



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

User Guide Mining Hazard (not including coal) in Great Britain (version 5.1)

Open Report OR/14/037



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Front cover

Middleton limestone Quarry and Mine, Gorebridge, Midlothian.
Crown Copyright

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Maps and diagrams in this book use topography based on Ordnance Survey mapping.

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British Geological Survey offices

BGS Central Enquiries Desk

Tel 0115 936 3143

Fax 0115 936 3276

Email enquiries@bgs.ac.uk

Environmental Science Centre, Keyworth, Nottingham NG12 5GG

Tel 0115 936 3241

Fax 0115 936 3488

email sales@bgs.ac.uk

Murchison House, West Mains Road, Edinburgh EH9 3LA

Tel 0131 667 1000

Fax 0131 668 2683

email scotsales@bgs.ac.uk

Natural History Museum, Cromwell Road, London SW7 5BD

Tel 020 7589 4090

Fax 020 7584 8270

Tel 020 7942 5344/45

email bgslondon@bgs.ac.uk

Columbus House, Greenmeadow Springs, Tongwynlais, Cardiff CF15 7NE

Tel 029 2052 1962

Fax 029 2052 1963

Maclean Building, Crowmarsh Gifford, Wallingford OX10 8BB

Tel 01491 838800

Fax 01491 692345

Geological Survey of Northern Ireland, Colby House, Stranmillis Court, Belfast BT9 5BF

Tel 028 9038 8462

Fax 028 9038 8461

www.bgs.ac.uk/gsni/

Parent Body

Natural Environment Research Council, Polaris House, North Star Avenue, Swindon SN2 1EU

Tel 01793 411500

Fax 01793 411501

www.nerc.ac.uk

Website www.bgs.ac.uk

Shop online at www.geologyshop.com

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Summary

This report describes the national scale Mining Hazard (not including coal) dataset. The methods used to create the dataset have been evaluated and deemed fit for purpose by specialists in BGS.

This User Guide describes the dataset, outlines why it was created, its potential uses and provides advice on using the dataset.

1 Introduction

Founded in 1835, the British Geological Survey (BGS) is the world's oldest national geological survey and the United Kingdom's premier centre for earth science information and expertise. The BGS provides expert services and impartial advice in all areas of geoscience. Our client base is drawn from the public and private sectors both in the UK and internationally.

Our innovative digital data products aim to help describe the ground surface and what's beneath across the whole of Great Britain. These digital products are based on the outputs of the BGS survey and research programmes and our substantial national data holdings. This data coupled with our in-house Geoscientific knowledge are combined to provide products relevant to a wide range of users in central and local government, insurance and housing industry, engineering and environmental business, and the British public.

Further information on all the digital data provided by the BGS can be found on our website at <http://www.bgs.ac.uk/products/geohazards/> or by contactin:

Central Enquiries
British Geological Survey
Environmental Science Centre
Nicker Hill
Keyworth
Nottingham
NG12 5GG
Direct tel. +44(0)115 936 3143
Fax. +44(0)115 9363150
Email enquiries@bgs.ac.uk

2 About the Mining Hazard (not including coal) Dataset

Underground extraction of minerals and rocks has taken place in Britain for more than 5000 years. A variety of raw materials have been extracted, ranging from precious metals such as gold and silver, to sandstone and gypsum, using both surface and underground methods.

The voids resulting from past underground mining activity could pose a possible hazard. The Mining Hazard (not including coal) in Great Britain data layer draws together a diverse range of information derived from geology, which constrains distribution. Supplemented by literature searches to identify historic locations and expert knowledge to assemble, interpret and compile a digital dataset indicating the spatial extent of former mine workings.

Mining of coal is specifically excluded from this dataset and enquiries on past coal mining should be directed to the Coal Authority.

Information relating to individual polygons is stored in an attribute table and includes the hazards classifications used, which are described in section 2.3 and the minerals worked.

2.1 BACKGROUND

Public understanding of the effect of ground conditions to the safety of their property and the implication for the value of their property is growing. Local councils are under increasing pressure from central government to provide environmental information. Information about

geological and anthropogenic hazards is needed, in particular, the identification of areas with a potential for ground movement.

In response to this, The British Geological Survey initiated a development programme to produce datasets that identified and assessed potential geohazards threatening the human environment in Great Britain. The mining hazard (not including coal) datasets maps the results of our historical mining legacy as part of a comprehensive suite of geohazard datasets. The BGS development programme has also generated:

- Six ground stability hazard datasets (collapsible deposits, compressible ground, soluble rocks, running sand, landslides, shrink-swell)
- Superficial deposit thickness models
- Scans of onshore borehole logs for Great Britain
- Scans of geology and historic topography maps
- Ground permeability data
- Susceptibility to groundwater flooding data
- Geological indicators of past flooding data
- Radon potential
- Soil chemistry
- Soil parent material

2.2 WHO MIGHT REQUIRE THIS DATA?

The Mining Hazard (not including coal) dataset provides essential information for planners and developers working in areas where former shallow underground mine workings are a potential hazard.

Mining hazards may lead to financial loss for anyone involved in the ownership or management of property, including developers, householders and local government. These costs could include increased insurance premiums, depressed house prices and, in some cases, engineering works to stabilise land or property. Armed with knowledge about potential hazards, preventative measures can be put in place to alleviate the impact of the hazard to people and property. The cost of such prevention may be very low, and is often many times lower than the repair bill following ground movement.

2.3 WHAT THE DATASET SHOWS?

The voids resulting from past underground mining activity pose a possible hazard. Former underground workings, particularly where shallow, may collapse and cause surface settlement. The British Geological Survey dataset provides information on the potential for hazards resulting from past underground (non coal) mining.

Six classes are used to indicate different degrees of the likelihood the existence of underground workings resulting from non-coal mining activities as described below.

They are based on a combination of geological factors relating to the known distribution of mineral veins and other commodities that have been mined in the UK supplemented by information on known and suspected locations of workings.

It should be noted that this is not an assessment of mining instability but it does identify the likelihood of past non-coal mining at any particular location. It does not attempt to classify the risk of instability; and, even where undermined, the workings may be stable and therefore either present no risk of subsidence, or be at such a depth that even if collapse has occurred, the surface will not be affected.

The user is advised to seek further advice on the existence of known workings and, if present, their potential impact on surface stability.

Stabilisation by remedial treatment is not taken into account in this dataset. The impacts of mining methods, such as roof collapse behind longwall workings, where surface impacts occur within a few years of the mining activities following which surface effects are minimal, have also not been considered. Due to these factors some high rated areas that have been extensively mined in the past will have an E rating but may not have any surface stability issues as a result of this mining.

CLASS DESCRIPTORS

Unclassified

There is no known hazard from underground mine workings because the rock types present are such that no commodities or metal ores have been worked by underground mining methods. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, you should still consider a Coal Authority mining search for the area of interest.

Occasional minor mining may have occurred but of restricted extent (A)

Hazards because of underground mine workings are uncommon, localised and of limited area. The rock types present in this area are such that minor mineral veins may be present within them on which it is possible that there have been attempts to work these by underground methods and/or it is possible that small scale underground extraction of other materials may have occurred. All such occurrences are likely to be restricted in size and infrequent. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, you should still consider a Coal Authority mining search for the area of interest.

Rare and localised small scale mining may have occurred. (B)

Hazards because of underground mine workings may occur. The rock types present in these areas are such that small mineral veins may be present on which it is possible that small scale mining has been undertaken and/or it is possible that limited underground extraction of other materials may have occurred. All such occurrences are likely to be of minor localised extent and infrequent. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, you should still consider a Coal Authority mining search for the area of interest.

Small scale mining may have occurred but restricted in extent. (C)

Hazards because of underground mine workings are unlikely. The rock types present in these areas are such that mineral veins may be present on which it is possible that mining has been undertaken and/or it is possible that small scale underground extraction of other materials may have occurred. All such occurrences are likely to be of localised extent and infrequent. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, you should still consider a Coal Authority mining search for the area of interest.

Underground mining is known or considered likely to have occurred within or close to the area. The location extent and nature of past mining should be considered in any site investigation. Potential for difficult ground conditions should be considered. (D)

Hazards because of underground mine workings are probable. These are areas known or suspected to contain underground mining for minerals and/or other materials. In the case of mineral veins these are areas within 500m of mapped mineral veins within which it is likely that mining activities may have occurred and subsidiary veins explored and exploited. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, you should still consider a Coal Authority mining search for the area of interest.

Underground or opencast mining is known or considered likely within or very close to the area. Location, extent & nature of past mining should be considered in site investigations. Potential for difficult ground conditions should be considered. (E)

Hazards because of underground mine workings are to be expected. These are areas known or suspected to contain underground mining for minerals and/or other materials where workings are likely to be extensive. In the case of mineral veins these are areas within 200m of mapped mineral veins within which it is likely that mining activities may have occurred. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, you should still consider a Coal Authority mining search for the area of interest.

3 Technical Information

3.1 SOURCE OF INFORMATION

Polygon outlines are derived from BGS 1:50,000 scale DiGMapGB (the digital geological map of Great Britain) data, plus additional information derived from expert knowledge and literature to define areas of potential hazard from past underground mining activity.

3.2 SCALE

The Mining Hazard (not including coal) dataset has been developed at 1: 50 000 scale and is not suitable for use at larger scales. Care must be taken when using the dataset at different scales because of the accuracy of the underlying geological map data from which the dataset is partially derived.

All spatial searches against the data should be done with a minimum 50m buffer.

3.3 CREATION OF THE DATASET

The Mining Hazard (not including coal) GB dataset considered some 50 mineral commodities which were sub divided into seven general categories with shared characteristics:

1. Vein Minerals includes copper, lead, zinc, tin.
2. Chalk
3. Oil shale
4. Building stone including limestone, sand, sandstone, slate.
5. Bedded ores including iron ores (haematite), manganese, sulphides.
6. Evaporites including gypsum, anhydrite, potash, salt.
7. Other commodities including ball clay, black marble, jet, graphite, chert.

A methodology was devised for each category based on the local geological factors, expert knowledge and detailed research from literature. The resulting spatial and geological data was processed using ArcGIS software.

Once the seven individual layers were defined they were then merged to produce a single comprehensive mining hazard layer. It should be noted that in bringing together the separate data layers normalisation of the hazard ratings was applied to ensure consistency in the identification of potential mining hazard.

3.4 FIELD DESCRIPTIONS

Table 1 Attribute table field descriptions

Field name	Field description
SHAPE	Necessary for the ESRI shapefile format indicating polygon data
NAME	This is the site name where available. For some data types for example building stones the sites specific names e.g. Bethel, Draycott-in-the-Moor, Ewe Crag this has been given. For other materials the localities are much more general and many not have details of the site name. This is the case for the majority of localities in which case this field is null. Where more than one name is given e.g. Dalry/Glenarnoch it indicates working of more than one resource type. See Note 1
COMMODITY	Where information is available on the commodity worked it is recorded here e.g. Bath stone, limestone, brine. Note 1 and Note 3
CLASS	The value in this field represents the overall mining hazard rating for each polygon. It represents the highest hazard value assigned to a polygon regardless of the mining type i.e. a polygon with a building stone rating of B and a vein mineral rating of E is given a class E rating See Note 2
LEGEND	Brief description of classes, for more detailed explanation see section 2.4.
COMMENTS	Contains supplementary information about a locality.
VERSION	Mining Hazard not Including Coal for Great Britain v5.1
Note 1	Where more than one commodity occurs at a location they are both shown e.g. Vein minerals/Building stone. The order also applies to the Name field i.e. Name = Dalry/Glenarnoch Group = Vein Minerals/Building stone Dalry is therefore a vein minerals location whilst Glenarnoch is the building stone name.
Note 2	If a site lies within a rated polygon, it does not necessarily indicate the presence of mining, rather the likelihood of past mining to have occurred. In these cases it is recommended that further enquiries are made regarding the potential for mining related hazard.
Note 3	Where no information is available a description of 'Not available' it indicates that no value has been found.

3.5 DATASET HISTORY

The original version of the Mining Hazard (not including coal) GB V1 was released in February 2009.

Since then work has continued to develop the dataset resulting in the release of this new version release as Mining Hazard (not including coal) GB V5. The main enhancements which have been made prior to the release of version 5 are:

- Inclusion of more building stone locations.
- Re-working of the chalk methodology to provide improved coverage
- Re-design of the vein minerals methodology to produce a more focused and representative extent for this set of commodities.

Early in 2014 a number of mining related sink hole events occurred. As a consequence a small number of revisions have been made to the Mining Hazard (not including coal) dataset. These revisions have resulted in the release of an interim Version 5.1 of the dataset prior to a major update to include coal mining hazards (due in 2015).

The updates were focused on generalisation of some of the known chalk localities in the South East of England. To reflect the change in the geometry of the data a comments field has been included in the attribute table to record chalk localities where an approximate grid reference is available but no further detail. These grid references are accurate to within 1000m so all features within a 1000m grid cell have been tagged with the comment to indicate that chalk workings are known at that locale but no more specific information is available.

Note: In 2008 BGS introduced its new versioning system whereby the version number of the dataset relates to the version of DiGMapGB-50 base data, the original version of Mining Hazard (not including coal) was released as version 1 but to comply with this naming practice it has jumped from Mining Hazard (not including coal) version 1 to version 5.

3.6 COVERAGE

Data coverage includes England, Scotland and Wales. For data distribution see Figure 1.

3.7 DATA FORMAT

The Mining Hazard (not including coal) dataset has been created as vector polygons and are available in a range of GIS formats, including ArcGIS (.shp), ArcInfo Coverages and MapInfo (.tab). More specialised formats may be available but may incur additional processing costs.

3.8 LIMITATIONS

- Most geological maps were originally fitted to a particular topographic base and care must be taken in interpretation, for example when the geological data are draped over a more recent topography. All spatial searches against the data should be done with a minimum 50 m buffer.
- The observations made in the production of this data are according to the prevailing understanding of the subject at the time. The quality of such observations may be affected by subsequent advances in knowledge, improved methods of interpretation, and access to new source of information.
- Raw data may have been transcribed from analogue to digital format, or may have been acquired by means of automated techniques. Although such processes are subjected to quality control to ensure reliability where possible, some raw data may have been processed without human intervention and may in consequence contain undetected errors.
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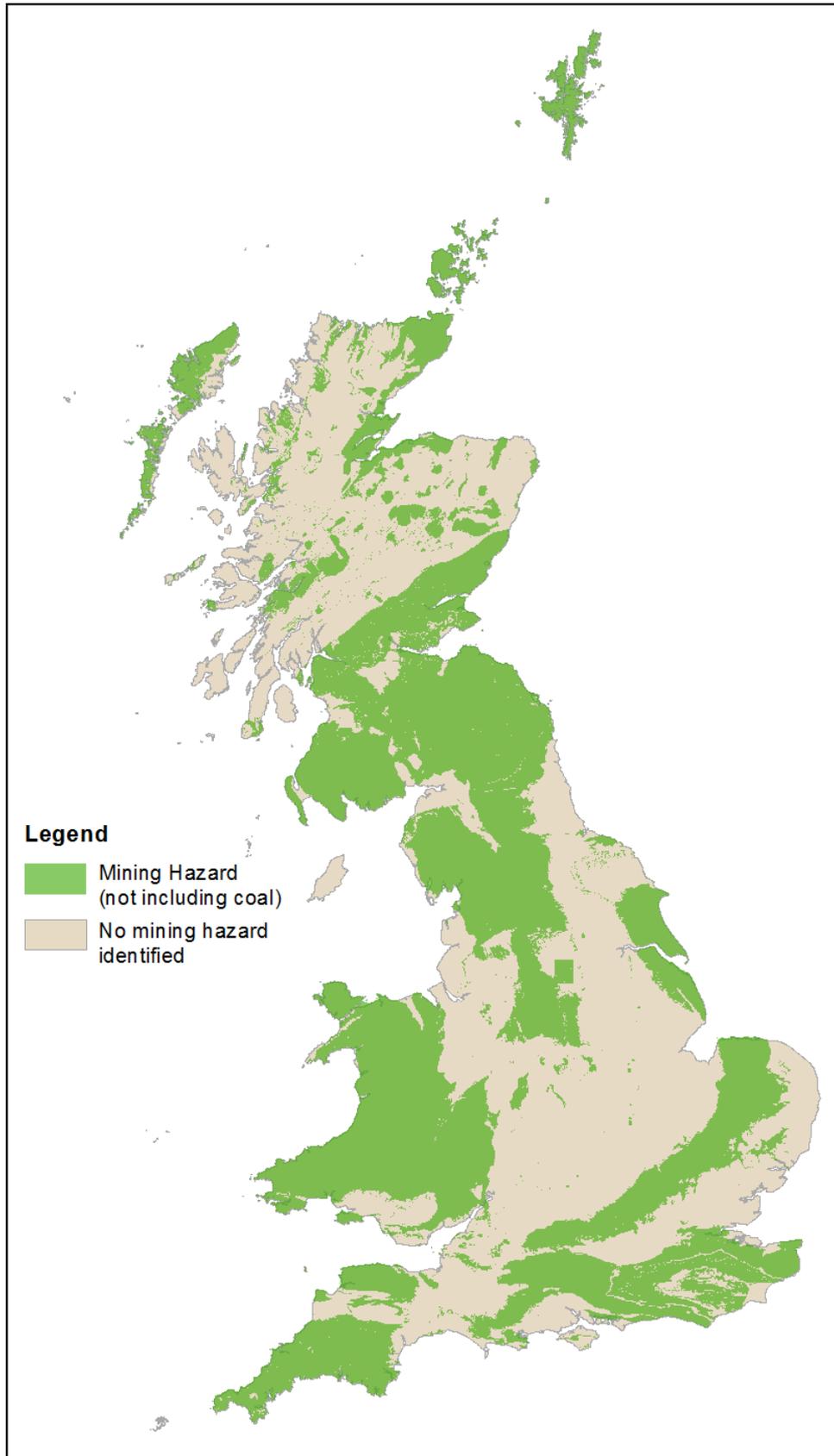


Figure 1 Coverage of the Mining Hazard (not including coal) dataset

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- If customers are uncertain about the use of particular data they should seek professional advice. They may consult the BGS contacts listed at the end of this document on technical matters, licensing arrangements, or geological aspects including the appropriateness and limitations of the data.
- Although there are a number of sites affected by underground mining where remediation has occurred including parts of the Northwich salt field, Barrow-on Soar, Coalbrookdale, Dudley and Bury St Edmunds, the impact of this remediation work is not considered in this assessment and all ratings are given as if localities are unremediated.

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