

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



June 2025
Issue 241

The Clay Research Group

CONTENTS

Issue 241, June 2025

Page 2 - 3

ChatGPT – Tree Risk by Species

Page 4

Accurate Predictions – or Crying Wolf?

Page 5

UK Met Office Anomaly Maps

Page 6

Tree Growth Rate

Weather Elements and Risk

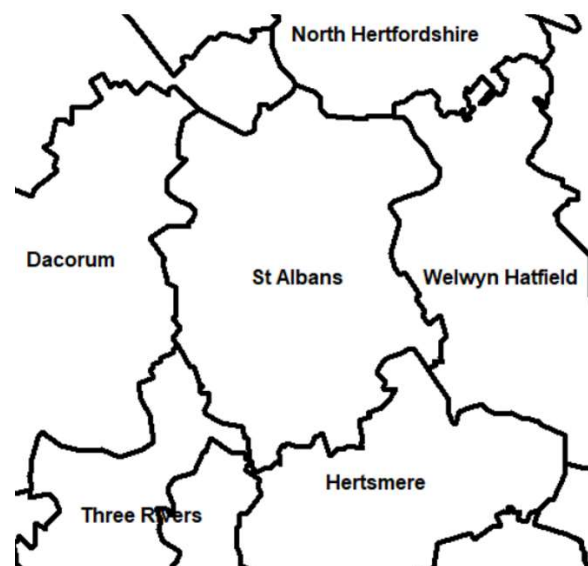
Pages 7 - 14

Subsidence Risk Analysis by District

St Albans

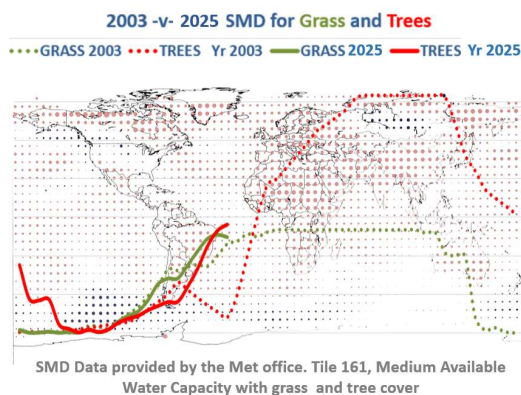
District and Sector Risk

St Albans is situated in East Hertfordshire, with a population of around 82,200 and occupies an area of 160.9km². It is the subject of the 'Risk by District' series in this month's edition. Its geology comprises superficial deposits of Clay with Flints, Till and sand and gravel overlying chalk – see Page 9.



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

SMD Graph



The SMD for both grass and trees exceeds the 2003 values for May and early June.

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

www.theclayresearchgroup.org

clayresearchgroup@gmail.com

Predicting Surge?

Tony Boobier considers the value of trying to predict the likelihood of surge on page 4. Do we take sufficient account of what science tells us when arriving at our predictions, or do we place too much reliance on our intuition?

On page 5 we take look at weather data from Heathrow to see what the science is telling us – but without the predictive elements unfortunately.



The Clay Research Group

ChatGPT – Highest Risk Tree?



First Question to ChatGPT

What species of tree delivers the highest number of subsidence claims to domestic buildings?

ChatGPT Response

The **oak tree (*Quercus robur*)** is most commonly associated with the **highest number of subsidence claims** to domestic buildings in the UK and other temperate regions.

Why oak trees?

- **High water uptake:** Oak trees have extensive root systems that extract large volumes of water from clay soils, especially during dry periods.
- **Size and root spread:** Mature oaks are large trees with root systems that can spread laterally well beyond the tree's canopy, sometimes reaching 1.5 times the height of the tree.
- **Common planting:** Oaks are widespread in urban and suburban areas, often planted near homes and gardens.

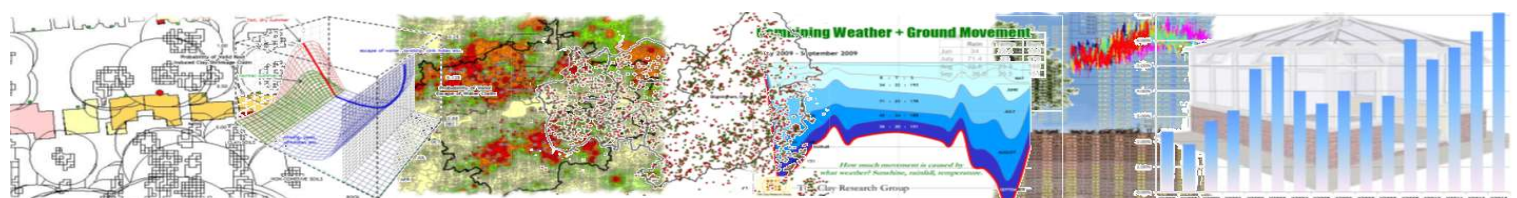
Other notable species involved in subsidence claims:

- **Willow (*Salix* spp.)** – Known for extremely high water demand.
- **Poplar (*Populus* spp.)** – Very fast-growing with invasive roots.
- **Plane (*Platanus × acerifolia*)** – Common in cities; large root spread.
- **Ash (*Fraxinus excelsior*)** – Aggressive root systems.

However, oak is typically at the top due to a combination of biological characteristics and prevalence near homes.

Let me know if you need region-specific data or stats.

See following page for more.



The Clay Research Group



ChatGPT – Available Data

Second Question to ChatGPT

Do you have region-specific data or stats relating to subsidence claims to domestic buildings caused by trees?

ChatGPT Response

Yes, there is region-specific data regarding subsidence claims in the UK, particularly those related to tree roots.

Key Statistics on Tree-Related Subsidence in the UK

- **Tree Influence on Subsidence:** Trees are responsible for over 60% of all subsidence claims in the UK. cet-uk.com
- **Soil Type:** The majority of tree-related subsidence occurs on clay soils, which are prone to shrinkage during dry periods. nalc.gov.uk+4ProHort+4Subsidence Forum+4

High-Risk Tree Species

Certain tree species are more commonly associated with subsidence due to their water uptake and root systems:

- Oak (*Quercus robur*): Known for high water consumption and extensive root systems.
- Willow (*Salix* spp.): Can extract up to 1,000 litres of water per day, making them particularly impactful on soil moisture levels. UK
- Poplar (*Populus* spp.): Fast-growing with invasive roots that seek out moisture aggressively. UK
- Ash (*Fraxinus excelsior*): Large, fast-growing trees with extensive root systems.

Regional Considerations

In the UK, regions with clay-rich soils, such as southern England, are more susceptible to tree-related subsidence. Areas like London, Essex, and Kent have higher incidences of such claims.

If you require more detailed statistics or information specific to a particular region, please let me (that is, ChatGPT) know, and I can assist further.



The Clay Research Group

Accurate Predictions – or Crying Wolf?

Tony Boobier

There's an interesting connection between the Greek writer Aesop, and the prediction of subsidence claims. The story of 'The Boy Who Cried Wolf' was written in Classical times, and tells the story of a boy who tricks villagers into thinking that a wolf is approaching. When the real wolf approaches, the villagers ignore his calls, and their sheep are lost.

It seems to me that we have been 'crying wolf' about the likelihood of a subsidence event year for a while now. The alarms bells start to ring the moment that we have a dry spring and the authorities start to threaten water shortages. But what's the reality? Can we really predict a subsidence event with any degree of certainty?

A recent article, reported in the April edition of CRG, seems to think so. It says 'Analysis from PwC suggests extreme temperatures could lead to increased subsidence insurance payouts of up to £1.9bn (US\$2.48bn) by 2030'.

I recall that the industry spoke about the £1.0 billion event year over 40 years ago, at a time industry costs were running in excess of £300m pa. Adjusting for inflation, £1.bn would equate to £4.0 bn in today's money, so maybe PwC's £1.9bn prediction isn't quite so bad?

We've come a long way since then. We've learned a lot but had to unlearn some things as well. For example, once there seemed to be much greater certainty regarding the impact of trees on buildings but now we seem to be less sure.

Beyond this, the world has also changed. We've become submerged in data which collectively should help provide us with better insight into the causes of subsidence, and our ability to forecast it. So why should prediction be so difficult?

Is it because there are so many contributory factors? Practitioners will be well aware of the key facts – trees, ground conditions, weather, distance, drains – but recognise other key factors such as the shape and vulnerability of buildings, the risk appetite of the property owner to the acceptance of damage, and even the impact of the housing market. Media attention also has its part to play.

The laws of big numbers should make the industry increasingly able to create broader-based models and give a better indication of the likelihood of a surge year with more confidence. Part of the analytical process is that of validation, where algorithmic models are created and then validated – or 'tested' – against what actually happened. Can't we use the past to help predict the future by retro-fitting calculations?

... continued



The Clay Research Group

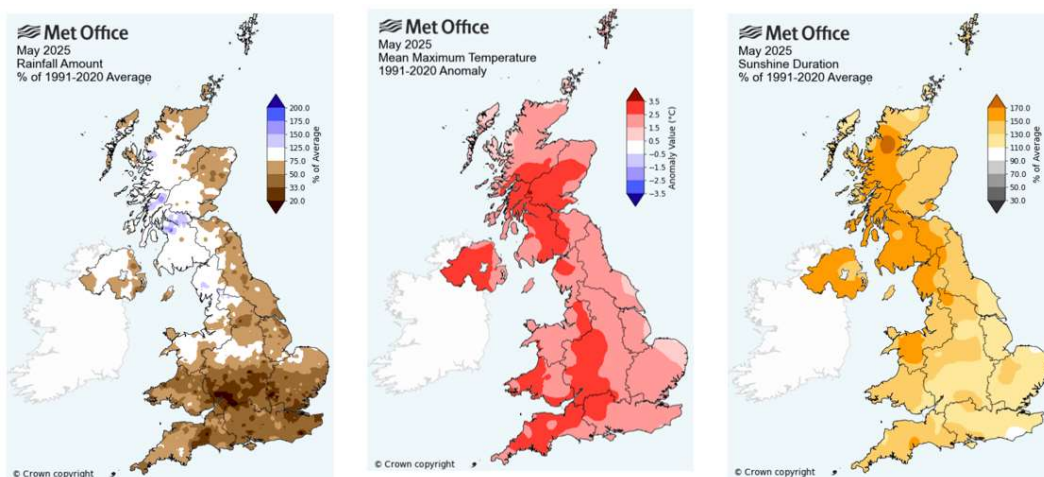
A combination of time-based, deep learning methods and satellite-based remote monitoring certainly gives greater insight but aren't these solutions proffered by technologists rather than practitioners? Despite the apparent wizardry of technology, until we can effectively model homeowner attitudes or the fluctuations of housing market conditions, won't we only be able to build a partial picture?

It seems like, at least for the moment, we'll probably just have to rely on intuition and how much the seaweed has dried out, which still seems (at least, to me) to still be a bit 'hit and miss'.

And as a result, won't the industry inevitably just have to 'cry wolf' until a surge event actually happens? By then, won't it be too late to act in terms of effective claims management and proactive customer service?

Met Office Anomaly Maps for May 2025

Anomaly maps from the Met Office web site for the month of May 2025 comparing data with the 1991 – 2020 average, reproduced below.



Met Office data shows reduced rainfall, higher temperatures and longer sunshine duration for May compared with 1991 – 2020 averages.

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



The Clay Research Group

Weather and Radial Growth Rate

“The impact of temperature and precipitation on radial growth rates of street trees: a case study of Plymouth, Southwest England”

Arboricultural Journal, 12th April 2025

Matthew Underwood, GE Consulting and Andy Hiron, Myerscough College.

An interesting paper describing the impact of weather elements relating to trees. The authors found that temperature and precipitation had a greater influence on growth rate than drought. The paper records *“The impact of temperature and precipitation were species specific, although all species responded positively to increased precipitation in the previous summer and in spring prior to bud burst”*.

<https://www.tandfonline.com/doi/full/10.1080/03071375.2025.2491246>

Is 2025 going to be a surge year?

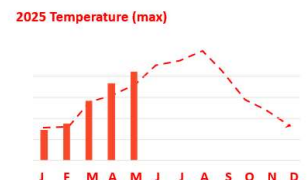
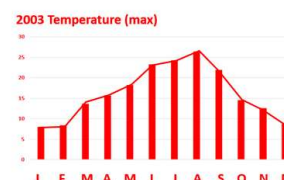
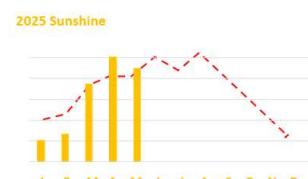
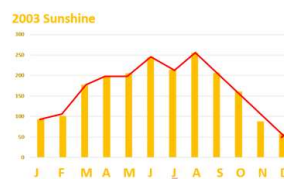
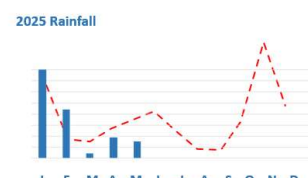
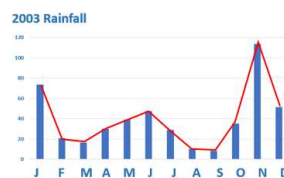
Continuing the topic from last month’s edition, plotting monthly values for rainfall, sunshine and temperature from the Heathrow weather station, monitored by the Met Office, the graphs below compare weather data for 2003 with the current year. Are there any indicators of a possible surge?

In the current year, there was more rainfall in January and February and significantly less in March, April and May.

There was less sunshine in January and February but more in March, April and May.

Temperatures were similar to 2003 in January and February, increasing in March, April and May.

‘In the moment’ the thoughts are that a surge may be possible with reports of record global warming etc., but as Tony Boobier points out in his article, times change and we need a detailed analysis looking at all data – claims and weather.



Left, weather elements as noted for a surge year – in this case, 2003. Right, weather data for 2005 with the 2003 profiles superimposed by a red dotted line.



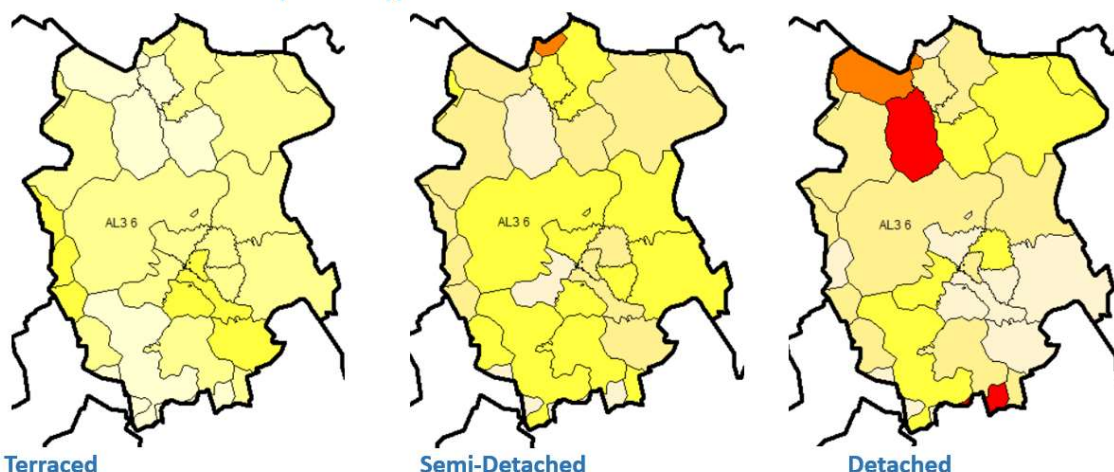
The Clay Research Group

St Albans - 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.

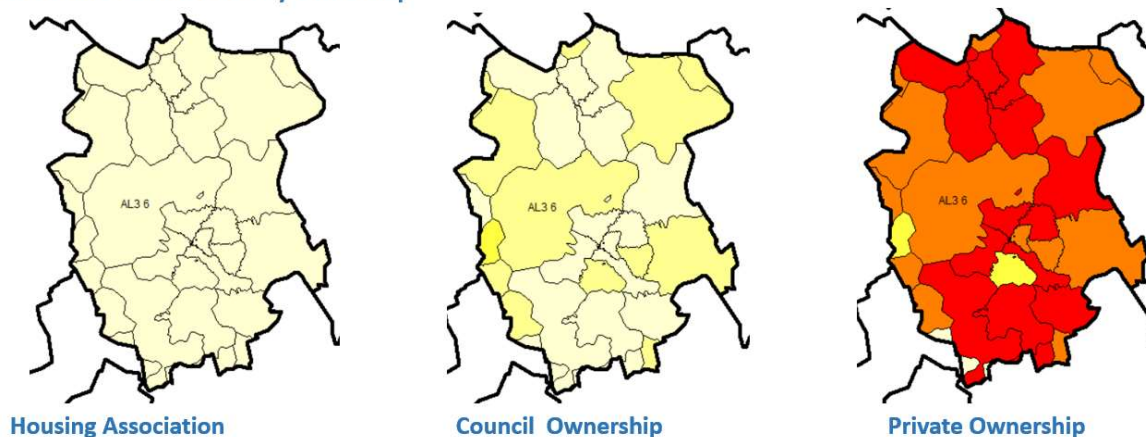
Risk increases with age of property and the model can be further refined if this information is provided by the homeowner at the time of taking out the policy.

St Albans - Distribution by House Type

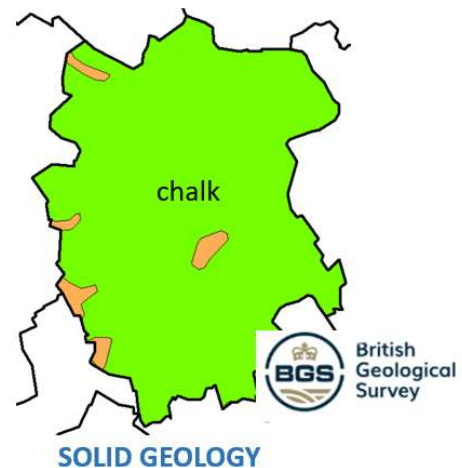
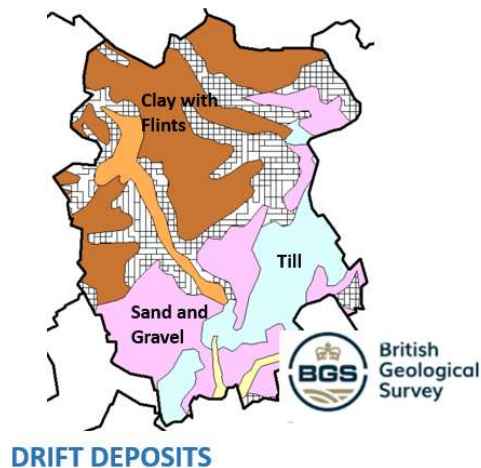


Distribution by ownership is shown below. Detached, private properties are the dominant class across the district.

St Albans - Distribution by Ownership

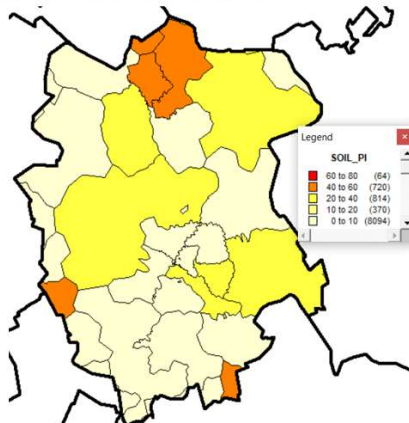


A postcode sector map on the following page records the PI of soils retrieved following site investigations from actual claims.

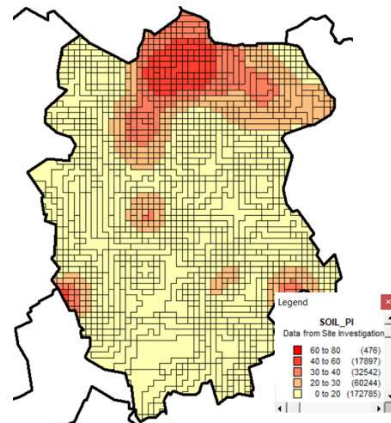


Below, the average PI by postcode sector (left) derived from site investigations and interpolated to develop the CRG 250m grid (right). The higher the PI values, the darker red the CRG grid.

St Albans – Soil Plasticity Index



Soil PI Averaged by Sector

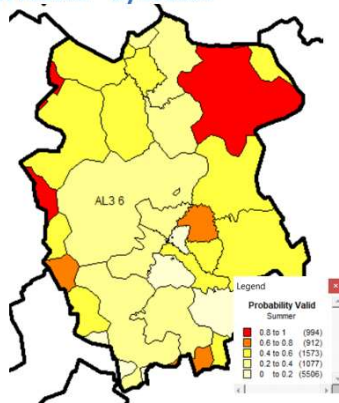


PI Interpolated on 250m CRG grid

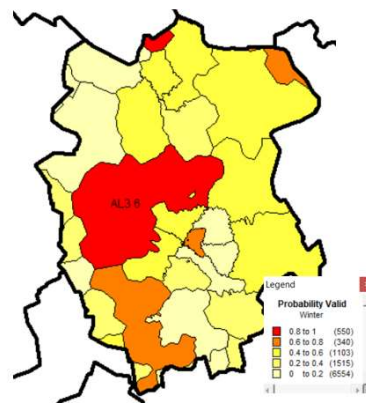
Zero values for PI in some sectors may reflect the absence of site investigation data - not necessarily the absence of shrinkable clay. A single claim in an area with low population can raise the risk as a result of using frequency estimates.

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.

St Albans – by season



Probability Valid, Summer



Probability Valid, Winter

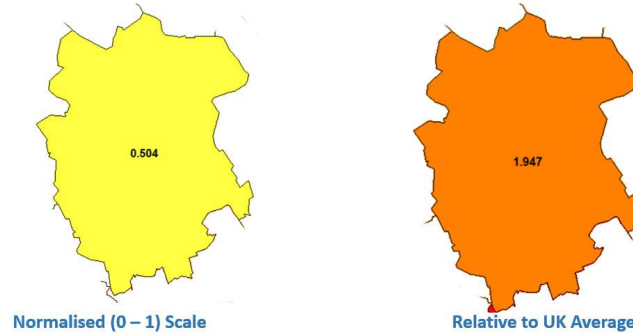
The 'claim by cause' distribution and the risk posed by the soil types is illustrated at the foot of the following page. A high frequency risk can be the product of just a few claims in an area with a low housing density of course and claim count should be used to identify such anomalies.



The Clay Research Group

District Risk. EoW and Council Tree Risk.

St Albans - Subsidence Risk Relative to UK

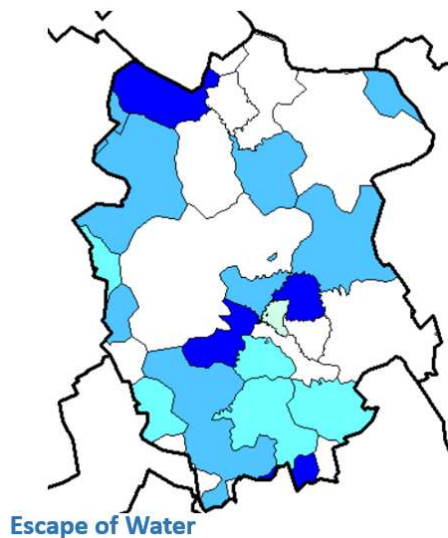


Below, left, mapping the frequency of escape of water claims confirms the presence of predominantly cohesive soils.

As we would expect, the 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. The claims usually coincide with the presence of shrinkable soils and the map below reflects the presence of shrinkable clay deposits.

St Albans



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

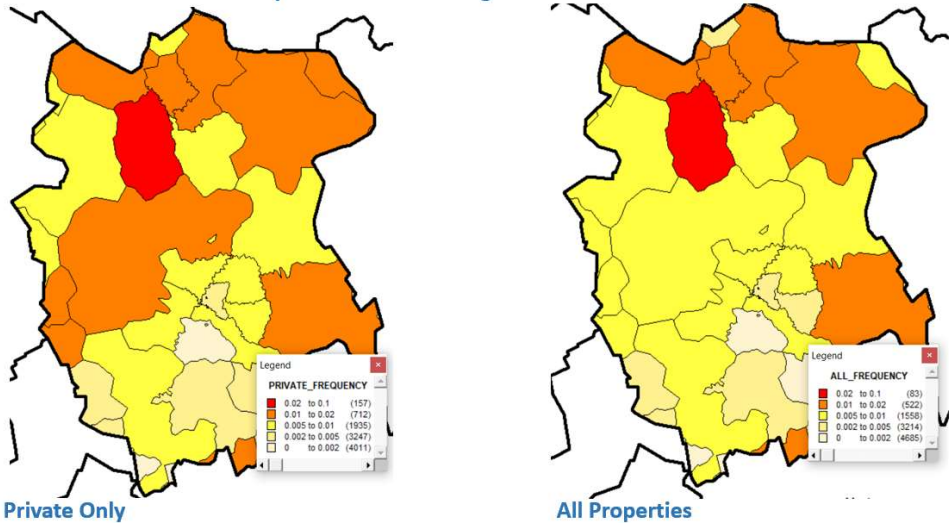


The Clay Research Group

St Albans - 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 tend to 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.

St Albans - Sector Risk Compared with UK Average



On a general note, 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.

Valid claims in the summer have a higher probability of being due to clay shrinkage, and in the winter, escape of water. For non-cohesive soils, sands, gravels etc., the numbers tend to be fairly steady throughout the year.

Liability by Season - St Albans

	valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
District						
St Albans	0.615	0.147	0.238	0.09	0.36	0.55

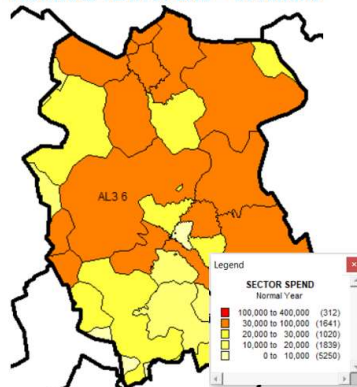


The Clay Research Group

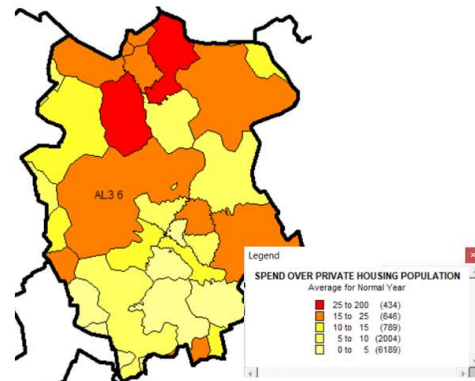
Aggregate Subsidence Claim Spend by Postcode Sector and Household in Normal & Surge Years

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 – St Albans



Spend by Sector

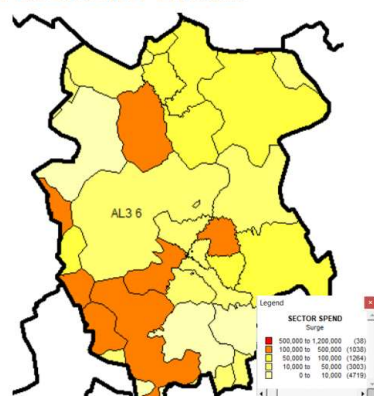


Spend Averaged Over Private Housing Population

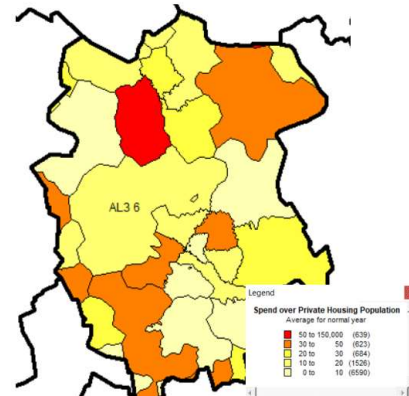
It will also be a function of the distribution of vegetation and age and style of construction of the housing stock. The images to the left in both examples (above and below) represent gross sector spend and those to the right, sector spend averaged across private housing population to derive a notional premium per house for the subsidence peril.

The figures can be distorted by a small number of high value claims. The absence of any distinct difference between surge and normal years reflects the geology.

SPEND in SURGE – St Albans



Spend by Sector



Spend Averaged over Private Housing Population



— SURGE — NORMAL

Sector	SURGE	NORMAL
AL19	0	0
AL21	0	10
AL22	5	8
AL37	5	15
AL12	10	10
AL13	15	5
AL53	20	25
AL36	25	28
AL35	28	20
AL49	35	25
AL11	38	25
AL15	40	15
AL55	40	85
AL51	40	10
AL54	55	45
AL48	60	40
AL40	75	70
AL34	80	20
AL23	85	15
HP27	90	10
AL52	100	75
AL14	100	55

Sectors most at risk at times of surge (from sample)

The models comparing the cost of surge and normal years are based on losses for surge of just over £400m, and for normal years, £200m.

