

## SAFEGUARDING STONE: IDENTIFICATION OF HISTORIC STONE SOURCES AVAILABLE FOR BUILDING AND CONSERVATION IN ENGLAND – AN UPDATE

**D. CAMERON<sup>1</sup>, J. MANKELOW<sup>1</sup>, E. CREW<sup>1</sup> AND G. LOTT<sup>1</sup>**

<sup>1</sup> British Geological Survey, Keyworth, Nottingham, NG12 5GG.

### ABSTRACT

The current mineral planning system emphasises the importance of sustainable development in mineral extraction. In England, Minerals Policy Statement 1 (MPS1)<sup>1</sup> (Department for Communities and Local Government, 2006) 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, 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) has been working with English Heritage and local geological teams to collate a spatial database of building stone quarries and significant buildings in England which have used local stones. The database has been developed in order to assist in the identification and protection of sustainable stone resources for building and conservation purposes. Using the database enables specific building stones to be identified and their sources and patterns of use determined. In addition, BGS is concurrently adding other mineral working sites to the BRITPITS national mines and quarries database, not only by systematic surveys in England, but also covering Scotland and Wales. This base level information will also allow planners and other interested parties to examine sources of other types of mineral found in their authorities.

Public access to the information will be facilitated via the BGS MineralsUK.com website to allow searches by local authorities, conservators and other interested parties to find potential sources of building stones, and assist in their safeguarding for the future. This paper updates some of the information previously presented in Cameron *et al.*, 2010.

*Cameron, D., Mankelow, J., Crew, E. and Lott, G., 2011. Safeguarding stone: identification of historic stone sources available for building and conservation in England – an update. Pp. 180-186 in Hunger, E. and Walton, G. (Eds.) Proceedings of the 16th Extractive Industry Geology Conference. EIG Conferences Ltd, 194pp.*

*E-mail: dgca@bgs.ac.uk*

### INTRODUCTION

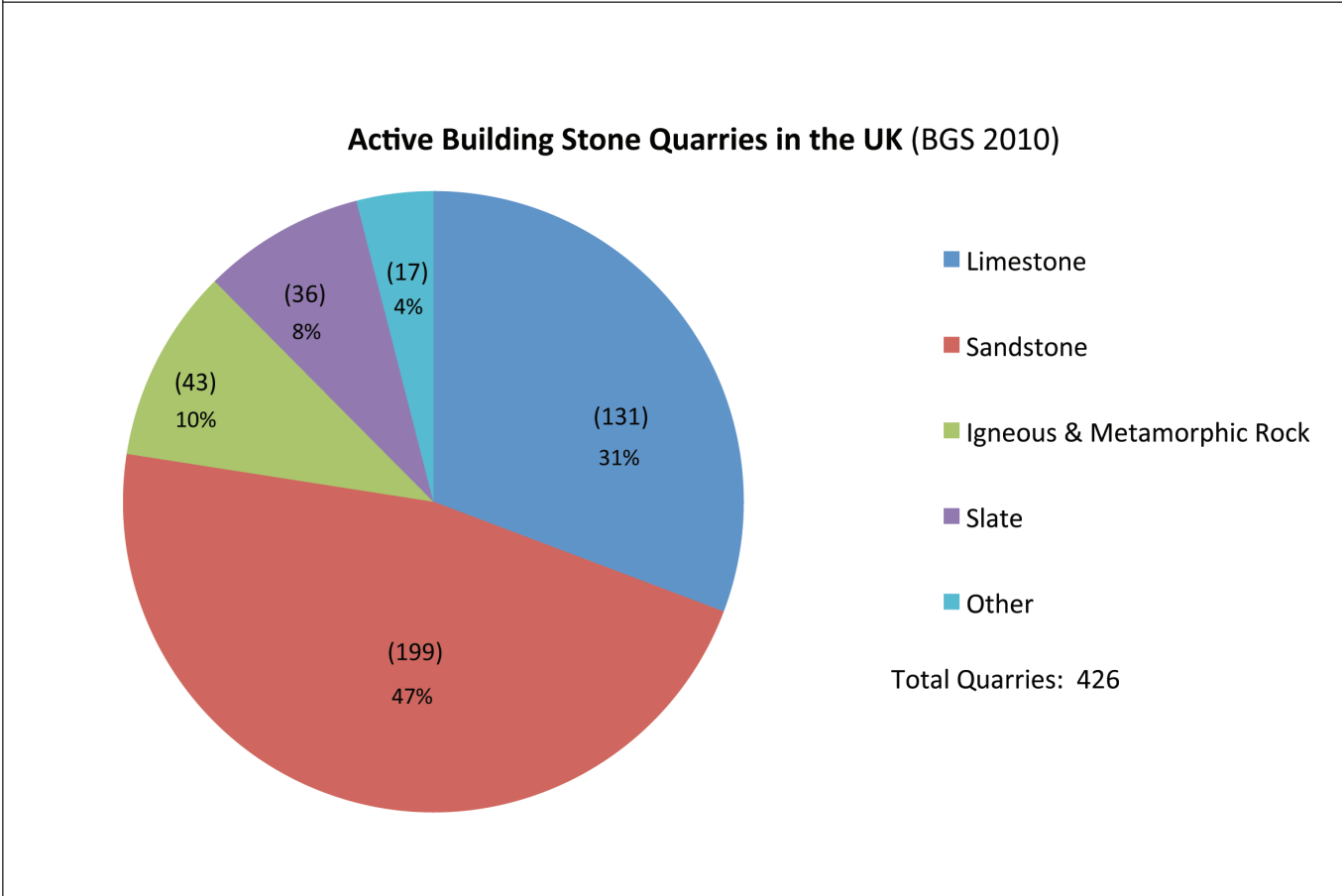
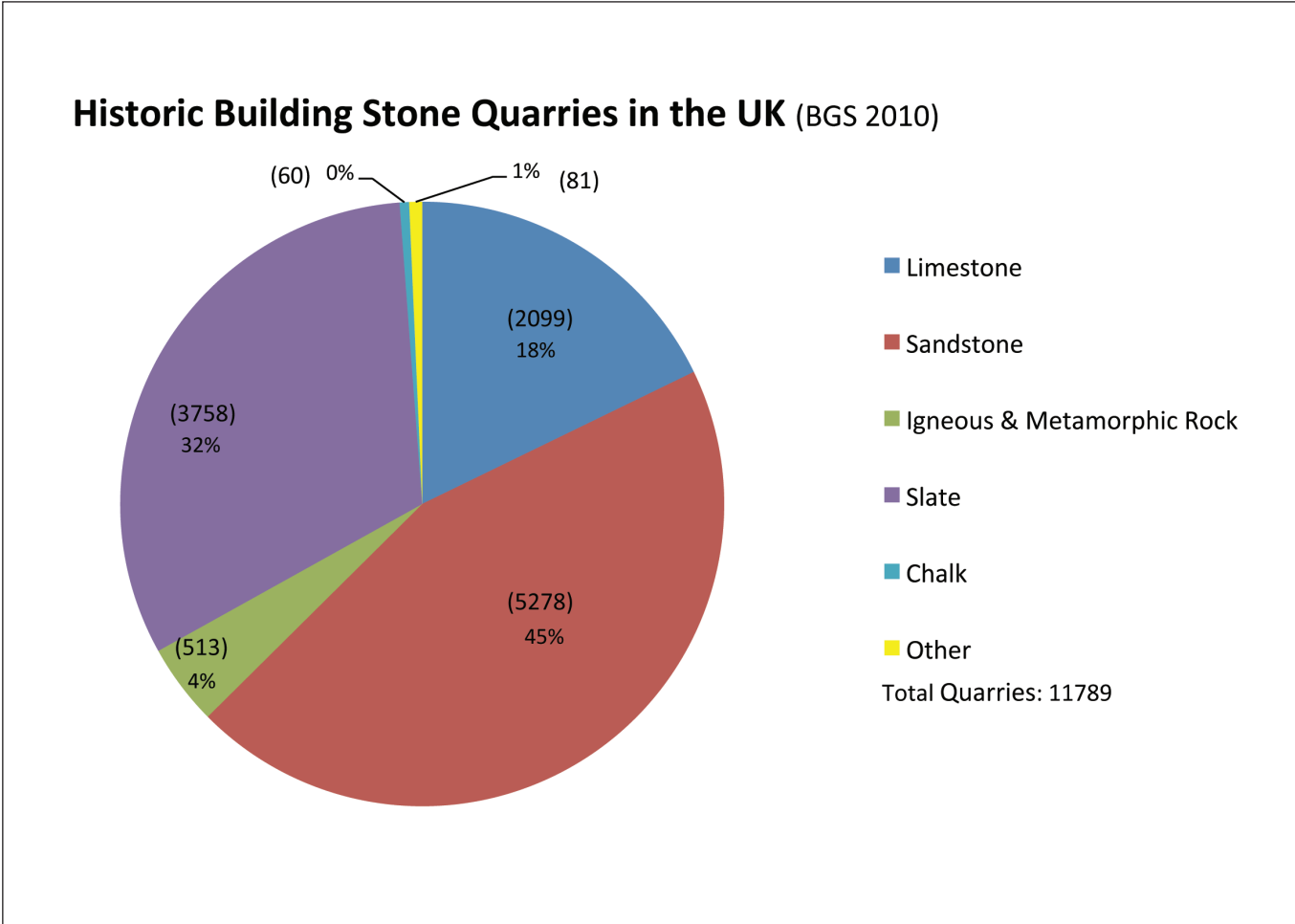
England is endowed with a wide variety of indigenous building stone resources. These represent important sources of stone which can be used for repairing our historic building stock, for constructing new buildings, and therefore, preserving locally distinctive landscape and townscape character.

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 potentially unnecessary sterilisation by other competing forms of development. In *Minerals Policy Statement 1 (MPS1): Planning and Minerals* (Department for Communities and Local Government, 2006), English Heritage and the stone industry are encouraged to make Mineral Planning Authorities (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

Local Development Documents (LDDs). Safeguarding will be most appropriate where stone is believed to be of suitable quality, scarce in terms of its properties and is a potential match for repair and conservation purposes.

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 an historic building or monument; or the quarry stone is technically compatible with the original stone used in the structure to be repaired; and will be required for restoration or conservation purposes in the absence of viable alternatives. A comparison of the stones produced by historical and currently active building stone quarries is given in Figure 1.

<sup>1</sup>Replaced by National Planning Policy Framework (NPPF) in March 2012, however, Safeguarding of mineral resources remains as policy in the new document. (DCLG, 2012)



**Figure 1.** A comparison of the types of stone produced by historic and currently active building stone quarries in the UK (data from BGS BRITPITS database, 2010).



English Heritage (2006) produced a technical advice note: 'Identifying and Sourcing Stone for Historic Building Repair' as a first step in advising how to obtain compatible replacement stone. Winning new stone is essential, but there is no intention to needlessly destroy 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, and, failing that, mitigation will be expected to minimise the harm and conflict currently associated with redevelopment of former building stone quarries.

As a result, recently developed English Heritage policy on mineral extraction and the historic environment (English Heritage 2006, 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.

With this in mind, English Heritage commissioned the Strategic Stone Study to identify which stones had been used in the buildings of England, where they had been sourced and to delineate areas of usage of particular stones. This was intended to draw upon the quarry and geology data holdings of the BGS, and the local knowledge of various interested parties who were known to hold a considerable amount of personal information on building stones.

## STRATEGIC STONE STUDY

In England, natural stone extraction has long ceased in many areas and distinctive local stone for conservation and new build can be difficult to source. English Heritage's response was to commission the BGS and local contractors to identify sources of building stone and the location of significant buildings over a 4 year period, in order to 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 various volumes from the Building Research Establishment (BRE): Building Limestones of the British Isles (Leary, 1983), Building Sandstones of the British Isles (Leary, 1986); Building Magnesian Limestones of the British Isles, (Hart, 1988) and Building Slates of the British Isles (Hart, 1991). Other useful references include those with a more historical perspective such as the BGS Building Stone Resources Map of the United Kingdom (British Geological Survey, 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 primary source of information on the mineral resources of an area at the time of surveying, and can include information on building stone usage.

Since 2008, BGS has added some 81,000 records to the BRITPITS database of UK mines and quarries (Cameron *et al.*, 2010), of which some 6,481 are considered to have produced Building Stone. The figures for England alone show that 4,269 historic building stone quarries have been added to the database giving a total of 9,710 at the date of writing (December, 2010). This is an increase of 78% over the existing building stone data holdings.

Data is also being collected on the building stones used in particular areas, the buildings where these stones are used and the sources of the stones. The data will be collated and presented in a simple and easy to understand way so that those responsible for safeguarding building stone resources can assess where this should take place. In addition, those in the conservation industry can also use the data to find alternative potential sources of stone suitable for repair if the original source quarry is unavailable. Information on building stone and buildings is being stored in the BGS National Stones Database.

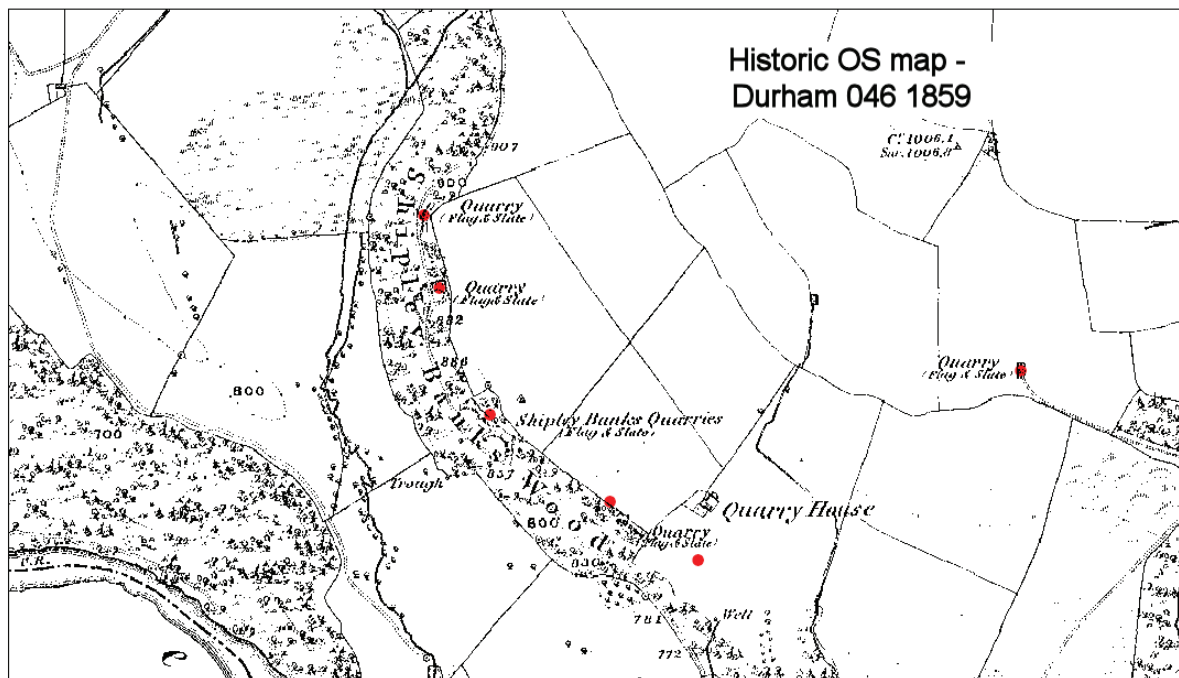
## THE METHOD OF QUARRY PICKING

Building stone and quarry data have 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 and ad hoc process over many years. In order to provide a base-level dataset of sources, BGS has developed a GIS-based quarry picking tool for use in gathering information on quarrying and mining on a semi automatic basis. The GIS allows digital access to much of the data required to identify an old quarry site (digital geological maps, scanned field slips etc) and automatically stores information about it. Quarries already stored within the BRITPITS database are also displayed to prevent duplication when adding new quarries, or to allow for amending locational information. Using the tool enables accurate, rapid and consistent collection of data including National Grid Reference, bedrock and superficial geology from the 1:50 000 scale BGS Digital Geology mapping (DiGMapGB50) (British Geological Survey, 2010) and the lithology potentially worked at the site. Collecting coded information in this fashion is much faster than techniques used in the past. The only attribute information that is required to be manually entered by the operator is the address of the site and the evidence used for identifying the source, e.g. 'Quarry (Sandstone)'. The operator also has to decide whether the quarry worked bedrock or superficial deposits.

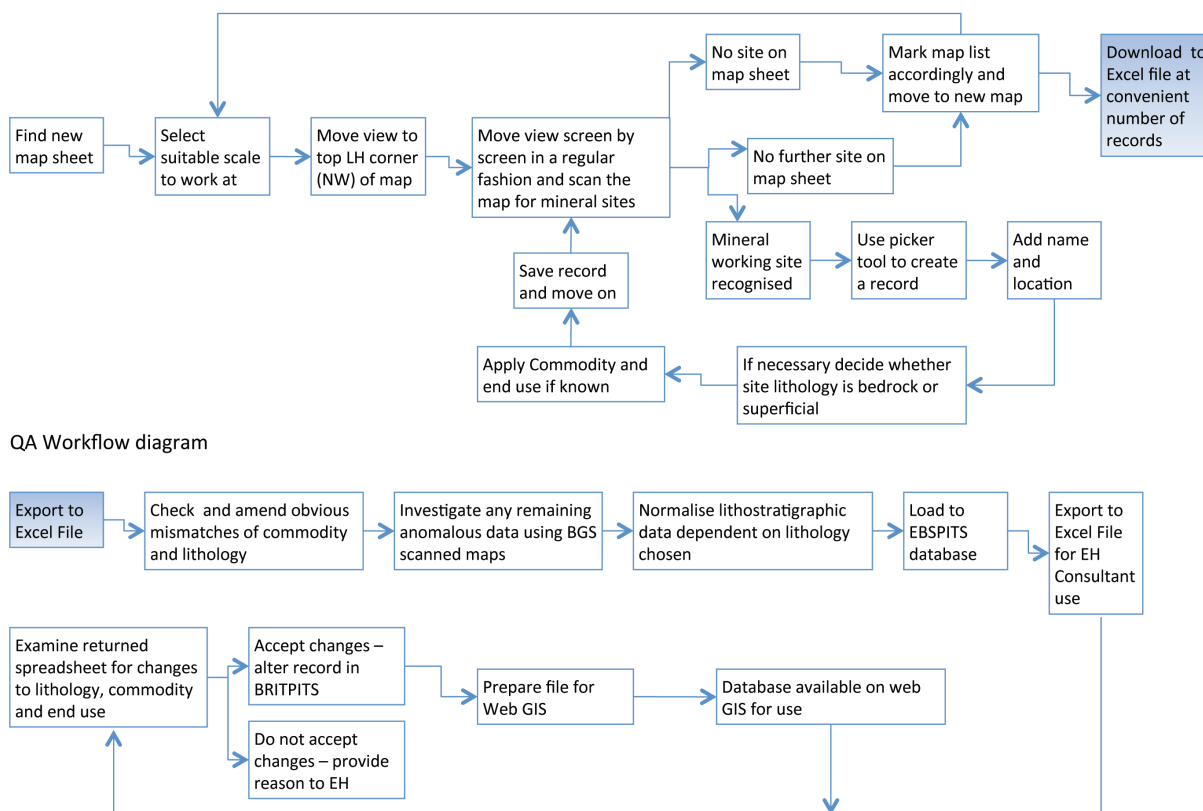
Using the quarry picking tool means that the equivalent of the annual rate of data collection using paper-based techniques can be added every month. Since the Strategic Stone Survey commenced, data interpretation has been improved, with the recognition that some of the Ordnance Survey descriptions of the material worked might be used to validate the end use of the Quarry. Use of stone for building is implicit in some of the quarry terms and, e.g. 'Delf' or 'Delph', 'Gaillard' 'Quarry (Flagstone)' 'Stone Pit' 'Quarry (Slate)' were indicators of building stone quarries. (Figure 2). Historical evidence showed that in certain areas, workings of particular lithologies could be assumed to have been used for building stone, e.g. the numerous

small pits in Sussex working the Ardingly Sandstone. However, a problem arises in this area in that the DiGMapGB50 is simplified and the resolution is insufficient to identify very small exposures worked via small pits. The automatically gathered evidence thus implies that the pit was working the overlying material, often a clay. In the Quality Assurance (QA) process, the fact that so many sites appeared to be worked for clay led to examination of the BGS 1:10,000 or 1:10,560 field

geologist survey maps (fieldslips). Here it was noted that the sites were mapped as "Old Stone Pit for Ardingly Sandstone" and the details of working then updated. Unfortunately, digital national coverage of geology at 1:10,000 scale is not yet available and noting the evidence and amending misleading information of this kind is time consuming. Figure 3 shows flowcharts for the Quarry picking and QA procedures.



**Figure 2.** Historic map example. At the initial data collection stage, we can make decisions on the commodity and end use of a quarry by looking at the historic OS maps, sometimes surveyors made useful comments showing this. In this example we know the quarries were used for Flagstones and Stone roofing slates (Flag & Slate).

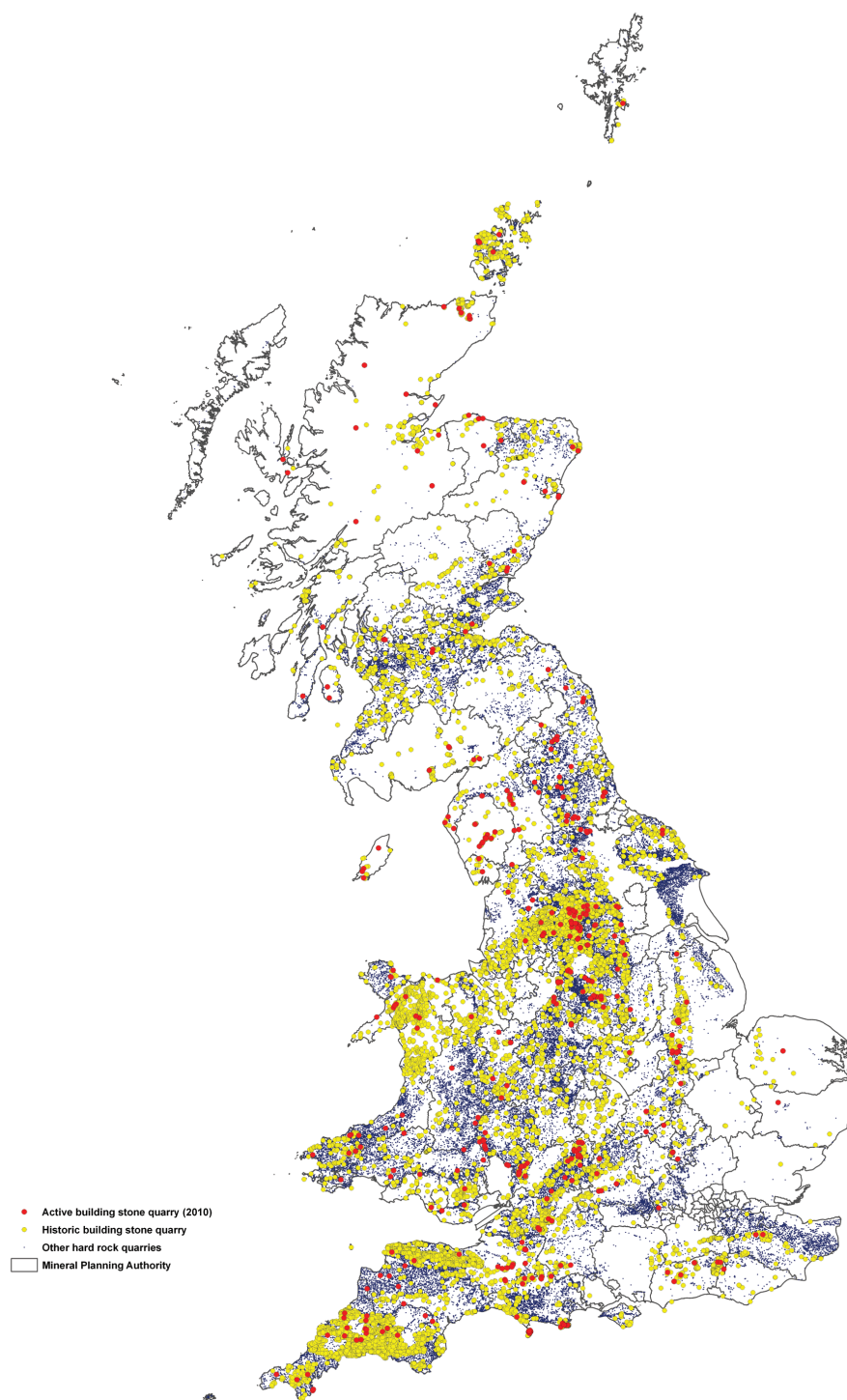


**Figure 3.** Flowchart for the quarry picking and QA procedures.

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 DiGMap lithology 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 is then ready to be loaded to BRITPITS and collated with the already existing BRITPITS data. A list of sites on a county basis is then produced and sent via English Heritage to local consultants for checking. The local consultants endeavour to confirm which of the sites produced building stone before

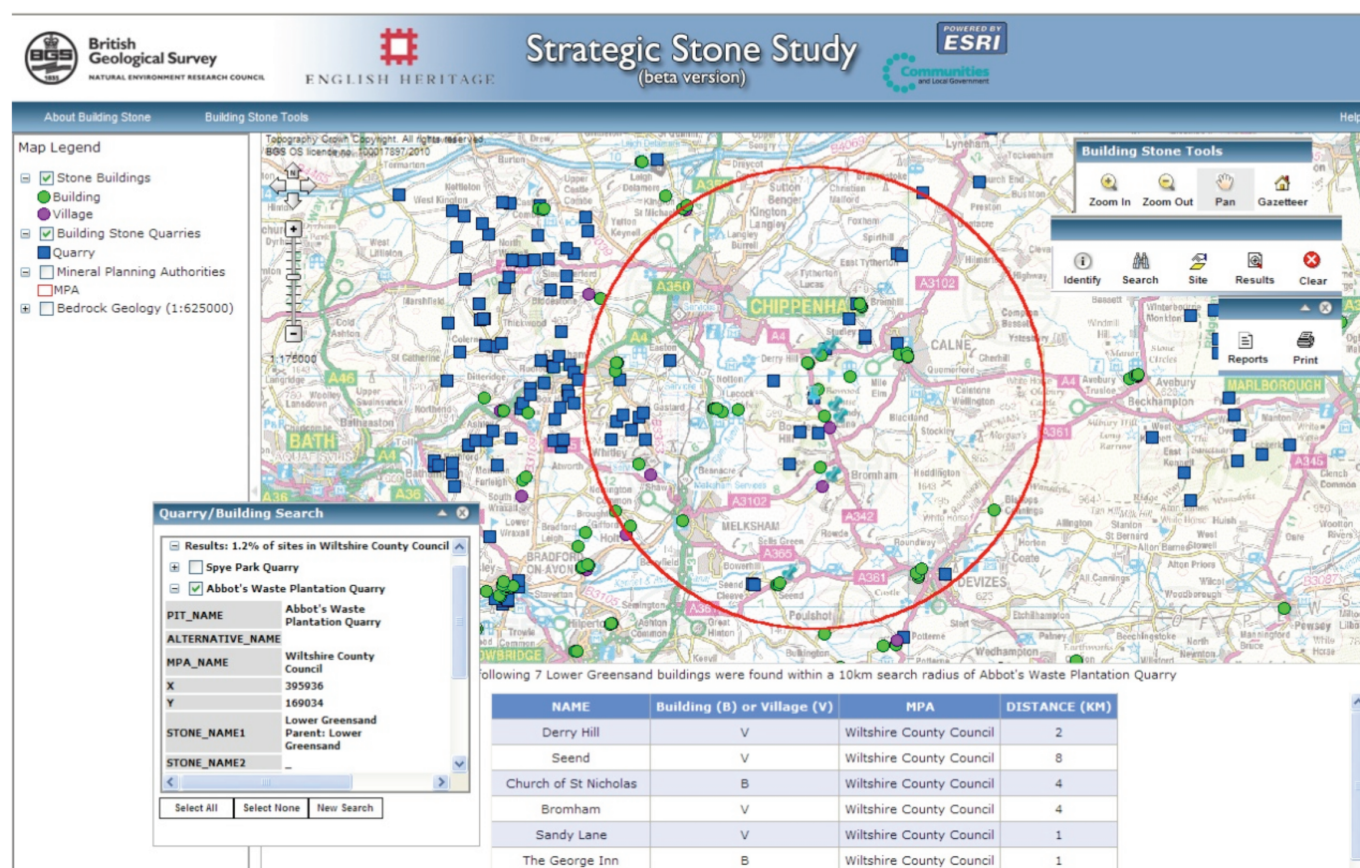
returning the list of sites along with any extra information considered useful via English Heritage to BGS. In addition to checking the collected quarry data the consultants identify the stones used within their particular counties, as well as completing a list of representative buildings or villages within which they have been utilised. The survey of the old workings will at the very least provide a base-level database of quarry sites, irrespective of the commodity worked, which can be expanded.

Figure 4 shows the current distribution of historical and active building stone quarries in the UK in 2010.



**Figure 4.** Distribution of historic and active Building stone quarries in the UK 2010 (Distribution data, BGS © NERC. Based on OS Topography © Crown Copyright, 2010. All rights reserved. BGS 100017897/2010).





**Figure 5.** MineralsUK.com web interface to the Strategic Stone Study GIS. (Contains Ordnance Survey data © Crown Copyright and database right 2010).

## 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. Upon completion of an area the data will be presented via the BGS mineralsUK.com website here:

[http://www.bgs.ac.uk/mineralsuk/mines/stones/EH\\_project.html](http://www.bgs.ac.uk/mineralsuk/mines/stones/EH_project.html) (British Geological Survey, 2012).

Using a simple search routine, it will be possible to locate quarries which are producing, or which have in the past produced, a particular building stone and similarly identify the buildings in which a particular stone was utilised.

The online GIS is available to all stakeholders, be they MPAs looking to inform the delineation of Mineral Safeguarding Areas (MSA) within LDDs and other planning considerations, architects looking to build new housing whilst retaining the local character, or conservators seeking sources of material for repair (Figure 5).

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