

The Clay Research Group

RESEARCH AREAS

Climate Change ♦ Data Analysis ♦ Electrical Resistivity Tomography
Time Domain Reflectometry ♦ BioSciences ♦ Ground Movement
Soil Testing Techniques ♦ Telemetry ♦ Numerical Modelling
Ground Remediation Techniques ♦ Risk Analysis
Mapping ♦ Software Analysis Tools
Artificial Intelligence



March 2026

Issue 250

The Clay Research Group

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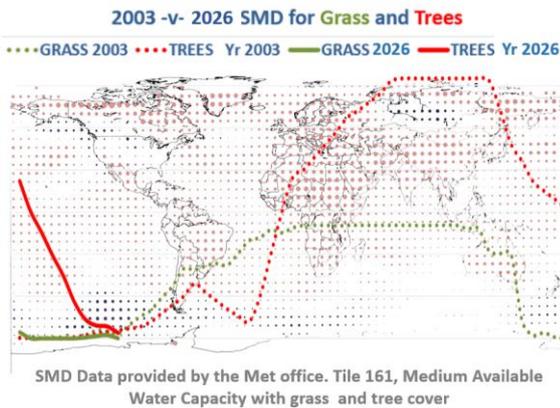
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Subsidence Risk Analysis by District

BROXBOURNE



SMD graph for Met Office tile 161 plotting the correlation between the SMD for a surge year (2003) and the current year in soils with medium water capacity.

Contributions Welcome

We welcome articles and comments from readers. If you have a contribution, please Email us at: clayresearchgroup@gmail.com

THE CLAY RESEARCH GROUP

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District and Sector Risk

Broxbourne is situated in Hertfordshire. It has an area of 51.43km² and a population around 102,000.

It is the subject of the 'Risk by District' series in this month's edition. Its geology comprises small areas of drift deposits overlying predominantly London clay – see Page 9.



The claim distribution is interesting, revealing the link between geological series and causation – drift with escape of water and clay soils link with trees.

It also illustrates the link between causation and season with clay shrinkage higher in the summer and escape of water in the winter.

The risk maps are built from a data sample covering four claim years, including one surge and three 'normal' years.



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ChatGPT



Question to ChatGPT

Which UK districts present the highest risk from subsidence?

Response

In the UK, **subsidence risk isn't evenly distributed** — it's driven mainly by local geology (especially **shrink-swell clay soils**) and, in some places, by historic mining or other ground instability. Insurance companies and geological studies consistently identify certain districts and regions where the risk is significantly higher than average.

▲ Highest-Risk Areas for Subsidence

1. Greater London (especially inner & outer boroughs)

- London sits largely on **London Clay**, one of the most shrink-swell susceptible soils, making ground movement and subsidence claims common.
- Some boroughs repeatedly cited for high risk include **Camden, Islington, Brent, Barnet, Harrow, Haringey, Waltham Forest, Lambeth, Lewisham** and other built-up, clay-rich areas.

2. South-East England beyond London

- Counties such as **Kent, Surrey, Sussex, Essex** and **parts of the Thames Valley** show elevated risk due to widespread clay geology and dense development.
- West Sussex has been specifically highlighted as a geohazard hotspot with ground instability concerns including subsidence.

3. Oxford and its surrounding arc

- The **Oxfordshire region (Oxford arc)** — extending into neighboring counties — is identified by insurers and geohazard analyses as at higher risk of clay shrink-swell movement.

4. Parts of the Midlands and Eastern England

- Areas like **Milton Keynes, North Hertfordshire, South Northamptonshire, Luton, Dacorum** and **Wellingborough** show elevated modelled risk factors in recent climate risk projections.

5. Northern districts with mining legacy

- In regions historically affected by coal and other mining (e.g., parts of **Yorkshire, Nottinghamshire, Derbyshire** and **north-east England**), older workings can cause localised subsidence independent of soil shrink-swell.



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Other Notable Susceptible Zones

- **Devon, Dorset, Hampshire and Cumbria** — flagged in geohazard maps for subsidence potential alongside other hazards.
- **Cornwall and the South West** — while generally lower risk on average, can have pockets of clay or mining-related ground issues.

Key Drivers of High Subsidence Risk

- **Clay soils:** Shrink when dry and swell when wet, causing ground movement under foundations.
- **Climate change:** More extreme dry spells are predicted to increase clay shrinkage events.
- **Historic mining and ground voids:** Present in parts of the Midlands and North where underground workings exist.

Summary

While exact ranking by **district authority** can vary by data source, the **consensus hotspots** for the highest subsidence risk in the UK are:

- **Greater London boroughs (especially clay-soil areas)**
- **South-East England (Kent, Surrey, Sussex, Essex, Thames Valley)**
- **Oxford / Oxford-Cambridge arc**
- **Certain Midlands and Eastern districts**
- **Some northern post-industrial (mining legacy) areas**

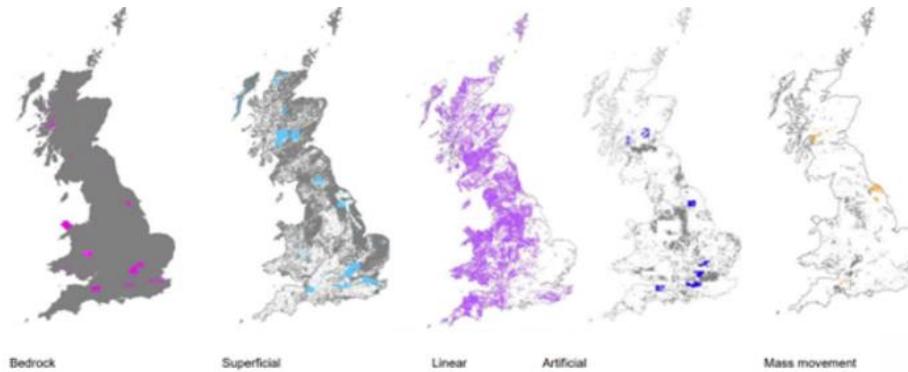
If you need specific local data (e.g., for a particular postcode or council district), there are detailed maps and tools from the **British Geological Survey (BGS) GeoSure dataset** that can show geohazard risk precisely.



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British Geological Survey Maps - Updates

The BGS have updated their digital geology maps. “Changes include new data and slight modifications to the dataset attribution. An overview of the changes is included with the data release and the images (see below) summarise the spatial distribution of updates between Version 8 and the new Version 9 of the 1:50 000-scale maps and between Version 2 and the new Version 3 of the BGS Geology 1:10 000 to 25 000 maps”.



Above: Locations of new or modified content in BGS Geology 50K. Bedrock changes (pink); superficial changes (light blue); linear changes (purple); artificial changes (dark blue); mass-movement changes (brown).

<https://www.bgs.ac.uk/news/latest-bgs-geology-50k-mapping-data-launched/>

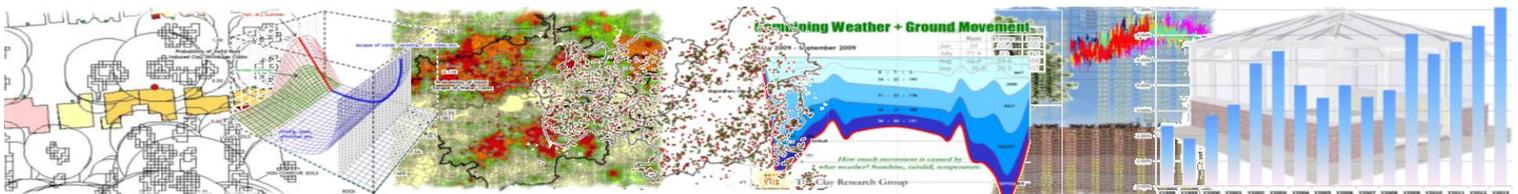
Trees and Design Action Group

The TDAG web site lists a wide range of publications and meetings scheduled for 2026 and 2027. Amongst the publications is **First Steps in Urban Tree Canopy Cover**, which plots a map of areas using LiDAR – image right.



The next on-line seminar, **designing with trees – Part 2: below ground challenges**, is scheduled for the 22nd April, 2 - 4pm GMT with registration via ZOOM. For further details visit their web site at:

<https://www.tdag.org.uk/events.html>



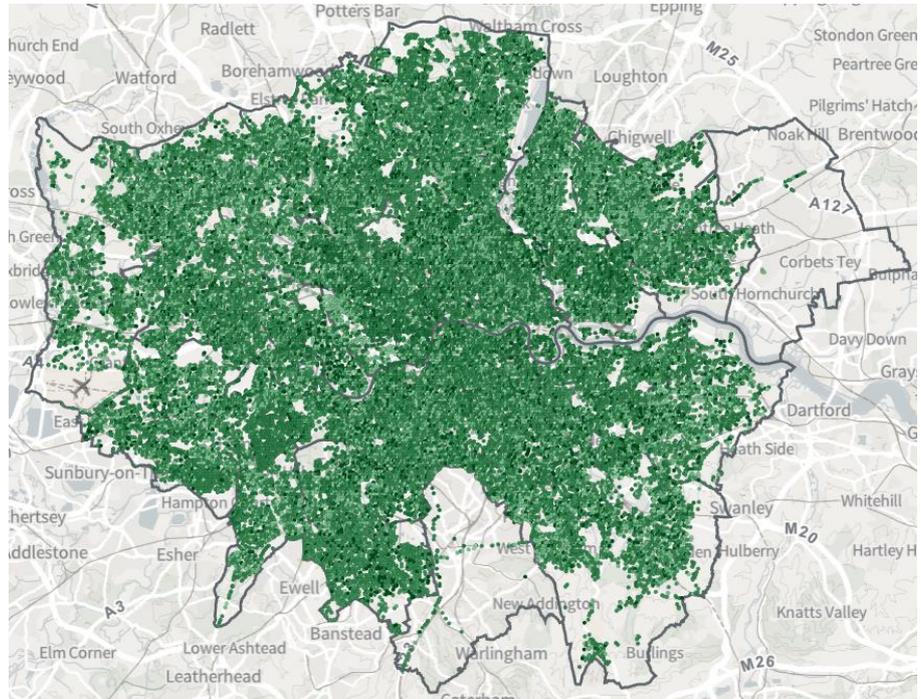
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Mapping London Street Trees

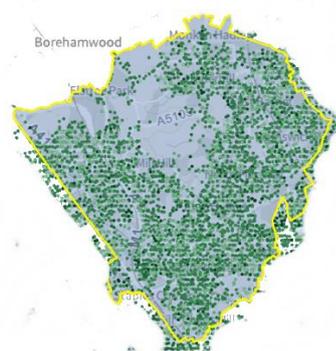
London's Tree Map application provides a lot of useful information relating to trees in London - see image, right.

The application maps 1.1m 'Public Realm Trees'.

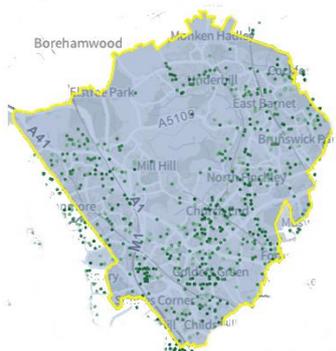
It allows a range of criteria to be selected, including location, species, tree height and a climate suitability score which shows how well the tree is expected to have coped with climate changes in the year 2090.



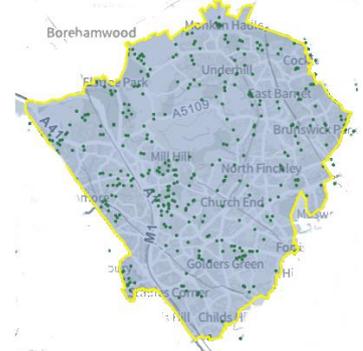
<https://apps.london.gov.uk/public-realm>



Map plotting all trees

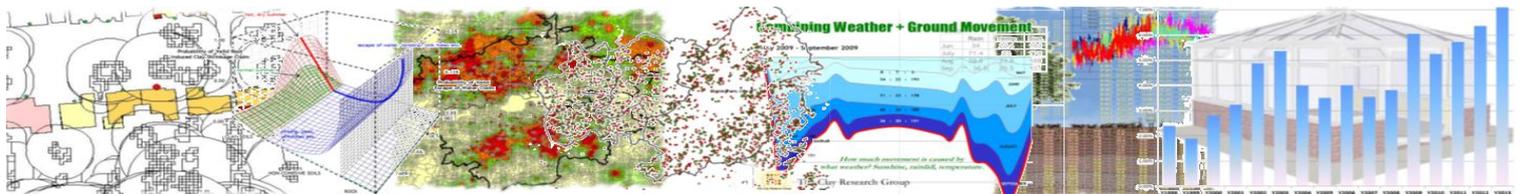


Map plotting all street trees in Council Ownership



Map plotting all oak trees including height and climate suitability.

-trees/explore



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Subsidence Forum Training Day

Subsidence Forum have arranged a Training Day at Mythe Barn, Warwickshire on Wednesday, 17th June, 2026. <https://www.subsidenceforum.org.uk/events-seminars/>

AI and Trees

A reader suggested we try our hand at identifying trees and measuring their height using the Apple iPhone.

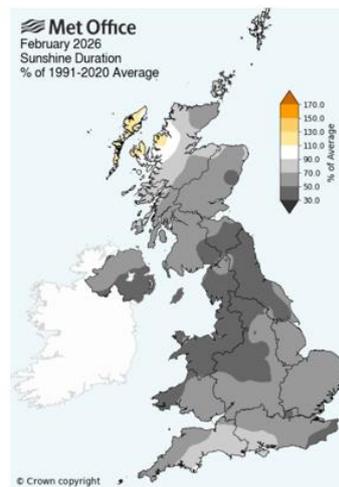
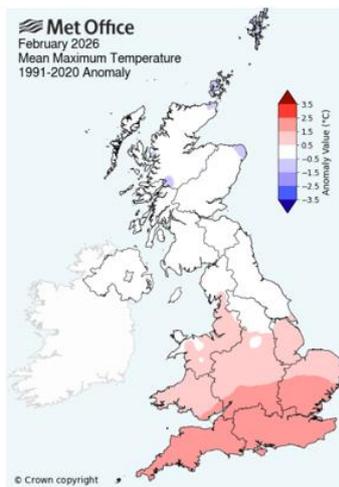
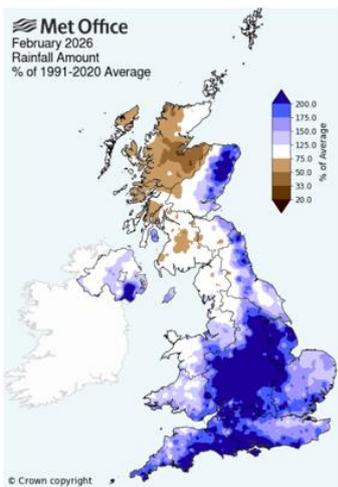


Left, a snapshot identified by the software as Ligustrum and by its side an image of that species downloaded from Google. Right, a tree measuring app. We have to say we are concerned that wrongful identification using AI could cause significant issues. Feedback welcome.



Met Office Anomaly Maps for February 2026

Anomaly maps from the Met Office web site for the month of February 2026 comparing data with the 1991 – 2020 average, reproduced below.



The maps reveal heavy rainfall and a slight increase in the mean maximum temperature to the south of England with shorter sunshine duration compared with 1991 – 2020 averages.

<https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-actual-and-anomaly-maps>

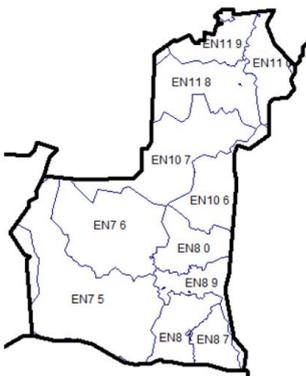


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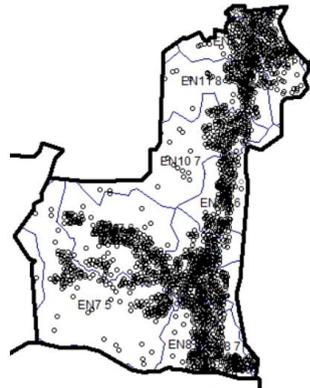
Subsidence Risk Analysis – Broxbourne

Broxbourne is situated in Hertfordshire and has an area of 51.43km² with a population of around 102,000.

BROXBOURNE



Postcode Sectors



Housing Distribution

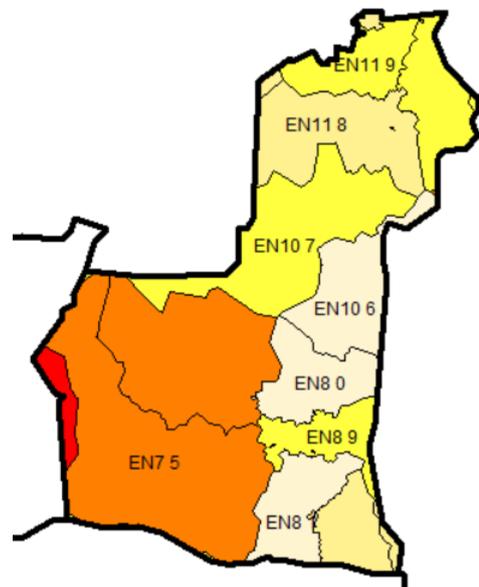
Distribution of postcode sectors and housing stock using full postcode as a proxy. Each sector covers around 3,000 houses on average across the UK and full postcodes include around 15 – 20 houses on average, although there are large variations.

Sector and housing distribution across the district (left, using full postcode as a proxy) helps to clarify the significance of the risk maps on the following pages. Are there simply more claims in a sector because there are more houses?

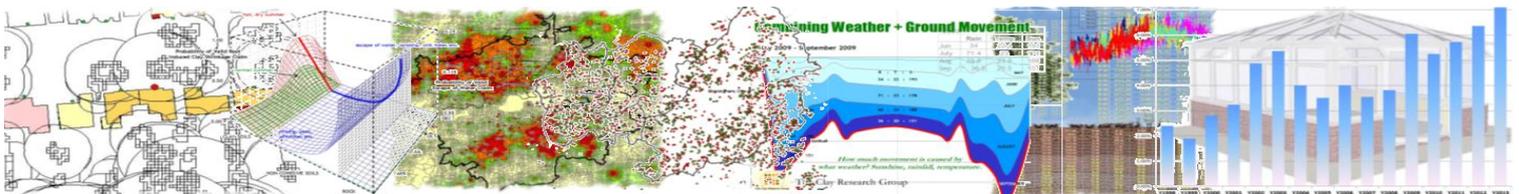
Using a frequency calculation (number of claims divided by private housing population) the relative risk across the borough at postcode sector level is revealed, rather than a 'claim count' value.

Broxbourne is rated 173rd out of 413 districts in the UK from the sample analysed and is around 1.592x the risk of the UK average, or 0.412 on a normalised 0 - 1 scale.

From the sample we hold, sectors are rated for the risk of domestic subsidence compared with the UK average – see map, right.



Sector risk compared to UK average from the sample analysed.



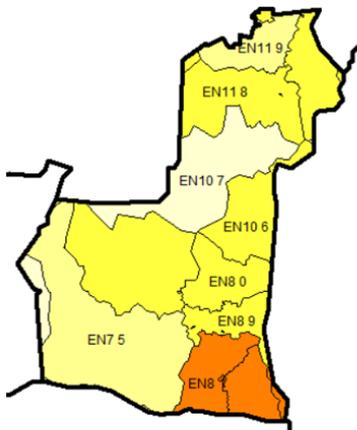
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Broxbourne - Properties by Style and Ownership

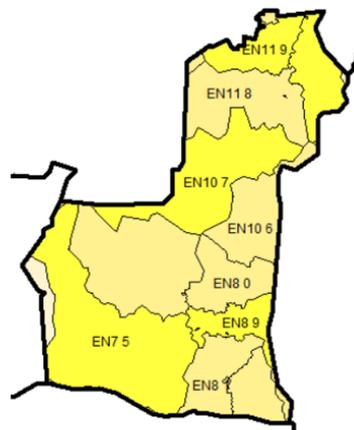
Below, the general distribution of properties by style of construction, distinguishing between terraced, semi-detached and detached. Unfortunately, the more useful data is missing at sector level – property age.

Risk increases with age of property and the model can be further refined if this information is provided by the homeowner at the time of taking out the policy.

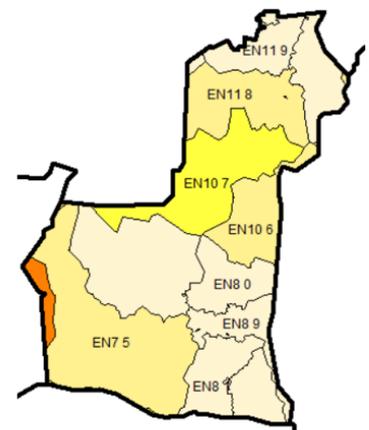
BROXBOURNE - Distribution by House Type



Terraced



Semi-Detached



Detached

Distribution by ownership is shown below. Terraced and semi-detached, private properties are the dominant class across the district.

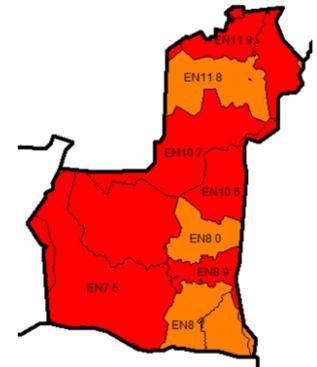
BROXBOURNE - Distribution by Ownership



Housing Association



Council Ownership



Private Ownership



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Subsidence Risk Analysis – Broxbourne

Below, extracts from the British Geological Survey low resolution 1:625,000 scale geological maps showing the solid and drift series. View at:

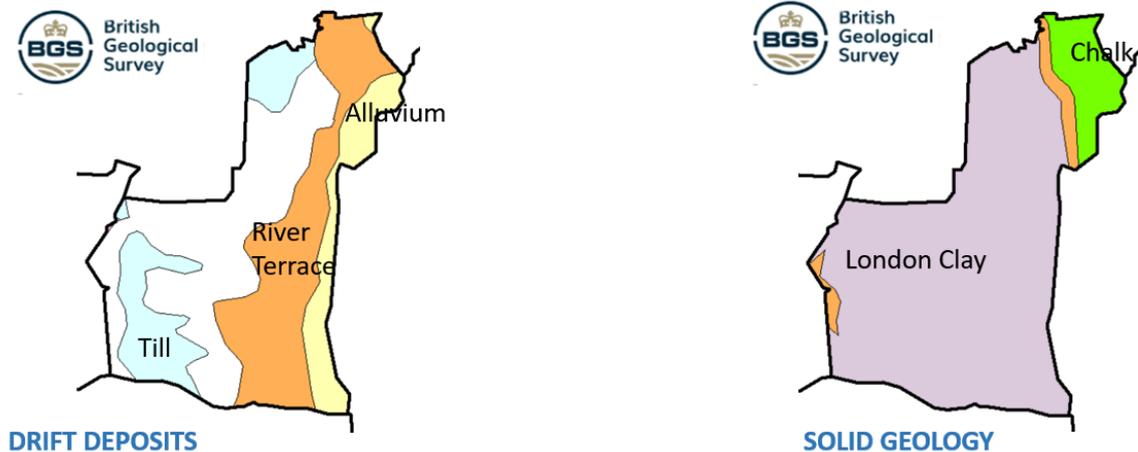
<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

See page 12 for a seasonal analysis of the sample which reveals that, at district level, there is around a 70% probability of a claim being valid in the summer and, of the valid claims, there is a 60-70% probability that the damage will have been caused by clay shrinkage.

In the winter, the likelihood of a claim being valid is around 60% and of the valid claims, 60-70% are attributable to an escape of water.

Site investigations undertaken relating to claims confirms the presence of clay soils (see following page) with a PI of around 50%.

BROXBOURNE : BGS Geology – 1:625,000 scale



Extracts from the 1:625,000 series British Geological Survey maps. Working at postcode sector level and referring to the 1:50,000 series delivers far greater benefit when assessing risk.

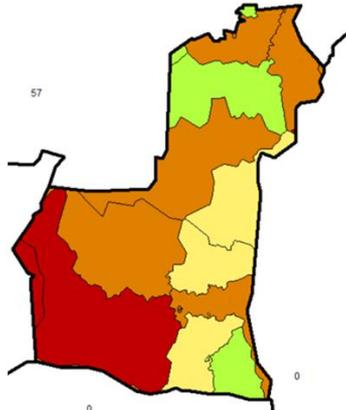


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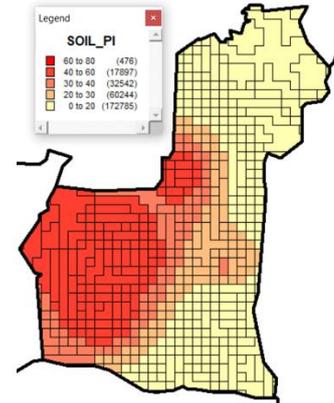
Liability by Geology and Season

Below, the average PI by postcode sector (left) derived from site investigations and interpolated to develop the CRG 250m grid (right), both confirming the varied geology across the district.

BROXBOURNE – Soil Plasticity Index



Soil PI Averaged by Sector

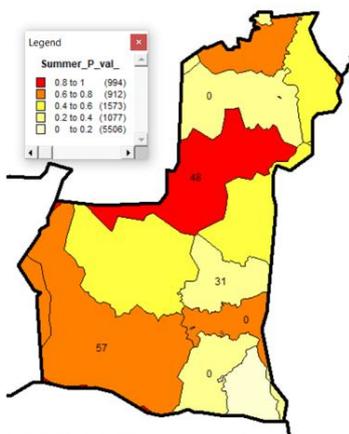


PI Interpolated on 250m CRG grid

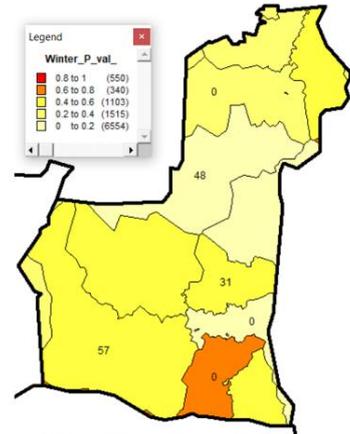
Zero values for PI in some sectors may reflect the absence of site investigation data - not necessarily the absence of shrinkable clay. A single claim in an area with low population can raise the risk as a result of using frequency estimates.

The maps below show the seasonal difference from the sample used. Combining the risk maps by season and reviewing the table on page 12 is perhaps the most useful way of assessing the potential liability, likely cause and geology using the values listed.

BROXBOURNE – by season

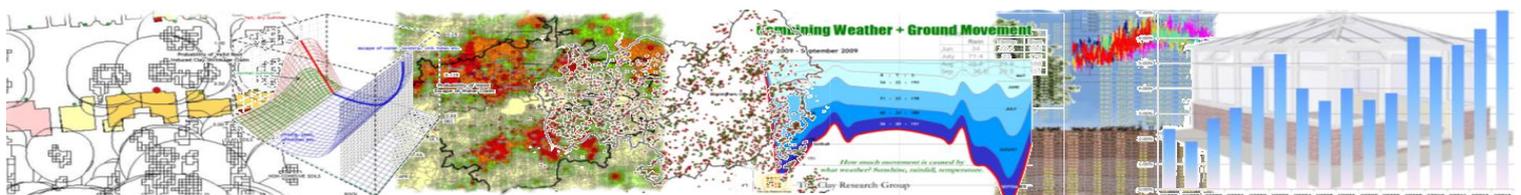


Probability Valid, Summer



Probability Valid, Winter

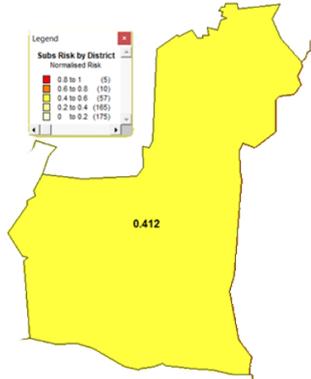
A high frequency risk can be the product of just a few claims in an area with a low housing density of course and claim count should be used to identify such anomalies.



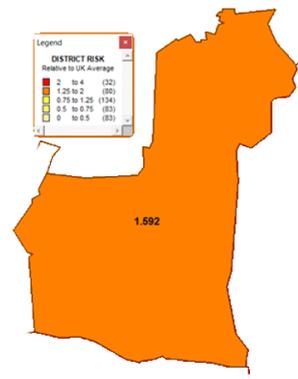
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District Risk. EoW and Council Tree Risk.

BROXBOURNE - Subsidence Risk Relative to UK



Normalised (0 – 1) Scale



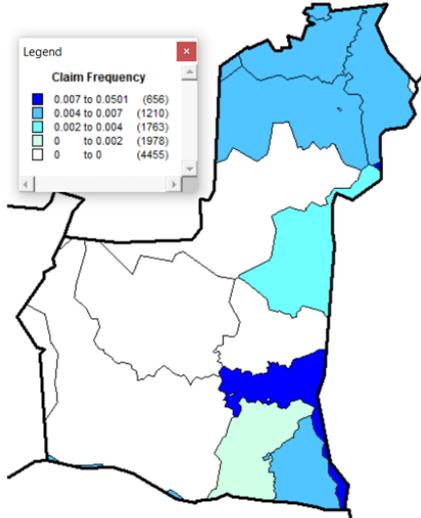
Relative to UK Average

Below, left, mapping the frequency of escape of water claims reflecting the presence of drift deposits of non-cohesive soils including sand and gravel and clay with flints underlain by chalk.

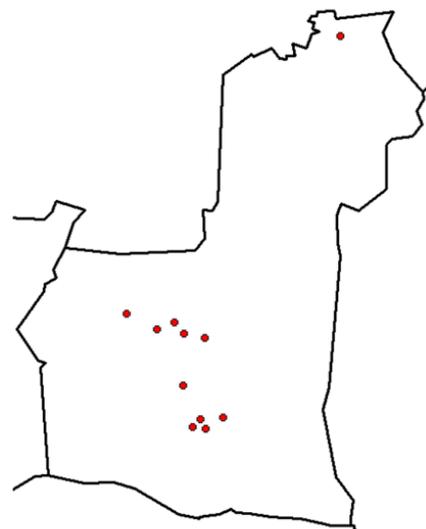
As we would expect, the 1:50,000 scale BGS map provides a more detailed picture. The CRG 1:250 grid reflects claims experience.

Below right, map plotting claims where damage has been attributable to vegetation in the ownership of the local authority from a sample of around 2,858 UK claims confirming the presence of shrinkable clay soils.

BROXBOURNE



Escape of Water



**Claims Involving Council Tree
(2,858 UK claim sample)**

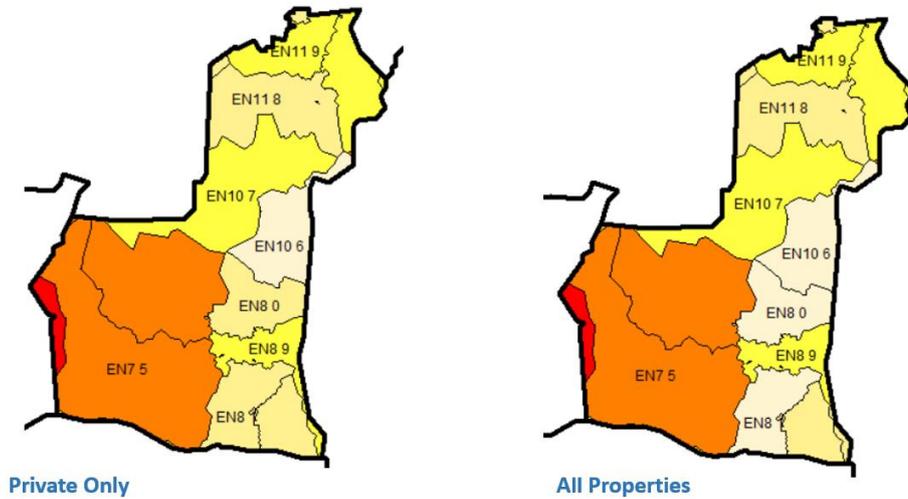


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Broxbourne - Frequencies & Probabilities

Below, mapping the risk of subsidence by ownership. Claims frequency that includes council and housing association properties delivers a misleading value of risk as they self-insure. The following show the normalised risk, taking account of the private housing population – that is, the rating compared with the average value for each category.

BROXBOURNE - Sector Risk Compared with UK Average

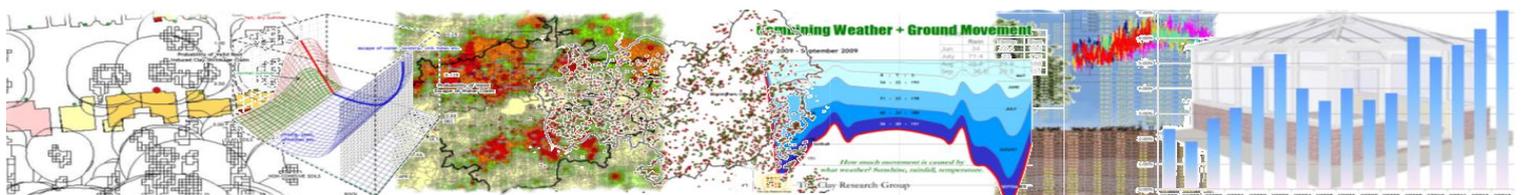


To reiterate, a reversal of rates for valid-v-declined by season is a characteristic of the underlying geology. For clay soils, the probability of a claim being declined in the summer is usually low, and in the winter, it is high.

In this case, the numbers reflect the presence and influence of the underlying geology with clay accounting for a higher proportion of claims in the summer and Escape of Water in the winter.

Liability by Season - BROXBOURNE

District	valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
Broxbourne	0.465	0.233	0.302	0.20	0.40	0.401

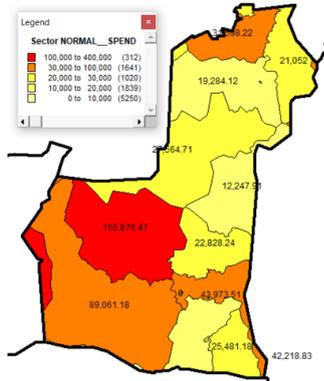


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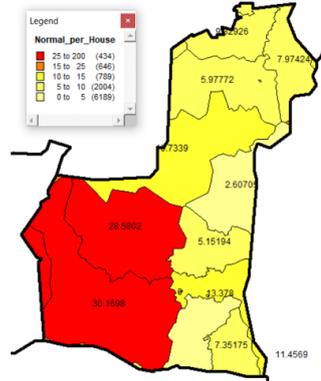
Aggregate Subsidence Claim Spend by Postcode Sector and Household in Normal & Surge Years

The maps below show the aggregated claim cost from the sample per postcode sector for both normal (top) and surge (bottom) years. The figures will vary by the insurer’s exposure, claim sample and distribution of course.

NORMAL YEAR SPEND – BROXBORNE



Spend by Sector

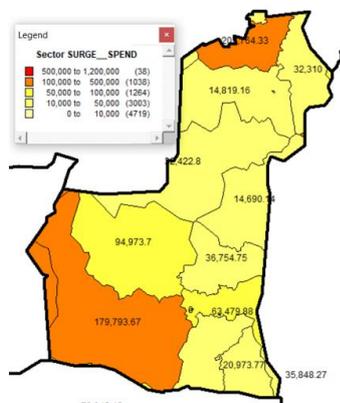


Spend Averaged Over Private Housing Population

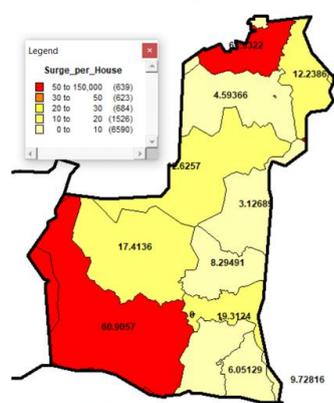
The images to the left in both examples (above and below) represent gross sector spend and those to the right, sector spend averaged across private housing population to derive a notional premium per house for the subsidence peril.

In this case, the absence of any distinct difference between surge and normal years reflects the geology.

SPEND in SURGE – BROXBORNE



Spend by Sector



Spend Averaged Over Private Housing Population

