Mapping suitability for open-loop GSHP systems

(Editorial article for the Ground Up Magazine -Newsletter of the European Ground Source Heat Pump Association)

The UK Government expects that by 2020 12% of the UK's heat demand will come from renewable sources, and is providing incentives to help achieve this. Open-loop ground source heat pumps (GSHP), which, for larger size installations (> 100kWth), can be more economic than closed-loop systems, could make a substantial contribution provided that obstacles to the uptake of GSHP's can be overcome.

One such obstacle is the perception of risk associated with unknown hydrogeological and economic conditions including the presence of an aquifer of sufficient productivity and water quality, reasonable pumping costs and conditions/regulatory requirements conducive to efficient abstraction (and discharge). To increase confidence at the early planning stage and to encourage the uptake of open-loop GSHP technology (where viable), the British Geological Survey (BGS) and the Environment Agency (EA) are collaborating to develop a tool that gives planners and developers an indication of the depth, productivity and quality of potential aquifers that exist in a given area.

Using BGS' national-scale data sets and its extensive knowledge of the UK's hydrogeology, a tool is developed that maps the conditions for open-loop GSHP installations (heating/cooling output >100kWth) in England and Wales at the 1:250,000 scale. The tool is being developed in close consultation with experts from the ground source heat pump industry (ESI, Anglian Water, Carbon Zero Consulting) and considers the most relevant hydrogeological and economic parameters, including productivity of the aquifer, discharge conditions and depth to the source, as well as locations of protected areas. Where data are available, the tool also provides information on the scaling/corrosion potential, iron concentrations and abstractions within a search radius around the location of interest.

Data are collated, grouped and summarised within a GIS environment and suitability for GSHPs is displayed in the form of a map and tables. Ranking and weighting of the data was deliberately avoided as these methods conceal the actual parameter values which are of great importance for the planning of GSHP schemes. As such the tool provides an effective instrument for the initial assessment of suitability of a location/area (at the given scale) thereby increasing confidence at the early planning stage. The tool can also be used as a resource planning tool at the county, regional or national scale or for the selection of suitable areas. For example, a pilot study, completed in 2011, has shown that the conditions in more than 50% of the West Midlands area of England are favourable for open-loop schemes of commercial size (>=100kWth), including, for example, the area around Birmingham International Airport (Figure 1).

Developed at the 1:250,000 scale, the tool does not provide definite answers at the site-scale, and designers will still have to obtain more detailed, site-specific information (such as provided by a BGS GeoReport) and/or to carry out a site-specific investigation to prove the hydrogeological and economic viability of a scheme at a specific site. Similarly, the Environment Agency will always require site-specific studies before issuing the permissions required for an open-loop scheme.

The BGS and the EA aim to complete the project in spring 2012 and to make the tool available on their respective websites (www.bgs.ac.uk, www.environment-agency.gov.uk) soon after that. They are currently looking for data and information on open-loop GHSP installations in England and Wales for the testing and validation of the developed tool. If you can provide such data[1] or require further information on this project please contact Dr Corinna Abesser at cabe@bgs.ac.uk.

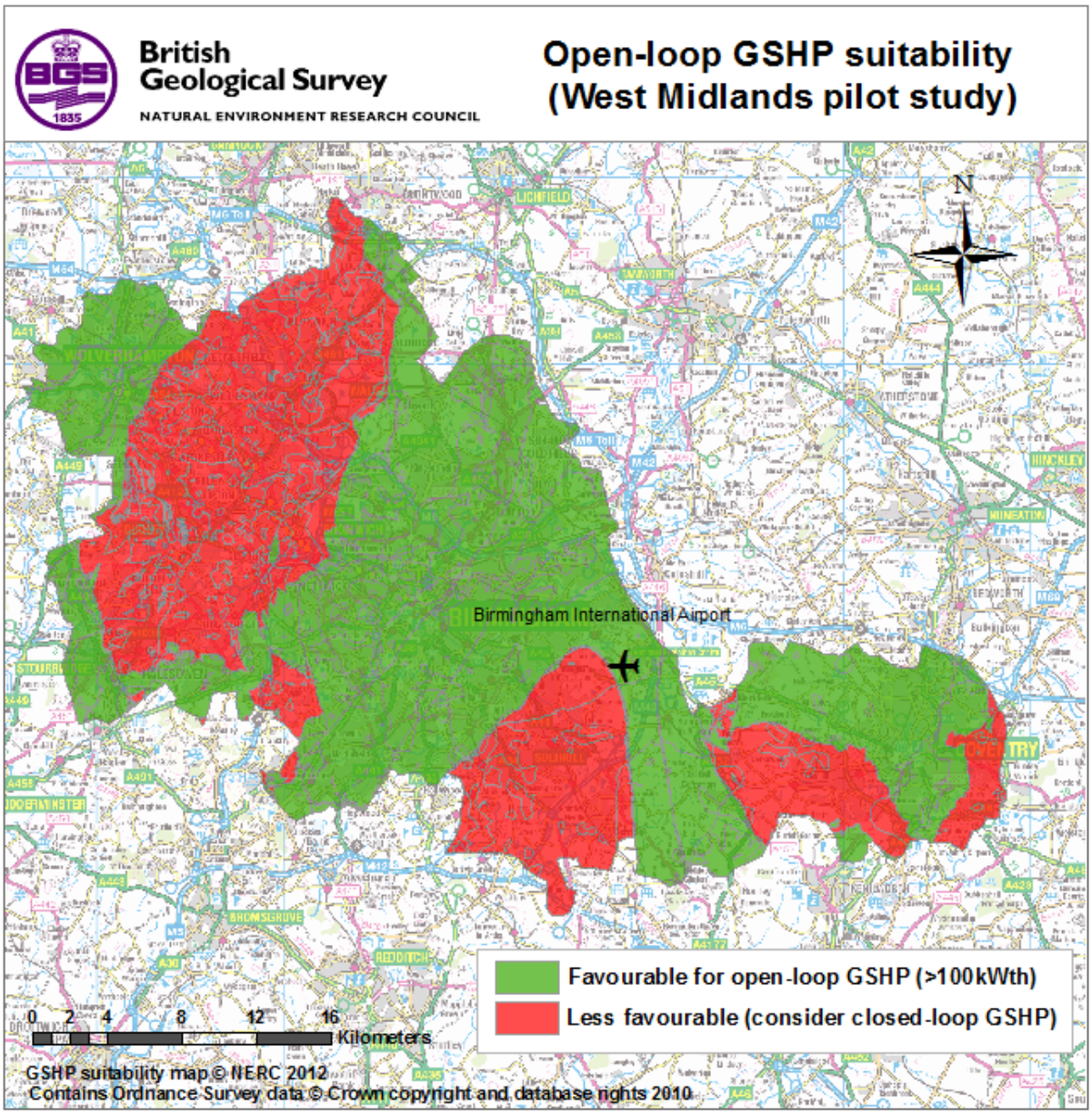

Figure 1: Output from BGS pilot study which mapped open-loop GSHP potential in the West Midlands area (Viewer will be published in April 2012 on BGS website)

[1] all data will be treated as confidential and used for validation purposes only