Minerals Topic Paper 3:

Building Stone

Somerset County Council

Minerals and Waste Development Framework

December 2012

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Cover photographs: main image of building in Hinton St George (supplied by Geckoella Ltd); smaller images top to bottom: Building stone site (supplied by Geckoella Ltd); Kilve Court (supplied by Geckoella Ltd); building stone processing (supplied by Geckoella Ltd).

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www.somerset.gov.uk/mineralsandwaste

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1 Introduction and policy background

1.1 This paper is one of a series of topic papers supporting the Somerset Minerals Plan and provides evidence to aid its development. These topic papers provide detailed information on key topics; this paper focuses on building stone.

1.2 In its role as Minerals Planning Authority, Somerset County Council is responsible for bringing forward the Somerset Minerals and Waste Local Development Framework (Minerals and Waste LDF or MWDF for short). Consequently it is currently preparing the Somerset Minerals Plan which will cover the period 2014 – 2030, and which will replace the adopted Minerals Local Plan which was adopted in April 2004 and covers the period up to 2011[1].

1.3 The Somerset Minerals Plan will set out the vision and planning policy framework for minerals development in Somerset. Policy must be defined for long enough to provide the minerals industry with a clear picture of the future to enable decisions about investment to be made. It will give certainty to local communities about minerals development in their area in terms of where activity is now and is likely to be over the next plan period. It will also set out what limits and controls should be placed on minerals activity to ensure any negative environmental and community impacts are mitigated as far as possible and at an acceptable level.

1.4 The Minerals Plan will include planning policy on all minerals worked in the county, primarily aggregates, building stone and peat. Focusing on building stone the County Council perceives a need for building stone policy that supports local stone for local demand and that also takes account of markets supplied outside of the county. This approach is supported by previous consultations[2] [3].

1.5 The County Council's approach is in accordance with the National Planning Policy Framework[4] which states that:

- In developing their Local Plan, local planning authorities should take into account:
    - the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
    - the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring; and
    - the desirability of new development making a positive contribution to local character and distinctiveness.
- When determining planning applications, local planning authorities should:

[1] Somerset County Council. Somerset Minerals Local Plan 1997-2011. Adopted April 2004.
[2] Somerset County Council. Minerals Options Paper. December 2011. Available at: http://www.somerset.gov.uk/irj/go/km/docs/CouncilDocuments/SCC/Documents/Environment/Minerals%20and%20waste/Mineral%20consultation%20papers/Minerals%20Options%20Paper.pdf
[3] Statement of Representations. Somerset Building Stones Paper – Issues Consultation for the Minerals Core Strategy. Available at: http://www.somerset.gov.uk/irj/go/km/docs/CouncilDocuments/SCC/Documents/Environment/Minerals%20and%20waste/Mineral%20consultation%20papers/Building%20Stone%20Issues%20consultation.pdf
[4] Communities and Local Government. National Planning Policy Framework. March 2012 (paragraphs 126 and 144).

- consider how to meet any demand for small-scale extraction of building stone at, or close to, relic quarries needed for the repair of heritage assets, taking account of the need to protect designated sites; and
- recognise the small-scale nature and impact of building and roofing stone quarries, and the need for a flexible approach to the potentially long duration of planning permissions reflecting the intermittent or low rate of working at many sites.

1.6 For further information on the Minerals and Waste Development Framework, and how this paper relates to other parts, please visit

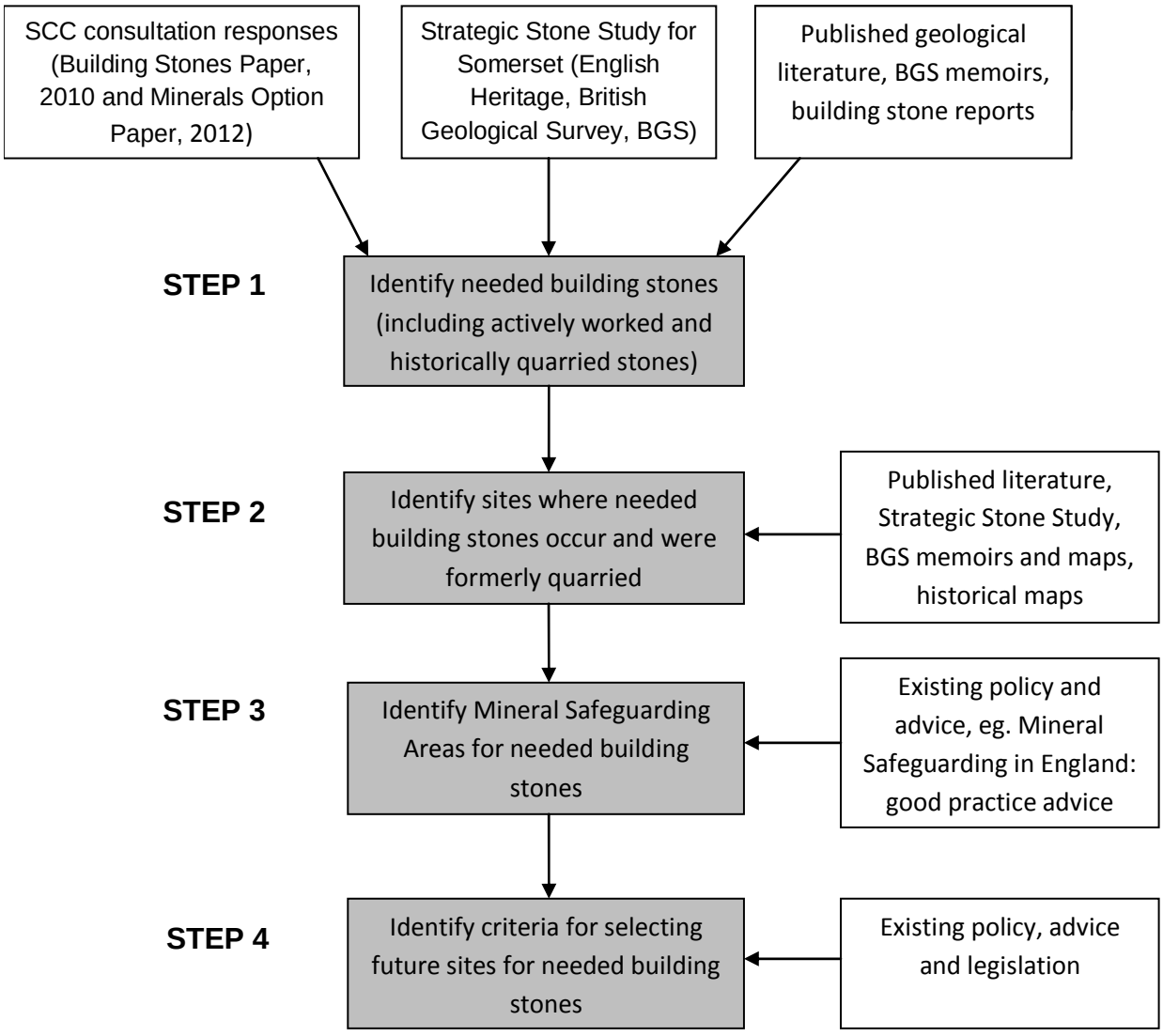
www.somerset.gov.uk/mineralsandwaste

2 Purpose of this topic paper

2.1 Building stones are a key part of the economic minerals sector and enhance the character of the built heritage of Somerset. They are required by the construction industry for new buildings, and for the conservation and restoration of existing historic buildings.

2.2 However, many building stone types previously used within the County are no longer quarried, and certain stones that are currently worked may potentially already be in risk of short supply. Data on the occurrence of needed building stones, former quarry locations and further supportive information (such as identifying safeguarding boundaries and selection criteria for future sites) is required to help develop emerging policy.

2.3 This Topic Paper sets out the rationale and process behind the selection of needed building stones within Somerset and provides supporting information on each of the data requirements noted above. The process adopted to handle this data was iterative and based on the following four steps, each preceeding step providing a cumulative evidence base employed by the successive step.



Each of these steps is described in more detail in later sections of this paper.

3 Somerset's building stones - valuing our built heritage

3.1 Somerset has an extremely diverse geology, varying in age from Silurian rocks (425 million years old) in the core of the Mendip Hills, to recent alluvial and peat deposits on the Somerset Levels which are just a few thousand years old. Virtually all of Somerset's rocks are sedimentary in origin, but this still provides a considerable variety of building stones ranging from extremely hard, highly durable siliceous flints, cherts and quartzitic sandstones, to softer limestones and fissile slates used for roofing and walling.

3.2 Quarrying for building stones has occurred in Somerset since at least Roman times, and traces of this activity can still be seen in the Mendip Hills. Today, the Mendip area still contains very large, active limestone quarries although the stone is extracted mainly for aggregate rather than building purposes. However, the current need for local stone for either conservation repair or to maintain traditional character in new buildings is still evident, although the number of quarries now available for many building stones is only a very small fraction of those formerly worked.

3.3 The oldest building stones commonly used in Somerset occur in the Quantock and Brendon Hills (and extend westwards into Exmoor). These are resilient, hard weathering red-purple Devonian sandstones and traces of many old sandstone quarries remain around the flanks of the Quantock Hills. Slates are also present in some areas, and where they occur in suitable quality, they have been quarried and used for roofing. Former large quarries at Oakhampton near Wiveliscombe provided large quantities of roofing slate and employed many people in the local area.

3.4 The Mendip Hills are formed mainly of Lower Carboniferous limestones and these provide much of the dramatic gorge and cave scenery characteristic of the area. Formerly the limestone was used as building stone and many houses in Wells, Cheddar and Wookey are constructed from it. Similar limestones occur at Cannington, and Lower Carboniferous limestones from Westleigh, near Wellington, have been used in many public and Municipal buildings including Taunton Railway Station.

3.5 Some of the most attractively coloured building stones used in Somerset are the reddish-brown Permo-Triassic sandstones which mainly occur in the Vale of Taunton Deane and along the southern and eastern fringes of the Quantock Hills. These sandstones often occur with coarser pebble conglomerates, and this variety of rock types has resulted in a considerable number of local stone names being used, such as Wiveliscombe Sandstone, Milverton Conglomerate, Nynehead Sandstone and Lydeard Stone. Many villages and small towns in west Somerset are built from these distinctive sandstones.

The magnificent West Front of Wells Cathedral, completed in 1250 and built of Doulting Stone.

Bishops Lydeard almshouses, dating from 1616, built of local Otter Sandstone.

3.6 Draycott Stone (also called Draycott Marble) is an attractive pinkish-grey Triassic conglomerate which was formerly quarried around Draycott and Cheddar. It was employed in many buildings along the southern edge of the Mendip Hills, and was also used for the characteristic round-top gate posts which are sometimes encountered in the local area. A variety of Triassic limestone occurs locally around Wedmore; this stone often weathers to a warm golden yellow colour, and Wedmore church and many buildings in the village centre are constructed from it.

3.7 The most widely used and readily available building stones in Somerset are latest Triassic and Jurassic aged limestones. The oldest are the distinctive pale cream coloured White Lias limestones which are overlain by the bluish-grey slightly younger Blue Lias limestones. The latter often occur in tabular layers and are readily cut into regular blocks for building purposes. Many villages and towns in central Somerset, especially Street, Somerton and Langport are composed largely of Blue Lias stone.

3.8 Amongst the most attractive of Somerset's building stones are the famous pale yellow coloured Ham Stone and Doulting Stone which only occur in the vicinity of Yeovil and Doulting respectively. Both are high quality building stones, and are often associated with higher status buildings within and outside of Somerset. For example, Montacute House (dating from late Elizabethan times) is built mainly of Ham Stone; and the 12th century West Front of Wells Cathedral is constructed mainly from Doulting Stone. The uniform grain size of both these stones has enabled them to be utilised for decorative purposes, and the tracery of windows and doorways of many Somerset churches is fashioned from Ham Stone.

3.9 Other Jurassic limestones used as local building stones include Hadspen Stone (an attractive buff–brown weathering limestone from the Castle Cary area), yellow Inferior Oolite limestones (used extensively around Crewkerne, and in picturesque villages such as Hinton St George and Seavington St Mary) and Forest Marble, (a grey, rubbly limestone which occurs along the south eastern edge of the County).

3.10 The youngest rocks used as building stones in Somerset are Cretaceous aged Greensands and cherts and flints which occur in the Blackdown Hills. Chert nodules were often collected from surface brash on fields by locals, and are used in many buildings in the Blackdowns and nearby villages, including Staplehay and Blagdon Hill.

More detailed accounts of Somerset's building stones can be found in the following papers:

- King, A. 2011: Building Stone Atlas of Somerset and Exmoor. Strategic Stone Study, English Heritage and British Geological Survey, 28pp [available at http://www.bgs.ac/downloads/start.cfm?id=1619]
- Prudden, H. 2002: Somerset Building Stone – a guide. SANHS Proceedings, vol. 146, pp. 27-36 [available at http://www.sanhs.org/Documents/Proc Building stone.pdf]

4 The identification of needed building stones

4.1 There are approximately 40 main types of building stones employed in Somerset, but many more varieties occur. Local names for stone types abound, although in many cases these names often refer to the same main stone type occurring at different locations along its outcrop; for example, Marlstone is also referred to as Moolham Stone or Petherton Stone respectively at those villages, and Thurlbear Stone, Curry Rivel Stone and Keinton Stone all refer to local varieties of Blue Lias limestone.

4.2 Some building stone types formerly quarried are of extremely limited geographical occurrence. Although distinctive, these stone types may have relatively minor use (for example, Cockercombe Tuff is mainly confined to occasional buildings around Plainsfield in the Quantock Hills) or have been used on a village-wide scale and contribute significantly to the local built heritage and character (for example, Draycott Stone and Wedmore Stone). Other building stone types have a much wider geographical occurrence, and crop out across large areas of Somerset; for example, Blue Lias is used extensively in buildings and walls all along its outcrop length, and Street, Somerton and Langport all provide particularly good town-scale examples of its use. Somerset Blue Lias is renowned as a quality building stone, and significant quantities of the stone are exported and employed outside of the County where supplies of similar Blue Lias are not available.

4.3 Responses received from consultations undertaken by Somerset County Council in 2010 (Building Stones Issue Paper) and 2012 (Minerals Option Paper) identified 20 types of building stones that respondents felt were in ‘short supply’ or ‘unavailable’ in Somerset. Responses were received from a broad range of consultees, including national and county organisations (such as English Stone Forum, English Heritage, Natural England, CPRE, Somerset Wildlife Trust), Local Authorities, District and Parish Councils, local quarry operators and stonemasons, geologists and building stone specialists, and members of the public.

4.4 Given the large variety of building stones used in Somerset and the positive interest demonstrated by consultation responses, a logical first step in considering future policy for building stones is to identify which stone types are needed. Although it is generally recognised that demand for natural stone has seen considerable growth across the UK over the last 20 years, especially to meet the requirements of new build (English Stone Forum, February 2012), it is extremely difficult to obtain reliable and quantifiable data at a county level about the true need for specific stone types, and the tonnage amounts of stone per annum that the market requires.

4.5 In the relative absence of quantifiable information, the approach taken to identify need for individual Somerset building stones was based on a combination of data from the following sources:

- Responses to Somerset County Council consultations
- Strategic Stone Study (for Somerset) – a national project on the use of building stones coordinated by English Heritage and the British Geological Survey (BGS)
- Published geological literature, BGS reports, memoirs
- Existing active building stone quarries in Somerset, annual outputs etc.

4.6 To assist in the assessment of identifying needed stones, a categorisation scheme for Somerset building stones was developed. This scheme took into account the general significance that individual stone types made to local built heritage and character (as indicated in Table 1 below).

Table 1. Definition of building stone categories

Category number	Definition of stone types assigned to category	Examples of stone types
7	Building stones which do not occur within Somerset, but which are still used within the county, often in prestigious buildings (as ornate facings, dressings, ashlar, sills etc.) or in public works /civic buildings	Bath Stone, Westleigh Stone
6	Building stones which have a small geographical occurrence in Somerset, but are well know and frequently used extensively within those areas (where they make a major contribution to the built heritage and character) and wider afield, both within Somerset and beyond the county. All are identified in consultation responses	Doulting Stone, Ham Stone
5	Building stones, and their varieties, which have a wide distribution within Somerset and are used extensively within many parts of the County (or beyond) and make a major contribution to the built heritage and character of Somerset. All are identified in consultation responses	Blue Lias, Inferior Oolite
4	Building stones, and their varieties, which have a wider distribution in parts of Somerset than category 3, are frequently used, are key components of, and contribute significantly to the built heritage and character in parts of Somerset. Many stones of this category are well known within the quarrying and stonemason trades, and most have been identified in consultation responses	Otter Sandstone, White Lias, Marlstone
3	Building stones which are confined to relatively small areas of Somerset and are of local use, but where they do occur they are frequently used, well known, distinctive, and contribute significantly to the local built heritage and character. Many stones of this category are well known within the quarrying and stone mason trades, and most have been identified in consultation responses	Draycott Stone, Wedmore Stone, Calcareous Grit
2	Building stones which have a very localised geographical occurrence and are used in very local circumstances, but may contribute significantly to the built heritage within those localised areas. Typically of too specialist or niche use to be identified in consultation responses	Cockercombe Tuff, Devonian limestones
2W	A subcategory of category 2 which relates to stones which typically have a flaggy nature and are utilised mainly for walling, often drystone walling, especially in Southeast Somerset	Cornbrash,
1	Building stones which have an extremely localised geographical occurrence in Somerset, and are used only within the very local area or nearby. Typically utilised in a minor, almost sporadic fashion within a building or structure, usually not constituting the main stone fabric of the construction. Generally of too specialist, or extremely niche use to be identified in consultation responses	Hestercombe Diorite

4.7 All known main types of Somerset building stone could then be assigned to a specific category (numbered 1-7), and this in combination with information from other sources (listed at the top of the previous page) were used to assess which building stones were 'needed'.

4.8 Categorisation greatly facilitated the selection of needed building stone types for stones which were historically worked in Somerset, but are not currently quarried. All stones of category 3 or higher (the majority of which were also identified in the consultation responses) were selected, ie. were needed. Bath Stone and Westleigh Limestone (both category 7) are quarried outside of Somerset and adequate resources are available; therefore these stone types were not regarded as needed.

4.9 In the cases of building stones which are currently actively quarried in Somerset, only White Lias and Blue Lias were selected on the basis of perceived market need and the emphasis placed on these rock types in consultation responses. For the purpose of the research, other well known building stones presently quarried worked in Somerset (including Ham Stone, Doulting Stone, Capton Stone and Forest Marble) are deemed to have adequate resources to meet current need, and a number of these quarries have permissions for extraction which extend well beyond the duration of the Somerset Minerals Plan (2014-2030).

4.10 A summary of the stone categories and decisions of need (or not) reached for each of the main Somerset building stone types is provided at Appendix 1.

4.11 The results of this process identified the following 17 Somerset building stone types as 'needed' and these were taken forward for further analysis in Steps 2 to 4. The 'geological distribution' of these needed stones (along with their formal stratigraphical names as used by BGS) is provided in Appendix 2.

Needed building stones which are currently worked in Somerset:

1. Blue Lias
2. White Lias

Needed building stones which were formerly quarried in Somerset:

3. Chert / Flint
4. Calcareous Grit
5. Inferior Oolite (Misterton Stone only)
6. Yeovil Stone
7. Marlstone (including Moolham Stone and Petherton Stone)
8. Wedmore Stone
9. North Curry Sandstone
10. Draycott Stone
11. Otter Sandstone (including Lydeard Stone, Nynehead Sandstone)

12. Milverton Stone (Milverton Conglomerate)
13. Wiveliscombe Sandstone
14. Lower Carboniferous Limestone (Vallis Limestone, Chinastones, Cheddar Limestone and Cheddar Oolite only)
15. Morte Slates
16. Ilfracombe Slates
17. Hangman Sandstones (including Triscombe Stone, Trentishoe Grits)

5 Sites where needed building stones were formerly worked

5.1 Following the identification of the needed building stones (Step 1), Step 2 involved the identification of the quarry sites where the 17 needed stones were formerly worked.

5.2 This process required the analysis of all available data on historical quarry locations and building stone sources in Somerset for each of the needed stones. This was cross-referenced where necessary against the relevant BGS memoirs and 1:50,000 scale maps to confirm that the identification of building stone types and locations were correct.

5.3 The following information sources were key for this task:

- The complete set of current BSG memoirs (where published) covering Somerset, and corresponding 1:50,000 geological map sheets: sheet nos. 278 (Minehead), 279 (Weston-super-Mare), 280 (Wells & Cheddar), 281 (Frome), 295 (Taunton & Quantock Hills), 296 (Glastonbury), 297 (Wincanton), 311 (Wellington), 312 (Yeovil) and 313 (Shaftesbury)
  The above information was supplemented by older versions of BGS memoirs (eg. Ussher 1906, 1908 for Wellington and Chard, and the Quantock Hills, Taunton and Bridgwater respectively) where these were available.
- Data from the Strategic Stone Study covering Somerset. The occurrence of known building stones and selected former building stone source quarries are available at http://www.bgs.ac.uk/mineralsuk/mines/stones/EH_atlases.html
- Historical maps for Somerset, 1888-1892, 1:10,560 scale
- Modern Ordnance Survey 'Explorer Series' maps, 1:25,000 scale, map nos. OL9, 114, 115, 116, 128, 129, 140, 141
- Other published literature, reports and papers on Somerset geology

Details of active building stone quarries in Somerset (as of 2004) can be found at http://www.somerset.gov.uk/irj/go/km/docs/CouncilDocuments/SCC/Documents/Environment/Minerals and waste/Minerals Local Plan/MLP Appendix3Building

5.4 For each needed building stone type, the following general data was compiled: local name, alternative names and varieties, the Geological period to which the stone belongs, its main area of occurrence and use in Somerset, its typical lithology, and features which help distinguish the building stone type from any other similar building stone lithologies.

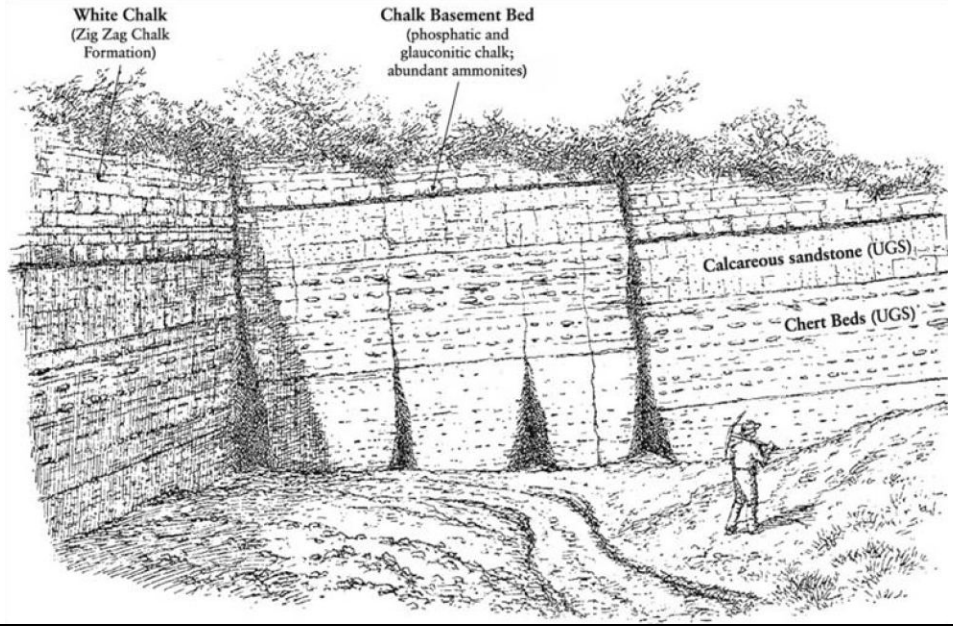
5.5 An example of this data compiled for Calcareous Grit is provided in Table 2 below.

Table 2. General occurrence and lithological data compiled for Calcareous Grit

Building Stone name	**CALCAREOUS GRIT**
Alternative names	Upper Greensand, Malm, Malm Rock, Blackdown Stone, Greensand
Named varieties	Whitestaunton Stone, Whitestaunton Limestone, Foxmould
Geological Period	Upper Cretaceous (mostly)
Occurrence in Somerset	Blackdown Hills, in a zone extending from Whitestaunton in the west to Chaffcombe and Winsham in the east. The Foxmould Member is particularly well developed within the western Blackdowns Hills area above Wellington, but extends eastwards towards Chard.
Lithology	Pale grey, hard, nodular, calcareous sandstone with poorly-sorted grains of translucent quartz and chalky calcite set in sparse, powdery calcite cement. The proportions of quartz and calcite grains vary and varieties where one greatly predominates over the other are common. Green glauconite, and black iron oxides derived from it, are widespread. The Foxmould is a glauconitic sandstone, calcareous in part, greyish-green when fresh, but becoming a characteristic orange-brown ('foxy-brown') colour on weathering.
Similar lithologies	None really, but the presence of fine-grained carbonate cement in the Greensand encourages the growth of a characteristic crimson algae, which helps to distinguish this sandstone from pale coloured sandstones of Permian or Triassic age, especially on north-facing walls. The Greensand often contains sponge spicules and the characteristic fossil serpulid worm *Rotularia concava*. In the eastern part of outcrop, the Greensand may contain scattered, coarse, very well-rounded quartz grains.
Area and examples of use	In addition to its use as the main building stone (ashlar, dressings and rubblestone) in villages close to the source quarries, such as Combe St Nicholas and Winsham, the Upper Greensand is also widely used for the quoins and dressings of medieval churches (eg. Church of St Stephen, Winsham) and also for other high status structures throughout the Blackdown Hills (eg. Wellington Monument). Its use extends north into the Vale of Taunton Deane and Taunton (eg. Castle Bow). The village of Whitestaunton, notably the church of St Andrew, is composed mainly of local Whitestaunton Stone.

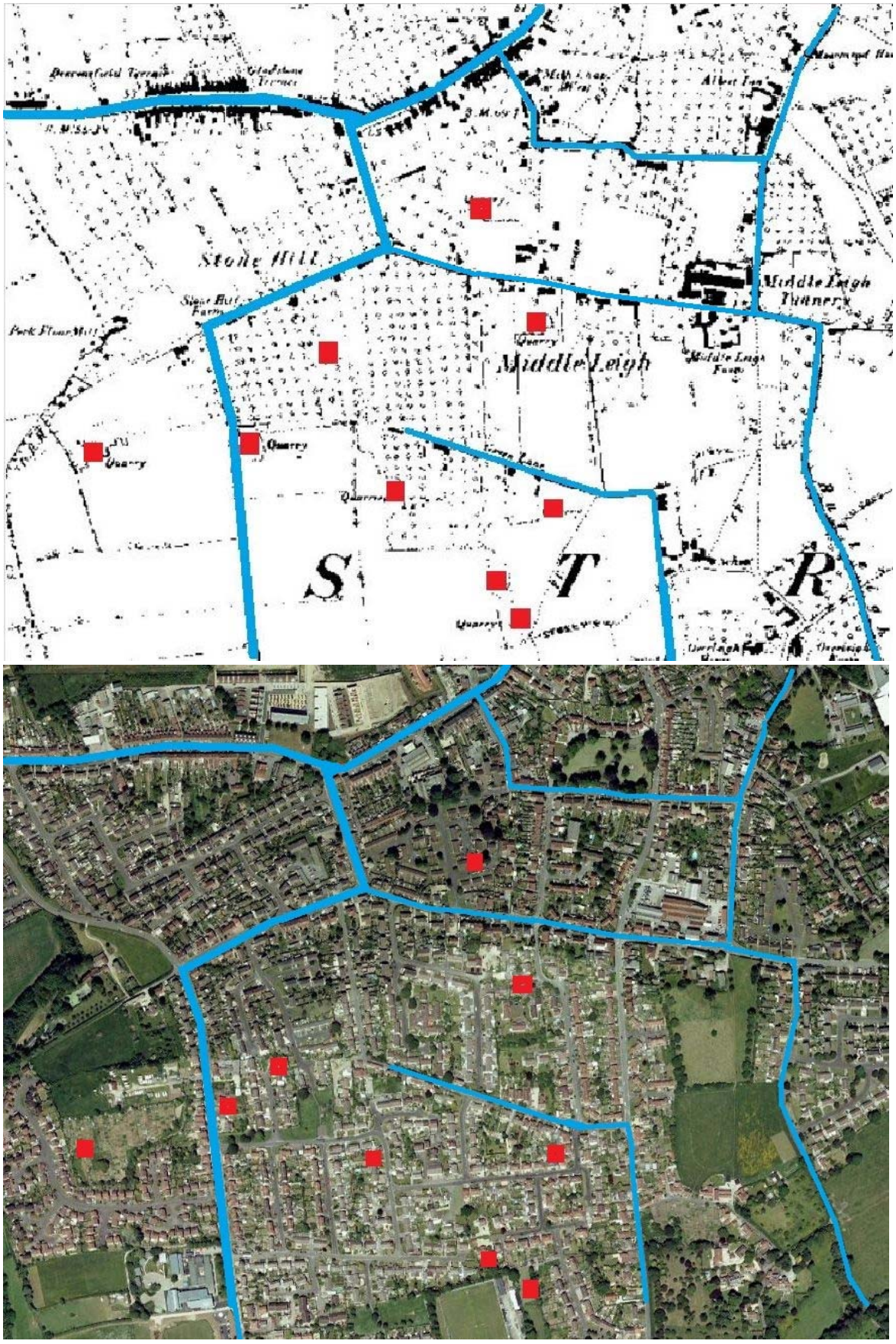
5.6 For each former quarry location identified, the following information was compiled: quarry/site name and general location, 8-figure grid reference, dates of working and operator where known, the building stone name and site-specific lithology, ancillary notes and source references. An example of the data compiled for the well-known Snowdon Hill Quarry, near Chard (along with a woodcut showing its exposure in 1892) in given in Table 3 overleaf.

Table 3. Example of the location data compiled for Snowdon Hill Quarry, Chard.

Quarry/site name	**SNOWDON HILL**
Location	Chard
Grid reference	ST 3122 0889
Operator and dates of working	Unknown. Was certainly operating in the 1890s and early 1900s (see woodcut illustration below depicting the quarry in 1892; taken from Jukes-Browne & Hill, 1903)
Main lithology	Calcareous sandstone
Local stone name	Calcareous Grit
Formal BGS name	Upper Greensand Formation
Notes and References	Old quarry. Mainly worked calcareous sandstone in Upper Greensand (under Chalk overburden) for building stone. Ussher, 1906, pp.38-39, 44. Notified as a Geological SSSI in 1985. 

5.7 Although not analysed specifically, it became clear from compiling data for Step 2, that the majority of former building stone quarries in Somerset have either become extensively overgrown or infilled. In many cases the quarries are now located in dense patches of woodland or the site has reverted to agriculture; this has resulted in former quarry locations being unrecognisable even from inspection of aerial photographs. In these instances re-tracing the location of the quarry is dependant entirely on the accuracy and interpretation of historic maps, and details recorded in geological reports or other records.

5.8 Many former quarry sites, especially in the case of Blue Lias, have become sterilised by relatively recent (post 1940s) housing and industrial developments. A particularly poignant example is provided by Street (overleaf) where the majority of 19th century quarries which formerly supplied the Blue Lias stone (for which Street is renowned) have been completely built over and sterilised.



Street in 1888 (upper map) and 2010 (lower map). The location of former Blue Lias stone quarries is marked by red squares, main roads marked in blue (2010 basemap ©GeoEye)

6 Mineral safeguarding areas for needed building stones

6.1 The National Planning Policy Framework (NPPF)[5] emphasises the need to safeguard minerals, a finite resource, for the use of future generations, including protecting them from unnecessary sterilisation by other development.

6.2 NPPF also requires the Mineral Planning Authority (MPA) to identify Mineral Safeguarding Areas (MSAs) and define Mineral Consultations Areas (MCAs), for all minerals that are of sufficient economic or conservation value to warrant protection for future generations. Building stones in Somerset clearly fall into this category as they are needed for repairing historic structures and for maintaining local distinctiveness in new buildings.

6.3 The current Minerals Local Plan identifies MSAs (and MCAs) with a 100 metre buffer strip around building stone quarries. MSAs do not indicate quarry extension areas, they are identified to minimise conflict between mineral extraction and competing land-uses. There is no presumption that minerals within a MSA will be worked, or that development that would sterilise minerals cannot be approved in MSAs through the planning process. Defining a MSA simply means that the presence of possible mineral resources is highlighted for consideration alongside the broad range of issues that must be taken into account when determining a planning application.

6.4 Recent guidance[6] on safeguarding mineral resources makes the following recommendations and points which are highly relevant to building stones:

- The definition of MSA boundaries requires up-to-date factual information on the physical location of mineral resources and should be based principally on the best available mineral resource information at the time MSAs are defined;
- A good starting point for identifying MSAs are the BGS mineral resource maps, although these do not consistently show 'building stone resources'. The Strategic Stone Study has been commissioned by English Heritage to help support this process, and identifies stone resources for building and conservation purposes, and provides evidence of their importance. This will provide MPAs with information to help them identify sources of importance to the built heritage, whether disused or active, which they consider should be safeguarded;

- The compilation of mineral resource maps is best undertaken using a GIS which provides the user with flexibility to create maps at an appropriate scale and can show resources on a topographic base;

[5] National Planning and Policy Framework, Section 13. Facilitating the sustainable use of Minerals, pp. 32- 36 (March, 2012)

[6] Mineral safeguarding in England: good practice advice. British Geological Survey, Minerals and Waste Programme Open Report OR/11/046, 53pp (2011)

- MSAs should usually cover the whole resource and not be curtailed by other planning considerations, especially where mineral resources are of limited extent or occurrence. Any modifications made by the MPA to the extent of any resources should be fully justified and a record kept for future reference or challenges;
- In certain circumstances, MSAs covering resources that are not considered of any great national or regional importance and that occur extensively over the MPA area, could be reduced in size. Any reduction in extent of a MSA must be based on consistent and justifiable criteria, in particular geological, and if necessary, economic consideration in a transparent and credible way;
- Mineral safeguarding is not precluded by the presence of national and international environmental designations on the basis that sterilising development does take place in these areas. Defining MSAs alongside environmental and cultural designations will ensure that the impact of any proposed development on mineral resources will be taken into account and weighed against other land use/conservation interests at the time planning decisions are made;
- In exceptional circumstances, the definition of MSAs to include urban areas may not be justified. This is particularly the case where the method of working is unlikely to be acceptable in close proximity to an urban environment, such as blasting of hard rock resources.

6.5 In the case of Somerset and the 17 needed building stones, the identification of MSA boundaries (Step 3) is based substantially on BGS 1:50,000 digital geological map data (which depict the relevant lithostratigraphical boundaries). This information was overlain onto an OS topographic basemap for Somerset (1:50,000 scale), and is backed up with the previous analysis and data compiled from various sources including the Strategic Stone Study (Steps 1 and 2).

6.6 The resultant MSA maps (Maps 1-9) are provided in Appendix 4, and with the following exceptions, cover the whole building stone resource for each building stone type in Somerset:

Map 2: The White Lias and Blue Lias occur extensively in the MPA area and it is deemed impractical to regard the whole outcrop of these building stone types to constitute the MSA. There is also discrepancy in the BGS digital dataset between adjoining geological sheets in relation to where White Lias has been mapped separately from Blue Lias, and where the two stone types have been considered together in combination with overlying geological units.

Therefore, to overcome these factors, nine areas have been selected (three for White Lias, six for Blue Lias) which comprise the key geographical areas known to have been historically important for the quarrying of these building stones and which includes the recognised named stone variants Camel Hill Stone (White Lias), Thurlbear Stone, Curry Rivel Stone and Keinton Stone (all Blue Lias).

For each of these nine areas, the MSA boundary is defined by the extent of a circle of 2km radius (diameter 4km) and includes all the outcrop of White Lias and Blue Lias stone which lie within that circle. The centrad point of each of the nine MSA circles is defined in Table 4. The 2km radius size of these MSAs was chosen to contain the main known historic quarries for the needed building stones, and to ensure that adequate future resources of named stone variants were included within the MSA.

Table 4. Centrad points of the nine White Lias and Blue Lias MSA

LITHOLOGY	CENTRAD POINT OF MSA (with 2km radius)	
	Grid reference	**Ground location**
Blue Lias	ST 4803 3545	Tannery Ground Football Club, Street
Blue Lias	ST 5295 2907	Charlton House, Charlton Mackrell
Blue Lias	ST 4906 2854	Market Cross, Somerton
Blue Lias (Thurlbear Stone)	ST 2655 2128	Thurlbear CE VA Primary School, Thurlbear
Blue Lias (Curry Rivel Stone)	ST 3917 2539	Church of St Andrew, Curry Rivel
Blue Lias (Keinton Stone)	ST 5490 3079	Methodist Church, Keinton Mandeville
White Lias	ST 4278 2683	Huish Episcopi (Langport) School, Huish Episcopi, Langport
White Lias	ST 4252 3107	Church of St Andrew, High Ham
White Lias (Camel Hill Stone)	ST 5885 2552	Camel Hill, Queen Camel

Map 4: Inferior Oolite limestones (in a broad sense) have a wide distribution within the MPA and encompass a number of distinct building stone types including Doulting Stone, Cary/Hadspen Stone and Misterton Stone (named here on account of its extensive use in that village and the presence of a nearby former source quarry).

Only Misterton Stone has been identified as a needed building stone amongst the suite of other Inferior Oolite limestones that occur in Somerset, namely: Doulting Stone, Cary/Hadspen Stone, and a pale form of Inferior Oolite limestone that occurs at Shepton Mallet. These other limestones are all actively quarried with long extant permissions and extensive reserves.

Misterton Stone occurs in an irregular broken outcrop pattern, extending eastwards from near Seavington St Mary via Crewkerne and Misterton to near Milborne Wick, Charlton Horethorne and Blackford. (North of the A303 the Inferior Oolite facies changes to Cary/Hadspen Stone type). The MSA boundary defined here in Map 4 only relates to the Misterton Stone facies of the Inferior Oolite.

Map 8: Lower Carboniferous limestones (in a broad sense) also have a wide distribution within the MPA and encompass a number of distinct building stone types including Hotwells Limestone, Clifton Down Limestone, Burrington Oolite and Black Rock Limestone. Extensive reserves of all these limestones remain and it is assumed that the large currently active Carboniferous Limestone quarries in the Mendip Hills would (with appropriate extraction arrangements) be able to readily supply sufficient quantities of these stones. Therefore they are not included within the MSA boundary.

This approach would leave a number of 'niche' Carboniferous Limestones used as building stones unavailable or still potentially in short supply, namely Vallis Limestone, Chinastones, Cheddar Limestone, Cheddar Oolite and Cannington Park Limestone. These have limited outcrops in Somerset and are mainly no longer worked. The MSA boundary defined here in Map 8 incorporates the outcrop of all these ‘niche’ Carboniferous Limestone types.

7 Criteria for selecting sites for needed building stones

7.1 Following the identification of MSA boundaries for the needed building stones (Step 3), Step 4 involved identifying criteria that could be used when selecting future preferred areas or suitable locations for the needed building stones.

7.2 A summary of these criteria is provided in Table 5. For SCC purposes these criteria may be classified into two groups: Strategic Criteria (SC) (which link with strategic policy on building stone in the Somerset Minerals Plan – see Preferred Policy SMP10 in the Preferred Options Paper) and Development Management Criteria (DC). These are identified by the positions of black shaded areas in Table 5.

7.3 It should be carefully noted that the criteria listed in Table 5 primarily relate to the geological and physical location/environment of the proposed quarry site and its potential afteruse. They do not cover any specific set-up operational or ongoing site management procedures whilst the quarry is working (such as the management of noise, dust levels, traffic movement, land stability or removal of overburden). These factors, and any other related operation or site management procedures, should be covered within any application for planning permission in the usual way.

Table 5. Checklist of Criteria for selecting preferred locations

MAIN CRITERIA	SC	DC	SPECIFIC CRITERIA & CONSIDERATIONS	JUSTIFICATION
Location			The proposal site should be located within a Mineral Safeguarding Area identified for needed stones (MSA maps 1-9).	Following recommended guidance provided in 'Mineral safeguarding in England: good practice advice (2011)'
			Where stone resources, viability and availability permit, the re-opening of a former quarry site (or opening of a site adjoining a former quarry), will be favoured over the opening and working of a new 'fresh' site.	NPPF (para 144) states that when determining planning applications, LPA should consider how to meet demand for small-scale extraction of building stone at, or close to, relic quarries needed for the repair of heritage assets, taking account of the need to protect designated sites
Buildings and settlements			Proposal sites situated further away from settlements will be favoured over sites located closer to habited areas.	Minerals can only be worked where they occur. To avoid inappropriate competition with other land use priorities and reduce the risk of unacceptable impacts on local amenity, it is logical to favour accessible locations away from settlements.
			Any possible direct or indirect impacts that the location, development and working of the proposal site may have on nearby buildings, houses, villages, settlements or towns should be carefully considered and assessed.	NPPF (para 143) states that in preparing local plans, local planning authorities should set out environmental criteria, in line with the policies in this Framework, against which planning applications will be assessed so as to ensure that permitted operations do not have unacceptable adverse impacts on the natural and historic environment or human health, including from noise, dust, visual intrusion, traffic, tip- and quarry-slope stability, differential settlement of quarry backfill, mining subsidence, increased flood risk, impacts on the flow and quantity of surface and groundwater and migration of contamination from the site; and take into account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality.
Access			Main access routes to/from the proposal site must be adequate and fit-for-purpose, or readily modifiable at the proposers cost to meet that purpose.	As in accordance with the NPPF (para 32) which states that all developments that generate significant amounts of movement should be supported by a Transport Statement or Transport Assessment. Plans and decisions should take account of whether: • the opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport

				infrastructure; • safe and suitable access to the site can be achieved for all people; and • improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe.
			Where alternative access routes to/from the proposal site exist, a clear assessment should be undertaken to demonstrate the reasoning behind a favoured route, especially taking into account increased use of quarry traffic along the route and any resultant impacts on nearby buildings, houses, villages, settlements or towns.	As in accordance with the NPPF (paragraph 32) which states that all developments that generate significant amounts of movement should be supported by a Transport Statement or Transport Assessment. Plans and decisions should take account of whether: • the opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure; • safe and suitable access to the site can be achieved for all people; and • improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe
Landscape			The location, development and working of the proposal site should not have temporary or permanent large-scale visual or other impacts on the landscape.	NPPF (para 143) states that in preparing local plans, local planning authorities should set out environmental criteria, in line with the policies in this Framework, against which planning applications will be assessed so as to ensure that permitted operations do not have unacceptable adverse impacts on the natural and historic environment or …. visual intrusion…and take into account the cumulative effects of multiple impacts from individual sites and/or a number of sites in a locality.

Permitted extraction levels			The proposal site will be small-scale during its operational life, ie. permitted extraction will not normally exceed an average of 2000 tonnes per annum.* (* http://www.englishstone.org.uk/documents/small.html)	Although MPS1 refers to small and large scale building stone quarries, it does not provide definitions of these, leaving that to the discretion of the MPA. The English Stone Forum has provided guidance that small stone quarries can be defined as producing 2000m^3 or less per annum.*
Geology and need for the building stone			Evidence of the geology and presence of the specified building stone type at the proposal site (including demonstration of proven adequate reserves) should be provided. A suitable method for this would be by a brief geological report, including results of any recent trial pits/exposures along with relevant stratigraphic logs and supporting photographs. The availability of selected rock samples for inspection would also be beneficial.	Adherence to principles of ensuring that the best geological and mineral resource information is provided to assist the planning process ('Mineral safeguarding in England: good practice advice (2011))'
			Supporting information demonstrating the extent of the historical use of the stone (in buildings, settlements, Conservation Areas etc) and data supporting the current and projected market need for the stone for heritage conservation and /or new build purposes, should be provided.	This information allows planning officers to make a more informed decision on the need for the development and associated stone in accordance with para 144, bullet point 8 of the NPPF.
			Supporting information indicating whether the same building stone remains available at other locations, and the rationale behind selecting the proposal site in favour of other locations, should be provided.	The consideration of alternative options is a basic principle in planning, not least to ensure that the use of secondary and recycled materials is considered before the extraction of primary materials (para 143, bullet point 2 of the NPPF).
Archaeology			The location, development and working of the proposal site should not have any negative impacts, directly or indirectly, upon any land, buildings or features designated for their archaeological importance, for example, Scheduled Ancient Monuments (SAM) or sites listed under Somerset Historic Environment Records. An archaeological survey may be required.	To ensure compliance with the Ancient Monuments and Archaeological Areas Act, 1979 (as amended).
Hydrology			The location, development and working of the proposal site should not have any negative impacts, directly or indirectly on the local hydrology, including water tables. A hydrological survey may be required.	To ensure compliance with the Water Environment Regulations, especially in relation to preventing and controlling groundwater pollution and preventing inputs of hazardous substances (including from stockpiled materials) into groundwater or watercourses (Environment Agency Groundwater protection: Policy and guidance (GP3) 2008)

Ecology and biodiversity			The proposal site should not be located within, or have any negative impacts either directly or indirectly, upon any land or features which are designated or protected for their international wildlife importance, for example Ramsar sites, Special Protection Areas (SPA) or Special Areas of Conservation (SAC).	To ensure compliance with international and national wildlife legislation, including the EU Habitats Directive, the Wildlife & Countryside Act (1981, as amended) and the Countryside and Rights of Way (CRoW) Act (2000, as amended)
			The proposal site should not be located within, or have any negative impacts either directly or indirectly, upon any land or features which are designated for their national importance, such as National Nature Reserves, Sites of Special Scientific Interest (SSSI) or Areas of Outstanding National Beauty.	To ensure compliance with international and national wildlife legislation, including the EU Habitats Directive, the Wildlife & Countryside Act (1981, as amended) and the Countryside and Rights of Way (CRoW) Act (2000, as amended)
			Unless there are exceptional circumstances, or over-riding demonstration of need for a particular building stone at a specific location, the proposal site should not normally be located within, or have any negative impacts either directly or indirectly, upon sites designated for their local wildlife importance, for example Local Wildlife Sites (LWS). However, it is understood that workings can exist within or adjacent to these designations as long as adequate measures are put in place.	Local wildlife sites comprise an important part of the ecological network and therefore need to be considered carefully (para 117 NPPF refers). Building stones sites and local wildlife sites can coexist if appropriate measures are implemented.
			Consideration may be given to proposals on a case-by-case basis at sites which are designated or protected on account of their geology, such as geological SSSI or Local Geological Sites, especially where re-exposure of the geology may benefit the interest for which the site is designated.	This is in accordance with the NPPF (particularly para's 109, 117, 143) which seek to conserve and enhance geodiversity.
			A Phase 1 ecological survey should be undertaken on the proposal site (including any areas affected by the proposal) to establish the level of any impacts upon wildlife. This survey should identify the likely presence of any protected species or habitats that may support such species and recommend where further survey (Phase 2 ecological Surveys) will be required.	To ensure compliance with wildlife legislation and provide suitable mitigation for any protected species (if present) which would be affected by the proposed development. To ensure compliance with Natural England Standing Advice on Protected Species.
Afteruse			Wherever practical, any afteruse scheme at the proposal site should include features that benefit geological and wildlife conservation, for example by retaining quarry faces for their geological/educational value.	NPPF states that LPA should ensure that '... high quality restoration and sftercare of mineral sites takes place, including for agriculture (safeguarding the long term potential of best and most versatile agricultural land and conserving soil resources), geodiversity, biodiversity, native woodland, the historic environment and recreation.'

APPENDIX 1: SUMMARY OF CATEGORIES AND NEED FOR THE MAIN SOMERSET BUILDING STONES

SUMMARY OF CATEGORIES AND NEED FOR THE MAIN SOMERSET BUILDING STONES

Building stone name	Stone identified in consultation responses	Stone category (1-7)	Stone identified as 'Needed' (YES/NO), and explanatory comments
STONES CURRENTLY QUARRIED IN SOMERSET			
Cornbrash	Yes	**2W**	NO. Although Stone was flagged-up in one consultation response, the stone has a relatively minor distribution in Somerset, confined to the southern edge of the county. Where it has been utilised, Cornbrash has mainly been employed for drystone walling purposes (often as a by-product of quarrying the underlying Forest Marble - which also possesses a flaggy nature suitable for walling purposes). Larger resources of the Cornbrash occur in adjoining counties.
Forest Marble	No	**4**	NO. Current working at Farm Quarry, Henstridge appears to meet needs (compensating in terms of output at 2500 tpa for combined output of Landshire Lane and Copse quarries). Additional output for Forest Marble not identified in any consultation responses.
Inferior Oolite	No (but refer also to Inferior Oolite entries below and over page)	**5 (overall)**	NO, for main pale-coloured Inferior Oolite limestone type, as current output from West Cranmore Quarry seems sufficient to meet need, and this type of Inferior Oolite limestone was not specifically identified in consultation responses as requiring additional output.
Inferior Oolite - Cary Stone/Hadspen Stone	No	**4**	NO. Present working at Castle Cary (Hadspen) Quarry appears to meet current needs. Additional output for Cary Stone/Hadspen Stone not identified specifically in any consultation responses.
Inferior Oolite - Doulting Stone	Yes	**6**	NO. Current quarries at Doulting appear to meet present needs.
Ham Stone	Yes	**6**	NO. Current quarries at Ham Hill appear to meet present needs.
Blue Lias	Yes	**5**	YES. A key building stone within Somerset, and Somerset Blue Lias stone is a known product and used outside the County. Blue Lias has been flagged-up by a number of consultees (to both the Building Stones Issues and Minerals Options papers) as being in short supply, especially with a perceived growing market for the product despite overall permitted output of Blue Lias increasing from 10,200 tpa in 2010 to 11,400 tpa in the near future (as Westfield Farm Quarry becomes operational).
White Lias	Yes	**4**	YES. Has been extensively flagged-up by a number of consultees including quarry operators, as being in short supply and availability is limited. Although supply from Bowden's Lane Quarry has been steady (1200 tpa), the small amount of White Lias formerly worked at Downslade Quarry, Somerton (to June 2010) has now ceased and the site is restored. However, permission to work a new White Lias quarry at Camel Hill, near Sparkford (4000 tpa), has just been granted by SCC .

Capton Stone	Yes	**4**	NO. The current quarry at Capton appears to meet existing requirements for this particular type of 'Permo-Triassic red sandstone' (but this stone differs lithologically from other Permo-Triassic red sandstones such as Otter Sandstone. However, there is a definite need to maintain existing supplies of Capton Stone in addition to sourcing supplies of other (different) red Triassic sandstones in Somerset.

STONES NOT CURRENTLY QUARRIED IN SOMERSET			
Chert, Flint	Yes	**4**	YES. Original surface brash was a key source for chert/flint used in buildings (in addition to specific quarries), this stone makes a major contribution to the built heritage in the Blackdown Hills and was widely used within this area, and in villages south of Taunton, including Corfe, Blagdon, Trull etc.
Calcareous Grit	Yes	**3**	YES. This stone has a wide usage within the Blackdown Hills and beyond. The importance and potential need for the stone was identified in a number of consultation responses (Building Stones Issues Paper).
Shaftesbury Sandstone	Yes	**2**	NO. Although this stone was identified by one consultee, it has a very limited distribution confined to the far Southeast corner of Somerset, and is used in only a few buildings in the Penselwood area. There is no indication that the stone will be required in any amounts in the near future, and larger resources of the same lithology are available in adjoining counties.
Cucklington Oolite	No	**2W**	NO. The stone has a very limited distribution in Somerset and has been used mainly for rough/drystone walling purposes. Not identified as needed within the consultation responses.
Fuller's Earth Rock	No	**2W**	NO. The stone has a very limited distribution in Somerset and has been used mainly for rough/drystone walling purposes. Not identified as needed within the consultation responses.
Bath Stone	Yes	**7**	NO. The stone occurs outside of Somerset and a new resource has recently become available (former dormant site - Park Lane Quarry, near Corsham, Wiltshire).
Inferior Oolite - Misterton Stone	Yes	**4**	YES. The pale yellow-coloured Inferior Oolite limestone (Misterton Stone) used in villages such as Hinton St George and the Seavingtons in South Somerset, is not currently worked.
Yeovil Stone	Yes	**3**	YES. Suitable building stone mainly confined to Yeovil area of Somerset (outside the county the Upper Lias facies changes and becomes highly condensed). The stone has been used in a number of prestigious buildings and structures in and around Yeovil.
Marlstone	Yes	**4**	YES. Stone contributes significantly to the built heritage of a number of villages in South Somerset, and was identified in consultation reponses to both the Building Stones Issues and the Minerals Option papers. One consultee noted that Ham Stone was widely used for repair, extensions and new-build in many villages in South Somerset, such as Barrington, South Petherton and Dawlish Wake, as an alternative stone to Marlstone which had been used historically but which was no longer available. Ham Stone was noted to lack the intensity of colour of the local Marlstone and was changing the character of these villages.

Downside Stone	No	**2**	NO. Stone not identified in consultation responses, and although used in some prestigious locations and structures (eg. walls around Wells Cathedral grounds), it is often used in combination with other stones such 'normal facies' Blue Lias and Lower Carboniferous Limestone).
Harptree beds	No	**1**	NO. Stone has an extremely limited distribution and minor usage within Somerset, and does not contribute extensively to the built heritage. Where it is used, the stone is often found in combination with other stones, such as 'normal facies' Blue Lias or Carboniferous Limestone.
Wedmore Stone	Yes	**3**	YES. Stone offers an important contribution to the local built heritage where utilised (notably within the Wedmore/south Mendip Hills area) and was identified in a number of consultation responses to both the Building Stones Issues and Minerals Options papers.
North Curry Sandstone	Yes	**3**	YES. Stone offers an important contribution to the local built heritage where utilised (notably in the Taunton and Vale of Taunton Deane areas) and was identified in a number of consultation responses to the Building Stones Issues Paper.
Draycott Stone	Yes	**3**	YES. Stone offers an important contribution to the local built heritage where utilised (notably within the Draycott-Cheddar/south Mendip Hills area) and was identified in a number of consultation responses to both the Building Stones Issues and Minerals Options papers..
Otter Sandstone	Yes	**4**	YES. Stone offers a major contribution to the local built heritage where utilised (notably in the Vale of Taunton Deane areas) and was identified in a number of consultation responses to both the Building Stones Issues and Minerals Options papers..
Milverton Stone	Yes	**3**	YES. The stone offers an important contribution to the local built heritage where utilised (especially in the Milverton and nearby villages area) and was identified in a number of consultation responses to both the Building Stones Issues and Minerals Options papers..
Luccombe Breccia	No	**2**	NO. The stone has an extremely limited distribution and minor usage within Somerset, and does not contribute extensively to the built heritage. Not identified in any consultation responses.
Vexford Breccia	No	**2**	NO. Has an extremely limited distribution and relatively minor usage within Somerset, and does not contribute extensively to the built heritage. Not identified in any consultation responses.
Wiveliscombe Sandstone	No	**3**	YES. Although not flagged-up within the consultation responses, this stone offers an important contribution to the local built heritage where utilised. It is also the only Permian sandstone resource in Somerset used for building purposes and differs lithologically from Triassic red sandstones.
Hestercombe Diorite	No	**1**	NO. The stone has an extremely limited distribution and minor usage within Somerset, and does not contribute extensively to the built heritage. Not identified in any consultation responses.
Pennant Sandstone	No	**1**	NO. The stone has an extremely limited distribution and relatively minor usage within Somerset. Extensive resources of the same lithology are available in BaNES and Bristol UAs. Not identified in any consultation responses.

Lower Carboniferous Limestone	Yes	**5**	YES. An important stone in the built heritage of Somerset, and was identified in a number of consultation responses. Although extensively quarried as an aggregate mineral, Lower Carboniferous Limestone is not seemingly available for building purposes. Assuming that many of the varieties of Carboniferous limestone can be obtained from existing active very large aggregate quarries (using suitable extraction techniques that avoid micro-fracturing the rock during blasting), only 5 varieties of this limestone used historically for building purposes (and no longer quarried) need to be considered in Steps 2-4. These are: Vallis Limestone, Chinastones, Cheddar Limestone, Cheddar Oolite and Cannington Park Limestone.
Westleigh Limestone	No	**7**	NO. Although the stone is used in a number of (mainly civic) buildings in Somerset, the main outcrop lies outside of Somerset (just within the Devon border) where adequate resources remain. Not identified in any consultation responses.
Doddiscombe Beds	No	**1**	NO. The stone has an extremely limited distribution and minor usage within Somerset, and does not contribute extensively to the built heritage. Not identified in any consultation responses.
Portishead Beds	No	**2W**	NO. The stone has an extremely limited distribution and minor usage within Somerset, being mainly confined to dry stone walls in the Mendip Hills area where adequate surface brash resources remain which are 'fit for current purpose'. Not identified in any consultation responses.
Pickwell Down Sandstone	No	**2**	NO. The stone mainly occurs (and is used extensively) within Exmoor National Park where extensive reserves remain.
Morte Slates	No	**4**	YES. Although not identified in the consultation responses, this stone is one of three key Devonian building stones used within the Quantock Hills and surrounding area, and makes a major contribution to the local built heritage. Formerly much quarried from the area, although there are no current active workings. Some facies are also important for the provision of high quality local roof slates.
Ilfracombe Slates	No	**4**	YES. Although not identified in the consultation responses, this stone is one of three key Devonian building stones used within the Quantock Hills and surrounding area, and makes a major contribution to the local built heritage. Formerly much quarried from the area, although there are no current active workings.
Devonian limestones	No	**2**	NO. Devonian limestones were not identified in any consultation responses. They have a limited distribution in Somerset (confined to narrow outcrops in the Quantock and Brendon Hills) and have contributed on a small scale to the local built heritage, but were also worked for lime.
Cockercombe Tuff	No	**2**	NO. Stone not identified in the consultation responses. The stone has an extremely limited distribution and area of use (eg. Plainsfield in the Quantock Hills). The stone is unique to Somerset, and is only known to have been quarried from 1 or 2 locations in the Quantock Hills.

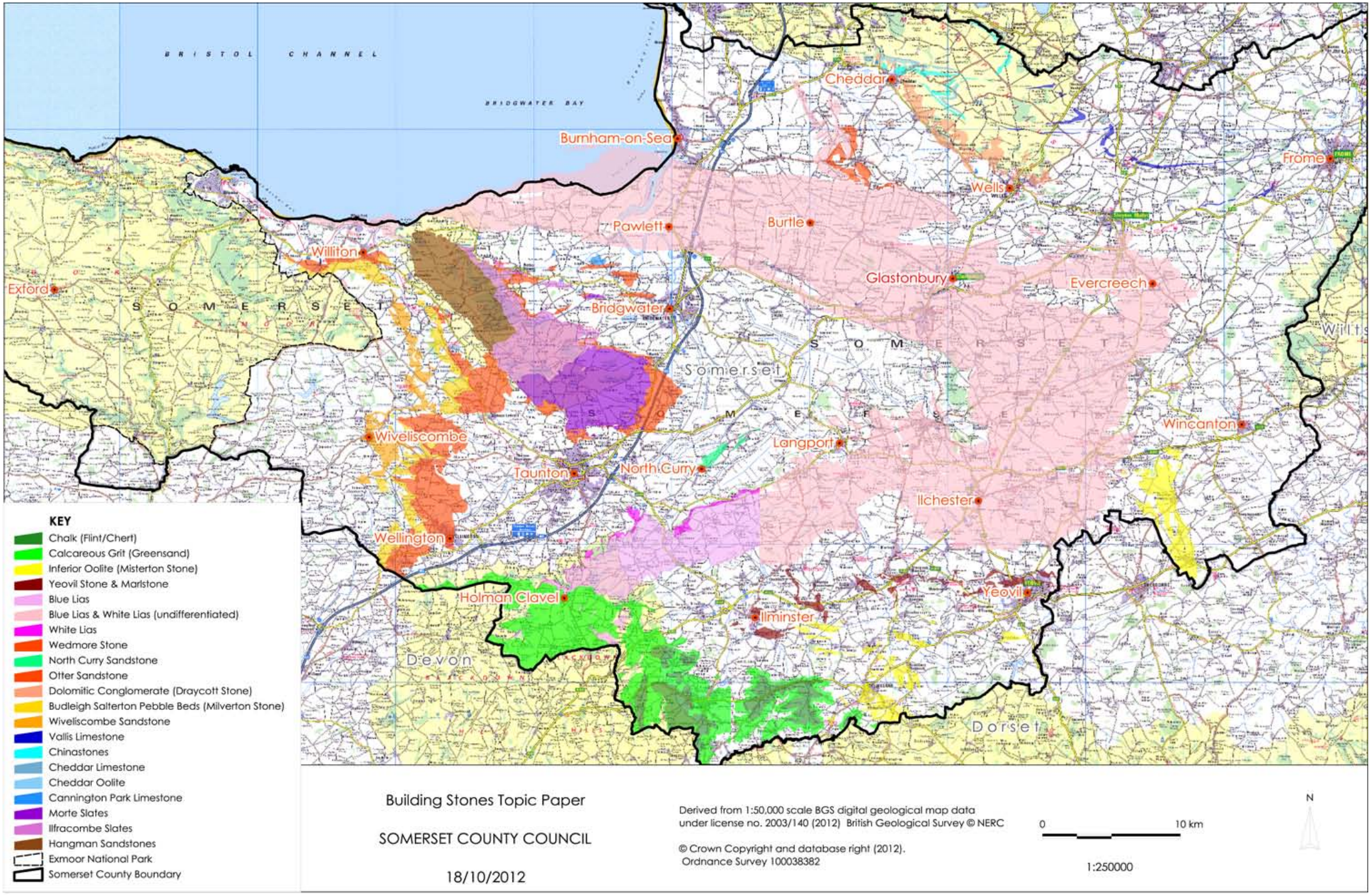
Hangman Grits	Yes	**4**	YES. Identified in the consultation responses, this stone is one of three key Devonian building stones used within the Quantock Hills and surrounding area, and makes a major contribution to the built heritage in west Somerset. Formerly much quarried from the area, although there are no current active workings.

APPENDIX 2: SUMMARY GEOLOGICAL TABLE OF NEEDED BUILDING STONES

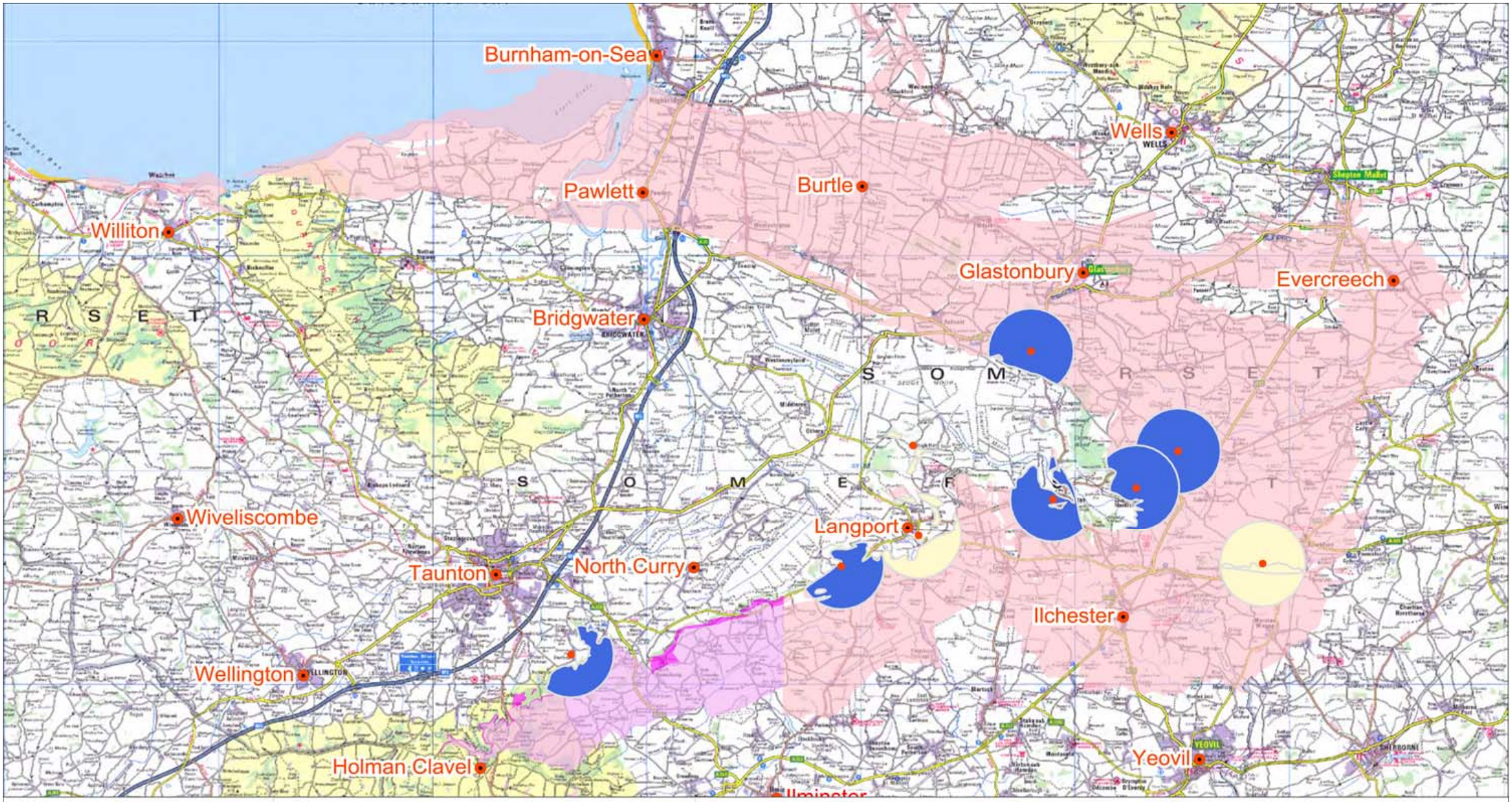
SUMMARY GEOLOGICAL TABLE OF NEEDED BUILDING STONES

GEOLOGICAL PERIOD	FORMAL GEOLOGICAL (BGS) NAME	LOCAL STONE NAMES
Cretaceous	Chalk Group & Upper Greensand Formation	Chert, Flint
		Calcareous Grit (Whitestaunton Stone)
Jurassic	Inferior Oolite Group	Misterton Stone
	Beacon Limestone Formation	Yeovil Stone (Barrington Stone)
		Marlstone (Moolham Stone, Petherton Stone)
	Blue Lias Formation	Blue Lias (Thurlbear Stone, Curry Rivel Stone, Keinton Stone, Langport Stone)
Triassic	Lilstock Formation	White Lias
	Westbury Formation	Wedmore Stone
	Mercia Mudstone Group	Draycott Stone, (Draycott Marble, Dolomitic Conglomerate)
		North Curry Sandstone (Curry Stone)
	Otter Sandstone Formation	Otter Sandstone (Lydeard Stone, Nynehead Sandstone)
	Budleigh Salterton Pebble Beds Formation	Budleigh Salterton Pebble Beds (Milverton Stone)
Permian	Aylesbeare Group	Wiveliscombe Sandstone
Carboniferous	Pembroke Limestone Group (Lower Carboniferous Limestone)	Vallis Limestone, Chinastones, Cheddar Limestone, Cheddar Oolite, Cannington Park Limestone
Devonian	Morte Slates Formation	Morte Slates (Oakhampton Slates)
	Ilfracombe Slates Formation	Ilfracombe Slates (Avill Slates-and-Sandstones, Leighland Slates)
	Hangman Sandstone Formation	Hangman Sandstones (Triscombe Stone, Little Hangman Sandstones)

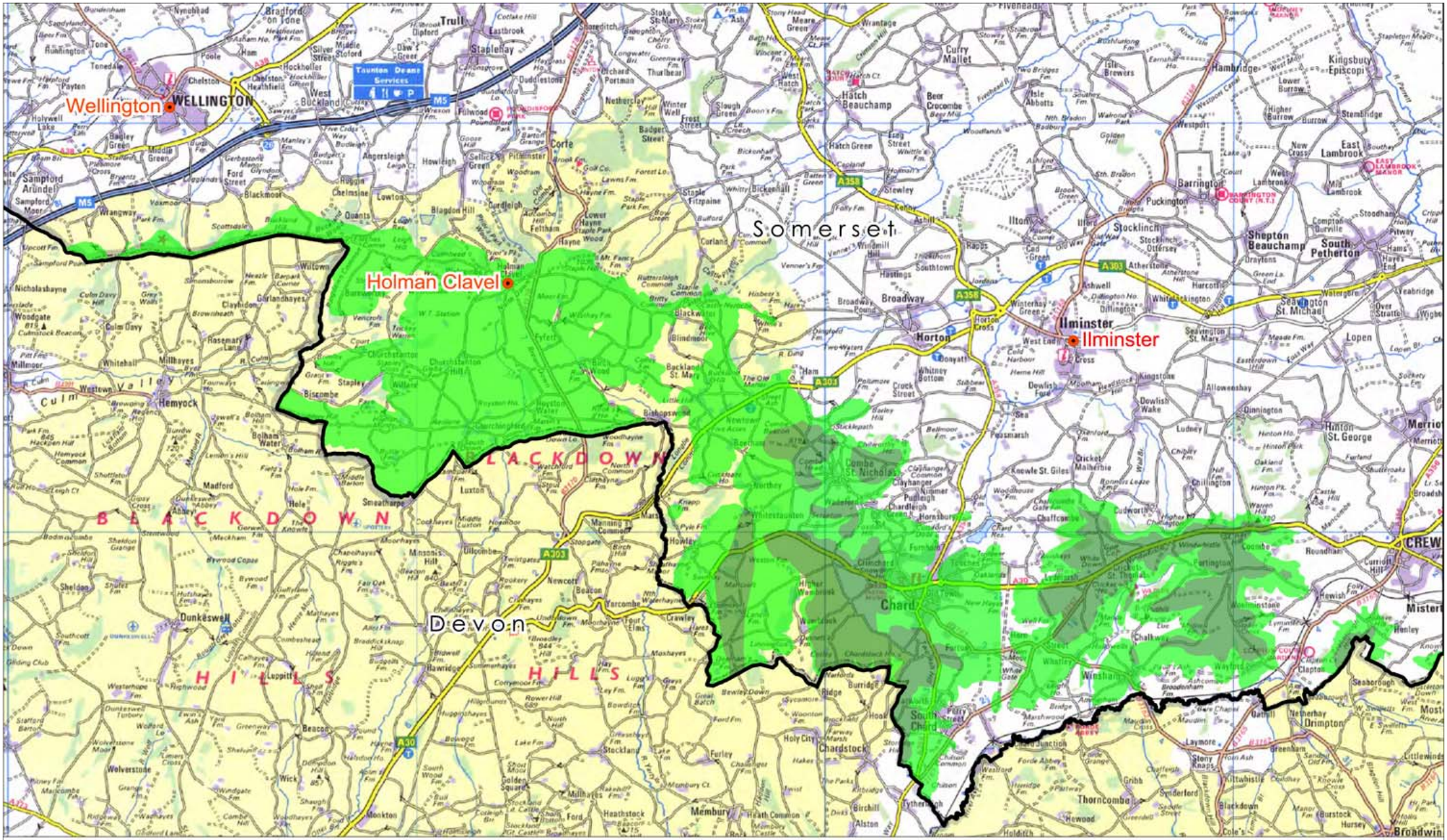
APPENDIX 3: MAPS OF MINERAL SAFEGUARDING AREAS



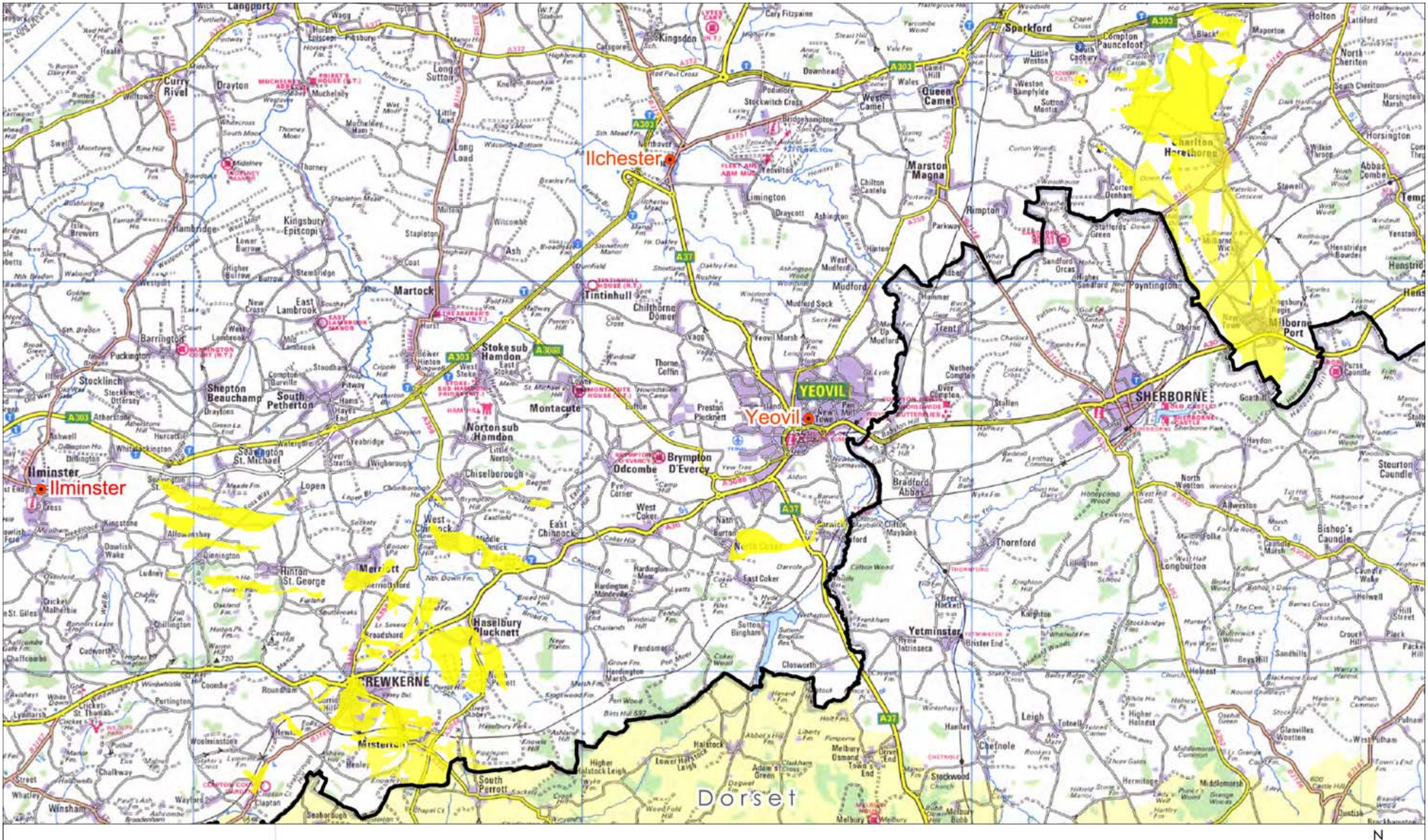
Map 1. General distribution map of Somerset needed Building Stones



Map 2. White Lias and Blue Lias Mineral Safeguarding Areas



Map 3. Flint / Chert and Upper Greensand (Calcareous Grit) Mineral Safeguarding Areas



Building Stones Topic Paper

SOMERSET COUNTY COUNCIL

17/09/2012

KEY

Inferior Oolite (Misterton Stone)

Somerset County Boundary

N

0 5 km

1:130000

Map 4. Inferior Oolite (Misterton Stone) Mineral Safeguarding Areas

Building Stones Topic Paper

SOMERSET COUNTY COUNCIL

17/09/2012

KEY

Yeovil Stone & Marlstone

Somerset County Boundary

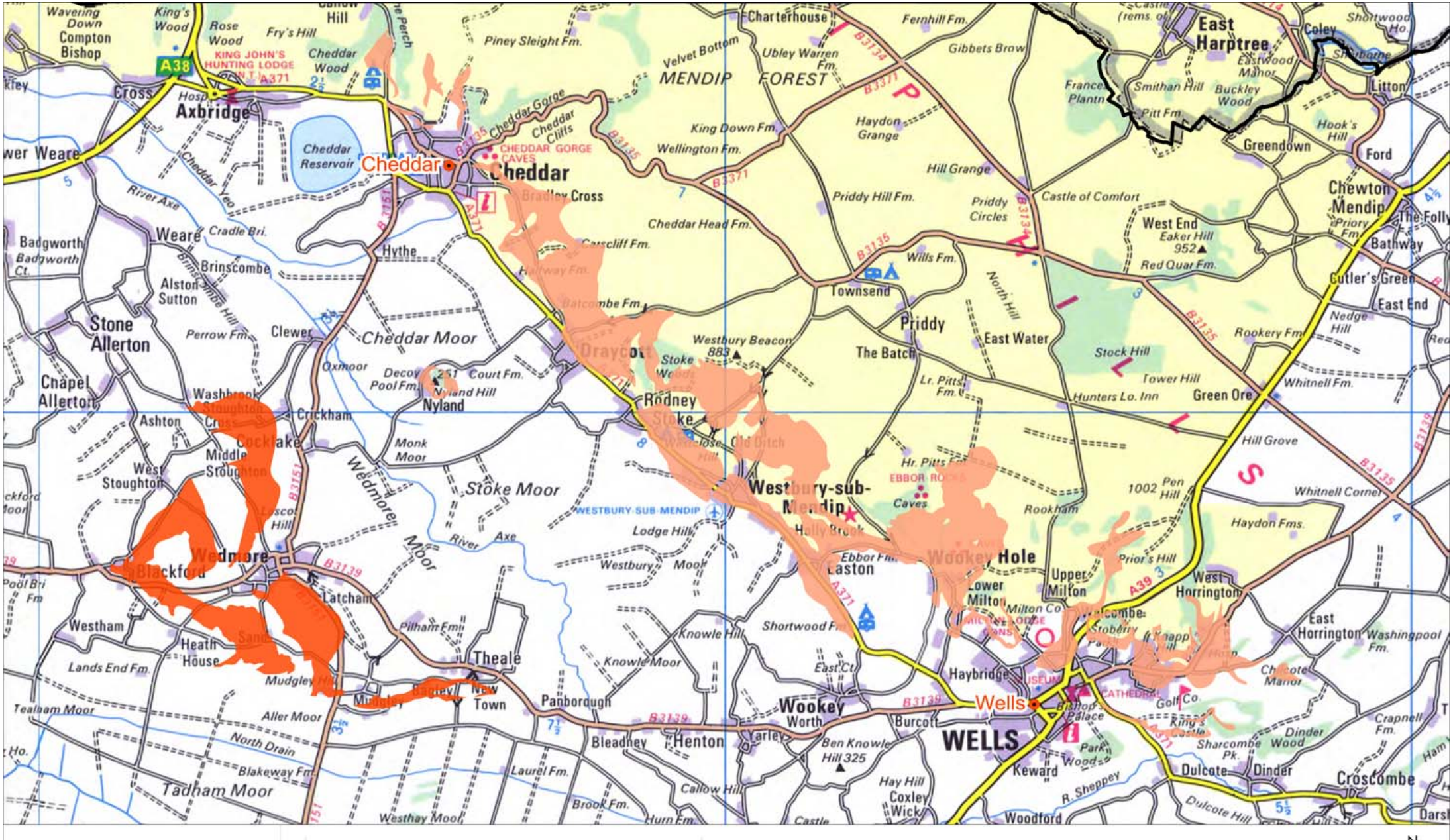
Derived from 1:50,000 scale BGS digital geological map data under license no. 2003/140 (2012) British Geological Survey © NERC

N

0 2.5 km

1:90000

Map 5. Yeovil Stone and Marlstone (including Moolham Stone, Petherton Stone) Mineral Safeguarding Areas



Building Stones Topic Paper

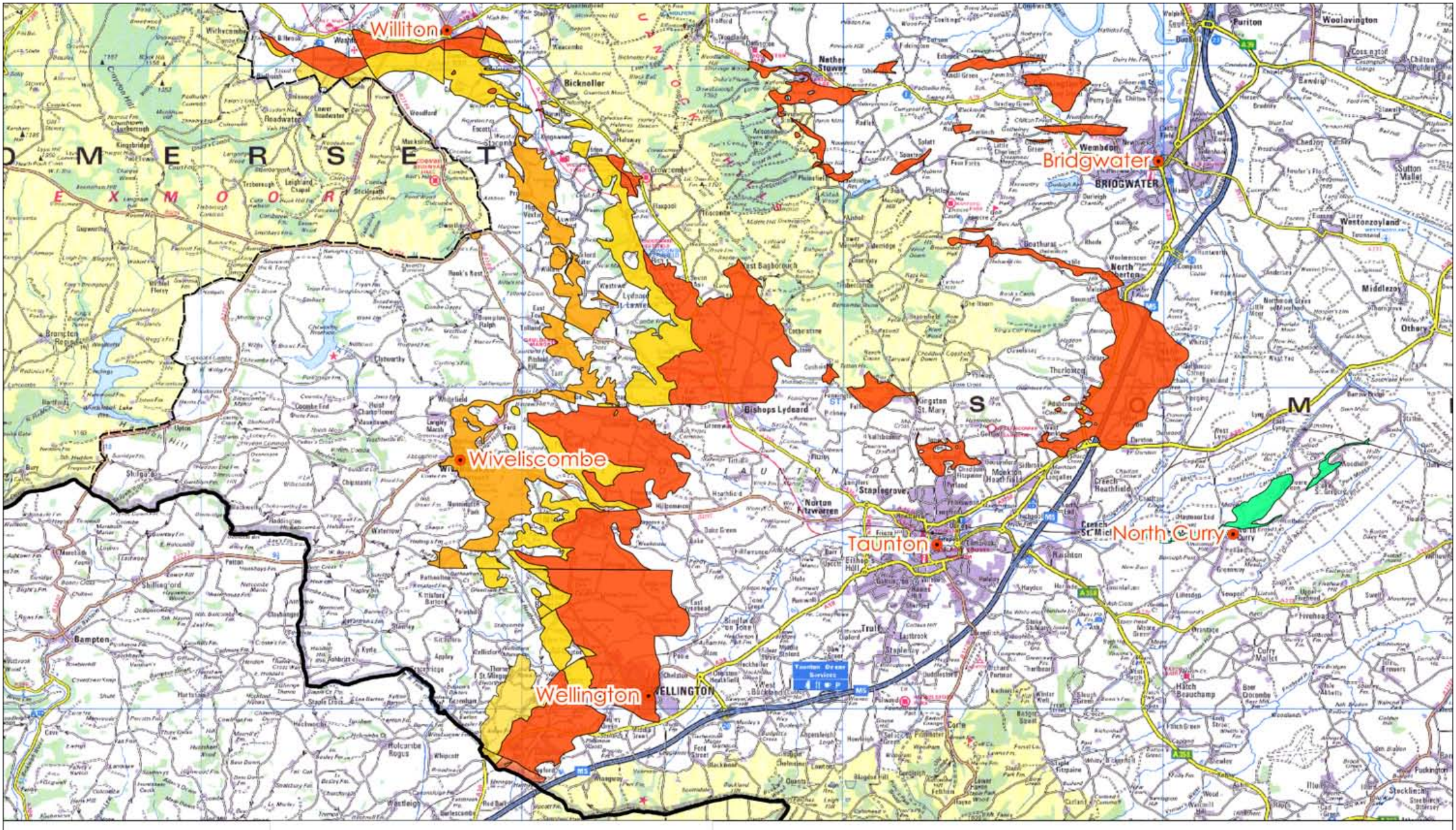
SOMERSET COUNTY COUNCIL

17/09/2012

KEY

- Wedmore Stone
- Dolomitic Conglomerate (Draycott Stone)
- Somerset County Boundary

Map 6. Wedmore Stone and Dolomitic Conglomerate (Draycott Stone) Mineral Safeguarding Areas



Building Stones Topic Paper

SOMERSET COUNTY COUNCIL

18/10/2012

KEY

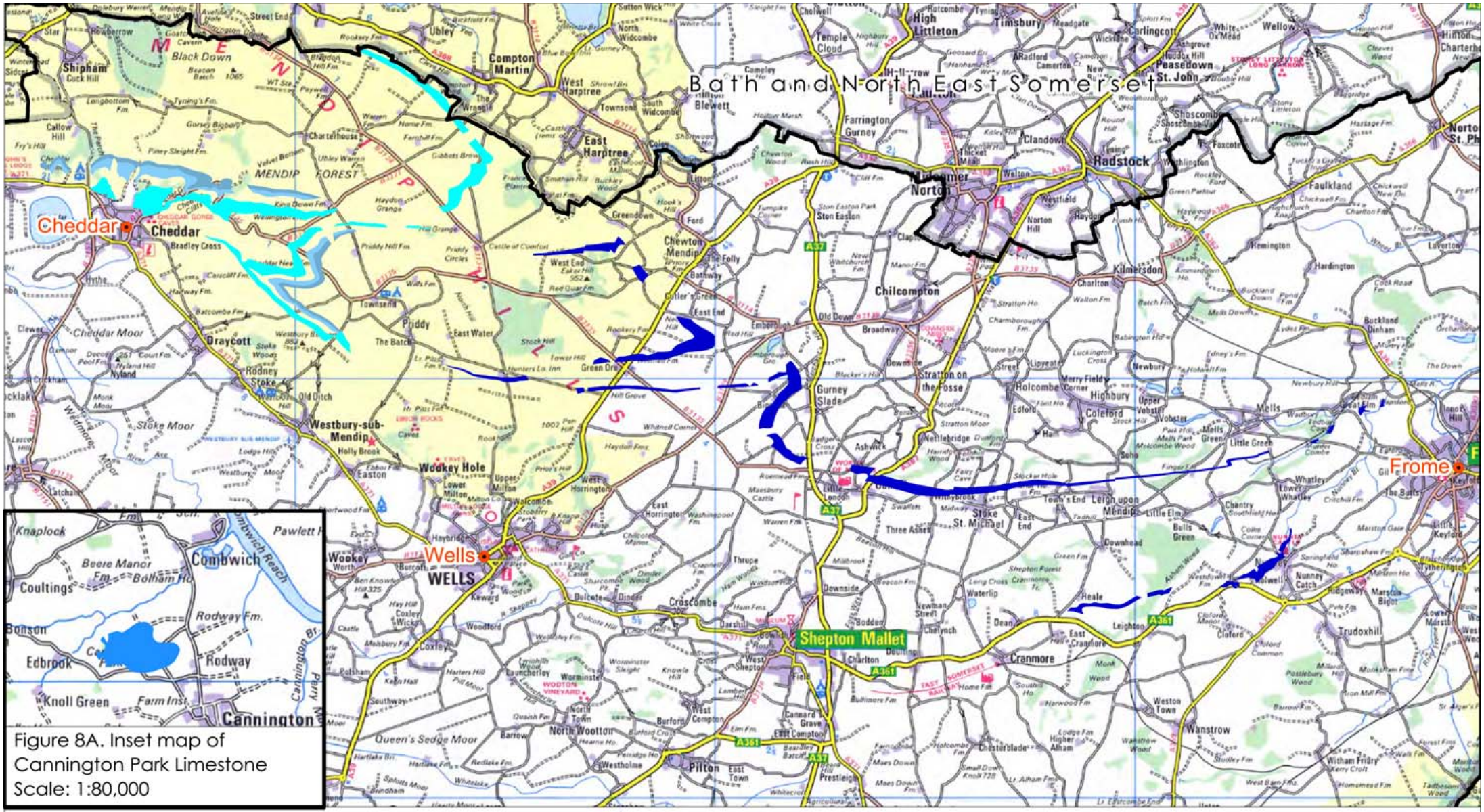
- Budleigh Salterton Pebble Beds (Milverton Stone)
- North Curry Sandstone
- Otter Sandstone
- Wiveliscombe Sandstone
- Exmoor National Park
- Somerset County Boundary

0 5 km

1:160000

N

Map 7. Permo-Triassic sandstones and conglomerates Mineral Safeguarding Areas



Building Stones Topic Paper

SOMERSET COUNTY COUNCIL

17/09/2012

KEY

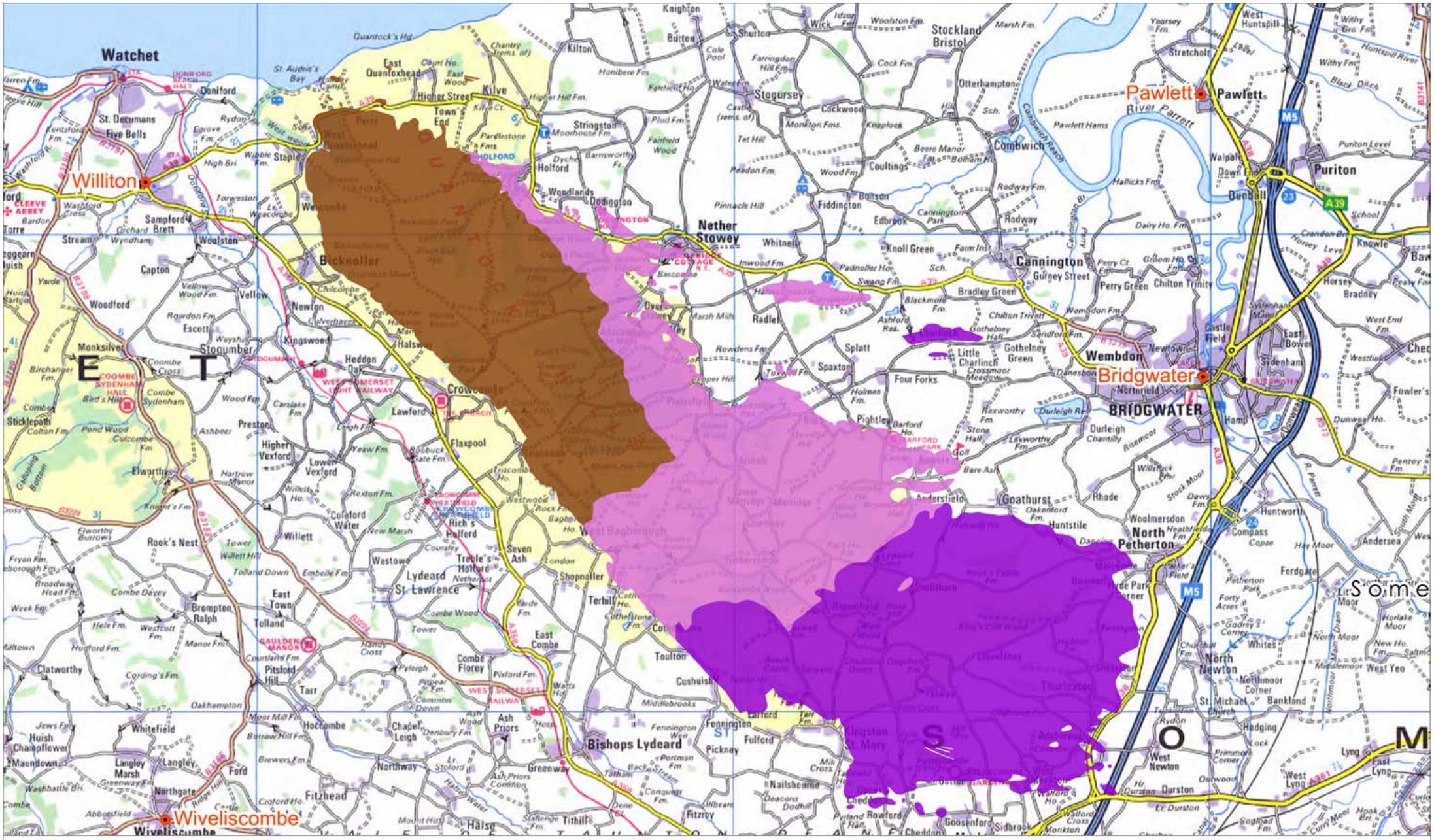
- Vallis Limestone
- Chinastones
- Cheddar Limestone
- Cheddar Oolite
- Cannington Park Limestone
- Somerset County Boundary

0 2.5 km

1:130000

N

Map 8. Lower Carboniferous limestones Mineral Safeguarding Areas



Map 9. Devonian sandstones (Morte Slates, Ilfracombe Slates, Hangman Sandstones) Mineral Safeguarding Areas

APPENDIX 4: GLOSSARY OF TECHNICAL TERMS AND GEOLOGICAL NAMES

GLOSSARY OF TECHNICAL TERMS AND GEOLOGICAL NAMES

Alluvial, alluvium	An unconsolidated sediment, deposited by a stream
Ashlar	A regularly cut, 'dressed' block of building stone
Blue Lias	An extensive sequence of Jurassic, blue-grey coloured limestones, which typically occur in regular, tabular layers
Calcareous Grit	A type of Cretaceous sandstone, typically whitish in colour containing distinct quartz grains
Calcareous sandstone	A sandstone which contains a significant proportion of lime
Calcite	A pale coloured to transparent mineral, calcium carbonate, the main constituent of limestones
Carboniferous	A period of geological time, extending from 360 to 290 million years ago
Cheddar Limestone	A pale grey variety of Carboniferous Limestone, occurring in the Cheddar area
Cheddar Oolite	Like Cheddar Limestone, but containing oolites (see Oolitic limestone)
Chert	A form of very hard, often brownish-grey quartz with microscopic crystals
Chert nodules	Spherical or irregularly rounded pieces of Chert (see above)
Chinastones	Very fine-grained, pale coloured limestones (called 'porcellaneous', ie they have a smooth appearance like porcelain)
Conglomerate	A sedimentary rock composed of rounded pebbles
Cretaceous	A period of geological time, extending from 145 to 65 million years ago
Devonian	A period of geological time, extending from 408 to 360 million years ago
Doulting Stone	Pale coloured, even-grained Jurassic limestone quarried from the Doulting area, a famous building stone often used in prestigious buildings
Draycott Stone	A type of Triassic conglomerate or breccia (with angular pebbles) from the Mendip area, containing pieces of Carboniferous limestone
Fissile	Usually applied to slates, easily split into thin, even layers
Flint	A form of black chert, often in the form of rounded 'pebbles' or nodules
Forest Marble	A sequence of Jurassic greyish, rubbly limestones that, in Somerset, occur in the eastern part of the county
Glauconitic Sandstone	A sandstone that contains small grains or 'flecks' of glauconite, a blackish-green iron mineral
Hadspen Stone	A type of buff-brown weathering Jurassic oolitic limestone from the Castle Cary area of Somerset

Ham Stone	Pale yellow coloured Jurassic limestone quarried from Ham Hill, near Yeovil, used extensively in buildings, and for finer tracery especially for windows
Hangman Sandstones	Red-purple coloured sandstones of Devonian age, typically found in the central and northern Quantock Hills
Ilfracombe Slates	Reddish and grey-green slates of Devonian age, typically found in the central Quantock Hills
Inferior Oolite	A group of Jurassic rocks characterised by pale coloured oolitic limestones
Jurassic	A period of geological time, extending from 200 to 145 million years ago
Lithology	The physical characteristics of a rock or stone, including its colour, texture, grain size, minerals etc
Lithostratigraphical	The division of groups of rocks on the basis on their different lithologies (see Lithology above)
Marlstone	A buff-brown Jurassic limestone, used extensively as a building stone in the Yeovil, Ilminster and South Petherton areas
Milverton Stone	A Triassic reddish conglomerate often containing pebbles of grey limestone (also called Milverton Conglomerate)
Morte Slates	Silvery-grey slates of Devonian age, typically found in the southern Quantock Hills
North Curry Sandstone	A greenish-grey coloured Triassic sandstone
Oolitic limestone	A pale coloured limestone, formed of small spherical grains (‘ooliths’)
Otter Sandstone	A reddish-brown coloured Triassic sandstone, much used as a building stone in the Vale of Taunton Deane
Permo-Triassic	A period of geological time, including the Permian and Triassic, and extending from 290 to 200 million years ago
Quartzitic sandstone	A hard, relatively pure sandstone, formed predominantly of quartz
Quoins	Large regular blocks of stone, located at the corners of buildings
Rubblestone	An irregular network of stones, usually applied to buildings and walls
Sedimentary rock	A rock formed of sediments, for example sands, muds, clays, pebbles
Serpulid	A worm fossil, often represented by small portions of ‘straw-like’ tubes
Siliceous	Containing much silica (quartz)
Silurian	A period of geological time, extending from 439 to 408 million years ago
Sponge spicules	Part of the skeleton of fossil sponges
Sterilisation	To make land barren, unproductive, or unworkable

Surface brash	Rubble or rough rock pieces, lying loose on the ground surface
Tracery	Fine detailed, carved stone work, often associated with windows, doors
Triassic	A period of geological time, extending from 245 to 200 million years ago
Wedmore Stone	A grey Triassic limestone from the Wedmore area, which typically weathers to a golden yellow colour
Vallis Limestone	A dark coloured variety of Lower Carboniferous limestone
Westleigh Limestone	A form of grey coloured Carboniferous limestone that occurs in SW Somerset and Devon. Often irregularly banded with chert
White Lias	A sequence of pale coloured Triassic limestones, which occur below the Jurassic Blue Lias
Wiveliscombe Sandstone	An orange-red Permian sandstone (see Permo-Triassic)
Yeovil Stone	A pale coloured Jurassic limestone, often rich in fossils, found in the Yeovil and Ilminster areas

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