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SAFEGUARDING STONE: IDENTIFICATION OF LOCAL STONE RESOURCES FOR BUILDING AND CONSERVATION IN ENGLAND.

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ABSTRACT

The current mineral planning system, enshrined in the Environment Act 2004, emphasises the importance of sustainable development in mineral extraction. In England, Minerals Policy Statement 1 (MPS1) sets out national policy for safeguarding minerals. At the same time English Heritage has developed a policy on mineral extraction and the historic environment. This links the historic significance of landscape and quarrying sites and impact on the environment caused by mineral extraction; with provision of mitigation measures, the supply of natural stone to conserve the historic environment and the need to preserve local distinctiveness. In many parts of England, natural stone extraction has long ceased, and distinctive local stones for building and conservation use are very difficult or impossible to source. The British Geological Survey (BGS) is working with English Heritage and local geological teams to collate a spatial database of building stone quarries and significant buildings for England in order to assist in the identification and protection of sustainable stone resources for building and conservation purposes. The work will identify building stones which are currently worked or have been used in the past and enable specific building stones to be identified and their patterns of use determined. The information will be publically available through the BGS MineralsUK.com website to allow searches by local authorities, conservators and other interested parties to find potential sources of building stones, and help ensure that they are safeguarded for the future.

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BACKGROUND

England is endowed with a wide variety of indigenous building stone resources. These represent important sources of stone to be used for repairing our historic building stock, for new buildings and for preserving locally distinctive landscape and townscape character. However, stone resources are finite and must be utilised in a sustainable manner. With the planning system responsible for addressing competing pressures on land-use, it is particularly important to identify building stone resources in order to safeguard them from potential unnecessary sterilisation by other competing forms of development.

Minerals Policy Statement 1 (MPS1): Planning and Minerals (Department for Communities and Local Government, 2006), sets out the Government's objectives and national planning policies for minerals in England. It stresses the importance of undertaking mineral extraction within a sustainable framework, both in terms of mineral supply and with an integrated approach to social, economic, environmental and cultural factors. Mineral Planning Authorities (MPAs) are required to define Mineral Safeguarding Areas (MSAs) which contain known resources of sufficient economic or conservation value to be protected for future use. This includes clay and building stone resources. MSAs are to be included in

district Local Development Documents (LDDs) to help ensure that potential sterilisation of mineral resources is considered when planning decisions are made.

In MPS1, English Heritage and the stone industry are encouraged to make MPAs aware of important sources of building and roofing stone that they consider should be safeguarded from other forms of development through policies in their LDDs. Safeguarding will be most appropriate where stone is believed to be of suitable quality, and is:

- scarce in terms of its technical properties and/or aesthetic characteristics; or
- has been identified as having characteristics which match those required for repair and preservation purposes, including those related to individual, or groups of, culturally important buildings of local, regional or national significance.

Many important sources of building stone have been long disused, and would need a new planning application to be worked again. Important historic quarries should be safeguarded, as far as practicable, where it can be shown:

- that the quarry was the original source of stone

used in the construction of a historic building or monument; or

- that the stone is technically compatible with material in the structure to be repaired; and
- that stone from the quarry is, or will be, required for restoration or conservation purposes in the absence of viable alternatives.

MPAs should consider whether small-scale extraction of building stone might be sustainable at, or close to, relic quarries, some of which have been designated in respect of industrial archaeology, wildlife and geological conservation, where small-scale extraction would contribute to repair of historic buildings without compromising the requirement to protect designated sites. To that end, Natural England and English Heritage are encouraged to discuss the prospects for future working at specific important sites and to advise the relevant MPAs of their conclusions. Any extraction and restoration proposals should have proper regard to the purposes of the designation both during and after extraction.

Local planning authorities (LPAs) should notify Natural England and English Heritage when a development proposal is made which affects an old building stone source to provide an opportunity for its significance to be assessed (MPS1, 2006).

Similar advice is given in respect of new building stone supply. As a result, recently developed English Heritage policy on mineral extraction and the historic environment (English Heritage, 2008) reflects these aims under three headings:

- the historic significance of mining and quarrying sites and landscapes;
- the impacts on the historic environment that can be caused by mineral extraction together with advice on appropriate mitigation measures; and
- the need for, and supply of, natural stone and other materials required to conserve the historic environment and maintain local distinctiveness.

In support of this policy, English Heritage has begun a major national study to draw together the very considerable amount of fieldwork and archival work that has already been undertaken. The results of such work currently largely reside in ad hoc collections or as undocumented specialist knowledge.

Winning stone is essential for restoration or conservation purposes, but there is no intention of needlessly destroying old quarry sites that are now recognised for their archaeological, geological or wildlife interests. The aim is to identify sites where closely matching stone can be won with the least damage. Failing that, mitigation measures will be expected to minimise harm and conflict if there are competing interests on the site in question.

STRATEGIC STONE STUDY

In England, natural stone extraction has long since ceased in many areas and distinctive local stone for conservation and new build is difficult to source. English Heritage's response has been to commission the British

Geological Survey (BGS) and local contractors to identify sources of building stone and the location of significant buildings over a 4 year period, in order to identify and safeguard sustainable stone resources for building and conservation.

Sources of information available to assist in this task include those which deal with currently available building stone resources. These include the Natural Stone Directory 1968 onwards; The Building Limestones of the British Isles; and the Building Sandstones of the British Isles from the Building Research Establishment (BRE) (Leary, 1983; 1986). Other useful references include those with a more historical perspective such as the BGS Building Stone Resources Map of the United Kingdom (Lott *et al.*, 2001) and various local publications such as The Building Stone Heritage of Leeds (Dimes and Mitchell 1996) and Northamptonshire Stone (Sutherland, 2003). BGS Geological Sheet Memoirs are also a useful source of information on the mineral resources of an area at the time of surveying, and can include information on building stone usage.

At the time of writing, the BGS BRITPITS database contains records of 50,451 sites of mineral working, of which 34,381 are in England. Of those sites located in England, 5,441 are known sources of building stone, and 458 are active mineral workings where building, decorative or walling stone etc, was known to be available. These include aggregate workings where building stone is a secondary product as well as primary building stone producers (Figure 1).

Data are being collected on the stones used in particular areas, the buildings where these stones are used and the sources of the stones. This will be collated and presented in a simple and easy to understand way so that those responsible for safeguarding can assess where this should take place. In addition, those personnel in the conservation industry can use the data to find potential sources of suitable repair material if the original source quarry is unavailable.

THE METHOD OF QUARRY IDENTIFICATION

Building stone quarry data has traditionally been gathered using paper geology maps, historical topographic maps, field slips (the map made in the field by the field geologist) and reference books. This has been a slow ad hoc process over many years. To speed up the process of collecting data BGS has now developed a GIS-based quarry picking tool for use in gathering information on quarrying and mining on a more automated basis. The GIS allows digital access to much of the data required to identify an old quarry site through, for instance, digital geological maps or scanned field slips and then automatically store information about it. Quarries already stored in the BRITPITS database are also displayed to prevent duplication when adding additional quarries.

Using the tool enables accurate and rapid collection of data such as National Grid Reference, bedrock and superficial geology, and lithology potentially worked. The operation is known as 'drilling down' through the data layers and collecting coded information in this fashion is faster than manual collection. The only

attribute information that is required to be manually typed by the operator is the address of the site and the evidence used for placing the location point dot, e.g. 'Quarry (Sandstone)'. The operator also has to decide whether the quarry worked bedrock or superficial deposits.

All surface working sites are being collected and the data are held in a spatial database linked to the GIS. Using the quarry picking tool means that over one thousand sites can be added monthly, whereas previously this would have typically represented the total collected in one year.

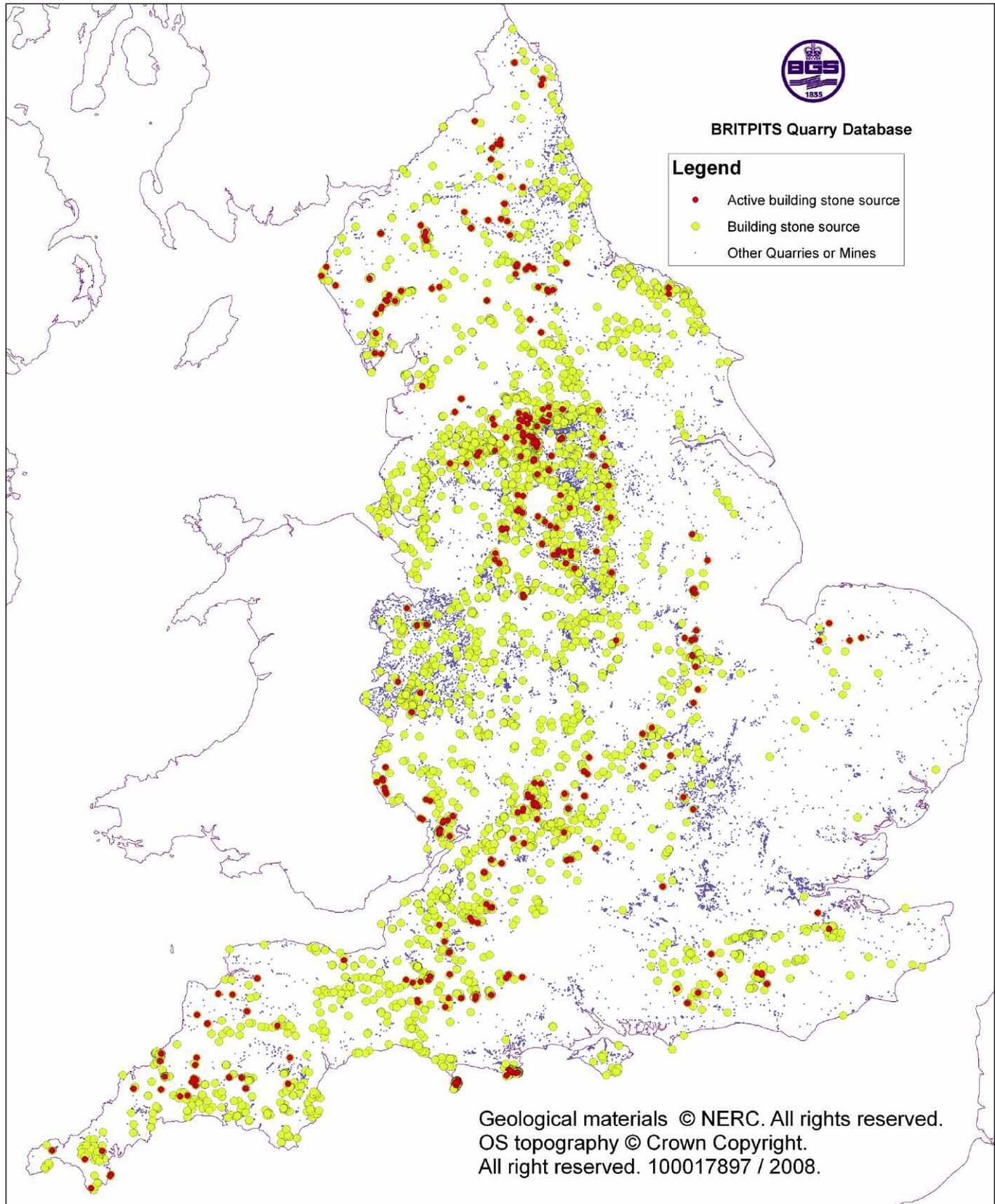


Figure 1. Map of building stone producers in England.

Once collection is complete, the data is downloaded from the spatial database and preliminary quality assurance is performed. The attribution of bedrock or superficial geology is checked against the lithology collected and commodity produced and, if necessary, a further check of the site is made against the BGS field slip to see if there is any further information that may clarify any queries. The data are then ready to be loaded to BRITPITS, collated with the already existing BRITPITS information.

A list of sites on a county basis is produced and sent via English Heritage to local consultants for checking. The local consultants endeavour to identify which of the sites actually produced building stone before returning the list, along with any extra information considered useful, via English Heritage to BGS. In addition to checking the collected quarry data the contractors will identify the stones used within their particular counties, as well as typical buildings in which they have been utilised.

DERBYSHIRE EXAMPLE

In BRITPITS, previous knowledge of building stone working in Derbyshire showed 313 out of 760 mineral sites were known building stone sources, the vast majority being sandstones or gritstones. Using the tool an additional 2,311 sites have been added, mostly located on limestone. These are being checked and verified by

English Heritage's local contractor. Should additional building stone sites be verified, then potential new sources of the stone extracted will increase. This will assist in identifying those quarries that may be able to provide like for like replacements during stone maintenance on historic buildings.

WHY COLLECT HISTORIC BUILDING STONE DATA?

Matching sources to uses poses difficulties ranging from identification of suitable quarries to local or national policy approaches. A pilot study undertaken in the West Midlands looked at the distribution of white building sandstones (Yates *et al.*, 2005), during which, an estimate of the historical use of these stones was made. Currently only one site, Grinshill, produces a white Triassic sandstone although in the past several lithologies were worked for this material from several local quarries. Grinshill Quarry is located within a Site of Special Scientific Interest (SSSI) and is close to housing (Figure 2).

The results of a survey of buildings in the areas found that there was concern with stone decay in one particular building stone, the Arden Sandstone. Certain facies of Arden Sandstone were weathering badly (Figure 3a) while others appeared sound (Figure 3b). No quarries currently work any Arden Sandstone facies, which has a limited exposure under the thick cover of glacial deposits in the area.

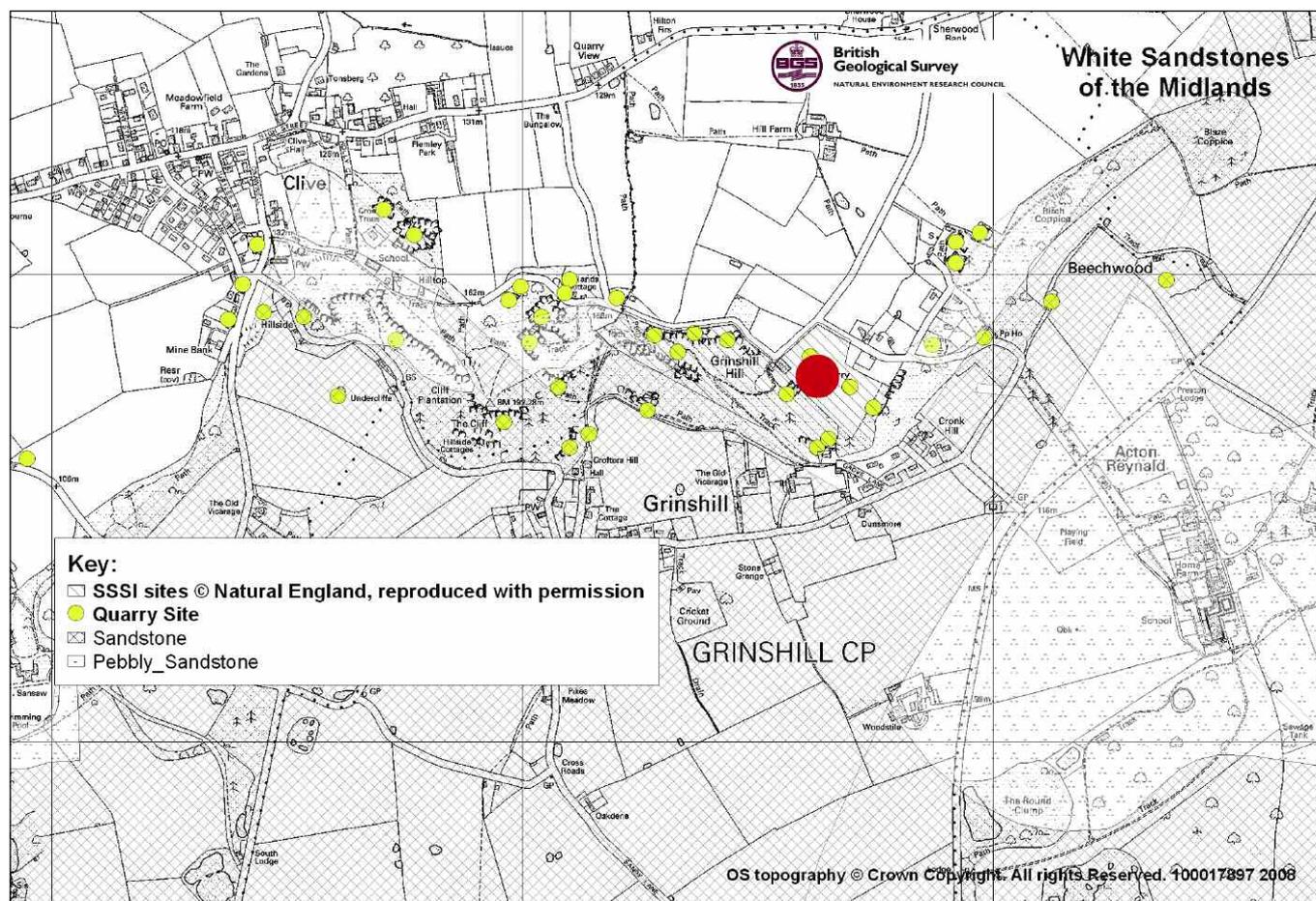


Figure 2. An example of constraint on a quarry working. Grinshill Quarry, red dot, the only white sandstone producing site active in the West Midlands (Yates *et al.*, 2008).

English Heritage's policy is to replace like with like, so the sound Arden Sandstone would not be looked upon favourably as a replacement for the unsound, even if it was readily available, due to its differing appearance. Past practice appeared to ignore matching properties such as colour, and as the number of producers declined, stone appears to have been sourced from any quarry that would supply it (Figure 3c).

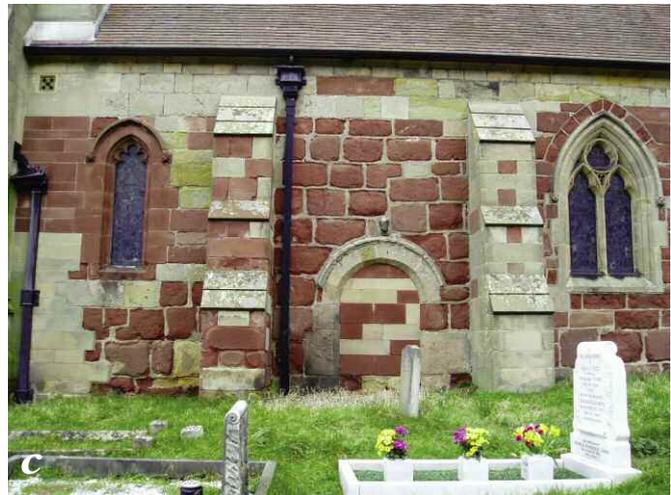
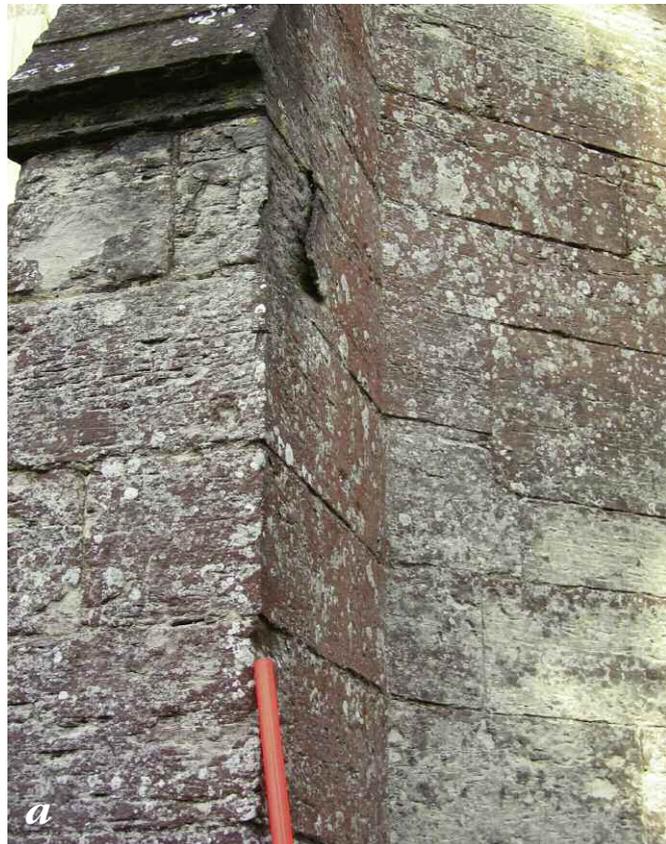


Figure 3. Arden Sandstone decay and soundness. **a.** heavily decayed sandstone in a church. **b.** sound, flaggy Arden Sandstone used in vernacular building. **c.** Use of any available stone in a church.

CONCLUSION

The BGS and English Heritage are collecting and collating information on the locations of old quarries, the stone type extracted from such quarries and typical buildings that contain the stone. Once completed for an area, the data will be loaded onto the BGS minerals information GIS hosted on the BGS mineralsUK.com website where existing regional mineral resource maps may be found. Using a simple search, it will be possible to locate quarries which are producing, or which have in the past produced a particular building stone and similarly to identify buildings in which a particular stone was utilised.

The GIS will be available to all stakeholders be they Mineral Planning Authorities looking to inform the delineation of Mineral Safeguarding Areas within Local Development Documents, other planning considerations, architects looking to build new housing whilst retaining the local character, or conservators seeking sources of material for repair.

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