



BGS GeoSure 5km hex grids

1. Introduction to hexagon grids

Hex grids are an alternative method of displaying and visualising spatial data and allow a statistical analysis of often complex datasets. BGS have developed a series of hex gridded datasets based on their geohazard and geological property data to provide users with an open licence, easy to view visualisation. It is intended that these provide a generalised regional to national scale overview of information to enable the user to perform a quick assessment before more detailed studies or investigations are planned. The hex grid version of our datasets are currently available for the following datasets:

- Mining hazard (not including coal)
- GeoSure, including:
 - Landslides (slope stability)
 - Shrink Swell potential
 - Soluble rocks (dissolution)
 - Compressible ground
 - Collapsible deposits
 - Running sand
- Superficial thickness model

2. What the data shows

These datasets provide a generalised overview of the susceptibility to six naturally occurring geohazards in Great Britain. The hexagon grid provides a national-scale summary of the GeoSure data product. The detailed dataset (see <http://www.bgs.ac.uk/products/geosure/home.html>) is also available to licence and provides further detail (see examples below) at a scale of 1:50 000.

The data has been generalised into a vector map of interlocking hexagon cells (a side length of 5km), with an area approximately 65km². There are 3 classes included within the data, as described in the tables below.

The six layers of data provided are as follows:

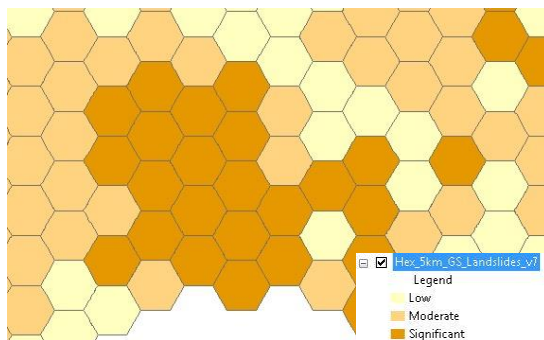
Landslides (slope stability)



Slope instability occurs when particular slope characteristics (such as geology, gradient, sources of water, drainage, or the actions of people) combine to make the slope unstable. Downslope movement of materials, such as a landslide or rockfall may cause damage, such as a loss of support to foundations or services or, in rare cases, impact damage to buildings.

Class	Legend	Advisory	Notice	Version
1	Low	Areas of localised significant rating	Not suitable for local or site specific analysis, data is generalised for national overview uses only	V8
2	Moderate	Areas of localised significant rating	Not suitable for local or site specific analysis, data is generalised for national overview uses only	V8
3	Significant	Areas of localised significant rating	Not suitable for local or site specific analysis, data is generalised for national overview uses only	V8

The data is visualised as a 5km scale hex grid and 3 categories as described below.

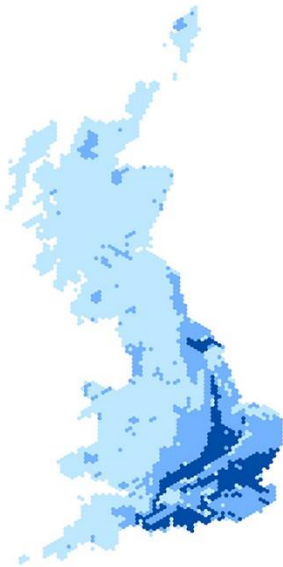


a) 5km hexagon grid data



b) 1:50K detailed source dataset of the same area

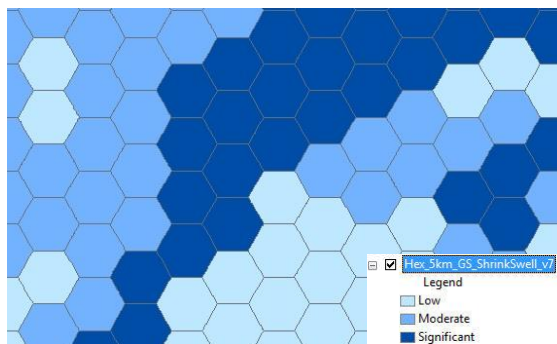
Shrink Swell potential



Swelling clays can change volume due to variation in moisture, this can cause ground movement, particularly in the upper two metres of the ground that may affect many foundations. Ground moisture variations may be related to a number of factors, including weather variations, vegetation effects (particularly growth or removal of trees) and the activities of people. Such changes can affect building foundations, pipes or services.

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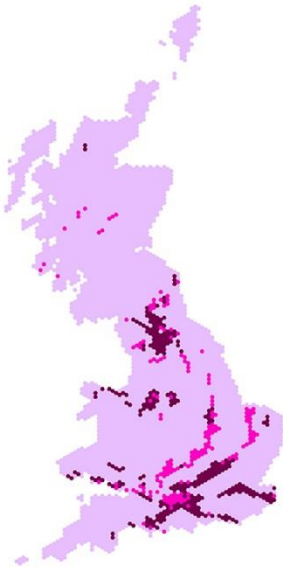


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b) 1:50K detailed source dataset of the same area

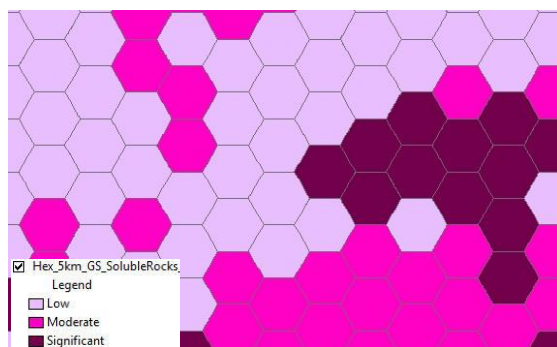
Soluble rocks (dissolution)



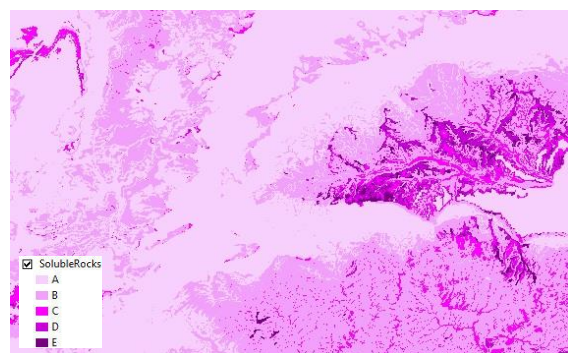
Ground dissolution occurs when certain types of rocks, containing layers of soluble material, get wet and the soluble material dissolves. This can cause underground cavities to develop. These cavities reduce support to the ground above and can lead to a collapse of overlying rocks.

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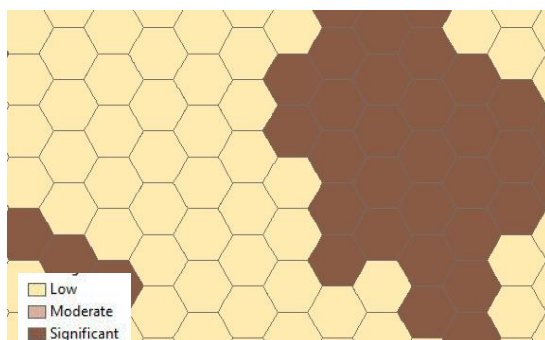
Compressible ground



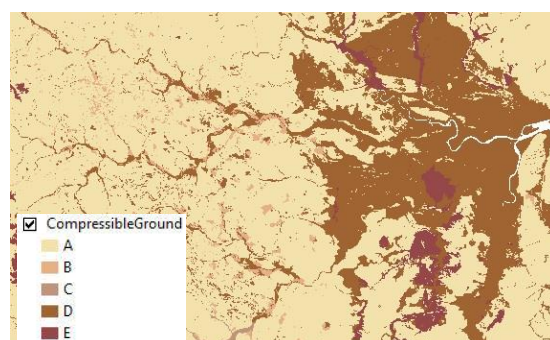
Some types of ground, may contain layers of very soft materials like peat or some clays. These may compress if loaded by overlying structures, or if the groundwater level changes. This compression may result in depression of the ground surface, potentially disturbing foundations and services.

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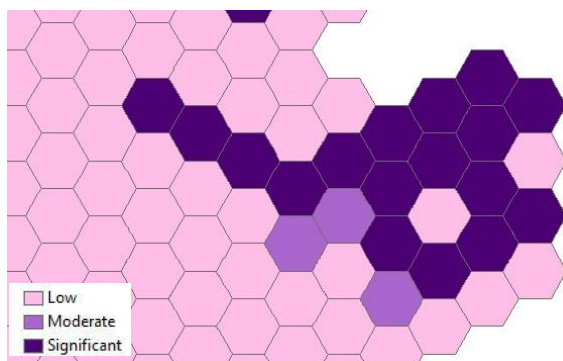
Collapsible deposits



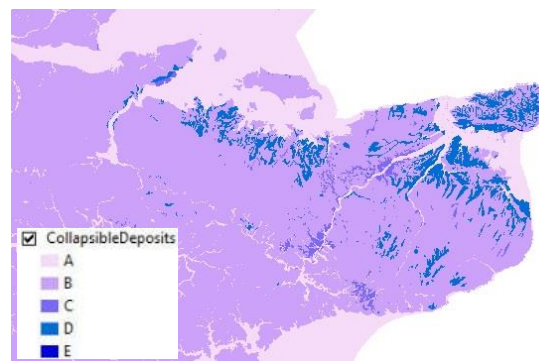
Some kinds of rocks and soils may collapse when a load (such as a building or road traffic) is placed on them, especially when they become saturated. Such collapse may cause damage to overlying property or services.

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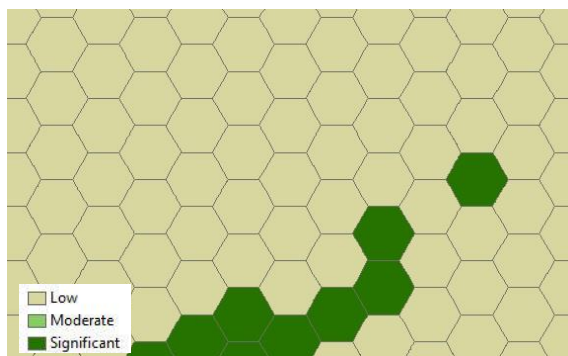
Running sand



Some rocks can contain loosely packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', potentially removing support from overlying buildings and causing damage.

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How the data was generalised

The class divisions were generalised from 5 down to 3 from the detailed dataset. This was to simplify the amount of data and to group 'similar' types of category to ensure that appropriate detail and definition can be portrayed clearly and is appropriate for the resolution of the data.

All layers were generalised from 5 classes to 3 as follows:

A + B = 1

C = 2

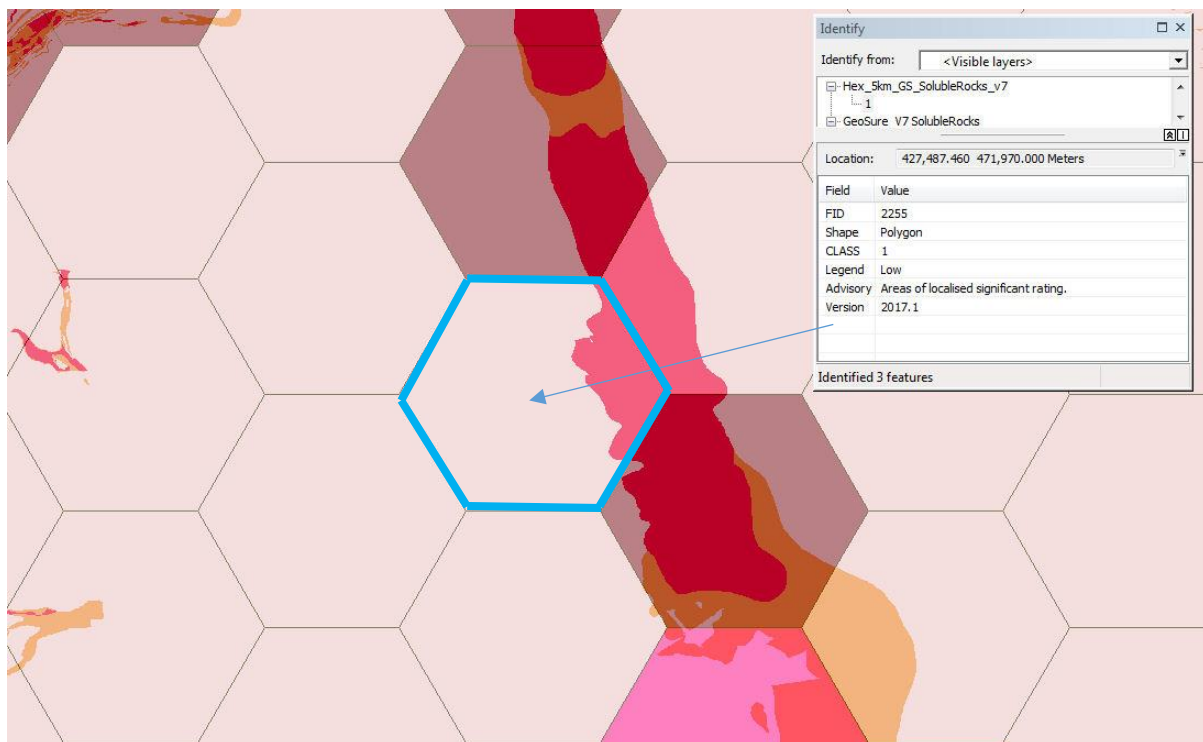
D + E = 3

The following processes were applied:

GeoSure: Shrink Swell	Generalise GeoSure A-E classes into 1 - 3	Identify the worst case score within each 1km hexagon.	Attribute the whole 1km hex grid cell with the worst case score.	Dissolve result into clean 1km hex grid.	Generalise the 1km data up to 5km hex grids. Score the 5km hex grid with the dominant coverage.
GeoSure: Compressible Ground	Generalise GeoSure A-E classes into 1 - 3	Identify classes 2 and 3 at 1km hex. Calculate their coverage and remove any polygons with <20% coverage.	Attribute the 1km hex grid cell with the worst case score.	Dissolve result into clean 1km hex grid.	Generalise the 1km data up to 5km hex grids. Score the 5km hex grid with the dominant coverage.
GeoSure: Running Sand	Generalise GeoSure A-E classes into 1 - 3	Identify classes 2 and 3 at 1km hex. Calculate their coverage and remove any polygons with <20% coverage.	Attribute the 1km hex grid cell with the worst case score.	Dissolve result into clean 1km hex grid.	Generalise the 1km data up to 5km hex grids. Score the 5km hex grid with the dominant coverage.
GeoSure: Soluble Rocks	Generalise GeoSure A-E classes into 1 - 3	Identify the worst case score within each 1km hexagon.	Attribute the 1km hex grid cell with the worst case score.	Dissolve result into clean 1km hex grid.	Generalise the 1km data up to 5km hex grids. Score the 5km hex grid with the dominant coverage.
GeoSure: Collapsible Deposits	Generalise GeoSure A-E classes into 1 - 3	Identify the worst case score within each 1km hexagon.	Attribute the 1km hex grid cell with the worst case score.	Dissolve result into clean 1km hex grid.	Generalise the 1km data up to 5km hex grids. Score the 5km hex grid with the dominant coverage.
GeoSure: Landslides	Generalise GeoSure A-E classes into 1 - 3	Identify classes 2 and 3 at 1km hex. Calculate their coverage and remove any polygons with <20% coverage.	Attribute the 1km hex grid cell with the worst case score.	Dissolve result into clean 1km hex grid.	Generalise the 1km data up to 5km hex grids. Score the 5km hex grid with the worst case score.

Limitations

- Data has been generalised to 5km² hexagon grid, it must not therefore be used at larger scales (i.e. not to be used with higher resolution maps, or data).
- Summarising via spatial statistics may lead to under or over estimation of the extent of a hazard. For example the highlighted cell in the Ripon area (shown below) has a narrow but continuous area of soluble rocks which are classed as a high hazard susceptibility, however because of generalisation, this detail is not evident. **In these cases we have included a field 'Advisory' which indicates where areas of significant rating occur, but are not large enough to code the hex grid at this scale.**



- Conversion to a hexagon grid generalises the data altering perception of the spatial distribution. Results of any analysis and subsequent interpretation should be viewed with care.
- Comparison with the underlying source data will reveal variations due to the generalisation process applied.
- GeoSure is concerned with potential ground stability relating to NATURAL geological conditions only. GeoSure does not include man made hazards such as contaminated land or mining. The only exception is the compressible ground layer which does consider man-made ground e.g. landfill.
- GeoSure is based on, and limited to an interpretation of the records in the possession of British Geological Survey at the time the dataset was created.



- An indication of natural ground instability does not necessarily mean that a location will be affected by ground movement or subsidence. Such an assessment can only be made by inspection of the area by a qualified professional.

Licensing

To encourage the use and re-use of this data we have made it available under the Open Data Licence (www.nationalarchives.gov.uk/doc/open-government-licence/version/3/), subject to the following acknowledgement accompanying the reproduced BGS materials: "Contains British Geological Survey materials ©NERC [year]".

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- Map viewers
- Apps
- Downloadable data
- Web services
- Photos and images
- Publications
- Scanned records
- Collections
- Software

Please refer to OpenGeoscience [www.bgs.ac.uk/Opengeoscience] for more information and a full listing of datasets and services available under this service.