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

April 2023
Issue 215

The Clay Research Group

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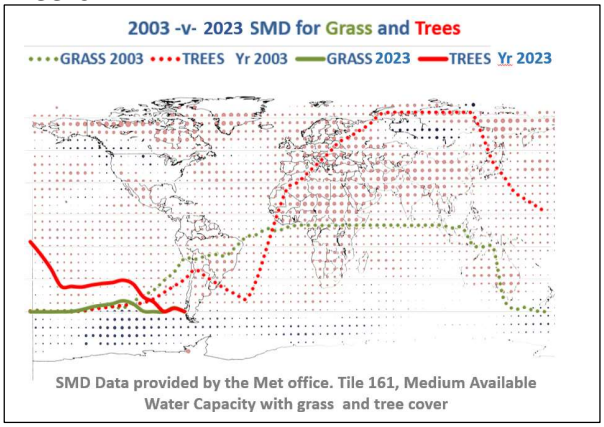
SOUTHWARK

Soil Moisture Deficit Update

The Soil Moisture Deficit for both grass and trees stands at zero at the date of issue, reflecting the heavy rainfall over recent weeks.



SMD Data provided by the Met office. Tile 161, Medium Available Water Capacity with grass and tree cover

Contributions Welcome

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

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District and Sector Risk

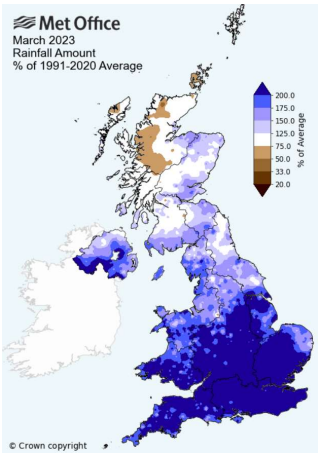
Southwark is the topic of the 'Risk by District' series in this month's edition. Southwark borders the south bank of the Thames and has superficial deposits of river terrace and alluvium to the north and outcropping London clay to the south.

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

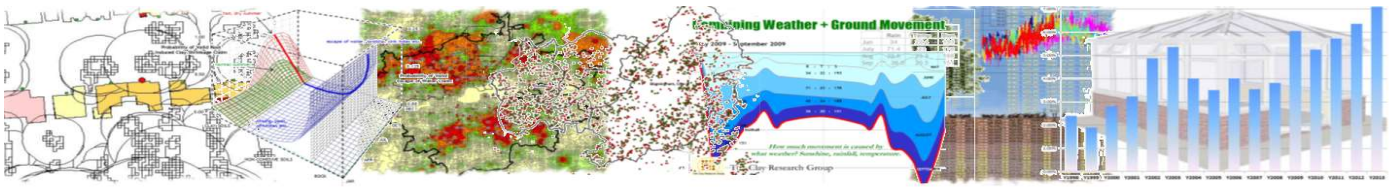
March Weather Update

Anomaly maps produced by the Met Office compare the weather in the selected month with those from previous periods.

The map, right, shows the increased rainfall in March 2023 with the rainfall for the period 1991 – 2020, revealing a significant increase.



In last month's edition the Met Office anomaly map revealed that February 2023 received only 20% of the 1991-2020 average.



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BGS GeoSure Insurance Product

The British Geological Survey (BGS) have updated their 1:50,000 scale map showing the risk of the following perils, based on the underlying geology:

- Clay shrinkage
- Landslip
- Running sands
- Soluble rocks
- Compressible deposits
- Collapsible deposits

The data links the geology to the postcode database, all subject to obtaining a licence. Check their web site for further information:

https://www.bgs.ac.uk/datasets/geosure-insurance-product/

Talking Trees?

A recent paper in the Nature journal describes the findings of a team who recorded distress in tobacco and tomato plants when under stress which takes the form of *"ultrasonic clicks that, when processed to make them audible to humans, sound like popping popcorn."* Apparently healthy plants emitted 1 click an hour which rose to 35 clicks when the plants suffered distress due to lack of water and may be generated *"from air bubbles forming or breaking in the plants' xylem."*

Imagine if trees were found to emit clicks and a future where devices are implanted into trees growing near to houses on clay soils, triggering hydration from buried services when clicks reached a certain level.

I Love Claims

The I Love Claims annual conference, **In Focus**, was held on the 23rd March 2023 at the Manufacturing Technology Centre, Coventry and explored the Subsidence Surges of 2018 and 2022 and the practical difficulties in handling them.

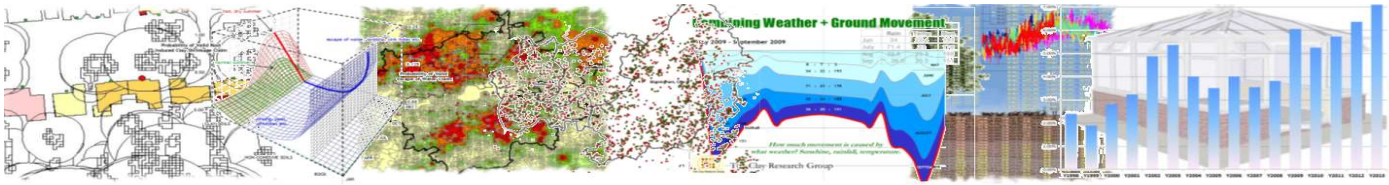
Speakers included Richard Rollit, Technical Director, Innovation Group; Mike Lawson, Property Risk Inspections, Kevin Williams, Head of Subsidence & Valuations, Sedgwick and Nick Hill, Head of Home Claims, Aviva.

Richard explained *"2022 began as a very quiet year, but then from August we received over a period of four months the same amount of volume of work we'd expect to get in the whole year. So, if you imagine a business that gets 12 months of work in four months, that's the hurdle we have to jump over."*

Nick Hill from Aviva recognised that spike – *"Claims started to accelerate in August and over the next three or four months we saw a huge amount of notifications,"* he said – and according to Kevin the same trend was mirrored across the whole industry. Kevin explained, *"The surges of 2018 and 2022 are very similar, but in 2022 there was much more use of digital solutions, such as live video and automation."*

For more details of this and future events visit their web site at:

https://www.iloveclaims.com/motor_claims/in-focus-the-subsidence-surges-of-2018-and-2022/



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Southwark Tree Data

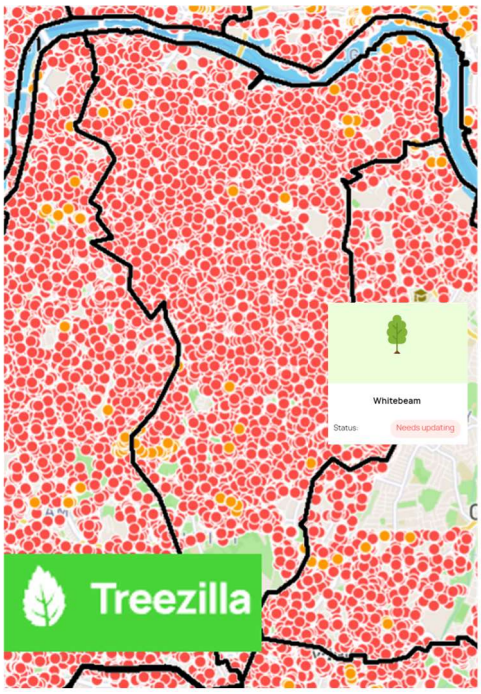
"Chainsaw Massacre", published in 2007 by the London Assembly, recorded the presence of 15,436 trees in the borough of Southwark, the subject of the risk analysis in this issue of the newsletter. At the time of publication this is reported as an increase of between 5 – 17% since 2002.

It recorded the loss of 120 trees due to claims for subsidence damage compared with 105 lost due to concerns about health & safety. Across London, the data records 2,023 trees felled due to subsidence and 30,157 due to health & safety.

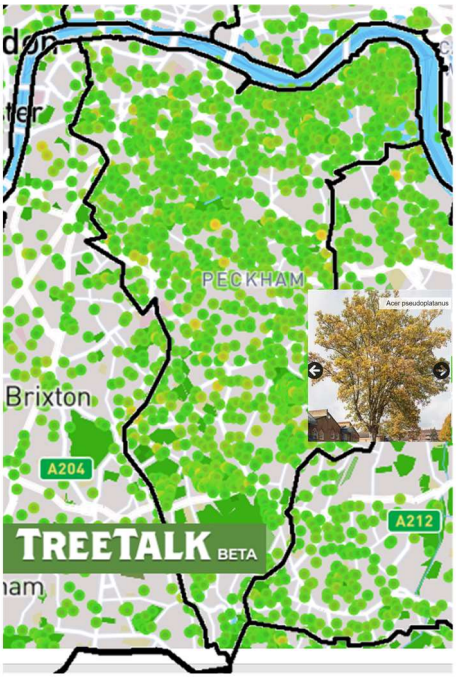
Southwark is reported as having the highest percentage loss amongst the London boroughs listed at 47.81%, followed by Hackney at 40%. The average across all boroughs was 5.07%

A later publication, Branching Out, published in 2011, recorded around 16,500 street trees in Southwark – amounting to 572 trees/sq.km. The findings suggested (page 39) that "*some of the smaller inner London boroughs have a relatively high concentration of street trees. LB Islington has the highest number of street trees per square kilometre, followed by LB Southwark".*

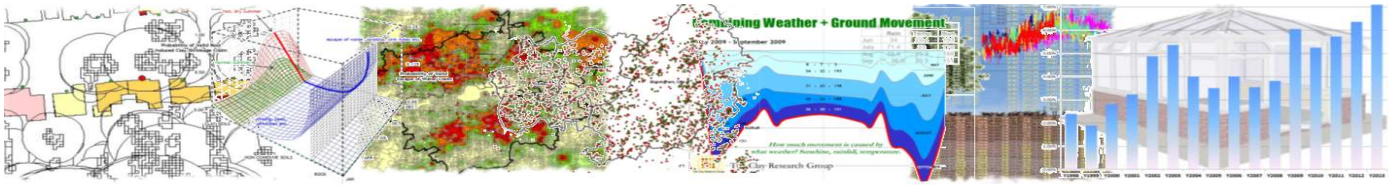
The following maps plotting tree locations, species etc., can be found on the web sites indicated. In addition, the London Tree Map at https://data.london.gov.uk/dataset/local-authority-maintained-trees provides both a map and an Excel spreadsheet.



https://treezilla.org



https://www.treetalk.co.uk



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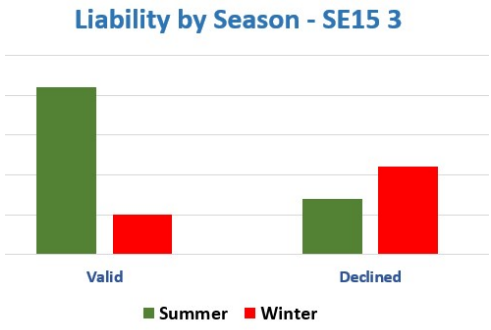
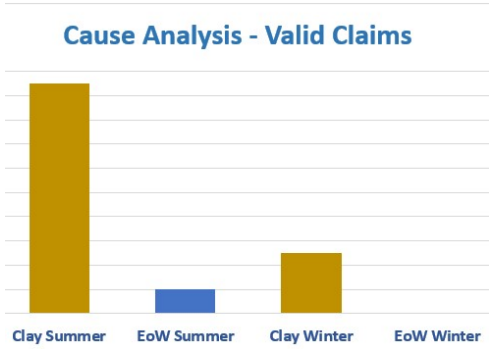
SOUTHWARK Area Sector Level Sample. Using Past Claims Data to Infer Geology and Derive Probability of Cause and Liability



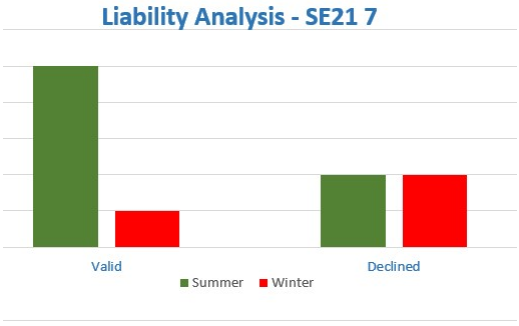


SE15 3 – High incidence of clay shrinkage claims in both the summer and winter associated with outcropping London clay.

The table below lists the probability of both causation and liability by season, which reflects the underlying geology, at postcode sector level.

valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
0.67	0.07	0.25	0.31	0.00	0.68

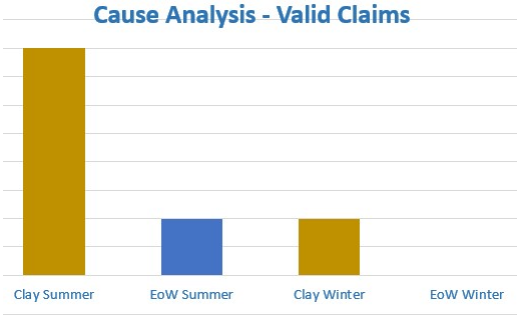
There is a high probability that any claim notified in the summer will be valid and associated with clay shrinkage. Declinature rates increase significantly in the winter, although valid claims are still likely to be caused by clay shrinkage.

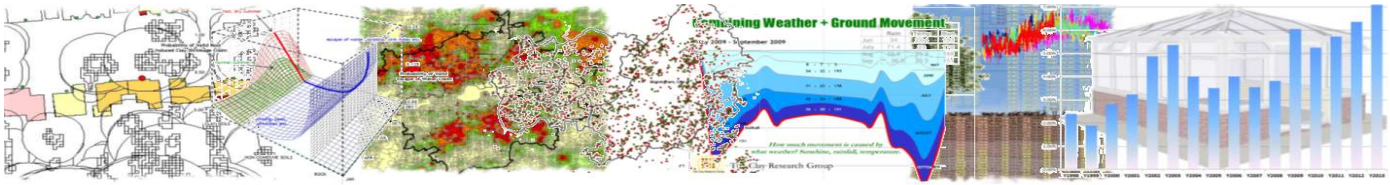


SE21 7 – A similar profile to SE15 3 above, with clay shrinkage being the most likely cause of damage in both summer and winter months, and a high probability that a claim is likely to be valid in the summer, decreasing in the winter.

Below, sector data.

valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
0.57	0.14	0.28	0.33	0.00	0.66





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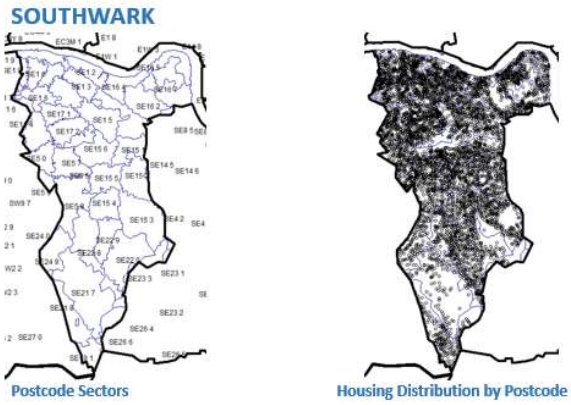
Subsidence Risk Analysis – SOUTHWARK

Southwark is situated in London on the south bank of the Thames and occupies an area of 28.85km^2 with around 120,400 households and a population of around 307,600.



Distribution of housing stock using full postcode as a proxy. Each sector covers around 2,000 houses on average across the UK and full postcodes include around 15 – 20 houses on average, although there are large variations.

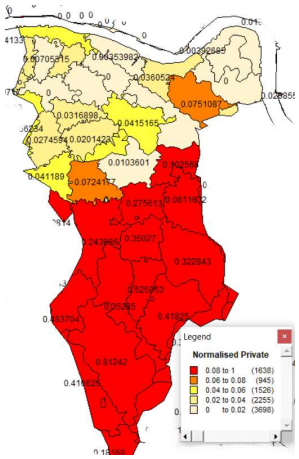
Sector and housing distribution across the district (left, using full postcode as a proxy) helps to clarify the significance of the risk maps on the following pages. Are there simply more claims in a sector because there are more houses?

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.

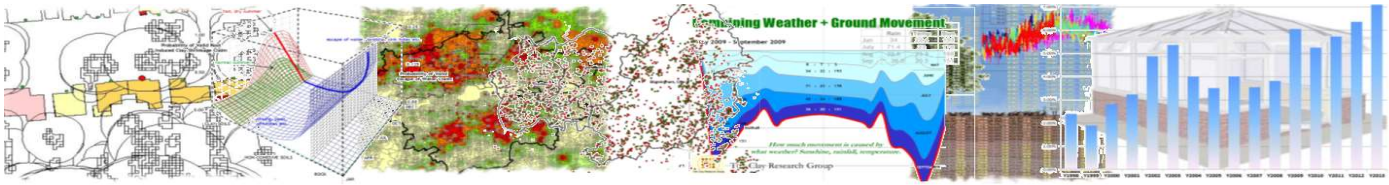
From the sample we hold, sectors are rated for the risk of domestic subsidence compared with the UK average – see map, right.

Southwark is rated 49th out of 413 districts in the UK from the sample analysed and is around 1.74x the risk of the UK average, or 0.45 on a normalised 0 - 1 scale.

There is an increased risk to the south of the borough as can be seen from the sector map, right, which corresponds with outcropping London clay.



Southwark district is rated around 1.74 times the UK average risk for domestic subsidence claims from the sample analysed. Above, normalised risk by sector.



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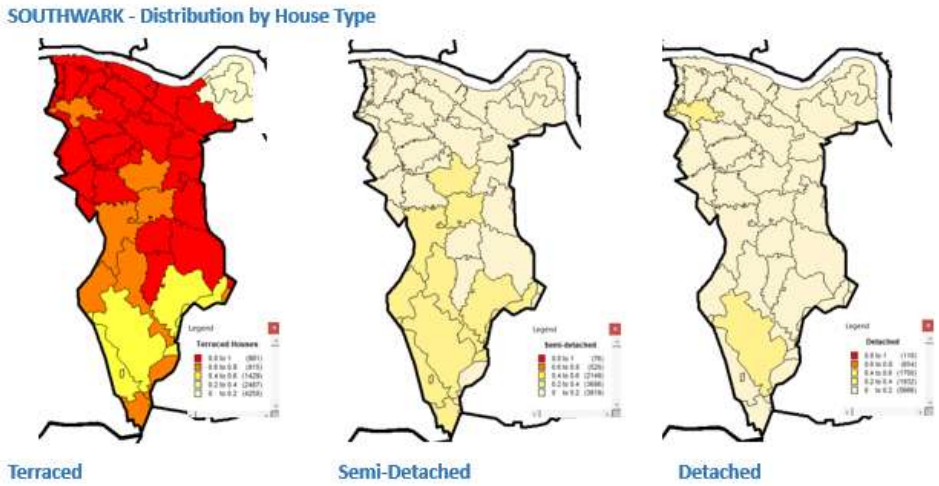
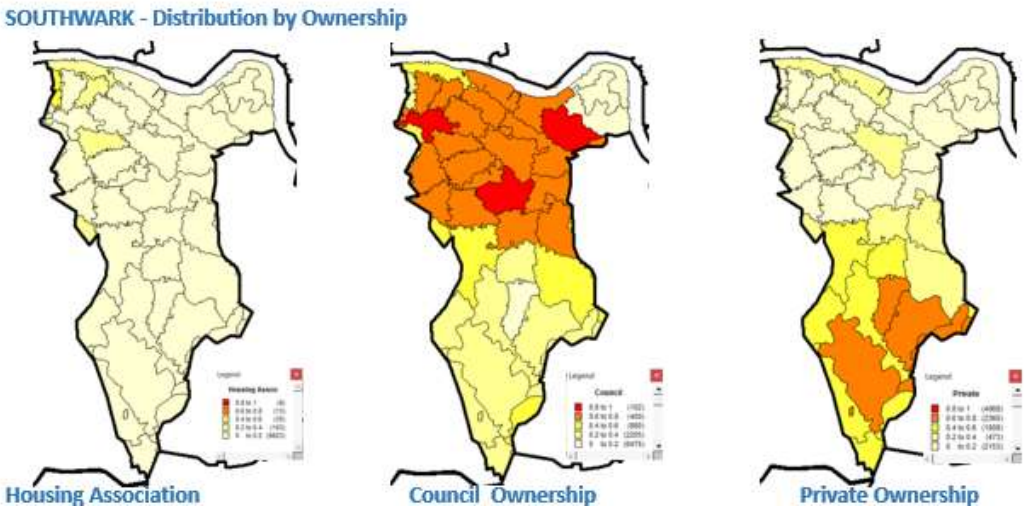
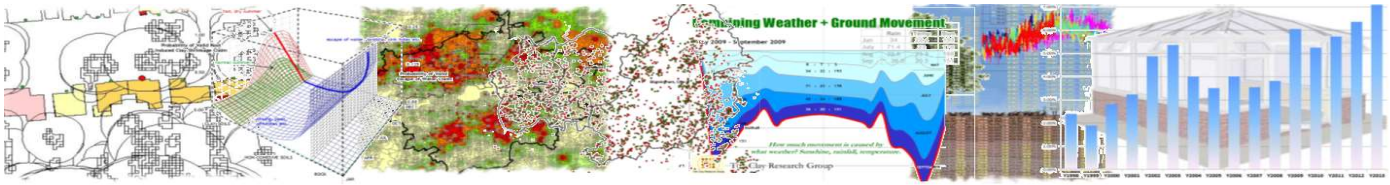
SOUTHWARK - Properties by Style and Ownership

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 application.



Distribution by ownership is shown below. Terraced properties are the dominant class with private ownership increasing to the south of the borough. See page 10 for distribution of risk by ownership.





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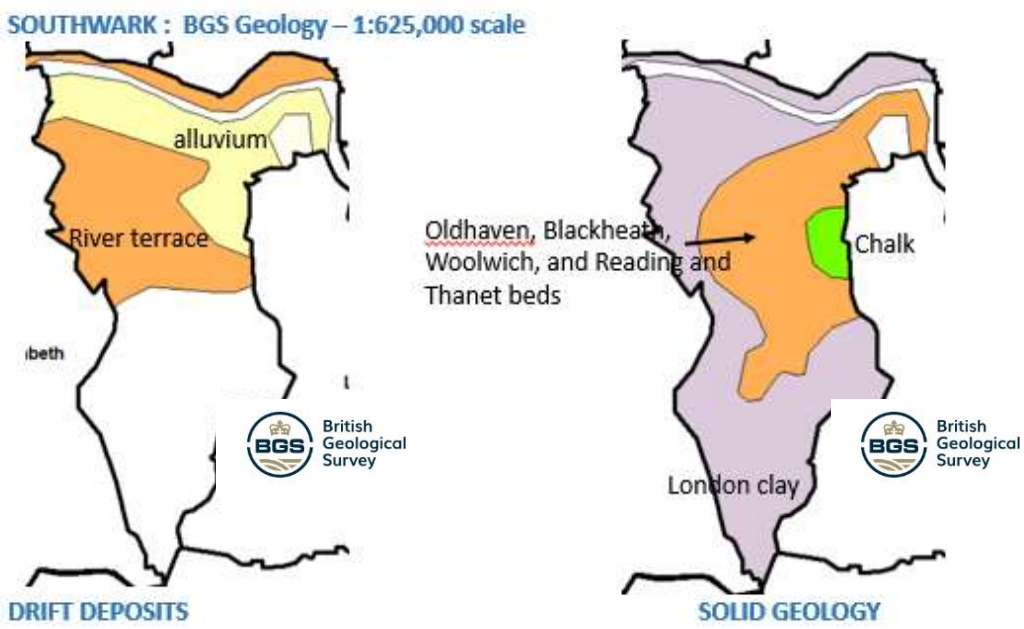
Subsidence Risk Analysis – SOUTHWARK

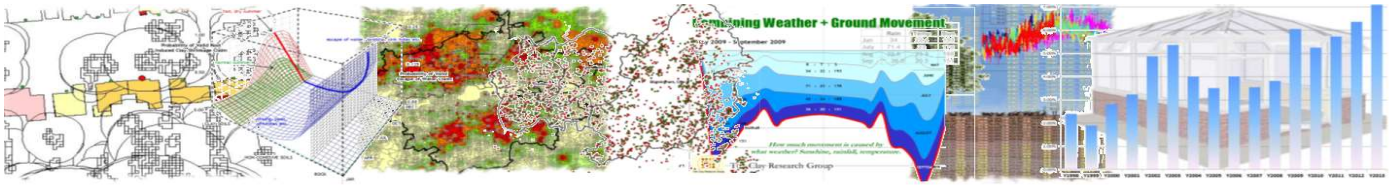
Below, extracts from the British Geological Survey low resolution 1:625,000 scale geological maps showing the solid and drift series. View at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html for more detail.

See page 10 for a seasonal analysis of the sample which reveals that, at district level, there is a greater than 70% probability of a claim being valid in the summer and of the valid claims, there is a greater than 80% chance that the cause will be clay shrinkage.

In the winter the likelihood of a claim being valid is around 30% - and if valid, there is around a 90% probability the cause will be due to an escape of water. Maps at the foot of the following page plot the seasonal distribution.



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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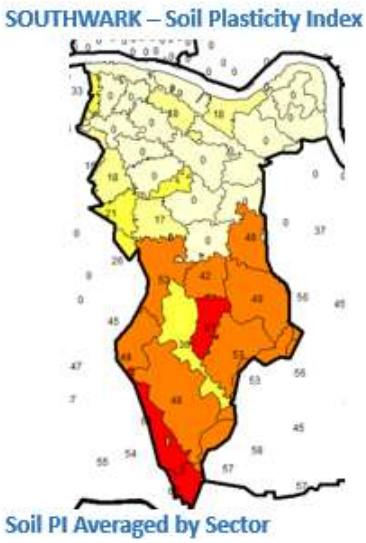
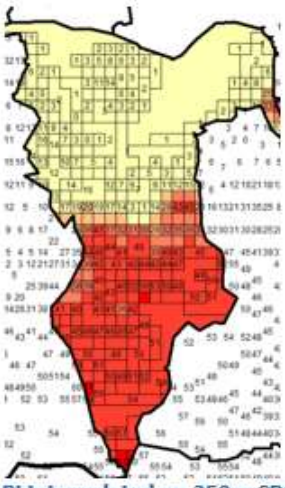
Liability by Geology and Season

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

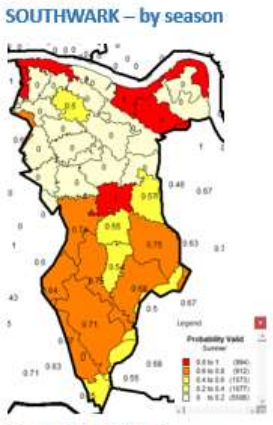


Soil PI Averaged by Sector

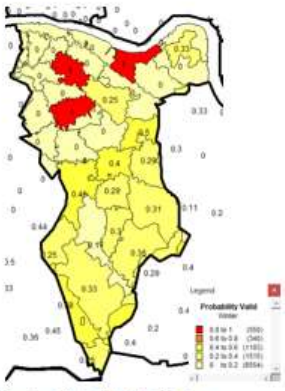


PI Interpolated on 250m CRG grid

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.



Probability Valid, Summer

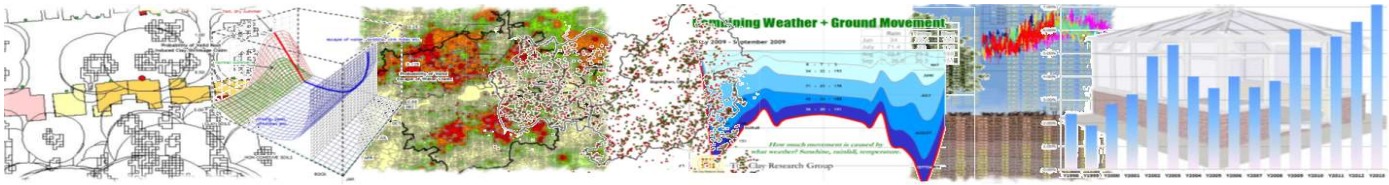


Probability Valid, Winter

The maps, left, show the seasonal difference from the sample used.

Combining the risk maps by season and reviewing the table on page 10 is perhaps the most useful way of assessing the potential liability, likely cause and geology using the values listed.

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.



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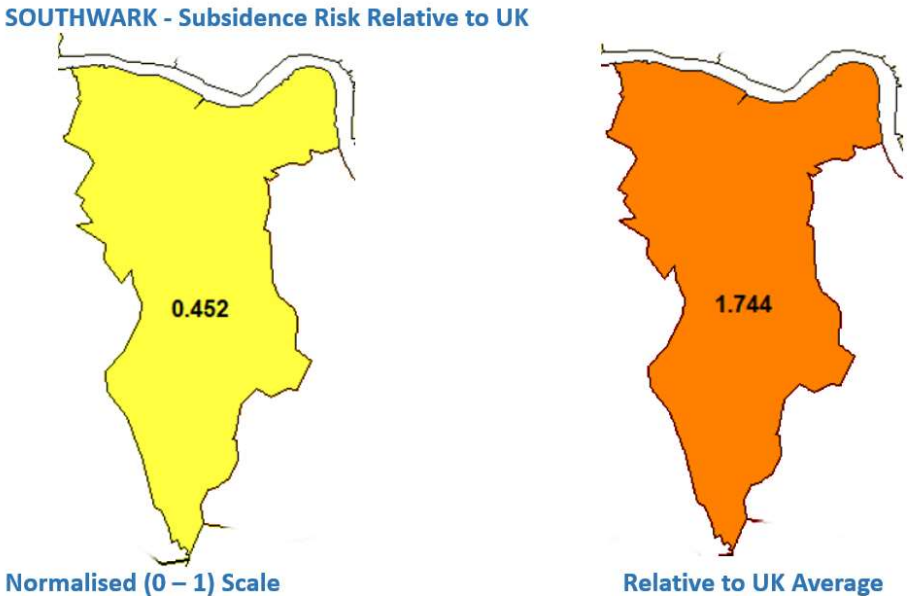
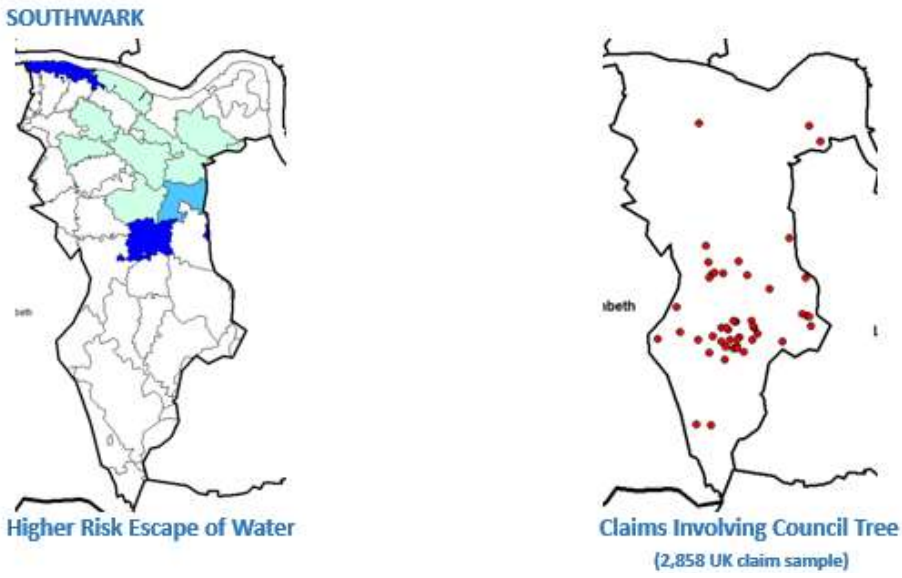
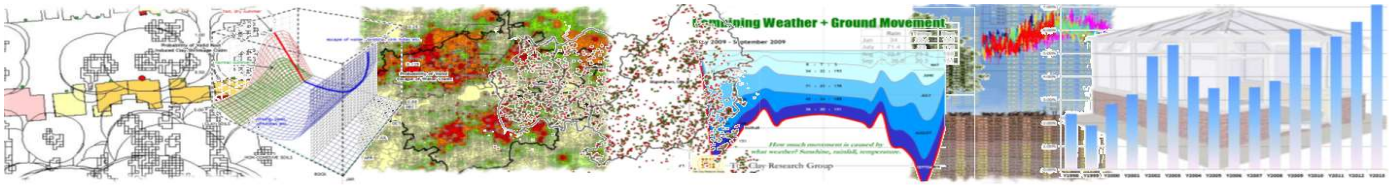
District Risk -v- UK Average. EoW and Council Tree Risk.



Below, left, mapping the frequency of escape of water claims confirms the presence of non-cohesive soils bordering the Thames - deposits of River Terrace and alluvium, sands and gravels etc. 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 concentrated to the south of the borough, reflecting the combination of outcropping clay soil and private housing.





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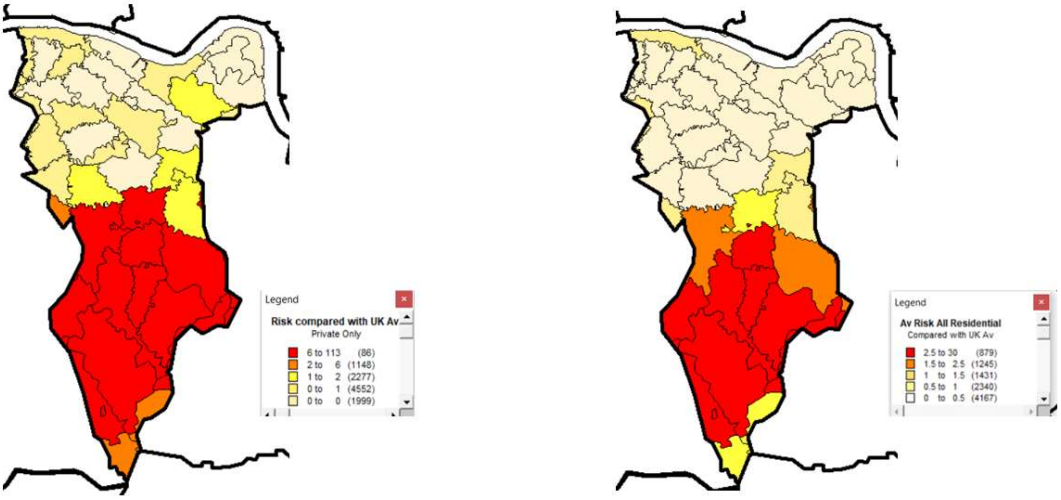
SOUTHWARK - Frequencies & Probabilities

Below, mapping the total housing stock by ownership reveals the importance of understanding claims frequency relating to the number of properties at risk. Left, claims frequency for private ownership only reveals an increased risk compared with claims frequency for the total housing stock with council and housing association properties included.

SOUTHWARK - Sector Risk Compared with UK Average



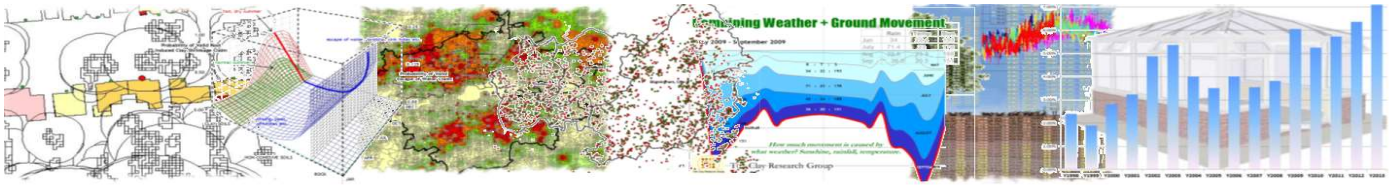
Private Only **All Properties**

On a general note, the 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 are likely to be 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 - SOUTHWARK

District	valid summer clay	valid summer EoW	Repudiation Rate (summer)	valid winter clay	valid winter EoW	Repudiation Rate (winter)
Southwark	0.683	0.096	0.221	0.04	0.27	0.69



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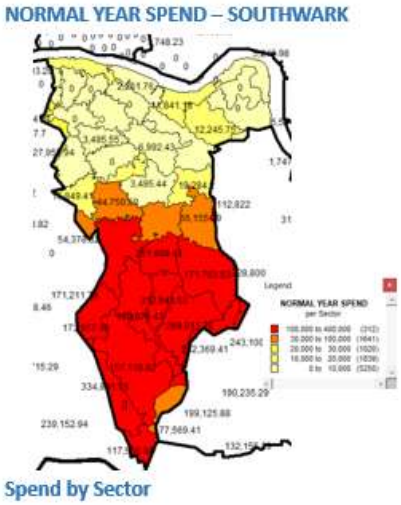
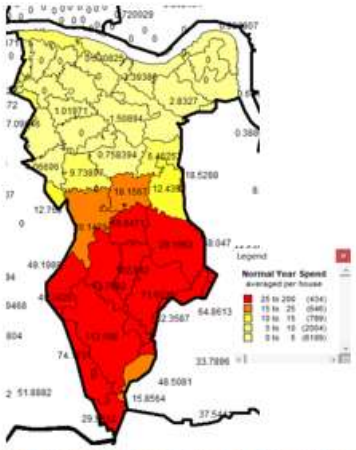
Aggregate Subsidence Claim Spend by Postcode Sector and Household in Surge & Normal Years

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.

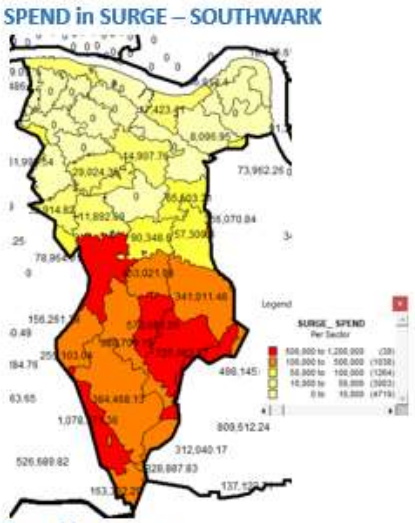


Spend by Sector

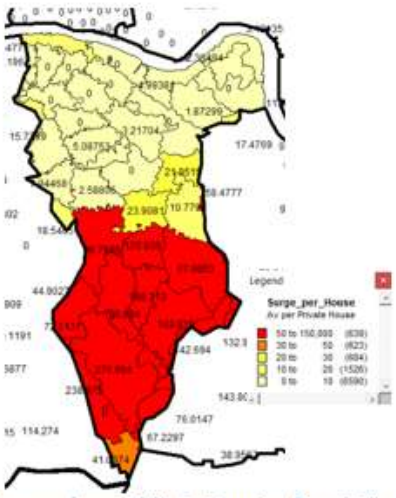


Spend Averaged over Housing Population

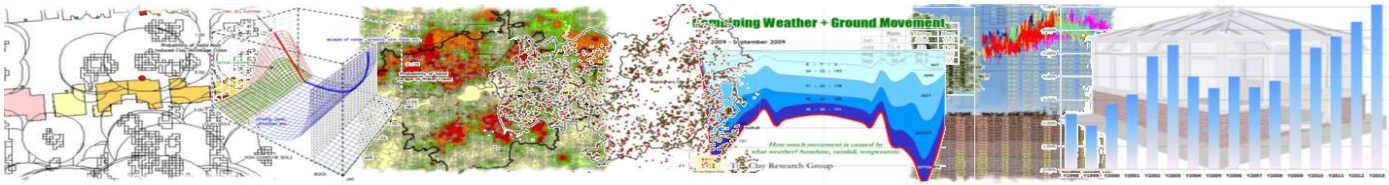
It will also be a function of the distribution of vegetation and age and style of construction of the housing stock. The images to the left in both examples (above and below) represent gross sector spend and those to the right, sector spend averaged across housing population to derive a notional premium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



Spend by Sector



Spend Averaged over Private Housing Population



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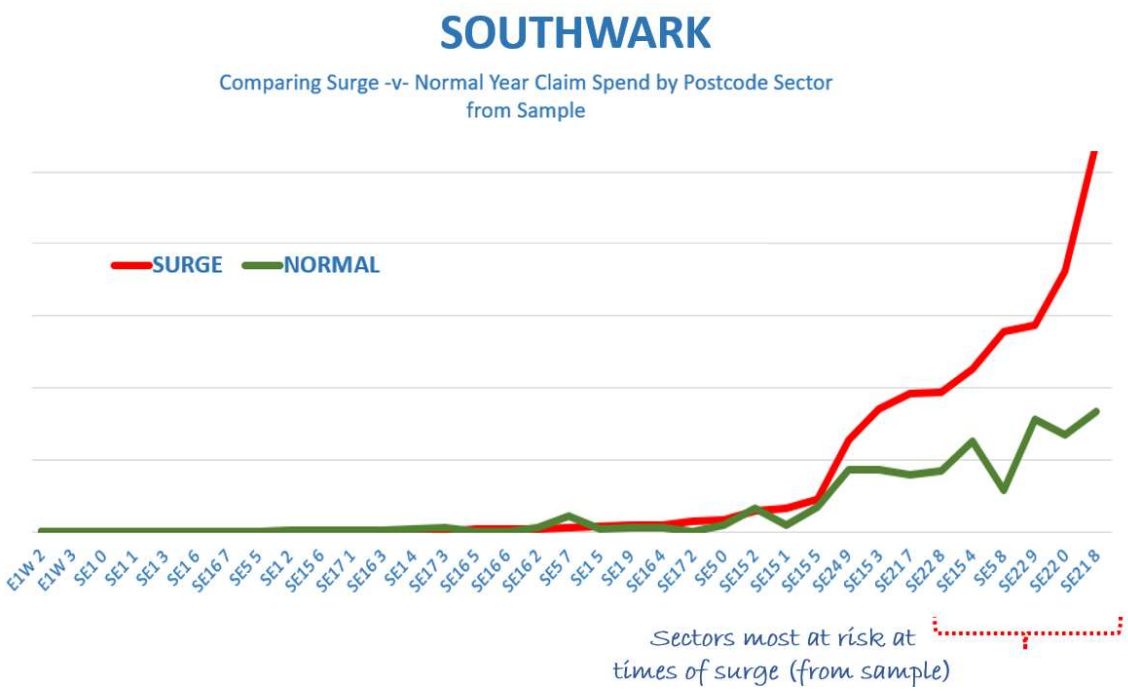

The above graph identifies the variable risk across the district at postcode sector level from the sample, distinguishing between normal and surge years. Divergence between the plots indicates those sectors most at risk at times of surge (red line).

It is of course the case that a single expensive claim (a sinkhole for example) can distort the outcome using the above approach. With sufficient data it would be possible to build a street level model.

In making an assessment of risk, housing distribution and count by postcode sector play a significant role. One sector may appear to be a higher risk than another based on frequency, whereas basing the assessment on count may 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 less or more of a threat than it actually is.

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.