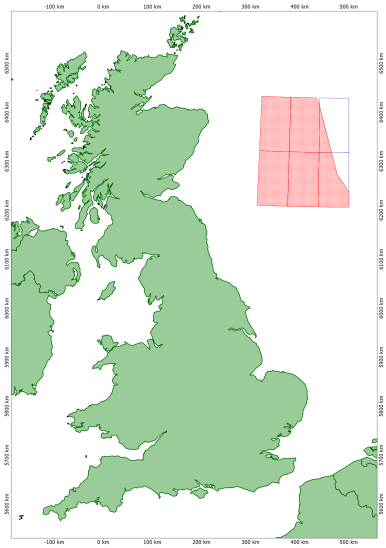
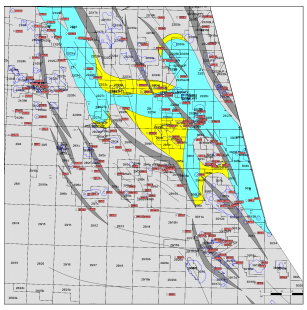
Spatial Databases & Common Risk Segments

Calderdale Geoscience (CGL), a UK-based geosciences consultancy established in 2004, offers mapping and spatial database services, utilising spatial queries, to the geoscience community.



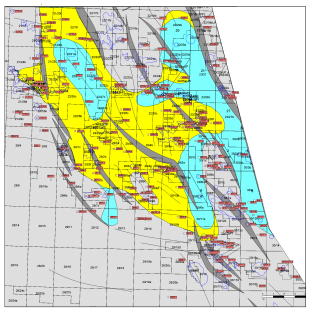
CGL's workflow facilitates the combination of many spatial tables (or map layers) into a single database table. The new database table contains polygons (or segments) of spatially contiguous combinations of the original maps. These polygons can be thematically recombined in GIS to reproduce any of the original maps or any combination of the original maps, thereby facilitating hypothesis-testing and the drawing of risk segments.

CGL's workflow is illustrated here using public-domain[1] .shp files of gross depositional environment (GDE) maps, drawn on sequences J46-J73 of the Upper Jurassic, in Quadrants 21-23 and 28-30, of the UK Central Graben. The input GDEs are shown below:



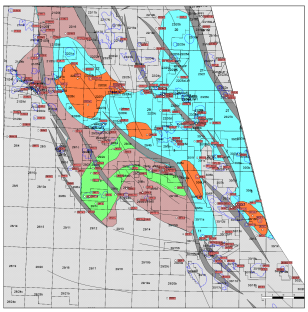
Play fairway map for the J46-J52 Genetic Sequence (Early to Middle Oxfordian)

Grey = emergent land
Blue = marine mudstones
Yellow = Shallow marine / shoreface sands (Franklin Formation)
NB. The distribution of sands within the mapped fairway will be controlled significantly by underlying Triassic pods and intervening salt walls.



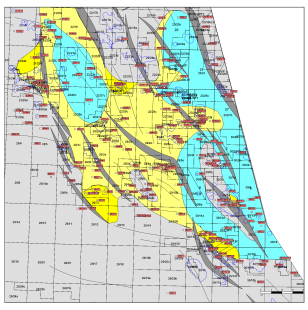
Play fairway map for the J54 Genetic Sequence (up to the LJ2 depositional sequence boundary) (early Late Oxfordian)

Grey = emergent land
Blue = marine mudstones
Yellow = Shallow marine / shoreface sands (Puffin Formation)
NB. The distribution of sands within the mapped fairway will be controlled significantly by underlying Triassic pods and intervening salt walls.



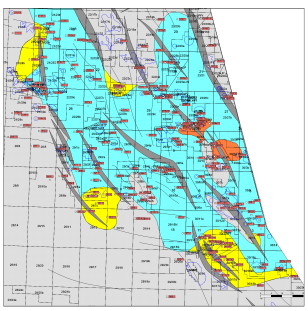
Play fairway map for the J54 Genetic Sequence (at the LJ2 depositional sequence boundary) (mid Late Oxfordian)

Grey = emergent land
Blue = marine mudstones
Brown = newly emergent land
Orange = mass-flow basinal sands (Freshney Member)
Green = estuarine, incised valley transgressive fill (Curlew Member)
NB. The distribution of sands within the mapped fairway will be controlled significantly by underlying Triassic pods and intervening salt walls.



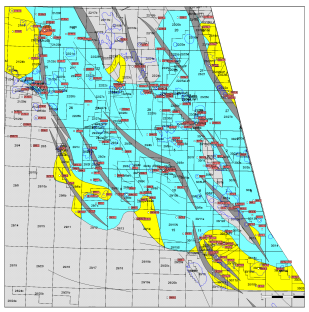
Play fairway map for the J54 Genetic Sequence (above the LJ2 depositional sequence boundary) (late Late Oxfordian)

Grey = emergent land
Blue = marine mudstones
Yellow = shallow marine/shoreface sands (Puffin Formation)
NB. The distribution of sands within the mapped fairway will be controlled significantly by underlying Triassic pods and intervening salt walls.



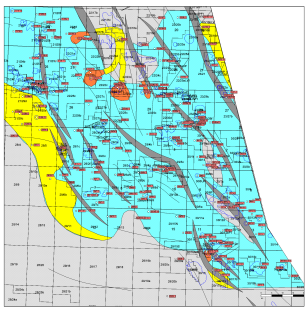
Play fairway map for the J56 Genetic Sequence (latest Late Oxfordian to early Kimmeridgian)

Grey = emergent land
Blue = marine mudstones
Yellow = shallow marine/shoreface sands (Puffin Formation or Lower Fulmar Formation)
Orange = mass-flow basinal sands (Shearwater Member)
NB. The distribution of sands within the mapped fairway will be controlled significantly by underlying Triassic pods and intervening salt walls.



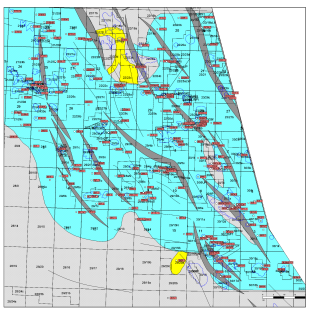
Play fairway map for the J62 Genetic Sequence (early to mid Kimmeridgian)

Grey = emergent land
Blue = marine mudstones
Yellow = shallow marine/shoreface sands (Ryton Member, Leen Member, Upper Fulmar Formation, Ula Formation)
Orange = mass-flow basinal sands (Christian Member)
NB. The distribution of sands within the mapped fairway will be controlled significantly by underlying Triassic pods and intervening salt walls.



Play fairway map for the J63-J64 Genetic Sequence (mid Kimmeridgian to mid Early Volgian)

Grey = emergent land
Blue = marine mudstones
Yellow = shallow marine/shoreface sands (Laver Member, Upper Fulmar Formation, Ula Formation)
Orange = mass-flow basinal sands (Selkirk Member, Ribble Member)
NB. The distribution of sands within the mapped fairway will be controlled significantly by underlying Triassic pods and intervening salt walls.



Play fairway map for the J66-J73 Genetic Sequence (mid Early Volgian to mid Late Volgian)

Grey = emergent land
Blue = marine mudstones
Yellow = shallow marine/shoreface sands (Nidd Member)
NB. The distribution of sands within the mapped fairway will be controlled significantly by underlying Triassic pods and intervening salt walls.

[1]Geostrat Report – The Sequence Stratigraphy and Sandstone Play Fairways of the Late Jurassic Humber Group of the UK Central Graben
A non-exclusive report purchased by the OGA from Geostrat as part of the Data Purchase tender process (TRN097012017) that was carried out during Q1 2017. The contents do not necessarily reflect the technical view of the OGA but the report is being published in the interests of making additional sources of data and interpretation available for use by the wider industry and academic communities.

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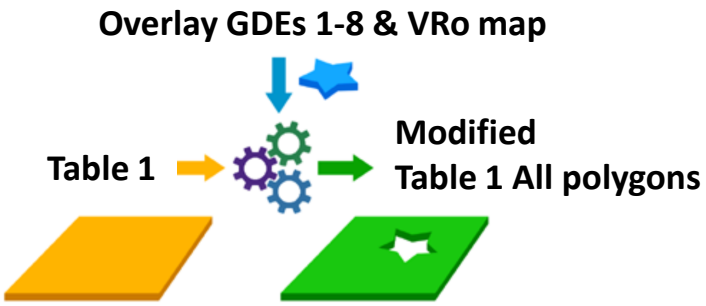
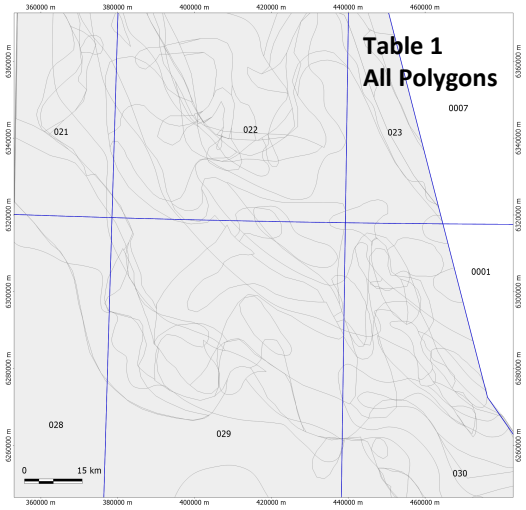
Technical Workflow:

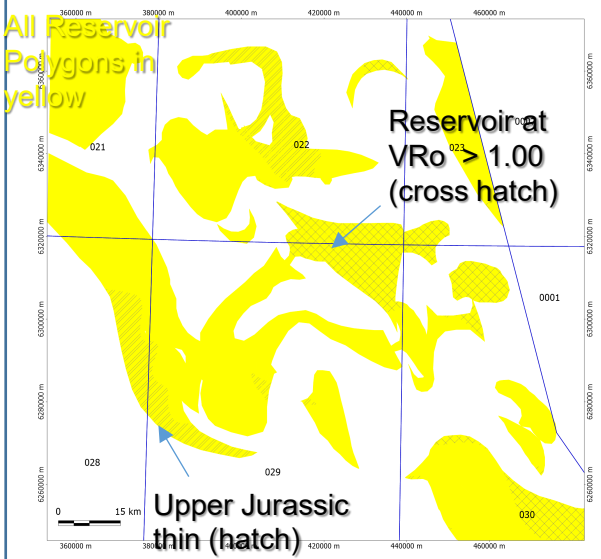
GDE maps (and any other maps) are overlain iteratively to create a spatial database Table 1 which can be queried as illustrated below:





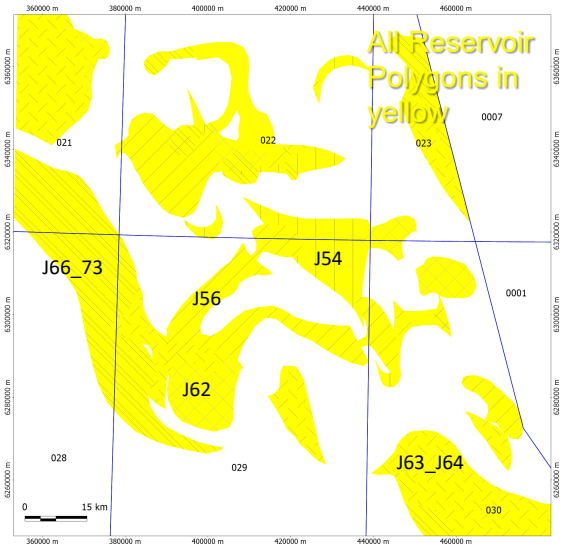
Total Reservoir Presence and Reservoir Effectiveness theme:

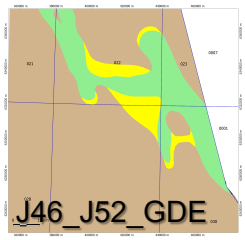
SELECT From Table 1.GDE (1 to 8)
WHERE Reservoir = 'Present'
HATCH BY Ro > 1.00 AND 'UJur_Thin'

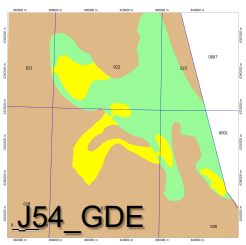


Reservoir – Seal Pairs theme:

SELECT From Table 1.GDE (1 to 8)
WHERE Reservoir = 'Present'
HATCH BY Seal_Age







Products:

CGL can convert client-sourced files in any GIS format into a spatial database table and output as .shp, geodatabase (.gdb), or Access (.mdb). CGL also has a library of facies and structure maps in vector and raster format.

For more information, please contact Dave Melnyk; davem@calderdalegeoscience.co.uk
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