2006 *The Geology of England and Wales* (2nd edn), The Geological Society, London (p135)

7 Distinctive settlement character

Stone buildings and settlements created during the last 800 years contribute strongly to the character and quality of the landscape through the design, construction and detailing of individual buildings, the form, layout and pattern of villages and hamlets and the settings of many of the buildings.

Much of the vernacular building style dates back to medieval times, when some of the earliest stone buildings were built, such as Hazelslack Tower, Arnside Tower, much of Leighton Hall, Beetham Hall and a number of farmsteads. The presence of date stones, small 'fire windows', hood mouldings constructed over windows and 'slobbered masonry' used to weatherproof limestone rubble-wall buildings, demonstrate a strong local tradition that continued to be used by later generations, developing a local style of building that remains a key characteristic of the AONB.

The earliest settlements, at Warton, Yealand Redmayne, Beetham and Hale, have a distinctive historic character, retaining a medieval linear form with a characteristic 'main street' that is still clearly evident.

There is evidence of occupation within the AONB dating back some 12,000 years, but special knowledge is required to interpret the remaining features from the distant past. Unsurprisingly it is with the advent of building with stone that marks a step change in the influence of settlement character, which has developed in ways that reflect major developments at different time periods in history.

Three built environment Conservation Areas in the AONB covering parts of Beetham, Warton and the Yealands afford these villages greater protection from development. Silverdale and Arnside were only developed as distinct settlements from Victorian times following the arrival of the railway in the Area. Silverdale's settlement pattern was also related to the position of fresh water wells, with mains water only freeing these restraints in the 1930s.

8 Strong community and culture

Vibrant communities exist within each of the villages, but there is also a shared identity with parishes coming together as part of the AONB, strongly connected to the landscape. Working the land is the foundation of the rural economy and the long-standing cultures of low-intensity pasture management and woodland coppice management have created important habitats upon which many of today's notable species depend.

There are many opportunities for people to get involved, learn about and actively participate in the conservation of the area. There are numerous local groups and societies that provide activities based on, and which support interest in, the AONB such as natural history, local history, ornithology, sustainability and walking groups and societies. There is high community awareness of the area's unique qualities and of its designation as an Area of Outstanding Natural Beauty.

The AONB has become an important locus for scientific investigation and education due to its outstanding wildlife and geology. Many artists and crafts people choose to live and work in the area, attracted by its scenic beauty, wildlife and quality of light. Cultural events with a distinct AONB focus, such as Greenwood Fairs and Apple Days, have flourished and Festivals promoting increased understanding of and connection to the area's special qualities have become annual calendar fixtures.

The historic crossing of the Morecambe Bay sands is unique; the route is extremely hazardous due to quick-sand, moving channels and fast incoming tides,

and led to the royal appointment of the first official guide in 1548. The 'Queens Guide to the Sands' still regularly guides groups safely across the sands today.

The Furness Railway line influenced local settlement development and still provides an important transport link which reinforces economic and social connections to neighbouring areas.

The six parishes of the AONB also played a role in securing the designation of the area as a AONB, working collectively to seek funding and influence the government through the Countryside Commission and the two County Councils involved in the designation process – Lancashire and Westmorland (pre 1974 local authority re-organisation)

The six parishes through coming together and working toward the designation of the area as an AONB, helped establish the AONB as a distinct location and with an identity in its own right.

The small geographical scale, unique geology, diverse habitats and rich wildlife of the area have led during the last few decades to development of the AONB as an extremely important locus for scientific investigation and education at many different levels from primary education to post-graduate study.

The difficulty of crossing the sands which led to the appointment of the Queen's Guide cannot be over-stressed. Attempting to cross the sands without local expert help is dangerous and loss of life has been an outcome of unaccompanied travel across the sands, despite skilled and well practised local rescue services located at Arnside and Flookburgh.

9 Opportunities to enjoy the countryside of the AONB

The area offers wonderful opportunities to enjoy quiet recreation such as walking, cycling, wildlife watching and horse riding. The network of narrow lanes and minor highways is one of the delights of the area and, along with an intricate web of public rights of way, access land and other paths, provides many opportunities for people to come into close contact with the area's wildlife, geology and history, providing inspiring learning opportunities and engaging visitors with the landscape.

Existing access to the coast enables visitors to experience the strong contrast between the landscape and the seascape and this will be enhanced by the future development of the England Coast Path.

Attractions, such as Leighton Hall, RSPB Leighton Moss Reserve and the Wildlife Oasis and draw people to the AONB and enhance the visitor experience.

While recreational activities change in popularity and new activities come along with sometimes negative impacts, the mosaic of open and wooded landscape can absorb many people.

Trowbarrow LNR provides challenges for many visitors, either as rock climbers, bouldering enthusiasts or younger mountain bikers as well as walkers, forest school participants or geology enthusiasts. The renown Arnside tidal bore attracts sea kayakers who surf the incoming tide to the viaduct, there to be challenged by the 'stoppers' – standing waves of great force created by the narrow channel under the widest span of the viaduct. The variety of activities available is surprising.

10 Sense of tranquillity, space and place

The AONB is a place for inspiration, spiritual refreshment, dark skies at night and clear, unpolluted air. People come here to relax, unwind and recharge their batteries, to get close to nature, breathe in the fresh sea air and absorb exhilarating wide open views. Tranquillity and a sense of space are easy to find both in the intimate inland landscape and on the hills and open coast.

The area's distinctive character and unique combination of scenery, history, abundance of wildlife, peace and quiet, and culture makes the AONB unique. For many, this very particular sense of place is the primary motivation to visit and creates a strong connection with and love for this landscape.

There are few places in the AONB which attract many visitors, and many places are rarely visited. The intimate scale of the inland landscape means that considerable numbers of visitors are relatively easily absorbed without any great awareness of others, while recreation activities within the AONB are primarily quiet and non-intrusive, such as walking, bird-watching, cycling and horse-riding; causing little or no disturbance to other users.

Events that cause significant disturbance are few and far between. Cross Bay walks, through their popularity, are such an occasion where numbers of participants can cause negative impacts and over stretch parking, transport and tea-room infrastructure!

However, even in the busiest parts of the AONB, there is a general lack of commercialisation which gives a traditional and relaxed feel.

11 Designations

A measure of how important the area is for its biological, geological and historical interest is provided by the number and extent of locally, nationally and internationally designated sites which lie within the AONB:

- 49% of the total AONB area is designated under European directive for its habitat, species or bird interest
- 54% of the AONB is covered by national Site of Special Scientific Interest (SSSI) designation
- a further 12% of the AONB has been identified as being of local wildlife value (Local Wildlife Sites) by Lancashire and Cumbria County Councils
- over 15% of the the AONB is covered by Limestone Pavement Orders
- 7 sites covering nearly 6% of the area of the AONB are designated as Local Geological Sites
- there are 10 Scheduled Monuments, 114 Listed Buildings, and 1 Registered Park and Garden
- 3 village Conservation Areas have also been identified for their built heritage value.

The number and area of sites designated provide a measure of how important the AONB is for its biological, geological and historical interest. The quality of some of the Local Wildlife Sites suggests that they would be designated as SSSI but for the already very extensive coverage of these nationally designated sites within the AONB.

Public Consultation

Prior to the 2013 Review of the AONB Management Plan, the special qualities list had evolved from earlier work and a range of sources. One outcome of discussion about how to conduct the current review was a desire to test the current list against best practise by understanding how UK National Park Authorities had built greater public awareness of the importance of their Special Qualities.

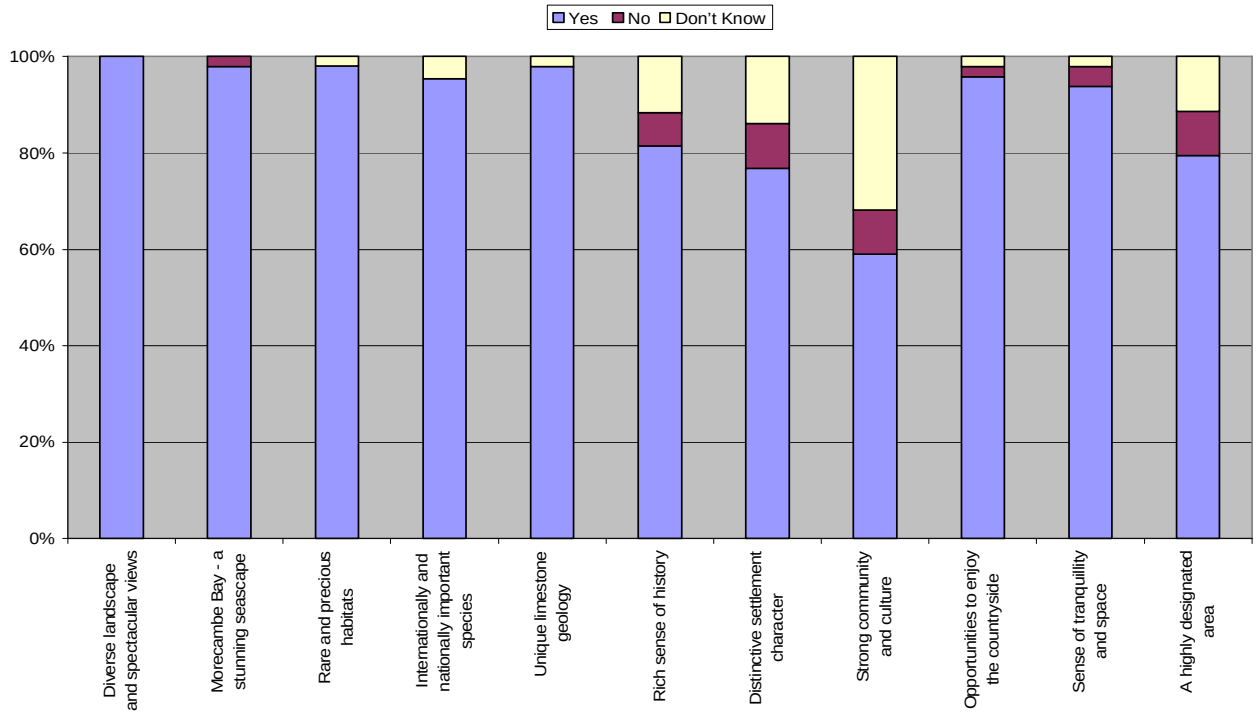
The first stage, following completion of a comparative exercise by the AONB team and production of a discussion document, set out a proposed list. Development of this list was undertaken as a facilitated workshop as part of the 40th Anniversary celebration event. This event was held in December 2012 during the public launch of the AONB Management Plan Review and identified gaps and omissions and considered if some attributes indentified in the 2009 Management Plan as Special Qualities were best deleted. The initial list outlined and developed during the workshop was then consulted on more widely during the early part of 2013 as a website survey. Both the workshop and the online consultation suggested the list being developed was appropriate and enjoyed general support.

A more definitive list of eleven Special Qualities was produced as part of the AONB's Outline Plan Proposals, published on 17th June 2013. The consultation which was open until 7th August 2013 asked the following questions in regard of the Special Qualities:

- **Do you agree with our list of special qualities?**
- **Are there any special qualities you think we have missed?**
- **Do you have any further comments on the list of special qualities or their descriptions?**

The outcome of this consultation was the broad affirmation of the list of 11 features which now form the definitive list of Special Qualities adopted within the AONB Management Plan 2014-19 (within the consultation draft and final versions of the plan). The detail text of the list used in the draft plan was amended to respond in part to suggestions made during the consultation and to help strengthen the understanding of individual attributes making up the Special Qualities. The was particularly the case for **Strong community and culture** which attracted notably weaker support (15% Don't Know responses) than other more readily appreciated qualities such as **Outstanding landscape and spectacular views.** The chart below records feedback to the consultation, showing agreement levels for each attribute.

Chart 1: NB Some of the Special Quality titles have been modified since the chart was produced for the OPP Consultation.



PART TWO:

EVALUATION OF SPECIAL QUALITIES

1 Outstanding landscape and spectacular views

The principal feature for which the Arnside & Silverdale area was designated as an AONB is its unique and highly valued landscape. The scenic qualities of the area are determined not simply by the presence of natural elements or their rarity value, but by the way in which they combine to form distinctive landscapes. The mosaics of landscape types are created by the interactions of features such as geology, landform, vegetation and climate as well as cultural and social features such as land use, settlement and enclosure.

Within the relatively small area of the AONB, covering just 75 km^2, there is an intricate mosaic of limestone habitats interspersed with large areas of wetland; all in a coastal setting with extensive views over Morecambe Bay and the Lake District to the west and north, as well as views towards the Yorkshire Dales and the Forest of Bowland to the east and south. The small-scale, but complex nature, of the landforms within the AONB gives a feeling of being enclosed within the valleys which contrasts with the expansive scenery from higher ground and along the coast.

The character of the AONB landscape has been classified and described at various levels. On a national scale, the AONB is classified as falling within Landscape Character Area 20 - Morecambe Bay Limestones (which also covers land to the east of the AONB up to the Lune Valley, including Hutton Roof and Farleton Knott, and much of the southern Cumbria coast). Defining features of this Character Area which are relevant to the AONB are:-

- Wide expanses of shifting intertidal sandflats and saltmarsh, gravelly or muddy beaches, backed by low limestone cliffs.
- Low undulating farmland of pastures divided by dry stone walls with infrequent, individual, windswept trees but also areas of scrub and broadleaved woodland.
- Conspicuous limestone hills, with cliffs and scree slopes, rising above the low-lying pastures and wetlands.
- A richness of semi-natural habitats, including limestone pavements, scrub, semi-natural coppice woodland, herb-rich grasslands, peaty fenlands and mosslands.
- Scrub woodland including juniper and unimproved grasslands on gently undulating hills divided by shallow valleys with hedgerows.
- Stately homes set in parkland landscapes with well maintained gardens.

On the county scale, the Cumbria Landscape Classification and the landscape character assessment of Lancashire both identify two basic landscape types, labelled *Estuary and Marsh* and *Wooded Hills and Pavement* in Cumbria and *Open Coastal Marsh* and *Wooded Limestone Hills and Pavements* in Lancashire.

A detailed Landscape Character Assessment of the AONB is presented in The Arnside and Silverdale Landscape (1997). This describes the way in which patterns of landform, land-cover and features form seven distinctive local landscape types: coastal landscapes; wetlands; open pasture; enclosed pasture; species-rich limestone pasture with scrub; wood pasture on low limestone hills and parkland. This work has been updated and refreshed with the preparation of the Arnside & Silverdale AONB Landscape and Seascape Character Assessment in 2011.

The new Landscape Assessment, drawn up in accordance with current guidance from Natural England, identifies six local landscape types found within the AONB are: Intertidal flats, saltmarshes and lagoons, lowland moss, coastal limestone pasture, inland pasture and parkland and wooded limestone hills and pavements[4].

[4] Arnside & Silverdale AONB Landscape and Seascape Character Assessment LUC, 2011

Importantly, it is the mosaic of several of these features coming together within a relatively small area which gives the AONB such a distinctive landscape of unique charm.

The most distinctive aspect of the AONB's landscape is its limestone features, which essentially define the designated area. This comprises unimproved grasslands, woodlands and undulating pasture over the underlying and frequently outcropping limestone rock, as well as areas of sparsely-vegetated limestone pavement, scree and cliff. Examples of sites where such features are strongly demonstrated include the prominent limestone hills of Warton Crag in the south of the AONB and Arnside Knott in the north, the extensive limestone pavements at Gait Barrows and the limestone cliffs and outcrops at Jack Scout.

Limestone is also prominent in the human features of the landscape, where local stone has been used, for example, to mark field boundaries with the dry stone walls which are so characteristic of the AONB, and to build houses, notably in settlements which date back more than 200 years such as along Warton Main Street.

Extensive wetlands and mosses typically cover the flat, lowland areas between the limestone hills, which also contribute to the overall quality of the landscape. Leighton Moss, in particular, has a prominent position within the AONB landscape and affords stunning views across its pools and reedbeds from the surrounding limestone hills; changing colour through the seasons as the reeds develop from bright green shoots in spring through to purple flowers in summer and brown stems in winter.

Trees also make a highly significant contribution to the landscape, with woodland covering a third of the AONB. Large wooded areas have developed over both the limestone hills and the more neutral and acidic soils of the valleys in between, while numerous field trees and small copses add height to the landscape of the open grasslands and pastures. While a considerable range of different tree and shrub species can be found in the AONB's woods, by far the most ubiquitous is the ash tree. With its open pinnate leaves, typically amongst the later species to unfurl, ash allows plenty of light through its canopy to enable often spectacular displays of woodland herbs in the spring; including carpets of bluebells, wood anemone and wild garlic at sites such as Warton Crag, Hynings Scout Wood, Eaves Wood and Arnside Knott. Also of note are the many evergreen yew trees, often forming large stands with dark, dense canopies over moss-covered limestone pavement, such as those at Cringlebarrow Wood, Yealand Allotments, Marble Quarry and Gait Barrows.

As well as the landforms and vegetation, there are also occasions when the wildlife of the AONB provides a startling visual spectacle which contributes to a dramatic living landscape. Amongst such occasions are the huge flocks, or *murmurations*, of starling which gather above Leighton Moss on winter afternoons, prior to roosting overnight in the reeds, as thousands of birds twist and turn, forming vast, rippling patterns in the sky. Similarly, large flocks of wading birds often provide spectacular displays as they gather together at high tide roosts at Arnside, Jenny Brown's Point and the Warton and Carnforth Marshes, while the abundance of butterflies and other insects in flower-rich meadows on a sunny summer's day, accompanied by a proliferation of bird song, adds a strong sense of life to the landscape.

2 Morecambe Bay - a stunning seascape

Morecambe Bay is a broad, expansive bay on the northwest coast of England, situated on the Irish Sea, nearly due east of the Isle of Man. The Bay straddles the boundary of two counties, Cumbria and Lancashire, with the Lake District National Park sitting just to the north of the Bay. The coastal area and seascape are dominated by open skies that create an ever-changing backdrop to the scene: clear blue skies; swift-blown clouds on a windy day; blackening clouds before a storm; shafts of light shining through a gap in the cloud cover; or vivid sunsets which fill the sky and reflect on the shallow waters of the mudflats. The tidal influence within the estuary provides a further twice daily dynamic.

The Bay is the largest continuous expanse of intertidal mudflats and sand in the United Kingdom, covering a total area of 310 km2 . The Bay is one of 67 Ramsar treaty sites in England with 37,404 hectares designated. (Leighton Moss, on the edge of the Bay is also a Ramsar site but is much smaller and extends to just under 129 hectares.)

On the east and north of the Bay, the sandflats are bordered by extensive areas of salt marsh, only ever covered by the highest tides. Morecambe Bay is an internationally important wildlife site, with abundant bird life and varied marine habitats. As for the birdlife of the Bay, Morecambe Bay is the most important site in Britain for its total wader population, especially Oyster catcher[5]. In fact, some sources suggest that Morecambe Bay is the third most important estuary in Europe.

The Bay supports rich fish and shell fisheries. As well as being a food resource for many thousands of wading birds, the rich cockle beds are well known throughout Britain and have been fished by locals for centuries. Morecambe Bay is also noted for its shrimp fisheries.

As well as being noted for its wildlife, the Bay is also famous for its fast flowing tides (said to move as fast as a horse can run) and the speed of the advancing tide gives rise to a tidal bore which is most noticeable at Arnside. Another more infamous feature is the extensive and variable quicksands, which can be extremely dangerous. Coupled with the rapid rising tides, the quicksands make the Bay a place that swallows up anything in its path. The Sands at one time formed the most direct route to the Furness area, with all manner of traffic crossing the Bay until the Furness Railway line was connected to the rest of the country with the construction of the viaduct at Arnside in 1857.

The dangers of the route across the sands are the reason that there has been a Royaly appointed official guide to the sands since 1536. The traditional role carries no salary, but includes a rent free residence known as "Guides Cottage", near Grange.

There are a number of islands in the bay, although only Walney Island is of any substantial scale and includes a reknown bird observatory at its southern extremity. Of the others, Piel Island is of note for its castle and heritage and is designated as a SSSI. Piel Castle stands on the South-Eastern point of Piel Island at the mouth of the deep-water harbour of Barrow-in-Furness, guarding the passage to and from the Bay. Sandside in the AONB was a busy port until the mid 19th Century and in Roman times Milnthorpe had a wharf for cargo. The cultural heritage and strong historical associations add further appeal to the broad seascape of the Bay, adding myth and legend to its scenic beauty.

The general landscape of the AONB is considerably enhanced by its location; in particular its proximity to Morecambe Bay, but also the fact that the AONB lies immediately to the south-east of the Lake District National Park, less than 5 km north-west of the Forest of Bowland AONB and less than 15 km to the west of the Yorkshire Dales National Park, all of which form a panoramic backdrop. The coastal saltmarsh and mudflats of Morecambe Bay lie partly within the AONB (actually covering about a third of the total AONB area) but also extend westwards over a huge area of intertidal mud and sand.

[5] http://www.rspb.org.uk/reserves/guide/m/morecambebay/star_species.aspx

This is fringed by various coastal habitats, including saltmarsh, low cliffs and sand and pebble beaches southwards along the Lancashire coast to Morecambe and Heysham and westwards along the southern Cumbria coast round to Walney Island.

The Bay exerts a maritime influence over the climate in the AONB, exerting a moderating effect on the locality, producing mild conditions that allow some southern species to survive beyond their normal extent, added to some northern species which find a niche beyond their expected range. Therefore the Bay, merely by its presence, contributes much to the wildlife diversity in the AONB.

3 Rare and precious habitats

Aside from the landscape, the most striking feature of the AONB is its incredible biodiversity. For an area of just 75 km^2, there is a very high diversity of habitats which, in turn, support a considerable range of species.

The AONB contains almost half of England's 56 Priority Biodiversity Action Plan (BAP) habitats, listed in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. These habitats are considered to be of principal importance in England either because: they are habitats which are internationally important; or they are natural and semi-natural habitats at risk such as those with a high rate of decline or which are rare; or they are habitats which are important for key species.

Priority BAP habitats which can be found within the AONB are: traditional orchard; hedgerow; coastal saltmarsh; intertidal mudflats; maritime cliff and slopes; eutrophic standing waters; oligotrophic and dystrophic lakes; ponds; rivers; lowland calcareous grassland; lowland meadows; lowland heath; Calaminarian grasslands; inland rock outcrop and scree; limestone pavement; coastal and floodplain grassland; lowland fen; reedbeds; lowland mixed deciduous woodland; upland mixed ashwood; wet woodland; and wood pasture and parkland.

Of particular significance amongst these habitats within the AONB, for their extent and biodiversity value, are:

- **upland mixed ashwoods**, which are the fern- and moss-rich ash woodlands typically found over limestone outcrops and pavement at sites such as Warton Crag, Underlaid Wood, Cringlebarrow Wood, Gait Barrows, Yealand Hall Allotments and Eaves Wood;
- **lowland calcareous grassland**, usually dominated by blue moor grass *Sesleria caerulea* with a wide range of characteristic herb species which cover the thin soils over limestone in unimproved areas, such as can be found at Warton Crag, Jack Scout, Arnside Knott and around the Silverdale golf course;
- **lowland heath**, which is unusual within a limestone setting but found in mosaic with limestone grassland here due to the windblown deposits of loess which have created pockets of more acidic soils, notably at Arnside Knott, Warton Crag and Yealand Hall Allotment;
- **oligotrophic and dystrophic lakes**, as occurs at Hawes Water where the marl lake is recognised as being of international importance and one of only a few natural marl lakes in North West England;
- **lowland fen** and, especially, **reedbeds**, which are found at Leighton Moss, Haws Water, Barrow Scout and Silverdale Moss, with Leighton Moss containing the most extensive area of reedbed in North West England;
- **inland rock outcrop and scree** which are widespread throughout the AONB, but particularly notable at Warton Crag and Arnside Knott;
- **limestone pavement**, which again occurs widely throughout the AONB in both open (with just scattered vegetation) and wooded forms, with particularly fine examples at Gait Barrows (long regarded as the most botanically rich limestone pavement in England, Ward & Evans 1976), Marble Quarry, Yealand Allotments and Middlebarrow;
- **maritime cliff and slopes**, which, around Morecambe Bay, support rare ledge and limestone grassland communities such as can be found at Jack Scout;

- **coastal saltmarsh**, which is extremely important to roosting and nesting waterfowl and other seabirds - notably at Warton Marsh (which stretches between Jenny Brown's Point and Carnforth) and at Arnside, though most of the Silverdale marsh has been lost locally in recent decades due to the changing direction of channels in the Bay; and
- **intertidal mudflats** which stretch across Morecambe Bay (the largest continuous area of intertidal sand and mudflats in UK), supporting a huge invertebrate biomass and associated numbers and diversity of birds which feed on this (with Morecambe Bay being amongst the top three sites in England for waterfowl numbers, Marsh & Roberts 2012).

Other habitats also occur which have not been identified nationally as priority habitats but which are important locally. An example of this is the stands of bracken, which often grow on deeper soils of wind-blown loess in valleys between the limestone. In many cases a spring herb layer more typical of open woodland, including violets, bluebells and wood anemone, has developed beneath the bracken litter (layer of decaying fronds from previous years' bracken growth) prior to full development of the current years' bracken growth which later shade out other potential herb competitors. These bracken stands, as found for example at Warton Crag, Arnside Knott, Heathwaite and Gait Barrows, are vital for the populations of fritillary butterflies which lay their eggs on the violets (their larval foodplant) and rely on the bracken litter to maintain an appropriate micro-climate for development of their eggs.

4 Internationally and nationally important species

The AONB supports a considerable diversity of species; many of which are uncommon in a national or international context but thrive within the unique combination of habitats and conditions within the AONB.

Over 100 species included on the list of Priority Biodiversity Action Plan (BAP) species (Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006) are known to occur regularly within the AONB. This includes 9 mammal species, 18 species of breeding birds, 3 reptiles, 1 amphibian, 65 invertebrate species (including 10 butterfly species), 6 species of fungi, 2 lichens and 9 vascular plants.

In addition, at least 29 nationally rare (i.e. recorded in 15 or fewer hectads or 10 x 10 km squares) and 48 nationally scarce (recorded in 16 - 100 hectads) invertebrates (including 1 nationally rare and 4 nationally scarce butterflies) have been recorded at sites within the AONB, along with 24 nationally rare fungi (with Gait Barrows alone having had a total of over 1,600 species of fungi recorded) and 3 nationally rare and 20 nationally scarce species of vascular plant. There are also at least 19 species of breeding birds listed on the RSPB Red List (globally threatened or suffering severe population decline in the UK) and at least 40 species on the Amber list (species of conservation concern in Europe or uncommon/declining populations in the UK) which have been recorded in the AONB in recent years. Nationally, and sometimes internationally, significant numbers of several bird species are regularly present at Leighton Moss or on the coastal marshes.

The numbers and diversity of butterflies within the AONB are particularly impressive. 34 species can be found in most years, out of about 52 regularly occurring UK species, with high numbers of many of these species recorded annually in the unimproved grasslands and scattered scrub at places like Arnside Knott, Heathwaite, Gait Barrows and Warton Crag. These include the nationally rare high brown fritillary, which lays its eggs on the violets beneath bracken stands and in coppiced woodland, for which the AONB is now a UK stronghold, as well as the nationally scarce pearl-bordered fritillary, Duke of Burgundy, white-letter hairstreak and northern brown argus, and one of only two English populations of Scotch argus.

The list of notable invertebrates in the AONB also includes the narrow-mouthed snail *Vertigo angustior*, which in the UK is known only from a few widely scattered localities. This is a tiny species, less than 2 mm in size, which is typically found in marshy ground and is often restricted to a narrow zone around wetlands, only a few metres wide, due to its specific microhabitat requirements.

At Gait Barrows, however, it occurs in some local abundance in depressions within the limestone pavement (Killeen 1997).

While the natural history of the AONB has been generally very well studied by researchers and amateur naturalists alike, the depth of biodiversity within the AONB is well illustrated by a recent invertebrate survey of Warton Crag which found two species of sawfly which had never previously been recorded in England and a species of mite which had never previously been recorded in the UK (Knight 2012). It is highly likely that similar studies at other sites in the AONB (or, indeed, perhaps further effort at Warton Crag) would find other such notable invertebrates.

Over half of the UK flowering plant species have been recorded in the AONB (Anon 2009). This list includes 15 species of British native orchids, including the lady's slipper orchid at one of its last two known UK locations prior to recent conservation reintroductions. Other notable species include the Lancaster whitebeam which is found in the world only around Morecambe Bay, usually on the sea cliffs and limestone pavements, and another UK endemic, the purple ramping fumitory which is restricted to the west of Britain and the east of Ireland, typically growing in arable margins but also found, as in the AONB, on disturbed ground along road and path margins and in gardens (Skelcher 2005).

Perhaps one of the most important plant species in the AONB is the blue moor-grass, which is scarce in the UK as a whole but dominates the unimproved grasslands on the thin limestone soils. This species commonly grows in the AONB with a range of nationally scarce associates including spring sandwort, dark red helleborine, rare spring sedge and spring cinquefoil. These species can also often be found scattered over open limestone pavement alongside other nationally scarce species; rigid buckler-fern, limestone fern and angular solomon's seal.

The list of breeding birds for the AONB includes several reedbed specialists which are found at Leighton Moss such as bittern, marsh harrier and bearded tit, with Leighton Moss being the only site in North West England where bittern currently breed. In winter, Leighton Moss supports a significant proportion of the UK's shoveler population, while the coastal marshes and sandflats support significant numbers of shelduck, curlew, redshank, black-tailed godwit and oystercatcher (Horner, Miller & Mower 2011; Marsh & Roberts 2012). In particular, the high tide roost at Jenny Brown's typically supports internationally significant numbers of oystercatcher in autumn and nationally important numbers in winter.

Leighton Moss also provides a home for some of the more notable mammals found in the AONB; providing a base for the resident otter population and reed canary-grass habitat for harvest mice. The Quicksand Pool, leaving Leighton Moss, is also the most recent location within the AONB where the rapidly declining water vole has been recorded.

The huge diversity of species found within the AONB is, in much part, due to the wide variety of habitats which exist here in such close proximity, but is also due to the geographic location of the area. The Gulf Stream provides a very mild climate, with extreme weather conditions being very rare events, while the area also lies in an overlap zone for many species which have a generally northern or southern distribution in the UK. For example, amongst the butterflies, the northern species Scotch argus and northern brown argus are found here at the southern edge of their UK range while populations of the high brown fritillary and Duke of Burgundy occur at or near their northern UK limits.

5 Distinctive limestone geology

The main geological interest of the AONB is its distinctive Carboniferous limestone geology. This geology underpins the landscape and has created many of the opportunities now present for such a wide biodiversity interest. The limestone landscape of the AONB is particularly unusual for two reasons: firstly, it was formed at low altitude, and secondly, it shows significant evidence of glacial and post-glacial processes. This combination of attributes, which is not found in any of the other AONBs or National Parks, makes the Arnside and Silverdale AONB a very important natural asset.

The Carboniferous Period of geological history stretched from 359 Million years ago (Ma) to 299 Ma. It is marked by a period of continental collisions, culminating in the formation of the supercontinent Pangea and associated mountain building (the Variscan Orogeny). The Carboniferous Limestone bedrock of the AONB was deposited during the Dinantian sub-period (or lower Carboniferous period) over some 10 - 15 million years, up to approximately 330 (Ma), when the region was located near the equator.

At the start of the Carboniferous period the area that is now south Cumbria/ north Lancashire was some 10 degrees south of the equator and formed a shallow marine basin. The basin was situated between the Laurentian continent to the north and the smaller Amorica land mass to the south, and the whole of this tectonic conglomeration was drifting slowly northward. The shallow sea produced ideal conditions for the deposition of both shelf and basin (deeper water) limestones.

The different depths of this ancient tropical sea, coupled with varying sea levels due to Eustatic change[6] or changes to land elevation (isostatic change)[7] accounts, in part, for the different characteristics of the limestone beds found in the AONB and elsewhere around Morecambe Bay. Around 340 Ma the area was dominated by shallow tropical seas, with varying sea levels and changing sedimentary conditions; giving periods of clear water then episodes of sediment-laden waters. The proximity of large land masses meant that water conditions could change from clear tropical waters, producing pure limestones to sediment rich waters found near major deltaic systems, forming mudrocks, sandstones, shales and even coal measures. These conditions tended to change cyclically, although steady state conditions were also maintained for considerable periods. These extended periods of steady state conditions are indicated where repeated massively bedded limestones were formed. A pattern of repeated deposition within the differing lithologies is demonstrated by easily distinguished repeating rock sequences.

The main limestone forming period ended around 325 Ma, when the Silesean (or upper Carboniferous period) marked a transition from limestone to deltaic sediments, initially of mill-stone grit and later in the period to the coal measures, (no rocks from the Silesian sub-period outcrop in the AONB). There were also extended periods where newly formed limestones were raised above sea level and subject to both erosion and/or karst formation sometimes with soil formation and vegetation growth. These rocks are exposed now as the marine peneplane beds (as at Far Arnside Coral Bed) or as paleokarst formations (e.g. Red Wall in Trowbarrow LNR).

Three principal limestone formations underlie the AONB, which unify its character and shape its landscape (in decreasing age): the Dalton Beds; the Park Limestone; and the Urswick Limestone (Lower and Upper). Additionally the overlying and younger Gleaston Formation is exposed in a few places.
The three blocks exhibit different lithologies and appearances[8]:

- the Dalton Beds are described as bituminous dark grey well-bedded bioclastic packstones interbedded with thin shale layers and mudrocks, with undulating bedding planes. Thicker-bedded limestones occur, especially towards the base and top of the formation.
  The depositional environment was a gentle sloping submarine ramp below storm wave base, perhaps at depths below 100m. The sequence is approximately 100m thick

[6] Eustatic change is when the sea level changes due to an alteration in the volume of water in the oceans or, alternatively, a change in the shape of an ocean basin with a change in the amount of water the sea holds.

[7] Isostatic sea level change is the result of an increase or decrease in the height of the land. When the height of the land increases, the sea level falls and when the height of the land decreases the sea level rises. Isostatic change is a local sea level change whereas eustatic change is a global sea level change.

[8] The Dinantian Limestones of the Far Arnside and Silverdale shoreline. Mike Balderstone and Mike Dewey, Westmorland Geological Society Proceedings No.31 (2003)

- the Park Limestone is poorly bedded and lacking in structure, composed of bioclastic and peloidal grainstone. The sequence is approximately 125m thick, formed in shallow water.
- the Urswick Limestone is also a shallow water formation and rests on a karstic surface developed on the upper Park Limestone as a result of the emergence of the rock above sea level. There are both major and minor carbonate depositional cycles in the Urswick Limestone Formation, resulting in repeating sequences of thin bedded packstones and wackstones. The major cycles originate from steady subsidence whereas the minor cycles are glacio-eustatically controlled cycles superimposed on the major cycles. Parts of this formation display thickly bedded units of limestone of up to 3m thickness. In total, the Urswick Limestone is between 120 and 160 metres thick

Additionally there are recurrent beds of mudstones and shales, deposited as the marine shelf south of the Lake District High was inundated by incursions of fluvio-deltaic sediments.
The most extensive and significant is the Woodbine Shale that outcrops in a number of locations around the AONB. The shale bed is close to the boundary between the Upper and Lower Urswick limestones. It now sits within a sequence of near vertically bedded limestones and consequently forms a linear feature that can be traced across the AONB from the south near Leighton Moss to the north around Sandside.

A number of sites have good exposures of fossil assemblages; notably the exposures of the Dalton Beds along the shoreline between Arnside Promenade and New Barns Bay and in the Park Limestone as far as Jack Scout, where the outcrop changes to Urswick Limestone. Trowbarrow LNR is also important for fossil preservation and is noted for its particularly rich microfossil assemblage. This site is also regarded as one of the most important shelf limestone localities in northern England. The fossil coral beds of Far Arnside are of particular interest and a new fossil coral species was identified here in 2001. This site is one of the most important and rare local geological exposures and has been designated as a RIGS site. Here the Lower Carboniferous limestones are seen. A smooth bed of upper Dalton Limestone was exposed in 2000 when the salt marsh was eroded by the River Kent channel. This flat rock surface is called a ‘marine peneplaned hard-ground’ it was eroded by coarse calcareous sands shortly after the sediment became lithified (became solid rock). This scouring action cross-sectioned the bedrock and has produced a near polished surface that now displays many perfectly preserved fossil corals. This exposure provides a unique opportunity to examine perfectly cross-sectioned rugose (wrinkled) corals.[9]

Around 280 Ma, the Carboniferous rocks were uplifted and folded into a broad dome during the Variscan Orogeny. This dome was then eroded, exposing the higher fells of the Lake District and leaving a ring of Limestone around a mountainous core. The southern part of the ring, which includes the AONB, was regionally folded and faulted leading to the arc of limestone being more broken and disrupted than to the north of the Lake District.

These tectonic structural movements and the differing limestone lithologies within the area have ensured the development of a wide variety of landforms and contributed to the formation of many different karst landscape features. The strong regional faulting, trending approximately north-south, together with secondary east-west subsidiary faults and associated folding within the limestone, split the local area into a series of steep sided upland blocks, such as Arnside Knott, that are separated by low-lying basins.

A linear zone of near vertical bedding within the Urswick Limestone, including the Woodbine shale and associated with folding and faulting along the “Silverdale Disturbance”, is responsible for a feature known as “The Trough”. “Disturbances” are rare geological features, with only three such zones identified in England, and comprise a zone of disrupted rock strata comprising significant folding and faulting, stretching for several miles as a distinct linear feature. This remarkable shale and limestone sequence, faulted to either side and tilted near vertically as the central limb of a monocline fold, has formed a trench-like feature between two small limestone cliffs.

9 http://www.cumbriarigs.co.uk/?download=far_arnside_flier.pdf

The Trough outcrops dramatically in both the north and south of the AONB above Storrs Lane, where a permissive path follows it line into Trowbarrow Quarry, and at Throughs Lane in Storth. The deep cut of the Trough is due to the presence of a mudrock or shale, known as the Woodbine Shale, which is sandwiched within the Lower Urswick Limestone. The softer mudrock has been eroded more rapidly than its enclosing walls of hard limestone, resulting in a gorge-like feature some 8 m wide. The Woodbine Shale also forms an extensive impervious layer within the Limestone that has a profound effect on the local hydrogeology.

Some areas of the limestone bedrock have been subjected to intensive modification and mineralisation through deposition, for example at Red Rake and Guard Hill.
Of particular importance is the introduction of haematite iron ore (Fe203) which may have occurred during the Cretaceous or early Tertiary period (between 135 Ma and 54 Ma), or possibly even earlier during the upper Triassic or Permian period (between 280 to 195 Ma). The mineralization, associated with hydrothermal fluids often corresponds with faulting and results in the distinct red discoloration of the rock over considerable areas.

Low cliffs fringe the coast between the mouth of the Kent Estuary and Silverdale and generally occur where the Carboniferous Limestone is more massively bedded, especially near Jack Scout. In addition to these natural cliffs, usually associated with faulting, excavated cliff-like rock faces are found a number of locations in the AONB, created by past and current quarrying activities.
High cliffs exist at the disused quarries at Trowbarrow, Warton Crag, Jenny Brown's Point and Middlebarrow and the still active quarry at Sandside, while smaller scale features can be found at numerous other minor quarries and stone workings scattered around the AONB. The quarry faces at Trowbarrow are particularly striking as they are formed by rock bedding planes – the east quarry face being the underside of the bedding, which display extensive fossil assemblages in some cases. The extensive displacement of the limestone is apparent where ever one chooses to look along the quarry floor.

Solution hollows form in limestone where removal of rock results in the formation of an underground chamber, which then partially collapses, forming a funnel-like hollow at the ground surface. These hollows are known as *dolines***.** Where several dolines form adjacent to one another and have coalesced into one large depression the term *uvala* is used to describe them. Within the AONB, many dolines have been identified and their characteristic form recognised. Within Cringlebarrow Wood the formation of an uvala has resulted in the development of Deepdale Pond, a deep depression surrounded by high cliff walls of limestone, though this is best appreciated in winter when the trees are bare.

The free draining nature of the underlying geology generally mitigates against numerous ponds or large bodies of standing water. The higher ground has no surface drainage pattern due to the permeable nature of the rock. This does give rise to a considerable number of springs in the area, many of which were used used by local people to provide water for domestic use, washing pools, hemp ponds and watering places for livestock, prior to mains water being widely available. Some of these springs have had stone walled holding pools built to help maintain a constant supply of water, such as at Woodwell in Silverdale. Ephemeral water bodies such as turloughs (winter seasonal lakes) and dew ponds are also evident in the area.
Whilst some ponds are associated with dolines (e.g. Deepdale & Bank Well) or low lying peat mosses (e.g. Hale Moss Pond), Hawes Water is a more extensive water body (the largest natural water body in Lancashire). It was formed by glacial action, the ice over deepening a depression in the bedrock, as the ice sheet advanced towards the Irish Sea from the Cumbrian high fells. Hawes Water is one of only two water bodies remaining in Lancashire that have a natural origin and is one of very few lakes with marl margins in England.

Weathering of the limestone within the AONB has resulted in the development of two unusual and distinctive types of cave system. Sea caves occur along the limestone cliffs at a former sea level. Although these are mostly dry and fossilised, they illustrate an unusual type of cave development, considered unique in Northern England, in which caves were eroded as roughly circular passages by water under pressure.

At Hale Moss, a system of caves has developed in the steep cliff-like limestone bluffs, which once formed the margin of the Hale Moss *polje* lake, and provide Britain's only examples of this feature. There are also a scattering of caves formed by solution of limestone by sub-surface drainage water.

Distinctive areas of *limestone pavement* have developed throughout the AONB, many of which show evidence of glacial erosion. The pavements, often wooded, but sometimes open with only a scatter of vegetation, are broken into blocks (known as clints) by deep solution-widened fissures (called grikes) etched into the surface along bedding planes, mineral veins and joints. The intricate form of the pavements allows a variety of microclimates to develop and the grikes commonly contain a wide range of plant species; particularly ferns, such as the nationally scarce Rigid Buckler Fern, and stunted trees which struggle to grow in the almost non-existent soils. Limestone pavement can be found throughout much of the AONB, with particularly fine examples at Gait Barrows National Nature Reserve, Thrang End, Yealand Hall Allotment, Eaves Wood and Warton Crag.
Many areas of pavement show a range of karren forms (a general term used to describe the total complex of superficial micro-solutional features of soluble rocks such as limestone). These include sharp-ridged grooves (rillenkarren) and their larger, elongated cousins (rinnenkarren), as well as rounded runnels formed beneath a soil cover (rundkarren). Other forms found include the ubiquitous solutional hollows (kamenitzas), grikes and clints. When solution features on a limestone pavement are exposed due to soil loss, they become more weathered and 'sharper' in appearance. It is possible to differentiate newly exposed pavement from pavement which has been exposed for longer periods of time by looking at the sharpness.[10]

About 2 million years ago the Earth's climate cooled, allowing the development of glaciers and ice sheets which, at their maximum covered most of mainland Britain. These cold episodes were called Glacials and were separated by warmer Interglacials. It is now widely accepted that there may have been many such climatic oscillations within the Devensian glacial period (c 118,000 to 12,000 years ago) although most of the evidence of glaciation seen today is from the last glacial episode. The upstanding Carboniferous limestone blocks were scoured by ice which swept away overlying soils, and preferentially eroded weaker beds of limestone.

Exposed on the surface, the limestone has been weathered during warmer climatic periods – including the current interglacial - by moderately acidic water. This solutional erosion of the limestone has produced a range of characteristic features collectively known as karst landforms, such as dolines, polje and limestone pavements.

The majority of the ice that scoured the landscape of the AONB was from the Lake District and is believed to have been over 1,500 metres thick and powerfully erosive; leading to the formation of heavily scoured extensive outcrops of smoothed limestone, some of which have been moulded by the ice into gently undulating topography.

Study of loess deposits on Warton Crag suggests that the ice last retreated from the landscape of the AONB around 19,000 years ago[11]. At the end of the glacial period, as the climate warmed extensive till deposits would have covered the limestone outcrop, which in turn would lead to soil formation, providing conditions for the formation of limestone pavements. It is the layer of debris left by the retreating glaciers and also by wind deposits that hold the key to the development of the characteristic limestone pavement landforms over the last 15,000 years. The karst landforms were formed by the gradual dissolving of the limestone by mildly acidic water seeping through the plant cover which had become established on the soil above the limestone platforms. If this glacial debris had not been in position, then the weathering processes that form limestone pavements could not have taken place.
During the early Holocene (c 11,000 years ago) sea-level was some 3m below present levels, and the coastline was therefore different from that of today. During this period, sea-level continued to rise, drowning previously 'dry land' such as the areas of limestone pavement which can be seen dipping into the sea or beneath saltmarsh, as at Jenny Brown's Point. By about 8,000 years ago the sea had deposited clays over peats in the area of Silverdale Moss before it became re-colonised by sedges and finally raised bog.

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10 http://www.limestone-pavements.org.uk/geology.html

11 New constraints on the age of the last ice-sheet glaciation of NW England, Telfer M.W. et al. Journal of Quaternary Science 24, 2009.

Other indications of general changes in the post-glacial environment include the blocks of cemented scree on Arnside Knott, while the main tufa deposits in Woodwell, Silverdale are considered to be visible evidence of the post-glacial climatic maximum.

The many prominent erratic boulders are also of interest. The numerous large limestone erratics may be of relatively local provenance or could have been transported south from outcrops near the source of the Shap granite erratics, which are also found in the AONB. Other erratics are found composed of Silurian siltstones / flagstones and Borrowdale volcanic material and are widely scattered across the AONB, indicating an outflow of ice over the area from the Lake District to the north. Many smaller erratics are wedged in the grikes of limestone pavements or have been built into dry stone walls which are common in the area.

Stratified and cemented screes characterise the steep faces of some of the upland blocks. These developed where the underlying rock is intensively fractured Park Limestone. Much affected by frost, the limestone broke down into highly shattered small rock fragments, leading to scree formation on the steep slopes. These screes formed in the post glacial period as all earlier loose scree material would have been swept up by the erosive force of the ice sheet.

An important feature of the AONB is the variation of soil types, with both acid and alkaline soils being present in close association. The acidic loess soils, which accumulated as wind-blown deposits in hollows and depressions in the limestone, were derived from the extensive sandur that developed at the end of the ice age in Morecambe Bay, before sea levels rose to their present levels. Peat mosses also formed in the area following glacial retreat, where waterlogged raised mires developed over significant areas of low-lying ground.

6 Rich Sense of history

Most of the AONB's landscape today is the product of a long history of human interaction with the environment. The cultural, archaeological and historic heritage of the AONB is an integral part of its character and quality, with many features demonstrating "time-depth" within the landscape.

The earliest evidence of human occupation comes from the edges of the mosses, where people lived and exploited the rich resources of the wetlands and the upland areas around them during the Mesolithic period (12,000 - 6000 years before present – bp). The earliest farmers appeared in the area during the Neolithic period (6000 - 4000 years bp), beginning the large-scale clearance of the area's woodlands by a combination of deliberate clearance and livestock grazing to prevent regeneration. During the Bronze Age (4000 - 2700 years bp) the occupants of the area developed burial and ritual sites, in the shape of burial cairns and standing stones at Yealand. In the Iron Age (2700 - 1900 years bp) Warton Crag was used as the site of a hill fort; a settlement surrounded by ramparts that were for defence and to demonstrate the status of the occupants. The now crumbling stone ramparts are still visible today within the Warton Crag woodland. The area around the fort has produced evidence of the exploitation of the area during the Roman period, although little is known about the ordinary settlements and everyday lives of the people living in the area.

Changes to land tenure during the Middle Ages probably led to the establishment of some nucleated villages with communal, open fields, laid out in strips on the fertile eastern fringes of the AONB. These can be recognised by long, narrow fields with an aratral curve, where the boundaries are a very shallow 'S' shape; such as can be found within the historic settlement pattern of Hale, Yealand Redmayne and Yealand Conyers. While most of the area covered by this type of field pattern is today farmed as pasture, it is likely that many of the enclosures were at one time used for arable cultivation.

The 19th century Acts of Enclosure probably had little effect on the AONB. Instead the remaining open areas or 'wastes' of the AONB were taken into private ownership by piecemeal local agreements between about 1600 and 1850. Fields enclosed at this time tend to be medium in size (4-16 hectares) with a significant proportion of small enclosures, often irregular in shape.

On Hawes Water, Silverdale, Hale and White Mosses, long thin straight-sided fields relate to the later drainage and exploitation of the mosses for turf/peat cutting for fuel in the 18th and early 19th century.

Enclosures were not restricted to dry land. Reclamation and enclosure of salt marsh has left a small number of regular enclosures on the coastal fringe of the AONB. In 1881 Mannex & Co. reported that 6000 acres of sand flats were then *"in the course of reclamation"*. This almost certainly involved the use of slag from the Carnforth Iron Works to construct a sea wall or embankment. The remains of this failed attempt at enclosure can still be seen on Warton Sands today.

There are a number of features in the landscape which link to past industrial activity; particularly associated with quarrying activities. Carboniferous limestone has long been quarried to provide building stone for the construction of cottages and farmsteads, and for agricultural walling. Numerous small abandoned quarries can be found within the AONB landscape; some were once worked by individual farmers, while others were communally owned by parishes providing for local needs. Locally quarried limestone was also used for mortar, lime-wash and as a soil conditioner after firing in lime kilns. There are 36 known lime kiln sites in the AONB, most of which are substantial limestone-built structures and form significant landscape and industrial heritage features. These probably fell into disrepair through lack of maintenance when it became cheaper to buy mass-produced lime products, but several of the most notable or accessible kilns were restored or consolidated during the Limestone Heritage Project between 2001 and 2007. Some quarries, however, developed into large-scale extraction industries, producing thousands of tons of rock annually, and are highly visible reminders of past industrial activity. Larger quarries at Sandside, Warton Crag, Trowbarrow, Middlebarrow, Jenny Brown's Point, Scout Crag and Cotestones were operated commercially. Only Sandside quarry remains active, producing both stone and tarmac products, although it is due to close in 2020.

The remains of various types of metalliferous mines can still be seen today, mainly within the southern half of the AONB. The chimney at Jenny Brown's Point is believed to have belonged to a failed copper enterprise. Shallow iron workings are found at the Cove and on the top of Cringlebarrow in Yealand Redmayne. The Backbarrow Company constructed a large iron furnace at Leighton Beck in 1713 and evidence suggests extensive use of water from Leighton Beck with canalisation of its course evident in places, and draining of the mosslands around Hale, to supply water to the iron-making process. Just outside the AONB boundary, Carnforth was a major iron-working centre in the past, and the slag banks on the southern edge of Warton Saltmarsh are a remnant of this heavy industry.

Several other landmarks in the AONB are associated with large-scale operations and industries. For example, the chimney structure at Crag Foot was part of the engine house for the pumps which drained Leighton Moss up to the period of the First World War. This rich peat landscape was an important arable and cereal cropping area, known locally as the Golden Acres. Intensive coppicing and charcoal production were associated with the metal working industry

From the 16th to 18th century much of the AONB's woodland was utilised as a fuel source, though other woodland products would have been produced to satisfy local demand. Coppicing and pollarding wood for charcoal production was primarily carried out to supply fuel for the local iron industry, and sites can be found where charcoal pits were constructed by coppice workers. In the 18th century a charcoal-fuelled blast furnace was built on the Leighton Beck, and the remains of the site are still visible today.

The area has a long association with the Quaker movement, particularly with the development of the Meeting House in Yealand Conyers, built in 1692. A number of notable early Quakers have strong associations with the area, particularly given the association with Swarthmoor Hall, the Quaker movement's headquarters during the 17th Century. The Hall is across the Bay near Ulverston and most access to this area during this period was via the Cross Bay routes. Yealand Conyers would have provided a refuge after a hazardous crossing.

Yealand Conyers forms an important part of the movement's heritage in the North West of England, (now know as "1652 Country") where George Fox gathered many of the first Quakers. The Old School, adjoining the Meeting House is run as a simple hostel by the Quaker Meeting at Yealand Conyers, offering low-cost accommodation in the AONB, which is in part promoted as a base from which to explore the "1652 Country".

Warton village, listed in the Domesday Book in 1086, along with its church and Rectory are also of international note. The Rectory built in 1267, served as both a residence and court house and although now a ruin cared for by English Heritage, it attracts many visitors. Interestingly, Warton has links to the founding of the USA, in that the Washington family has ancestral links to the village dating back to around 1300. George Washington, first President of the United States was seven generations later than his ancestor, Lawrence Washington who settled in Warton in 1300. Warton Church flies the Stars and Stripes every 4th July, using a flag that had flown above the Capitol building in Washington DC, donated by a United States Senator at the end of World War II[12]

The arrival of the railway created a surge in both residential and industrial development, as the area was suddenly made easily accessible to the urban centres of Lancashire and beyond. Arnside had been a hamlet prior to the railway and quickly developed as a Victorian resort from the 1860s. Many of the large houses in Silverdale and Arnside were built by industrial entrepreneurs from the cities of North West England, investing their fortunes in grand houses away from the noise, murk and smoke of the Lancashire mill towns.

Industries in the area, in particular Quarrying, benefited from the improved transport opportunities the railway provided. The building of a railway through the area was originally proposed in 1837 by George Stephenson, who sought to promote a coastal railway to Scotland, but it wasn't until 1857 that the Arnside Viaduct across the Kent estuary was completed, which provided the final connection of the Furness Line to the London & North Western Railway at Carnforth. The line through Sandside and Hincaster was added as an extra link to the main line in 1876, largely to facilitate the transit of coal and iron ore trains from Durham to Barrow.

7 Distinctive settlement character

While there is evidence of occupation within the AONB dating back some 12,000 years, it is the stone buildings and settlements created during the last 800 years which contribute so strongly to the character and quality of the AONB's landscape today. This contribution lies not only in the strong vernacular traditions of the area, which are reflected in the design, construction and detailing of individual buildings, but also in the form and layout of villages and hamlets and the settings of many of the buildings. Because the distinctive attributes are not just about individual buildings, but include the setting and layout of the settlements, these qualities are especially vulnerable to incremental small-scale change and development.

Some of the earliest stone-built buildings in the AONB are believed to date back to medieval times. As well as Hazelslack Tower and Arnside Tower and The Rectory at Warton, which now survive only as ruins, these early buildings include much of Leighton Hall, Beetham Hall, Beetham Church and Watermill and a number of farmsteads.

The farmstead in particular have a vernacular style that includes distinctive features such as the presence of date stones, small 'fire windows' and hood mouldings constructed over windows. Together with the 'slobbered masonry' used to weatherproof limestone rubble-wall buildings, these features demonstrate a strong local tradition that continued to be used by later generations, developing a local style of building that remains a key characteristic of the AONB.

The earliest surviving settlements are the villages of Warton, Yealand Redmayne and Hale, which lie along the eastern fringe of the AONB.

12 http://en.wikipedia.org/wiki/Warton,_Lancaster

They have a distinctive, historic character, retaining a medieval linear form with a characteristic ‘main street’ that is still clearly evident today, along with associated land behind the properties along the street, divided into long thin strips known as burgage plots.

In contrast, Arnside, Silverdale and Storth probably developed originally as dispersed agricultural settlements where there was a scattering of farms and hamlets over a wider area. These villages expanded considerably in the 19th century when wealth, generated from industrial development in Lancashire and the opening of the railway, stimulated the construction of large villa properties set in landscaped grounds which are now distinctive features of the villages of Arnside and Silverdale.

There are three built environment Conservation Areas in the AONB; within the villages of Beetham, Warton and the Yealands, which consequently benefit from greater protection from development.

8 Strong community and culture

A strong sense of community exists within each of the AONB's villages, with many local events organised. There is also a strong feeling of these villages coming together as part of the AONB - as a distinct location and identity in its own right - and an apparent greater awareness of the AONB amongst the local population than exists in other similar areas. The understanding and support of the local community is vital in ensuring that the aims of the AONB are met.

In terms of influencing the landscape, the long-standing cultures of low-intensity pasture management and woodland coppice management have been very important and have created important habitats upon which many of today's notable species depend. In the past, coppicing was very important for charcoal production but today coppicing is mainly carried out as a management tool to enhance the habitat for butterflies, scrub-nesting birds and woodland flowers.

There are few strong artistic associations with the AONB; perhaps because of the area's proximity to the more famous Lake District which provided greater attraction for artists and poets seeking inspiration in the past. The Victorian novelist Elizabeth Gaskell (1810–1865) regularly holidayed in Silverdale in the 1840s and 1850s. The Gaskell Memorial Hall in Silverdale is named after her and it is believed that some of her work was written in Lindeth Tower shortly after it was built. The English poet Gordon Bottomley (1874–1948) also lived in Silverdale in later life. The AONB's influence on art has perhaps become greater in recent years. Increasingly, the AONB has become a home to many artists and crafts people, taking inspiration from the landscape and wildlife, and displaying their work at local events such as the annual Art Trails, the Greenwood Fair and the Apple Day.

In the last few decades, the AONB has also become extremely important as a locus for scientific investigation and education, due to the wide range of important habitats and species which are present in such a relatively small area and the ease of access enabling species and habitats to be easily found and experiments and observations to be made. The RSPB employ teachers to work with schools and other groups at Leighton Moss, while the AONB Unit, National Trust, Lancashire Wildlife Trust and Natural England all run occasional training and educational events within the AONB. Examples of research projects carried out in the last few decades include investigation of requirements for notable local species such as the high brown fritillary in the bracken fields and coppices of Warton Crag, bittern and bearded tit in the reedbeds of Leighton Moss, reintroduction of the lady's slipper orchid to the limestone grasslands of Gait Barrows and other local sites, charting the loss of red squirrels in the area following colonisation by greys and changes in saltmarsh distribution.

A unique cultural feature associated with the AONB and the wider Bay is the public byway across the Morecambe Bay sands, which extends from Hest Bank, south of Carnforth, over the Warton Sands and Kent Channel to Kents Bank near Grange-over-Sands. This is an extremely hazardous route that was used for centuries by coaches, carts, packhorses and pedestrians as a short cut to avoid the long roads around the head of the Bay and remained a major transport route until the completion of the railway in 1857.

The inherent dangers of rapidly changing quick-sands, river channels that moved around, the speed of the incoming tides and the importance of the route meant an official guide was necessary to aid safe passage. The Guide was first appointed by the Duchy of Lancaster in 1548 to guide traffic across the Bay. The current official 'Queens Guide to the Sands' still regularly guides groups on foot (and occasionally by other means of transport) across the sands today, though this is now done for recreation or charity fundraising rather than out of any necessity, with Arnside and Silverdale both commonly used as starting points for these walks. It must be stressed that attempting to cross the sands without local expert help is dangerous and loss of life has been an all-too-frequent outcome of unaccompanied travel across the sands.

The railway line links two of the AONB's communities together (Arnside and Silverdale) and to the communities beyond the boundary. Carnforth sits on the southern boundary of the AONB and the Station there is world famous for its cinematic association with the David Lean film "Brief Encounter" made in 1945, which now attracts cultural tourists from all over the world to the area. The Furness line provides an important rapid transport link to Manchester and Barrow, which reinforces economic and social connections to both neighbouring areas around Morecambe Bay and to international air travellers.

9 Opportunities to enjoy the countryside of the AONB

The AONB is outstanding in the extent and quality of access available. The network of narrow lanes and minor highways is one of the delights of the AONB and, along with an intricate web of public rights of way, access land and other paths, provides a means to reaching almost all parts of the area. This ease of access affords many opportunities for people to come into close contact with the landscape, geology and wildlife; encouraging interest in the area, providing educational opportunities and engaging visitors with the inspiring environments which the AONB has to offer.

Typically the lanes are relatively narrow and undulating, having an intimate character; particularly where they pass through woodland where high tree canopies enclose the route and limit opportunities for views. Species-rich grassy verges provide wildlife corridors adjacent to the lanes. These are commonly lined by limestone walls in the southern parts of the AONB, while thick hedgerows are more prevalent in the northern part.

The lanes are linked by a comprehensive network of well-signed footpaths that provide good facilities for walkers throughout the area. Many paths are a result of early enclosure and the requirements of people to move between farms and villages, on to common resources such as salt marsh grazing and woodlands, and to travel to places of employment such as quarries and mines. Improvements to the network have been made in recent times through the *Limestone Heritage Project* and other initiatives, creating a number of permissive routes and improving surfaces on both concessionary and public rights of way to improve countryside access for the less able. The wooded nature of the area gives it a surprisingly high capacity to absorb recreational users and can seem surprising deserted even when visitor numbers are quite high.

In all, the AONB has 181 footpaths and 23 bridleways, covering a total length of 110 km; and 2 byways open to all traffic (BOATs). There is also a further network of permissive paths covering 17 km. Some of these routes are included within *18 Easy Access Walks*, *the Limestone Link* and *Lancashire and Cumbria Coastal Paths* Long Distance Footpaths and the *NCN 6 Lancashire and Cumbria Cycleways route*.

There is an area of open access land at Redhills Pasture and also open access to much of the National Trust owned land at Arnside Knott, Heathwaite, Eaves Wood, Jack Scout and Heald Brow; to the Lancaster City Council owned land at Trowbarrow and Warton Crag; to the Lancashire Wildlife Trust reserve at Warton Crag; to the AONB Landscape Trust land at Coldwell Parrock and Teddy Heights; and to the RSPB owned land at Warton Crag and Challan Hall Allotments; as well as open access to the entire coast.

Access to Gait Barrows and Hawes Water is available from a network of waymarked trails that supplement the public rights of way across the reserve, with access to the remoter areas by arrangement with the Natural England site manager. Access to view the reedbeds at Leighton Moss and hides along the edge of Warton saltmarsh is free to RSPB members or available for a small entrance fee for non-members.

The excellent access afforded within the AONB is further enhanced by the ease of travel to the AONB from urban populations. There are train stations at Carnforth, Silverdale and Arnside which connect to Lancaster, Preston, Manchester and Leeds. Access to and from the M6 motorway is provided at junction 35, Carnforth, at the southern edge of the AONB. There are also bus services serving the villages within the AONB, which link to services at Carnforth to Lancaster and Kendal.

There are numerous walking guides to the area, and the AONB Partnership website includes downloadable walks, heritage trails and more recently added, the newly devised Storth geotrail. Routes have also been created for those with mobility difficulties, wheelchair users and parents with buggies for younger children. The AONB Team has also helped host “tramper days” with the Disabled Ramblers Association and other partners, allowing access to many sites around the AONB for off road mobility scooters.

The area is well known for is recreational climbing and bouldering opportunities. Trowbarrow Local Nature Reserve (LNR) provides challenges for many visitors, either as rock climbers, bouldering enthusiasts or younger mountain bikers as well as walkers, forest school participants or geology enthusiasts. Trowbarrow Quarry hosts many climbs, varying in grade from V Diff to Extremely Severe E7. David Bowie songs have been the inspiration for naming some of the most famous climbs, including Jean Jeanie (VS 4c) and Aladdinsane. (ES E1 5a). In all there are 151 routes and bouldering problems available in the old Quarry[13]. Trowbarrow Quarry has several walls each of which offers something different for both newcomers and experienced rock climbers. The site is popular as it is often a good local evening crag as the main wall gets afternoon and evening sunshine and as also a reliable wet weather alternative to the Lake District being more sheltered from the weather. The site was purchased from Tarmac by the Arnside & Silverdale AONB Landscape Trust, with assistance from the British Mountaineering Council among other donors. Ownership was transferred to Lancaster City Council and is managed for conservation and recreation by the AONB Team. There are other sites that are popular with climbers on Warton Crag, though these are generally less well known than the climbs in Trowbarrow.

The renown Arnside tidal bore attracts sea kayakers who surf the incoming tide to the viaduct, there to be challenged by the ‘stoppers’ – standing waves of great force created by the narrow channel under the widest span of the viaduct. The estuary around Arnside is also popular with windsurfers and kitesurfers when the tide and winds are right. The variety of activities available is surprising.

[13] http://www.ukclimbing.com/logbook/crag.php?id=467

10 Tranquillity

A strong sense of tranquillity arises from the peacefulness and calm which can easily be found throughout the AONB. Lying in the shadow of the Lake District as a tourist destination, there are few places which attract many visitors, which makes it very easy to escape into quiet, rarely visited areas. The intimate scale of the inland landscape means that numbers of visitors are easily absorbed without any great awareness of others, while recreation activities within the AONB are primarily quiet and non-intrusive, such as walking, bird-watching, cycling and horse-riding; causing little or no disturbance to other users. Even in the busiest parts of the AONB, such as the seaside village of Arnside and the Leighton Moss RSPB Reserve, there is a lack of commercialisation which gives a very traditional and relaxed feel.

While tranquillity is, in many ways, a subjective quality, attempts have been made to quantify the elements which make a place feel tranquil. Research commissioned by the Campaign to Protect Rural England and others (Jackson *et al.* 2008) found that the most important elements for people in describing tranquil places were: *Seeing a natural landscape*; *hearing birdsong*; *hearing peace and quiet*; *seeing natural looking woodland*; *seeing the stars at night*; *seeing streams*; *seeing the sea*; *hearing natural sounds*; *hearing wildlife*; and *hearing running water*. All of these elements can readily be found within the AONB.

The major negative features affecting tranquillity identified by Jackson *et al.* were: *Hearing constant noise from cars, lorries and/or motorbikes*; *seeing lots of people*; *seeing urban development*; *seeing overhead light pollution*; *hearing lots of people*; *seeing low flying aircraft*; *hearing low flying aircraft*; *seeing power lines*; *seeing towns and cities and seeing roads*. All of these elements are rare events, highly localised or absent within the AONB.

Cross Bay walks are in themselves such popular events, that they are one of the occasions where the AONB can feel very busy. Parking can be impossible to find and tea rooms are stretched beyond their capacity.

Having said that these events are spaced throughout the summer and are transitory in nature, once the large group of walkers moves away from the shore line and out into the Bay, the group shrinks in scale and impact, having little effect on other visitors and the wildlife as they make their way across the sands and channels of the Bay under the watchful eye of the official guide.

A map of tranquillity in North West England (CPRE 2006) shows that the coastal zone of the AONB from, Far Arnside, through Silverdale, to the southern end of Warton Marsh, is particularly tranquil, while nowhere within the AONB is subject to high levels of disturbance.

The area's distinctive character and unique combination of scenery, history, abundance of wildlife, peace and quiet, and culture makes the AONB unique. For many, this very particular sense of place is the primary motivation to visit and creates a strong connection with and love for this landscape.

11 Designations

A measure of how important the area is for its biological, geological and historical interest is provided by the number and extent of designated sites which lie within the AONB. 49% of the AONB area is designated under European directive for its habitat, species or bird interest. A total of 54% of land within the AONB is covered by national Site of Special Scientific Interest (SSSI) designation while a further 12% of land area has been identified as being of local wildlife value by the Lancashire and Cumbria county councils. 10 Scheduled Monuments, 114 Listed Buildings, 1 Registered Park and Garden, and 3 Conservation Areas have also been identified for their historic value.

There are 19 Sites of Special Scientific Interest (SSSI) which lie either completely or partially within the boundary of the AONB. Together, these cover a total area of 4028ha; 898ha of which is terrestrial and 3130ha is estuarine.

This represents 54% of the total area of the 75 km^2 AONB; 20.5% of the terrestrial AONB (4370ha) and 100% of the AONB's intertidal zone. 15 of these SSSI are designated purely for their biological interest, 2 just for their geological interest and a further 2 for both biological and geological interest.

The biological SSSI are at *Arnside Knott* (167.94 ha), *Coldwell Farm Pasture* (0.82 ha), *Cringlebarrow and Deepdale* (50.16 ha), *Eaves Wood* (52.23 ha), *Far Arnside* (2.09 ha), *Jack Scout* (6.74 ha), *Leighton Moss* (131.62 ha), *Marble Quarry and Hale Fell* (43.09 ha), *Middlebarrow* (18.12 ha), *Morecambe Bay* (3130.07 ha), *Silverdale Golf Course* (0.60 ha), *Thrang End and Yealand Hall Allottments* (51.48 ha), *Thrang Wood* (4.77 ha), *Underlaid Wood* (106.59 ha) and *Warton Crag* (72.70 ha). SSSI with both biological and geological interest are at *Gait Barrows* (69.75 ha) and *Hawes Water* (89.39 ha). SSSI with only geological interest are at *Hale Moss Caves* (22.38 ha) and *Trowbarrow* (7.46 ha).

In addition, there are 6 European designations which lie either completely or partially within the AONB boundary: 2 Special Areas of Conservation (SAC) designated under the EC Habitats and Species Directive, 2 Special Protection Area (SPA) designated under the EC Birds Directive and 2 Ramsar wetland sites. These sites overlap considerably but cover a single combined area of 3670 ha which represents 49% of the total area of the AONB; 100% of the intertidal AONB and 12% of the terrestrial AONB. The SAC are: *Morecambe Bay Pavements* (which include most of the Cringlebarrow and Deepdale, Marble Quarry and Hale Fell, Middlebarrow, Thrang End and Yealand Allotments, Underlaid Wood and Gait Barrows SSSI), which covers a total 2609.69 ha, of which 411.02 ha is within the AONB; and *Morecambe Bay*, covering a total 61506.22 ha, of which 3130.07 is within the AONB. The SPA/Ramsar sites are: *Leighton Moss* which covers a total 128.61 ha entirely within the AONB; and *Morecambe Bay*, covering a total 37404.6 ha, of which 3130.07 is within the AONB.

121 ha at Gait Barrows and Haws Water have been declared a National Nature Reserve (NNR), while there are also three Local Nature Reserves (LNR) at Trowbarrow Quarry, Warton Crag and Warton Crag Quarry, covering a combined total of 41.04ha.

Local Wildlife Sites are identified as *Biological Heritage Sites* (BHS) in Lancashire and *County Wildlife sites* (CWS) in Cumbria. These sites do not have a statutory designation but are protected through the planning system. There are 64 Local Wildlife Sites within the AONB covering 887.3 ha. These comprise 44 BHS in Lancashire covering 606.76ha and 20 CWS in Cumbria covering 280.5 ha.

Geological sites which are of regional importance are designated as *Local Geological Sites* (LGS - previously known as RIGS or Regionally Important Geological and Geomorphological Sites). There are 7 LGS in the AONB; 4 in Lancashire (at 7 locations) and 3 in Cumbria (at 5 locations), covering a total area of 428.83 ha (9.8% of the terrestrial AONB).

There are 16 Limestone Pavement Orders within the AONB covering 15.9% of its area. Large portions of these sites are also designated SSSI and 5 form part of the *Morecambe Bay Pavements* SAC. These sites are recognised as being among the best examples of lowland limestone pavement in the world.

One-third of the AONB is covered in woodland, 623 ha of which is considered to be Ancient Woodland within 45 different sites.

The Historic Environment Record (HER) holds information on known archaeological and historical sites: finds, historic landscapes, buildings and other aspects of the historic environment, plus information on past research and investigations. The HER is continually updated with information on new sites and finds and additional details about existing sites with information provided from a range of sources. Currently there are 655 Historic Environment Records in the AONB, including 10 Scheduled Monuments, 114 Listed Buildings, 1 Registered Park and Garden, and 3 Conservation Areas.

The Scheduled monuments within the AONB are: *Arnside Tower* (also a Grade II* listed building); *Beetham Hall (curtain wall and uninhabited portion)* (Grade II* listed); *Hazelslack Tower* (Grade II listed); *Ringwork in Dallam Park 380m south east of Dallam Tower*; *Dog Holes Cave, Warton Crag*; *Badger Hole, Barrow Scout, Warton*; *Warton Crag Hillfort*; *Round cairn on Summerhouse Hill, Yealand Conyers*; *Old Rectory, Warton* (Grade I listed); and *Stone circle on Summerhouse Hill, Yealand Conyers*.

Other Grade I and Grade II* listed building within the AONB are: *Dallam Tower*; *Orangery attached to south of Stables to north of Dallam Tower*; *Statue approximately 5m south of Orangery to Dallam Tower*; *Church of St Michael, Beetham*; *St Oswalds Vicarage, Main Street, Warton* (all Grade I); *Beetham Hall and attached outbuildings*; *Ashton House, Beetham*; *Heron Corn Mill and attached Mill Race, Beetham*; *Leighton Hall, Yealand Conyers*; *Quaker Meeting House* (formerly listed as Friends Meeting House); *Slackwood Farm, Slackwood Lane, Silverdale*; *Church of St. John, Emesgate Lane, Silverdale*; and *The Castle, 15 Silverdale Road, Yealand Redmayne* (all Grade II*). *Dallam Tower* is the AONB's lone Historic Park and Garden.

Arnside Tower, *Beetham Hall (curtain wall and uninhabited portion)*, *Hazelslack Tower*, *Warton Crag Hillfort* and *Slackwood Farm, Slackwood Lane, Silverdale* are all considered to be at risk due to poor maintenance and are listed on English Heritage's 'Heritage at Risk Register'.

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APPENDIX 1: Likely occurrence of *Section 41 Habitats of Principal Importance in England* within the Arnside & Silverdale AONB

Broad habitat	Habitat name	AONB	AONB examples
Arable and horticulture	Traditional orchards	✓	Scattered throughout AONB
Boundary	Hedgerows	✓	Frequent bordering lanes and marking field boundaries
Coastal	Coastal saltmarsh	✓	Most extensive at Warton Marsh. Also at Silverdale (mostly now eroded) and Arnside.
Coastal	Coastal vegetated shingle	✓	Sparse shingle vegetation present very locally at Silverdale, but not over a significant area of ground.
Coastal	Intertidal mudflats	✓	Morecambe Bay
Coastal	Maritime cliff and slopes	✓	Jack Scout and Silverdale coast
Freshwater	Eutrophic standing waters	✓	Leighton Moss
Freshwater	Oligotrophic and dystrophic lakes	✓	Hawes Water (marl lake) categorised as oligotrophic water body in Gait Barrows management plan
Freshwater	Ponds	✓	e.g. Bank Well pond, Frith Wood Pond
Freshwater	Rivers	✓	River Bela along north-eastern edge of AONB. River Kent at north-western edge. Smaller streams such as Leighton Beck and Quicksand Pool.
Grassland	Lowland calcareous grassland	✓	Widespread. Extensive examples at Warton Crag, Arnside Knott, Heald Brow, Jack Scout and Silverdale golf course.
Grassland	Lowland meadows	✓	Scattered examples at Gait Barrows meadows, 16 Bouys, Bank House, Hazelwood Farm
Grassland	Purple moor-grass and rush pastures	-	Good rush pasture at More Thwaite (opposite Marble Quarry woods). Also present at margins of Hawes Water. Low grade rush pasture around Silverdale Moss and at Hale moss. No known stands of purple moor grass.
Heathland	Lowland heathland	✓	Limestone heath at Arnside Knott and Jack Scout. May not fully accord with the BAP habitat description but warrants inclusion here.
Inland rock	Calaminarian grasslands	✓	At Carnforth slag heaps (plus old Carnforth Iron Works immediately outside AONB).
Inland rock	Inland rock outcrop and scree habitats	✓	Widespread including Arnside Knot, Warton Crag, Eaves Wood, Jack Scout - BAP description focuses more on cliff ledge & upland communities.

Inland rock	Limestone pavements	✓	Widespread including Gait Barrows, Yealand Allotments, Marble Quarry, Underlaid Wood, Middlebarrow, Eaves Wood, Warton Crag - both wooded and open.
Marine	Estuarine rocky habitats	✓	Along foot of Silverdale cliffs.
Wetland	Coastal and floodplain grazing marsh	✓	fairly widespread - notably Silverdale and Arnside mosses, Warton/Millhead fields and Hale
Wetland	Lowland fens	✓	Leighton Moss, Hawes Water, Silverdale Moss (plus Thrang Moss - NE maps)
Wetland	Reedbeds	✓	Leighton Moss, Hawes Water plus newly established stands at Barrow Scout Field and Silverdale Moss

APPENDIX 2: Occurrence of nationally rare and scarce species within the Arnside & Silverdale AONB according to records held in local management plans

AK = Arnside Knott management plan 2001; CP = Coldwell Parrock 2005; EW = Eaves Wood 2000; GB = Gait Barrows 2007; HB = Heald Brow 2000; JS = Jack Scout 2000; LM = Leighton Moss 2009; SG = Silverdale Golf Course 2008; TH = Teddy Heights 2007; WC99 = Warton Crag 1999; WC11 = Warton Crag invertebrate survey 2011.

				Source of Record										
	Species	**Status**	**Group**	**AK**	**CP**	**EW**	**GB**	**HB**	**JS**	**LM**	**SG**	**TH**	**WC99**	**WC11**
large yellow feather-moss	*Scorpidium turgescens*	NR	Bryophytes				x							
fragile amanita	*Amanita friabilis*	NR	fungi				x							
a fungi	*Clavaria purpurea*	NR	Fungi				x							
a fungi	*Clavaria zollingeri*	NR	Fungi			x								
a fungi	*Clavicorona taxophila*	NR	Fungi			x								
a fungi	*Cortinarius aureoturbinatus*	NR	Fungi			x								
a fungi	*Cortinarius caesiocynaneus*	NR	Fungi			x								
a fungi	*Creolophus cirrhatus*	NR	Fungi			x								
a fungi	*Dendrodochium sp*	NR	Fungi				x							
a fungi	*Entoloma bloxamii*	NR	Fungi				x							
a fungi	*Entoloma nitidum*	NR	Fungi			x								
a fungi	*Hydnellum concrescens*	NR	Fungi			x								
a fungi	*Inocybe calospora*	NR	Fungi			x								
a basidiomycete fungus	*Limacella glioderma*	NR	Fungi			x							x	
an agaric	*Melanophyllum eyrei*	NR	Fungi			x							x	
an earth tongue	*Microglossum olivaceum*	NR	Fungi			x								
a fungi	*Ophiosphaerella eriksonni*	NR	Fungi				x							
a fungi	*Phellodon confluens*	NR	Fungi			x	x							
a fungi	*Ramaria broome*	NR	Fungi				x							
a basidiomycete fungus	*Ramaria broomei*	NR	Fungi			x							x	
a fungi	*Ramaria sub-botrytis*	NR	Fungi				x							
a fungi	*Ramariopsis biformis*	NR	Fungi			x	x							
a fairy club	*Ramariopsis pulchella*	NR	Fungi			x								
a fungi	*Thuemenidium atropurpureum*	NR	Fungi			x								
a basidiomycete fungus	*Tricholoma*	NR	Fungi										x	
a sawfly	*Empria parvula*	NR	Bees and Sawflies											x
a sawfly	*Nematus pseudodispar*	NR	Bees and Sawflies											x
a leaf-rolloing sawfly	*Pamphilius fumipennis*	NR	Bees and Sawflies											x
a sawfly	*Periclista pubescens*	NR	Bees and Sawflies											x
a sawfly	*Pristiphora decepiens*	NR	Bees and Sawflies											x
a mason bee	*Osmia parientina*	NR	Bees and saw-flies				x							
a beetle	*Agaricophagus cephalotes*	NR	Beetles			x								

				Source of Record										
	Species	**Status**	**Group**	**AK**	**CP**	**EW**	**GB**	**HB**	**JS**	**LM**	**SG**	**TH**	**WC99**	**WC11**
a pollen beetle	*Amphotis marginata*	NR	Beetles											x
a false click beetle	*Dirhagus pygmaeus*	NR	Beetles			x								
a ground beetle	*Notiophilus rufipes*	NR	Beetles	x										
a leafhopper	*Issus muscaformis (possibly same as muscaeformis which is just NS?)*	NR	Bugs				x							
Leafhopper	*Trigonocranus emmeae*	NR	Bugs				x							
high brown fritillary	*Argynnis adippe*	NR	Butterflies	x	x	x	x	x	x	x	x		x	x
Woodlouse	*Armadillidium pictum*	NR	Crustaceans				x							
a mite	*Euphthiracarus monodactylus*	NR	Mites											x
round-mouthed snail	*Pomatias elegans*	NR	Molluscs	x									x	
least minor	*Photedes captiuncula*	NR	Moths	x			x						x	
Sciarid fly	*Bradesia chandleri*	NR	True Flies				x							
a fly	*Cheilosia nebulosa*	NR	True Flies							x				
a fly	*Dactylolabis sexmaculata*	NR	True Flies				x							
Biting midge	*Dasyhelea lithotelmatica*	NR	True Flies				x							
a dance fly	*Empis laetabilis*	NR	True Flies											x
a fly	*Empis prodromus*	NR	True Flies				x							
a fly	*Limnophila pictipennis*	NR	True Flies							x				
Hoverfly	*Microdon mutabilis*	NR	True Flies				x							
a fly	*Platypalpus carteri*	NR	True Flies				x							
a flesh-fly	*Sarcophaga ebrachiata*	NR	True Flies				x							
a fly	*Sphaerophoria loewi*	NR	True Flies							x				
a cranefly	*Tipula alpina*	NR	True Flies				x							x
a cranefly	*Tipula hortorum*	NR	True Flies											x
a lichen	*Leptogium diffractum*	NR	Lichens										x	
a lichen	*Leptogium massiliense*	NR	Lichens										x	
lady's-slipper orchid	*Cypripedium calceolus*	NR	Vascular Plants								x			
Lancashire whitebeam	*Sorbus lancastriensis*	NR	Vascular Plants	x		x	x	x	x	x			x	
Teesdale violet	*Viola rupestris*	NR	Vascular Plants	x										
a sawfly	*Abia lonicerae*	NS	Bees and Sawflies											x
a mining bee	*Andrena apicata*	NS	Bees and Sawflies											x
a sawfly	*Ardis sulcata*	NS	Bees and Sawflies											x
a parasite bee	*Nomada lathburiana*	NS	Bees and Sawflies										x	
a leaf-rolloing sawfly	*Pamphilius inanitus*	NS	Bees and Sawflies											x
a sawfly	*Pristiphora ?lativentris*	NS	Bees and Sawflies											x
a sawfly	*Trichiosoma sorbi*	NS	Bees and Sawflies											x
a leafbeetle	*Cryptocephalus bipunctatus*	NS	Beetles			x								
a longhorn beetle	*Grammoptera variegata*	NS	Beetles											x
a beetle	*Hylecoetus dermestoides*	NS	Beetles											x

				Source of Record										
	Species	**Status**	**Group**	**AK**	**CP**	**EW**	**GB**	**HB**	**JS**	**LM**	**SG**	**TH**	**WC99**	**WC11**
a weevil	*Magdalis carbonaria*	NS	Beetles											x
a soldier beetle	*Malthinus balteatus*	NS	Beetles					x						
a soldier beetle	*Malthodes guttifer*	NS	Beetles					x						x
a beetle	*Melandrya caraboides*	NS	Beetles											x
a thick-legged flower beetle	*Oedemera virescens*	NS	Beetles										x	
a thick-legged flower beetle	*Oncomera femorata*	NS	Beetles			x								
a beetle	*Orchesia minor*	NS	Beetles											x
a weevil	*Orthochaetus setiger*	NS	Beetles											x
a weevil	*Phytobius waltoni*	NS	Beetles											x
a weevil	*Polydrusus mollis*	NS	Beetles											x
a soldier beetle	*Rhagonycha translucida*	NS	Beetles											x
a long-horn beetle	*Saperda scalaris*	NS	Beetles										x	
a beetle	*Tritoma bipustulata*	NS	Beetles											x
a leafhopper	*Issus muscaeformis*	NS	Bugs			x								
northern brown argus	*Aricia artaxerxes*	NS	Butterflies	x		x	x	x	x	x	x		x	x
pearl-bordered fritillary	*Boloria euphrosyne*	NS	Butterflies	x	x	x	x	x	x	x	x		x	x
Duke of Burgundy	*Hamearis lucina*	NS	Butterflies	x		x	x		x		x			
white-letter hairstreak	*Strymonidia w-album**	NS	Butterflies			x								
a pill woodlouse	*Armadillidium pulchellum*	NS	Crustaceans						x				x	x
a woodlouse	*Trichoniscoides saeroeensis*	NS	Crustaceans											
a lacewing	*Micromus angulatus*	NS	Lacewings											x
a lacewing	*Sympherobius elegans*	NS	Lacewings											x
a door snail	*Clausilia dubia*	NS	Molluscs											x
a whorl snail	*Vertigo pusilla*	NS	Molluscs										x	
cistus forester	*Adscita geryon*	NS	Moths							x			x	
white spotted sable	*Anania funebris*	NS	Moths							x			x	
barred carpet	*Perizoma taeniata*	NS	Moths										x	
barred tooth-stripe	*Trichopteryx polycommata*	NS	Moths										x	
comb-footed spider	*Rugathodes bellicosus*	NS	Spiders										x	
a money spider	*Satilatlas britteni*	NS	Spiders							x			x	
a soldier fly	*Beris fuscipes*	NS	True Flies											x
a hoverfly	*Brachypalpus laphriformis*	NS	True Flies											x
a hoverfly	*Didea fasciata*	NS	True Flies											x
a robber fly	*Dioctria oelandica*	NS	True Flies											x
a dolicopodid fly	*Hercostomus nigrilamellatus*	NS	True Flies											x
a dance fly	*Oedalea zetterstedti*	NS	True Flies											x
a dolicopodid fly	*Orthoceratium lacustre*	NS	True Flies											x
a dolicopodid fly	*Sympycnus spiculatus*	NS	True Flies											x
a lichen	*Placynthium subradiatum*	NS	Lichens										x	

				Source of Record										
	Species	**Status**	**Group**	**AK**	**CP**	**EW**	**GB**	**HB**	**JS**	**LM**	**SG**	**TH**	**WC99**	**WC11**
fingered sedge	*Carex digitata*	NS	Vascular Plants			x	x							
rare spring sedge	*Carex ericetorum*	NS	Vascular Plants	x			x		x	x	x			
mezereon	*Daphne mezereum*	NS	Vascular Plants			x								
rigid buckler fern	*Dryopteris submontana*	NS	Vascular Plants	x			x						x	
dark-red helleborine	*Epipactis atrorubens*	NS	Vascular Plants	x		x	x	x		x			x	
purple-ramping fumitory	*Fumaria purpurea*	NS	Vascular Plants											
limestone fern	*Gymnocarpium robertianum*	NS	Vascular Plants	x			x						x	
stinking hellebore	*Helleborus foetidus*	NS	Vascular Plants	x		x	x							
Hawkweed	*Hieracium cymbifolium*	NS	Vascular plants							x				
Hawkweed	*Hieracium silvaticoides*	NS	Vascular plants							x				
pale St. John's wort	*Hypericum montanum*	NS	Vascular Plants	x			x	x		x			x	
spring sandwort	*Minuartia verna*	NS	Vascular Plants	x		x	x	x	x	x	x		x	
yellow bird's-nest	*Monotropa hypopitys*	NS	Vascular Plants			x								
angular solomon's seal	*Polygonatum odoratum*	NS	Vascular Plants			x	x						x	
spring cinquefoil	*Potentilla neumanniana*	NS	Vascular Plants	x		x	x				x			
bird's-eye primrose	*Primula farinosa*	NS	Vascular Plants				x							
blue moor-grass	*Sesleria albicans*	NS	Vascular Plants	x	x	x	x	x	x	x	x		x	
Whitebeam	*Sorbus intermedia*	NS	Vascular Plants				x							
rock whitebeam	*Sorbus rupicola*	NS	Vascular Plants						x					
spiked speedwell	*Veronica spicata*	NS	Vascular Plants	x										

APPENDIX 3: Red and Amber listed breeding birds (according to 2009 criteria) within the Arnside & Silverdale AONB

Red List species which have been confirmed as breeding within the AONB since 1997

bittern	tree pipit	house sparrow
lapwing	song thrush	tree sparrow
dunlin	grasshopper warbler	linnet
herring gull	wood warbler	hawfinch
cuckoo	spotted flycatcher	yellowhammer
lesser spotted woodpecker	marsh tit	
skylark	starling	

Red List species which have been recorded during the breeding season within the AONB since 1997, but not confirmed as breeding

grey partridge	yellow wagtail	lesser redpoll

Amber List species which have been confirmed as breeding within the AONB since 1997

little grebe	ringed plover	house martin
little egret	snipe	meadow pipit
shelduck	woodcock	grey wagtail
gadwall	curlew	dunnock
teal	redshank	wheatear
mallard	common sandpiper	mistle thrush
gargany	Mediterranean gull	whitethroat
shoveler	black-headed gull	willow warbler
pochard	lesser black-backed gull	bearded tit
tufted duck	greater black-backed gull	treecreeper
marsh harrier	stock dove	bullfinch
kestrel	swift	reed bunting
oystercatcher	green woodpecker	
avocet	swallow	

Amber List species which have been recorded during the breeding season within the AONB since 1997, but not confirmed as breeding

goldeneye	barn owl	common redstart
common tern	kingfisher	whinchat

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APPENDIX 4: Photographs to illustrate some of the features of the Arnside & Silverdale AONB's Special Qualities

DIVERSE LANDSCAPE AND SPECTACULAR VIEWS - View from Arnside Knott looking west across the Kent Estuary and the Lake District National Park (above) and limestone scar and herb-rich grassland at Warton Crag with view eastwards to Ingleborough in the Yorkshire Dales National Park (below).

DIVERSE LANDSCAPE AND SPECTACULAR VIEWS - View from Arnside Knott southwards into AONB, showing limestone hills, lowland pastures and wetland, and extensive woodland (above) and use of limestone in dry stone wall field boundaries along Bottoms Lane, looking towards Eaves Wood (below).

DIVERSE LANDSCAPE AND SPECTACULAR VIEWS - Mixed woodland canopy viewed from Arnside Knott (above) and 'Murmuration' of starlings, gathering in their thousands to roost in the Leighton Moss reedbeds (below)

MORECAMBE BAY: A STUNNING SEASCAPE - Limestone cliffs and shallow water of Morecambe Bay viewed from the cave at Silverdale Cove at high tide (above) and Morecambe Bay sand and mudflats at low tide viewed from Jack Scout (below)

RARE AND PRECIOUS HABITATS - Limestone cliff, grassland, scrub and woodland at Warton Crag (above) and limestone outcrops, grassland and scrub at Jack Scout (below)

RARE AND PRECIOUS HABITATS - Limestone grassland (above) and 'limestone heath' (below) at Arnside Knott

RARE AND PRECIOUS HABITATS - Moss- and fern-rich ash woodland over limestone (above) and bluebells and other woodland herbs in field of bracken litter, prior to growth of summer fronds, at Warton Crag: habitat favoured by fritillary butterflies (below)

RARE AND PRECIOUS HABITATS - Leighton Moss reedbed (above) and area of open water between the reeds (below)

RARE AND PRECIOUS HABITATS - Reeds fringing the Hawes Water marl lake (above) and Warton saltmarsh (below)

RARE AND PRECIOUS HABITATS - coastal limestone cliffs at Jack Scout (above) and Morecambe Bay intertidal mudflats (below): the largest continuous area of this habitat in the UK

IMPORTANT SPECIES - Two species which have a worldwide distribution restricted only to the UK: Lancaster whitebeam at Jack Scout (above) and purple ramping-fumitory in Gibraltar Lane, Silverdale (below)

IMPORTANT SPECIES - Blue moor-grass on limestone pavement at Warton Crag: this is the dominant species in the AONB's unimproved limestone grasslands (above) and the nationally rare high brown fritillary, which is near the northern edge of its UK range in the AONB (below)

IMPORTANT SPECIES - Two northern species of butterfly which are found at the southern edge of their UK range in the AONB: the northern brown argus (above) and the Scotch argus (below)

IMPORTANT SPECIES - During the autumn, oystercatcher occur in internationally important numbers at high-tide roosts within the AONB (above) and large numbers of wintering wildfowl at Leighton Moss include nationally important numbers of shoveler (below)

DISTINCTIVE LIMESTONE GEOLOGY - Extensive limestone pavement at Gait Barrows (above) and an erratic boulder at Coldwell Parrock (below)

SENSE OF HISTORY - the disused limestone quarry at Trowbarrow (above) and lime kiln at Jack Scout (below)

SENSE OF HISTORY - The chimney at Jenny Brown's Point is believed to have belonged to a failed copper enterprise (above) and the railway viaduct across the Kent Estuary, connecting Arnside to Grange-over-Sands (below)

SETTLEMENT CHARACTER - Arnside Tower ruins viewed from Silverdale Moss (above) and Warton Main Street (below)

STRONG COMMUNITY AND CULTURE - Old coppice at Teddy Heights (above) and low-intensity pasture management using traditional breeds at Jack Scout (below)

OPPORTUNITIES TO ENJOY THE COUNTRYSIDE OF THE AONB - Narrow lanes and footpaths: Crag Road over Warton Crag (above) and footpath leading to Hawes Water (below)