



PropBase Query Layer: a single portal to UK subsurface physical property databases

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Until recently, the delivery of geological information for industry and public was achieved by geological mapping. Now pervasively available computers mean that 3D geological models can deliver realistic representations of the geometric location of geological units, represented as shells or volumes. The next phase of this process is to populate these with physical properties data that describe subsurface heterogeneity and its associated uncertainty. Achieving this requires capture and serving of physical, hydrological and other property information from diverse sources to populate these models.

The British Geological Survey (BGS) holds large volumes of subsurface property data, derived both from their own research data collection and also other, often commercially derived data sources. This can be voxelated to incorporate this data into the models to demonstrate property variation within the subsurface geometry. All property data held by BGS has for many years been stored in relational databases to ensure their long-term continuity. However these have, by necessity, complex structures; each database contains positional reference data and model information, and also metadata such as sample identification information and attributes that define the source and processing. Whilst this is critical to assessing these analyses, it also hugely complicates the understanding of variability of the property under assessment and requires multiple queries to study related datasets making extracting physical properties from these databases difficult.

Therefore the PropBase Query Layer has been created to allow simplified aggregation and extraction of all related data and its presentation of complex data in simple, mostly denormalized, tables which combine information from multiple databases into a single system. The structure from each relational database is denormalized in a generalised structure, so that each dataset can be viewed together in a common format using a simple interface. Data are re-engineered to facilitate easy loading. The query layer structure comprises tables, procedures, functions, triggers, views and materialised views. The structure contains a main table PRB_DATA which contains all of the data with the following attribution:

- a unique identifier
- the data source
- the unique identifier from the parent database for traceability
- the 3D location
- the property type
- the property value
- the units
- necessary qualifiers
- precision information and an audit trail

Data sources, property type and units are constrained by dictionaries, a key component of the structure which defines what properties and inheritance hierarchies are to be coded and also guides the process as to what and how these are extracted from the structure.

Data types served by the Query Layer include site investigation derived geotechnical data, hydrogeology datasets, regional geochemistry, geophysical logs as well as lithological and borehole metadata. The size and complexity of the data sets with multiple parent structures requires a technically robust approach to keep the layer synchronised. This is achieved through Oracle procedures written in PL/SQL containing the logic required to carry out the data manipulation (inserts, updates, deletes) to keep the layer synchronised with the underlying

databases either as regular scheduled jobs (weekly, monthly etc) or invoked on demand.

The PropBase Query Layer's implementation has enabled rapid data discovery, visualisation and interpretation of geological data with greater ease, simplifying the parametrisation of 3D model volumes and facilitating the study of intra-unit heterogeneity.