#MuseGeoERA

Concept for shallow geothermal opportunity mapping - UK

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Project motivation

- Achieving Net Zero CO_2 emissions by 2050 will require rapid and wide-scale deployment of renewable energy systems including ground and groundwater source heat pumps.
- Ground conditions are variable and can change over time.
- For Open Loop systems, confidence in aquifer geometry, groundwater yield and source temperature are key technical feasibility considerations considered by consultants making business cases to clients/ investors.
- Integration of geothermal opportunity maps into Energy Master Plans will hasten and derisk the transition to decarbonised heating and cooling systems.
- We present an example of a **shallow geothermal opportunities map** designed to inform stakeholders and developers and energy modellers using GIS.
- Note linking session ERE1.2 on Friday 8 May 8:30 - 10:15 CEST: https://meetingorganizer.copernicus.org/EGU2020/session/34714. 'GeoERA: Towards integrated European geoscience services for today's and future generations'

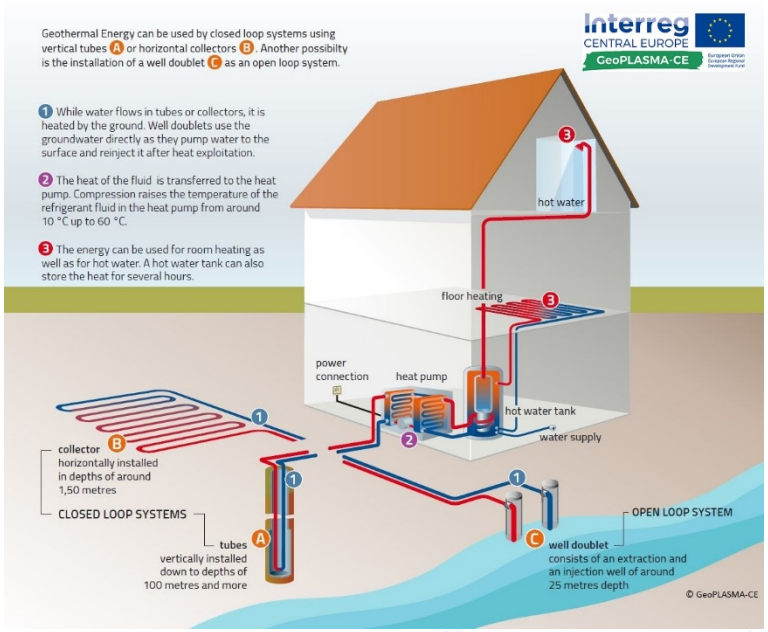

Image Source: https://portal.geoplasma-ce.eu/

MUSE GeoERA GEO-ENERGY

Managing Urban Shallow Geothermal Energy

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https://geoera.eu/projects/muse3/

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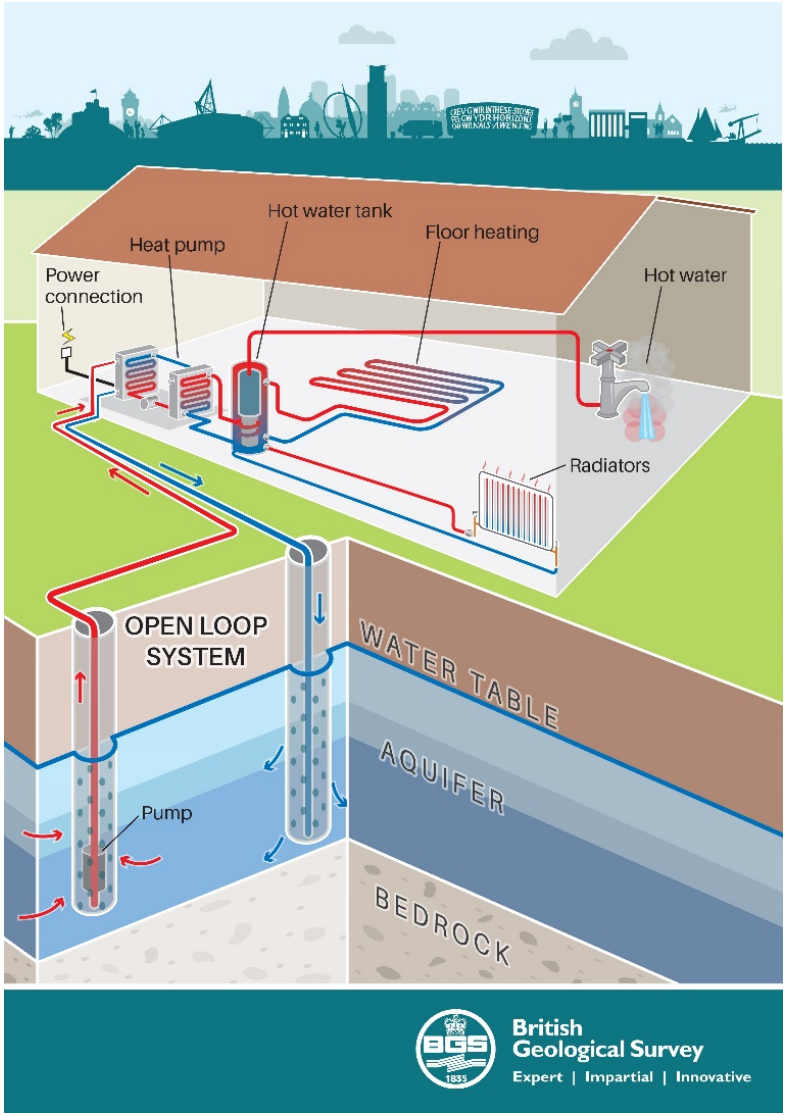
Input datasets

- Existing GSHP locations with details (e.g. BHE depth, capacity (kW), proven yields (l/s), TRT, (Not readily available in most countries!)
- Geology maps/3D models (BGS; Kendall et al 2020)
- Aquifer thickness & indicator of textural variability (Source: BGS)
- GW temperature, heads and flow direction. e.g. 13°C (Farr et al 2017; Scheidegger et al 2019)
- Groundwater chemistry / quality (BGS/CHA/NRW)
- Rock/Soil typical Thermal Conductivity (BGS)
- Building footprints/drilling constraints (OS/OSM)
- Open water bodies - rivers, canals (OS/OSM)
- Buried infrastructure - sewers, tunnels (OS & Utilities)
- Hazards (UXO, running sands, karst, artesian GW..)



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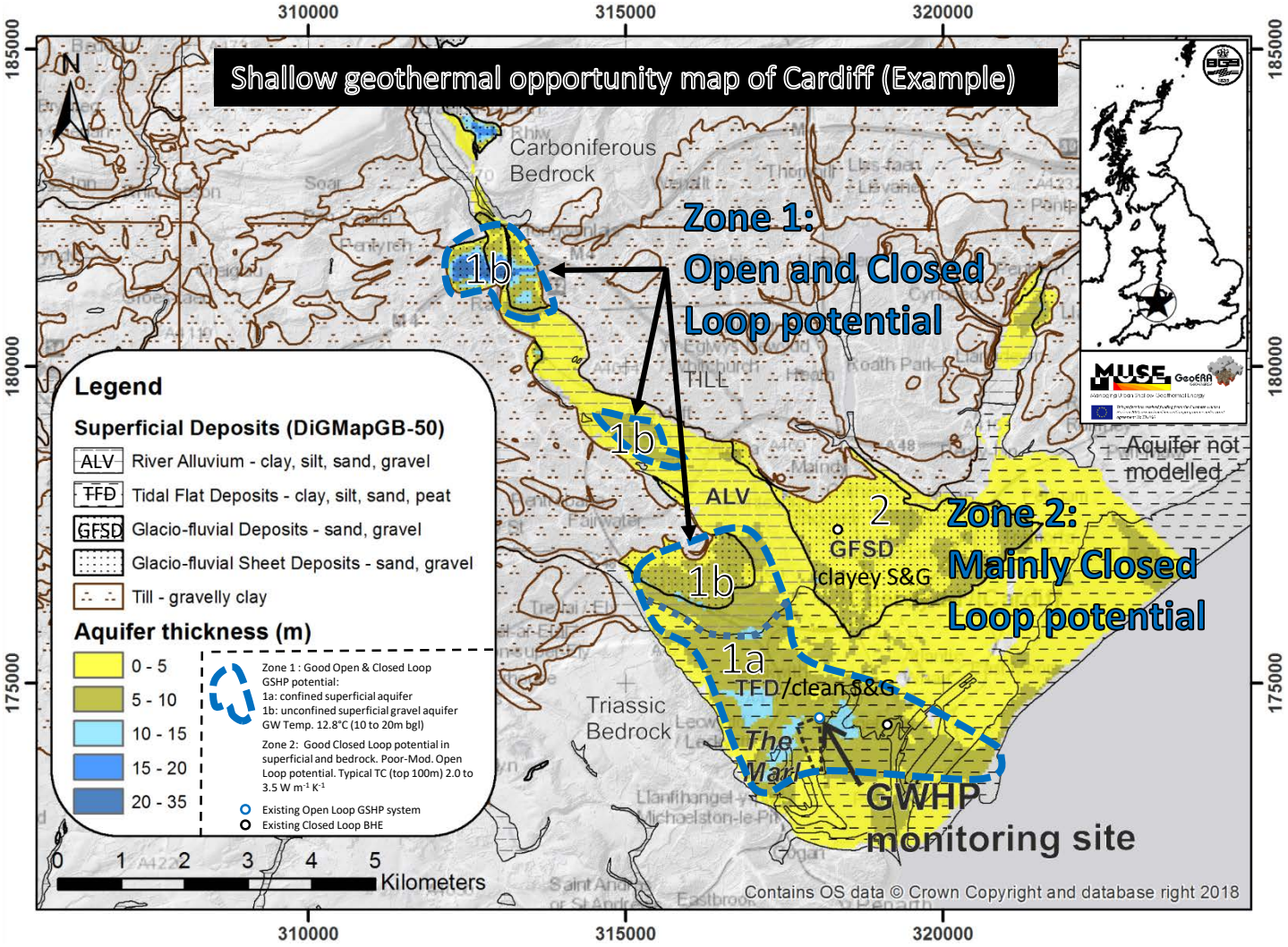
Shallow geothermal opportunity map/guide



Modified from Boon et al. 2019. Groundwater heat pump feasibility in shallow urban aquifers: experience from Cardiff, UK. *Science of the Total Environment*, 697. DOI: 10.1016/j.scitotenv.2019.133847

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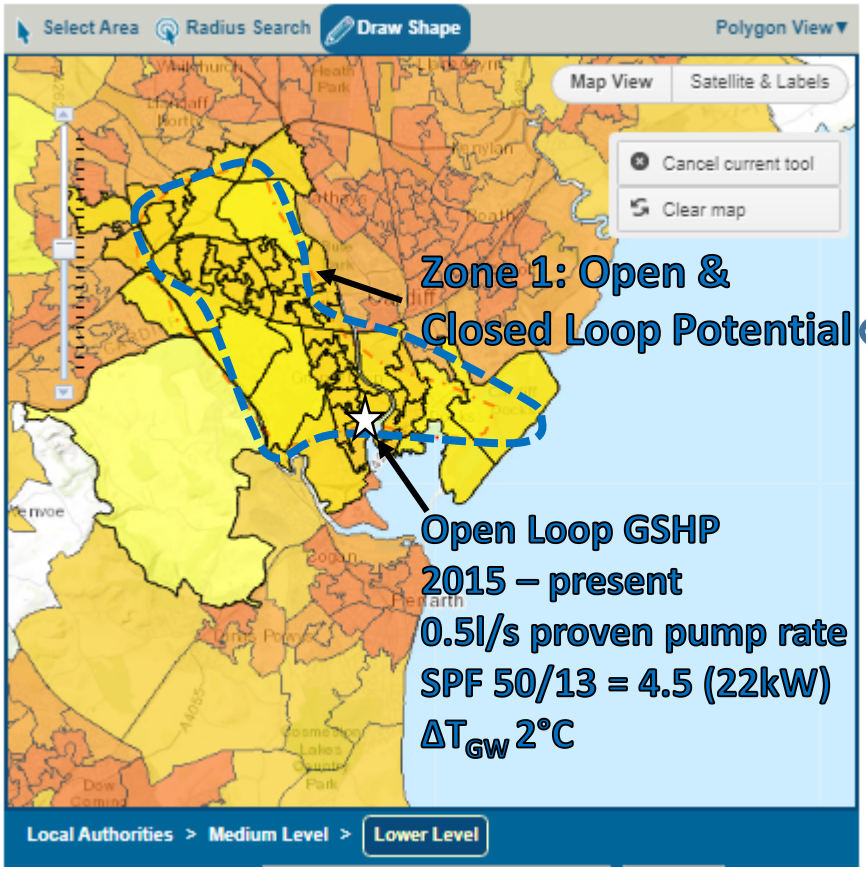
20% of total Domestic demand (340,000MWh$_{th}$) is located on Geothermal Zone 1



Legend and Layers

Results Area

Sector Totals | Large Heat Load Sites (0)

The table below shows the sector totals within your search area.

Sector Name	Share	Total MWh
Communications and Transport	0.45%	1,519 MWh
Commercial Offices	2.08%	7,017 MWh
Domestic	91.37%	307,763 MWh
Education	1.58%	5,326 MWh
Government Buildings	0.5%	1,693 MWh
Hotels	0.47%	1,574 MWh
Large Industrial	0%	0 MWh
Health	0.33%	1,126 MWh
Other	0.18%	598 MWh
Small Industrial	1.89%	6,352 MWh
Prisons	0%	0 MWh
Retail	0.8%	2,696 MWh
Sport and Leisure	0.15%	501 MWh
Warehouses	0.2%	678 MWh
District Heating	0%	0 MWh
Total heat load in Area		336,849 MWh

Download this search result data as a Microsoft Excel File (Right Click/Save As...)

The results for this area are shown below as a pie chart. The colours used in the pie chart,

By integrating 3D geology with energy demand mapping energy system transformations can now consider all geothermal opportunities!