

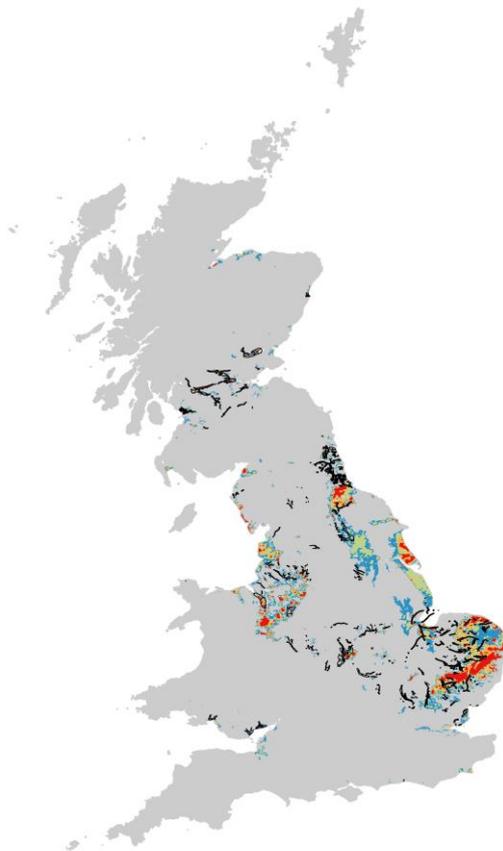


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User Guide for the British Geological Survey Buried Valleys Version 1

Open Report OR/19/024



BRITISH GEOLOGICAL SURVEY

GEOLOGY AND LANDSCAPE, ENGINEERING GEOLOGY AND INFRASTRUCTURE
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OPEN REPORT OR/19/024

User Guide for the British Geological Survey Buried Valleys Version1

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No. 100021290 EUL.

Keywords

Buried valley; Quaternary; tunnel
valleys; drift filled channels; sub-
drift topography.

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National Grid Reference

SW corner 208314,999999
NE corner 872636,655165

Front cover

The buried valley onshore data.

Bibliographical reference

KEARSEY, T.I., LEE, J.R., GOW,
H. . 2017. User Guide for the
British Geological Survey Buried
Valleys (onshore) Version1.
*British Geological Survey Open
Report, OR/19/024.* 17pp.

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Foreword

This User Guide describes the content and use of the Geographic Information System (GIS) suite of data relating to the Buried Valleys (onshore). It is designed to provide a better understand of the potential applications and limitations that the suite of data may have. Whilst unlocking the meaning through description of content and terminology used.

A second accompanying open report OR/19/003 describes the scientific detail and parameters used to develop the methodology used is also available. The purpose of this second report is to afford users a better appreciation of how the suite of data has been created.

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Acknowledgements

The authors would like to thank the many individuals (past and present) in BGS who have record the presence of buried valleys across the country. Marieta Garcia-Bajo for her expertise and freely sharing some of the input data from the National Superficial Deposit Thickness Model, which this data complements. Also all the borehole interpreters, without whom this work would have not been possible.

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> or by contacting:

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2 About the Buried Valley suite of data

2.1 BACKGROUND

Buried valleys are ancient sub-aerial (river) or subglacial (beneath a glacier) drainage networks that are now abandoned and have become either partly or completely buried by more recent sediment. As such, buried valleys often exhibit little or no surface expression within the modern landscape.

The concealed occurrence of buried valleys can have significant and often unexpected implications for groundwater, hydrocarbon and geothermal resources. Buried valleys can also be significant stores of sand and gravel mineral resources which can act as traps for contaminants as well as pathways into groundwater aquifers.

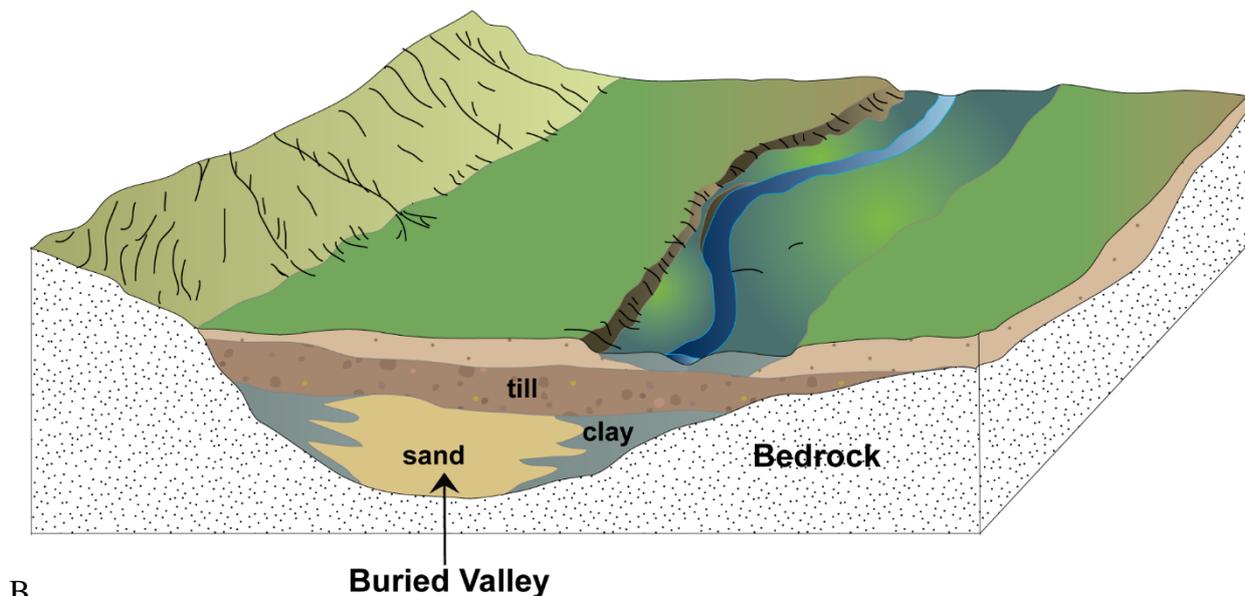


Figure 1. A stylised example of a buried valley. Note how it is offset from the modern river system. The sequence of sediment infilling the buried valley is purely illustrative and in reality the fill of a buried valley can vary greatly between valleys.

The British Geological Survey (BGS) has recognised and identified buried valleys through its survey activities since the 1870's (Mellard Reade, 1873), although no systematic GB dataset has ever been produced. Since the 2000's BGS has published a Superficial Deposits Thickness Model (SDTM) which models variation in thickness of natural largely unconsolidated deposits that cover much of the bedrock across Great Britain (Lawley and Garcia-Bajo, 2009). Kearsey *et al.*, (2018) recognised a key limitation of the SDTM methodology was that it under-represented the spatial occurrence of linear features such as buried valleys.

The British Geological Survey has initiated the development of the Quaternary Heterogeneities Program, which develops datasets that describe the distribution of non-uniform geological properties produced by geological processes that have occurred over the past 2.5 million years. The project is developing a range of datasets to consider a range of heterogeneities (defined as distinctly non-uniform characteristics). The Buried Valleys suite of data describes one of these heterogeneities.

2.2 WHO MIGHT REQUIRE THIS DATA?

This data is for users who are seeking information about the locations of buried valleys across Great Britain.

Buried Valleys are important features for geologists, civil engineers, hydrogeologists and environmental scientists because their presence and extent is often unknown. The presence of a buried valley can often have significant and unpredictable implications for users needing to understand the elevation of the bedrock surface, the thickness of superficial deposits and the interface between the two. Equally this data will be of interest to the research community of Great Britain as buried valleys provide detailed archives of palaeoenvironmental (i.e. an environment from the geological past) and landscape change.

The dataset aims to provide users with an initial indication of where a buried valley may be present (see also 3.6 Limitations). This dataset should not be used to replace the need for detailed site investigation using boreholes or geophysical methods to help characterise the feature.

2.2.1 Relationship to the superficial deposits thickness model

The BGS creates the National Superficial Deposit Thickness Model (SDTM) as a licenced product (Lawley and Garcia-Bajo 2009). Although the Buried Valleys (onshore) data shares some of the same input data it is not meant as a replacement but compliments the existing data.

The key differences are:

- The Buried Valleys (onshore) data is presented at a coarser scale than the SDTM Model (1:250 000 compared to 1:50 000 of the SDTM).
- The all superficial deposits between 40-161 m are grouped together in the Buried Valley dataset but are in the SDTM Model.
- The Buried Valleys (onshore) data was created through an expert driven process specifically targeted at identifying buried valleys, which has removed superficial features such as drumlins and other mounds.

Please do not use this as the Buried Valley dataset as an indicator of superficial thickness. For superficial thickness please use the National Superficial Deposit Thickness Model (SDTM).

2.3 WHAT THE DATA SHOWS?

The Buried Valleys (onshore) data suite is derived from two data resources and is delivered as three separate data layers:

- Historic published buried valley centre lines (linear features);
- Historic published buried valley margins (polygons);
- Modelled Thickness of Buried Valleys (polygons).

2.3.1 Historic references to Buried Valleys

The two historic layers contain a compilation of published interpretations of buried valleys. This data has been gathered from 96 different publications (see Kearsley et al. 2019 for details) which range in age from 1926-2018.

The geographic location of buried valleys identified from maps and diagrams in printed historic sources were used to create two data layers. Identified buried valley features were captured either using a centre line of the mapped feature (lines) or the margins of recorded feature (polygons).

2.3.2 Modelled Thickness of Buried Valleys

An alternative method which may recognise potential areas for the occurrence of buried valleys has been devised. This method identifies significant areas of superficial thickening from boreholes. A semi-automated interpretation method has been established to identify areas of significant superficial thickening. Where the centre of the feature contains >20m of superficial deposits. The source data is based on the current BGS onshore borehole dataset.

This new data was created as the BGS's digital borehole database postdates the majority of the historical references to buried valley references. The resulting methodology may be able to identify, and resolve more buried valleys when compared to those discovered through traditional geological mapping activities.

3 Technical Information

3.1 SCALE

The buried valley suite of data was produced for use at 1:250 000 scale providing 250 m ground resolution.

3.2 FIELD DESCRIPTIONS

Each buried valley theme (GIS map layer) contains a series of attribute fields specific to the data they contain. For example, the historic buried valleys include a reference field identifying the data source. Table 1 describes the Buried Valleys Historic data (centrelines and margins); whilst Table 2 lists the contents of the Modelled Thickness of Buried Valleys theme.

Table 1 Attribute table field descriptions for Buried Valleys Historic centrelines and Buried Valley Historic margins.

FIELD NAME	FIELD TYPE	DESCRIPTION
REFERENCE	Text	The reference from which the data was drawn from
FEATURE	Text	The name of the dataset: e.g. Buried Valley Historic centrelines
SCALE	Text	The scale used to prepare the digital data: e.g. 250000 for 1:250 000
VERSION	Text	Version number and attribute level of the digital data: e.g. v1.0

Table 2 Attribute table field descriptions for Buried Valleys Modelled Thickness of Buried Valleys theme

FIELD NAME	FIELD TYPE	DESCRIPTION
FEATURE	Text	The name of the dataset: e.g. Buried Valley Historic centrelines
THICKNESS	Text	Thickness of superficial deposits based on a computer interpolation
SCALE	Text	The scale used to prepare the digital data: e.g. 625000 for 1:625 000
VERSION	Text	Version number and attribute level of the digital data: e.g. v1.0

3.3 EXPLANATION OF THE DATA

3.3.1 Historic references to Buried Valleys

The Buried Valley Historic centrelines and Buried Valley Historic margins GIS layers contain the references from which the data they contain was mined.

In some instances, different references interpret the same features differently. In cases of multiple interpretations no judgement has been made and all interpretations are included. This enables the user to visualise the diversity of interpretations (Figure 2) and obtain a rudimentary understanding of uncertainty of their location.

For full details see Kearsey et al. 2019. Buried Valleys Version 1 - (OR/19/003)

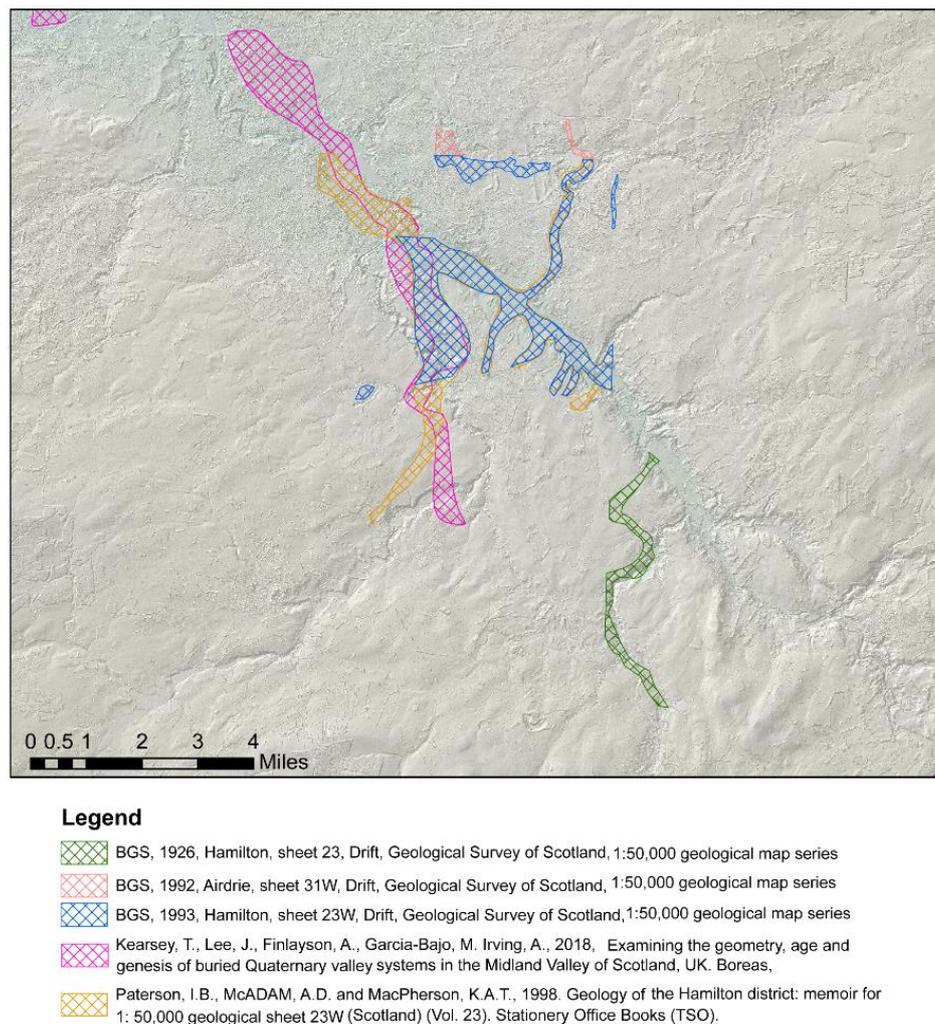


Figure 2. Multiple interpretations of the position of a set of buried valley margins. The colours pick out different interpretations of the locations of the positions of the features. Contains NEXTMap™ Britain elevation data from Intermap Technologies. Created using ArcGIS. Copyright © Esri. All rights reserved.

3.3.2 Modelled Thickness of Buried Valleys

Modelled Thickness of Buried Valleys is captured from open access borehole records contains the contoured thickness of superficial deposits. These features are grouped in the 5 different categories based on a computer interpolation. The categories are as follows:

- 10m – 20 m
- 20m – 30 m
- 30m – 40 m
- Greater than 40 m

The ‘Greater than 40 m’ category includes all features to a maximum thickness of 161 m of superficial deposits.

Buried Valleys are defined as features centred on five or more boreholes containing 20 m or more of superficial deposits. Locations which failed to meet either one of these criteria were removed from the data.

For full details see Kearsley et al. 2019. Buried Valleys Version 1 (OR/19/003)

3.4 COVERAGE

Data covers the known locations of buried valleys across Great Britain

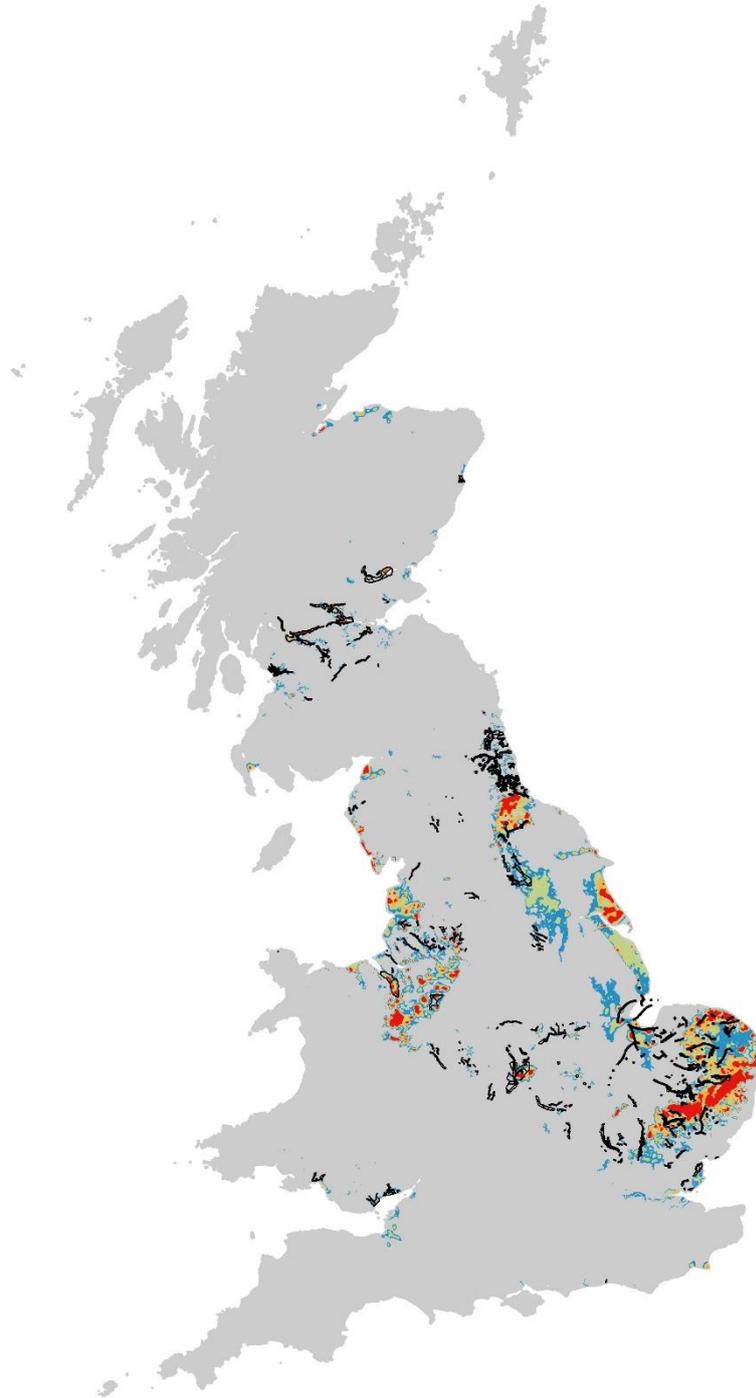


Figure 3. The coverage of the Buried Valley data. Contains Ordnance Survey Data © Crown Copyright and database rights 2019. Ordnance Survey Licence no. 100021290. Created using ArcGIS. Copyright © Esri. All rights reserved.

3.5 DATA FORMAT

The Buried Valley suite of data has been created as vector polygons. The data 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.

3.6 LIMITATIONS

- The Buried Valleys suite of data has been developed at 1:250 000 scale and must not be used at larger scales. All spatial searches against the data should therefore be conducted using a minimum 250 m buffer.
- Buried Valley data described here represents a baseline of BGS' current understanding of the locations of buried valleys onshore in Great Britain. This information is based on our currently held historical literature and borehole data. It is inevitable that some of the information may in the light of further evidence be deemed incorrect, and require revision or rejection. This data will form the basis of future research into these features and as a consequence will be periodically updated to include new information as it becomes available.
- Buried Valleys data should only be used as an indicator where evidence has pointed to the presence of a buried valley. However, the absence of evidence does not substantiate the absence of buried valley features.
- Buried Valleys data contains multiple interpretations as no judgement has been made and all interpretations are included. This enables the user to visualise the diversity of interpretations and obtain a rudimentary understanding of uncertainty of their location.
- The Historic Buried Valley data covers only known areas where research has been carried out and published. In other words it is an empirical dataset and this aspect of the dataset will evolve as additional material is identified or published.
- Coverage of the modelled thickness of buried valleys is limited to areas where the source data is available for processing.
- For a full discussion of the assumptions and limitation of the Buried Valley data see Kearsley et al. 2019. Buried Valleys Version 1 (OR/19/003).

4 Licensing Information

To encourage the use and re-use of this data we have made it available under the Open Government 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 ©UKRI [year]".

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- Apps
- Downloadable data

- Web services
- Photos and images
- Publications
- Scanned records
- Collections

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

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References

British Geological Survey holds most of the references listed below, and copies may be obtained via the library service subject to copyright legislation (contact libuser@bgs.ac.uk for details). The library catalogue is available at: <https://envirolib.apps.nerc.ac.uk/olibcgi>.

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