

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



July 2018
Edition 158

The Clay Research Group

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Issue 158, July, 2018

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Combining data from a talk given by Al Smith in 2014 with updated information from the web, an outline of the public ownership root induced clay shrinkage numbers and cost subsidence problem in Camden.

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SMD Update

The recent spell of hot dry weather brings thoughts of a possible event year – what are the chances, and does the current profile match an event year?

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What are the chances of a claim being valid or declined by location? Does it vary by season? What is the most likely peril and can we build a probability table to digitise the outcomes on a normalised scale? A

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Diary Notes

Some diary notes for the arboricultural community with reminders about Subsidence Forum meetings.

SMD Update

See page 3 for the updated SMD graph. A later than usual start to summer drying and a steeper than average gradient.

What does this remind us of?

In 2008 we reported on research being undertaken by Noel Keenlyside's team at the German Institute of Marine Science. Their paper appeared in Nature, predicting a 10 year pause before warming continued. Certainly, from the viewpoint of the subsidence industry the current spell of hot weather coinciding with the end of the predicted 10 year cooling cycle can't be ignored.

Triage

Continuing the study of London Boroughs, this month's edition reviews Bromley to identify the geology and to rate areas in relation to their subsidence risk. A range of maps identify the risk at postcode sector level.

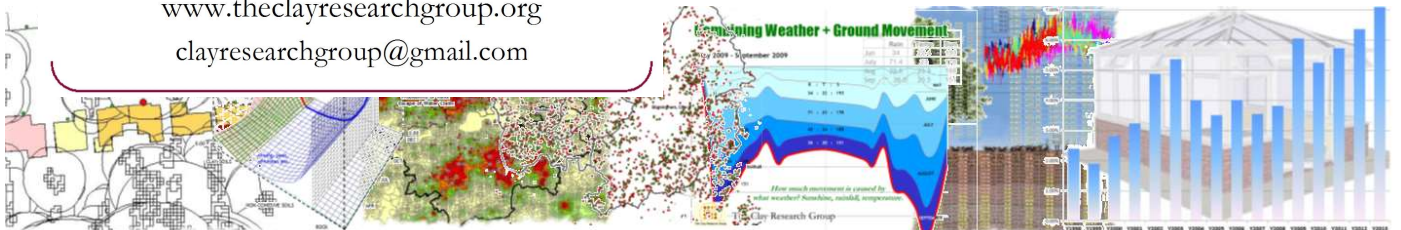
Rates vary both by season and by year. Figures that are higher in the summer and lower in the winter reflect a clay soil.

Understanding the composition of the underlying sample is central to the outcomes. For example, building a model using data from 2003 will deliver different results from one using 2017 data. How does the approach deal with changing weather patterns?

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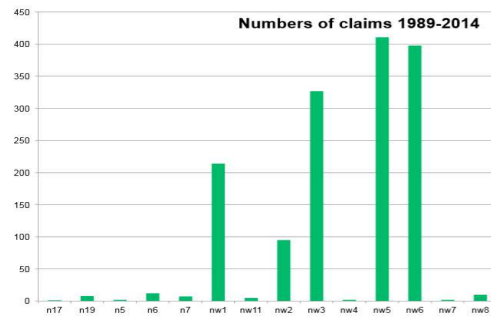
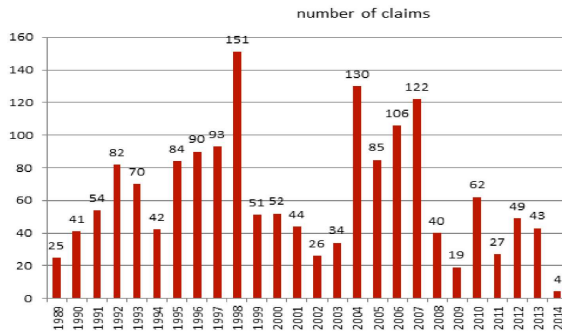
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Camden Borough Review

Below, figures from a presentation by Al Smith, Arboricultural Officer from Camden Borough Council, delivered in 2014, outlining the spend on tree management by postcode district. The borough had around 9,500 street trees at the time of the presentation.



Above left, the number of claims notified to Camden per year, and above right, the concentration by postcode district for the period 1989 - 2014. Right, the spend for the periods noted. The period 2002 – 2007 includes event years 2003 and 2006, whilst the reduced spend from 2008 – 2013 reflects a relatively benign period.

Time Period	No. of Claims	Cost of Claims
2002-2007	503	£4.6m
2008-2013	224	£2.5m

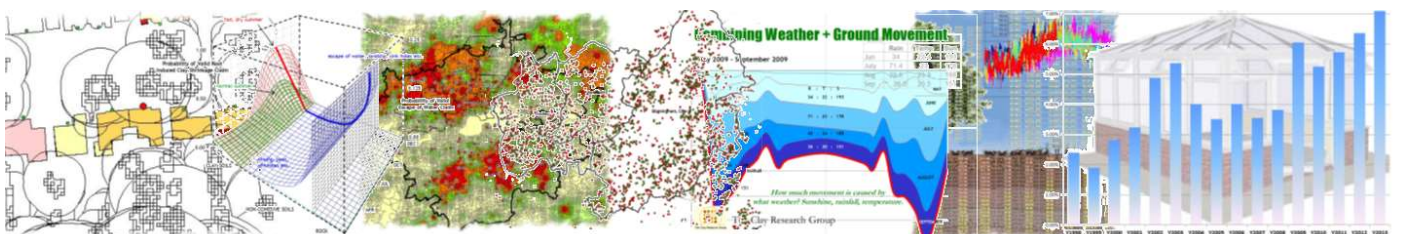
Al was the winner of the London Tree Officers Association Individual Commitment Award in 2014.

More recently, Camden have published¹ an update (thanks to Jon Heuch of Duramen Consulting for the link) which records the following:

- 2002-2007: Average annual: 100 claims at £920,000
- 2008-2013: Average annual: 49 claims at £500,000
- 2014: 23 claims at £216,000
- 2015: 10 claims at £93,500
- 2016: 2 claims at £2,500

This accords with industry figures showing a decline in claim numbers related to the more benign weather conditions. The web site also lists the count of trees felled and planted, as well as providing links to other data. For example, clicking on “Trees in Camden map” opens a map of the area. Click on one of the trees (blue circle) to see the species, height, spread and diameter of trunk at breast height.

¹ <https://opendata.camden.gov.uk/stories/s/Camden-Tree-Statistics/ad58-u6q7/>



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Soil Moisture Deficit Profiles

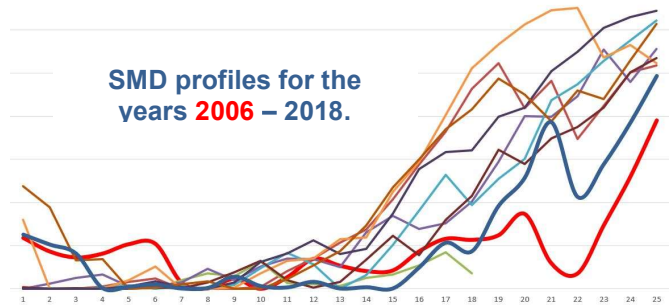


The SMD for years 2006 and 2018 follow similar profiles, rising sharply with similar gradients.

Left, comparing the developing Soil Moisture Deficit (SMD) profile of 2018 with that of 2006 – a busy year with 48,000 subsidence claim notifications.

The 2018 profile (blue) might suggest that we are about to see an upturn in claim numbers to match that of 2006. The soil in Tile 161 is currently drier than it was 12 years ago, and the gradients match.

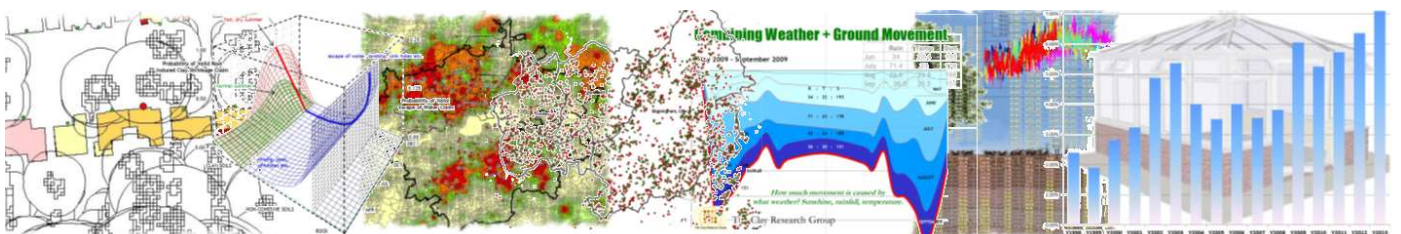
Right, a plot of all of the years from 2006 onwards and all but one were drier than 2006 and 2018 at this time. Both 2006 and 2018 are wetter than the non-event years plotted.



The SMD for other years (all non-event years) was higher and drying commenced earlier. 2018 will play a part in determining if the gradient is an influencing factor in subsidence claim numbers.

Perhaps 2018 will improve our understanding of the relevance of weather data in predicting claim numbers in the months ahead, although any prediction is likely to be measured in weeks, rather than months.

Harry Sturley from Cranfield University and winner of the Subsidence Forum prize in 2017 made contact last month and queried our comments in Edition 156 linking falling claim numbers to *“heavy bouts of intermittent rainfall reducing the contribution from root induced clay shrinkage claims.”* Harry could find no evidence of increasing rainfall that might explain the relationship. Unfortunately, there is no linear relationship between the two. Our reference to ‘intermittent’, sought to link the period and interval of watering with the physiology of the vegetation, distinguishing between bouts of (a) heavy saturation followed by long, dry periods, and (b) intermittent but frequent light showers. Not something that was adequately explained in the article but worthy of further research. Harry is currently working on his Master’s degree and hopefully will share his findings in due course.



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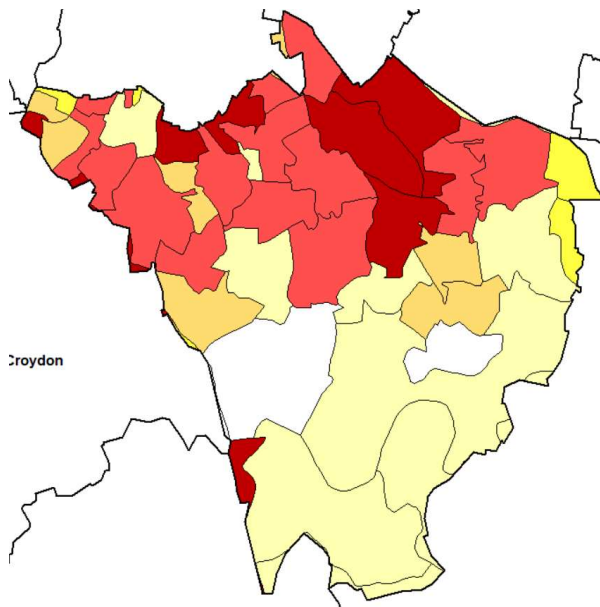
Bromley Borough – Risk of Subsidence

Population = 320,000
 Households = 136,000
 Area = 150 km² approx.
 UK Risk Frequency Risk
 16th (all residential)
 31st (private only)
 2.3 x average UK risk
 7^h in terms of count of claims



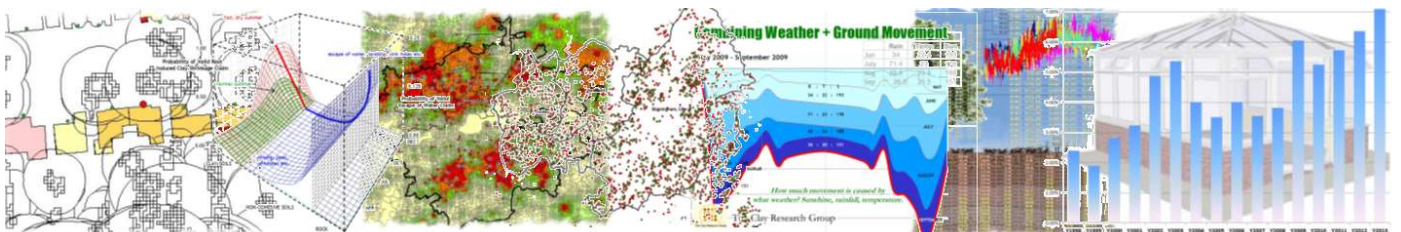
Borough	Edition	Date
Islington	Issue 47	Apr-09
Camden	Issue 69	Feb-11
Brent	Issue 71	Apr-11
Haringey	Issue 72	May-11
Barnet	Issue 77	Oct-11
Waltham Forest	Issue 79	Dec-11
Welwyn and Hatfield	Issue 80	Jan-12
Ealing	Issue 84	May-12
Sutton	Issue 91	Dec-12
Hillingdon	Issue 106	Mar-14
Havering	Issue 149	Oct-17
Harrow	Issue 150	Nov-17
Enfield	Issue 155	Apr-18
Southwark	Issue 156	May-18
Lewisham	Issue 157	Jun-18
Bromley	Issue 158	Jul-18

Above, a map of the London Boroughs showing the location of Bromley. It comprises 30% farm land – the highest of any of the London boroughs.



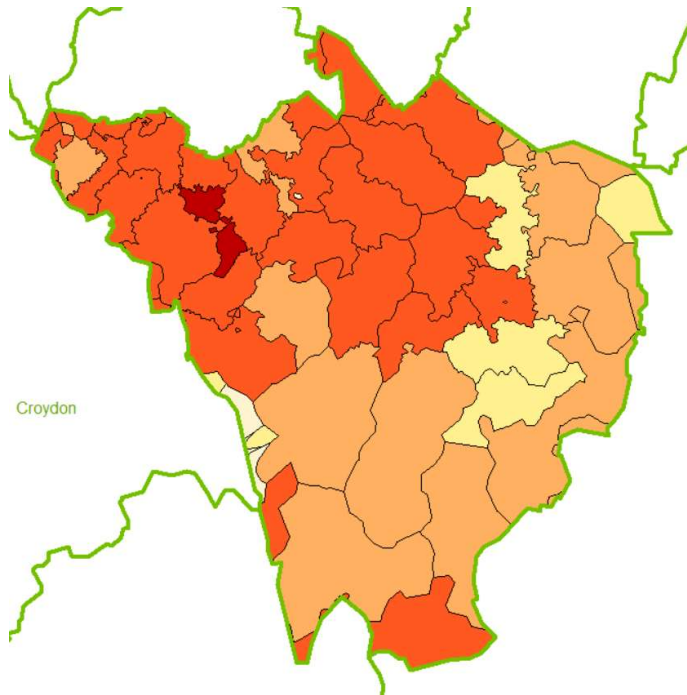
Left, a map showing the subsidence spend by postcode sector with high values towards the north of the borough.

The reason for this variation is described by maps on the following pages. The primary drivers are (a) the geology – outcropping London clay and (b) the distribution of private dwellings.



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Bromley Borough – Study Area

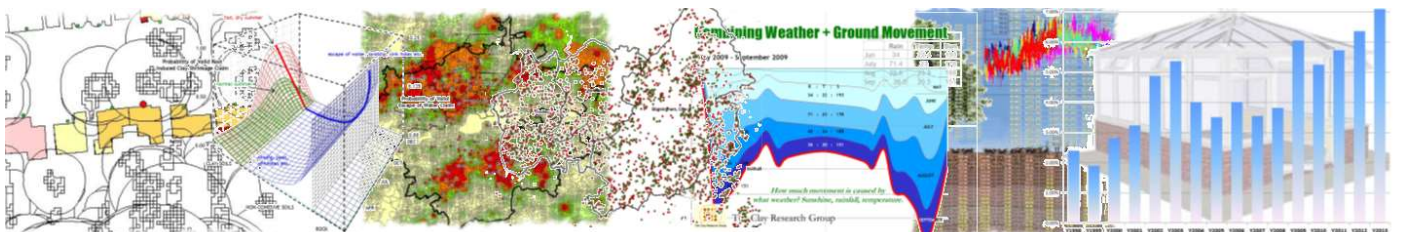
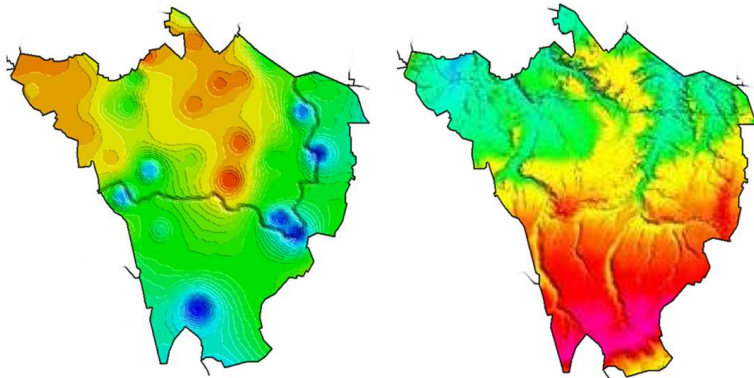
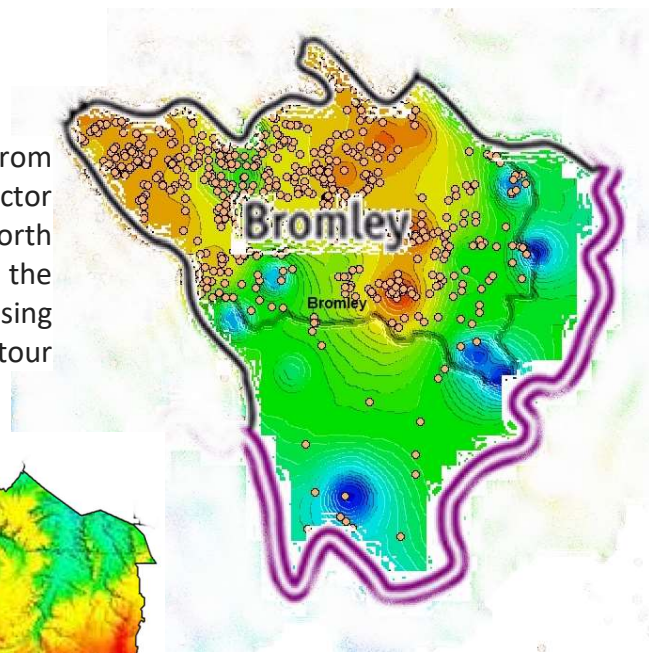


Left, the risk of subsidence by postcode sector, expressed as frequency – that is, the number of claims in the sample divided by the housing population.

The distribution reflects the claims spend shown on the previous page and the superficial shrinkable soils.

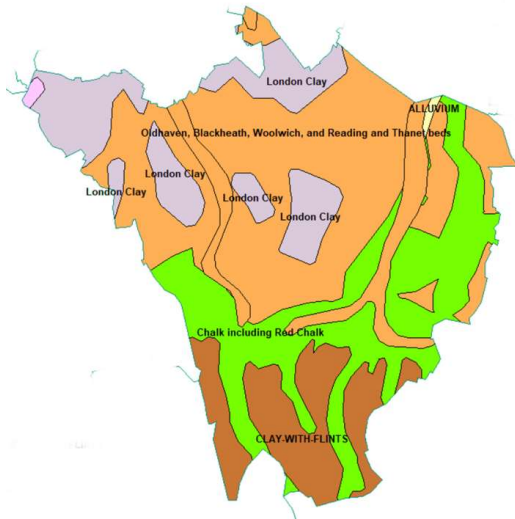
More information on distributions is provided on the following page.

Right, a map showing claims distribution from our claim sample. As revealed by the sector map above, the main area of risk is to the north of the borough. Below, digital images of the borough. Left a topographic map visualising the digital output and right, the LiDAR contour map.

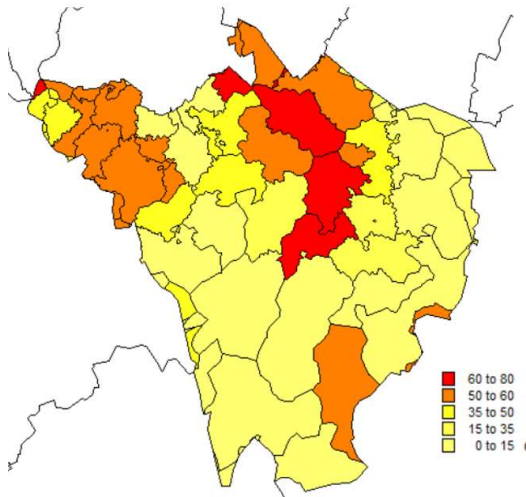


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Bromley Borough - Geology -

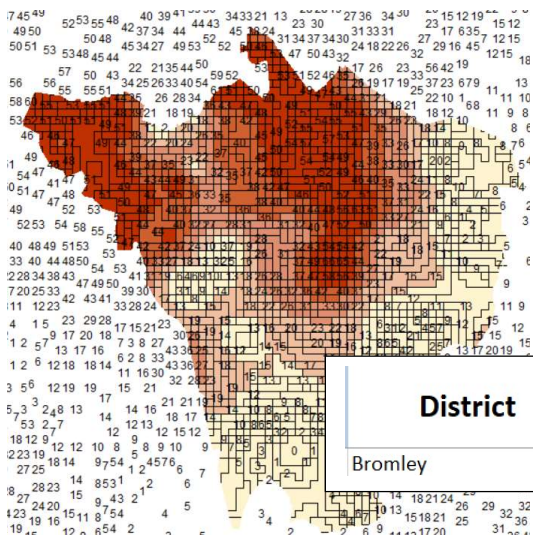


Following the format described in edition 156, top, the British Geological Survey 1:625,000 scale map of the area showing the various series which includes Oldhaven, Blackheath, Woolwich and Readings and Thanet beds with small areas of outcropping London clay to the north and chalk and clay with flints to the south.



Centre image, the sector map which is most useful for database referrals. Again, the distribution is noteworthy when comparing claims frequency, spend and geology.

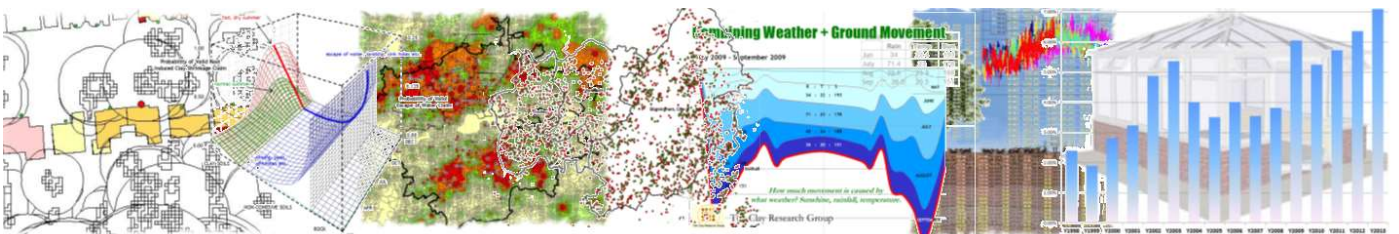
Bottom, the CRG geological map, built from site investigations and soil data obtained from the investigation of domestic subsidence claims, using interpolated data and plotted on a 250m grid.



The models are useful when handling claims and diagnosing causation. The matching profiles of claims/spend and geology are relevant in Triage and underwriting.

Below, an extract from the Triage application listing probabilities of valid/declined by peril and by season. **NB** the data here have been obtained from a sample of 14,000 claims and may be biased by years of collection and dominant peril. See page 8 for more details.

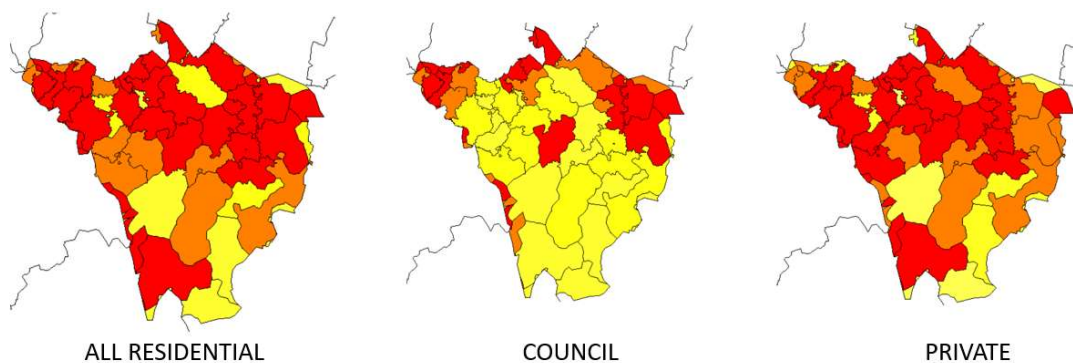
District	summer clay valid	summer EoW valid	Repudiation Rate (summer)	winter clay valid	winter EoW valid	Repudiation Rate (winter)
Bromley	0.626	0.136	0.238	0.08	0.37	0.55



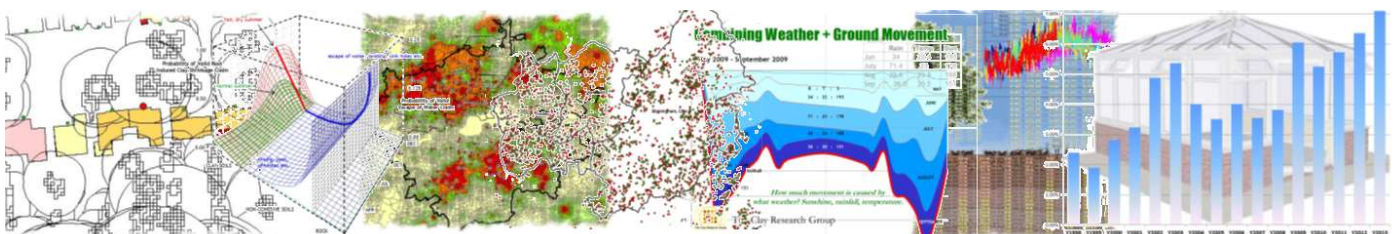
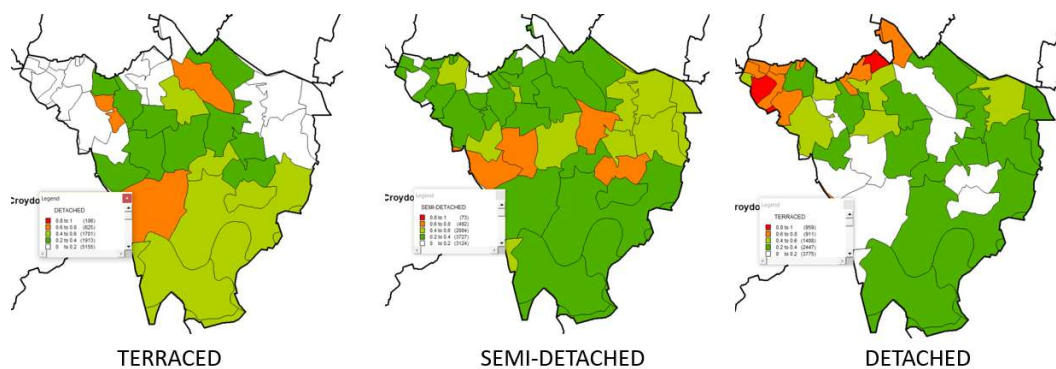
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Bromley Borough – Ownership and Style of Construction

The 'risk by ownership' ranking reveals that the borough is 49th in the 'by district' table taking into account all properties but rises to 10th place if private houses alone are considered.



Below, distribution of houses by style of construction showing the concentration of terraced, detached and semi-detached properties.



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Triage – Bromley - District & Sector Rates

Continuing the theme from last month’s newsletter relating to Triage, below is a table showing the aggregated (i.e. by district) risk for the borough of Bromley which reflects the seasonal influence related to the underlying geology, variable across the borough.

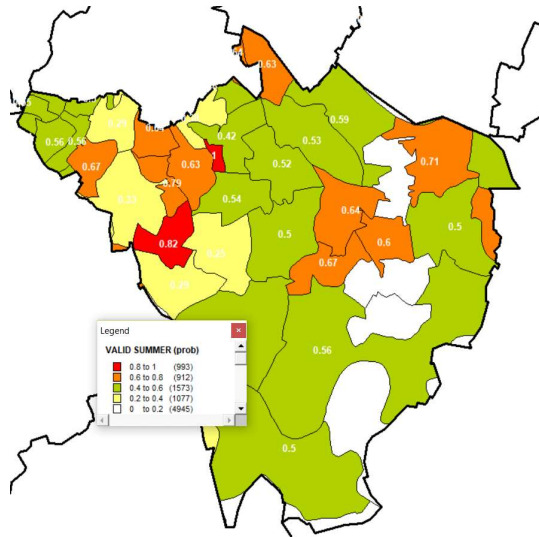
District	summer clay valid	summer EoW valid	Repudiation Rate (summer)	winter clay valid	winter EoW valid	Repudiation Rate (winter)
Bromley	0.626	0.136	0.238	0.08	0.37	0.55

The postcode sector maps below provide a more granular view, plotting the likelihood of a claim being valid in the summer (left) and winter (right) months, variable according to weather conditions at the time of the enquiry.

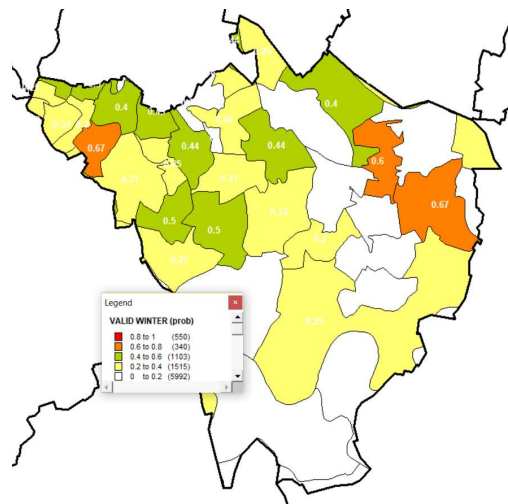
The probability of a claim being valid in the winter months reduces significantly in those sectors with shrinkable clay.

Conversely, EoW rates increase by a factor of nearly 3 in the winter.

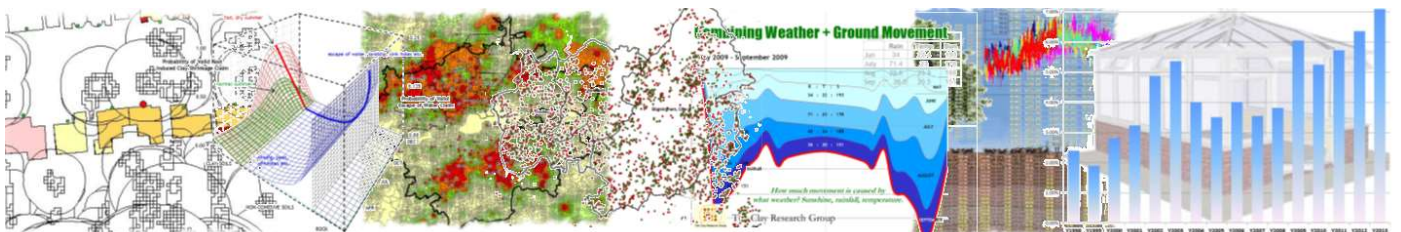
From the above table giving an aggregated view of the borough, it can be seen that the probability of a claim being valid, and due to clay shrinkage, is 0.626 in the summer, falling to 0.08 in the winter. Repudiation rates more than double in the winter.



Probability of a valid claim in the summer months, by postcode sector.



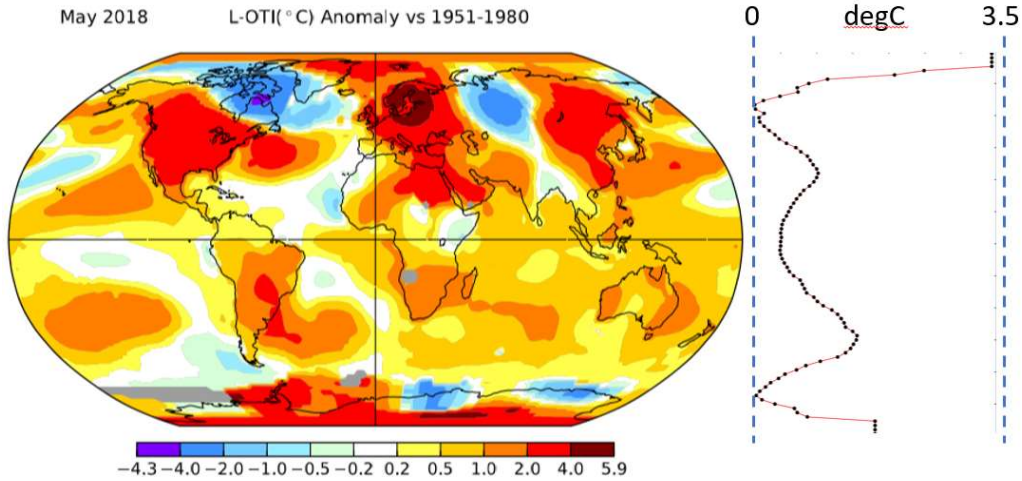
Probability of a valid claim in the winter months, by postcode sector.



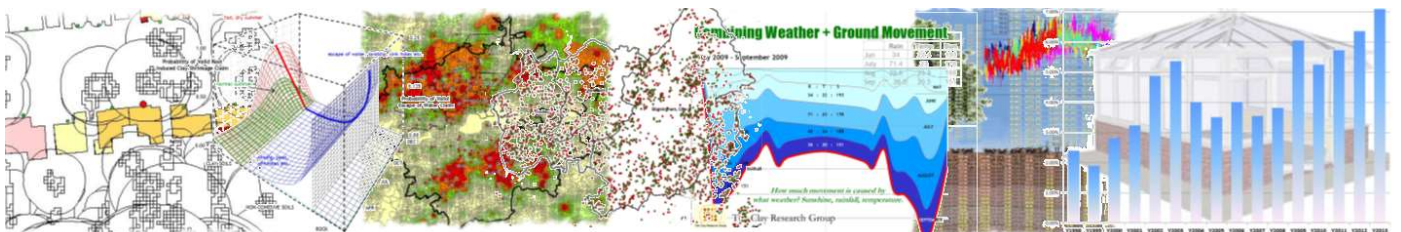
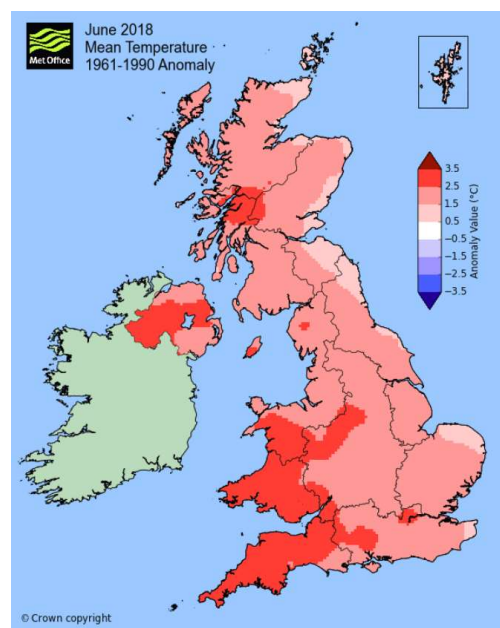
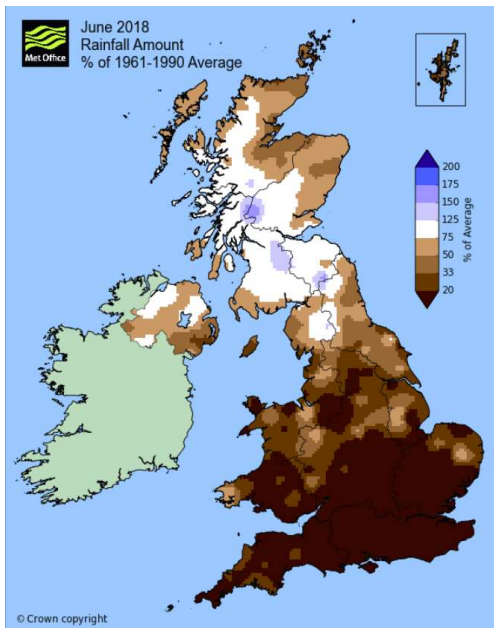
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World Climate Update

Map and Data below reproduced from the Goddard Institute of Space Studies (GISS) web site at <https://data.giss.nasa.gov/gistemp/maps/>



Above, an anomaly map comparing data from May 2018 with the 1951 – 1980 average. Greatest warming towards the northern hemisphere (nearly 3.5 degC) is revealed in the graph to the right of the world map. Below, June rainfall (left) and mean temperature (right) from the Met Office for 2018 compared with the 1961 – 1990 average.

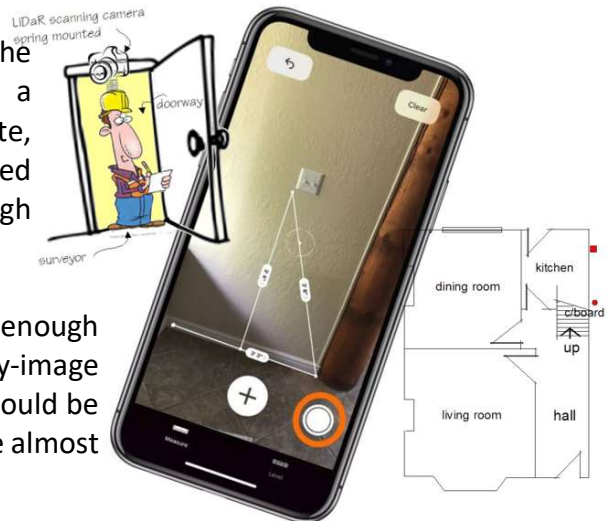


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Remote Surveys – iOS12

Something we have touched on before – the remote assessment of damage using a mobile phone or iPad. In their iOS12 update, Apple are releasing an application called ‘measure’, which does what says, although the accuracy has yet to be determined.

From press releases it is probably accurate enough for our purposes, although an image-by-image approach is unlikely to be attractive. If it could be coupled with the 360 image viewer, we are almost there.



The application may enable homeowners who are happy to engage to take a few snapshots of the damage and link it to an assessment and estimating package to assist in diagnosis and setting an initial reserve.

Diary Notes

Trees & Design Action Group (TDAG), the Royal Town Planning Institute (RTPI) and the Birmingham Institute of Forest Research (BIFoR) host a joint workshop on valuing trees and other green infrastructure in the urban environment. **University of Birmingham, 19th September**

Subsidence Forum:

- Subsidence Forum Exec. Meeting (exec members only) - Thursday 19th September
- Subsidence Forum Training day (members & non-members) - Thursday 17th October
- ASUC Awards (members & non-members) - Friday 23rd November

