

# The Clay Research Group

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## 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



November 2025

Issue 246

# The Clay Research Group

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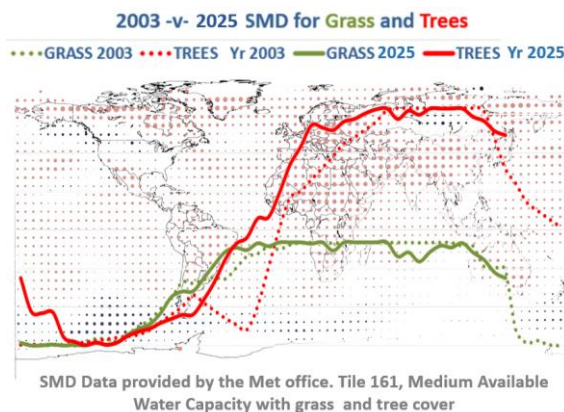
UK Met Office Anomaly Maps

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### AYLESBURY VALE

## SMD Graph



Plotting the correlation between the Soil Moisture Deficit for a surge year (2003) and the current year.

## Contributions Welcome

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

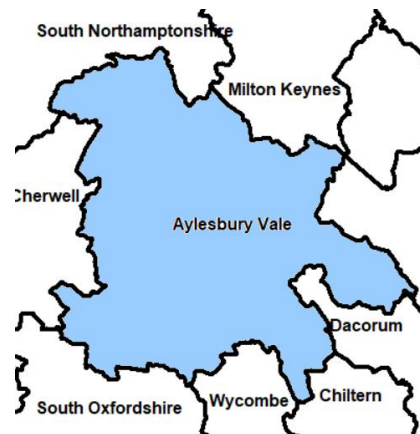
## THE CLAY RESEARCH GROUP

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## District and Sector Risk

Aylesbury Vale is situated in Buckinghamshire with a population of around 215,000 and an area of 903km<sup>2</sup>. It is the subject of the 'Risk by District' series in this month's edition. Its geology comprises small areas of drift deposits overlying shrinkable clay – see Page 9.



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

## Increasing Cost of Claims?

It's interesting to see the cost of subsidence claims from data published by the ABI. For example, the incurred figure for 2003 is listed at £7,202 and for 2024, £12,984. Costs appeared to have been increasing over the last three years. The average from 2003 to 2021 was £5,760. From 2022 to 2024, the figure was £11,287.

However, the ABI point out that figures provided from 2023 include commercial claims, which goes some way to explain the increase .... *"Please note that the 2023 annual totals are not directly comparable to 2022; this is due to the introduction of commercial subsidence and other commercial claims as categories for 2023 onwards."*



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## ChatGPT – repairing heave damaged properties



### Question to ChatGPT

What is the best evidence to confirm the cause of subsidence damage to a house?

### Response

The **best evidence to confirm the cause of subsidence damage** to a house depends on **identifying and verifying the mechanism** that has led to ground movement. No single test is conclusive on its own — the diagnosis relies on a **combination of structural, geotechnical, and environmental evidence**.

Here's how professionals (surveyors, structural engineers, or geotechnical specialists) confirm the cause:

#### 1. Crack pattern analysis

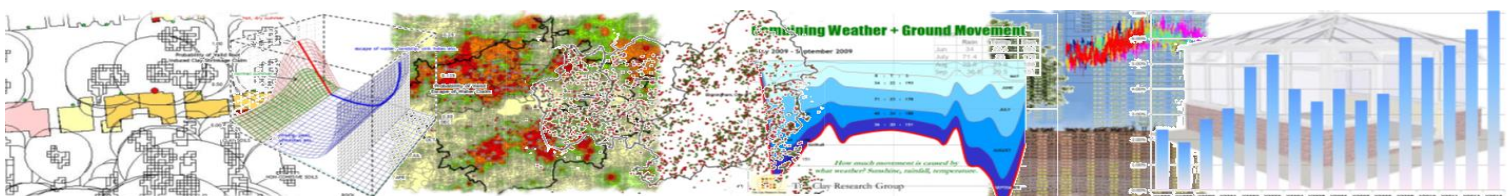
- **Evidence:** Location, direction, and width of cracks in walls, floors, and ceilings.
- **Purpose:** Different causes produce characteristic patterns.
  - *Clay shrinkage* → stepped diagonal cracks, usually near corners, widening toward the top.
  - *Leaking drains or washout* → localised vertical cracks near service trenches.
  - *Tree roots* → seasonal widening/narrowing of cracks near vegetation.
  - *Made ground or infill collapse* → irregular or differential settlement patterns.

#### 2. Soil investigation / borehole sampling

- **Evidence:** Boreholes or trial pits reveal soil type, moisture content, and any voids or instability.
- **Purpose:** Confirms ground conditions directly under foundations.
  - *Shrinking/swelling clay* → high plasticity index, desiccation fissures.
  - *Washout* → voids or softened soils from water movement.
  - *Mining/subterranean causes* → fractured or disturbed strata.

#### 3. Root identification and analysis (if vegetation suspected)

- **Evidence:** Roots found under or near foundations, confirmed by laboratory identification.
- **Purpose:** Confirms whether trees or shrubs are extracting moisture from shrinkable clay.
  - Root samples are sent for **species identification** to confirm origin (e.g., oak, willow, poplar).



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## 4. Drain or service testing

- **Evidence:** CCTV drain surveys or pressure tests.
- **Purpose:** Detects leakage or water erosion that could wash out fine soils beneath foundations.

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## 5. Monitoring movement over time

- **Evidence:** Crack gauges or precise level monitoring over several months.
- **Purpose:** Distinguishes **active subsidence** from **historic settlement** or **thermal movement**.
  - Seasonal or progressive movement indicates ongoing ground instability.

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## 6. Foundation and construction inspection

- **Evidence:** Exposing foundations to check depth, bearing strata, and construction type.
- **Purpose:** Identifies whether shallow or defective foundations contributed to movement.

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## 7. Moisture content and suction tests

- **Evidence:** Soil samples tested for water content and suction profiles at different depths.
- **Purpose:** Demonstrates drying due to vegetation or wetting due to leaks.

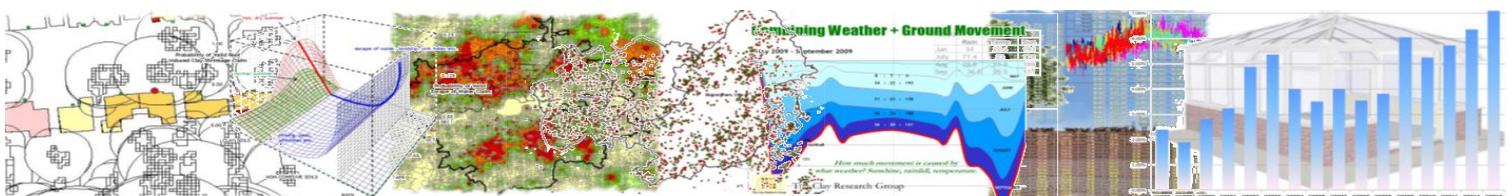
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## In summary:

The **best evidence** is a **combination** of:

- Crack pattern correlation
- Soil analysis (via boreholes/trial pits)
- Root and moisture content tests
- Drain surveys
- Ongoing movement monitoring

This **multi-evidence approach** provides the highest confidence in determining the **true cause of subsidence** and is the standard used by insurers and structural engineers.





The visualization is a multi-panel display titled "Coupling Weather + Ground Movement". It includes several data layers and charts:

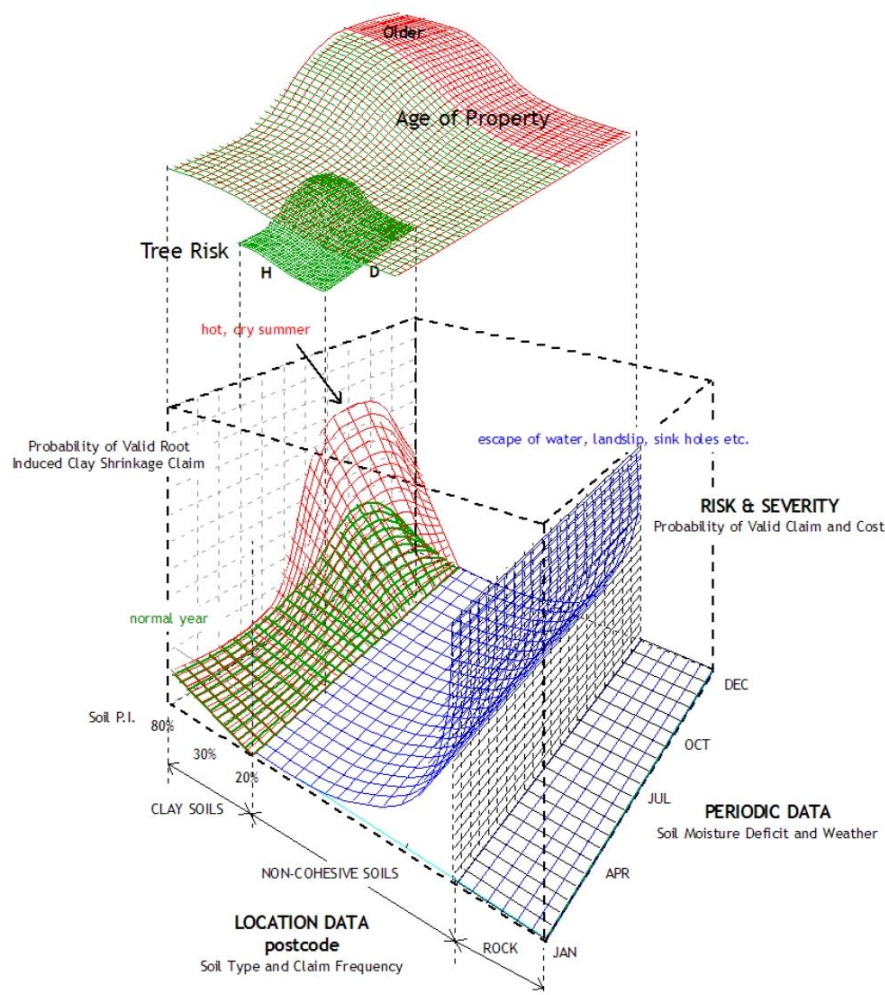
- Top Left:** A map showing a building footprint and surrounding area with various colored regions (yellow, orange, red, green) and a blue line representing a boundary or path.
- Top Center:** A map showing a large area with a grid of points and colored regions (red, orange, yellow, green, blue) representing different data categories.
- Top Right:** A chart titled "Coupling Weather + Ground Movement" showing a time series of data from 1/1/2009 to 1/1/2010. The chart has multiple y-axes and a legend.
- Bottom Left:** A 3D model of a building foundation and surrounding ground, showing the coupling between weather and ground movement.
- Bottom Center:** A chart titled "How much movement is caused by what weather? Humidity, rainfall, temperature" showing a time series of data from 1/1/2009 to 1/1/2010. The chart has multiple y-axes and a legend.
- Bottom Right:** A bar chart showing the movement of the building foundation over time, with bars colored in shades of blue and green.

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Clay soils are likely to have an increased count of valid claims in the summer months and for Escape of Water claims, the probabilities are fairly constant throughout the year.

The likelihood of a claim notified in the late summer for houses on shrinkable clay being valid are around 70%. If notified in the winter, the probability falls to around 20% and the most likely cause would be Escape of Water.

The count of valid claims is fairly constant throughout the year for drift deposits, and the area of damage might be related to the location of rooms with a drainage connection – kitchen, bathroom or toilet.



The graph above brings the data together, showing the risk by month taking into account the weather, trees by height, distance and species (where known), geology (including PI) and age of property.





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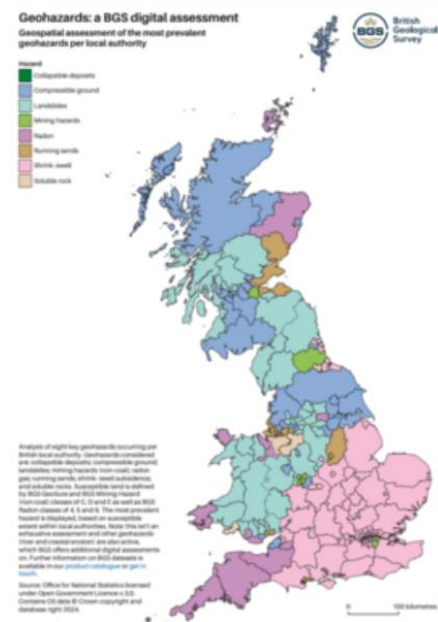
## British Geological Survey Update

The British Geological Survey have recently updated their 1:50 000 scale and 1:10 000 scale digital geology maps. Access their web site for more information - <https://www.bgs.ac.uk/>

The updates include changes to the following maps:

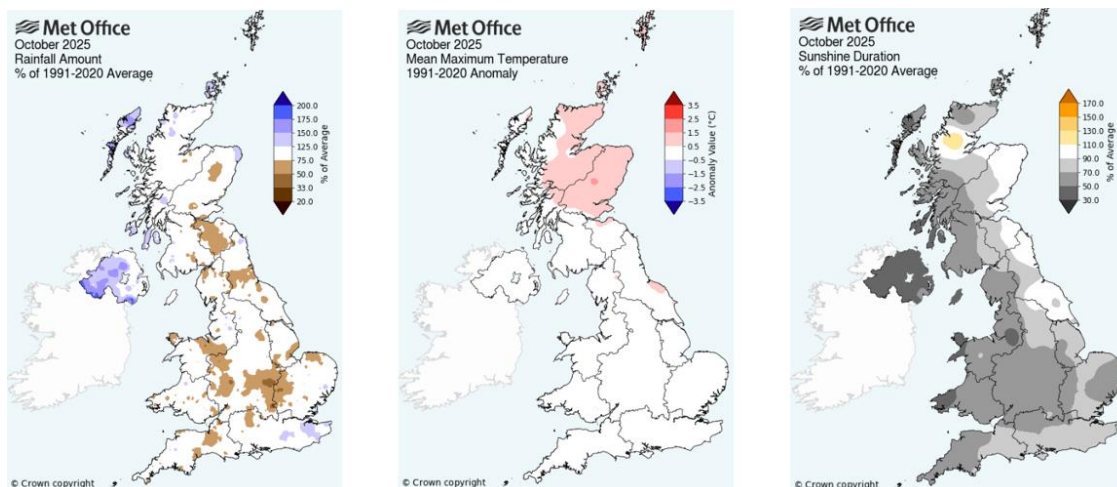
1. Bedrock
2. Superficial
3. Linear
4. Artificial
5. Mass movement

Eight key geohazards have also been included relating to natural subsidence, the presence of the ground-gas radon, the possibility of legacy mining in an area (excluding coal) along with a series of others with specialist interest.



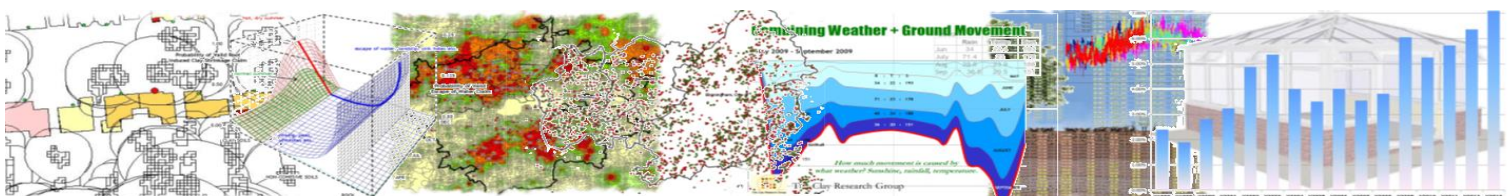
## Met Office Anomaly Maps for October 2025

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



The maps reveal fairly average rainfall mean maximum temperature across most of the UK and shorter sunshine duration compared with 1991 – 2020 averages.

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

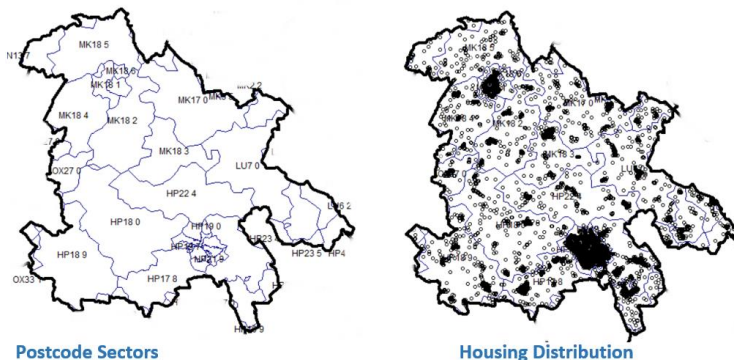


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## Subsidence Risk Analysis – Aylesbury Vale

Aylesbury Vale is situated in Buckinghamshire and occupies an area of around 903km<sup>2</sup> with a population approaching 215,000.

### AYLESBURY VALE



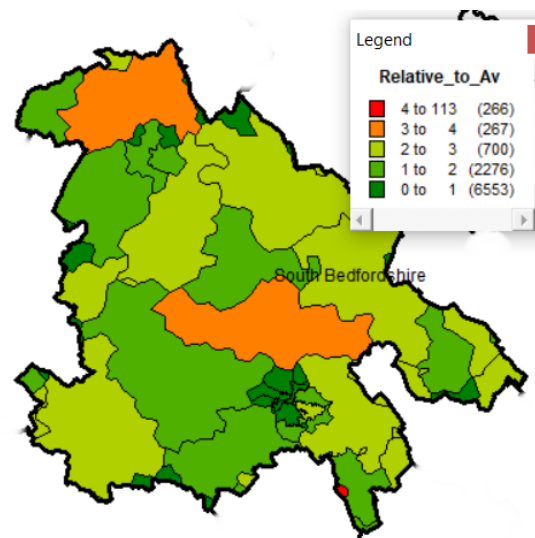
*Distribution of housing stock using full postcode as a proxy. Each sector covers around 3,000 houses on average across the UK and full postcodes include around 15 – 20 houses on average, although there are large variations.*

Aylesbury Vale is rated 57th out of 413 districts in the UK from the sample analysed and is around 1.64x the risk of the UK average, or 0.427 on a normalised 0 - 1 scale.

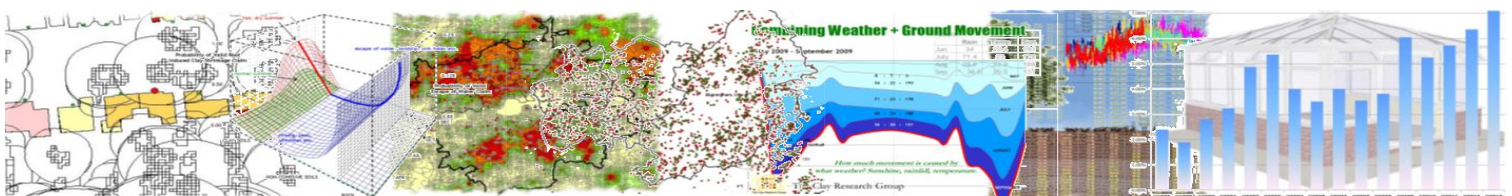
From the sample we hold, sectors are rated for the risk of domestic subsidence compared with the UK average – see map, right.

Sector 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.



*Sector risk compared to UK average from the sample analysed.*





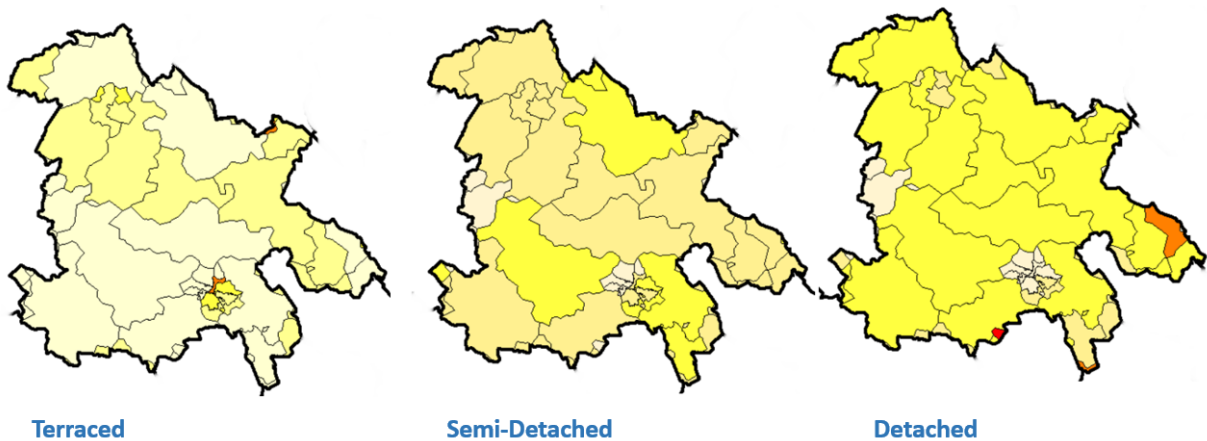
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## Aylesbury Vale - Properties by Style and Ownership

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.

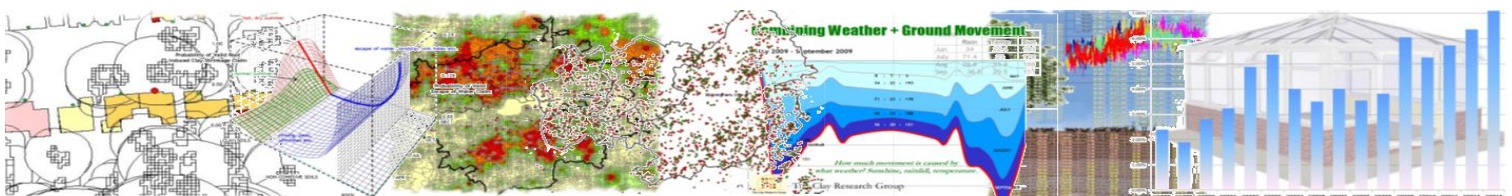
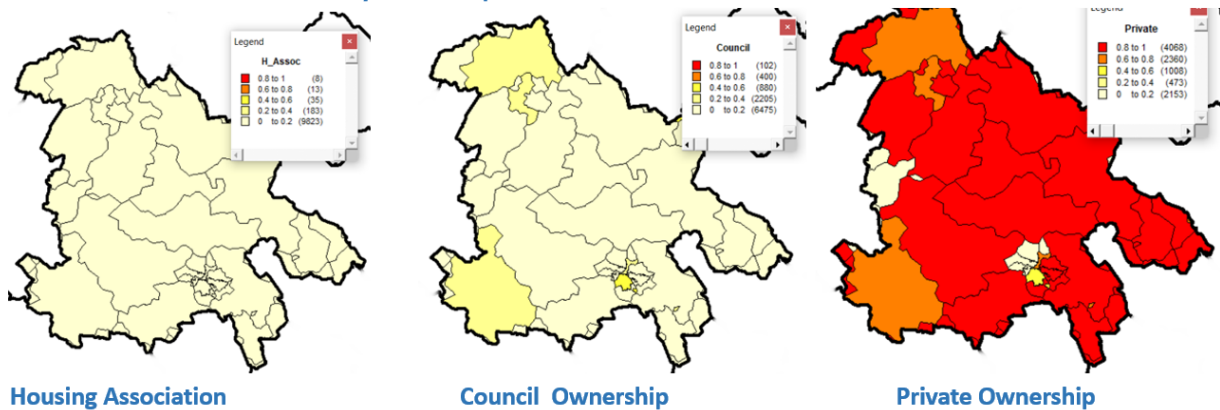
Risk increases with age of property and the model can be further refined if this information is provided by the homeowner at the time of taking out the policy.

### AYLESBURY VALE - Distribution by House Type



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

### AYLESBURY VALE - Distribution by Ownership



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## Subsidence Risk Analysis – Aylesbury Vale

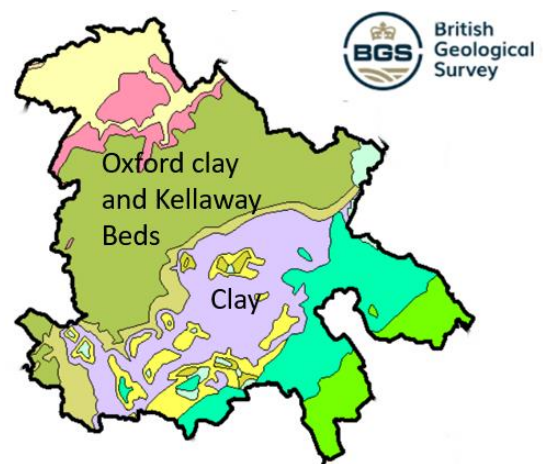
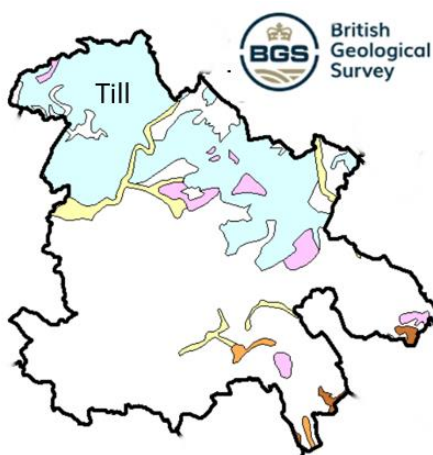
Below, extracts from the British Geological Survey low resolution 1:625,000 scale geological maps showing the solid and drift series. View at:

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

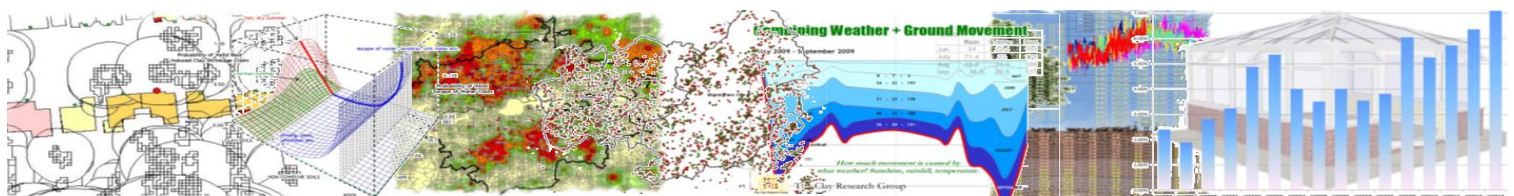
See page 12 for a seasonal analysis of the sample we hold which reveals that, at district level, there is around a 80% probability of a claim being valid in the summer and, of the valid claims, there is a 90% probability that the damage will have been caused by clay shrinkage.

In the winter the likelihood of a claim being valid falls to around 20%, and of those the dominant peril is escape of water, which accounts for over 90%.

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



*Above, 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.*



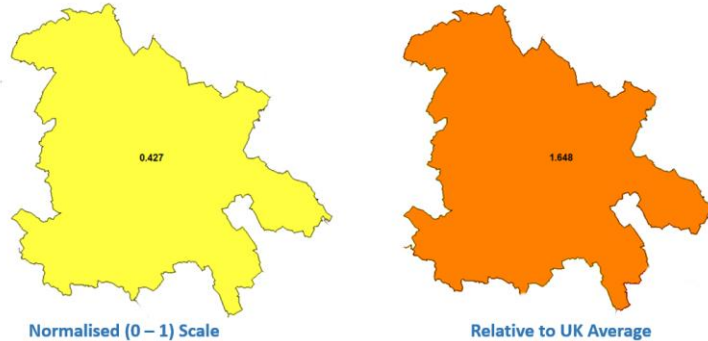




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## District Risk. EoW and Council Tree Risk.

AYLESBURY VALE - Subsidence Risk Relative to UK

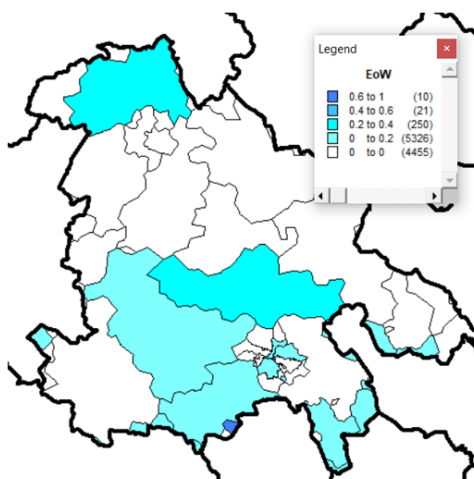


Below, left, mapping the frequency of escape of water claims reflecting the presence of drift deposits.

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. The location of claims reflects the outcropping clay series to the south and suggests fairly shallow drift deposits to the north.

AYLESBURY VALE

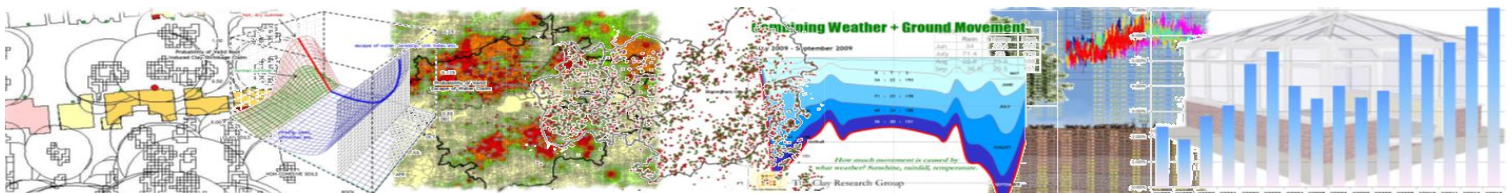


Escape of Water



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



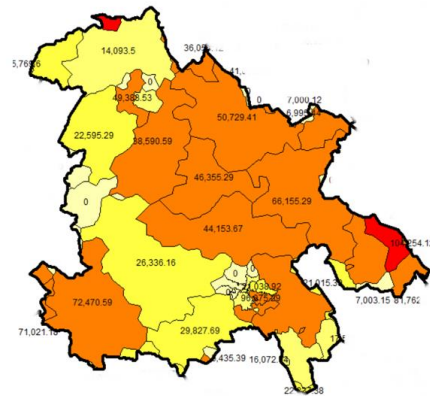


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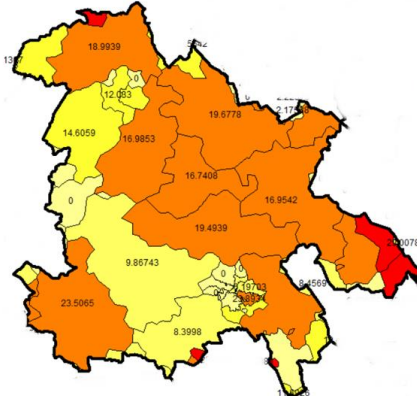
## Aggregate Subsidence Claim Spend by Postcode Sector and Household in Normal & Surge Years

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 – AYLESBURY VALE**



**Spend by Sector**

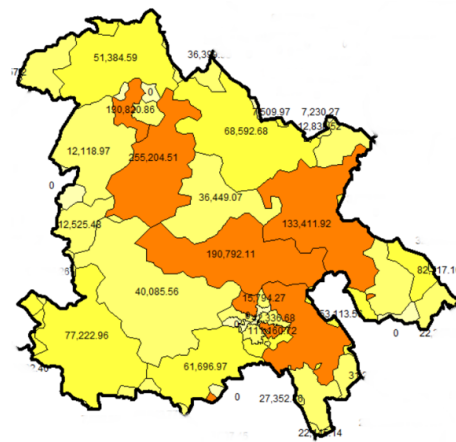


**Spend Averaged Over Private Housing Population**

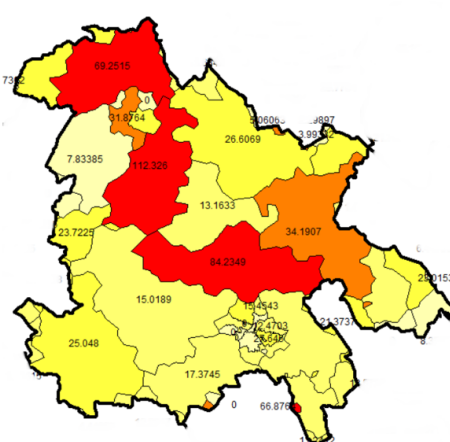
The images to the left in both examples (above and below) represent gross sector spend and those to the right, sector spend averaged across private housing population to derive a notional premium per house for the subsidence peril.

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

**SPEND in SURGE – AYLESBURY VALE**



**Spend by Sector**



**Spend Averaged over Private Housing Population**

