

# The open loop ground source heat pump screening tool for England and Wales

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## Introduction

The UK Government expects that by 2020, 12% of the UK's heat demand will come from renewable sources. Ground source heat pumps (GSHP) provide an energy-efficient and low-carbon alternative to traditional heating and cooling technologies. They use the subsurface as a natural heat source/sink to provide space heating/cooling while cutting down on heating costs and CO<sub>2</sub> emissions. Open loop GSHP systems abstract groundwater, pass it through a heat exchanger and then reinject the water back into the ground or discharge it at the surface.

The British Geological Survey and the Environment Agency have developed a web-based screening tool that indicates where conditions may be suitable for installing commercial scale (>100 kW heating/cooling demand) open loop GSHP systems. The tool considers both hydrogeological and economic constraints.

**Pilot:** A pilot study (at 1:50 000) in the West Midlands area showed that more than 70% of the area is favourable for domestic or commercial size open loop GSHP systems.

The tool uses colour to show suitability and Chernoff faces to represent:

- availability of bedrock aquifers (mouth)
- borehole productivity (eyes)
- estimated ground temperatures at 100 m depth (face colour)
- depth to the aquifer (length of nose)
- overlying superficial deposits (hair)

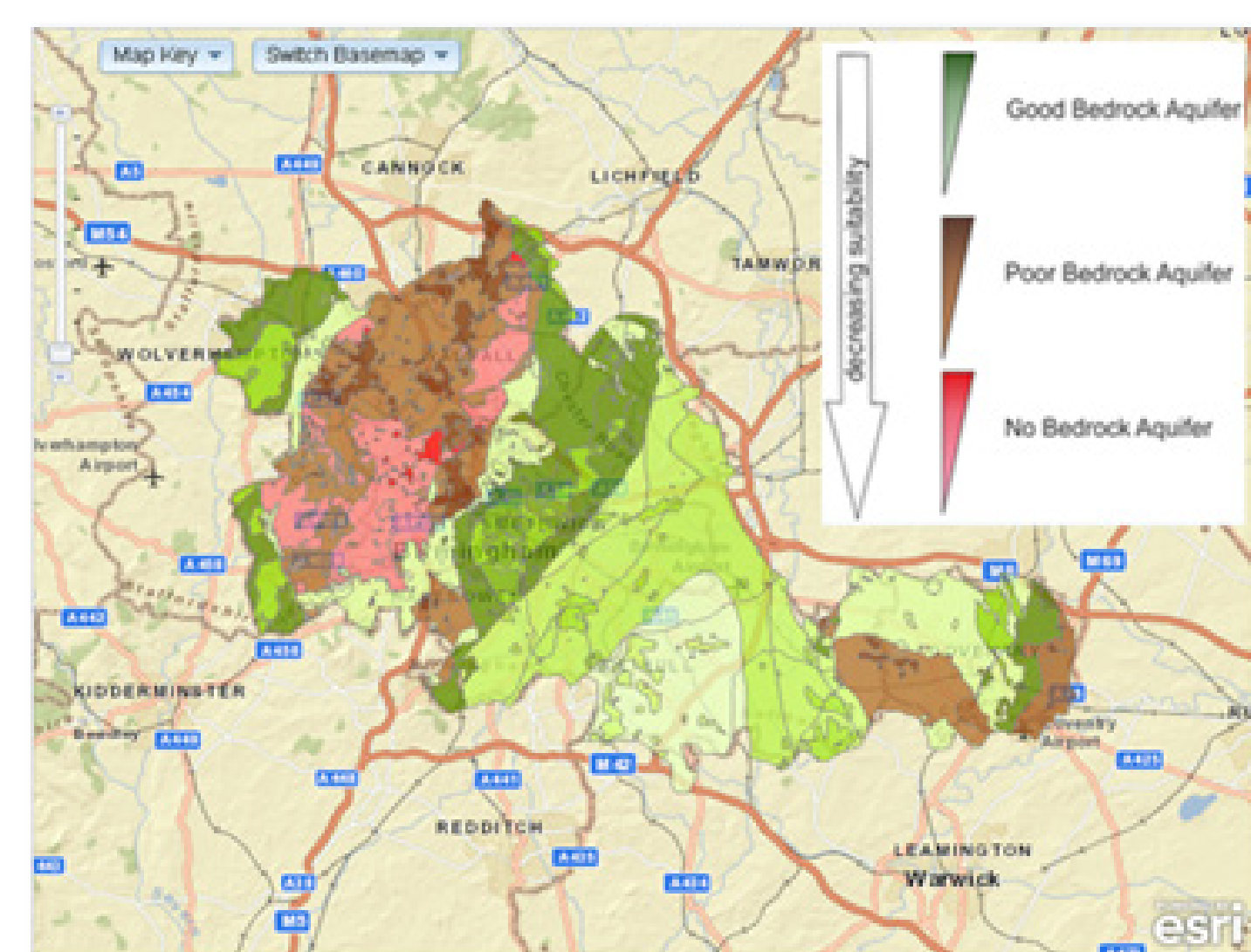
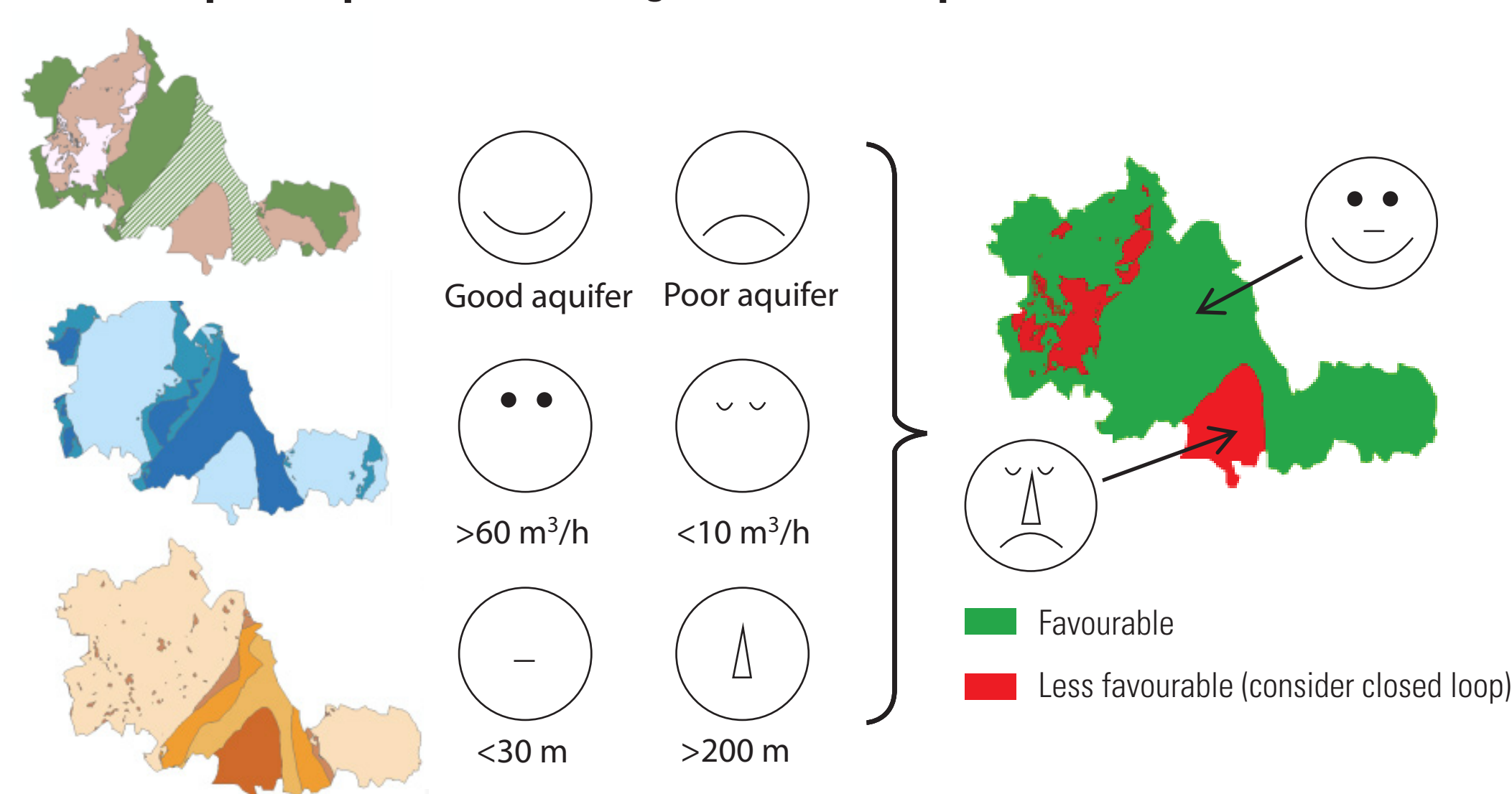
## National screening tool

This was developed for England and Wales at 1:250 000 for commercial sized (>100kW) open-loop GSHPs. It displays the overall suitability as a screening layer and provides more detailed information in the form of a table and maps.

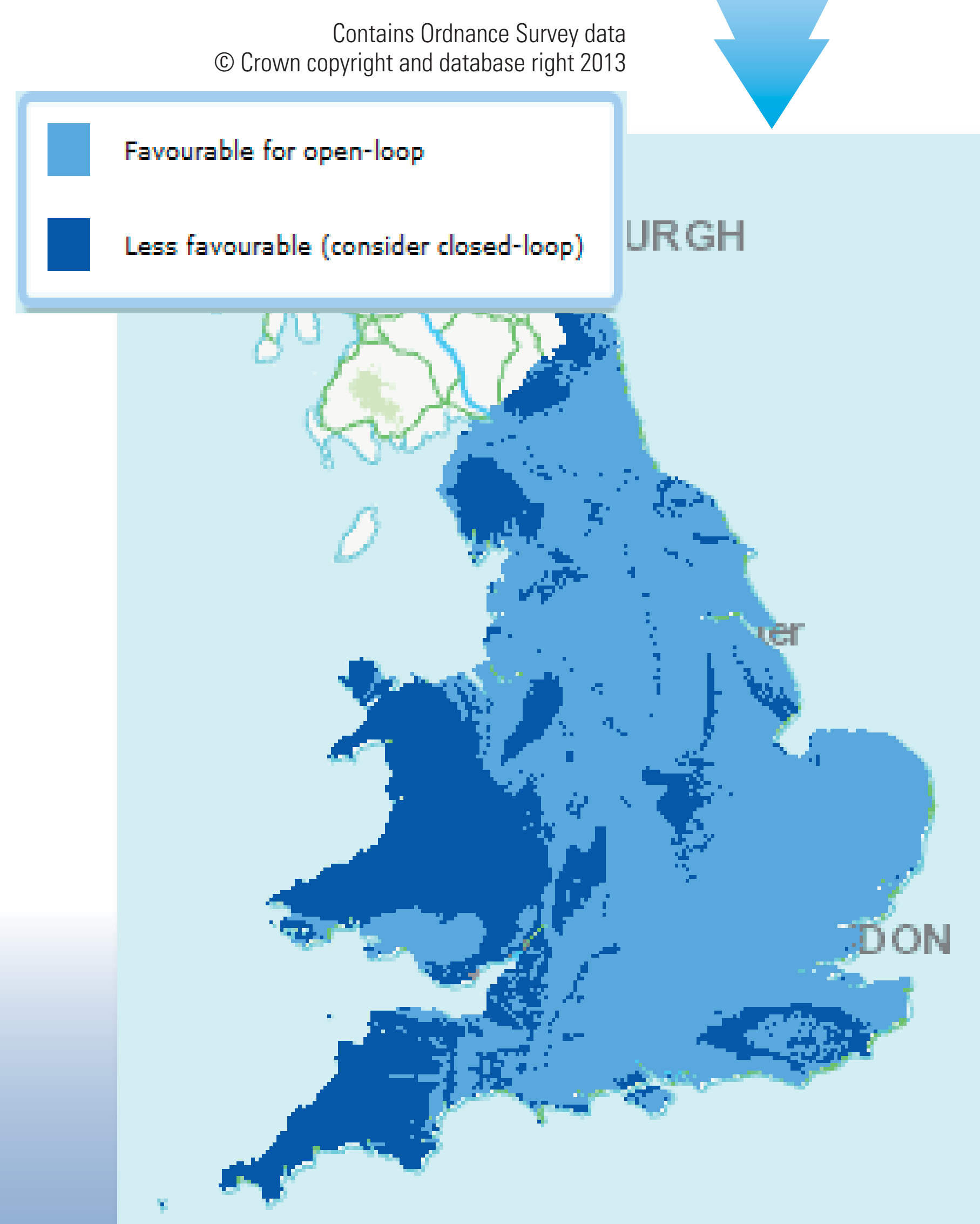
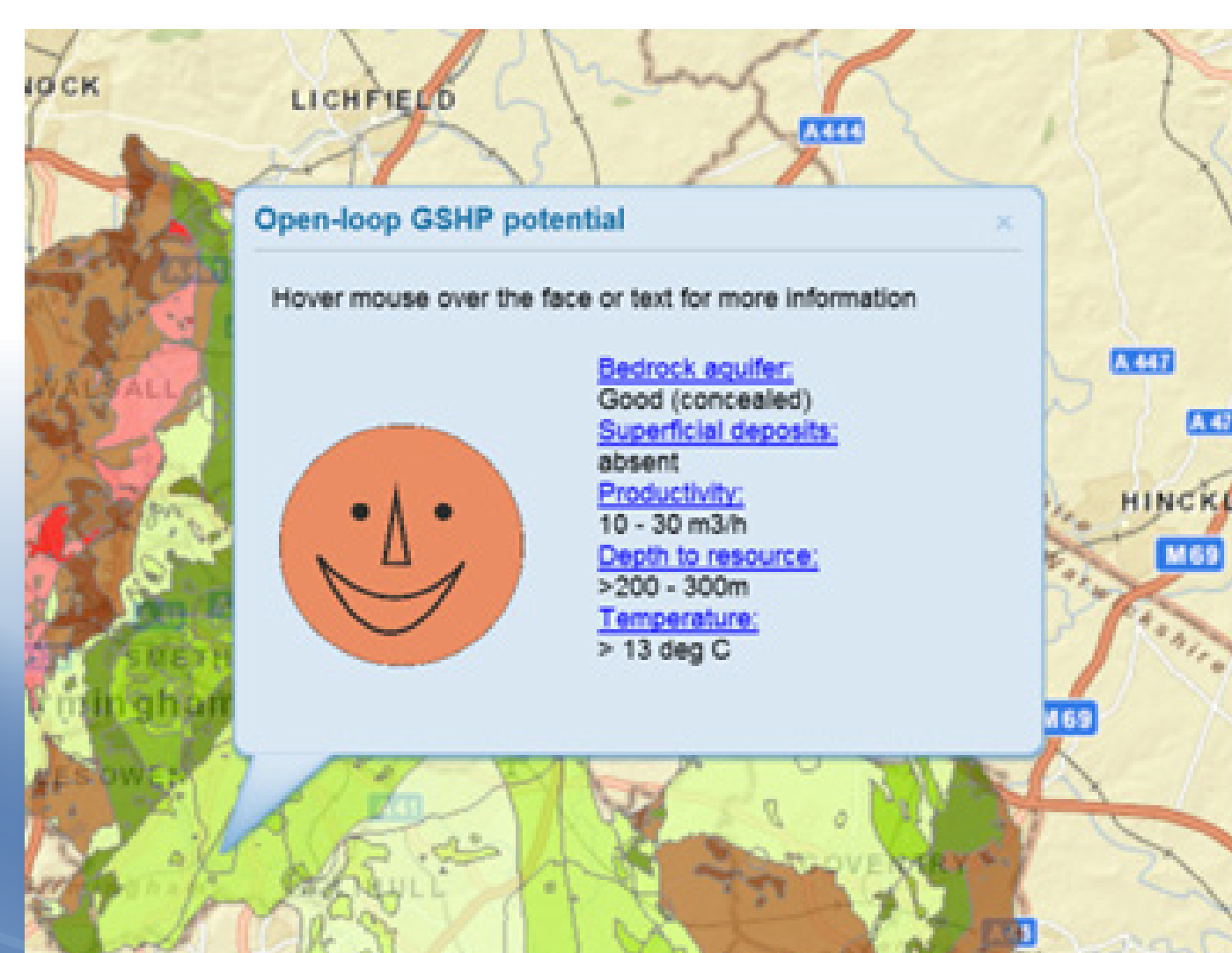
- Presence and productivity of bedrock aquifers
- Depth to source (depth to water or thickness of confining deposits)
- Protected areas
- Licensed abstractions (daily volumes within 600 m radius)
- Groundwater quality (scaling, corrosion and iron precipitation)

## The subsurface is suitable for open loop GSHPs where groundwater is present

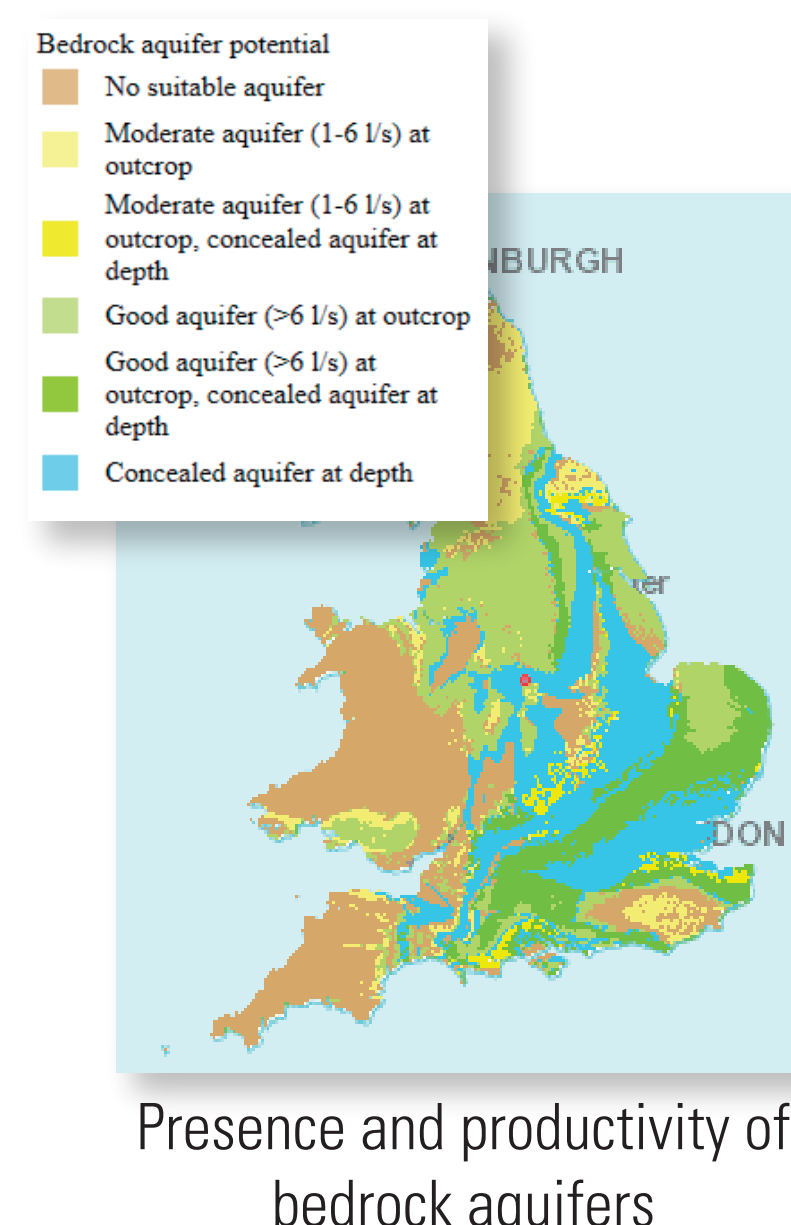
- in the bedrock (aquifer potential)
- at an adequate flow rate (borehole productivity)
- and relatively close to the surface (depth to resource)



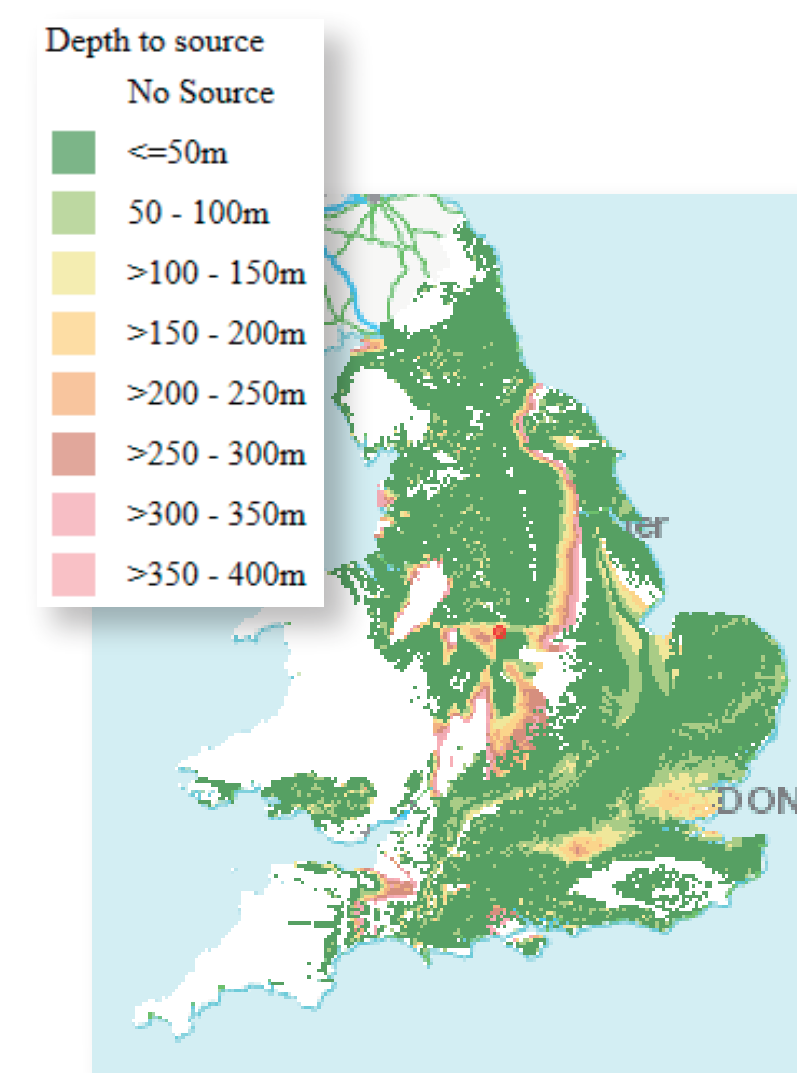
Suitability reduces from green to red



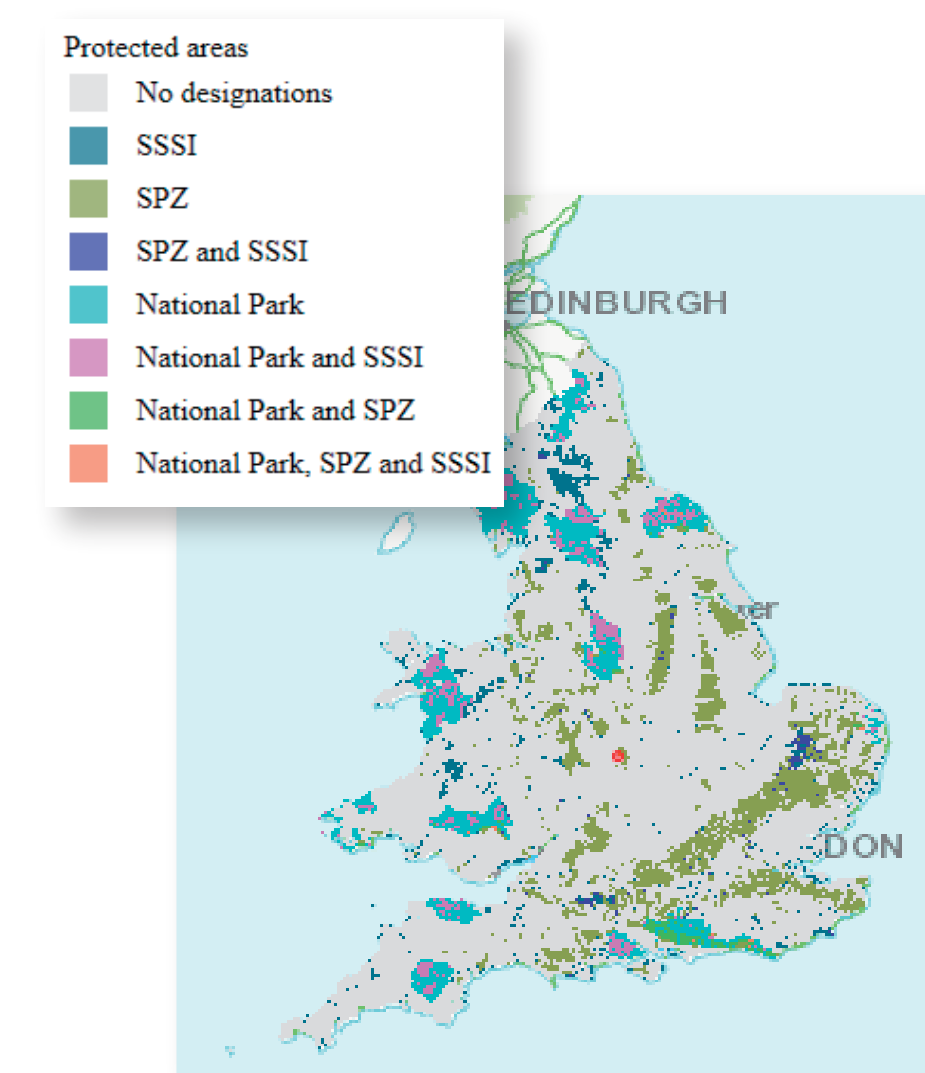
<http://www.bgs.ac.uk/research/energy/geothermal/gshp.html>



Presence and productivity of bedrock aquifers

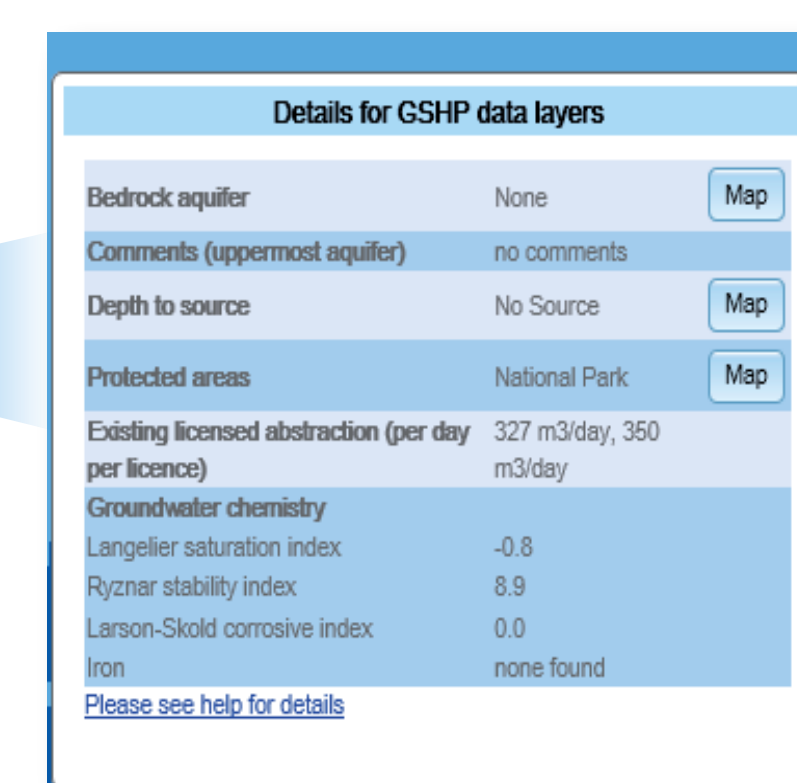


Depth to source (depth to water or thickness of confining deposits)



Protected areas

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Pop up table

Easting	Northing	Langelier saturation index	Ryznar stability index	Larson-Skold corrosive index	Iron

Groundwater quality (scaling, corrosion and iron)

Easting	Northing	Maximum daily abstraction

Licensed abstractions (daily volume within 600m radius)

## Factors not considered:

- Geohazards (e.g. soluble rocks, landslips, mine workings, contamination)
- Flow mechanism, direction and gradient of groundwater flow
- Potential for hydraulic and thermal interference
- Reinjection issues (air entrapment, clogging or biofilms)

## Contact information

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