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

November 2019
Edition 174

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CONTENTS

Good Practice Guide

CII Society of Claims Professionals Good Practice Guide for subsidence

Tony Boobier has drawn attention to a six-page guide produced by Jeremy Trott, non-executive director of the Society of Claims Professionals, in which he recommends the following approach when investigating subsidence claims:

First, treat all claims and requests for cover individually. Next, establish the risk or cause of subsidence to action an effective triage strategy. If subsidence isn't the only cause of damage, identify what other cover is available and finally, explain the anticipated timeframe.

For further information:

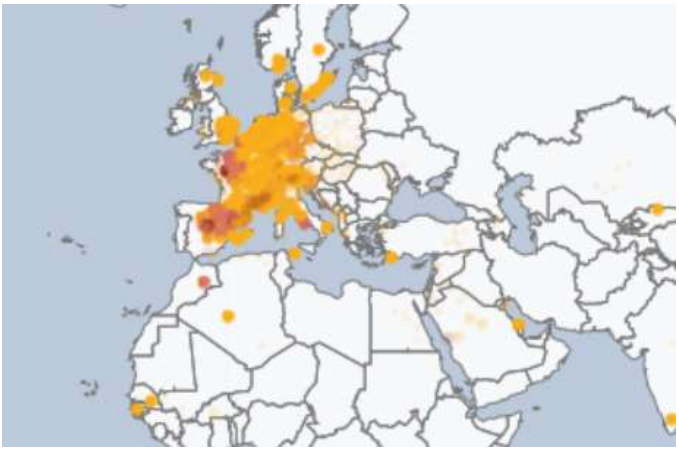
http://www.onlystrategic.com/Articles/featured/id/87386/key/48131ffa3c713870f5358e576bdf3d59/user/1000

In the news …

Thanks to Jon Heuch of Duramen for alerting us to the following item relating to the Allerton oak tree in Calderstones park, Liverpool, which has been declared the oldest tree in England, thought to be over 1,000 years old. https://www.bbc.co.uk/news/uk-england-merseyside-50141031

Below, an extract from a map produced by the California-based climate institute Berkeley Earth showing just how warm 2019 was, by geographic area and month:

https://www.bbc.co.uk/news/science-environment-49753680?intlink_from_url=https://www.bbc.co.uk/news/science_and_environment&link_location=live-reporting-story



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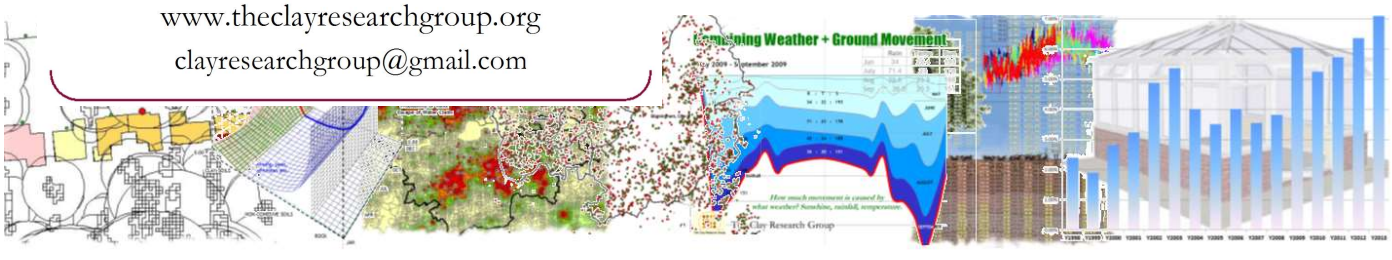

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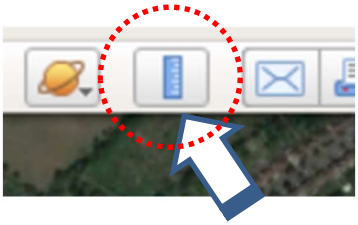
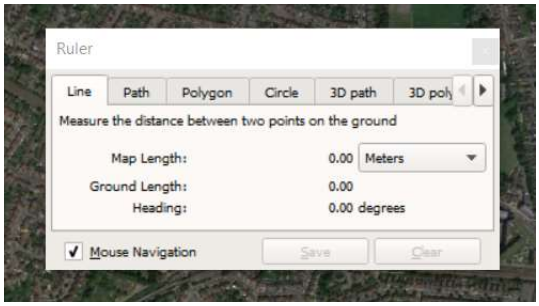
Site Measurements using Google Earth

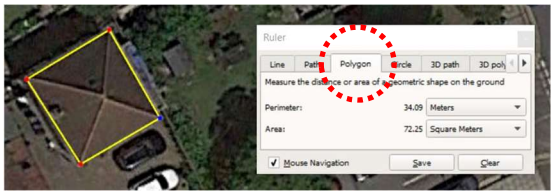
A colleague mentioned how he had come across the measuring tool in Google Earth and the following article explores how it might be useful in assessing risk when vegetation is involved.

The tool is available in Google Earth Pro, and can be found along the top toolbar – see right. Clicking on the icon reveals the screen below. Select the sort of measurement required – line, polygon, circle etc., and the unit of measure – metres, feet etc.

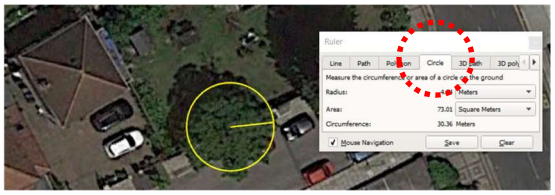




Zoom in or out to select the best screen resolution for your proposes, and start measuring by clicking on the mouse. A yellow line shows the path you have selected – polygon, circle or straight line as shown in the examples below.



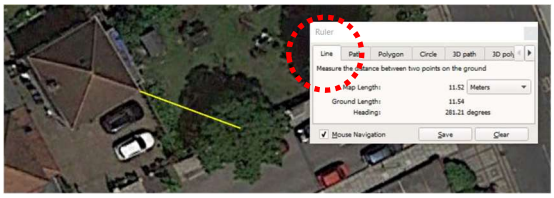
Top right, measuring the floor plan of the property to calculate sum insured which appears on the data screen as 72.25m^2. The building has an estimated perimeter of 34.09mtrs.

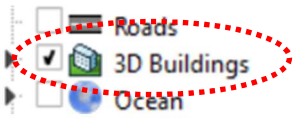


Middle, measuring the canopy radius, area and circumference of the nearby tree.

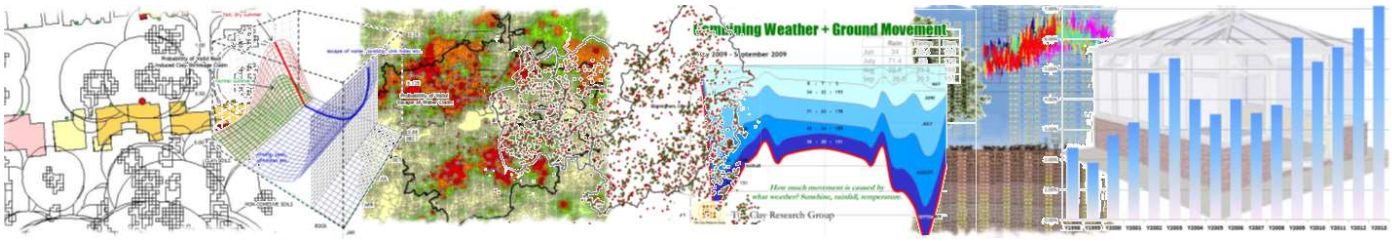
Bottom, measuring the distance from the estimated tree trunk to the property, and the heading relative to the north point.

Further useful information can be obtained by selecting the 3D button at the lower part of the left-hand toolbar on the Google Earth screen – see below and following page.





Above, examples from the Google Earth Pro screen showing various tools for measuring distance in one plane. Left, checking the 3D Building icon allows further measurements to be taken, including height.



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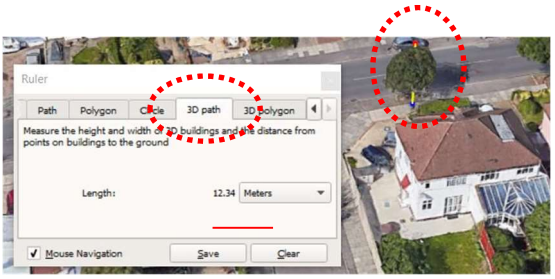
Site Measurements using Google Earth

Right, a 3D view of a property obtained by zooming in on the screen image on Google Earth. Here we have selected a view based on its clarity - the imagery is not always as clear as the example shown.



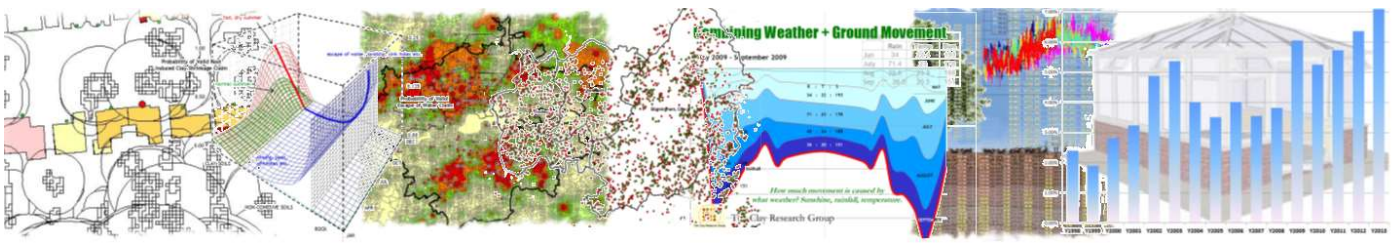
Using the mouse, click on the top and (estimated) base of the tree. The information screen indicates it as being 12.34m tall. The house is estimated to measure 5.3m to the eaves.

Below, a table comparing engineer's details based on an actual claim with Google Earth measurements and LiDAR imagery obtained in 2006.

The building footprint is recorded as being 48m^2 using LiDAR and 47m^2 measuring the Google Earth image. The distance between the tree and house is 13mtrs in both, which agrees with the engineer's site measurement. The tree was 19m tall in the LiDAR scan (2006) and 17m tall measured from the Google image (2019). As can be seen from the picture right, the tree canopy has been reduced in height and thinned, possibly explaining the differences between the measurements.

	Eng Report	Google (2019)	LiDAR (2006)
House Floor Area	-	47m^2	48m^2
Tree Height	20m	17m	19m
Tree Distance	13m	13m	13m

No doubt an arboricultural expert could identify the tree species from the Street View photograph. In this case we used the i-Tree web site recording London street trees which identifies the tree as an oak. In summary, the method provides a useful overview, available from a desk-top study. There is no claim to accuracy given the size and resolution of the imagery, but relative proportions are useful when (as is the case here) it is likely given the metrics and species that the root zone extends beneath the property.



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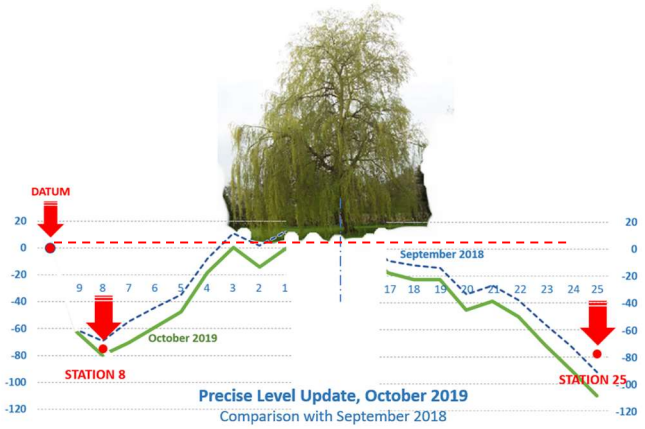
Aldenham Willow – Precise Level Update

In what must be one of the longest periods monitoring ground movement in the vicinity of a tree on clay soil, precise levels, taken by GeoServ Ltd., and funded by Crawford & Co., have yielded insight into moisture uptake by season and by year at the site of the Aldenham willow.

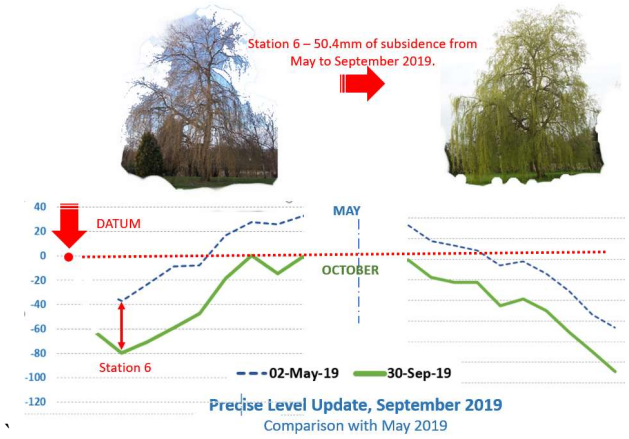
The readings reveal continued subsidence towards the root periphery of the tree, with maximum movement since monitoring began of 108.9mm, recorded at station 25 - see image right.



The pattern is mirrored, although the amplitude is slightly less, at station 8 which was around 79.7mm lower than its starting point.

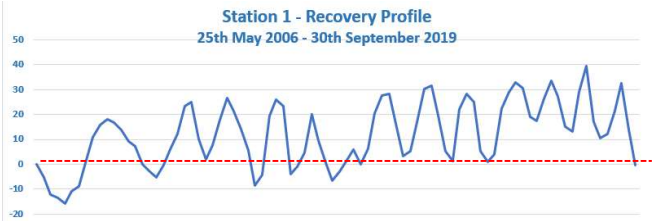
The patterns reveal the development of a persistent moisture deficit in these areas. There has been some rehydration closer to the tree at stations 1 – 4.

The furthest station in both arrays is 25mtrs from the 14m tall tree. The zone of desiccation peaks at over twice the height of the tree and the amplitude at this distance reveals the remarkable ability of the willow to seek moisture from such a distance.

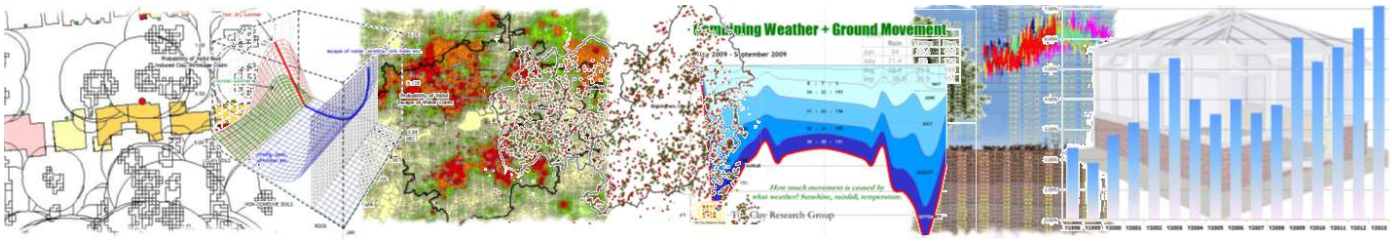


Movement over one summer – the difference between readings in May (blue) and October (green) 2019.

In the five-month period between 2nd May and 30th September 2019 (image, left) maximum subsidence of 50.4mm was recorded at station 6. Maximum recovery over the full monitoring term of 39.6mm has taken place at station 1, nearest the tree.



See issue No. 172 for site layout.



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Subsidence Risk Analysis – WELWYN HATFIELD

Continuing the study mapping subsidence risk by district and postcode sector across the UK, this month's edition is an update to the Welwyn Hatfield district article in Issue 80, January 2012. A UK sample of over 100k claims has been used and the output will vary by portfolio and claims experience, both by year and season.

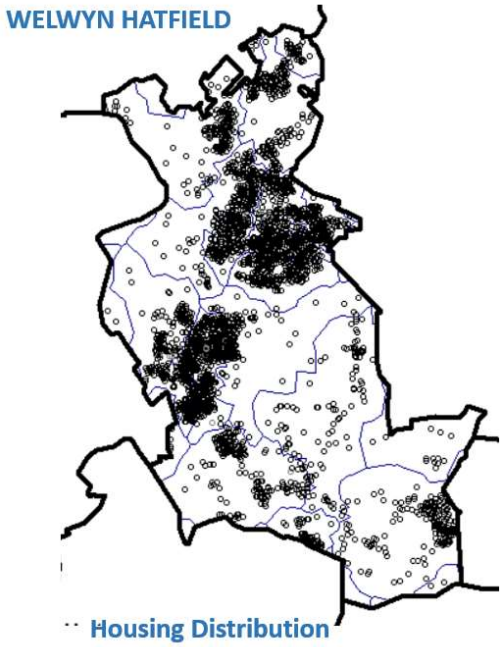
Layout of the Welwyn Hatfield borough in Hertfordshire. The borough has an estimated population of around 123,000 and an area of 129.6km^2.

Welwyn Hatfield is rated 1.83 times the risk of the UK district average in terms of subsidence. The highest risk rating on this scale is a value of 4.

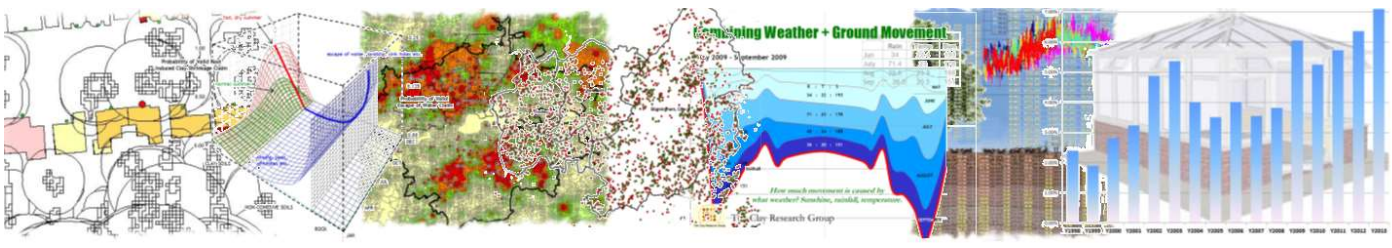
The borough comes 40th out of 413 UK districts in our 'rank order of risk' table for claims frequency.

Mapping housing distribution across the districts (below, using full postcode as a proxy) helps to clarify the significance of the risk maps on the following pages. Are there simply more claims 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 an absolute 'count of claim' value.



Distribution of housing stock using full postcode as a proxy. Each postcode in the UK covers on average 15 houses, although there is significant variation.



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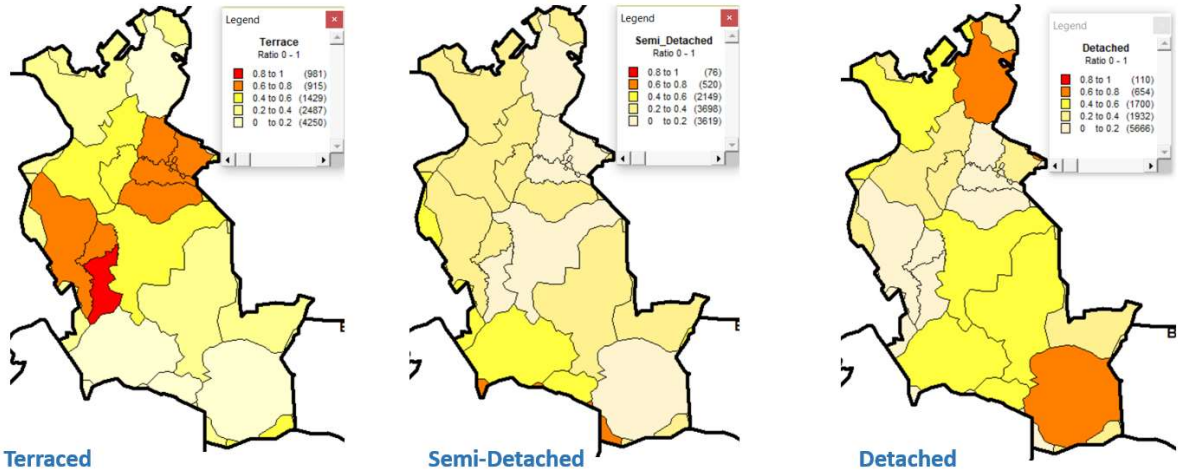
WELWYN HATFIELD - Properties by Style and Ownership

Below, the general distribution of properties by style of construction, distinguishing between terraced, semi-detached and detached.

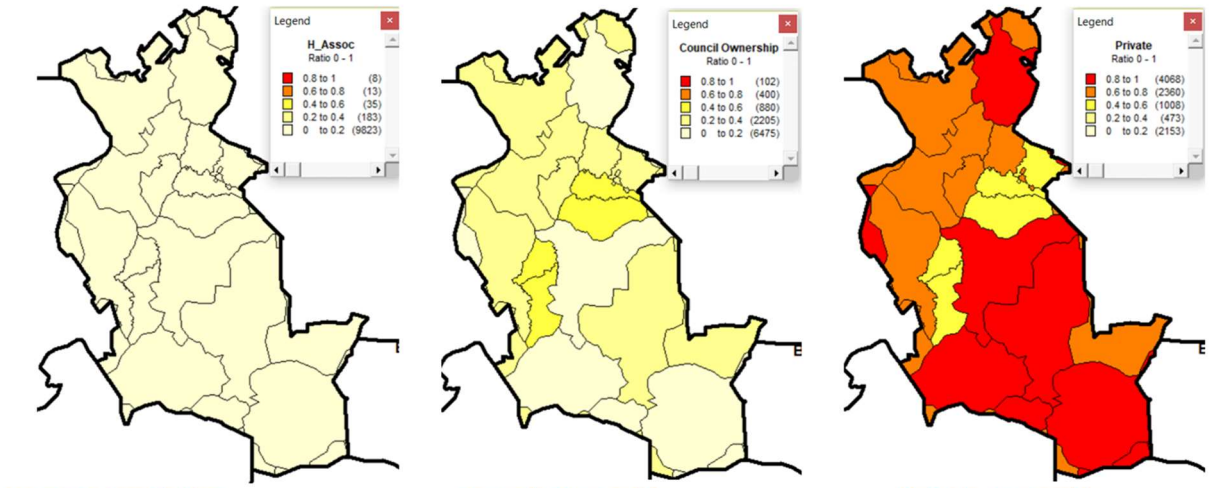
WELWYN District - Distribution by House Type



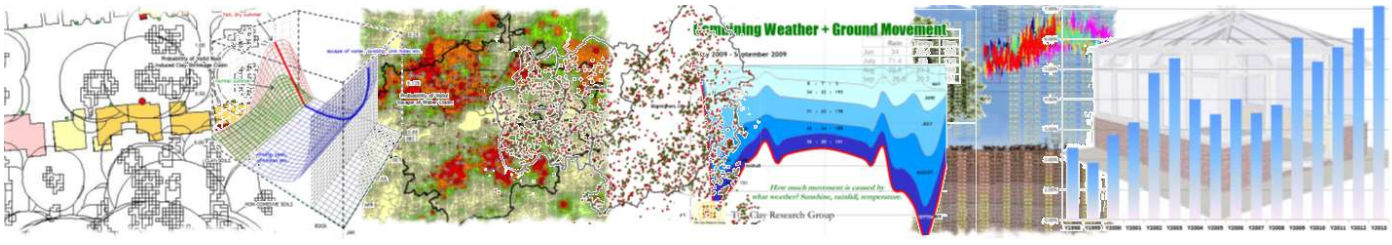
Terraced Semi-Detached Detached

Distribution by ownership is shown below, revealing a high population of privately-owned properties across the borough.

WELWYN District - Distribution by Ownership



Housing Association Council Ownership Private Ownership



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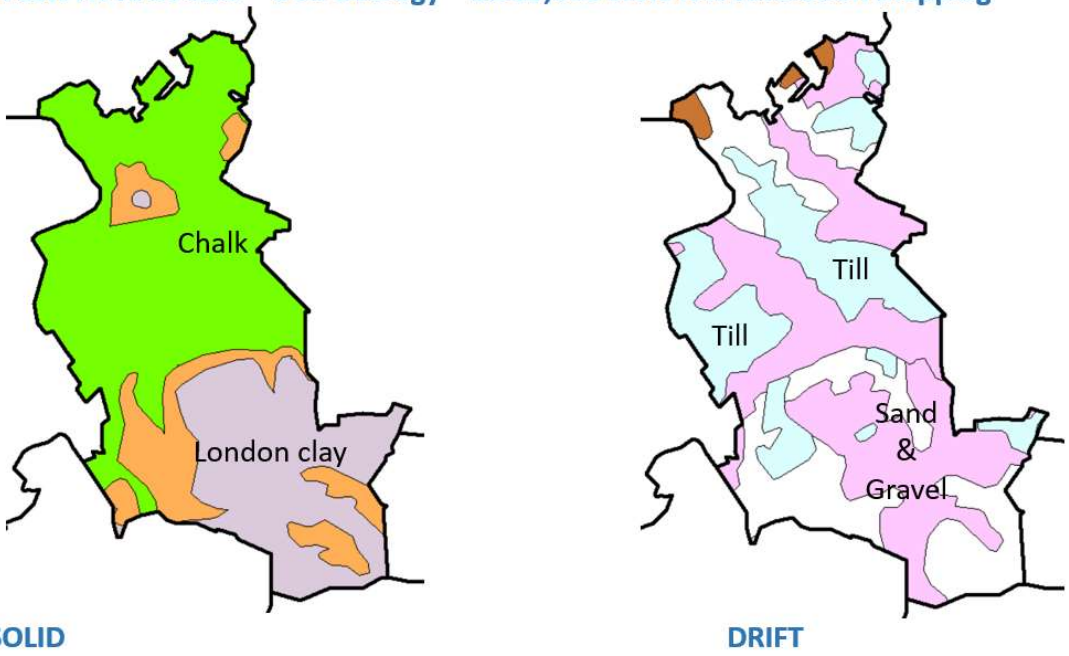
Subsidence Risk Analysis - WELWYN HATFIELD

Below, extracts from the British Geological Survey maps showing the solid and drift series. Go to:

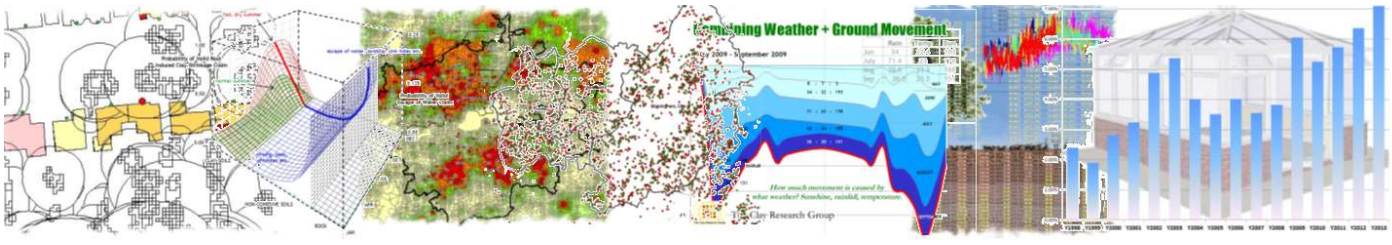
http://mapapps.bgs.ac.uk/geologyofbritain/home.html?

WELWYN HATFIELD - BGS Geology – 1:625,000 scale low resolution mapping



The drift deposits (predominantly till), appear to be relatively shallow given the apparent sensitivity to surge. See page 12 for a seasonal analysis, which reveals that the probability of a claim being due to clay shrinkage in the summer is high.

The above BGS web site also provides access to borehole data providing information on the depth and thickness of the strata.



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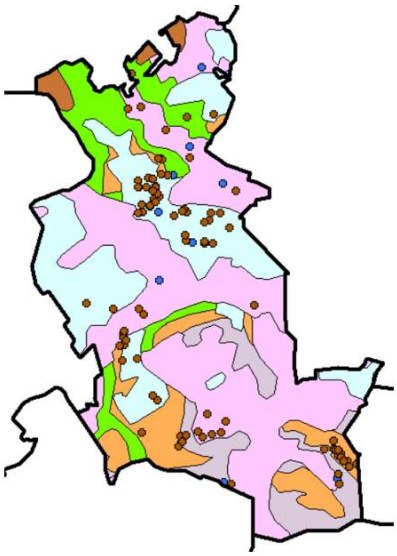
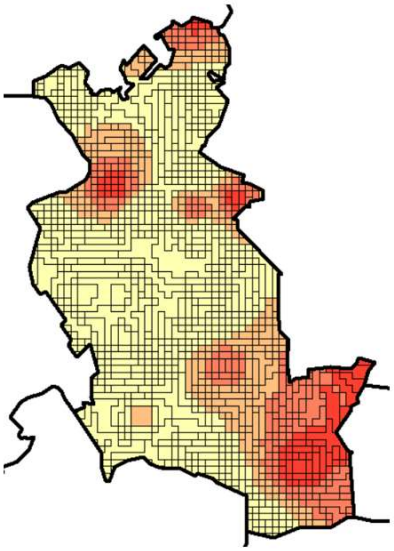
Liability by Season and Geology

Below, determining if there is a link with the underlying geology by making reference to the CRG 250m grid (below, right) plotting soil by PI obtained when investigating claims. The higher PI to the SE of the district correlates with higher probability of valid claims in summer as shown at bottom of the page and reduced risk of escape of water claims shown on following page.

WELWYN HATFIELD – Claims by Peril Distribution



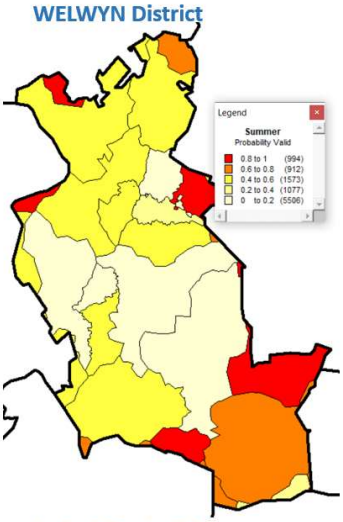
Escape of Water & Clay Shrinkage



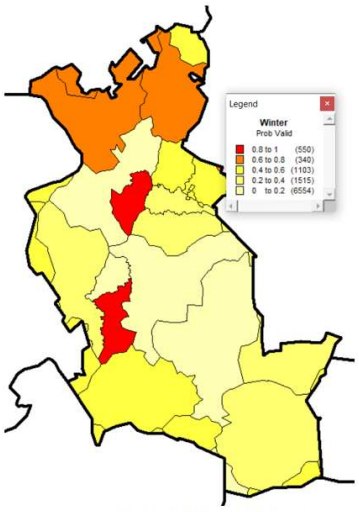
PI Interpolated on 250m CRG grid

Below, the probability of whether a claim is likely to be valid or declined by season.

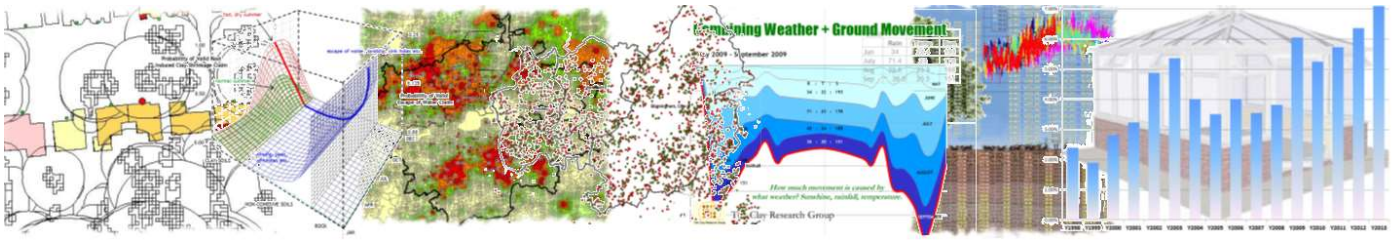
WELWYN District



Probability Valid, Summer



Probability Valid, Winter



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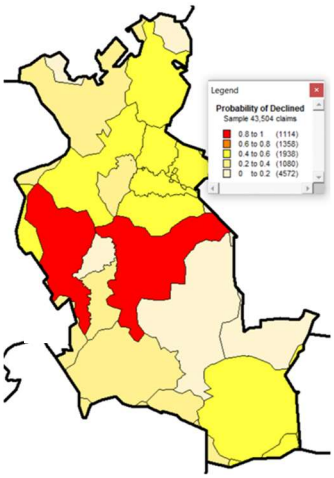
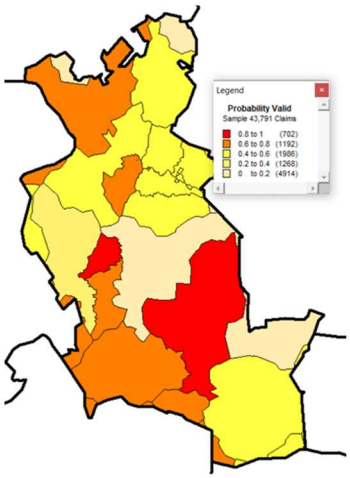
Liability by Sector. Escape of Water and Council Tree Claims Distribution

WELWYN District – Liability Distribution



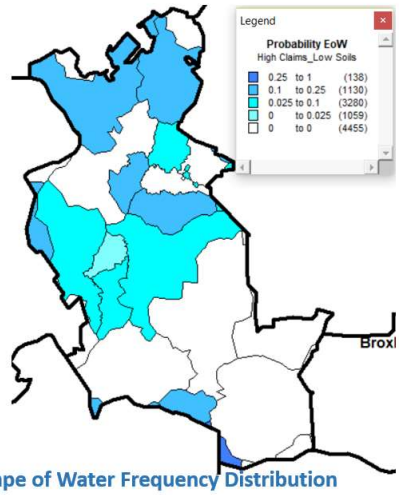
Declinatures



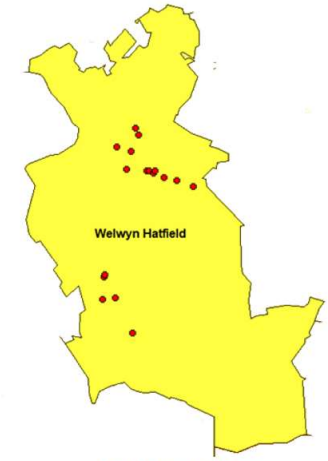
Valid Claims

Above, mapping liability and plotting distribution of valid and declined claims for the sample size shown, not taking into account any seasonal influence. Below left, mapping the frequency of Escape of Water claims from the sample reflects a link with the chalk series. Below, right, dots on the 'Council Tree Claims' map, represent properties where damage has been attributable to vegetation in the ownership of the local authority to determine if there is what is termed a 'hot spot'. The low numbers in the sample we hold may reflect the low count of street trees looking at Google Earth imagery.

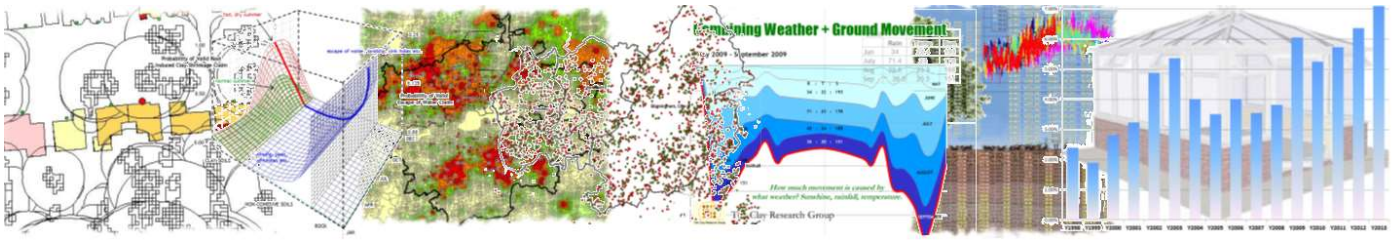
WELWYN District – Postcode Distribution



Escape of Water Frequency Distribution



Street Tree Claims



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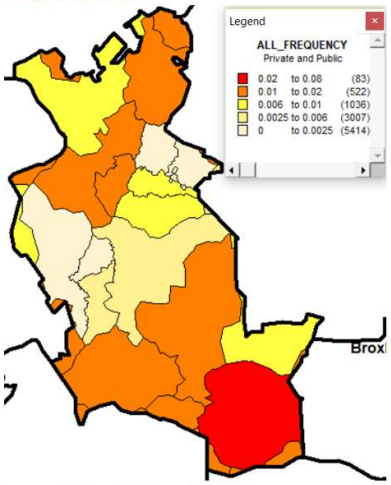
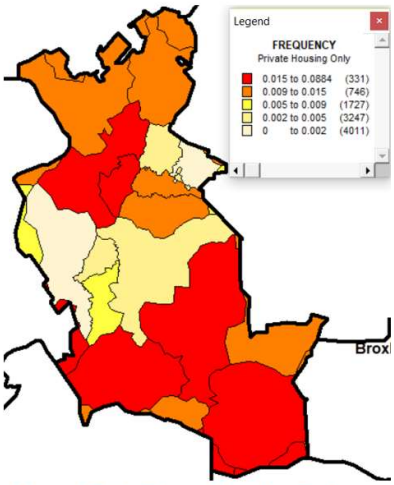
WELWYN HATFIELD - Frequencies, Count & Probabilities

WELWYN District



Sector Risk - All Housing



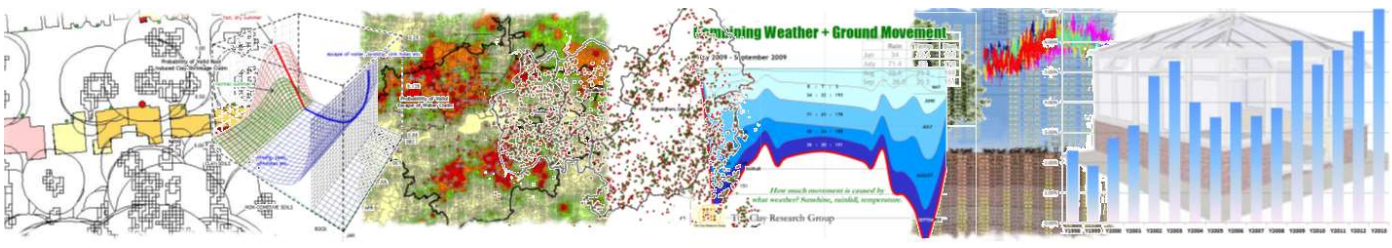
Sector Risk - Private Housing Only

Above, private housing plot links risk with the CRG geological map on page 8. Below, the figures reveal a borough with a variable seasonal risk. The chances of a claim being declined in the summer are just over 20%, and if it is valid, there is a greater than 90% chance (from the sample) of the cause being clay shrinkage. In the winter, the repudiation rate is around 80%, and if it is valid, the chance of a claim being due to clay shrinkage falls to around 6%.

The district illustrates the significant differences between boroughs, dependent on their geology. In this case, where the superficial drift deposits dominate, it gives a valuable clue to (a) their composition and (b) their thickness.

Peril and Liability by Season - WELWYN HATFIELD

District	valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
Welwyn Hatfield	0.735	0.050	0.215	0.01	0.16	0.83



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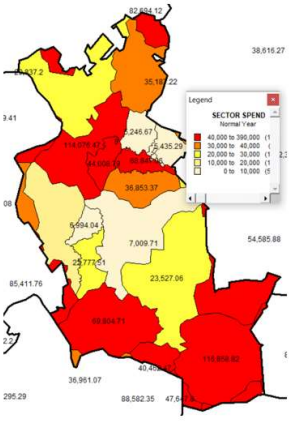
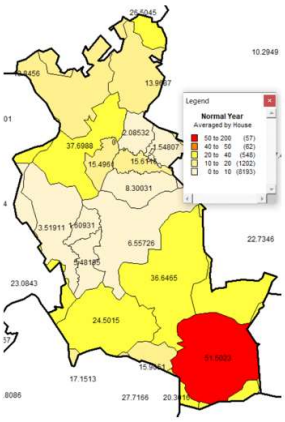
Aggregate Subsidence Claim Spend by Postcode Sector and Household to Derive Risk and Premium in Surge & Normal Years *...continued*

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

NORMAL YEAR SPEND by SECTOR – WELWYN HATFIELD



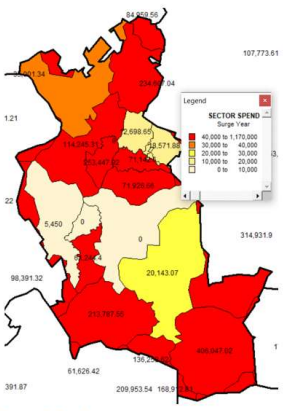
Spend by Sector



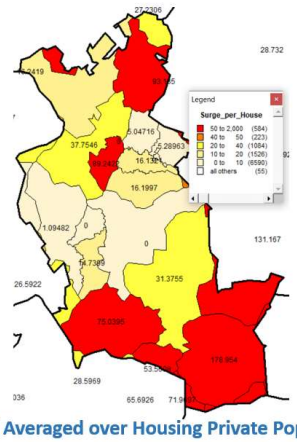
Spend Averaged over Private Housing Population

As mentioned in previous editions, not all areas see an increase in cost associated with surge, reflecting the variable geology. It will also be a function of the distribution of vegetation and age and style of construction of the housing stock. The image to the left in both examples represents sector spend and the figures to the right, sector spend averaged across housing population to derive a cost per house.

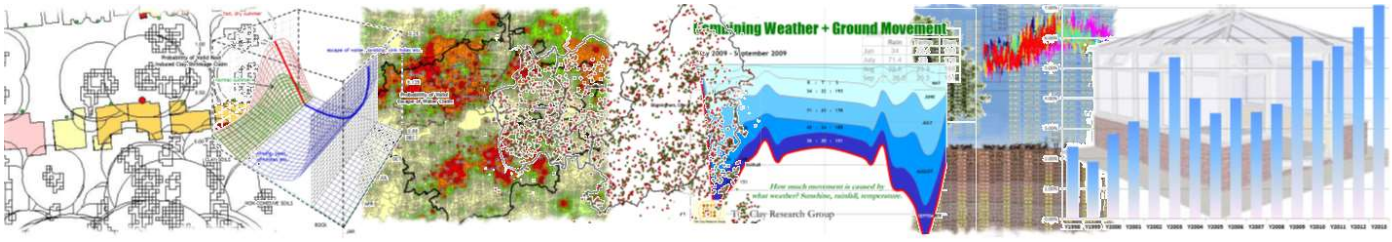
SURGE YEAR SPEND – WELWYN HATFIELD



Spend by Sector



Spend Averaged over Housing Private Population



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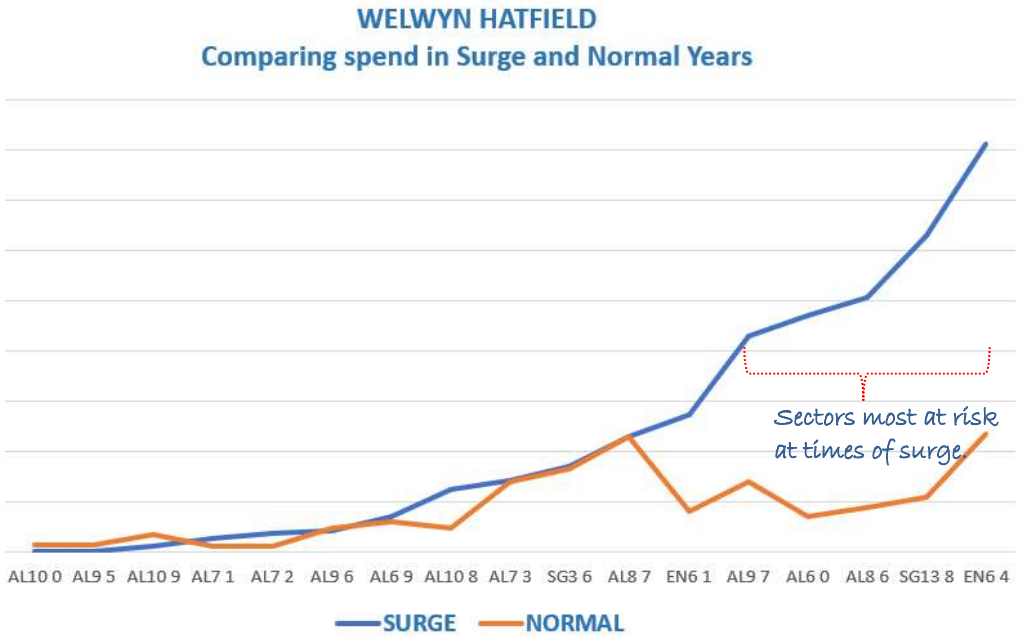

Identifying the variable risk across the district between normal and surge years by postcode sector. Divergence between the plots indicates those sectors most at risk at times of surge.

In making an assessment of risk, housing distribution and count by postcode sector plays a significant role. One sector may appear to be a higher risk than another based on frequency, whereas basing the assessment on count might deliver a different outcome. This can also skew the assessment of risk related to the geology, making what appears to be a high-risk series appear less of a threat than it actually is.