# Tools for building and delivering 3D models
# Perspectives by the BGS

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**(on behalf of the 3D community of BGS)**

**GGIPAC Workshop**

Geoscience Australia

Canberra

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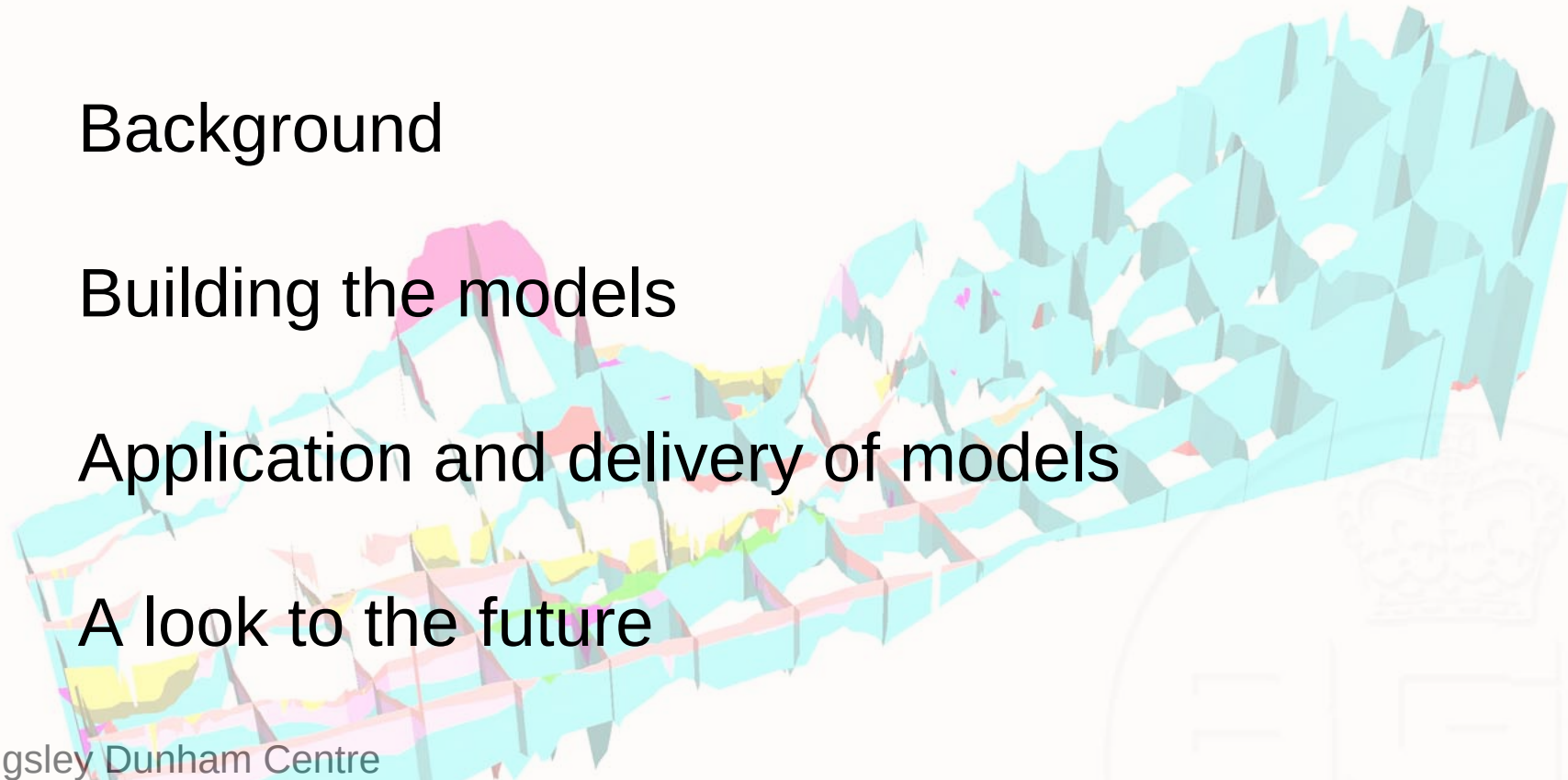
www.bgs.ac.uk/3dg



Background

Building the models

Application and delivery of models

A look to the future

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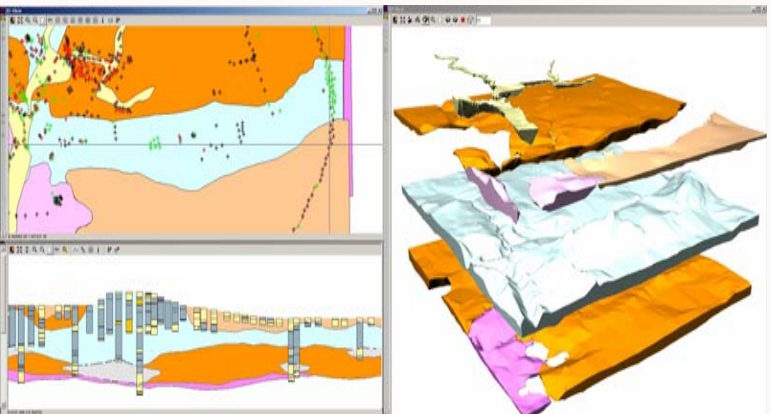
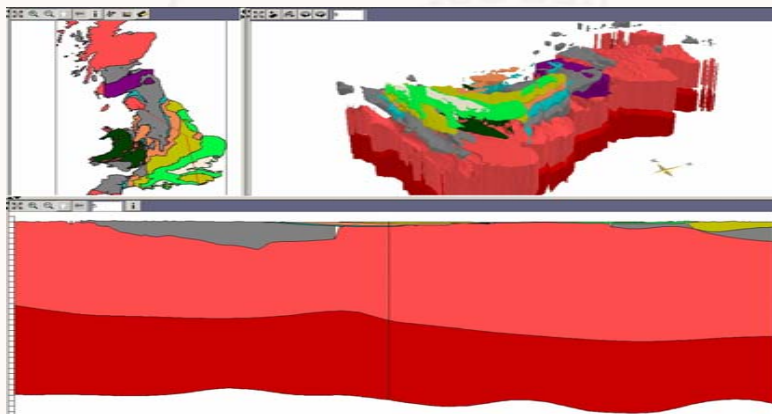
# 3-D modelling – definition of terms

- “A model is an abstract representation of a system from the modeller's viewpoint” (source wikipedia.org)
- Mathematical models and spatial models are different things

- Geological modelling is as old as the science itself
- The difference now: **we can capture, manage and visualise geology like never before**

- We sometimes prefer to call it **3d geological mapping**

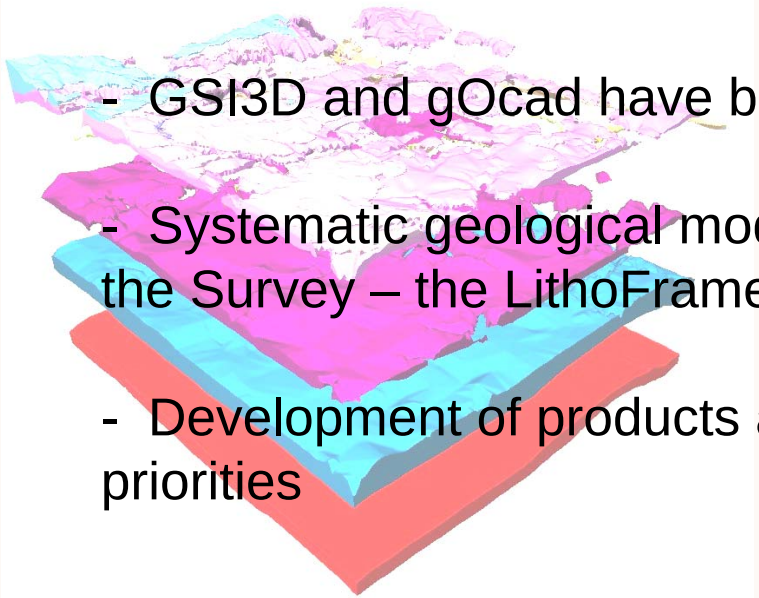




# How we got to where we are…

- 5 year research programme (DGSM) into 3D geological modelling completed in 2005 (http://www.bgs.ac.uk/science/3Dmodelling/docs/DGSM_Final.pdf)

- Standards, data formats and workflows have been established



- GSI3D and gOcad have been chosen as corporate software

- Systematic geological models of the UK are now core deliverable of the Survey – the LithoFrame concept was born

- Development of products and delivery methods is now one of the key priorities

30 projects and more than 50 staff have contributed to the work presented here – A BIG THANKS TO ALL…

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# The GSI3D methodology

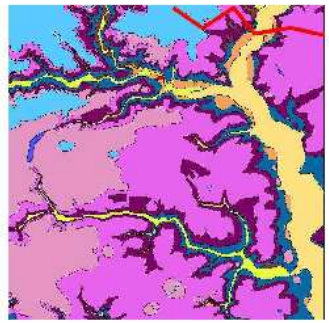
- developed by Hans-Georg Sobisch (INSIGHT, Cologne, Germany) since 1996

- methodology published in his PhD in 2000

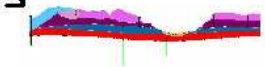
- since 2002 co-operation with the BGS and bespoke development of software tool

- the “Geologist’s vision” published in the Geoscientist (vol. 14) in 2004

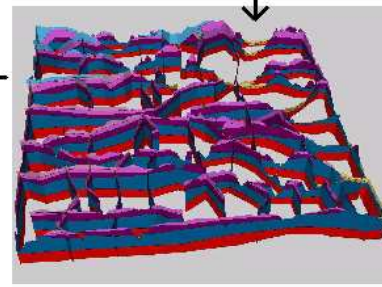
- More on: [bgs.ac.uk/3dg](bgs.ac.uk/3dg)



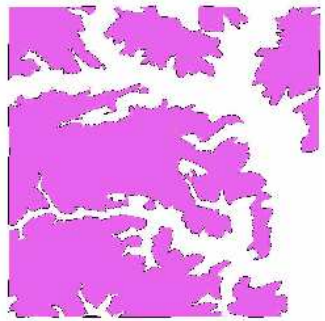
a) Map



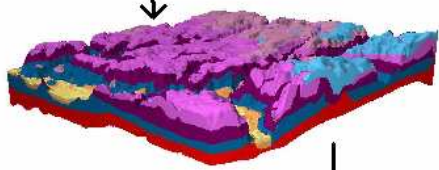
b) Section



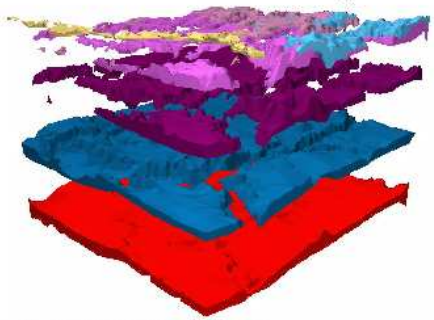
c) Fence diagram



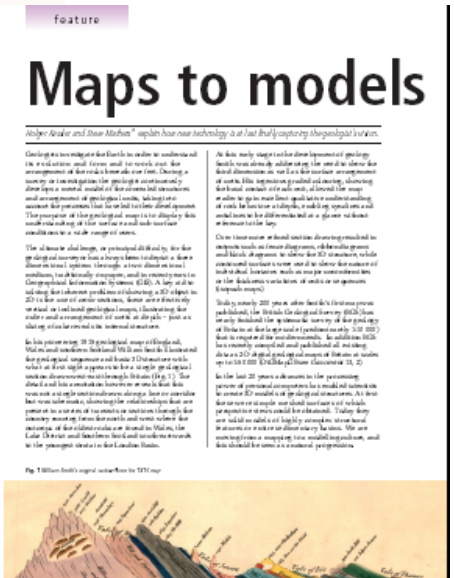
d) Unit distribution



e) Block model



f) Exploded view



feature

Maps to models

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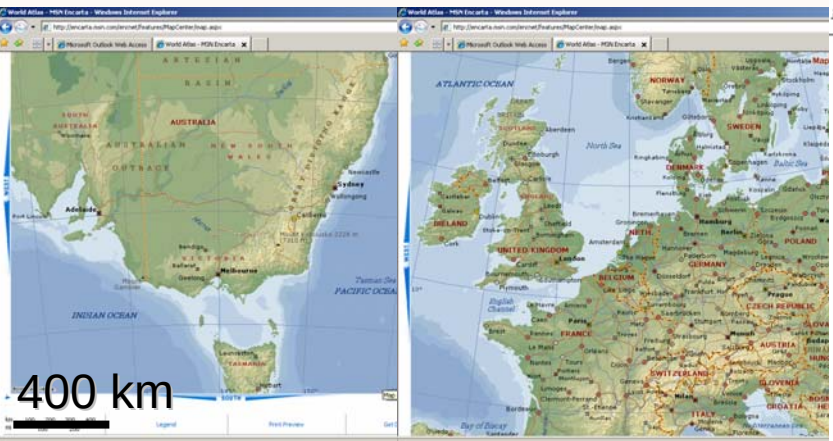
# Areas of work

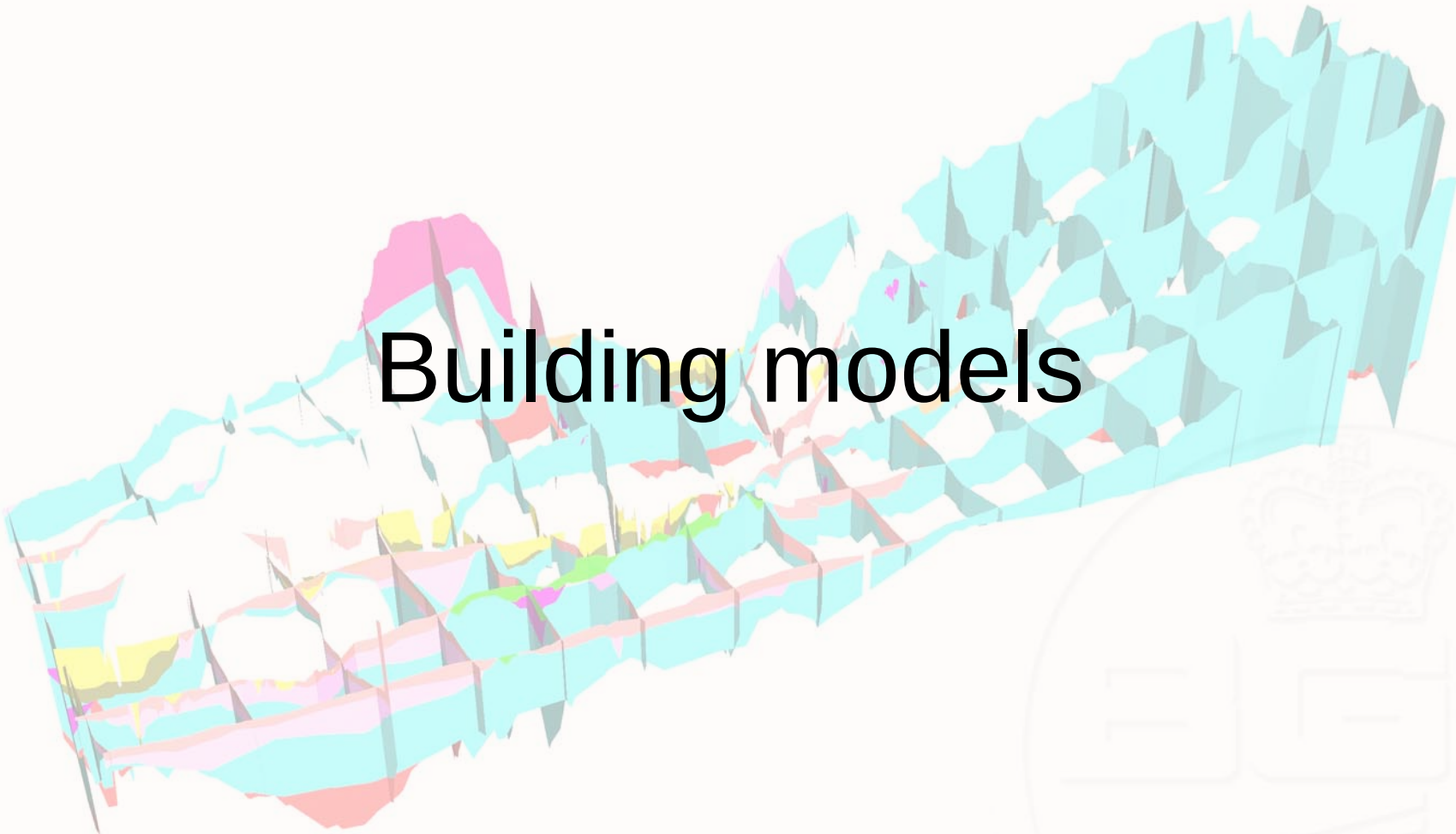
Current large scale (10k and 50k) modelling projects

Solid purple completed
Diagonal lines in progress



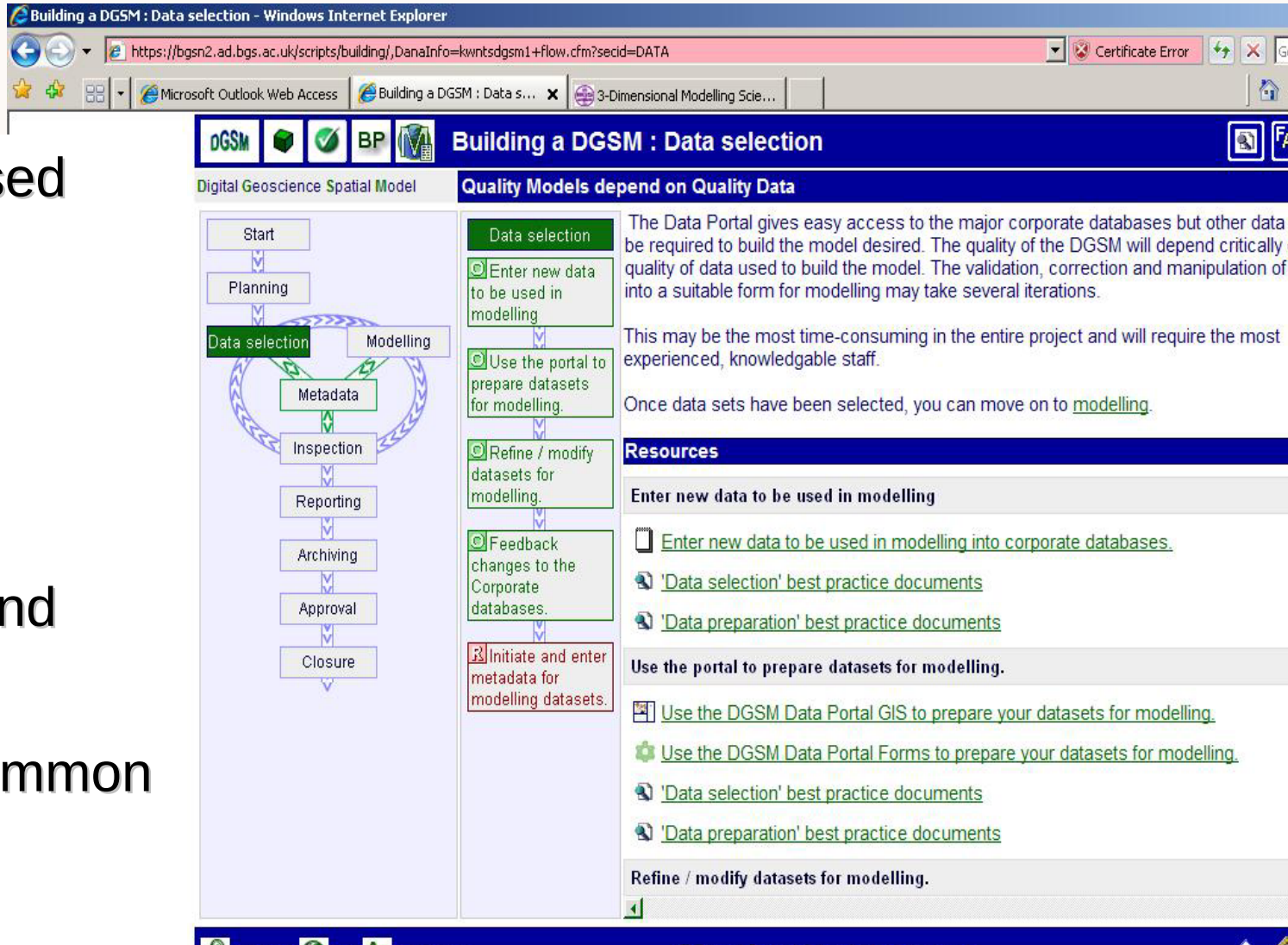

Glasgow
Manchester
York
Grimsby
Doncaster
Ipswich/
Sudbury
London/
Thames Gateway

# Building models



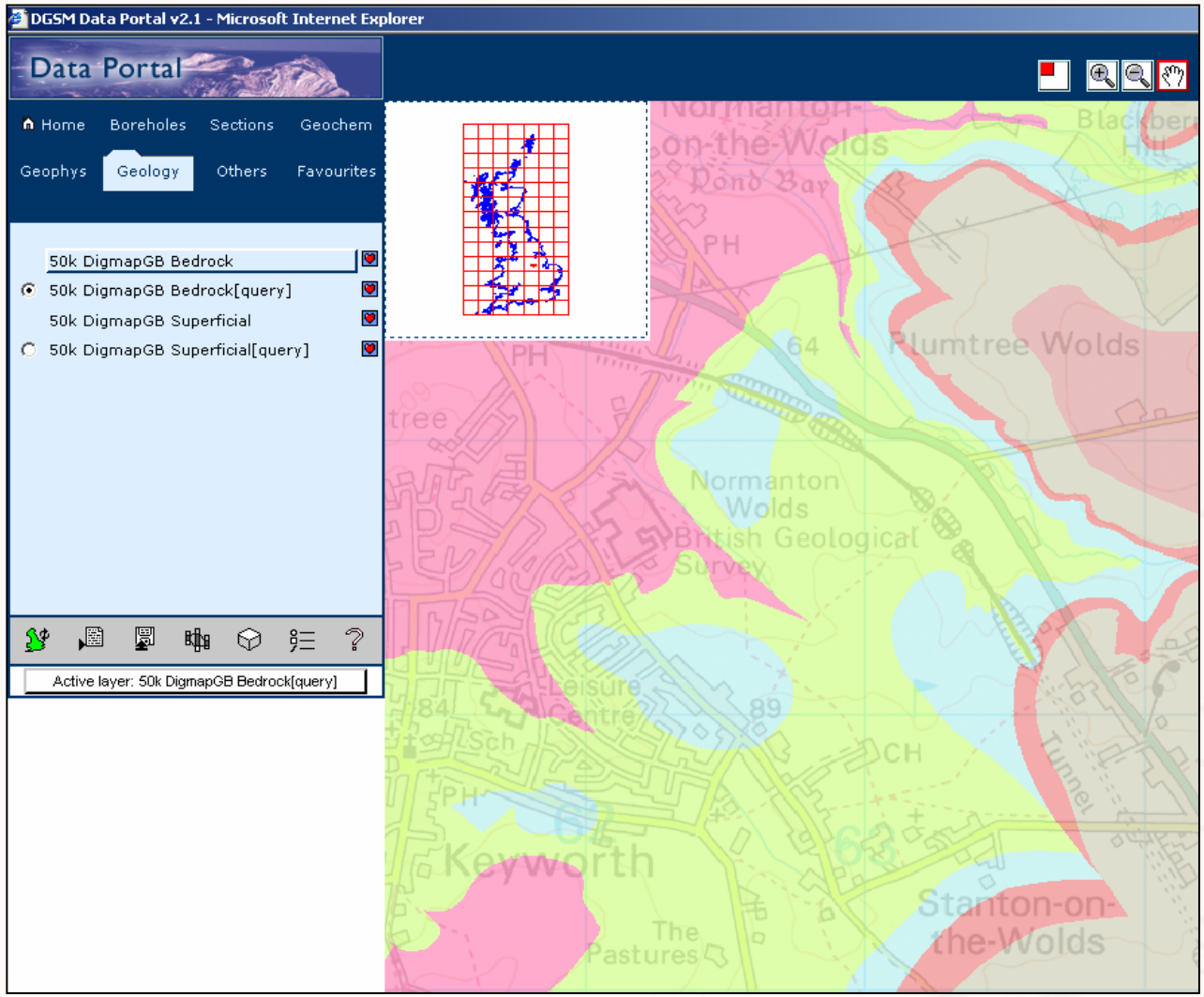
# The Modelling workflow

- Intranet based standardised workflow
- links to applications, reference documents and metadata
- enforces common approach



# The Data Portal

- Intranet based retrieval application
- runs ArcIMS and uses Java to retrive data from ORACLE or SAN (Small Area Network)
- exports are formatted for GSI3D and gOcad
- is the VITAL link between corporate databases and modelling applications

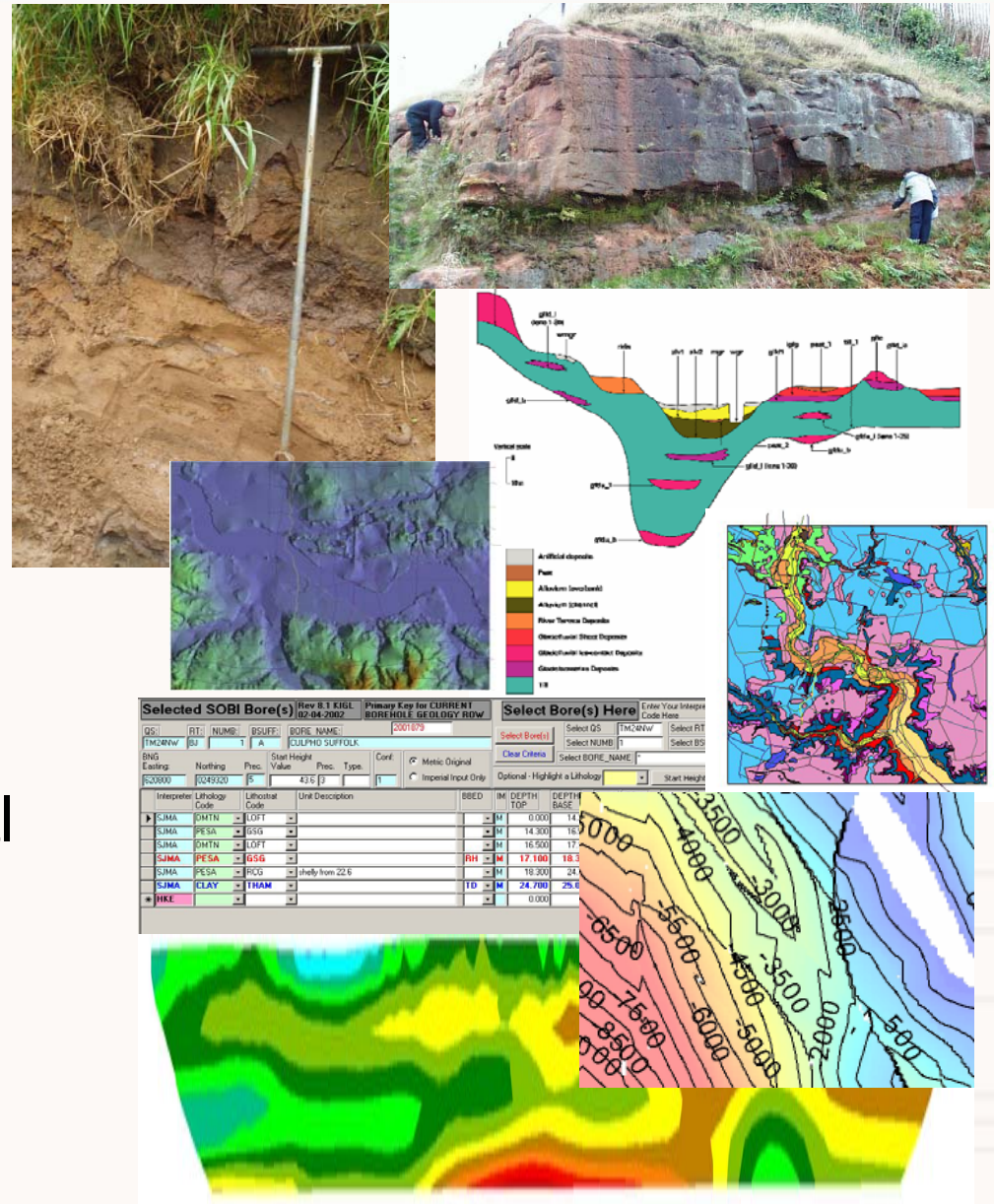


# What do you need to build subsurface models?

- Stratigraphy (topology)
- DTM (Digital Terrain Model)

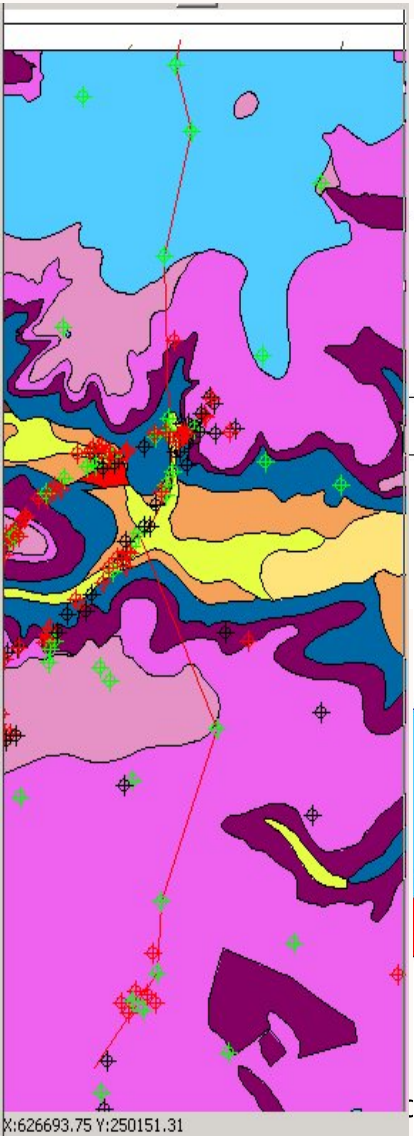
- Coded boreholes
- Geological linework
- Existing geological surfaces

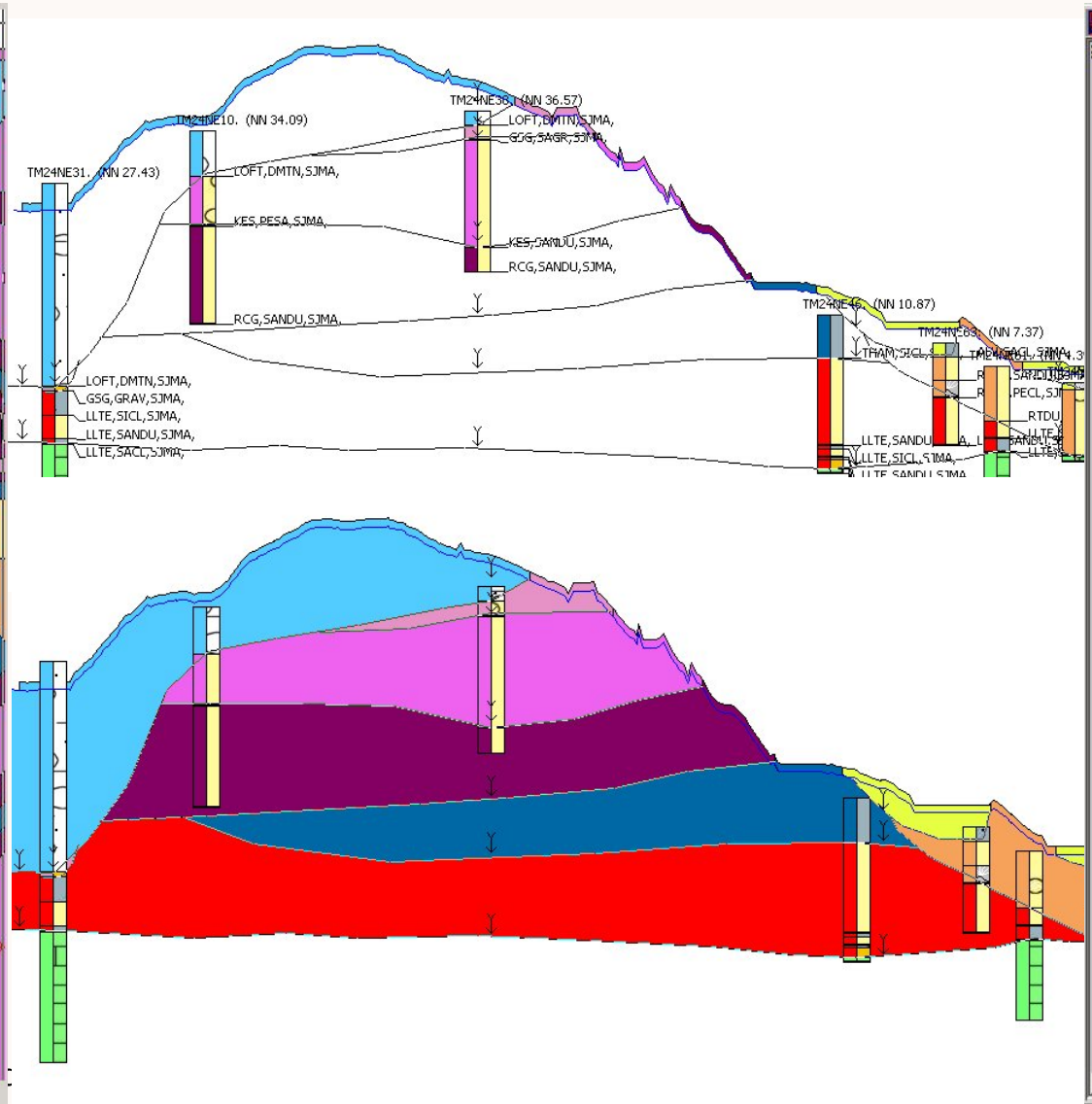
- Geochemical and geophysical measurements
- Hydrogeological data
- Topographic data
- Historic land use data …..

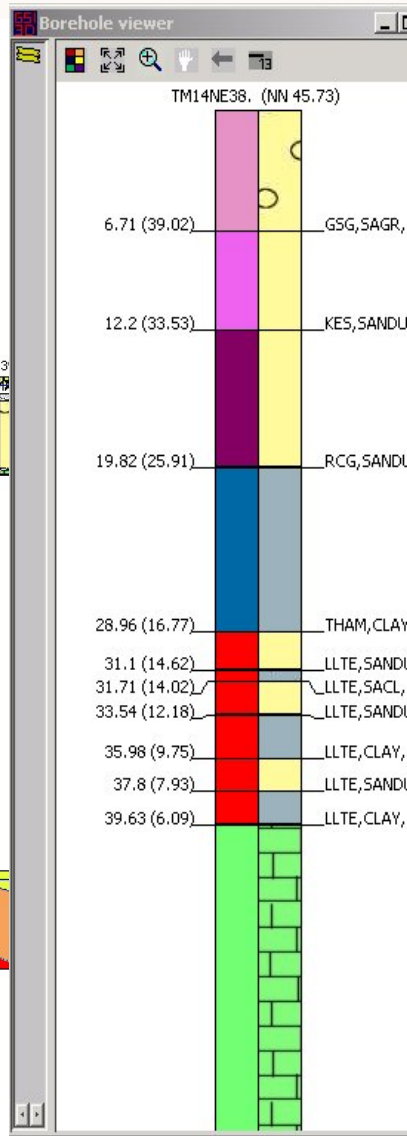


# … but most importantly: we need geologists

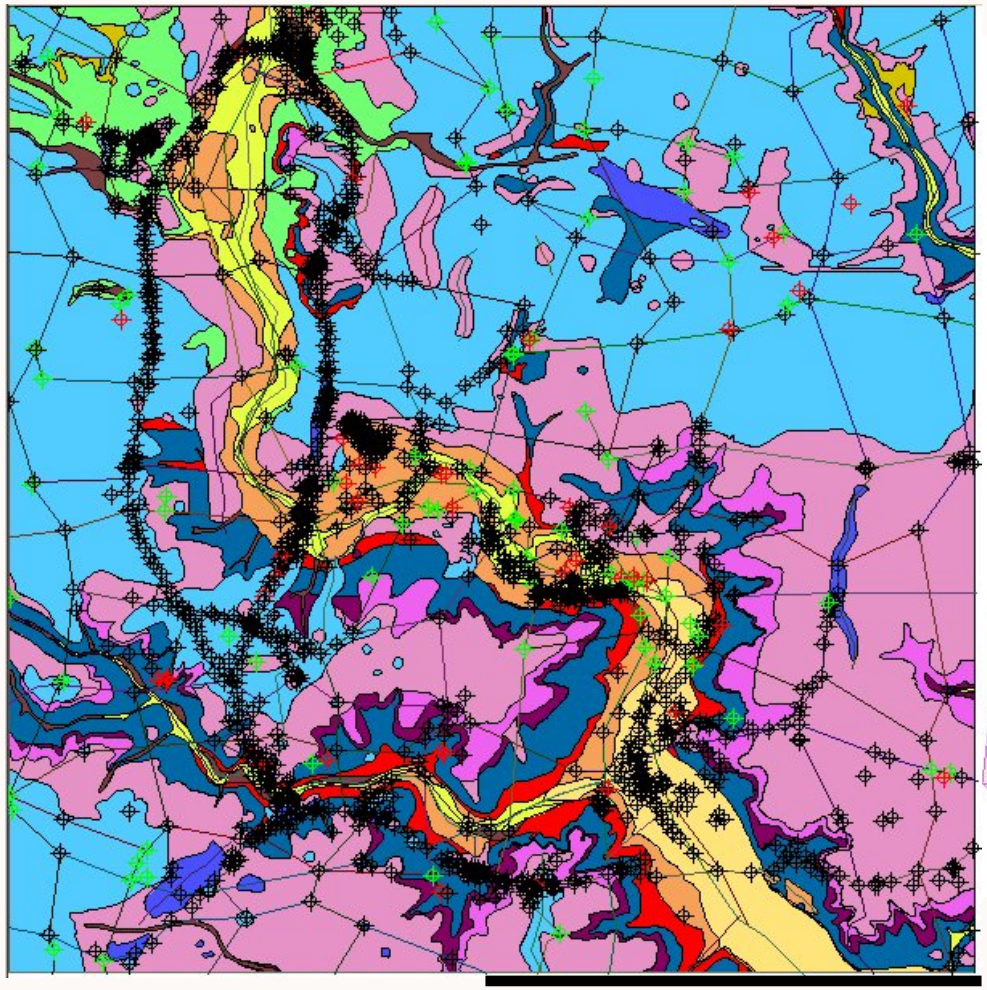
# Interactive section drawing – expert interpretation

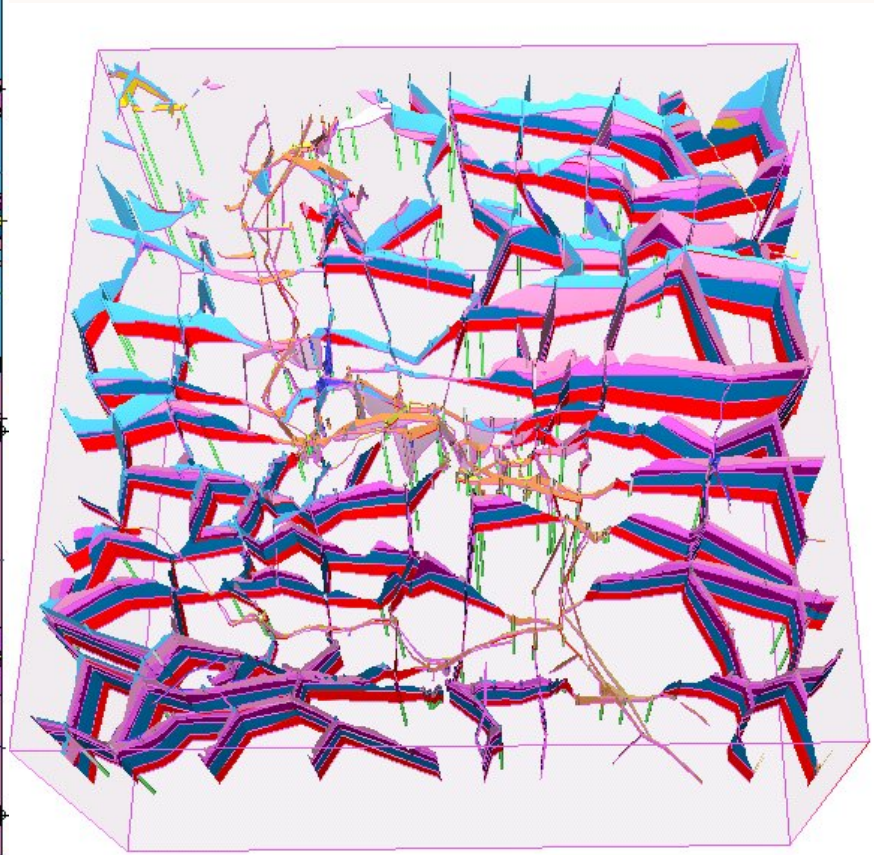


# Completed fence diagram

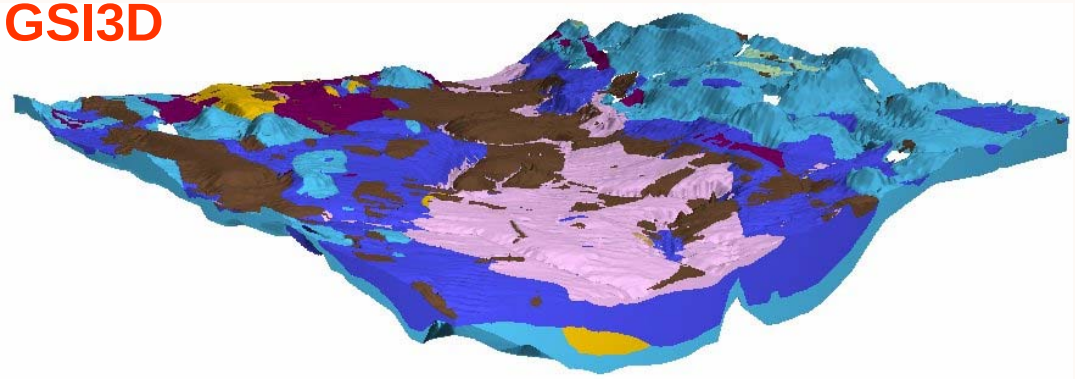


# The main differences in approach

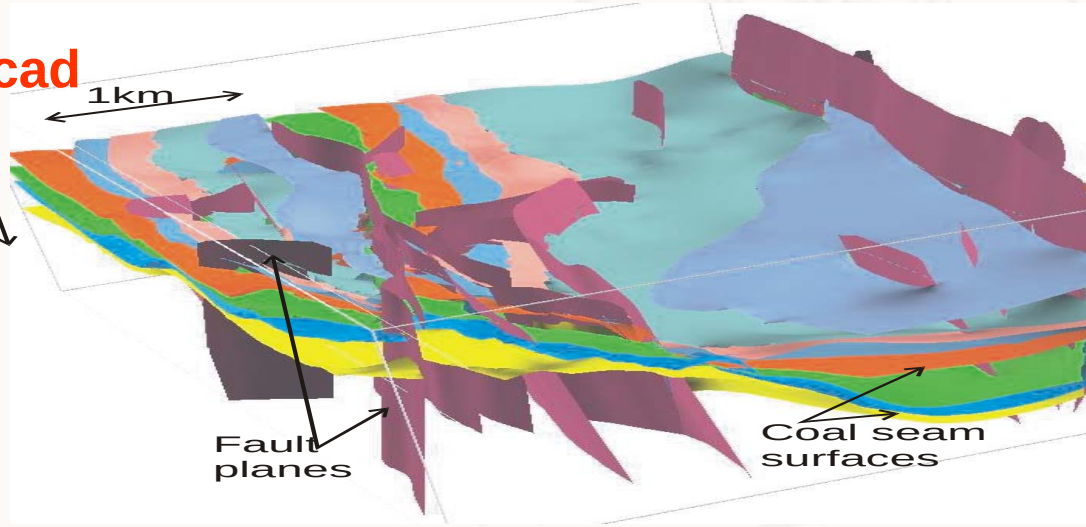
Superficials and simple bedrock - **GSI3D**
**'Geological interpolation'**
through expert knowledge from heterogeneous datasets.

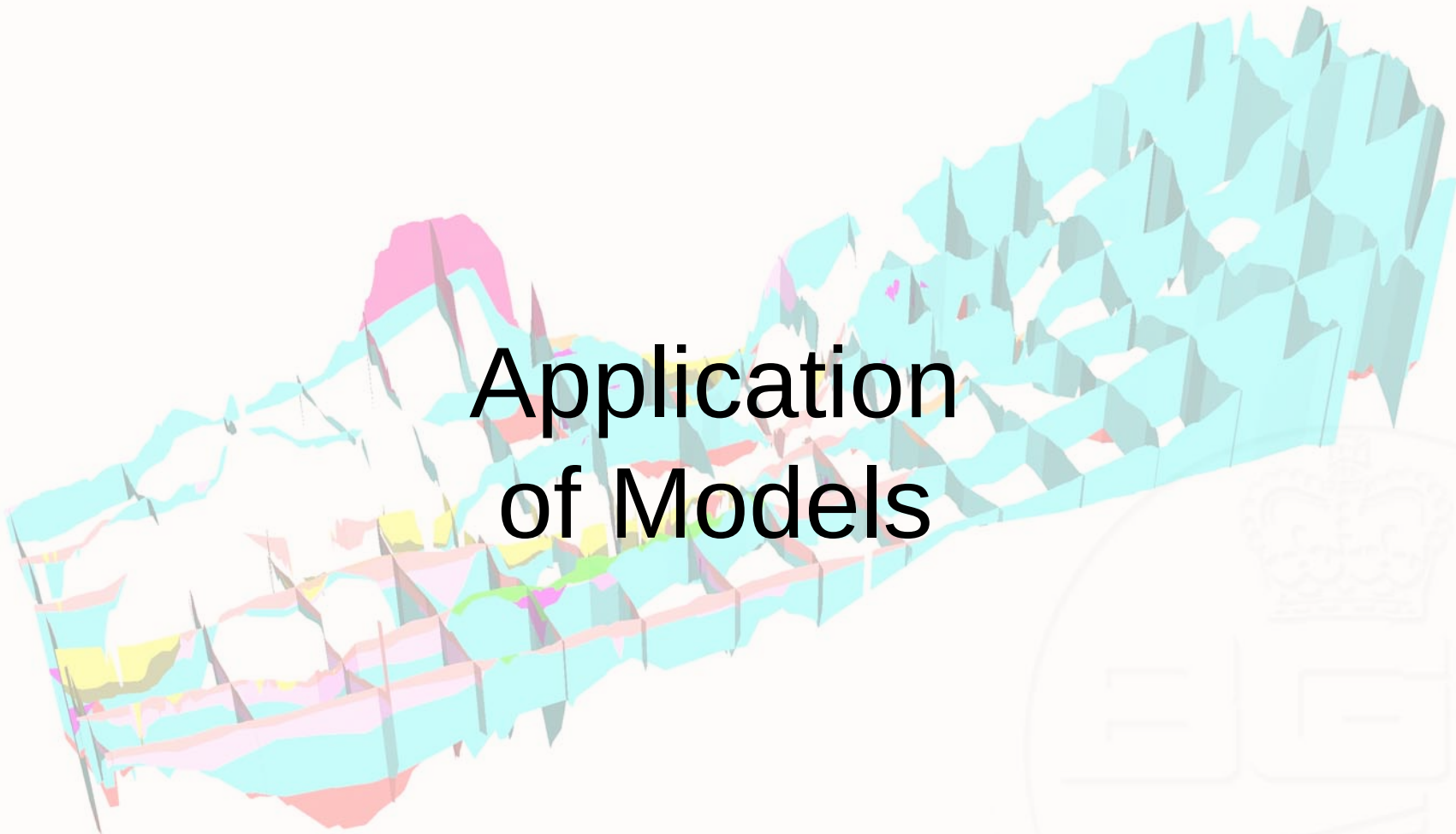
*"Full stack" modelling approach*



Complex and deep bedrock – **gOcad**
**'Mathematical interpolation'**
through algorithms from quality well and geophysical data.

*Surface modelling approach*

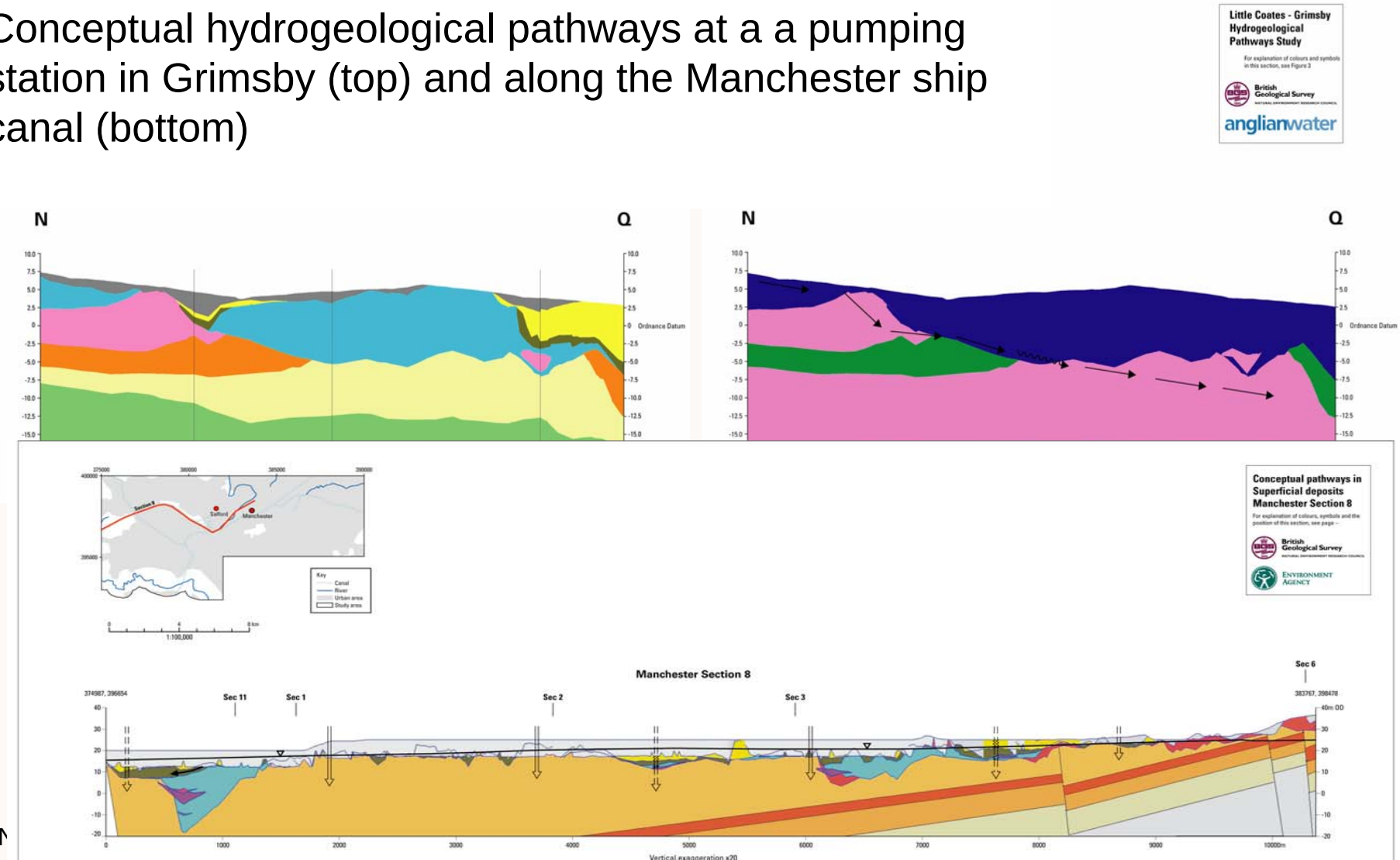




# Application of Models

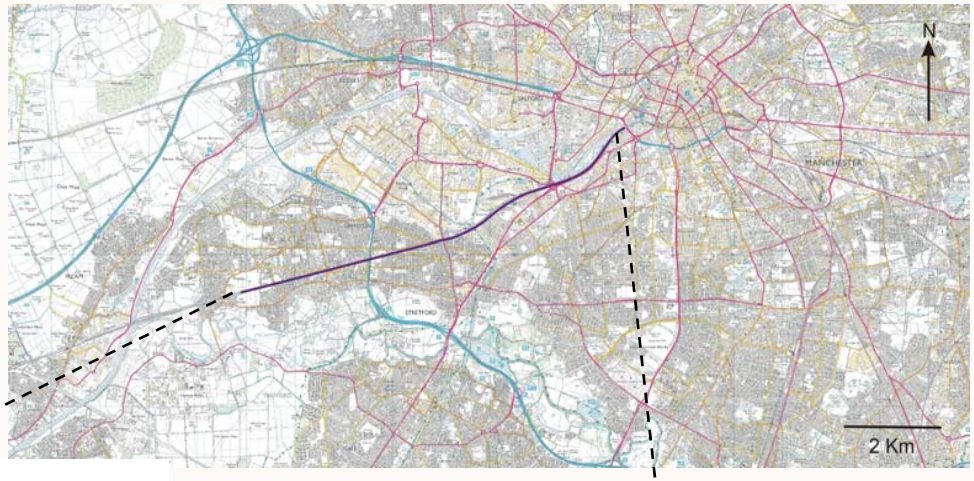
# Hydrogeological visualisation

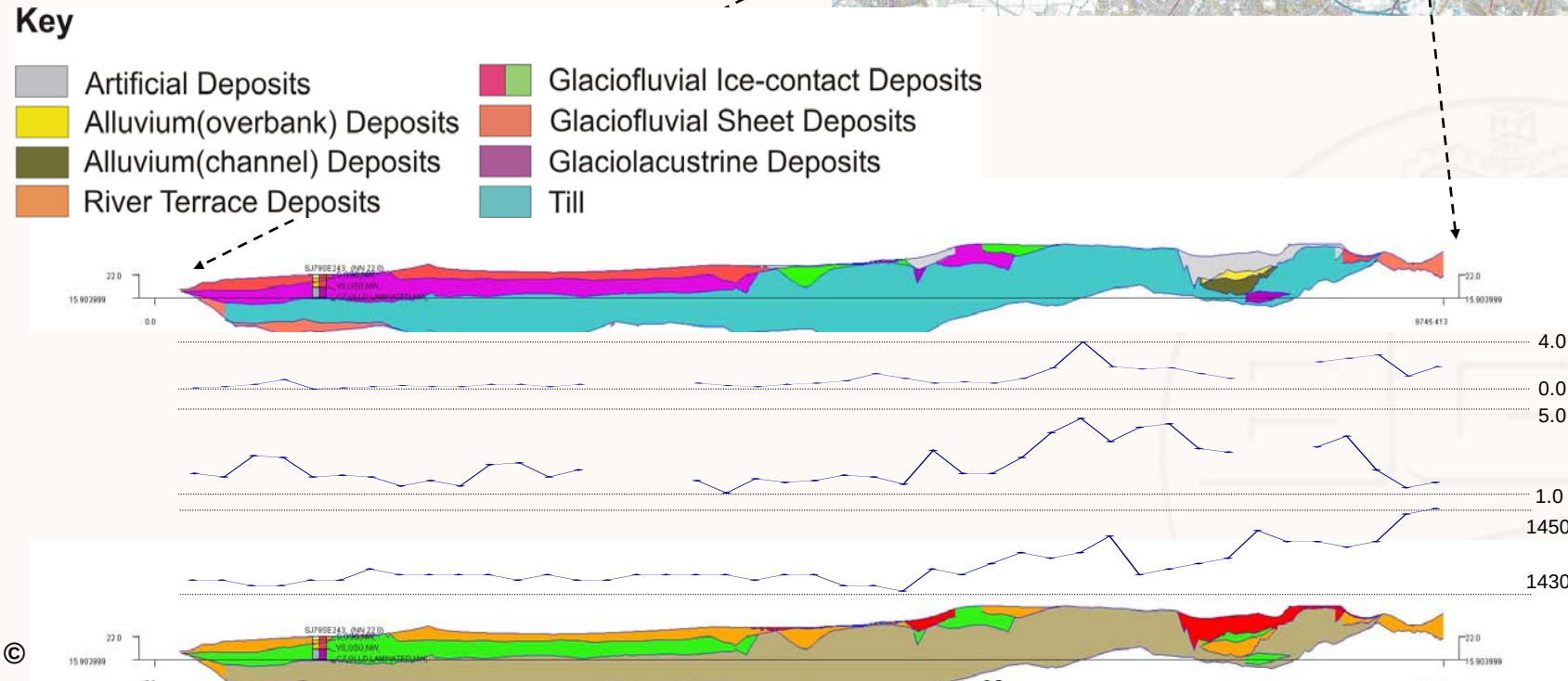
Conceptual hydrogeological pathways at a a pumping station in Grimsby (top) and along the Manchester ship canal (bottom)



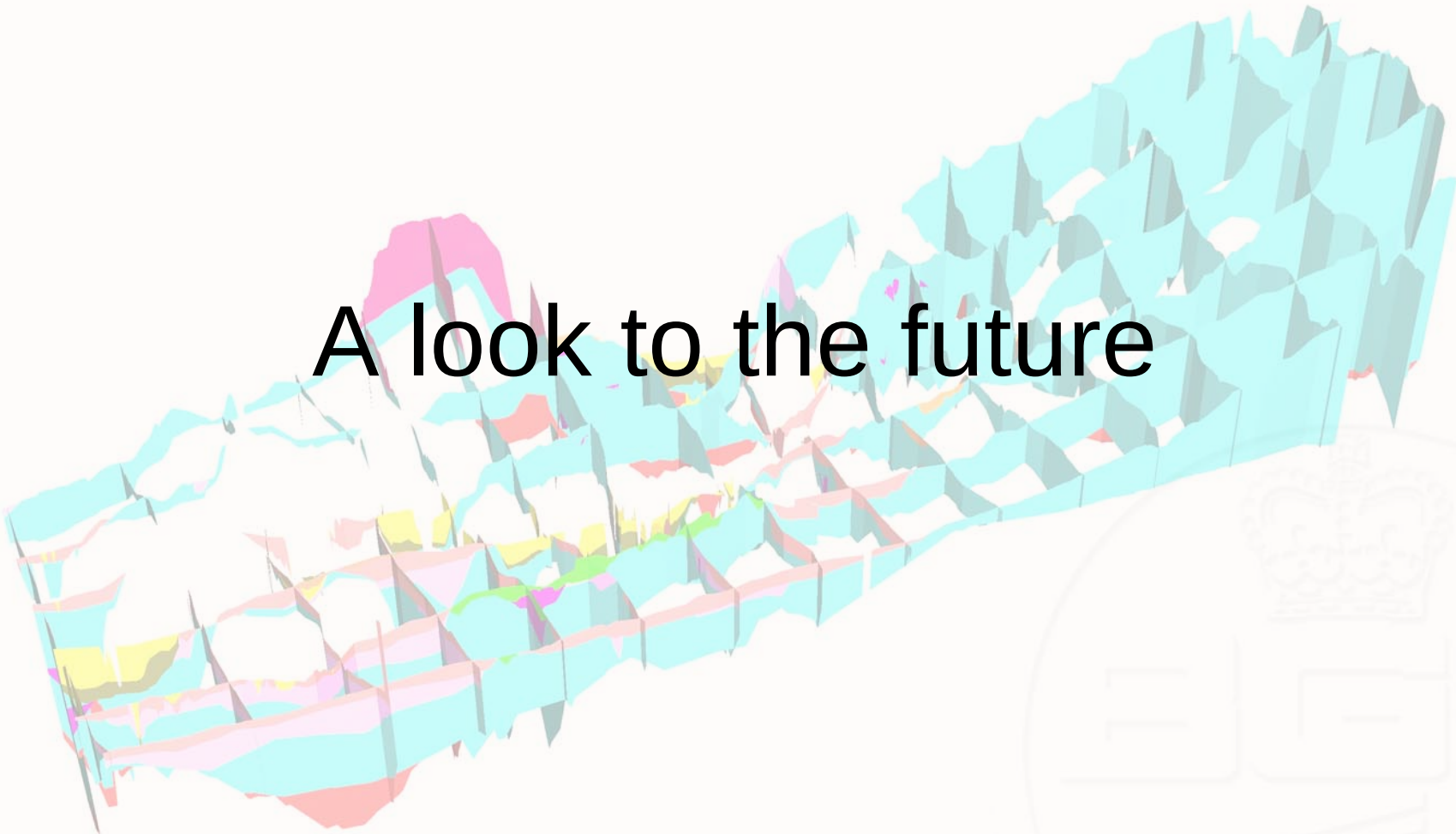
# Railway track bed geometry

Liverpool to Manchester Railway
Flixton – Central Manchester



# A look to the future



# Further development of bedrock modelling functionality in a 3 year project 2007-2010

The aim is one single integrated, easy to use workflow and software solution to carry out 3D mapping of both superficial deposits and bedrock.

The tool will be tied to working practices of bedrock surveyors and will have a strong link to field survey teams on the ground.

Tender process for external consultancy is still in progress.

INSIGHT is the current preferred bidder.

# Virtual field reconnaissance & 3D surveying in the field

# Delivering models to clients

BGS has identified 5 User Requirements for “3D model Viewers”

| | |
|---|---|
| Free | Thumbnails/Screenshots |
| | Frozen movies of models - *.avi, *.mov and flash |
| | Preview of model with interactive function – 3D pdf |
| Sold | The 3D geological map – Subsurface Viewer |
| Licensed | The full model in 3D software – LithoFrame model |

Increasing interactivity

Not one technology will suit all purposes and we still have to work closely with customers, from schools to industry to find out what really works for them!

# Live demonstration of the Subsurface Viewer – The 3D geological map

Key features of the Subsurface Viewer:

- JAVA based – platform independent
- software is free for the client
- delivers full richness of geological model including property information
- user can export sections, maps and 3D view as raster maps
- potential for web-enabling
- most importantly, it communicates our science …