

How geology can bring Olympic success



British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

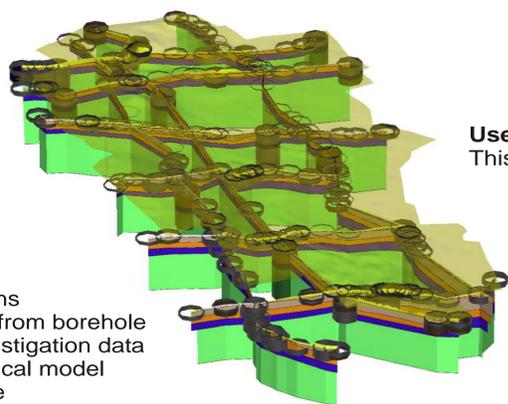
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Introduction

The 'jewel in the crown' for the London Olympics in 2012 will be the Olympic Park. It will be situated in the Lower Lea Valley in the East End of London, within the Thames Gateway Redevelopment Zone. So if the area has already been decided, why do we need to understand the geology? The answer is straightforward. All of the major development projects to be carried out in the run up to the 2012 Olympics will necessitate construction on ground that would be classed as 'difficult' in engineering terms. Compressible soils, high groundwater levels and contaminated brownfield sites are typical of the problems that will be faced. The Institution of Civil Engineers estimate that about 50% of cost and time over-runs on civil engineering projects are caused by 'unforeseen ground conditions.' In part, this is because too little is understood of the three-dimensional (3D) geology, the physical, mechanical and chemical properties and the processes acting on the ground.

Rapid developments in 3D modelling software are now providing challenging and exciting possibilities for constructing high-resolution geological models of the shallow sub-surface. Using this new technology, we can predict not only the type of rocks that lie beneath our feet, but also their engineering properties and hydrogeological properties. The data can then be imported into standard GIS packages and queried along with other complementary data, resulting in a powerful tool to assist in strategic planning, sustainable development and foundation design.

Olympic Park region - Lower Lea Valley



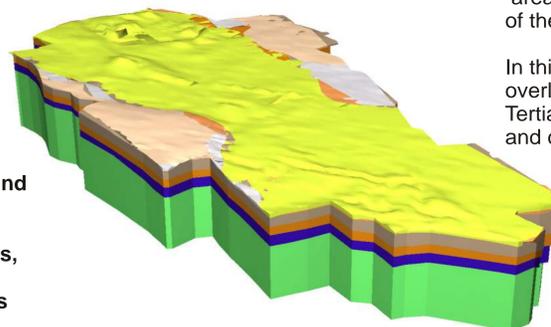
Using these cross-sections constructed from borehole and site investigation data a 3D geological model can be made

Uses

This model will:

- provide information on 3-D ground conditions
- provide information on thickness, distribution and composition of bedrock and superficial deposits
- provide a framework for geotechnical and hydrogeological attribution

3D Geological Model

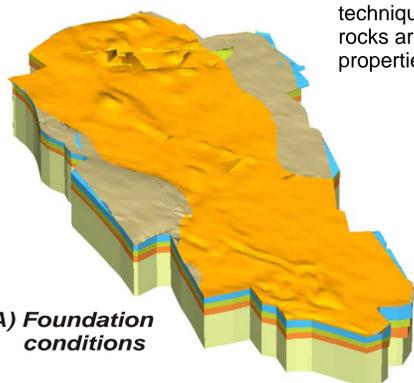


3D block model of the Olympic Park area displaying in detail the geology of the area.

In this case, clay sequences (yellow) overlie gravel (orange), Tertiary deposits (brown, orange and blue) and chalk bedrock (green).

Ground Conditions

Foundation conditions (A) and sulphate potential (B) block models for the Olympic Park area show how new modeling techniques can not only tell us about what rocks are beneath your feet but also their properties.

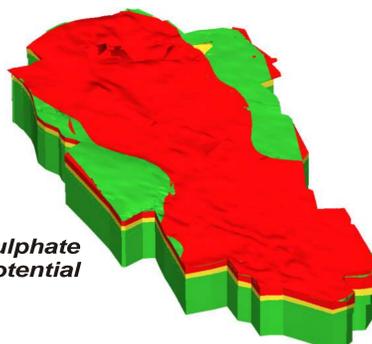


A) Foundation conditions

Uses

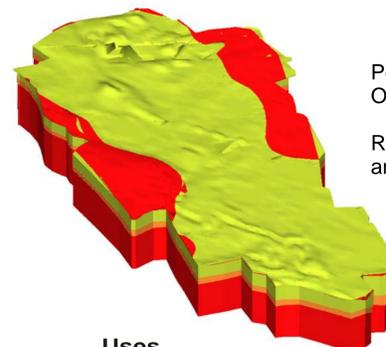
Models such as these will:

- enhance the visualisation of geotechnical properties such as strength, density, compactness, and swell shrink
- aid the planning of site investigations
- help with the identification of geological Hazards
- help with the analysis of potential foundation conditions, excavatability and stability of slopes



B) Sulphate potential

Sustainable Water Management



Permeability block model of the Olympic Park area.

Red - high, orange - intermediate and green - low

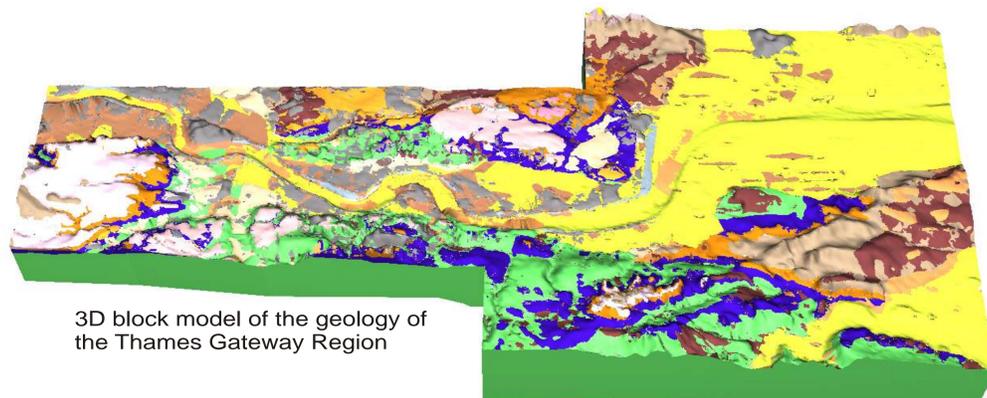
Uses

This model will:

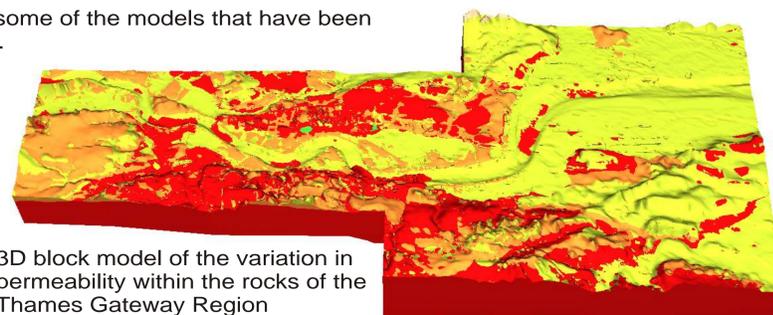
- help with risk management of contaminated land
- provide information to help with the determination of the urban water budget
- provide a way of determining aquifer vulnerability in urban areas
- provide information on where sustainable urban drainage techniques can be used

Thames Gateway Redevelopment Zone

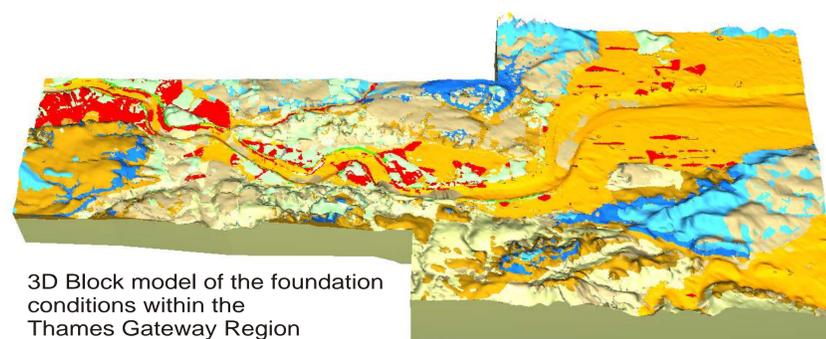
High resolution 3D models can be constructed for any urban area. The example below shows some of the models that have been developed for the Thames Gateway Redevelopment Zone (adjacent to the Olympic Park area).



3D block model of the geology of the Thames Gateway Region



3D block model of the variation in permeability within the rocks of the Thames Gateway Region



3D Block model of the foundation conditions within the Thames Gateway Region

Conclusions

The value in having vast quantities of geoscience information is not in the possession of it, but the interpretation and presentation of that data to the people that need it most.

Urban Geoscientists at the BGS are now not just providing raw data but interpreted data; not just 3D geological models but 3D models of properties. These can be used to provide answers to many of the problems encountered by planners, developers and enquirers today, without the need for further manipulation. This data revolution will allow for a wider uptake of geoscience data by non-specialists.