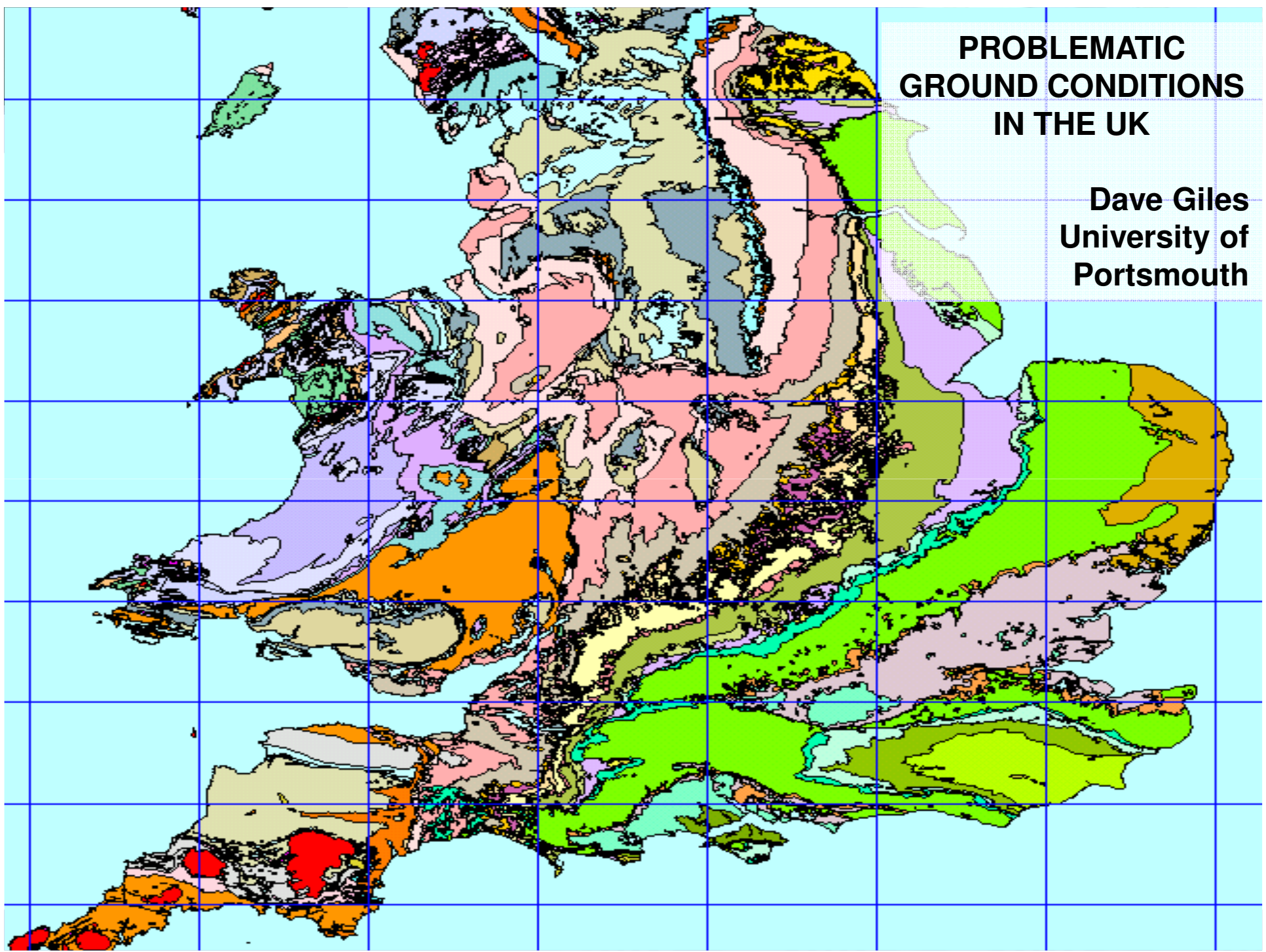


**PROBLEMATIC
GROUND CONDITIONS
IN THE UK**

**Dave Giles
University of
Portsmouth**



UNIVERSITY OF PORTSMOUTH

SCHOOL OF EARTH & ENVIRONMENTAL SCIENCES

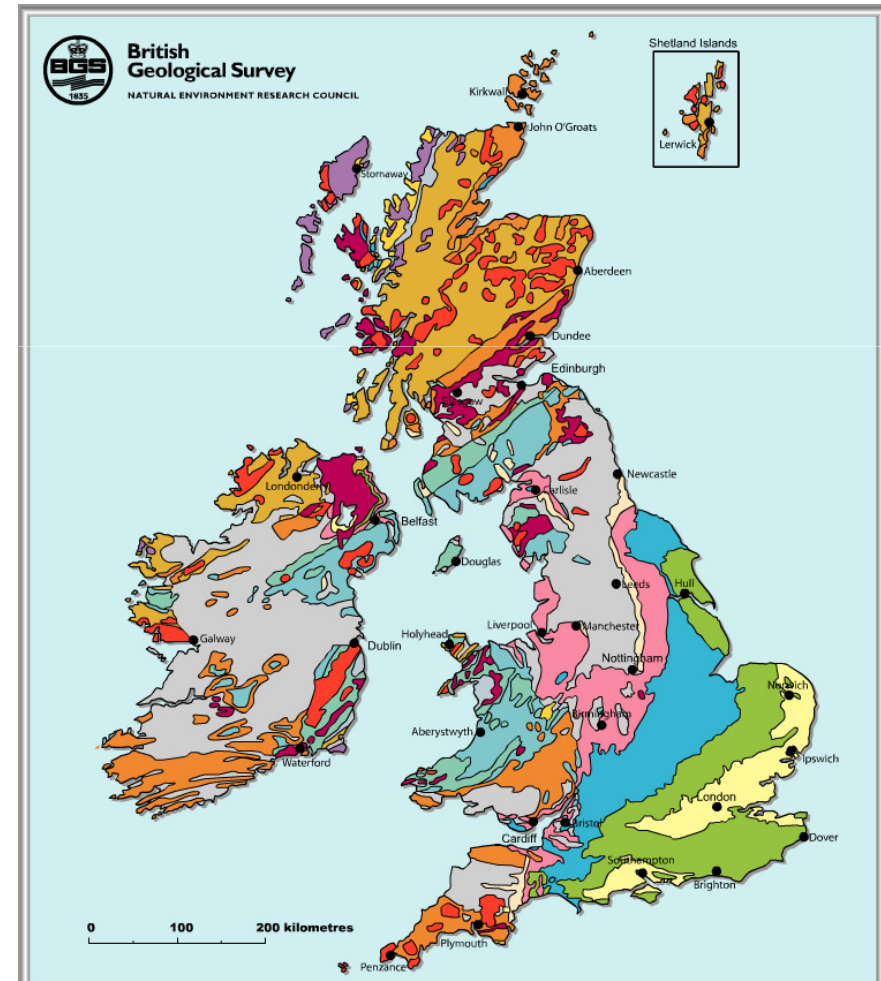
**Problematic Ground Conditions in the UK: Ground
Subsidence, Collapse & Problematic Soils**

Dave Giles

Principal Lecturer in Engineering Geology

Overview

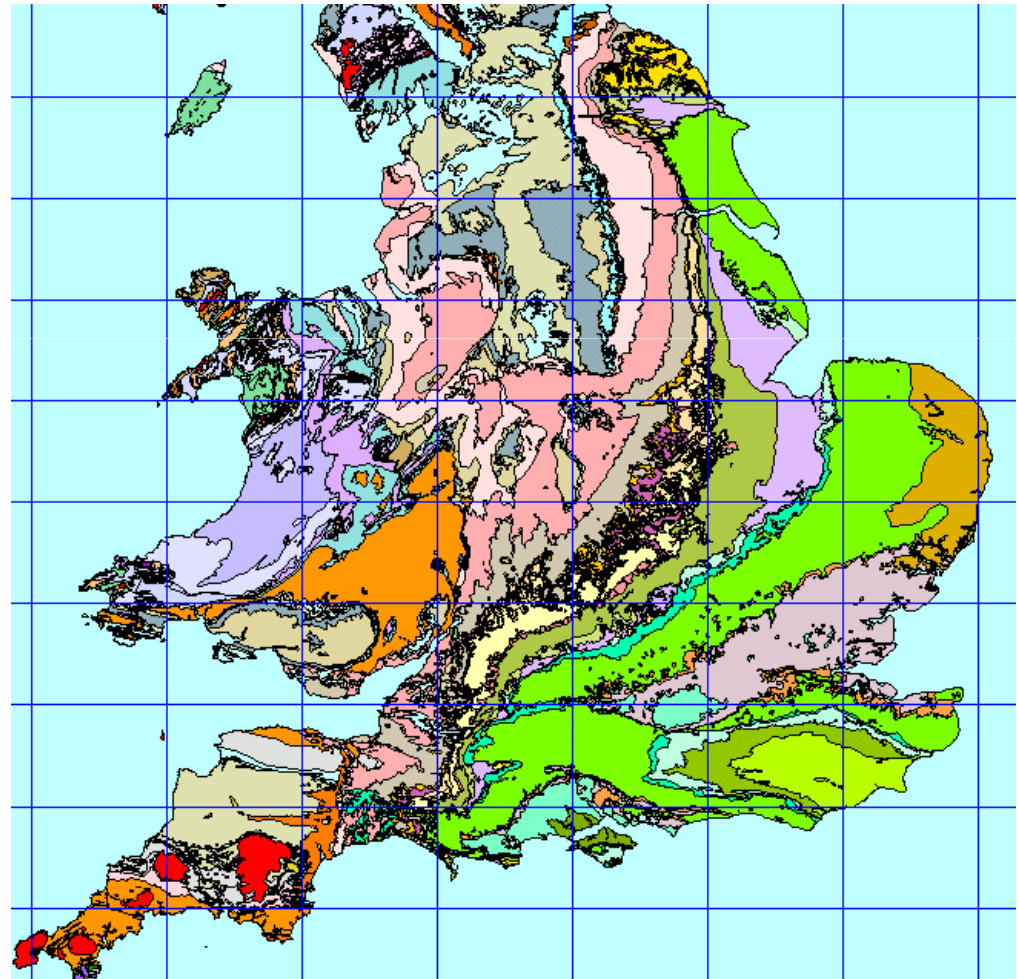
- Problematic Ground Conditions in the UK
- Stratigraphic - Lithological Legacy
- Mining legacy
- Periglacial Legacy
- **Problematic Geology**
 - Rocks
 - Soils
- Case Studies



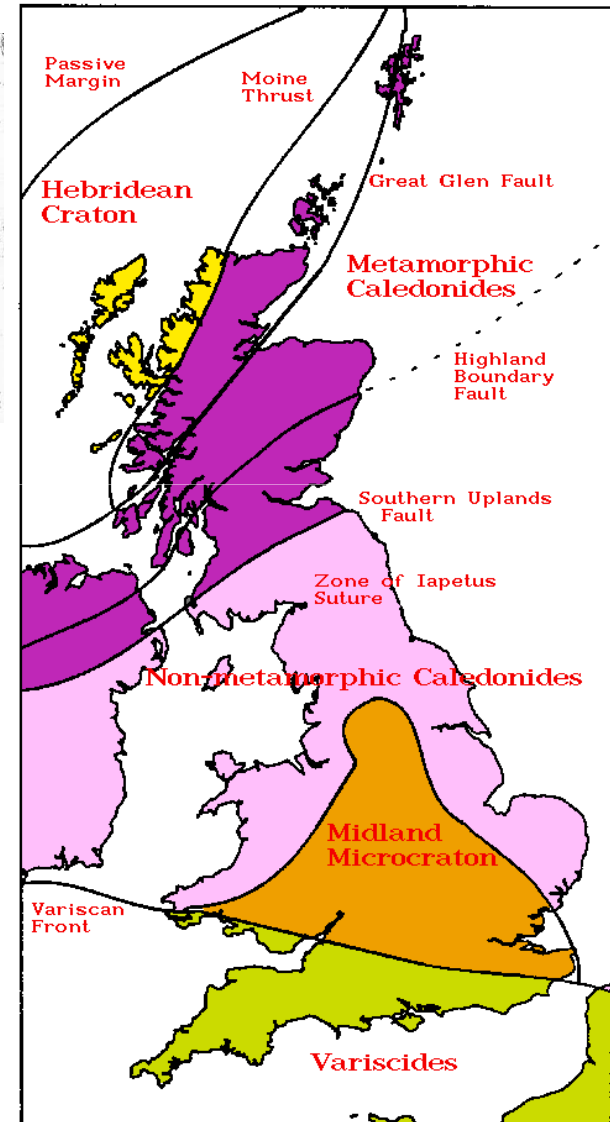
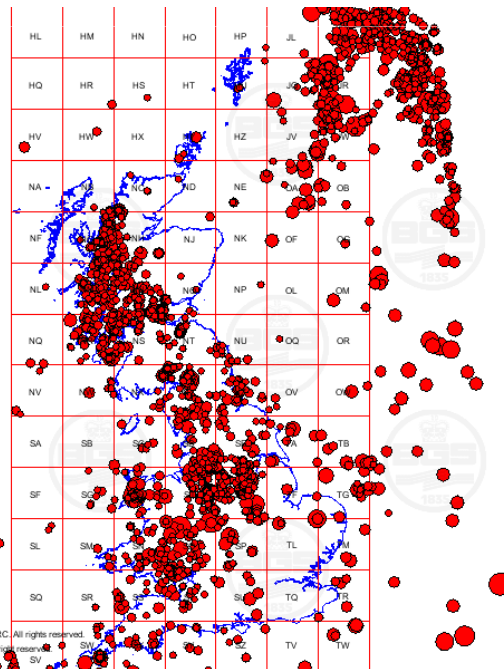
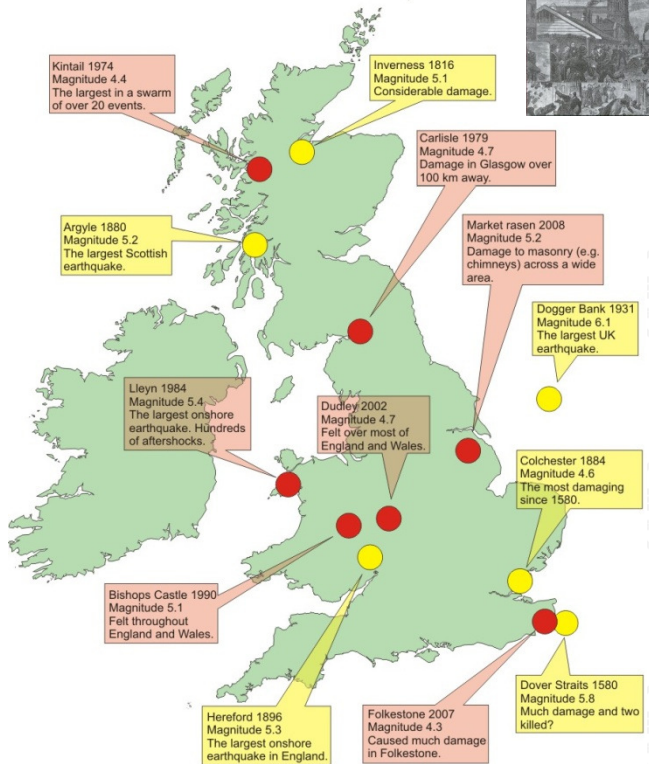
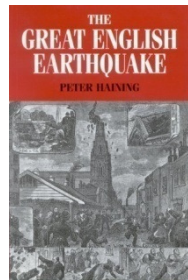


UK Problematic Ground Conditions

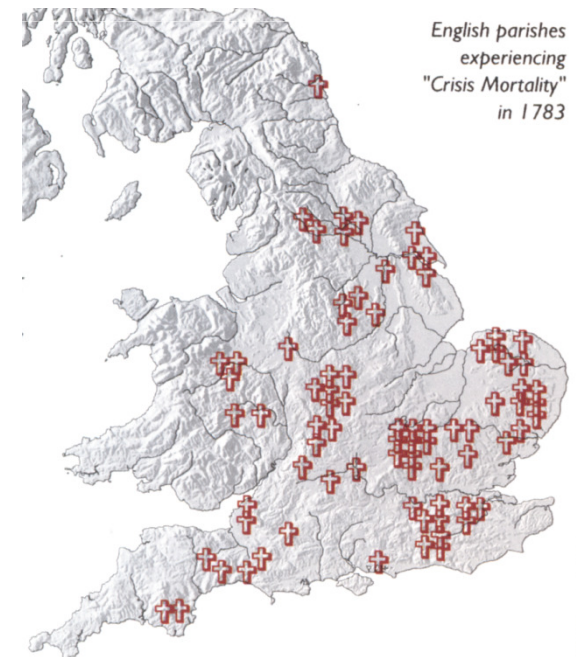
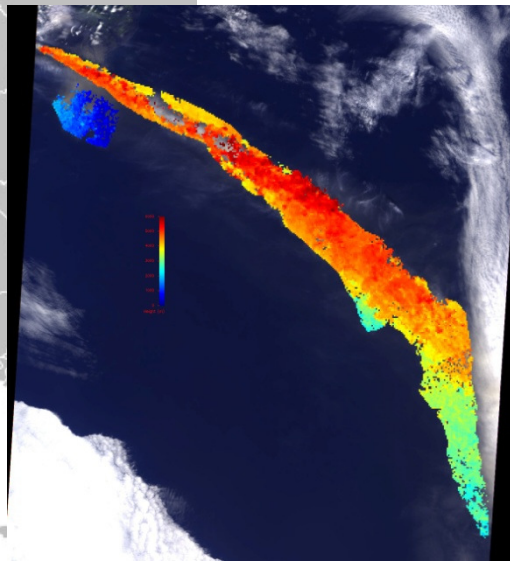
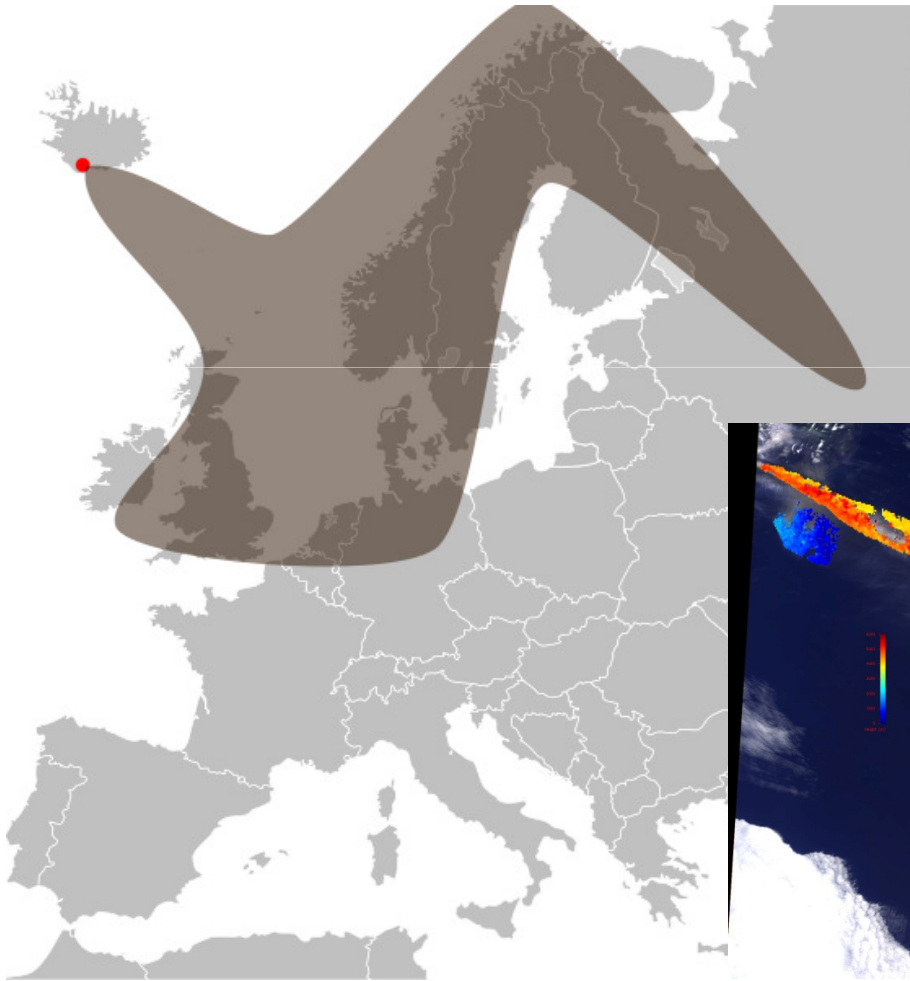
- Soluble
- Collapsible
- Swell / Shrink
- Compressible
- Mined & Extracted
- Radon
- Sliding & Spreading
- Gas Hazard
- Fault Reactivation
- Groundwater Recovery



UK Seismicity



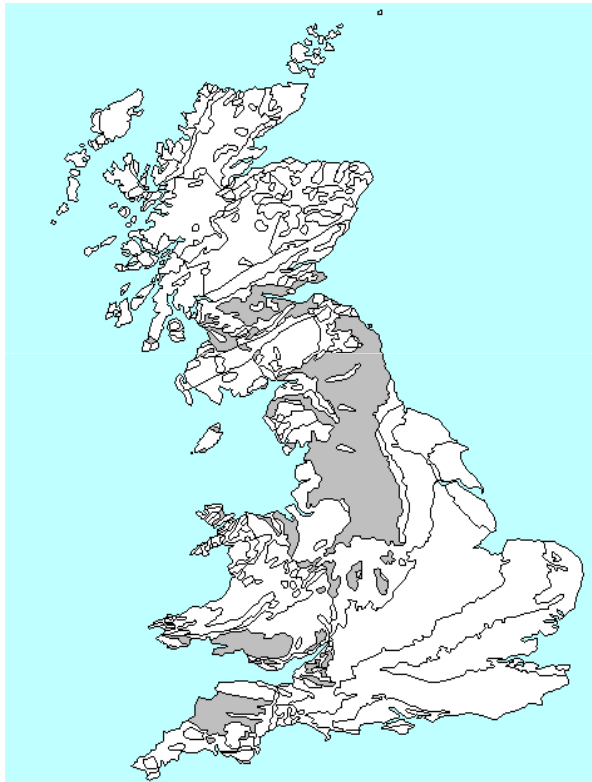
UK Volcanicity



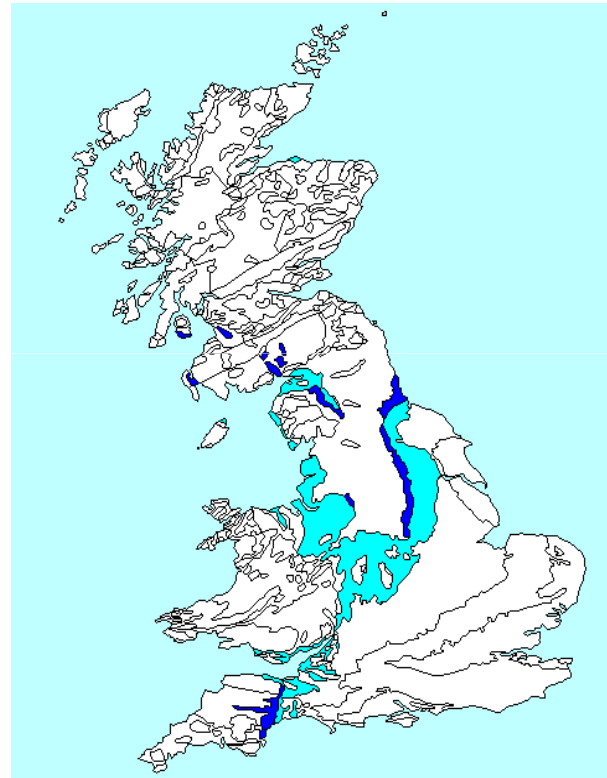
English parishes
experiencing
"Crisis Mortality"
in 1783



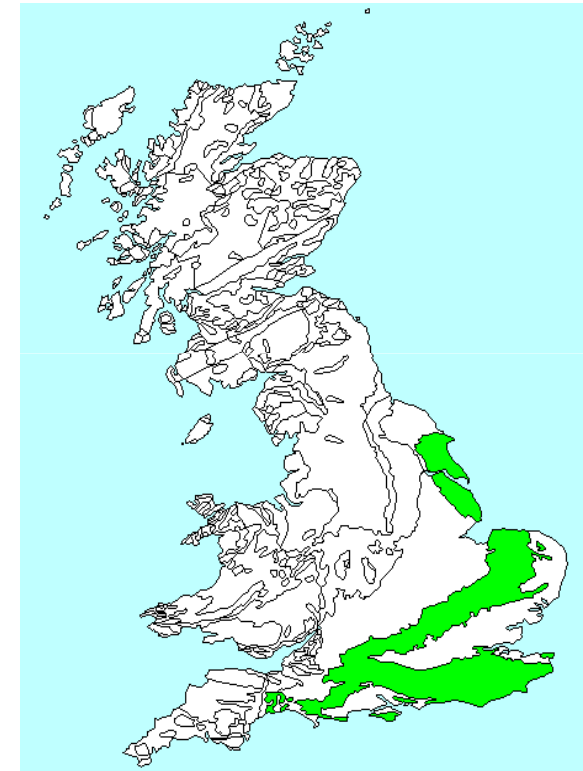
Soluble Rocks – Dissolution Hazard



**Permian Magnesian Limestones
Cretaceous Chalk**



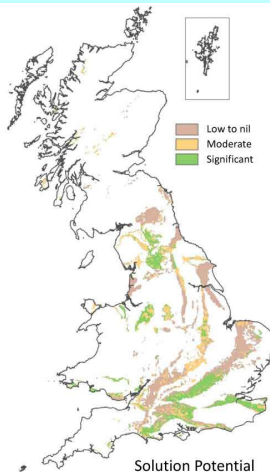
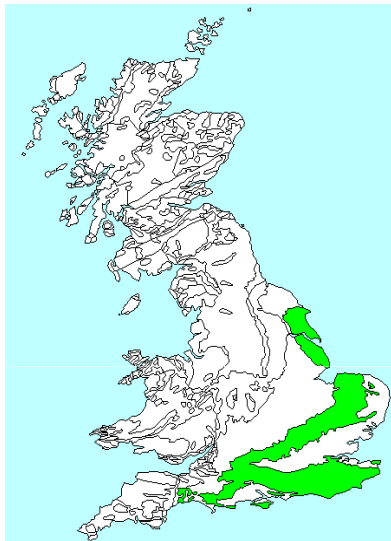
**Carboniferous Limestones
Permo-Triassic Evaporites**



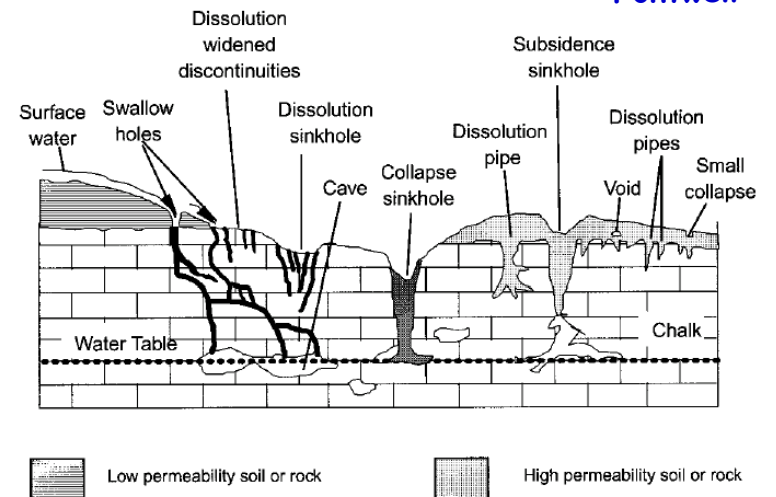
Chalk Dissolution



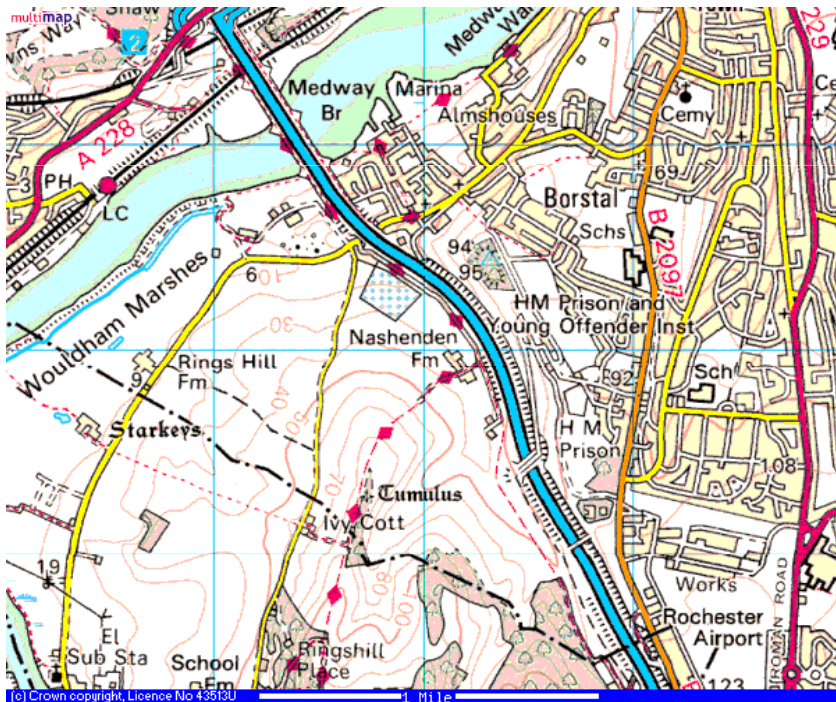
Lulworth Cove



Fontwell



M2 Widening Channel Tunnel Rail Link Kent





North Downs Tunnel, Channel Tunnel Rail Link, Kent

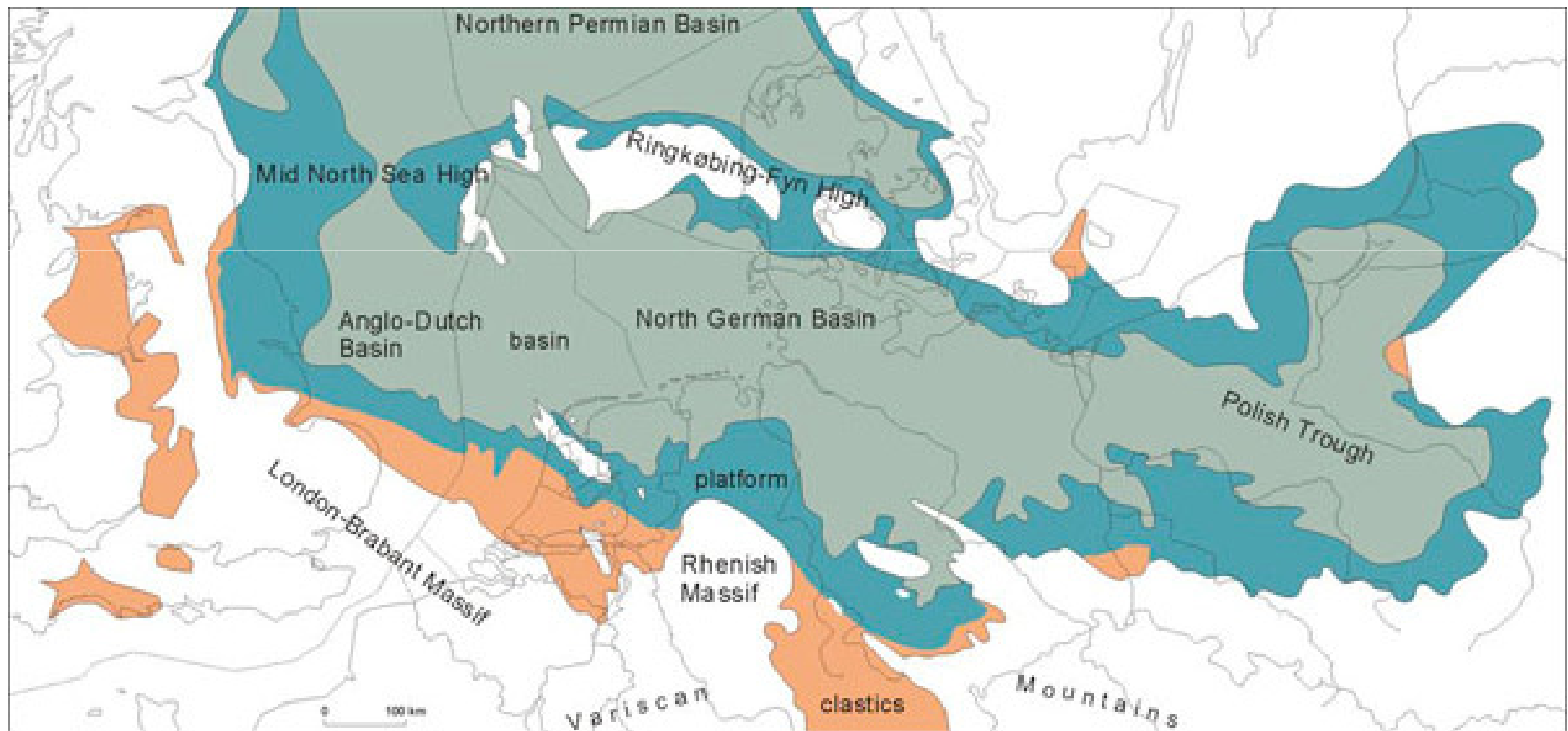








Evaporite Dissolution – The Zechstein Sea Legacy

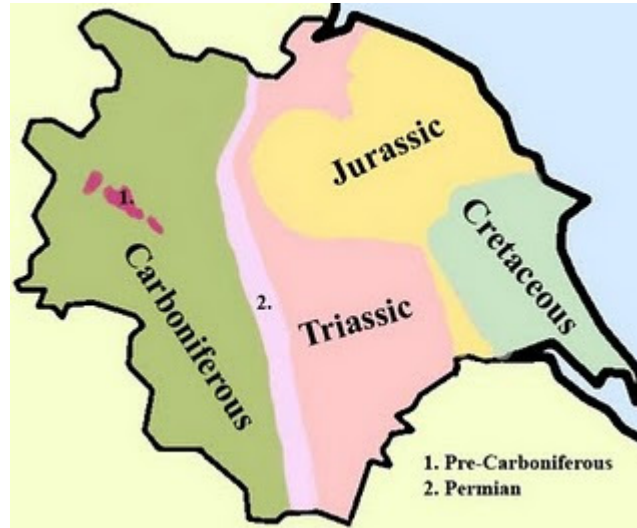
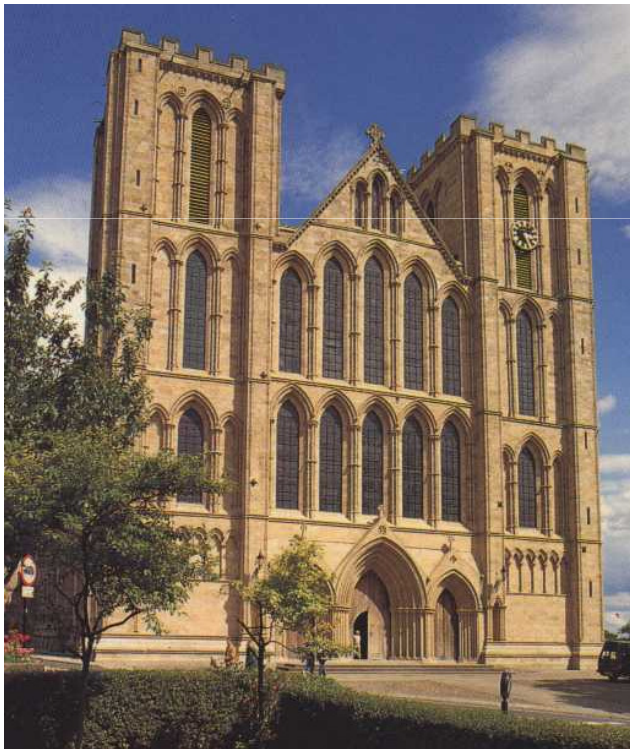




River Ure, Ripon

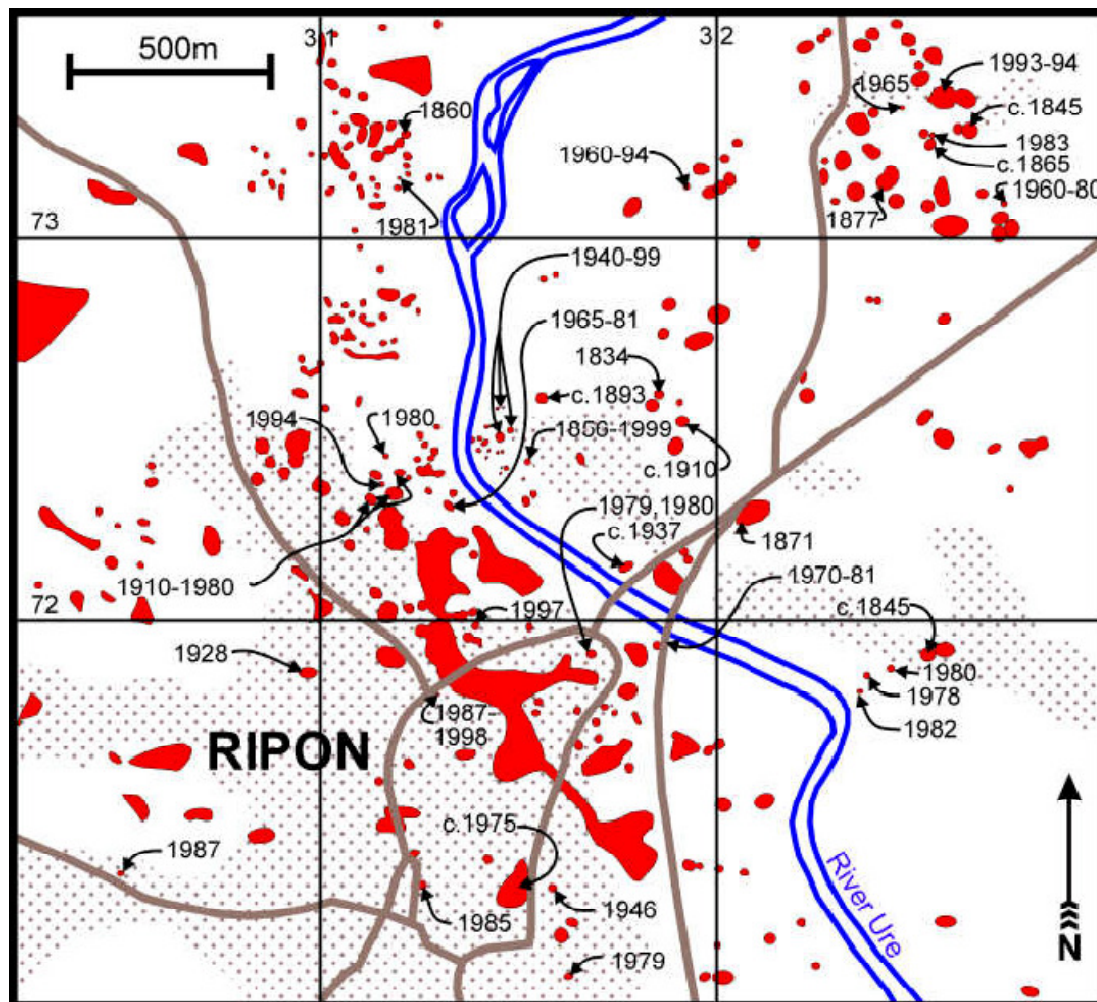


Ripon





Evaporite Dissolution



Ripon (UK) Gypsum Dissolution Subsidence Areas

Natural dissolution of gypsum results in a cave system which is continually and rapidly enlarging. Collapse into the caves causes severe catastrophic subsidence at the surface.

The natural subsidence is a major constraint to development in the area.

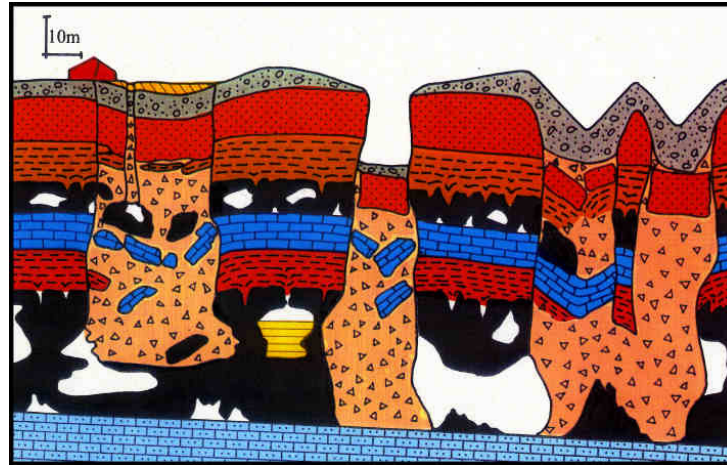
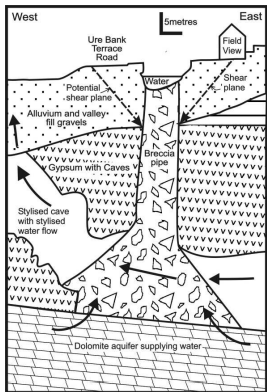
- Subsidence hollows with dates of subsidence
- Built up areas



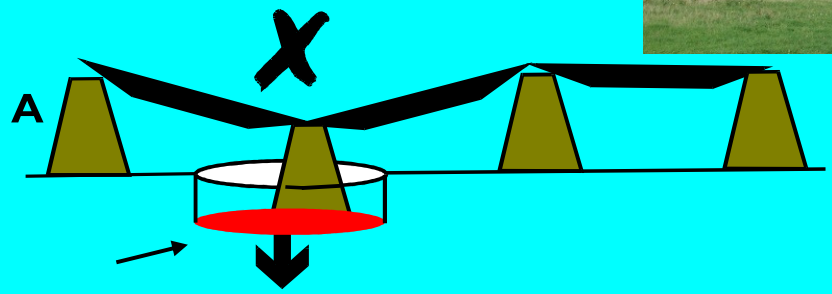




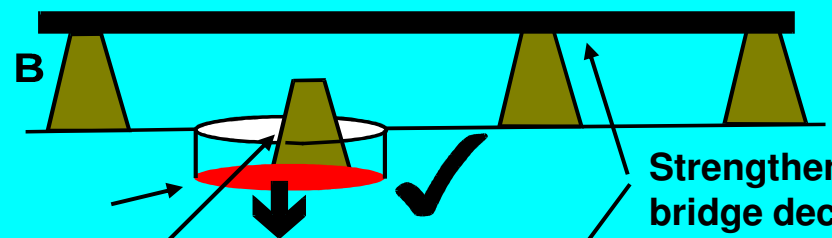
Ripon



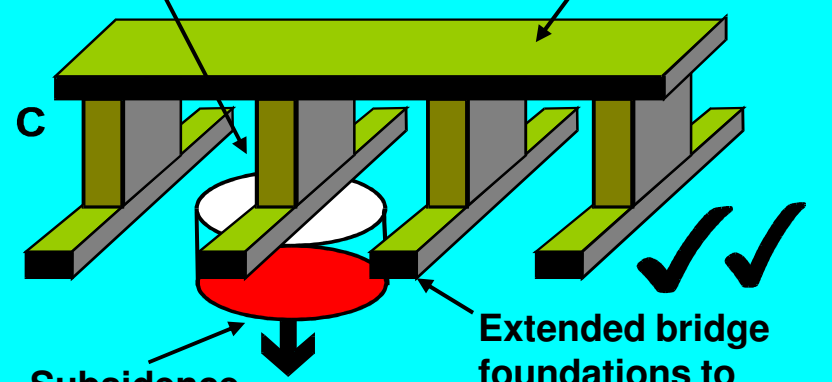




Sudden catastrophic collapse into subsidence hollow



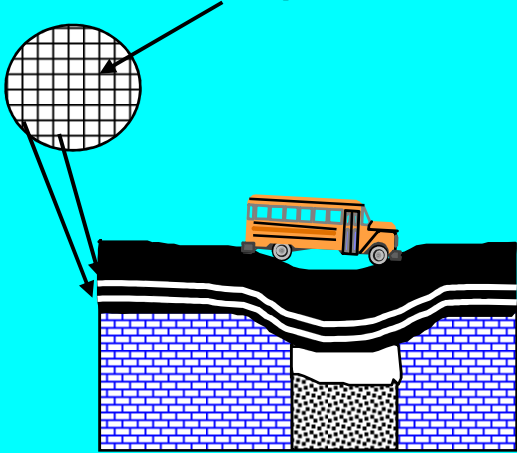
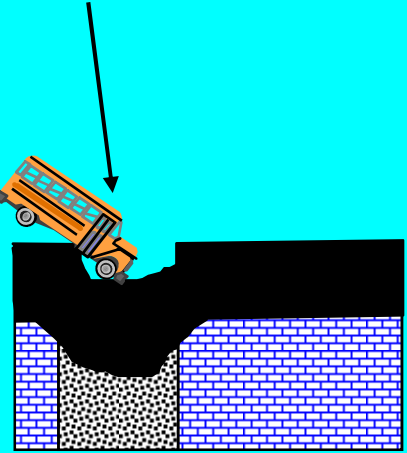
Strengthened bridge deck



Subsidence hollow

Extended bridge foundations to bridge subsidence

Layers of high-tensile reinforced plastic grid material in road sub-base and embankments to protect against sudden collapse



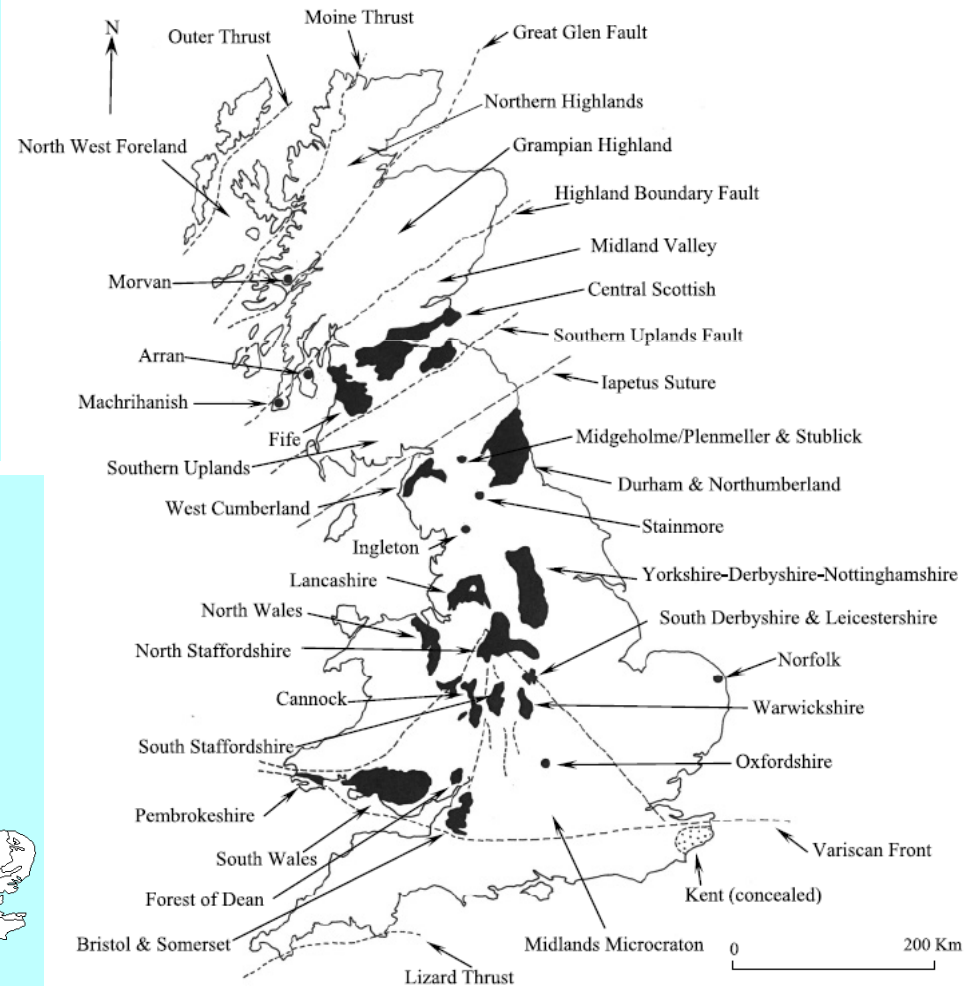
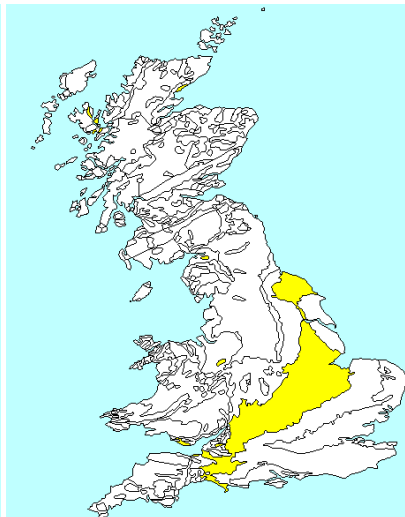
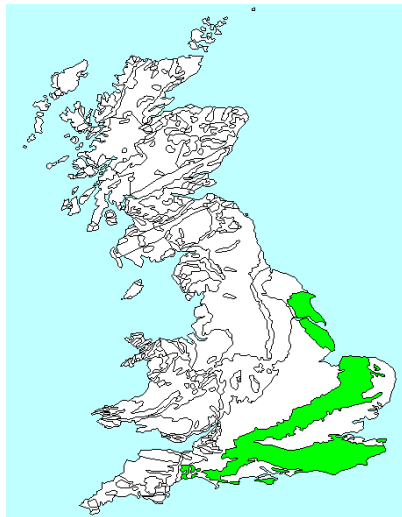
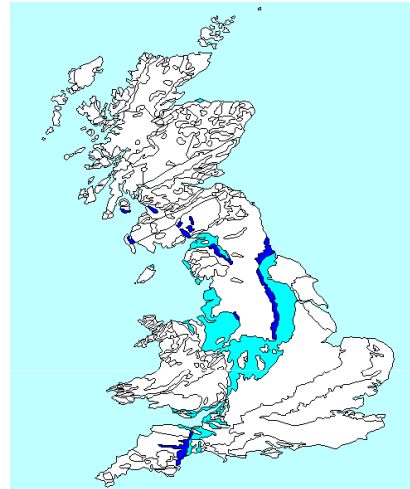
X



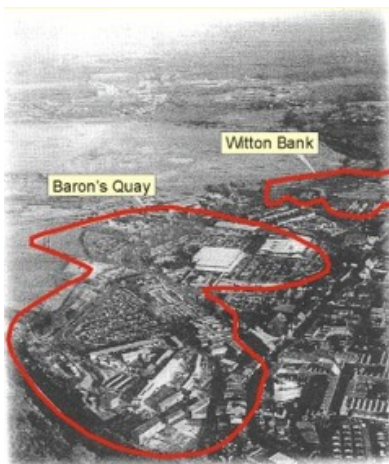
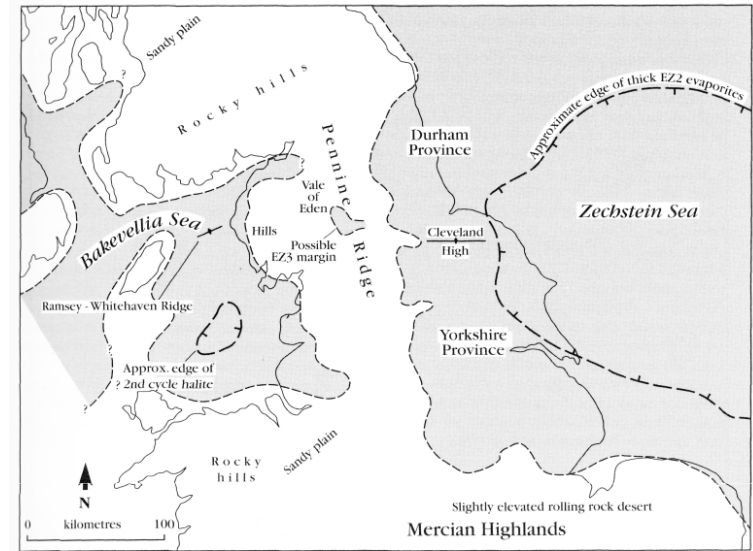
✓

Subsidence – Mining Geohazard

- Coal
- Chalk
- Limestone
- Salt
- Metalliferous

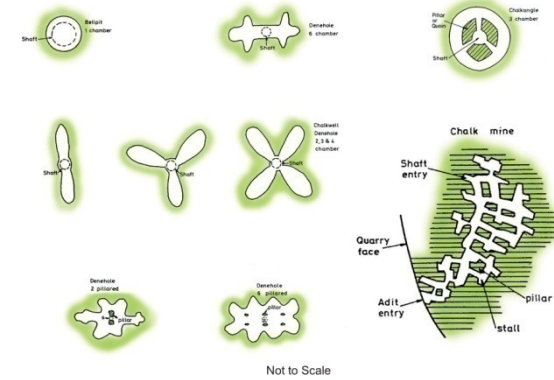


Salt Mining Subsidence



Chalk Mining Subsidence

Typical Plan Sections Through a Variety of Chalk Workings

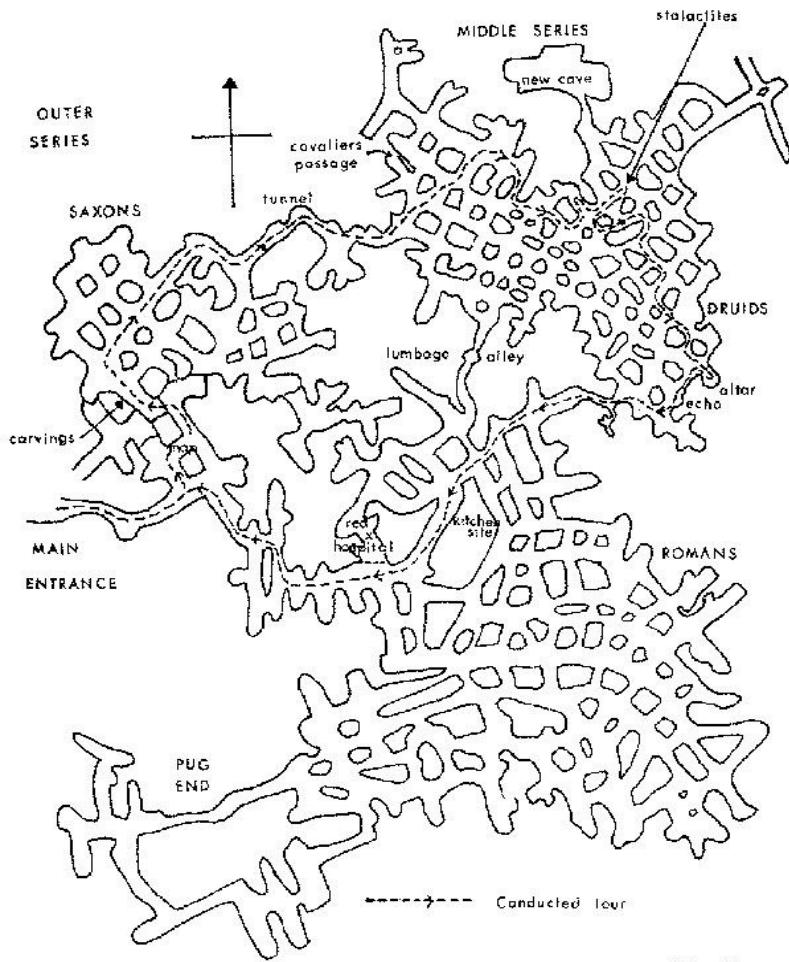


Blackheath Hill , London



Reading

Chalk Mines

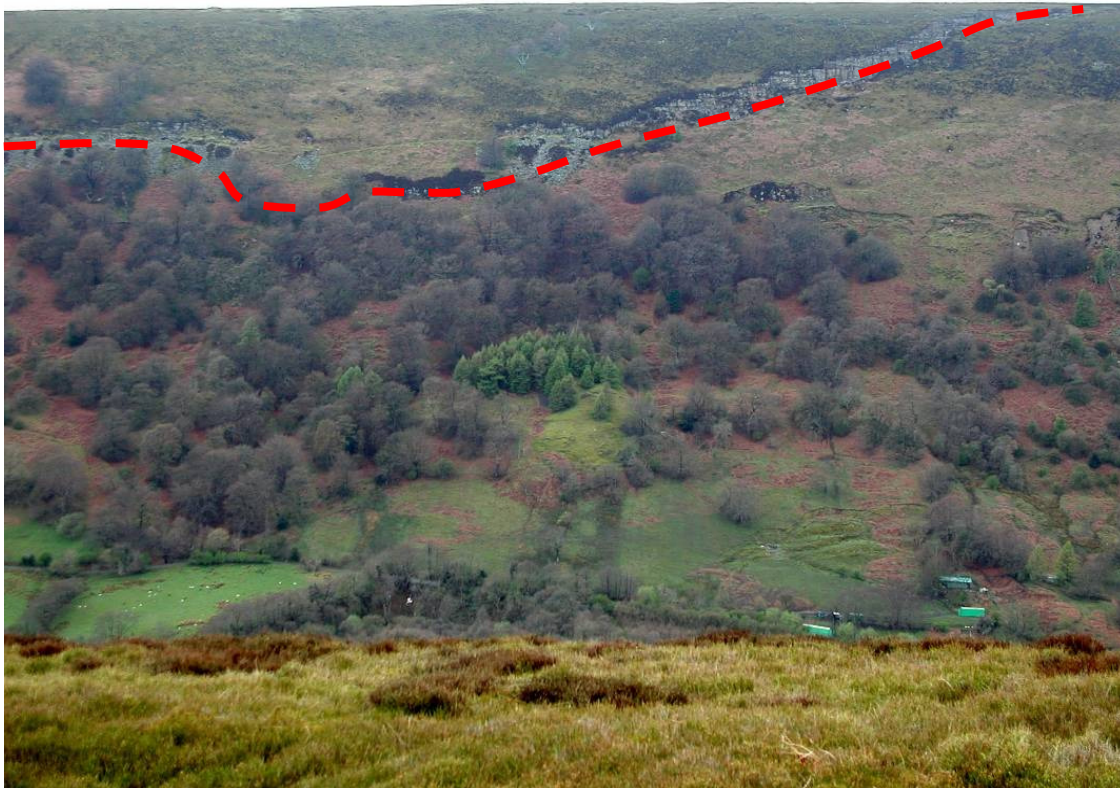


AS DISPLAYED ON THE WALL IN THE CAVES

Chislehurst, Kent



Coal Mining Subsidence



South Wales

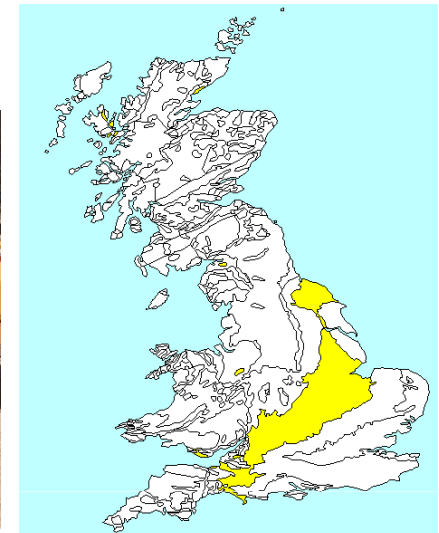
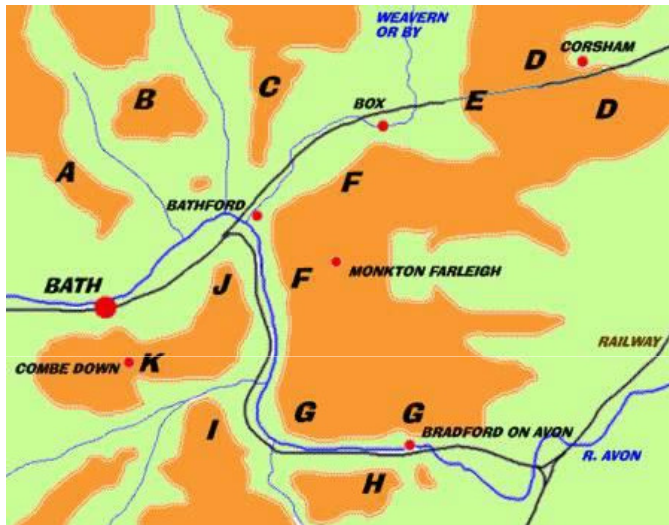
Crooked House Pub, Dudley



Edinburgh



Limestone Mining



Coombe Down,
Bath

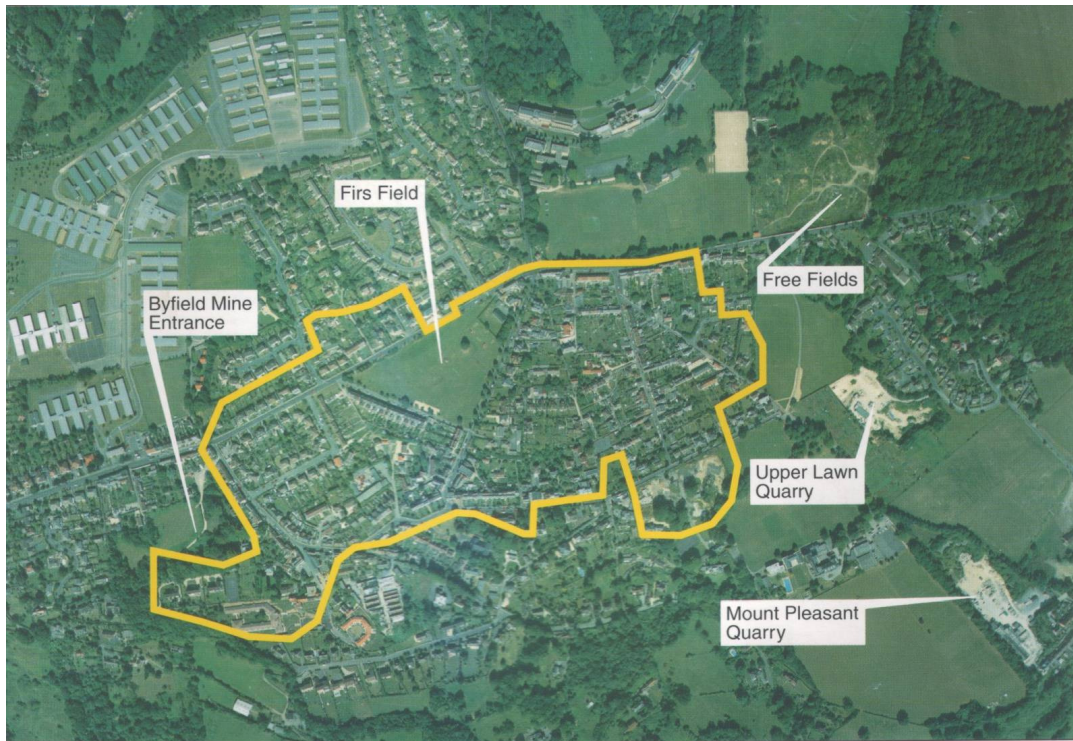




Westwood Mine, Bath

Limestone Mining

Coombe Down, Bath
Firs & Byfield Mine

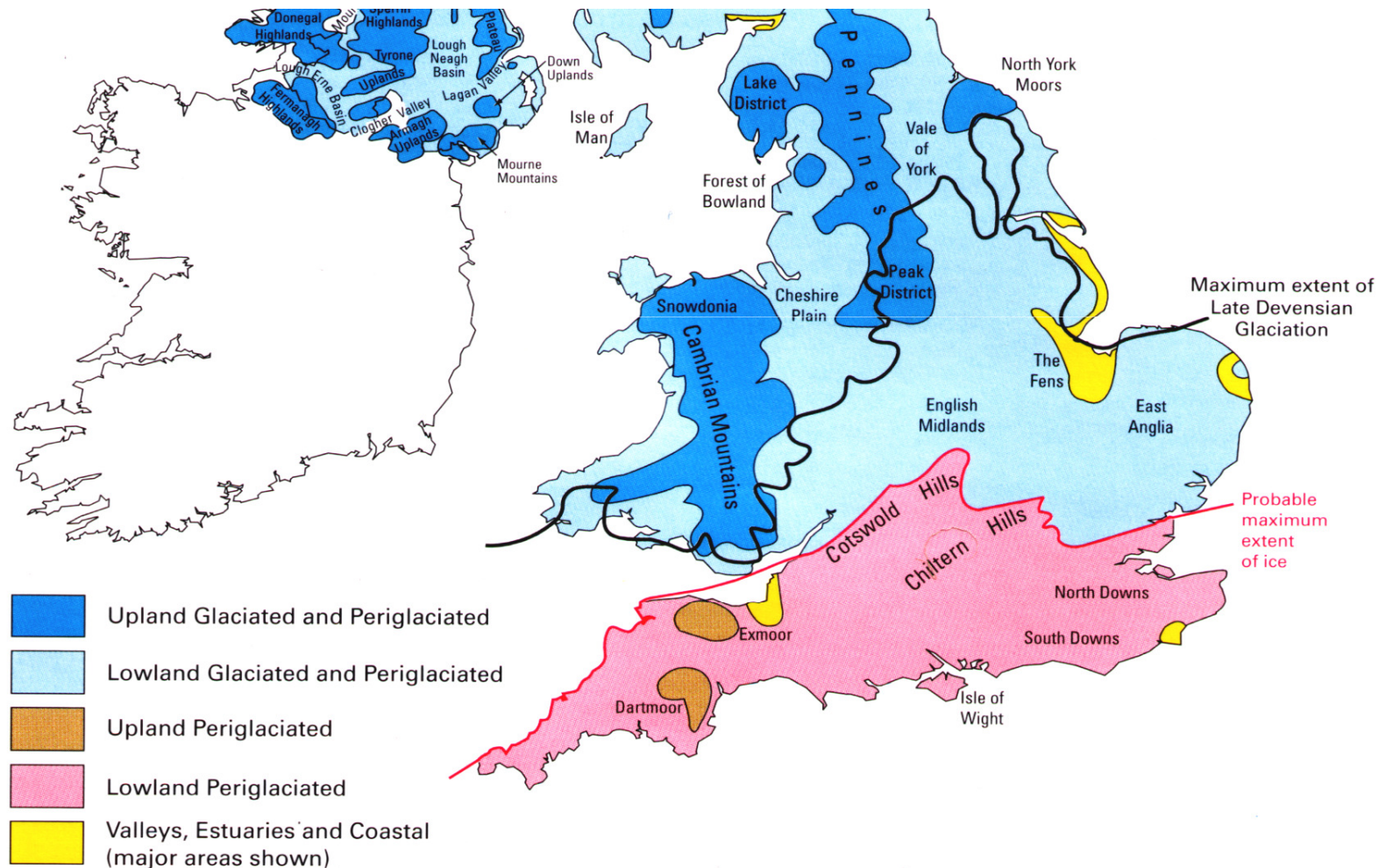


— Approximate boundary of Firs and Byfield mines.

Aerial photograph of Combe Down



The Periglacial Legacy





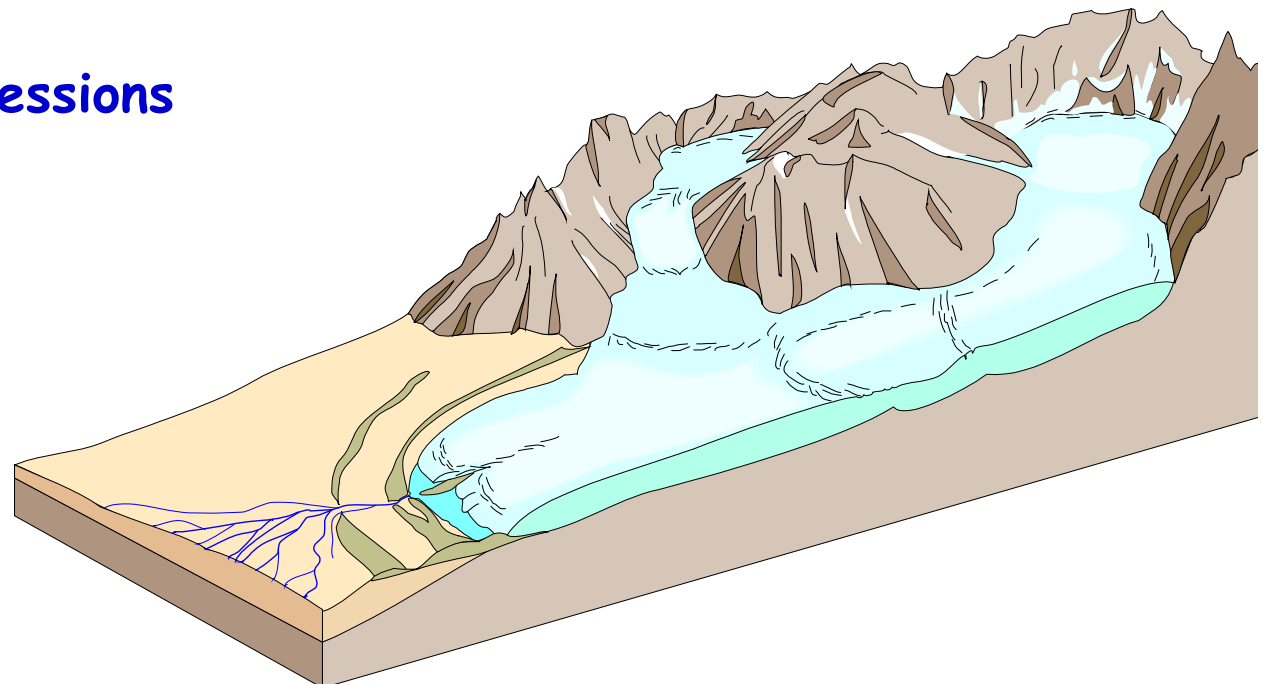
Periglacial Processes & Products

- Solifluction
- Cambering
- Valley Bulge

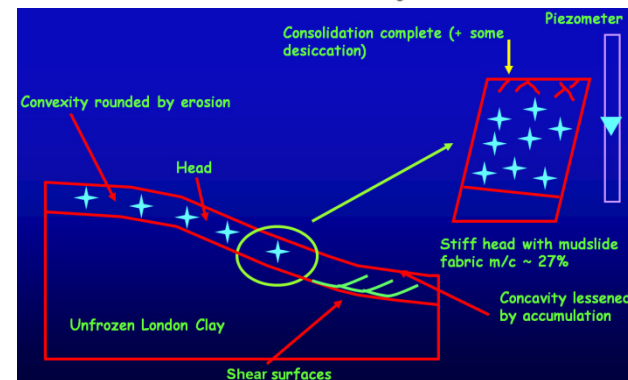
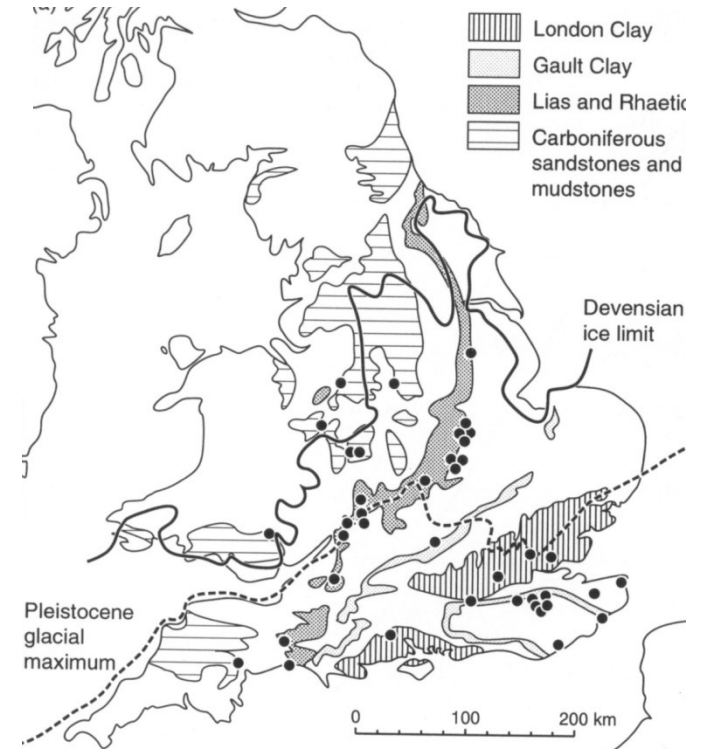
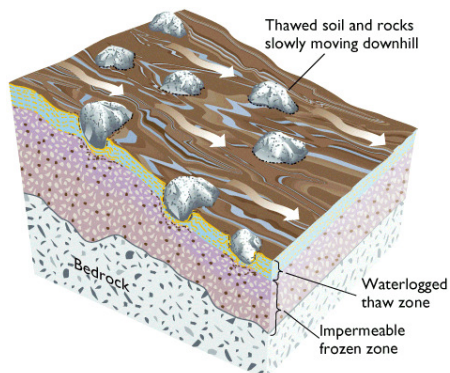
- Anomalous Depressions

- Ice Wedges

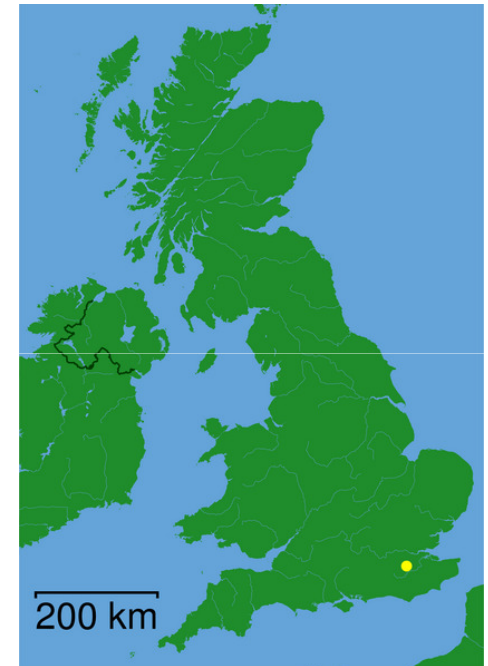
- Pingos



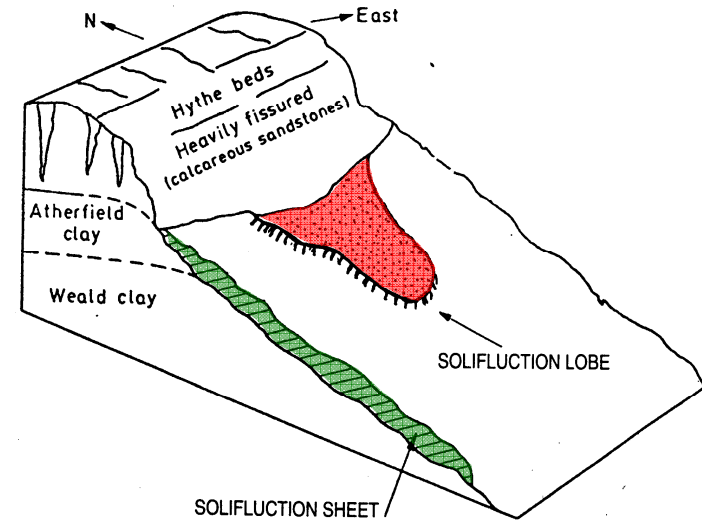
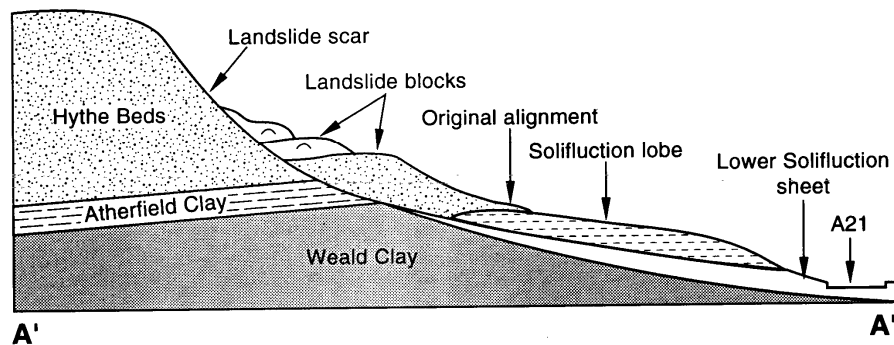
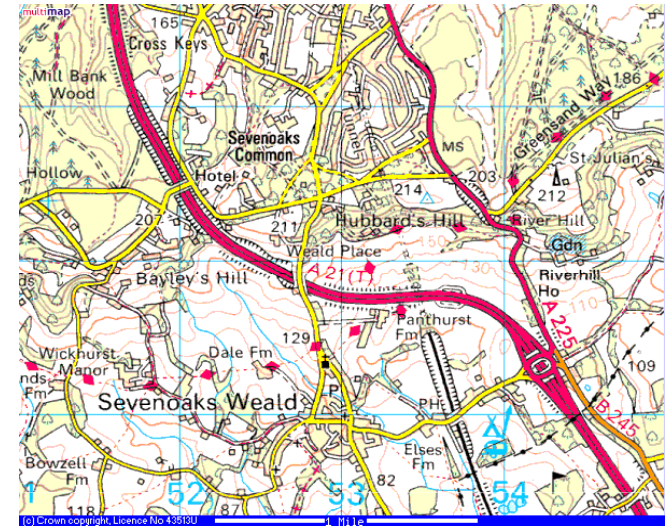
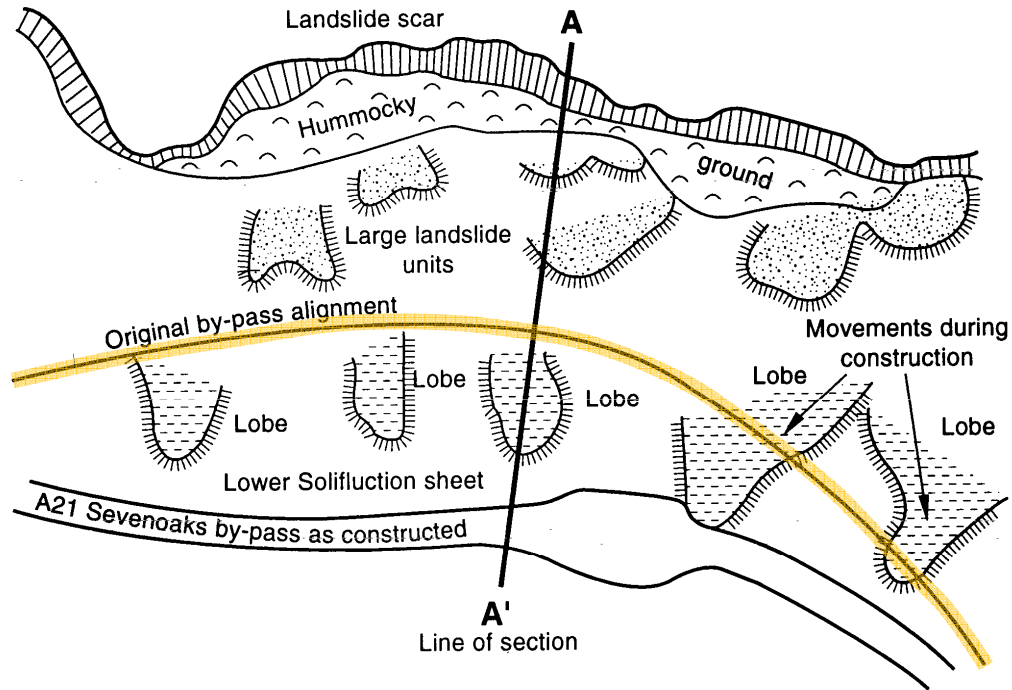
Periglacial Solifluction



Sevenoaks

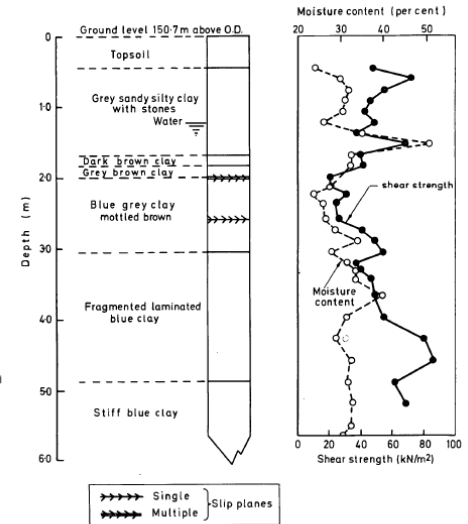
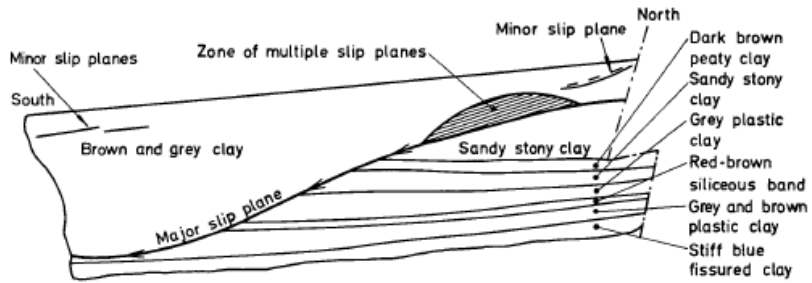


A21 Sevenoaks Bypass





A21 Sevenoaks Bypass

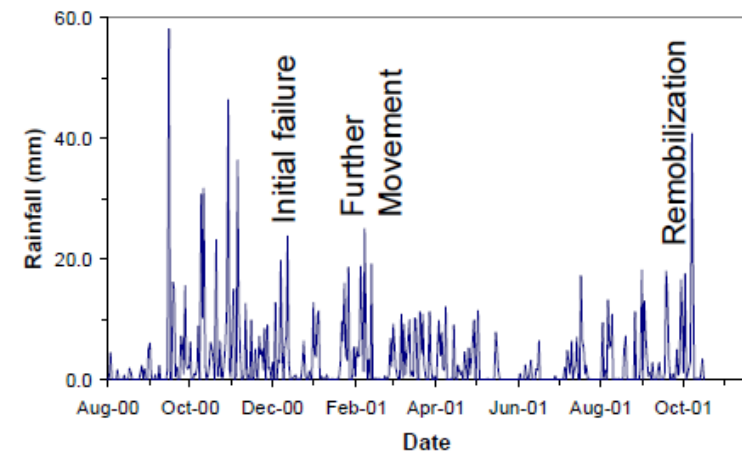
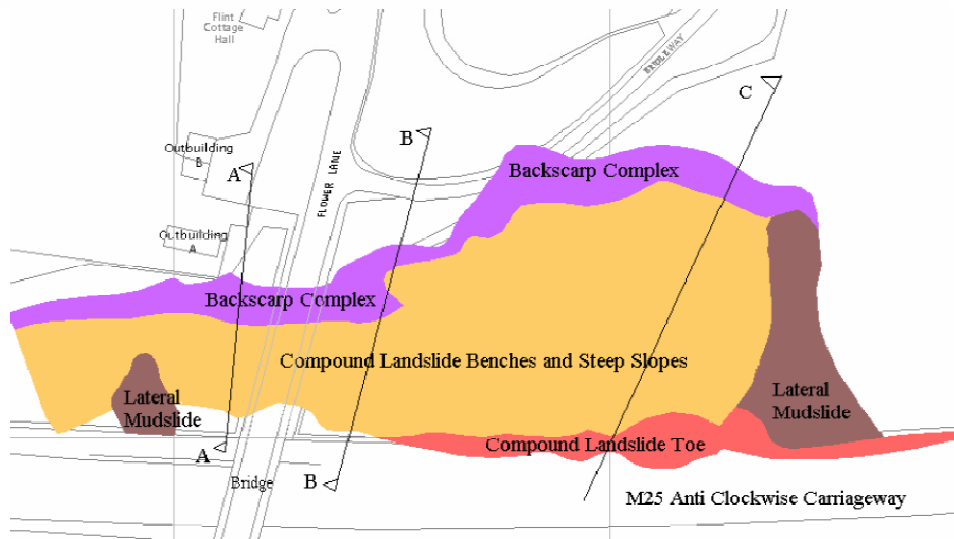
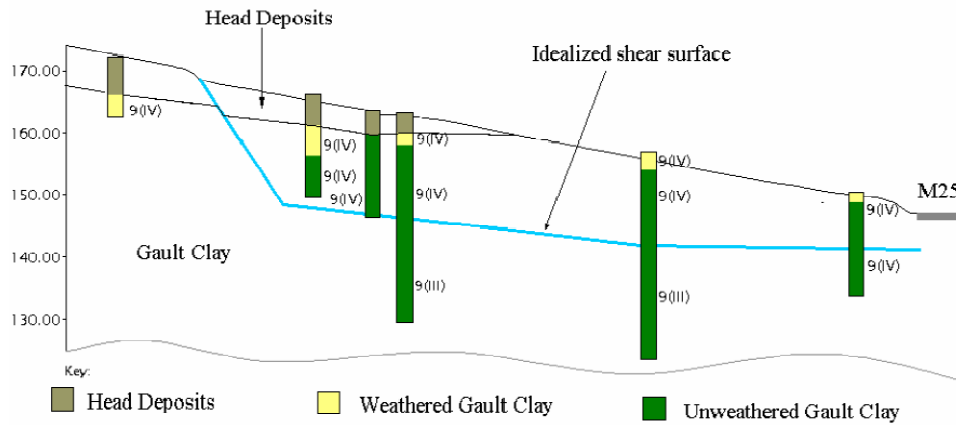


M25



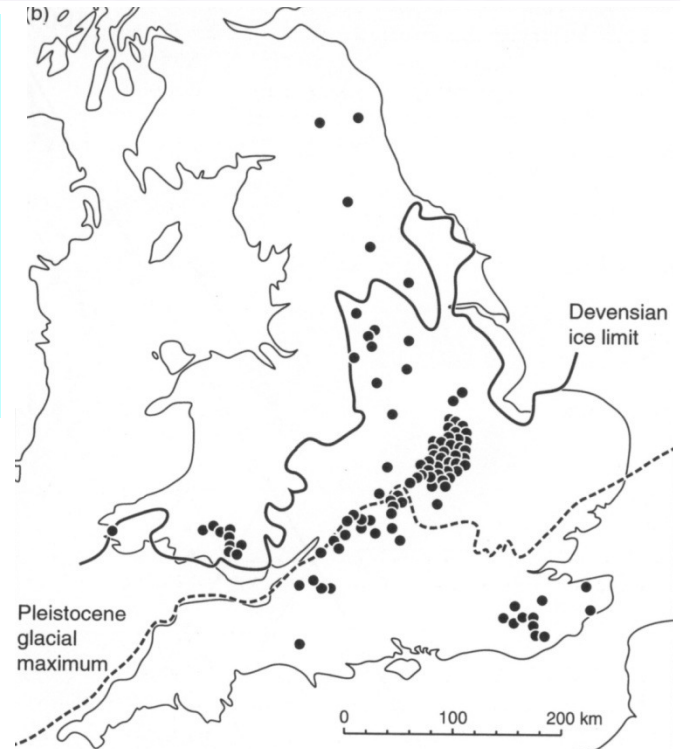
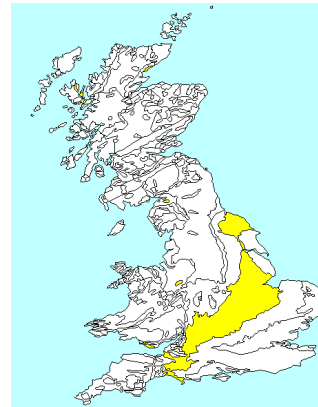
M25 Periglacial Shears

Flint Hall Farm Cutting

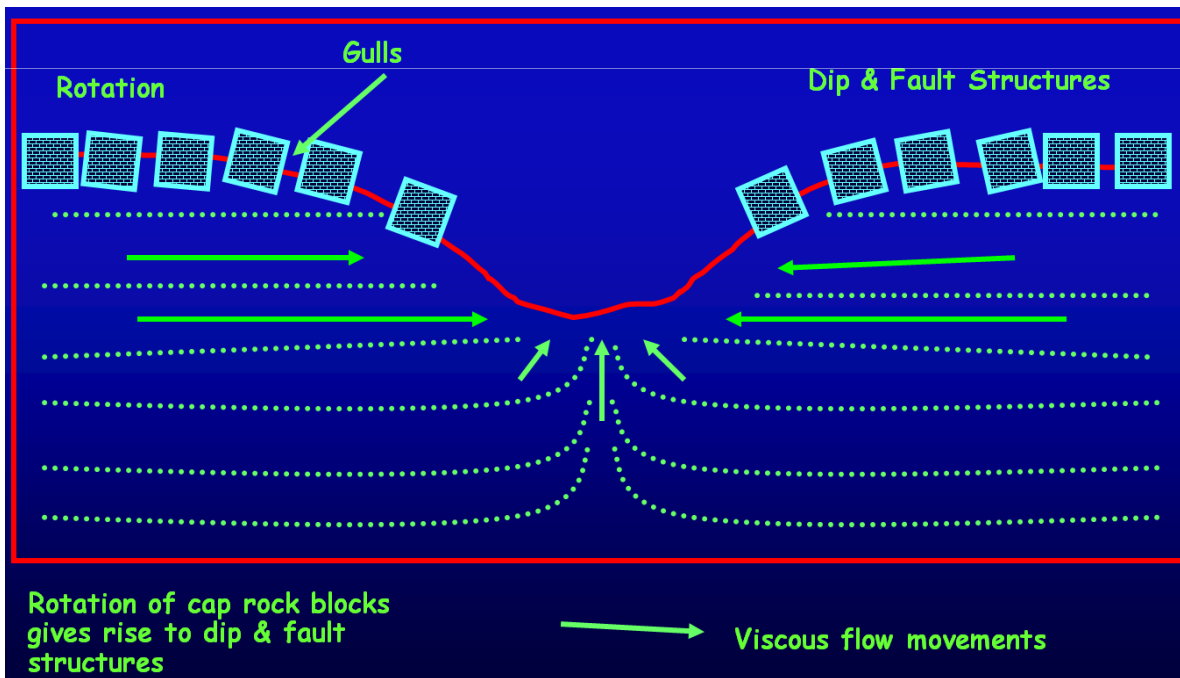


Superficial Valley Disturbances

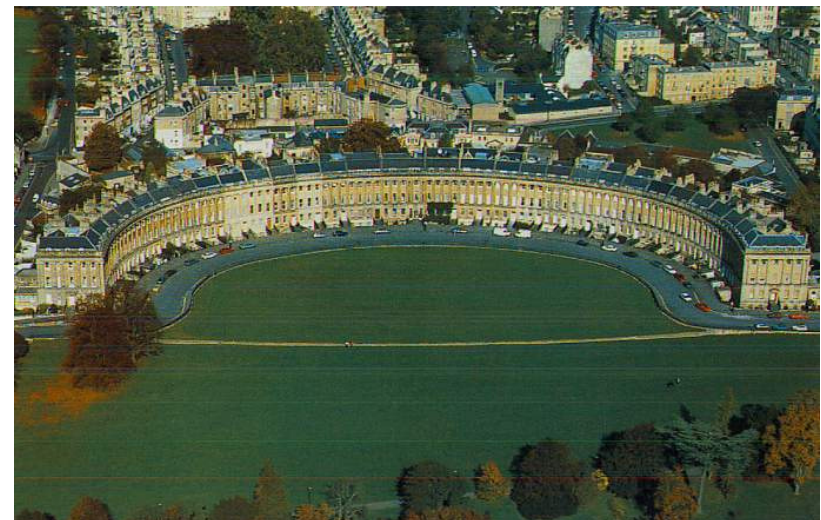
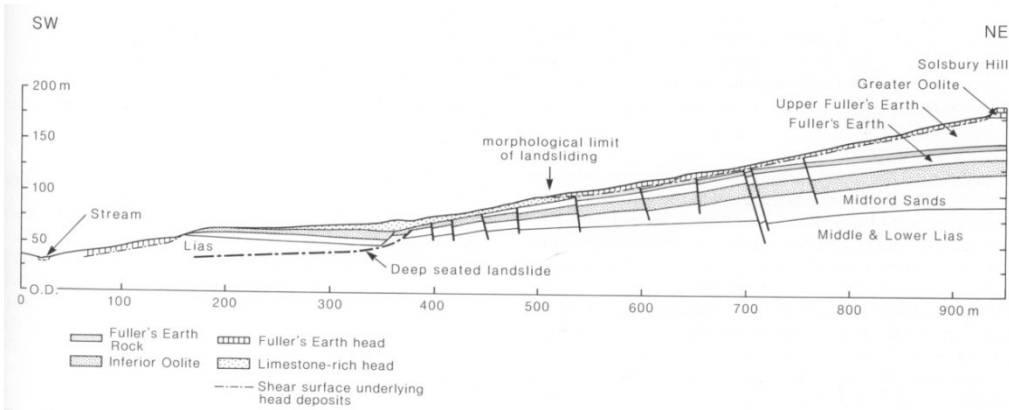
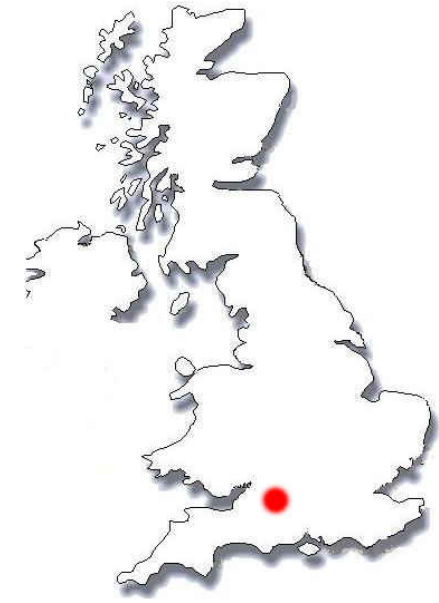
- Cambering
- Gulls
- Valley Bulging



Rowlee Bridge, Derbyshire



Bath





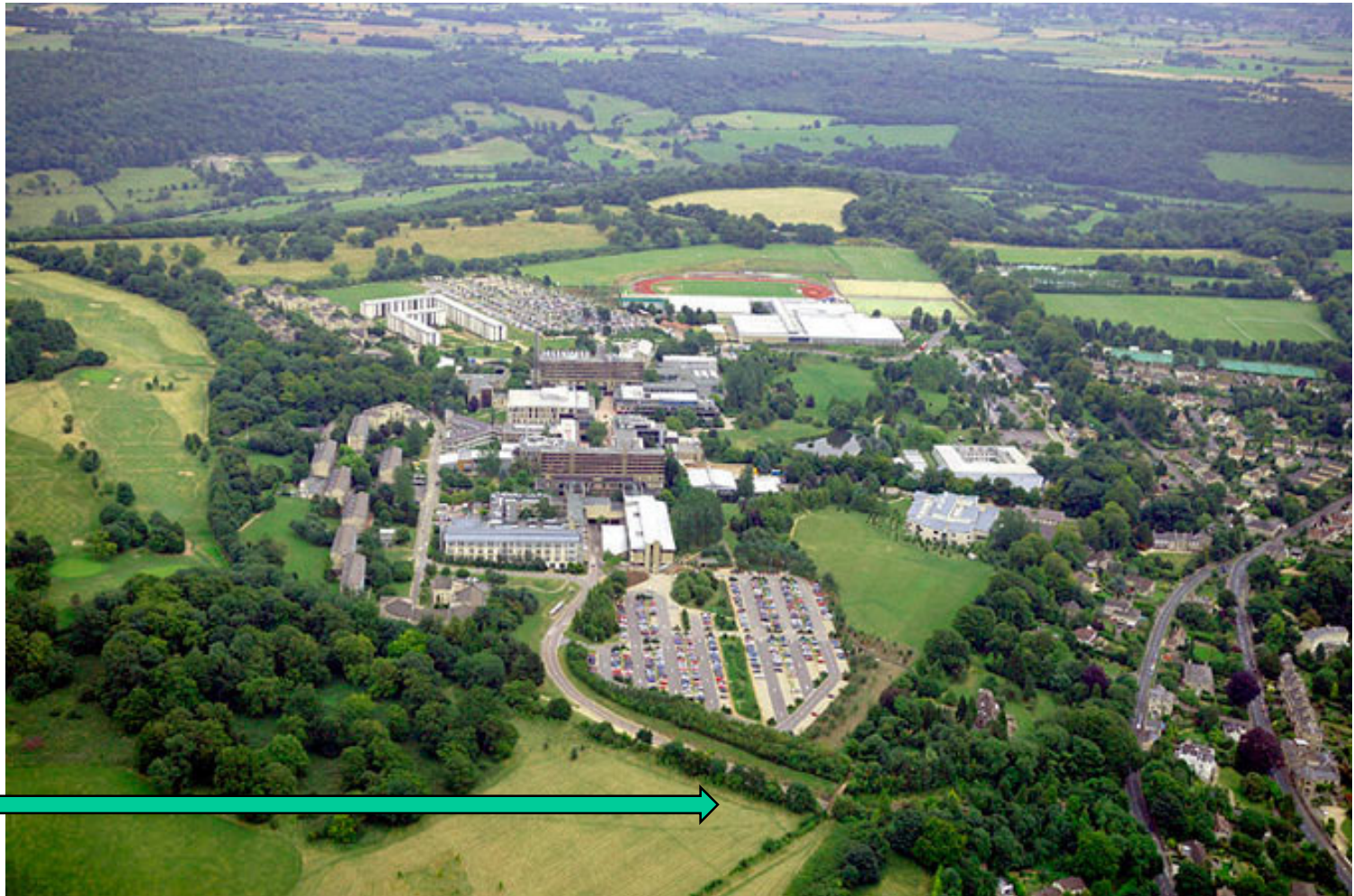
Gulls



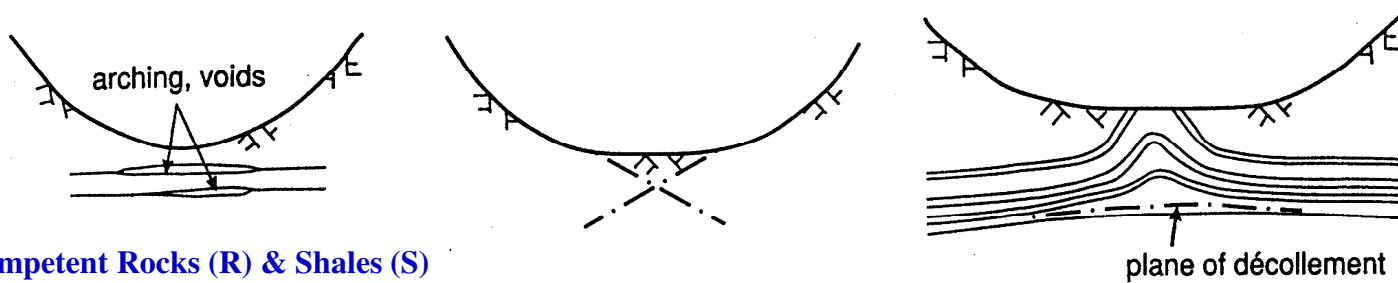
Westwood Mine



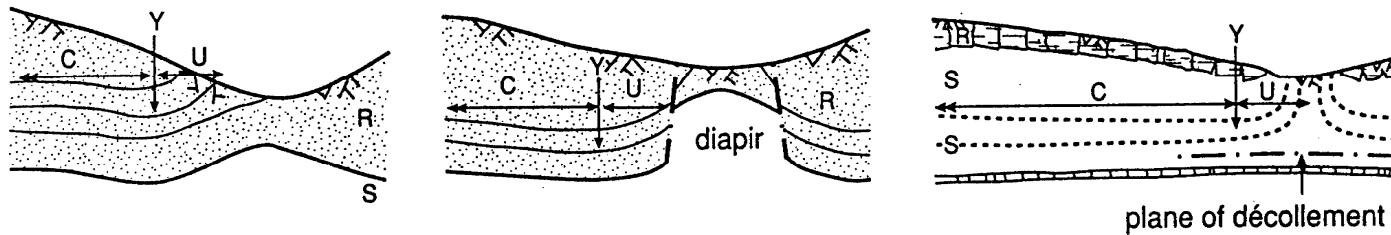
Bath University



Superficial Valley Disturbances

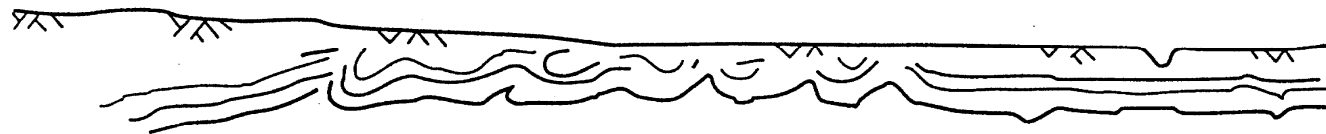


Alternations of Competent Rocks (R) & Shales (S)



Capping of Competent Rock (R) Over Stiff Clay / Shale (S)

Valley-side response muted



Wrinkle (multiple folds)

Predominately Well – Bedded Ductile Stiff Clay, Little Capping Rock

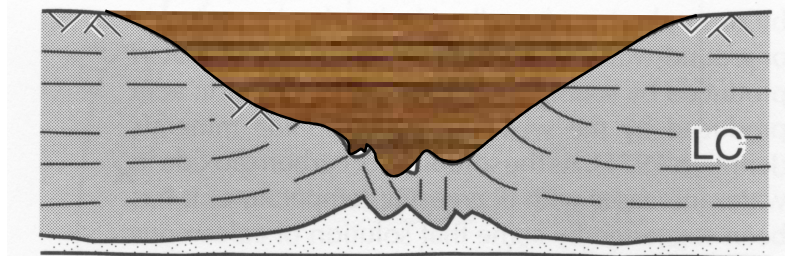
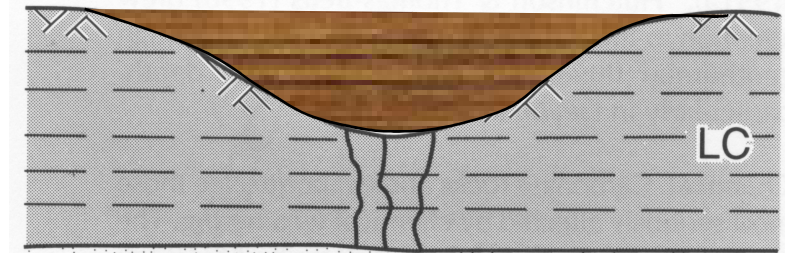


Batheaston

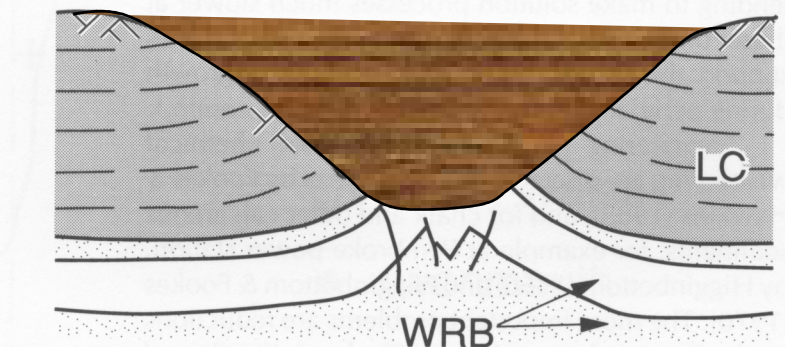


Anomalous Depressions

- Anomalies beneath river terraces



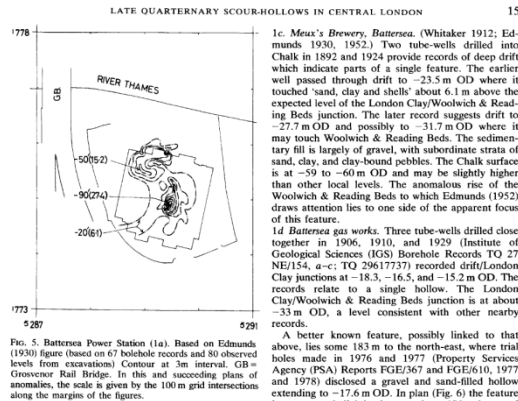
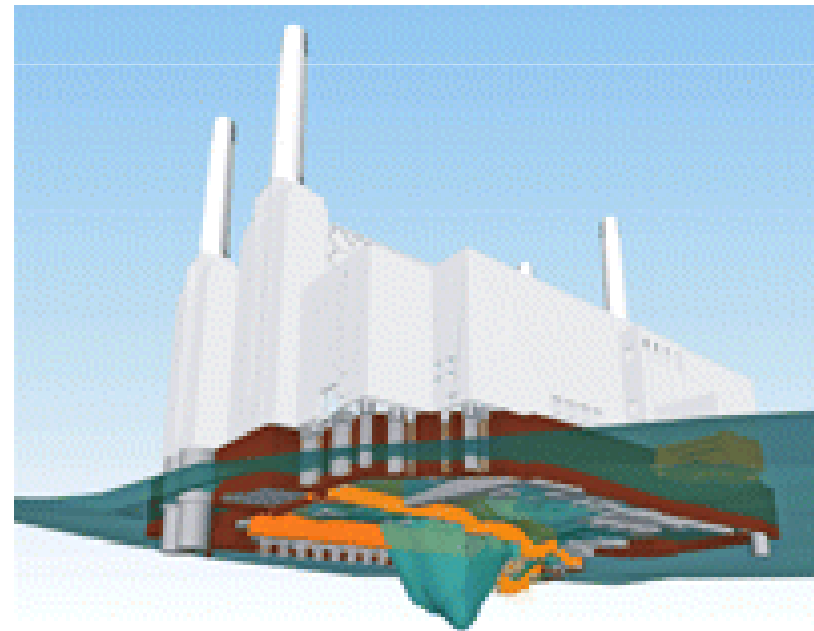
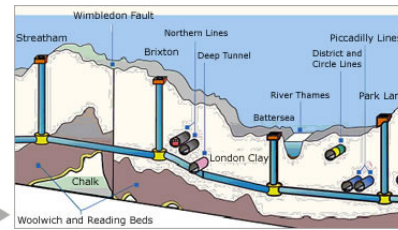
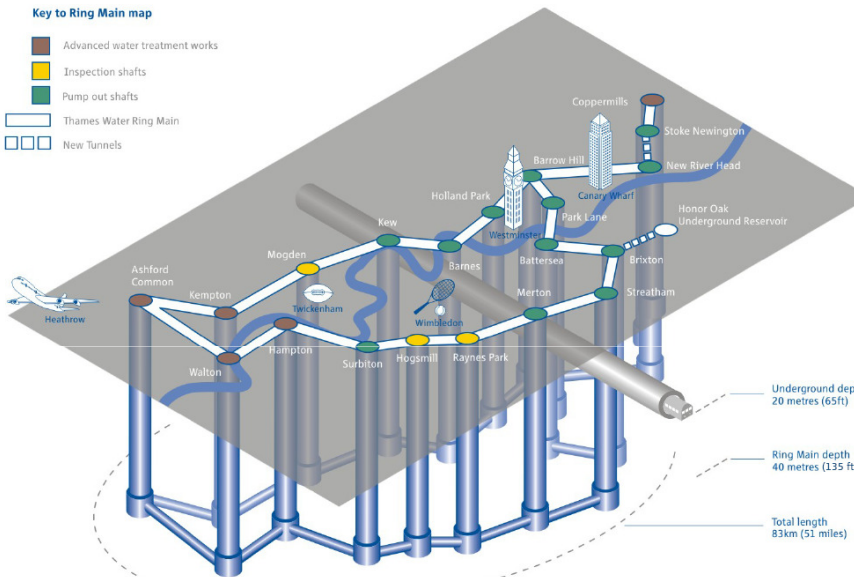
Woolwich and Reading Beds (WRB) clays



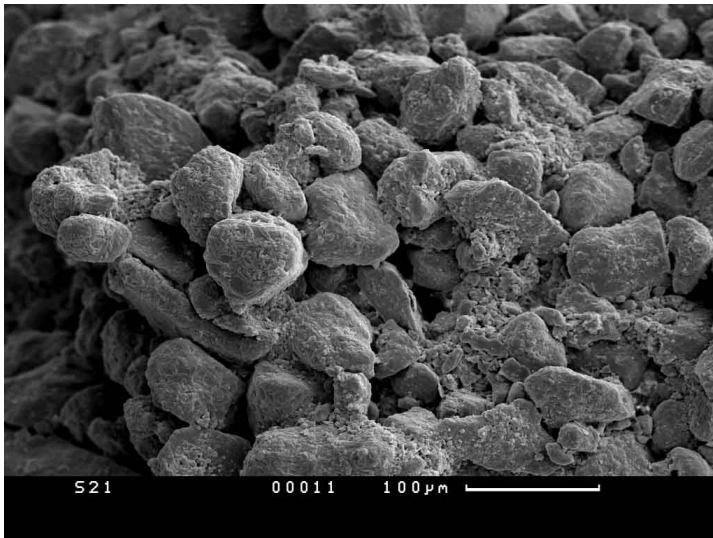
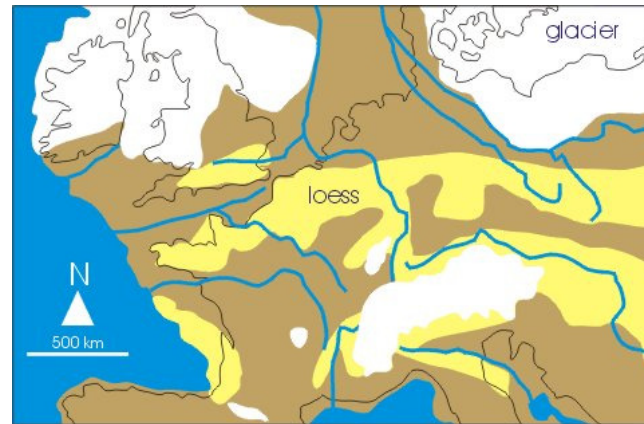
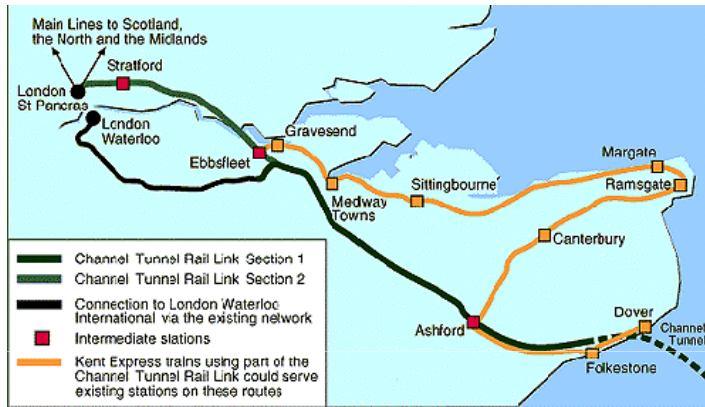
London Water Ring Main

Key to Ring Main map

- Advanced water treatment works
- Inspection shafts
- Pump out shafts
- Thames Water Ring Main
- New Tunnels



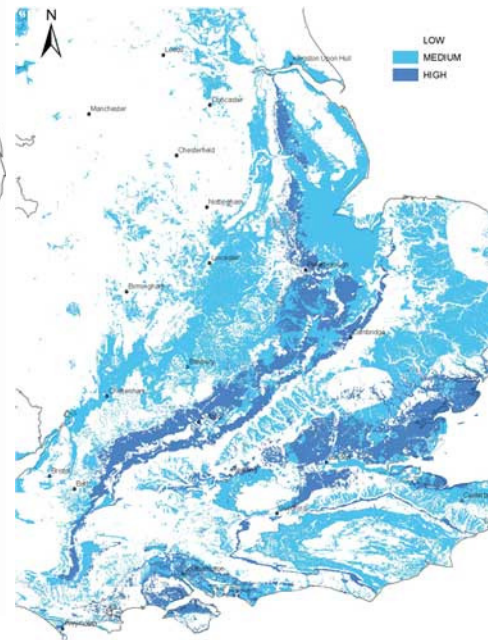
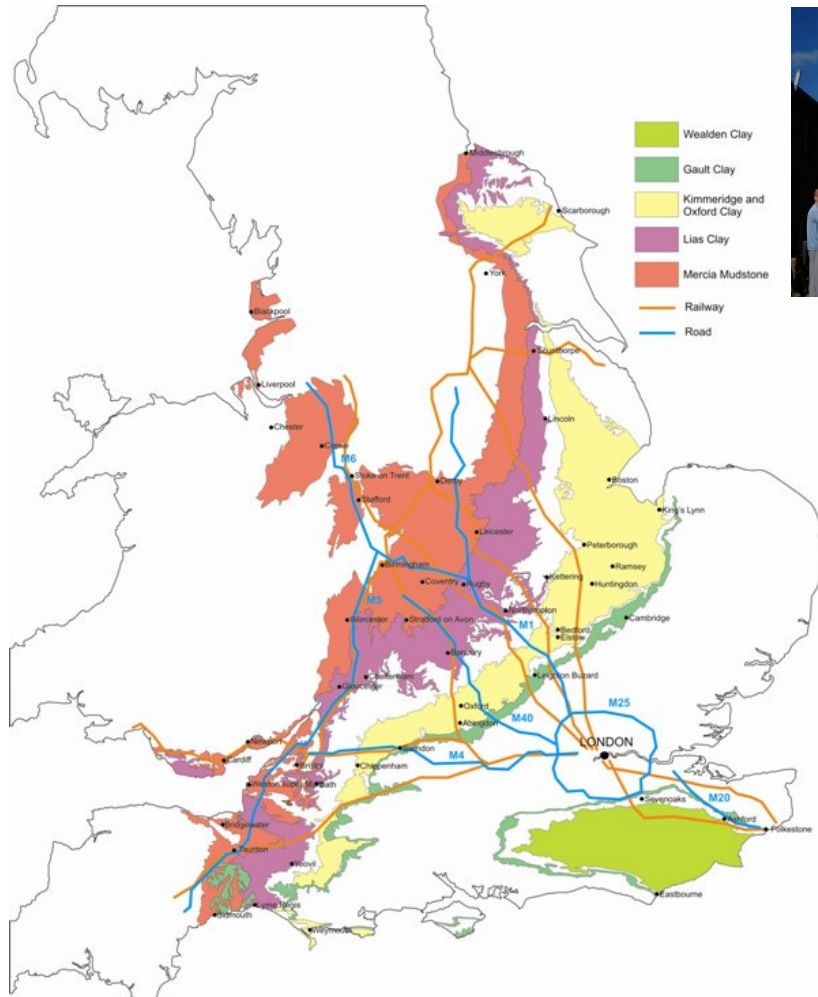
Collapsible Soils - Loess



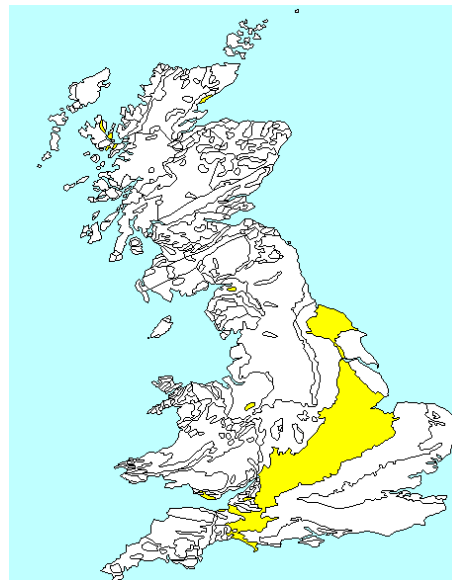
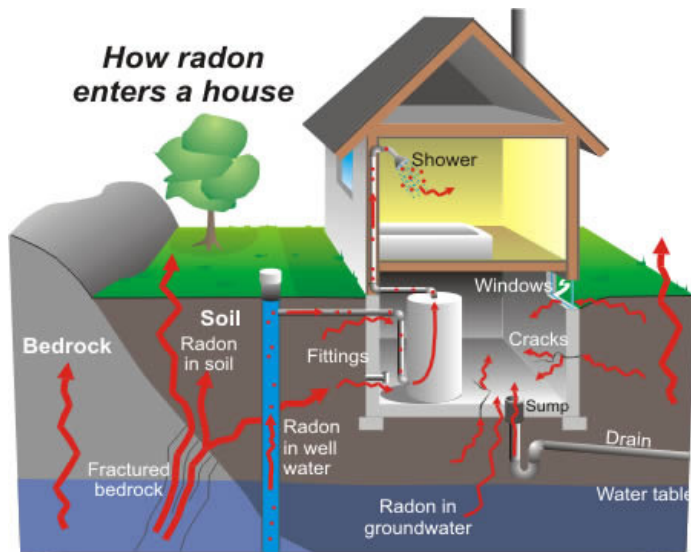
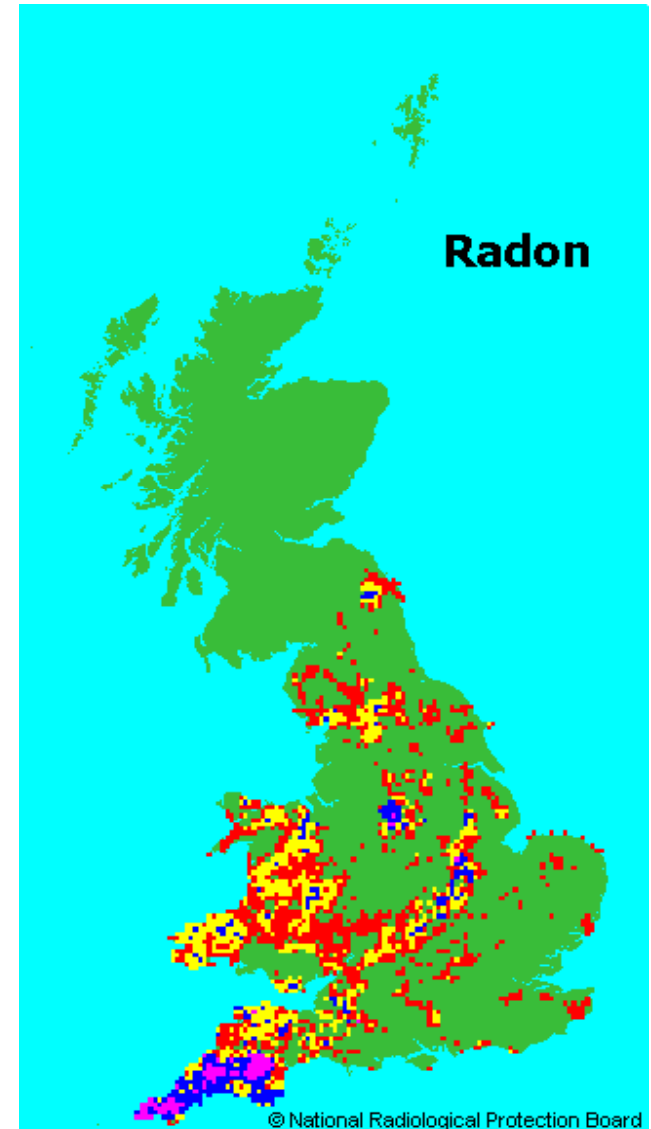
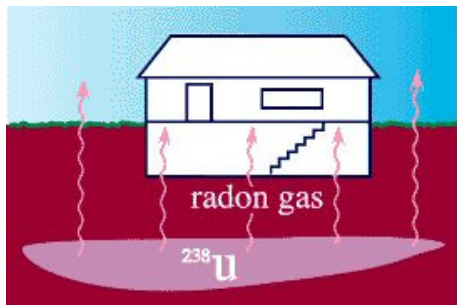


Pegwell Bay, Kent

Swell / Shrink



Radon



Key UK Landslides



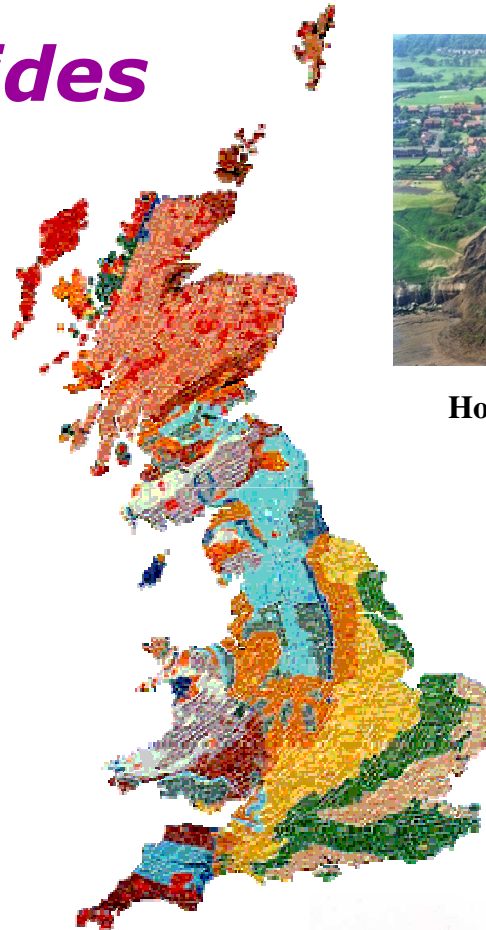
Quirang, Storr



Mam Tor



**Lyme Bay,
Black Venn**



Holbeck Hall



Warden Point



**South IOW, Ventnor
et al**



Folkestone Warren

References

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