Natural Area: 65. Mid Somerset Hills	Geological Significance: Some (provisional)

General geological character: The Mid Somerset Hills Natural Area comprises the ridge of 'relatively high ground' to the east of the Somerset Levels and Moors. It encompasses the rolling country south-east of Taunton, around Hatch Beachamp-Ilminster, skirts the base of the eastern Blackdowns and the margin of the Wessex Vales Natural Area. Northwards the Mid Somerset Hills incorporates the Polden Hills (which transect the Somerset Levels and Moors), the area around Glastonbury-Street and the southern fringes of the Mendip Hills around Wedmore and Wookey.

The solid geology of the area is relatively simple and consists dominantly of late Triassic and early Jurassic (Lias) sediments which are mostly flat-bedded. The oldest strata are the Mercia Mudstones (the 'Keuper Marl', approximately 235 to 210 Ma) which occur on the western fringes of the Natural Area and against the edge of the Mendip Hills to the north. Permanent exposure of these thick red mudstones is typically poor; occasional outcrops can be observed in the lower parts of the hills as they rise above the Somerset Levels. Above the Mercia Mudstones the late Triassic Penarth Group ('Rhaetic') is developed which is dated at approximately 210 to 208 Ma. Again exposure is poor, but hill slopes and scarce shallow road cuttings and scrapes reveal a sequence of alternating grey-green marls and black shales (Westbury Beds) passing up into buff, thinly-bedded limestones and shales (the 'White Lias' and 'Langport Beds') which in turn are overlain by grey alternating limestones and shales (the 'Pre-planorbis' Beds). These beds mark the transition from arid terrestrial environments to shallow marine seas; the 'White Lias' contains a restricted fossil bivalve fauna, rich in numbers of individuals but low in diversity. Passing-up into the 'Pre-planorbis' Beds the fauna becomes progressively more diverse and includes occasional marine reptiles.

The main underlying geology of the Natural Area comprises lower Jurassic sediments assigned to the Lower Lias (especially the 'Blue Lias' at the base). The strata consist of alternating grey clays and limestones (which weather yellowish) becoming clay dominated in higher parts. These beds are fully marine and contain a rich fossil fauna including ammonites, nautiloids, bivalves, brachiopods, belemnites and marine reptiles such as ichthyosaurs and plesiosaurs. The close proximity of land is implied by the amount of fossilised wood and bioturbation (fossil burrows) which these sediments frequently contain. Exposures of these strata is now relatively poor and mainly confined to overgrown quarries, hill slopes and stream sections. However, during the last century and earlier this century the stone was actively worked as building stone and numereous small quarries were excavated. Some of these around Hatch Beauchamp, Keinton Mandeville and Street became famed as sources of marine reptile fossils, especially ichthyosaurs.

Other Jurassic strata exposed in the Natural Area consists mainly of condensed, buff-coloured limestones (iron-stained and clayey in places) which are assigned to the Middle and Upper Lias (Marlstone and Junction Beds respectively). These strata crop out in the south-eastern corner of the area around Ilminster, Shepton Beauchamp and South Petherton; an outlier of the same strata forms Glastonbury Tor. The sediments are frequently extremely fossiliferous containing ammonites, bivalves, nautiloids, belemnites, and brachiopods; some horizons are renowned for the exquisite preservation of marine reptiles, 'crocodiles' and insects within nodules. Although the sediments were deposited under marine conditions, the water was extremely shallow at times and subject to emergence as indicated by the condensed and reworked nature of some of the deposits.

The youngest sediments exposed in the area consist of Quaternary deposits of Devensian and Ipswichian age (up to approximately 50,000 years BP). These relate to periods of (peri)glacial and interglacial conditions and the sediments typically comprise sands and gravels with cryoturbation, scour-and-fill features and mollusc/palynomorph subfossils.

Key geological features:

- Late Triassic (Rhaetic) and Lower Jurassic (Liassic) stratigraphy and palaegeography
- Well preserved vertebrate (marine reptile) fossil remains
- Quaternary 'Ice Age' (Devensian) gravels and associated subfossil faunas

Number of GCR sites:
Pleistocene/Quaternary of Somerset: 4

Geological/geomorphological SSSI coverage: There are 4 (P)SSSIs in the Natural Area containing 4 GCR SILs representing 1 GCR network - the Pleistocene/Quaternary of Somerset. Hurcott Farm exposes river terrace gravels which are correlated with the coeval marine Burtle Beds on the Somerset Levels and Ipswichian Interglacial deposits in eastern England. Langport Railway Cutting is one of the few permanently-exposed localities in Somerset showing cold-stage Pleistocene gravels and is the first site in Britain in which typical calcrete features have been recorded. Low Ham and Wookey Station both expose Devensian-aged sands and silts with associated mollusc and pollen 'subfossils'; sediments at the latter site also exhibit cryoturbation features and are a rare example of well exposed Mendip fan-gravels.

Key geological management issues:

- Maintain and enhance existing exposures
- Increase the number of permanent geological exposures, especially in late Triassic/early Jurassic strata
- Encourage recording/data collecting of temporary sections
- Misuse of sensitive fossil locations (such as Liassic reptile sites) if re-exposed

Key geological objectives:

1. **Maintain current geological exposures and enhance where practical**

2. **Increase the number of permanent geological exposures and/or recording of temporary sections** by encouraging joint initiatives with RIGs, local geological groups

3. **Encourage responsible fossil collecting** and contact with County Museum

Useful guides/references:

HUNT, C.O. *in* CAMPBELL, S. *et al.* (in press): Quaternary of South-west England, Chapter 8. JNCC Geological Conservation Review Series. Chapman & Hall. London

Also see references within:
EDMONDS, E.A. & WILLIAMS, B.J. 1985: Geology of the country around Taunton and the Quantock Hills. Memoir for sheet 295, New Series, British Geological Survey, NERC

Earth science (P)SSSIs in the Natural Area:

- Hurcott Farm
- Langport Railway Cutting
- Low Ham
- Wookey Station

Natural Area: 66. Mendips	Geological Significance: Outstanding (provisional)

General geological character: The Mendip Hills are a series of rolling ridges (periclines) which form a topographic high in north Somerset attaining a maximum height of 325m AOD. The Natural Area includes the Carboniferous inliers at Brean Down and Uphill-Middle Hope. The oldest rocks exposed in the area crop out in the eastern part of the area within the Beacon Hill Pericline. Here Silurian lavas (andesites, rhyodacites) and ashes are interbedded with sandstones and mudstones which contain fossil marine shells indicating a Wenlock age (approximately 430 Ma). The environment was probably a warm, shallow sea with volcanic islands rising above the waters. In the Mendip area Lower Devonian rocks were removed by erosion during the later stages of the Caledonian Orogeny and Silurian rocks are followed unconformably by Upper Devonian 'Old Red Sandstone'. These rocks (approximately 390 to 365 Ma) include coarse quartzitic sandstones, arkosic sandstones and quartz-pebble conglomerates which were deposited in a low-lying desert which was crossed by large seasonal rivers.

There is no break in sedimentation between Devonian and Carboniferous rocks in the Natural Area although the environment changed dramatically. The Lower Carboniferous (Dinantian, approximately 360 to 330 Ma) sequence begins with Lower Limestone Shales and passes up into a thick sequence of bioclastic and oolitic limestones (in ascending order these are the Black Rock Limestone and Dolomite, Burrington Oolite, Clifton Down Limestone and Hotwells Limestone [other local names exist]). These sediments represent a marine transgression indicated by the deposition of a series of muddy limestones followed by the development of widespread, shallow coral seas rich in marine invertebrates including solitary and colonial corals, crinoids, bivalves, brachiopods and occasional trilobites. By Late Carboniferous times huge deltas were gradually being built out over the shallow sea floor. These gave rise to quartzitic 'Pennant Series' sandstones and eventually to Coal Measures (sandstones, shales and interbedded coal seams) which were formerly best exposed around Radstock in the Somerset Coalfield. Coal tips around Kilmersdon and Writhlington (*see* 'Avon Ridges and Valleys' Natural Area) have yielded a variety of beautifully preserved plant fossils and insects. The east Mendip area of 290 Ma can therefore be pictured as a vast swamp-like delta, thickly vegetated and hosting a variety of insects and early amphibians.

Permian-aged strata are absent from the Mendips Natural Area, any rocks deposited at that time were removed by erosion associated with the folding that formed the Mendip Hills around 280 Ma. The Mendips mark the northern front of the strongly folded and thrusted belt of the Hercynian Orogeny. The surface of the Carboniferous Limestone is often deeply dissected and infilled with Triassic-aged (approximately 220 Ma) marls and marginal deposits known as the Dolomitic Conglomerate which represents alluvial valley infills. The Mendips are generally surrounded by a sequence (thickening to the south) of red mudstones termed the Mercia Mudstone Group and were deposited in a shallow hypersaline lake. Towards the end of the Triassic Period (approximately 208 Ma) the climate became generally wetter and this led to the development of underground watercourses and caves. It was from one such cave that the fossilized bones of the gliding reptile *Kuhneosaurus* were discovered; a wide range of lizards, rhynchocephalians and dinosaurs have since been found suggesting that by the end of the Triassic Period the Mendips were well populated with such animals. These fissure fills also contain fish remains indicating sporadic marine conditions.

The Mendips remained as islands in a warm shallow sea through the succeeding Lower Jurassic up to 165 Ma (Bathonian times). Tectonic activity resulted in local tension and the opening of faults and joints, in which accumulated fissure deposits including land-dwelling vertebrates (such as *Oligokyphus*, one of the earliest mammals). These Jurassic rocks contain shallow-water faunas including strongly-ribbed bivalves, corals and abundant encrusting and rock-boring animals. Fossil rocky sea floors have been found preserved beneath Lower and Middle Jurassic rocks in many parts of the south-east Mendips. These rocky sea floors were reworked many times, eventually froming a widespread, planar surface (hardground). This is now best preserved beneath the Upper Inferior Oolite where it is frequently found to be covered with oyster shells and traces of rock-boring animals.

There is no evidence in the Mendips of any rocks younger than mid Jurassic age, any such strata have since been removed by erosion. This erosion probably started in Pliocene times (about 10 Ma) and continued throughout much of the Quaternary when the Mendips were affected by glacial or periglacial conditions. Evidence of the (peri)glacial/interglacial conditions is gained from the preservation of Palaeolithic cave deposits containing remains of bear, wolf, cave lion, hyaena, deer, cave pika, small mammals and man. Swallow-hole and associated features probably formed at about the same time. The Natural Area includes an extensive and well-developed cave and karst system which has been little disturbed by glaciation. Drainage patterns are therefore largely 'original' and cave earths contain relatively long stratigraphical records.

The Mendips (a name probably derived from the mediaeval term 'Myne-deepes') have been the scene of occasional mining and quarrying for some 2,000 years. The area has been worked commercially for lead and zinc since Roman times, and minor deposits of iron and manganese have also been exploited. The minerals occur mainly as veins/fissure fills (carbonate-hosted 'Mississippian-type' ores) predominantly in the Carboniferous Limestone and Dolomitic Conglomerate; some mineralization is of secondary origin. Excluding evaporites, three main types of (metalliferous) ore mineralization can be recognised: lead and zinc ores; iron and manganese ores; and secondary lead and copper minerals. Some minerals such as *chloroxiphite* are unique to the Mendips.

Key geological features:

- Triassic-Lower Jurassic fissure fills containing fossilized early reptile and mammal remains
- Cave deposits containing Pleistocene animal and hominid fossils
- Highly fossiliferous Lower Carboniferous marine limestones
- Jurassic hardground surfaces encrusted with oysters and boring organisms
- Deep gorge and related scenic features, Cheddar and Ebbor gorges
- Mining grounds of geological, historical and cultural importance

Number of GCR sites:

Caves: 8 Karst: 6 Dinantian of S England/Wales: 5 Pleistocene Vertebrata: 5
Mineralogy of the Mendips: 5 Pleistocene/Quaternary of Somerset: 3 Hettangian-Pliensbachian: 2
Mesozoic Mammalia: 1 Permian-Carboniferous Igneous: 1 Permian-Triassic Reptilia: 1 Wenlock: 1

Geological/geomorphological SSSI coverage: There are 25 (P)SSSIs in the Natural Area containing 38 GCR SILs. These represent 11 different GCR networks which indicates the considerable variety of geological interest to be found in this area. Many of the sites selected represent cave/karst features: Brimble Pit and Cross Swallet Basins, Priddy Caves and Priddy Pools, Lamb Leer and Thrupe Lane Swallet. Other cave/karst sites are associated with a Dinantian interest (Lower Carboniferous stratigraphy block-Burrington Combe, St. Dunstan's Well Catchment) or occasionally with Pleistocene bone remains (Wookey Hole, Ebbor Gorge and the spectacular Cheddar Complex). The Silurian volcanic interest is represented by Moons Hill Quarry and the quarries at Emborough, Cloford and Holwell contain Rhaetic-Lower Lias fissure deposits which have yielded important vertebrate remains including those of flying reptiles, fish and the earliest mammals. Quaternary sediments, or younger, related to periglacial conditions are exposed at Bleadon Hill, Middle Hope and Brean Down - the latter is noted for the presence of a wedge of soft sediments against the SE face which contain an unusually complete archaeological succession extending from the Devensian Glacial (22,000 years ago) through Bronze Age and Medieval sediments to the 17th Century remains. The caves at Crook Peak to Shute Shelve Hill SSSI contain the remains of many Quaternary vertebrates including hyaena. Stratified deposits at this site have yielded a radiocarbon age of 35,000 years BP for animal remains, providing an important constraint on the date of events in the

Key geological management issues:

- Maintain existing coastal and inland exposures, increasing the number of permanent exposures (especially for Triassic and younger strata) where possible
- Maintain existing natural geomorphological processes
- Potential damage to delicate and sensitive cave and karst features through overuse/misuse by cavers
- Assist recording/data collecting of temporary sections
- Promote the link between underlying geology and the natural wildlife resource
- Overuse and misuse of sensitive locations with finite fossil resources, eg. cave deposits

Key geological objectives:

1. **Maintain the integrity of inland and coastal exposures** seeking enhancement of exposures/recording of temporary sections wherever practical

2. **Encourage production of cave conservation plans** for sensitive/vulnerable sites

3. **Promote the strengthening of links** between geology, landscape, habitats, flora and fauna

4. **Encourage responsible fossil collecting;** we should be consulted on any excavations concerning fossiliferous cave deposits and other *integrity*-type sites.

Useful guides/references:

GREEN, G.W. & WELCH, F.B.A. 1965: Geology of the Country around Wells and Cheddar. Explanation of sheet 280, New Series, Geological Survey of Great Britain. London

WHITTAKER, A. & GREEN, G.W. 1983: Geology of the country around Weston-super-Mare. Memoir for sheet 279 with parts of 263 and 295, Institute of Geological Sciences, NERC

SAVAGE, R.J.D. 1977: Geological excursions in the Bristol district. University of Bristol. Bristol

BARRINGTON, N. & STANTON, W. 1977: The complete caves of Mendip. Barton Productions and Cheddar Valley Press, Cheddar.

DUFF, K.L., MCKIRDY, A.P. & HARLEY, M.J. 1985: New sites for old, a students guide to the geology of the east Mendips. Nature Conservancy Council. Peterborough.

Earth science (P)SSSIs in the Natural Area:

- Bleadon Hill
- Ben Knowle
- Middle Hope
- Spring Cove Cliffs
- Brean Down
- Crook Peak to Shute Shelve Hill
- Brimble Pit and Cross Swallet Basins
- Burrington Coombe
- Ebbor Gorge
- Emborough Quarries
- Priddy Caves
- Priddy Pools
- Sandpit Hole and Bishop's Lot
- St. Dunstans's Well Catchment
- Thrupe Lane Swallet
- Wurt Pit and Devil's Punchbowl
- Lamb Leer
- Holwell Quarries
- Cloford Quarry
- Maesbury Railway Cutting
- Merehead Quarry
- Moons Hill Quarry
- Wookey Hole
- Shipham Zinc Orefield
- The Cheddar Complex

Natural Area: 67. Somerset Levels and Moors	**Geological Significance:** Some **(provisional)**

General geological character: The Somerset Levels and Moors Natural Area is underlain by Triassic rocks which represent a period of mountainous desert conditions which existed around 240 million years ago. The most common of these is the Keuper Marl (now known as the Mercia Mudstone Group) which is the product of the migration of desert dunes across the area. It is a calcareous clay laid down in ephemeral lakes on the floor of the desert. Although this forms a thick and extensive deposit, the character of the Natural Area is given by the surface accumulation of Quaternary (the last 2 million years) alluvium, peats and marine clays which create a low lying fenland landscape. The thick blanket of Quaternary deposits is broken only by the more resistant older rocks such as the Lias outlier at Brent Knoll. The origin of the Quaternary deposits lies in fluctuating climates and sea levels, with marine clays forming at times of high sea level such as interglacials and peat formation during times of low sea level. The area has also been affected by the Quaternary glaciations at a time when a large ice sheet moved down the Irish Basin. This deposited layers of glacial sands, gravels and clays across the area and also impounded a large glacial lake which is associated with lacustrine clays. Over the last 10,000 years, large accumulations of peat and raised bogs have formed in the the relatively mild interglacial climate. The Somerset Levels have been settled and cultivated by man throughout this time.

Key geological features:

- Quaternary glacial deposits
- Quaternary stratigraphy showing the sequence of marine clays and peat layers
- Archaeological artefacts and influence of geology on settlement patterns

Number of GCR sites:

Quaternary of Somerset: 4

Geological/geomorphological SSSI coverage: There are 2 (P)SSSIs in the Natural Area containing 4 GCR SILs representing 1 GCR network. Kenn Church, Kenn Pier and Yew Tree Farm (all one site) is important for Quaternary stratigraphy containing deposits which provide information about the history of glaciation and environmental change in the area over the last 500,000 years. There are currently no exposures of the geological interest at this 'greenfield ' site. Greylake SSSI is a greenfield site important as a reserve of the marine Burtle Beds, which formed during the high sea levels of the Ipswichian interglacial.

Key geological management issues:

- Lack of geological exposures in the important Quaternary deposits
- Protection and enhancement of key geological localities and "greenfield" sites
- Potential conflict between agriculture and geological/biological conservation

Key geological objectives:

1. Encourage the creation of permanent and temporary exposures in the Natural Area to increase opportunities for study of the underlying Quaternary stratigraphy.

2. Maintain the integrity of existing geological sites through (a) protection of existing geological exposures, (b) maintaining access to greenfield geological sites, and (c) promoting links between geological and biological conservation in the area.

Useful guides/references:

CAMPBELL, S. (in press): Quaternary of South West England. Geological Conservation Review Series, Chapman and Hall, London.

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

Earth science (P)SSSIs in the Natural Area:

- Greylake
- Kenn Church, Kenn Pier and Yew Tree Farm

Natural Area: 68. Avon Ridges and Valleys	Geological Significance: Outstanding (provisional)

General geological character: This Natural Area extends northwards from the Mendip Hills encompassing Bristol and central Avon; it is bordered to the east by the Cotswold Hills and to the west by the River Severn. The area has a varied topography which is related both to the nature of the underlying rocks and to the amount of erosion to which they have been subjected. In general, the harder Palaeozoic rocks form areas of moderately high relief (such as Broadfield Down) which exceed 125m AOD.

The solid geology of the Natural Area consists mainly of Upper Palaeozoic (Devonian-Carboniferous) and Mesozoic (Triassic-Middle Jurassic) rocks. The oldest strata are late Devonian aged (approximately 370 Ma) and these crop out in a series of inliers along the Clevedon-Portishead ridge. Lenticular beds of reddish fluvial sandstones, siltstones and conglomerates are exposed along the Portishead coast (the type area for the Portishead Beds and Black Nore Sandstone). Sediments at Woodhill Bay (the Woodhill Bay Fish Bed) contain important fossil fish faunas. Marine conditions spread across the area in early Carboniferous times (about 355 to 335 Ma) and resulted in the deposition of thick grey limestones which are now visible in the Clevedon-Portishead ridge, Broadfield Down (Kingswood-Lulsgate) and along the Avon Gorge. The last named is the type location for the classical 'Avonian Series' which was defined (by Vaughan in 1905) on the basis of fossil coral zones. Numerous names exist for the subdivisions of Lower Carboniferous limestones but basically the sequence consists of lower calcareous shales (the Lower Limestone Shales) overlain by more massive oolitic and bioclastic limestones (the Black Rock Limestone, the Clifton Down Group and Hotwells Limestone). Many beds yield coral, brachiopod and crinoid fossils.

Sedimentation and uplift during late Early Carboniferous times converted most of the area into land containing large rivers and extensive swamps. Here flourished the great 'Coal Measure forests' whose rotting debris accumulated as thick layers of peat, which ultimately became compressed and lithified to form coal seams. The Coal Measures are mainly of late Carboniferous age (Westphalian-lower Stephanian; approximately 310 to 295 Ma) and crop out in the Radstock district (the Somerset Coalfield), eastern Bristol and around Nailsea. The coal was formerly extensively mined but the last pit closed in 1971 and exposures today are usually confined to small scrapes on disused, landscaped tips. Writhlington is a notable exception and fossil Coal Measure plants and insects can still be collected from the shales. Thick deltaic/fluviatile sandstones above the productive Lower Coal Series are referred to the Pennant Series.

A period of earth movements and folding/erosion/non-deposition then occurred over the area and the next sediments encountered are of mid to late Triassic age (approximately 240 to 210 Ma). Marginal deposits consisting of breccias, conglomerates and coarse sandstones which accumulated against higher slopes and as outwash fans. These Dolomitic Conglomerates are well exposed along the Portishead coast where they lie unconformably over Devonian strata. Elsewhere thick deposits of red marls (the Mercia Mudstones, formerly the 'Keuper Marl') accumulated in arid, lacustrine conditions.

The youngest Triassic strata (210 to 208 Ma) are referred to the Penarth Group (or Rhaetic). These deposits (and the overlying Jurassic Lower Lias) form much of the undulating country around the south and east of Bristol (Stony Easton-Radstock-Farmborough-Keynsham) and within the Horfield area of Bristol itself. The Penarth Group consists of black shales (Westbury Formation) passing-up into buff, thinly-bedded limestones and shales (Lilstock Formation; Cotham and Langport Members, or 'White Lias') which in turn are overlain by grey alternating limestones and shales (the 'Pre-planorbis' Beds). These beds mark the transition from arid terrestrial environments to shallow marine seas. The Rhaetic contains a restricted fossil bivalve fauna, rich in numbers of individuals but low in diversity. Lower Jurassic sediments (approximately 208 to 190 Ma) are assigned to the Lower Lias (with the 'Blue Lias' at the base). The strata consist of alternating grey clays and limestones (which weather yellowish) becoming clay dominated in higher parts. these beds are fully marine and contain a rich fossil fauna including ammonites, nautiloids, bivalves, brachiopods, belemnites and marine reptiles such as ichthyosaurs. The area around Keynsham is famous for its 'Blue Lias' fossils and the division is formerly defined here.

During early Jurassic times parts of the Natural Area remained as islands and against these were deposited marginal facies of the Lower Lias. These marginal sequences are typically 'condensed' and contain many breaks when compared to the 'normal' successions. The youngest Jurassic sediments exposed in the area are approximately 190-175 Ma and crop out on Dundry Hill. Nere Middle-Upper Lias siltstones and limestones (the Dyrham Silts, Marlstone Rock and Junction Bed) are capped by pale oolitic limestones (the Inferior Oolite). These marine sediments are well known for their abundant and well-preserved ammonite and brachiopod fossils.

The youngest sediments present in the Natural Area are Quaternary in age. Extensive alluvial deposits extend from Clapton Moor to Avonmouth (and northwards); in places along the River Avon, First and Second Terrace Gravel deposits can be distinguished. Alluvial sands and gravels at Weston-in-Gordano are fluvioglacial and interglacial in origin.

The mineralogical interests of the Natural Area lie mainly in iron mineralisation (goethite, haematite, 'ochre' or various sulphides') with some copper, zinc and occasionally arsenic. The mineralisation tends to be associated with porous/permeable strata (such as the Triassic-aged Dolomitic Conglomerate) or within veins related to faults and cross-cutting neptunian dykes. Ochre deposits are particularly notable and often occur in carbonate-hosted form within cave deposits. Associated minerals include quartz-lined geodes ('potato stones'), barytes (barite) and barytocalcite.

The Natural Area has considerable interest in the history of the development of geology as a science. William Smith (the 'father of geology') based some of his founding geological principles upon strata and features exposed within the area.

Key geological features:

- Devonian stratigraphy and sedimentology of the Portishead Beds, including fossil fish faunas
- Lower Carboniferous ('Avonian') stratigraphy in the Avon Gorge
- Coal Measure fossil communities including plants, insects and arthropods, eg. Writhlington tips
- Lower Lias stratigraphy and sedimentology ('Blue Lias' and 'marginal' facies)
- Inferior Oolite sequences on Dundry Hill
- Fluvioglacial and interglacial Pleistocene/Quaternary gravels

Number of GCR sites:

Pleistocene/Quaternary of Somerset: 9 Mineralogy of the Mendips: 5 Aalenian-Bajocian: 3
Hettangian-Pliensbachian: 3 Westphalian: 3 Dinantian of S England/Wales: 2 Rhaetian: 2
Arthropoda: 1 Mesozoic Palaeobotany: 1 Non-marine Devonian: 1 Permian-Triassic Reptilia: 1
Pleistocene Vertebrata: 1 Silurian-Devonian Chordata: 1
Variscan Structures of South Wales and the Mendips: 1

Geological/geomorphological SSSI coverage: There are 26 (P)SSSIs in the Natural Area containing 34 GCR SILs. These represent 14 different GCR networks which indicates the considerable variety of geological interest to be found in this area. Many of the sites selected represent Pleistocene/Quaternary gravels and a proportion of these are 'green field sites' eg. Bourne, Stidham Farm, Newton-St-Loe, Nightingale Valley and Weston-in-Gordano. Mineralogical sites are represented by Clevedon Shore (mineralised vein) and Hartcliff Rocks Quarry with ochre mines at Banwell (2 sites) and Compton Martin. Westphalian (Coal Measure) strata are exposed at Bickley Wood and Winterbourne railway Cutting; Writhlington is actually selected for its fossil Caol Measure arthropods which can be collected along with abundant plant fossils from the excavated tips. Marginal and 'condensed' lower Jurassic sediments (Lias) are exposed at Kilmersdon Road, Huish Colliery and Bowldish quarries. Highly fossiliferous Middle Jurassic (Aalenan-Bajocian) sandy limestones crop out on Dundry Hill at Main Road South Quarry and Barns Batch Spinney. The Portishead Pier to Black Nore coastal section is selected for several GCR networks but is noted for its Non-marine Devonian strata and Silurian-Devonian Chordata (ie. Devonian fossil fish) interests.

Key geological management issues:

- Maintain, and where possible enhance existing exposures
- Increase the number of permanent geological exposures and/or recording of temporary sections
- Threats to coastal/foreshore exposures from engineering and coastal defence projects
- Overuse and misuse of sensitive fossil locations

Key geological objectives:

1. **Maintain current geological exposures and enhance where practical**

2. **Increase the number of permanent geological exposures and/or recording of temporary sections** by encouraging joint initiatives with RIGs, local geological groups

3. **Maintain existing coastal/froeshore exposures and the operation of natural coastal processes**

4. **Encourage responsible fossil collecting** and contact with Taunton and Bristol museums

Useful guides/references:

SAVAGE, R.J.D. 1977: Geological excursions in the Bristol district. University of Bristol. Bristol

MACFADYEN, W.A. 1970: Geological highlights of the West Country. Butterworth. London

GREEN, G.W. 1992: British Regional Geology: Bristol and Gloucester region. British Geological Survey, NERC

Earth science (P)SSSIs in the Natural Area:

- Holly Lane
- Clevedon Shore
- Portishead Pier to Black Nore
- Court Hill
- Avon Gorge
- Banwell Caves (including Banwell Bone cave)
- Banwell Ochre Caves
- Barns Batch Spinney
- Bickley Wood
- Bourne
- Bowldish Quarry
- Compton Martin Ochre Mine
- Dundry Main Road South Quarry
- Ham Green
- Hartcliff Rocks Quarry
- Quarry Steps, Durdham Down
- Stidham Farm
- Vallis Vale
- Writhlington
- Newton St. Loe
- Huish Colliery Quarry
- Kilmersdon Road Quarry
- Lulsgate Quarry
- Winterbourne Railway Cutting
- Nightingale Valley
- Weston-in-Gordano

Natural Area: 69. Greater Cotswolds	**Geological Significance:** Outstanding **(provisional)**

General geological character: The Greater Cotswolds Natural Area is dominated by Middle Jurassic limestones of Aalenian to Bajocian and Bathonian age (178 to 160 Ma). These limestones are historically referred to as the 'Inferior Oolite' and 'Great Oolite' and are a series of sedimentary rocks deposited in warm, shallow tropical seas. The Cotswold valleys beneath these limestones are floored by a variety of less resistant Lower Jurassic clays. Where the limestones occur next to these softer clays they appear as prominent scarps, the most famous of which is the Cotswold Scarp itself. The steep scarp slopes are often characterised by landslips where the capping limestones have moved downslope over the clays beneath. Recent Quaternary events (the last 2 million years) are represented by the deposition of large spreads of river gravels along the valley floors as a result of the migration of the river Thames and its tributary streams. The Greater Cotswolds is a historically important area for the science of geology, with numerous classic localities first described by Victorian geologists.

Key geological features:

- Cotswold scarp slope and clay vales below
- Exposures of limestones in Cotswold scarp and crest
- Cotswold stone buildings

Number of GCR sites:

Bathonian: 21 Aalenian-Bajocian: 13 Jurassic- Cretaceous Reptilia: 6 Mesozoic Palaeobotany: 3 Mesozoic Mammalia: 3 Toarcian: 3 Hettangian-Pliensbachian: 3 Pleistocene/Quaternary of Somerset: 2 Pleistocene/Quaternary of the Midlands: 2 Mesozoic-Tertiary Fish/Amphibia: 2 Palaeoentomology: 2 Mass Movement: 2 Rhaetian: 1 Fluvial Geomorphology: 1 Pleistocene/Quaternary of the Thames: 1 Dinantian of South England and Wales: 1

Geological/geomorphological SSSI coverage: There are 48 geological/geomorphological (P)SSSI in the Natural Area, covering 66 GCR SILs representing 16 different GCR networks.. The coverage is dominated by Jurassic-aged rocks, many of which (eg. Shipton-on-Cherwell) are national reference localities for named rock divisions of the middle Jurassic. Some sites are important for their fossil remains:- sites such as Stonesfield are the first places where dinosaur remains were discovered and other sites have yielded the remains of numerous vertebrates. The early Jurassic rocks include a number of internationally important sites for stratigraphy and palaeontology including Wooton Hill and Wellacre Quarry. The river gravels at Stretton-on-Fosse Pit provide a good example of the early drainage course of the Thames during the Quaternary.

Key geological management issues:

- Maintain and enhance existing exposures
- Promote the educational value of the resource
- Encourage links with Cotswold scenic appeal and landscape
- Ensure responsible fossil collecting from sensitive or vulnerable sites

Key geological objectives:

1. Maintenance and enhancement of geological resource through a) site clearance at overgrown or degrading sites, b) maintaining access to sites, and c) encouraging responsible collecting from sensitive or vulnerable fossil localities.

2. Promotion of geological resource by encouraging on-site interpretation and links between geology and scenery in the Cotswolds.

Useful guides/references:

KELLAWAY, G.A. & WELCH, F.B.A. 1980: BGS British Regional Geology: Bristol and Gloucester District London, HMSO.

Earth science (P)SSSIs in the Natural Area:

- Ardley Cutting and Quarry
- Ditchley Road Quarry
- Harbury Quarries
- Cross Hands Quarry
- Campden Tunnel Gravel Pit
- Cleeve Common
- Foss Cross Quarry
- Hampen Railway Cutting
- Harford Railway Cutting
- Brown's Folly
- Barnhill Quarry
- Corsham Railway Cutting
- Hampton Rocks Cutting
- Hawkesbury Quarry
- Hinton Charterhouse Pit
- Bull Cross, The Frith and Juniper Hill
- Coaley Wood Quarries
- Easter Park Farm Quarry
- Hook Norton Cutting and Banks
- Hornsleasow Quarry
- Horsehay Quarries
- Huntsman's Quarry
- Jackdaw Quarry
- Kirtlington Quarry
- Napton Hill Quarry
- Neithrop Fields Cutting
- New Park Quarry
- Notgrove Railway Cutting
- Reed Hill
- River Itchen
- Sharps Hill Quarry
- Shipton-on-Cherwell and Whitchill Farm Quarries
- Stonesfield Slate Mines
- Stretton-on-Fosse Pit
- Wellacre Quarry
- Stony Furlong Railway Cutting
- Nibley Knoll
- North Road Quarry Bath
- Rodborough Common
- Selsley Common
- Swift's Hill
- Veizey's Quarry, Tetbury
- Kemble Railway Cuttings
- Minchinhampton Common
- Wellow
- Wotton Hill
- Knap House Quarry, Birdlip
- Leckhampton Hill and Charlton Kings Common