

The enhanced classification of Artificial Ground as a tool to investigate and represent anthropogenic processes in the recent geological record



British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

The modern landscape, including the near subsurface, reflects the interaction between natural and human processes. The landscape evolves through time as a result of land use change brought about by human activity. These activities and their impacts are as diverse as the construction of Iron Age mounds through to large scale contemporary urbanisation to support 21st Century population growth. Understanding these landscape evolution processes, and their legacy of made, worked and infilled ground (Artificial Ground), provides a basis for characterising historical land use and modelling future environmental change. This presents a variety of environmental, geological and engineering challenges that the British Geological Survey aims to address through the provision of accurate information on anthropogenic deposits and processes.

An enhanced classification scheme of Artificial Ground has been developed to facilitate a more comprehensive representation of Artificial Deposits in 2D and 3D. This scheme builds on the conventional 5-fold classification currently used on BGS maps. The new scheme uses a hierarchy of Class, Type and Unit, with Class being the most basic level of information and Unit being the most detailed, similar to the way the BGS Stratigraphical Lexicon is ordered by Group, Formation and Member. Classes are defined based on a combination of landform and process of deposition.

Classification (after McMillan & Powell, 1999)

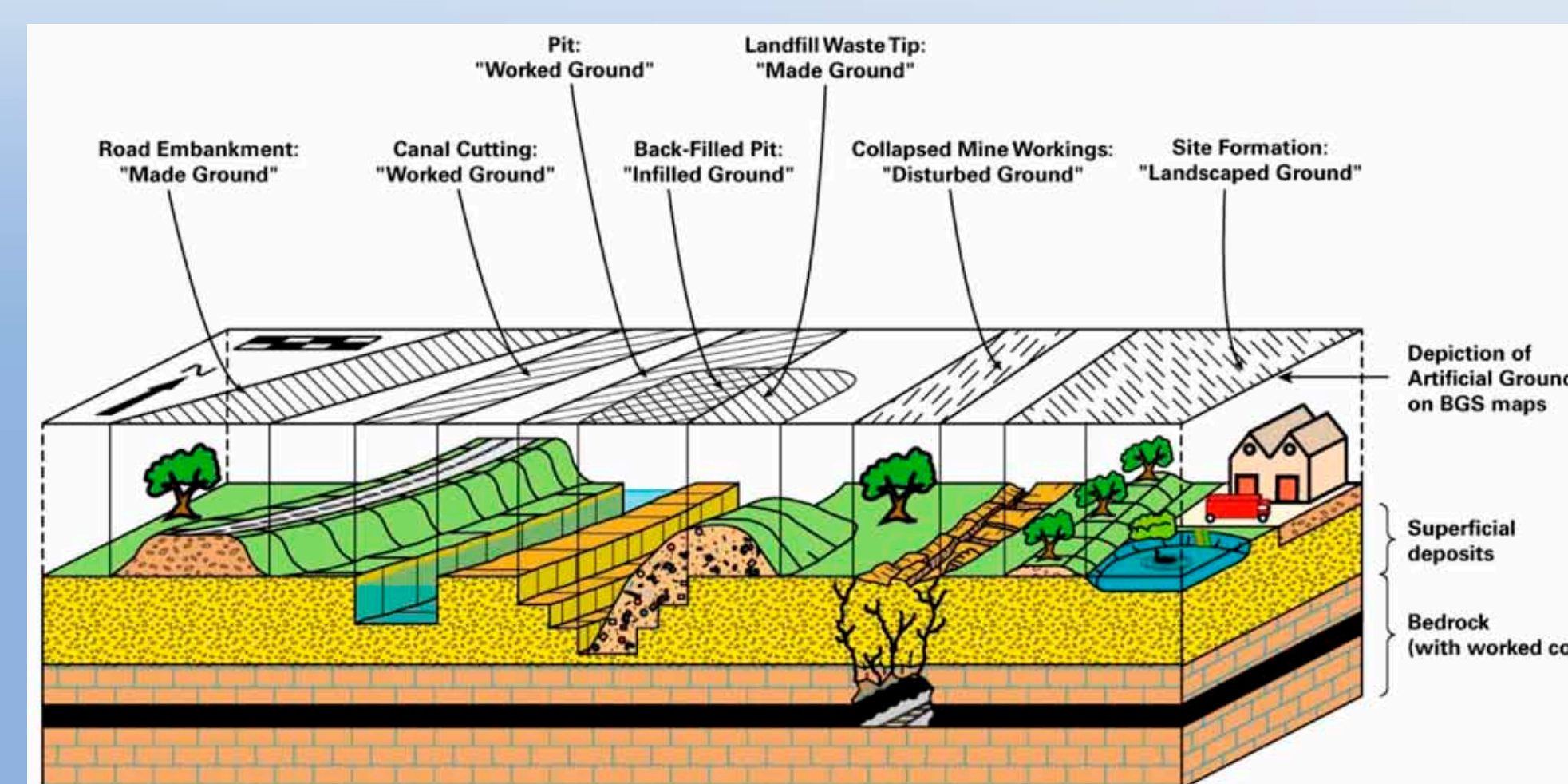
Made Ground Areas where material has been placed by man on the former natural ground surface (includes engineered fill).

Worked Ground Areas where the ground has been excavated by man.

Infilled Ground Areas where the ground has been excavated by man and then wholly or partially infilled with Made Ground.

Disturbed Ground Areas of ill-defined surface disruption caused by surface or near-surface mineral workings.

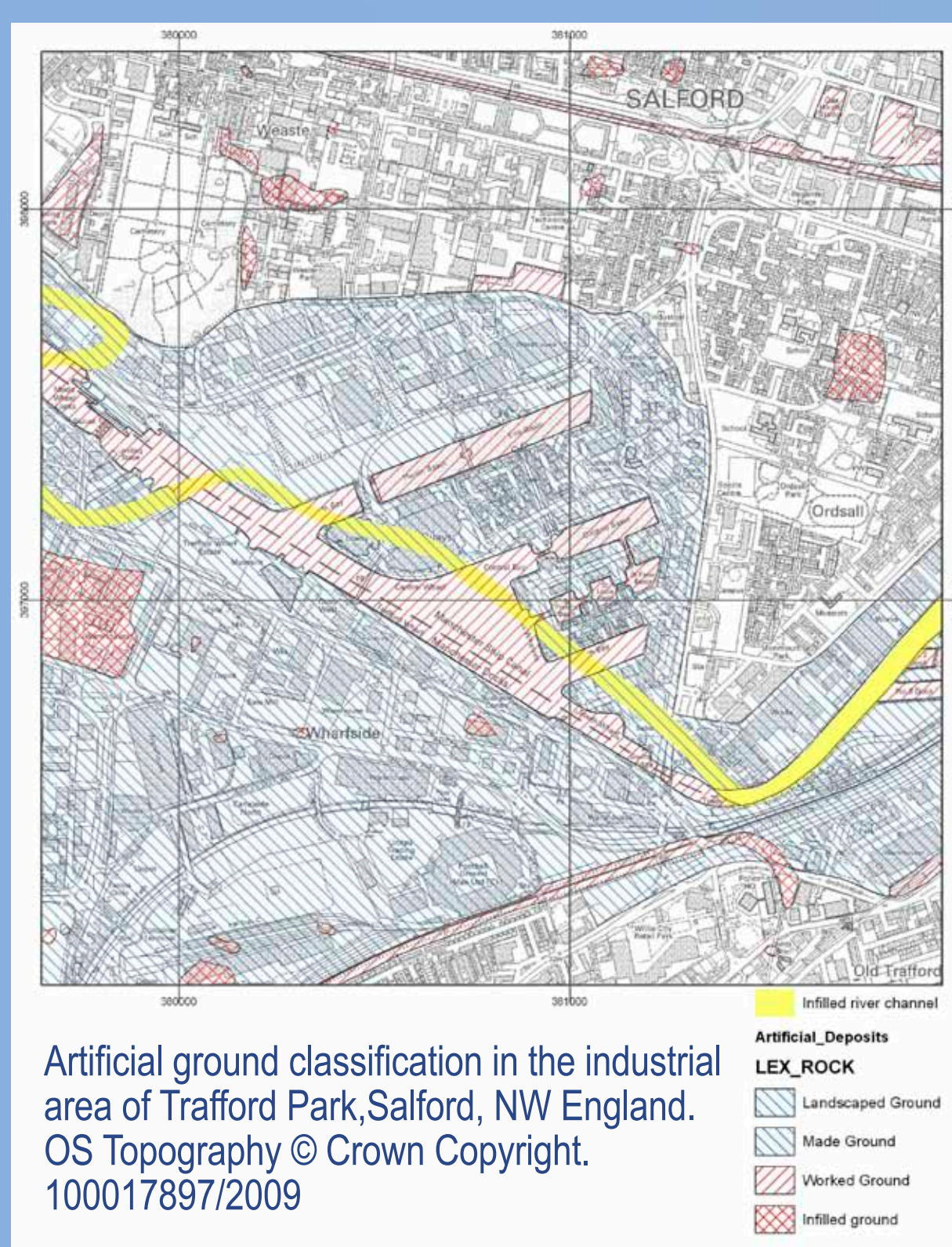
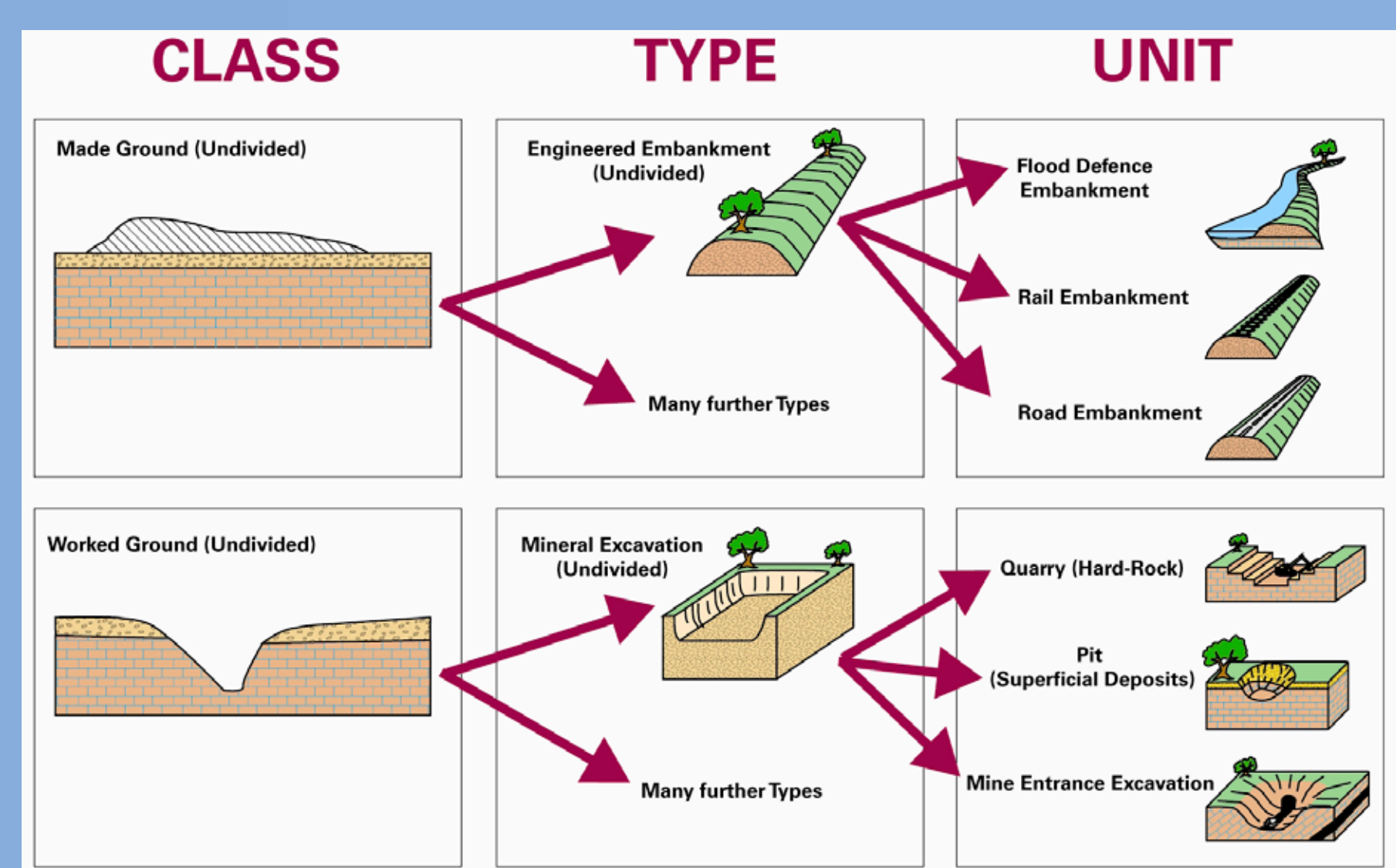
Landscaped Ground Areas where the original ground surface has been extensively remodelled but where it is impractical to delineate areas of worked or made ground.



The new scheme is designed to be compatible with the existing classification scheme and the BGS Lexicon of Named Rock Units (www.bgs.ac.uk/lexicon). It also provides a framework into which other types of artificial deposits (including archaeological material) can be added. Therefore, either a basic (Class), intermediate (Type) or detailed (Unit) level of information can be captured appropriate to the end use of the information.

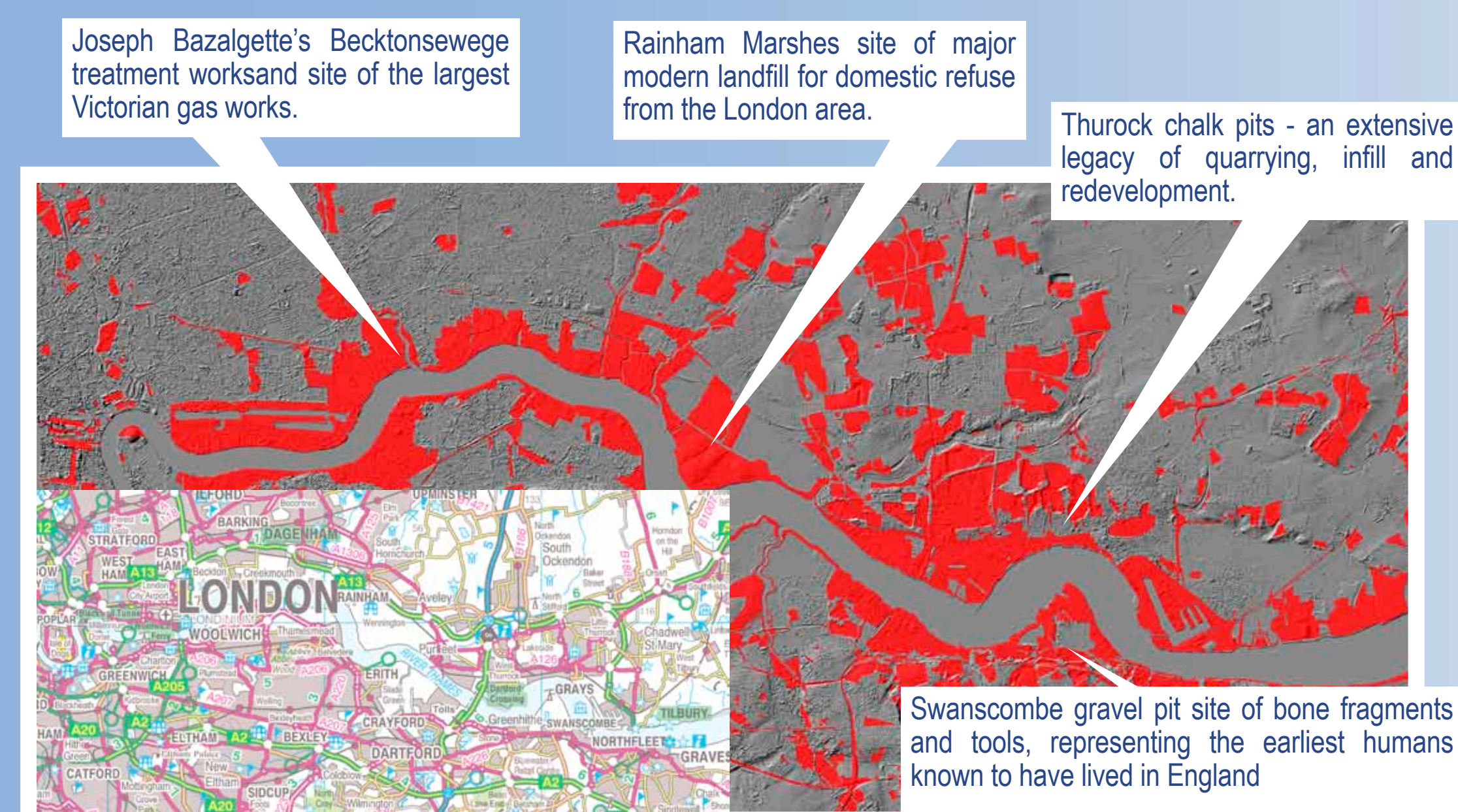
Examples (see diagram to the left): An excavation for limestone may be captured as Worked Ground at Class level, Mineral Excavation at Type level or Quarry (Hard Rock) at Unit level.

A road embankment may be captured as Made Ground at Class level, Engineered Embankment at Type level or Road Embankment at Unit level.



Historic Land Use

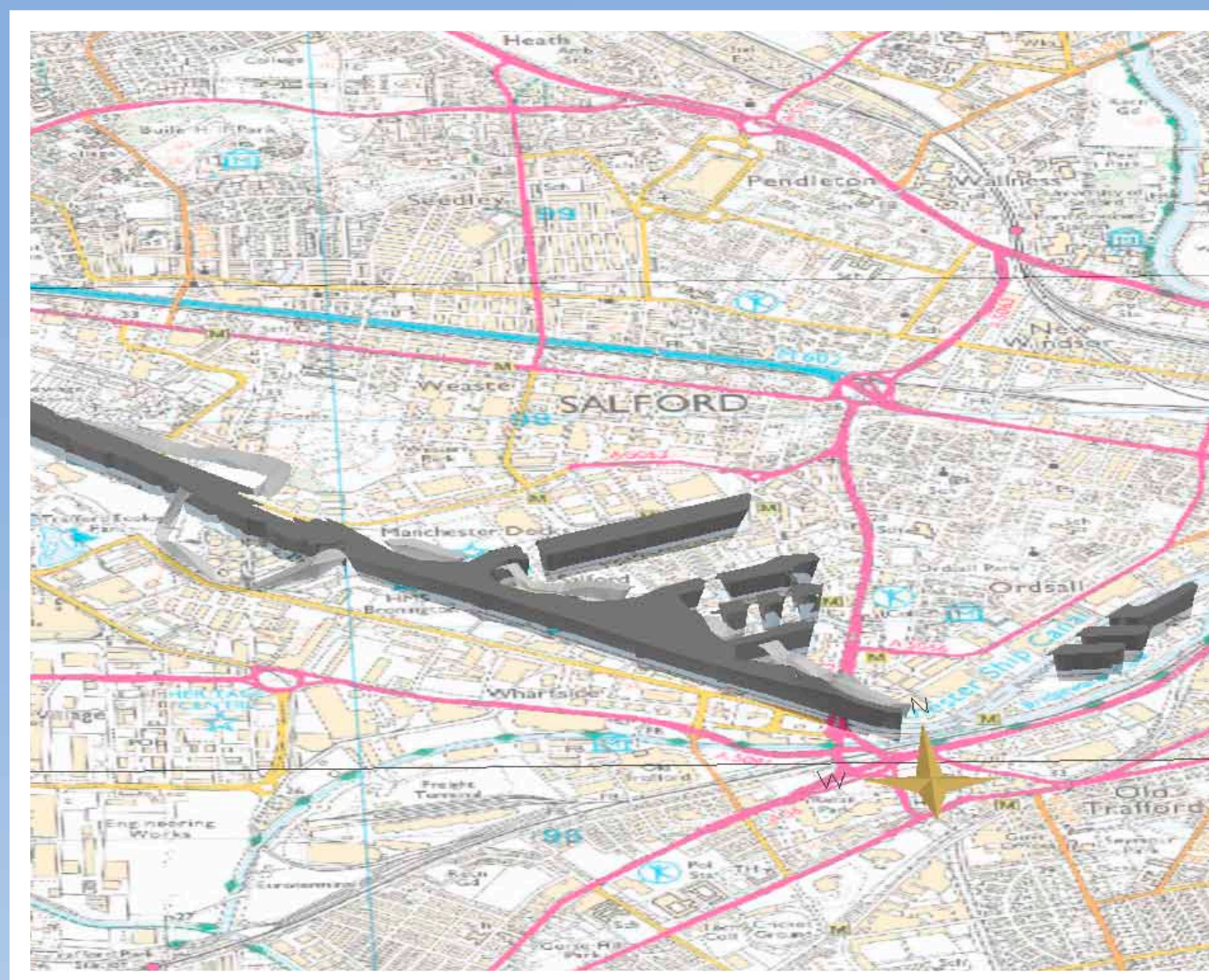
Historical land use data is used to digitally capture temporal land use changes and artificial deposits that result from it. Each land use type is classified according to its artificial ground stratigraphy. Historical topographical map data combined with borehole logs and local history records, provide the building blocks for developing a 3D model of the shallow sub-surface.



3D Modelling and visualisation

The artificial deposits classification scheme has been applied to characterise artificial ground in 3D.

Using 3D geological modelling techniques, an anthropogenic landscape evolution model can be developed to quantify the magnitude and spatial extent of human impacts on the landscape.



3D model of the Manchester Ship Canal (Worked Ground, dark grey) and backfilled meander loops of the River Inwell (Made Ground, light grey), Trafford Park, Salford, NW England. OS Topography © Crown Copyright. 100017897/2009

The mapped extent of artificial deposits (red areas) taken from geological maps of east London. Extracted from the 1:50,000 digital geological map of the UK, this dataset provides a broad overview of the largest areas of worked, made, infilled and landscaped ground. Although the current extents of these areas relate to modern development, many represent a legacy of anthropogenic process dating back to earlier periods of development. The enhanced classification scheme supports an improved understanding of this legacy by providing a detailed characterisation of artificial deposits. OS Topography © Crown Copyright. 100017897/2009, NextMap provided by Intermap.

Conclusions

The enhanced classification of artificial ground provides a framework to characterise anthropogenic impacts on the environment and the variability in the sub-surface that results from it. Importantly, it also forms the basis for the quantification and modelling of landscape evolution as a result of human processes in response to settlement, urbanisation and use of the land and its resources.

Ford J R, Kessler H, Cooper, A H, Price S J and Humpage A J. 2004. An enhanced classification for artificial ground: British Geological Survey report IR/04/038

McMillan, A A and Powell, J H. 1999. BGS Rock Classification Scheme Volume 4. Classification of artificial (man-made) ground and natural superficial deposits—applications to geological maps and datasets in the UK. British Geological Survey Research Report, RR 99–04

Price S J, Ford J R, Kessler H, Cooper, A H, and Humpage A J. 2004. Artificial ground: mapping our impact on the surface of the Earth: Earthwise issue 20

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