Natural Area: 50. New Forest	**Geological Significance:** Considerable **(provisional)**

General geological character: The New Forest Natural Area forms part of a broad and shallow syncline (geological basin) known as the Hampshire Basin. The overall structure of the basin evolved during the Tertiary Period (65-5 Ma) in response to the stresses created by the building of the Alps (the Alpine Orogeny). The syncline contains sediments of Tertiary age, mantled over much of the area by Quaternary deposits.The Tertiary deposits, consisting of a sequence of marine, non-marine, and estuarine deposits are represented by clays, sands and limestones largely of Eocene age (approximately 56-35 Ma). Many levels are fossiliferous and the non-marine horizons have yielded bones of crocodiles, various other reptiles and early mammals. The marine horizons include a sequence of marine clays of great international importance, including the Barton Formation exposed around Highcliffe and Barton-on-Sea. The Barton-on-Sea locality gives its name to a division of the upper part of the Eocene known as the Bartonian. This division is recognised globally and the rich molluscan and associated fossil faunas of the area are therefore of very great importance. The later Quaternary deposits (formed during the last 2 Ma) cover the Tertiary sediments to a variable depth. These include wide spreads and terraces of river gravels deposited by ancient river systems such as the Solent River. This river, now drowned by Southampton Water, once rose near Dartmoor and flowed eastward across the Natural Area before discharging into the English Channel. Sea level rise in the Quaternary drowned the course of the river, allowing the sea to separate the Isle of Wight from the mainland. The terrace gravels deposited by the Solent River are rich in archaeology and have yielded evidence of early human population in the form of Palaeolithic flint implements.

Key geological features:

- Tertiary stratigraphy
- Tertiary fossils including molluscs, vertebrates and plants
- Quaternary river gravels and associated Palaeolithic habitation

Number of GCR sites:

Palaeogene: 6 Pleistocene/Quaternary of South Central England: 5 Tertiary Palaeobotany: 4 Tertiary Reptilia: 2 Aves: 1 Mesozoic-Tertiary Fish/Amphibia: 1 Tertiary Mammalia: 1 Fluvial Geomorphology of England: 1

Geological/geomorphological SSSI coverage: There are 4 (P)SSSI in the Natural Area covering 21 GCR SILs representing 8 different GCR networks. The site coverage reflects the great importance of the Natural Area for Tertiary stratigraphy and palaeontology (for example Highcliffe to Milford Cliffs SSSI). This long coastal section shows the Bartonian stratotype and associated marine molluscan fauna. It also shows a number of associated vertebrate faunas, which includes mammals, reptiles, fish and birds. The New Forest SSSI and North Solent SSSI both show aspects of the terrace gravels of the former Solent River and their associated Palaeolithic archaeology. The New Forest is also important for illustrating the evolution of more recent fluvial systems.

Key geological management issues:

- Threat to key geological coastal sections from coastal defence and engineering works
- Natural degradation of inland geological exposures through neglect and disuse
- Intimate relationship between Quaternary geology and archaeology

Key geological objectives:

1. **Ensure that future coast protection works are part of an agreed shoreline management plan**

2. **Ensure continued maintenance and enhancement** of inland geological exposures

3. **Encourage initiatives aimed at integrating Quaternary geology/archaeology** of the area

Useful guides/references:

WHITTOW, J.B. 1992: Geology and Scenery in Britain. Chapman and Hall, London.

MELVILLE, R.V. & FRESHNEY, E.C. 1982: British Regional Geology, The Hampshire Basin and adjoining areas. Institute of Geological Sciences. HMSO, London.

Earth science (P)SSSIs in the Natural Area:

- Highcliffe to Milford Cliffs
- The New Forest
- Town Common
- North Solent

Natural Area: 51. South Wessex Downs	**Geological Significance:** Notable **(provisional)**

General geological character: The solid geology of the South Wessex Downs Natural Area is dominated by Upper Cretaceous chalk, a very pure and soft limestone deposited on a tropical sea floor around 97-84 Ma. Underlying the chalk and outcropping in narrow east-west trending anticlines are limited areas of Lower Cretaceous and Jurassic rocks. The Upper Jurassic rocks consist of limestones and subordinate shales deposited in a tropical climate which in some cases was marine but also brackish/freshwater. The Lower Cretaceous 'Wealden' consists of sandstones laid down on the floors of broad river valleys and extensive lakes. The trend of the anticlines indicates that they are related to Alpine tectonics during the Tertiary (approximately 65-5 Ma). During this time, the uplifted chalk was subjected to tropical weathering in a relatively warm and humid climate, resulting in the formation of clay-with-flints on the surface of the chalk. Also during this time, silcretes (sandstones with a hard, silica cement) formed as a result of weathering in sandy soils and rivers crossing the area deposited gravel terraces which now only remain as isolated patches on hill summits. As the silcretes were broken up, they became isolated blocks (now known as sarsen stones). They are often found at a distance from their original source area, having been transported over the chalk surface during the Quaternary 'Ice Ages' (the last 2 million years) by periglacial processes such as widespread solifluction (the flow of an active surface layer over seasonally thawed permafrost). During the times when permafrost covered the chalk, surface streams were able to flow over the normally porous surface cutting deep karst valleys. These remain today as the dry valleys or coombes of the area. Often the floors of these coombes are partially filled by a chalk and clay rubble mixture known as coombe rock. The area is renowned for its chalk karst landscape.

Key geological features:

- Jurassic/Cretaceous boundary sequence.
- Upper Cretaceous Chalk.
- Pleistocene Karst/periglacial features.

Number of GCR sites:

Palaeogene: 2 Portlandian-Berriasian: 2 Cenomanian-Maastrichtian: 2 Wealden : 1 Karst: 1
Pleistocene/Quaternary of South Central England: 1 Alpine Structures of Southern England: 1

Geological/geomorphological SSSI coverage: There are 8 (P)SSSI in the Natural Area covering 10 GCR SILs which represent 7 different GCR networks. The site coverage is spread widely across a range of deposits and features of the area. The junction between the Upper Jurassic and Lower Cretaceous is shown at Upwey Quarries and Bincombe Down SSSI, while the nature of the Cretaceous chalk and the effects of the Alpine folding are shown in exposures at West Harnham Chalk Pit SSSI. Blackdown (Hardy's Monument) SSSI provides a good example of a hill summit capped by Tertiary gravels. The Sarsen stones (Tertiary silcretes redeposited by 'Ice Age' periglacial action) are found at the classic Valley of the Stones SSSI, while Cull-Peppers Dish SSSI is an impressive and rare chalk swallow hole.

Key geological management issues:

- Potential loss of chalk exposures due to neglect or infill and restoration of disused sites
- Need to protect sensitive Quaternary landforms and features (eg Sarsen stones, chalk swallow holes) from disturbance and removal
- Damage to karst landscape from development such as change in land use or road building

Key geological objectives:

1. **Protection and enhancement of the Cretaceous sites**

2. **Protection of the periglacial and other Quaternary landforms** (eg Sarsen stones) and other features and need to **integrate with archaeological, biological and landscape conservation**

3. **Develop interpretation** of classic Sarsen stones and karst dry valleys

Useful guides/references:

WHITTOW, J.B. 1992: Geology and Scenery in Britain. Chapman and Hall, London.

MELVILLE, R.V. & FRESHNEY, E.C. 1982: British Regional Geology, The Hampshire Basin and adjoining areas. Institute of Geological Sciences, HMSO. London.

Earth science (P)SSSI in the Natural Area:

- Bincombe Down
- Blackdown (Hardy's Monument)
- Corton Cutting
- Cull-Peppers Dish
- West Harnham Chalk Pit
- Upwey Quarries and Bincombe Down
- Valley of Stones
- Shillingstone Quarry

Natural Area: 52. Dorset Heaths	**Geological Significance:** Notable (provisional)

General geological character: The Dorset Heaths Natural Area is underlain by gravels, sands, silts and subordinate clays deposited during the Palaeocene and Eocene Epochs (approximately 60-40 Ma) of the Tertiary. The sands and gravels which constitute the majority of the succession give rise to well-drained soils which are partly responsible for the development of the heathland. The lowest Reading Formation (Palaeocene) forms a sandy, partly cemented gravel, resting unconformably on the Upper Cretaceous chalk for example at Studland Bay. The relatively steep northerly dips of the rocks around Studland Bay decrease a short distance to the north giving rise to extensive outcrops of the Tertiary successions. The rapid change in dip results from the deformation which took place during the period of the Alpine Orogeny. The Reading Formation is succeeded by the Eocene London Clay Formation (predominantly a silt in this area). This in turn is overlain by the Bagshot Formation which consists predominantly of sands, but also contains lenses of clay which are worked commercially. The latter contain important fossil floras. The youngest beds outcrop along the coast and belong to the Bournemouth Formation (Eocene). They consist predomonantly of non-marine sediments, but a few marine horizons also occur. The outlier of younger beds on Creechbarrow Hill includes soft limestones and clays once thought to be of Oligocene age, but now assigned to the late Eocene. The area is partly underlain by the Wytch Farm Oilfield, the largest onshore oilfield in the UK, producing oil from Triassic and Lower Jurassic reservoirs deep below.

The effects of the Quaternary 'Ice Ages' on the area over the last 2 million years has been to cover the Tertiary sediments with wide spreads and terraces of river gravels deposited by ancient river systems such as the Solent River. This river, now drowned by Southampton Water, once rose near Dartmoor and flowed eastward across the Natural Area before discharging into the English Channel. Sea level rise in the Quaternary drowned the course of the river, allowing the sea to separate the Isle of Wight from the mainland. The terrace gravels deposited by the Solent River are rich in archaeology and have yielded evidence of early human population in the form of Palaeolithic flint implements. Along the coast there are several important coastal geomorphological features including the chalk cliffs.

Key geological features:

- Coastal exposures of Tertiary (especially Palaeogene) sediments
- Eocene fossils including rare floras

Number of GCR sites:

Palaeogene: 4 Coastal Geomorphology of England: 2 Tertiary Palaeobotany: 1
Alpine Structures of Southern England:1 Pleistocene/Quaternary of South Central England: 1

Geological/geomorphological SSSI coverage: There are 6 (P)SSSIs in the Natural Area covering 9 GCR SILs representing 5 different GCR networks. The site coverage emphasises the importance of the underlying Palaeogene sands and clays such as those exposed at Poole Bay Cliffs. Christchurch Harbour SSSI is important for Tertiary stratigraphy, showing exposures of the Eocene Boscombe Sands at Hengistbury. Important coastal geomorphological sites include the chalk cliff features at Studland Cliffs SSSI. This site also shows the Cretaceous/Tertiary boundary above the chalk, and the nature of the Alpine folding is illustrated by cross sections through the Purbeck Ridge.

Key geological management issues:

- Threat to key geological coastal sections from coastal defence and coastal engineering works
- Natural degradation of inland geological exposures through neglect and disuse
- Intimate relationship between Quaternary geology and archaeology

Key geological objectives:

1. **Ensure that future coast protection works are part of an agreed shoreline management plan**
2. **Ensure continued maintenance and enhancement** of inland geological exposures
3. **Encourage initiatives aimed at integrating Quaternary geology/archaeology** of the area

Useful guides/references:

HOUSE, M.R. 1993: The Dorset Coast. Geologists' Association Guide. Revised 2nd Edition.

WHITTOW, J.B. 1992: Geology and Scenery in Britain. Chapman and Hall, London.

MELVILLE, R.V. & FRESHNEY, E.C. 1982: British Regional Geology, The Hampshire Basin and adjoining areas. British Geological Survey, HMSO. London.

Earth science (P)SSSIs in the Natural Area:

- Arne
- Christchurch Harbour
- Oakers Bog
- Poole Bay Cliffs
- Studland and Godlington Heaths
- Studland Cliffs

Natural Area: 53. Isles of Portland and Purbeck	**Geological Significance:** Outstanding (provisional)

General geological character: The Isles of Portland and Purbeck Natural Area has superb coastal exposures which expose strata ranging from the Jurassic (161-145 Ma) Oxford Clay through to the Cretaceous (145-65 Ma) Chalk. Along the fault-belt between Bincombe and Poxwell there are also small inliers of slightly older Middle Jurassic Bathonian rocks (approximately 163 Ma). Much of the coastal scenery is dominated by two formations - the Portland Stone and the Chalk - both producing vertical cliffs. Oxford Clay and Corallian Beds occur along the coast eastwards to Ringstead Bay. The base of the Kimmeridge Clay is seen here but is best exposed further east around Kimmeridge (its type area). The Portland Beds, dominating the Isle of Portland, are exposed inland around Chalbury, along the Lulworth coast, and unbroken from St Aldhelm's Head to Anvil Point. Durlston Bay is the type locality for the Purbeck Beds which are also seen to the west. Wealden beds are at their thickest in the UK in Swanage Bay and are here succeeded by Lower Greensand which disappears at Lulworth. The vertical chalk ridge forms the spine of the Isle of Purbeck with younger Tertiary Palaeogene rocks to north. The folding of the sequence was the result of the Alpine orogeny, a mountain building phase in the late Tertiary (c. 15 Ma).

Though the area was not glaciated during Pleistocene times it has been affected by changes in glacial and interglacial climate, notably one of the most important raised beach sequences on the south coast. Coastal erosional features are also important; for example, landslips on the Isle of Portland and the classic cove at Lulworth.

Key geological features:

- World famous fossiliferous Jurassic rocks
- Type localities for Kimmeridge Clay, Portland and Purbeck Beds
- Key area for Cretaceous (pre-Albian) folding
- Key area for Alpine folding
- Holworth House unconformity
- Purbeck anticline and 'crumple'
- Abbotsbury-Ridgeway Fault Zone
- Poxwell and Chaldon periclines
- Oilfield at Kimmeridge
- Erosional features of Lulworth coastal area
- Candidate basal boundary stratotype sections for Kimmeridgian and Portlandian stages
- Portland Stone quarries.

Number of GCR sites:
Portlandian-Berraisian: 14 Jurassic-Cretaceous Reptilia: 5 Wealden: 4 Kimmeridgian: 3
Aptian-Albian: 2 Pleistocene/Quaternary South Central England: 2 Palaeoentomology: 2
Coastal Geomorphology of England: 2 Mass movement: 1 Mesozoic Palaeobotany: 1
Mesozoic-Tertiary Fish/Amphibia: 1 Tufa:1 Mesozoic Mammalia: 1 Oxfordian: 1
Cenomanian-Maastrichtian: 1 Alpine Structures of Southern England: 1

Geological/geomorphological SSSI coverage: There are 7 (P)SSSI in the Natural Area containing 42 GCR SILs; these represent 16 different GCR networks which indicates the importance and range of geological variety the area possesses. Two of the sites selected, the Isle of Portland and the South Dorset Coast, are viewed as internationally important. The South Dorset Coast SSSI contains twenty four separate geological interests including the type area for the Kimmeridgian, key Portlandian sections, Lower Cretaceous Wealden sections (Wessex Formation) and sections through Lower to Upper Cretaceous Gault, Upper Greensand and Chalk. The fossil fauna is equally important the SSSI having yielded many type specimens. These include reptiles from the Kimmeridge Clay and the Portlandian of Durlston Bay (turtles, crocodiles, pterosaurs, plesiosaurs, ichthyosaurs and dinosaurs). Durlston Bay is also the most important mammal locality of its age in the world and has yielded one of Britain's richest insect faunas. The Isle of Portland is the type area for the Portlandian Stage (also known as the Tithonian Stage), West Cliff being particularly important. It is also worth noting that the Isle of Portland exposes the South Coast's most important raised beach which documents at least two marine episodes. More recent landslips are also important with some of the best examples of joint and fissure controlled slab failure being present on the Isle.

Key geological management issues:

- Threats to type area of 'Portland Stage' through extensive quarrying and lack of appropriate restoration
- Damage by irresponsible fossil collecting to sensitive sites
- Integration of recreational geology, scientific/educational use, poorly developed
- Threat of inappropriate coastal defence

Key geological objectives:

1. **Protect complete resource and influence all relevant planning decisions** (including non-SSSI areas) **through integration of geological objectives in local plans.**

2. **Improve site management/conservation by integrating demands on sites and raising status of geology.**

3. **Promote non-damaging recreational use of resource** (interpretation).

4. **Integration of geology into Shoreline Management Plans**

5. **Development of responsible fossil collecting policy** on key sites

Useful guides/references:

ARKELL, W.J. 1947: The Geology of Weymouth, Swanage, Corfe and Lulworth. Memoir of the Geological Survey of Great Britain.

COPE, J.C.W., *et al.* 1980: A correlation of Jurassic rocks in the British Isles, 2. Middle and Upper Jurassic. Geological Society of London Special Report, 15

HOUSE, M.R. 1992: The Dorset Coast. Geologists Association Guide.

MacFADYEN, W.A. 1970: Geological highlights of the West Country: a Nature Conservancy Handbook. Publ. Butterworths.

MELVILLE, R.V. & FRESHNEY, E.C. 1982: British Regional Geology: The Hampshire Basin and adjoining areas. British Geological Survey. HMSO.

Earth science (P)SSSIs in the Natural Area:

- Blashenwell Farm Pit
- Corfe Common
- Chalbury Hill and Quarry
- Isle of Portland
- Poxwell
- Purbeck Ridge (East)
- South Dorset Coast

Natural Area: 54. Wessex Vales	**Geological Significance:** Outstanding **(provisional)**

General geological character: The age of the rocks in the Wessex Vales Natural Area varies from the Early Jurassic (Lower Lias; approximately 208 Ma) through to the Late Cretaceous (Chalk; approximately 80 Ma). Over much of the area the rocks dip gently to the east producing an eastward regional younging with Liassic rocks bounding the western side and uppermost Jurassic and unconformable Cretaceous rocks bounding the eastern side of the Natural Area. The two principle exceptions to this broad pattern are the domed area of the Vale of Marshwood and the E-W trending Weymouth anticline. The general rolling and open country of the Natural Area is produced by the mix of Jurassic clays, and limestones with hills in the east capped by Cretaceous Greensand and Chalk.

The Jurassic was dominated by fluctuating sea levels, at their greatest depth during the Lias and shallowing towards the Cretaceous. The uppermost Jurassic and Lower Cretaceous (Wealden) was dominated by freshwater and estuarine conditions before rise in sea level deposited the Greensand and eventually inundated the area by Upper Cretaceous times the associated deposition of the Chalk. The best exposures occur on the coast between Lyme Regis and Portland. Virtually the whole Jurassic sequence (Lower Lias-Purbeck) is represented, comprising mainly fossil-rich marine clays and shales (in places interbedded with limestones), making this possibly the best Jurassic section in Europe. Inland, the Lower Lias (Hettangian-Pliensbachian Stages) gives rise to low lying poorly drained ground such as the Vale of Illchester. The sandy Middle Lias is capped by the Middle-Upper Lias Junction Bed (Pliensbachian-Toarcian Stages) which forms a low topographic feature from Bridport northwards to the Mendips. The overlying Upper Lias (Toarcian Stage) sands include the Yeovil sands and the lime-rich Ham Stone, the latter forming prominent topographic features such as Ham Hill. The Middle Jurassic Inferior Oolite (Bajocian Stage) is dominated by fossil-rich oolitic limestones whilst the overlying Great Oolite (Bathonian) is initially dominated by clays including the Fuller's Earth Formation and then limestones of the Forest Marble. The Upper Jurassic Oxford Clay, Corallian and Kimmeridge Clay Formations have limited inland exposure forming an extensive low lying area on the western side of the Vale of Wardour. The Vale of Wardour itself exposes uppermost Jurassic Portland and Purbeck Beds dominated by limestones (eg. Portland Stone) overlain by poorly exposed Lower Cretaceous Wealden Beds. This sequence is unconformably overlain by the Lower Cretaceous Greensand Formation (Aptian-Albian) and the Chalk of the Wessex Downs.

Tertiary sediments are not preserved, the area being located on the edge of the Tertiary depositional basin. During Pleistocene times, the area was not glaciated but was affected by permafrost (during glacial periods), fluctuating sea levels during temperate interglacials and the development of rivers such as the Solent in the extreme east. Today, modern coastal processes remain important with the unique features such as Chesil Beach - a linear shingle storm beach - and the landslips of Black Ven at Charmouth - the largest coastal landslips in Europe.

Key geological features:

- Jurassic stratigraphy and palaeoenvironments
- Jurassic vertebrate palaeontology (marine reptiles, pterosaurs, dinosaurs, fish)
- Jurassic invertebrate palaeontology (ammonites, belemnites, bivalves, corals and insects)
- Uppermost Jurassic stratigraphy (Portland and Purbeck Beds)
- Cretaceous stratigraphy and palaeoenvironments

Number of GCR sites:

Aalenian-Bajocian: 15 Bathonian: 8 Toarcian: 6 Portlandian-Berriasian: 5
Hettangian-Pliensbachian: 4 Palaeoentomology: 3 Coastal Geomorphology of England: 3
Mesozoic Mammalia: 3 Mesozoic-Tertiary Fish/Amphibia: 3 Cenomanian-Maastrichtian: 2
Callovian: 2 Kimmeridgian: 2 Wealden: 1 Aptian-Albian: 1 Oxfordian: 1
Alpine Structures of Southern England: 1 Jurassic-Cretaceous Reptilia: 1 Mass Movement: 1

Geological/geomorphological SSSI coverage: There are 39 (P)SSSIs in the Natural Area covering 62 GCR SILs. This represents 18 different GCR networks which reflects the geological diversity and importance of the Natural Area. The West Dorset Coast SSSI, providing the best exposure in the Natural Area, is considered to be of international importance. It contains a number of international reference sections and is renowned for its fossil vertebrate and invertebrate fauna which has been extensively studied since the nineteenth century. Inland sites mainly comprise disused quarries and cuttings complimentary to the coastal section, again many standard reference sections and type localities (in particular Middle Jurassic Inferior Oolite) of international importance are present, a number of examples being cited in the following paragraph.

The Lower Jurassic fossiliferous Junction Bed (Pliensbachian-Toarcian boundary) has been the focus of much attention, from collectors and researchers alike, and is exposed at Maes Down. The Upper Toarcian Yeovil Sands are exposed at Babylon Hill in their type area. Middle Jurassic Inferior Oolite (Bajocian) sites are numerous including type localities at Bradford Abbas Railway Cutting, Frogden Quarry, Halfway House Quarry, Sandford Lane Quarry and Low's Hill Quarry. Bruton Railway Cutting exposes type Middle Jurassic Bathonian sections while the Fuller's Earth is exposed at Shepton Montague and Laylock Railway Cutting. Upper Jurassic Oxford Clay is exposed at Crookhill Brick Pit and the Kimmeridgian Abbotsbury Ironstone is exposed at Abbotsbury Blind Lane. The Vale of Wardour exposes important uppermost Jurassic Portland and Purbeck Beds (Upper Chicksgrove, Chilmark, Dinton and Lady Down Quarries) which are also important for their vertebrate and insect faunas. The Cretaceous Greensand is represented at Dead Maid Quarry and the overlying chalk at Charnage Down Quarry on the edge of the Natural Area.

Key geological management issues:

- Maintenance of natural coastal processes
- Maintenance and enhancement of existing exposures (especially inland)
- Assessment of new sites (temporary or permanent)
- Promotion of the scientific/educational value of the geological and geomorphological resource
- Fossil collecting on Jurassic sections, coastal and inland

Key geological objectives:

1. Maintenance and enhancement of the geological resource through a) clearance of existing exposures (e.g. recent clearance at Bruton Railway Cutting), b) development of local conservation strategies that include geology, c) careful management of the palaeontological resource through promotion of responsible collecting policies, d) maintenance of natural coastal processes - development of Shoreline Management Plans, e) assessment of educational/research value of new sites (especially inland quarries and cuttings, temporary or permanent).

2. Promotion of geological resource through a) promotion of site educational and scientific value, b) on-site interpretation (eg. sign boarding, trail guides, leaflets; see Charmouth Heritage Centre), c) promotion of the link between geology/geomorphology, local habitats and landscape evolution.

Useful guides/references:

ARKELL, W.J., 1947: The geology of the country around Weymouth, Swanage, Corfe and Lulworth. Memoir of the Geological Survey of Great Britain.

BRISTOW, C.R. *et al.* 1995: Geology of the country around Shaftesbury. Memoir of the British Geological Survey, Sheet 313, (England & Wales).

HOUSE, M.R., 1993: Geology of the Dorset Coast. Geologists' Association Guide No. 22.

MACFADYEN, W.A., 1970: Geological highlights of the West Country: a Nature Conservancy Handbook (NCC). Publ. Butterworths.

MELVILLE, R.V. & FRESHNEY, E.C. 1982: British Regional Geology, The Hampshire Basin and adjoining areas. British Geological Survey, HMSO.

WILSON, V. *et al* 1958. Geology of the country around Bridport and Yeovil. Memoir of the Geological Survey of Great Britain.

Earth science (P)SSSIs in the Natural Area:

- West Dorset Coast
- Seavington St Mary
- Chilmark Quarries
- Trill Quarry
- Dinton Quarry
- Windsor Hill Quarry
- Dinton Railway Cutting
- Peashill Quarry
- Abbotsbury Blind Lane
- Milborne Wick
- Babylon Hill
- Maes Down
- Bradford Abbas Railway Cutting
- Low's Hill Quarry
- Bruton Railway Cutting
- Burton Bradstock
- Charnage Down Chalk Pit
- Chesil Beach and the Fleet
- Conegar Hill
- Crookhill Brick Pit
- Dead Maid Quarry
- Frogden Quarry
- Goathill Quarry
- Godminster Lane Quarry and Railway Cutting
- Halfway House Quarry
- Ham Hill
- Doulting Railway Cutting
- Hobbs Quarry
- Tefont Evias Quarry/Railway Cutting
- South Dorset Coast (part)
- Viaduct Quarry
- Sandford Lane Quarry
- Shepton Montague Railway Cutting
- Upper Chicksgrove Quarry
- Holway Hill Quarry
- Horn Park Quarry
- Lady Down Quarry
- Laycock Railway Cutting
- Leighton Road Cutting

Natural Area: 55. Blackdowns	**Geological Significance:** Outstanding **(provisional)**

General geological character: The Blackdowns Natural Area is characterised by a gently eastward-dipping succession of Upper Triassic Mercia Mudstone Beds, succeeded by Penarth Group and latest Triassic-early Jurassic Lias Group rocks (ranging approximately 225-185 Ma in age). These deposits are overlain by a dissected plateau of horizontal Cretaceous Gault and Upper Greensand (approximately 110 Ma) resting with marked unconformity on the lower beds. Locally the Upper Greensand is succeeded by the Chalk, which in the region around Beer includes Upper Chalk. The Gault is thin and only present in the south east of the area, the Upper Greensand includes Chert Beds in its upper part and in the Blackdown Hills proper, south of Taunton, have yielded in the past magnificently preserved fossils replaced by chalcedony, now to be found in museum collections worldwide. (These fossils originate from the so-called 'Blackdown Greensand' facies, which is a variant of the normal Greensand rock-type). The Lower Chalk is in a condensed facies over the whole area and yields magnificent faunas of ammonites, echinoids and other fossils. The Middle Chalk usually contains flint nodules, but around Beer is represented by the Beer Stone, an important local building stone. The Upper Chalk is restricted to the area around Beer. This area includes the westernmost outcrops of Chalk in England. Scattered areas of Clay-with-Flints, now regarded as an Eocene residual deposit, occur over the Chalk outcrop.

Key geological features:

- Penarth Group and Lias Group fossils
- Blackdown Greensand fossils (preserved as replacement by chalcedony)
- Very fossiliferous condensed facies Lower Chalk (many famous localities eg. White Hart Pit, Wilmington; Shapwick Grange Quarry, Rousdon)
- Beer Stone Quarries
- Landslip coast between Lyme Regis and Seaton

Number of GCR sites:

Cenomanian-Maastrichtian: 4 Rhaetian: 2 Pleistocene/Quaternary of SW England: 2
Aptian-Albian: 1 Hettangian-Pliensbachian: 1 Mass Movement: 1 Jurassic-Cretaceous Reptilia: 1
Fluvial Geomorphology of England: 1 Mesozoic-Tertiary Fish/Amphibia: 1

Geological/geomorphological SSSI coverage: There are 10 (P)SSSIs in the Natural Area covering 14 GCR SILs representing 9 different GCR networks. The GCR site coverage is a very broad representation of the diverse geology of the area. Particular emphasis is placed on sites of late Lower and early Upper Cretaceous age (Albian-Cenomanian, eg. Wilmington Quarry, Snowdon Hill Quarry, etc) as these sites are of very high importance for stratigraphical and palaeontological studies. Stratigraphically important Liassic sites are also found between Axmouth and Lyme Regis, which is also famed for its remarkable demonstration of active landslips. Historically this section of coastline has had considerable influence on the development of geology as a science. Broom Gravel Pits were formerly one of Britain's richest sources of Palaeolitic hand axes.

Key geological management issues:

- Degradation of old quarries.
- Irresponsible fossil-collecting, especially of Cenomanian faunas.
- Incomplete GCR coverage of internationally important sites.

Key geological objectives:

1. **Ensure sites adequately maintained** through enhancement such as site clearance.

2. **Ensure responsible fossil collecting policies are adopted at all sensitive palaeonotological and stratigraphical localities.**

3. **Integrate SSSI and RIGS systems to help protect sites** not yet coveraged by former designation.

4. **Ensure local plans contain clearly defined geological conservation policies.**

5. **Include geological objectives within Shoreline Management Plans.**

6. **Promotion of the link between geology, habitat and scenery** through interpretation and cross-cutting initiatives.

Useful guides/references:

DURRANCE, E.M. & LAMING, D.J.C. 1982: The Geology of Devon. Publ. University of Exeter.

MacFADYEN, W.A. 1970. Geological highlights of the West Country. NCC.

EDMONDS, E.A., *et al.* 1975: British Regional Geology, South-West England. Institute of Geological Sciences, HMSO. London.

Earth science (P)SSSIs in the Natural Area:

- Axmouth to Lyme Regis
- Beer Quarry and Caves
- Broom Gravel Pits
- Furley Chalk Pit
- River Axe
- Shapwick Grange Quarry
- Sidmouth to Beer Coast
- West Dorset Coast (part)
- Snowdon Hill Quarry
- Wilmington Quarry

Natural Area: 56. Devon Redland	**Geological Significance:** Considerable **(provisional)**

General geological character: The solid geology of Devon Redland Natural Area is dominated by an easterly dipping Permian (in the west) and early Triassic succession (approximately 280-240 Ma) (in the east) which forms the distinctive westward 'tongue' roughly following the line of the River Teign.

The earliest deposits on the western edge of the area belong to the uppermost marine Devonian, sediments being deposited in a transitional environment between a shallow carbonate shelf (containing abundant reef corals) and deeper marine conditions (yielding goniatites). Marine conditions persisted into the Carboniferous when intermittent, but rapid, influx of sediment deposited the Westleigh Limestone turbidites. The Permian succession begins with coarse breccias and fines upwards to mudstones towards the end of this succession. Locally lavas (Exeter lavas), displaying an interesting mineralogy, are developed at the base of the Permian. The earliest Triassic sediments are the Budleigh Salterton Pebble Beds, a sheet-flood deposit of rounded pebbles, including predominant reddish quartzites yielding late Ordovician fossils of Armorican affinities; the quartzites have been matched with the Grès de May and the Grès Armorican of Brittany. The Permo-Triassic red sandstones are dominantly of continental origin having accumulated on the floor of a desert. Many desert features have been recognised, including screes, fan-conglomerates, braided stream deposits and aeolian dunes (including both seif and barchan types); ventifacts (wind polished pebbles), such as dreikanters, also occur. Triassic desert sandstones have yielded important reptilian faunas particularly within the Otter Sandstone Formation. The Haldon Hills, in the southwest of the area, consist of outliers of the younger Lower Cretaceous Upper Greensand (of Blackdown type) overlain by the Tertiary Haldon Gravels which consist of flints derived from a former Chalk cover to Dartmoor: they are now ascribed to mid-Eocene fluvial origins. The Bovey Basin (on the south western margin of the area) exposes late Eocene and Oligocene clays (approximately 25 Ma) along the Sticklepath Fault; these clays are worked as Ball Clays and rest on the Eocene Aller Gravels.

Though the area was not glaciated during the Pleistocene the extreme periglacial environment of the last (Devensian) 'Ice Age' obliterated features remaining from earlier glaciations.

Key geological features:

- Permo-Triassic red beds
- Permian Exeter lavas
- Derived Ordovician fossils (Budleigh Salterton Pebble Bed)
- Desert sedimentary features
- Reptile sites
- Carboniferous turbidites (Westleigh Limestone)
- Internationally important marine Devonian sites

Number of GCR sites:

Dinantian of Devon & Cornwall: 2 Permian-Triassic: 2 Permian-Triassic Reptilia: 2
Igneous rocks of SW England: 2 Palaeogene: 2 Coastal Geomorphology of England: 2
Fluvial Geomorphology of England: 2 Marine Devonian: 1

Geological/geomorphological SSSI coverage: There are 13 (P)SSSIs in the Natural Area covering 15 GCR SILs which represent 8 different GCR networks. Lower Dunscombe Farm Quarry exposes marine Devonian facies . The Carboniferous Westleigh Limestone is exposed at Stout's Cottage and Lower Whipcott. Permian lavas are exposed at Killerton and Posbury Clump. Permo-Triassic sediments are particularly well exposed on the coast at Dawlish, between Ladram Bay and Sidmouth and at Budleigh Salterton Cliffs (type locality for the Budleigh Salterton Pebble Bed). The last two, together with the Otter Estuary, are also important for Triassic reptiles (rhynchosaurs), fish and amphibia. Tower Wood Quarry and Buller's Hill Quarry are type Tertiary gravel localities. Brampford Speke provides importance evidence in our understanding of the River Exe flood plain development.

Key geological management issues:

- Loss of many small exposures due to infill and degradation.
- Absence of good exposures of Haldon sands (Cretaceous) including important coral-bearing band.
- Irresponsible fossil collecting
- Threats from coast defence works
- Need to maintain the operation of natural fluvial processes

Key geological objectives:

1. **Ensure adequate management of sites and adoption of geological policies** in local plans

2. **Encourage recording/conservation of new sites** (temporary or permanent) (e.g. Cretaceous Haldon Sands), consider designation as RIGS

3. **Adoption of responsible collecting policies** on key palaeontological/stratigraphical localities.

4. **Inclusion of geological conservation objectives in Shoreline Management Plans**

5. **Promotion of the link between geology, habitat and scenery** in particular through site interpretation and joint initiatives.

Useful guides/references:

DURRANCE, E.M. & LAMING, D.J.C. 1982: The Geology of Devon. Publ. University of Exeter.

EDMONDS, E.A., *et al.* 1975: British Regional Geology, South West England. Institute of Geological Sciences. HMSO. London.

MacFADYEN, W.A. 1970: Geological highlights of the West Country. NCC.

SELWOOD, E.B. *et al.*, 1984: Geology of the Region around Newton Abbott. Memoir of the Geological Survey of Great Britain. (Sheet 339).

Earth science (P)SSSIs in the Natural Area:

- Tower Wood Quarry
- Brampford Speke
- Killerton
- River Culm, Columbjohn
- Stout's Cottage
- Otter Estuary
- Ladram Bay to Sidmouth
- Budleigh Salterton Cliffs
- Lower Dunscombe Farm Quarry
- Posbury Clump
- Lower Whipcott
- Dawlish
- Buller's Hill Quarry