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

February 2012

The Clay Research Group

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Issue 81, February, 2012

NEXT MONTH

Palace of Westminster and Big Ben. Are there similarities with Pisa – or maybe even domestic subsidence? Will it cost £1bn to correct, or do we turn it into a tourist attraction?

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SIDCUP ROAD RE-VISITED

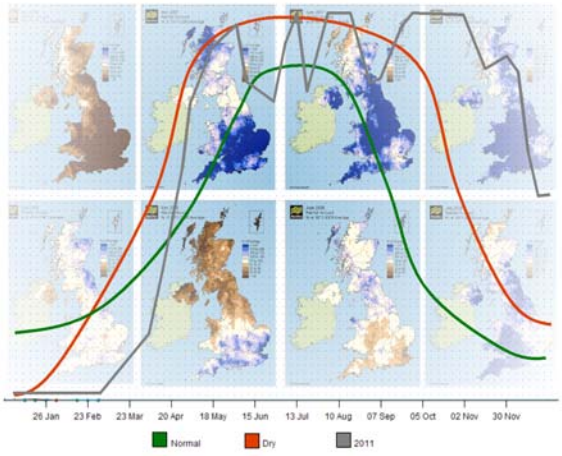
This edition includes a closer look at the Sidcup Road data, gathered last year with assistance from most industry colleagues. The objective is to improve our understanding of the tree/soil/climate/building interaction.

There are a greater percentage of trees around 10mtrs high (when expressed in terms of the total population) causing damage at the modelled root periphery than taller trees, where damaged structures tend to be closer.

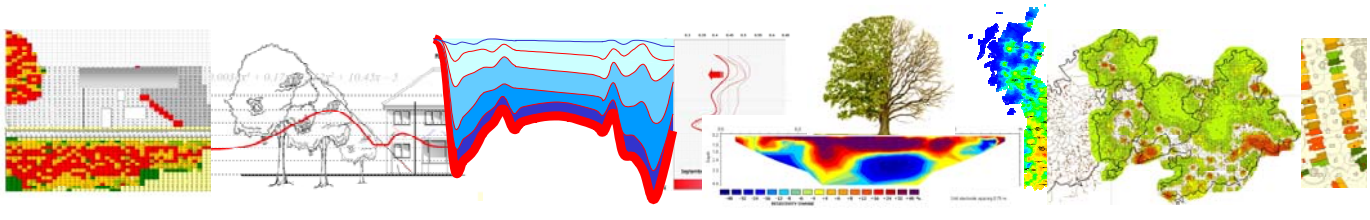
The modelled root overlap zone (defined elsewhere) presents the greatest risk in the range 20-40% as a percentage of the tree population in the study area.

2011 – Year in Reverse

In a snapshot, 2011 (grey line in graph below) was initially very dry, and threatened to deliver high claim numbers.



This all changed due to intermittent bouts of rainfall throughout the summer, which eventually gave way to another dry spell in autumn, delivering higher than average claim numbers for the time of year. It was almost 'a year in reverse', but not a surge after all.



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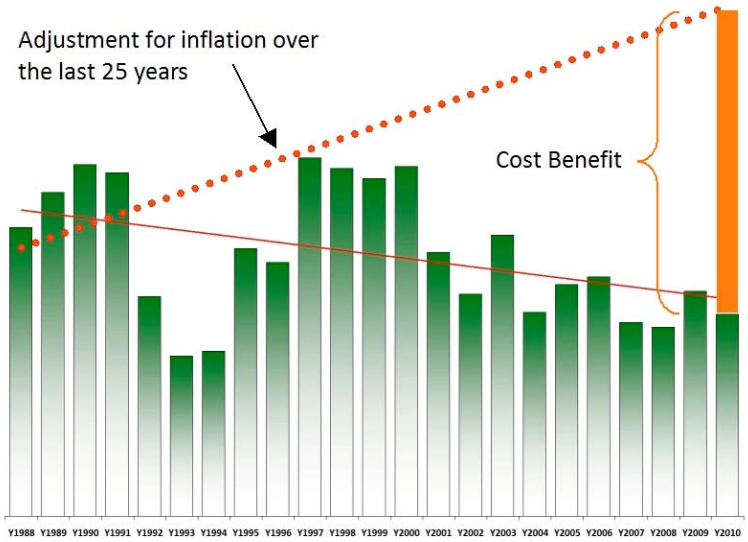
CLAIMS COST OVER TIME

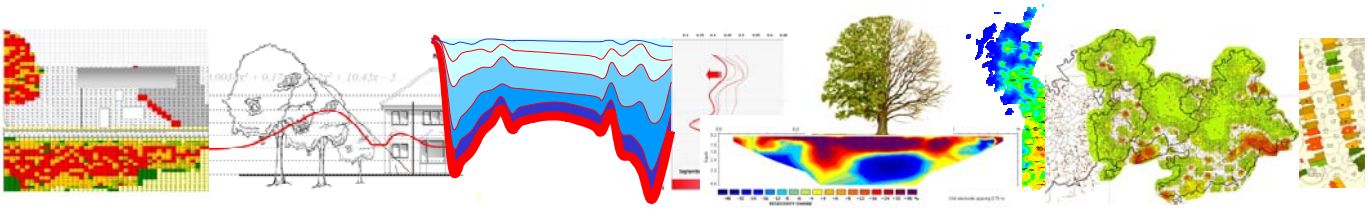
The ABI figures show a reduction in both cost and claim numbers associated with the benign weather conditions over more recent years, and on the face of it, costs appear to have been fairly static. In fact, taking into account inflation, the cost of the average subsidence claim has fallen dramatically. Compared with 25 years ago, and taking into account inflation, settlement costs have halved.



Falling Cost of Subsidence Claims.
Over the last 25 years, the cost of subsidence claims has fallen by more than 50% when adjusted for inflation.

Why? 25 years ago, nearly 50% of valid claims were underpinned. Piling of domestic properties was common-place. Now it is the exception. In most cases, the cause of movement is addressed. Leaking drains are repaired, and wherever possible, trees that have been proven to be the cause of damage are crown reduced or removed. Advances in monitoring satisfy the engineer that the action taken was appropriate. We have improved soil tests and have a better understanding of geotechnics. The role of the adjuster and engineer have been merged.

In short, a claim that would have cost £6k in 1988 should cost £13k today, but it doesn't. It still costs £6k.



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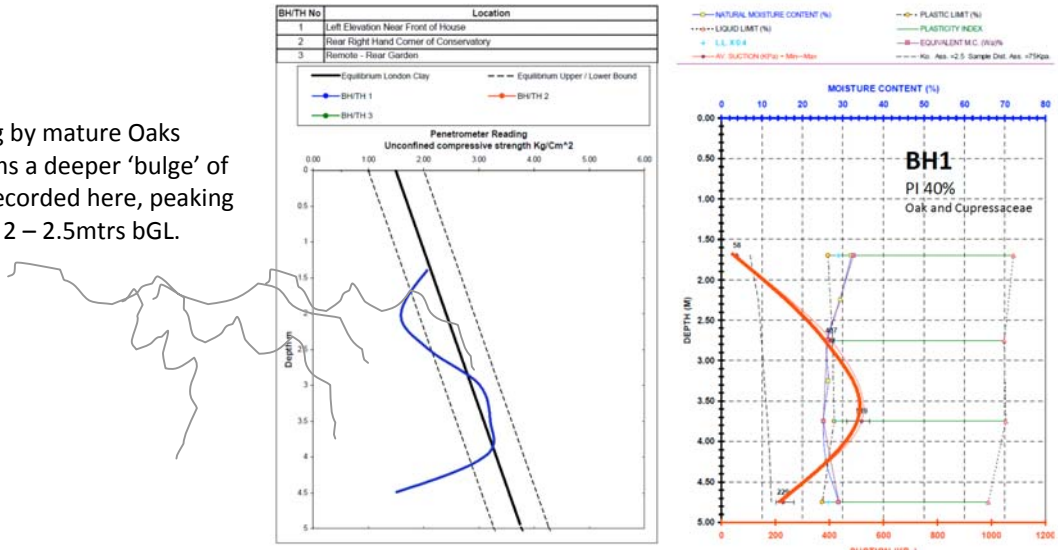
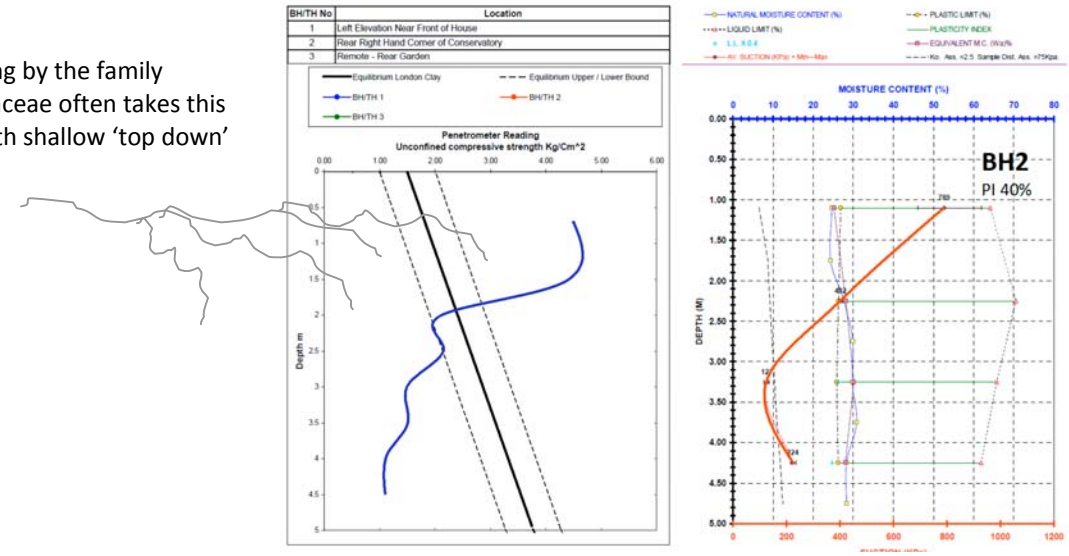
PENETROMETERS and SUCTIONS

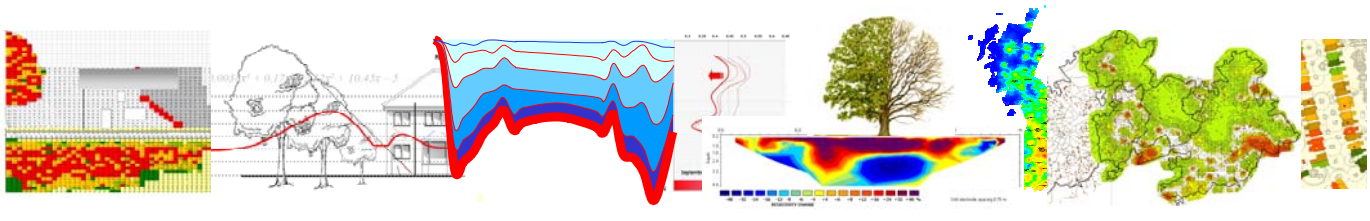
Soil drying by mature Oaks often forms a deeper 'bulge' of the sort recorded here, peaking at around 2 – 2.5mtrs bGL.



Soil drying by the family Cupressaceae often takes this form, with shallow 'top down' drying.



An example of both penetrometer and suction tests yielding good results provided care is taken in the field to record the presence of any sand lenses and/or gravel, and in the laboratory to ensure the filter papers are calibrated as described in BRE Information Paper 4/93. In the above examples BH1 records root induced desiccation peaking at around 3mtrs bGL, and in BH2, shallower soil drying.



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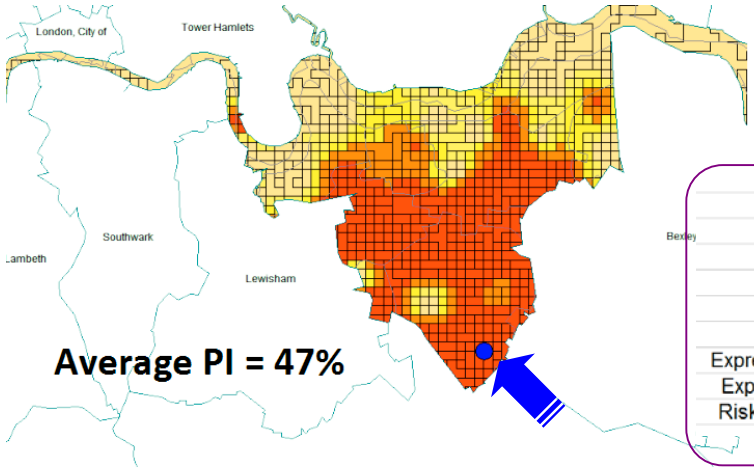
SIDCUP ROAD RE-VISITED

Sidcup Road comprises traditional 1950 style semi-detached houses. Nearby trees are predominantly Plane and Poplar, but not exclusively. Foundations are around 500mm deep. 10.69% of the housing population from our sample have had subsidence claims that we are aware of. The study is a conservative estimate of claims notified since 1990 as we can't be sure other houses have not been damaged in that period.



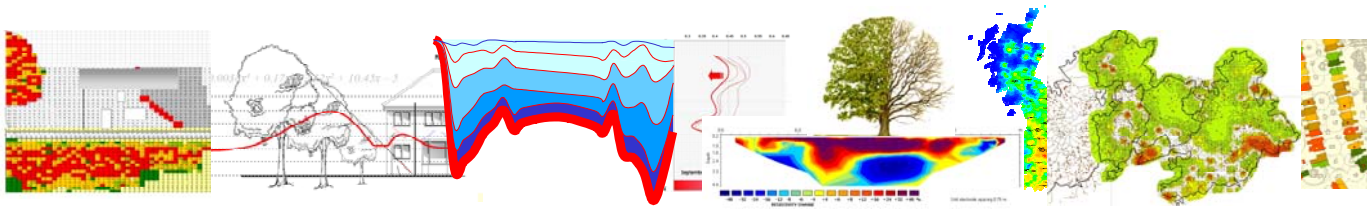
SIDCUP ROAD SAMPLE	
Houses in Sample	266
Claims	17
Houses (no root influence)	107
Houses (root influence)	159
Expressed as % (total population)	6.39
Expressed as % (root zone only)	10.6
Risk Compared with Industry Av.	1.75

** Reference to 'root influence/zone' relates to the model, and not the result of investigations.*

The claims frequency suggests that the sample is 1.75 times riskier than the UK average and that, over the 20 years, around 1 in 10 trees has caused damage. When expressed as frequency, there are more trees in the height range 5 – 10mtrs associated with subsidence claims than any other, even taking into account the fact there are more trees in this height range.

92% of the trees implicated in causing damage had a modelled root zone less than 50% overlapping the building footprint. 3 trees from the claims sample (total 17 claims) had been removed at the time the LiDAR was flown, and are not included in the the analysis because we have no information on their height and distance from the damaged building. Expressed as frequency, trees around 10mtrs tall present a greater risk than those that are taller or smaller, in the study area. Modelled overlap root zones of between 20-40% are 4.5 times riskier than the 0-20% category, and 2.5 times riskier than 40-60% group. This modelled root zone identifies 87.5% of recorded claims and is predictive.

This is a small and selective study driven by a road with a high claim count. The results will be skewed and may not be representative of a larger sample.



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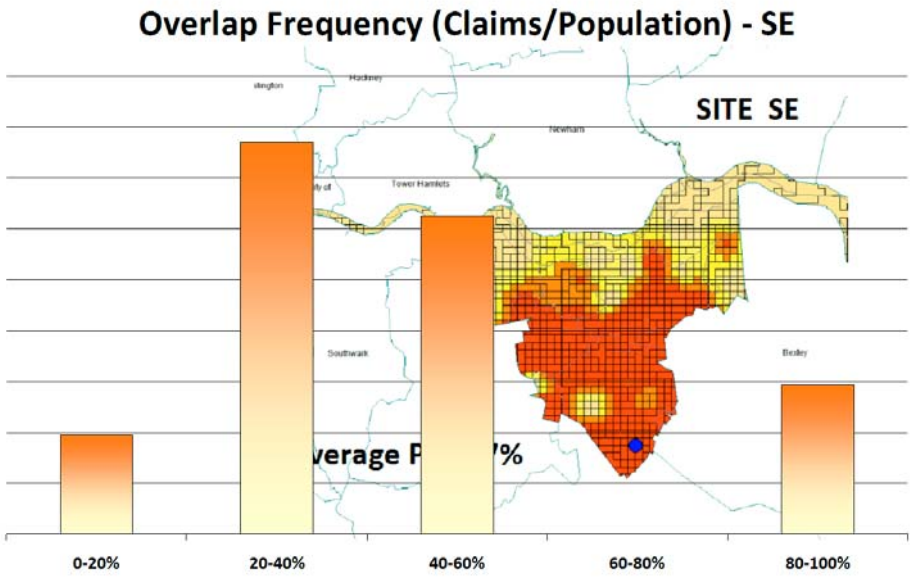
EXPRESSION of RISK by ROOT OVERLAP
- SIDCUP ROAD -

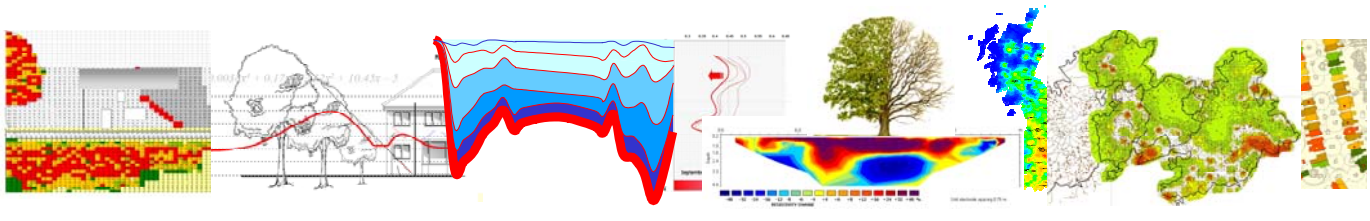


The 'modelled root overlap' might be more correctly defined as "the area of likely ground movement associated with root induced clay shrinkage based on a statistical sample and related to tree height".

By measuring all of the trees and then building zones around them that are a function of their height, making them (notional root zones) initially small and then larger until the 'best fit' was obtained to identify claims from a large sample, the average was set, with no account taken of species.

The purpose of the study? To assist underwriters to improve their understanding of risk. Instead of writing policies at postcode sector – or even unit – level, they can determine risk house-by-house.

Local Authorities might want to undertake their own assessment, reviewing claims. Is crown reduction of all street trees on clay soils the best use of a limited resource? Is this study representative of the Borough's experience?



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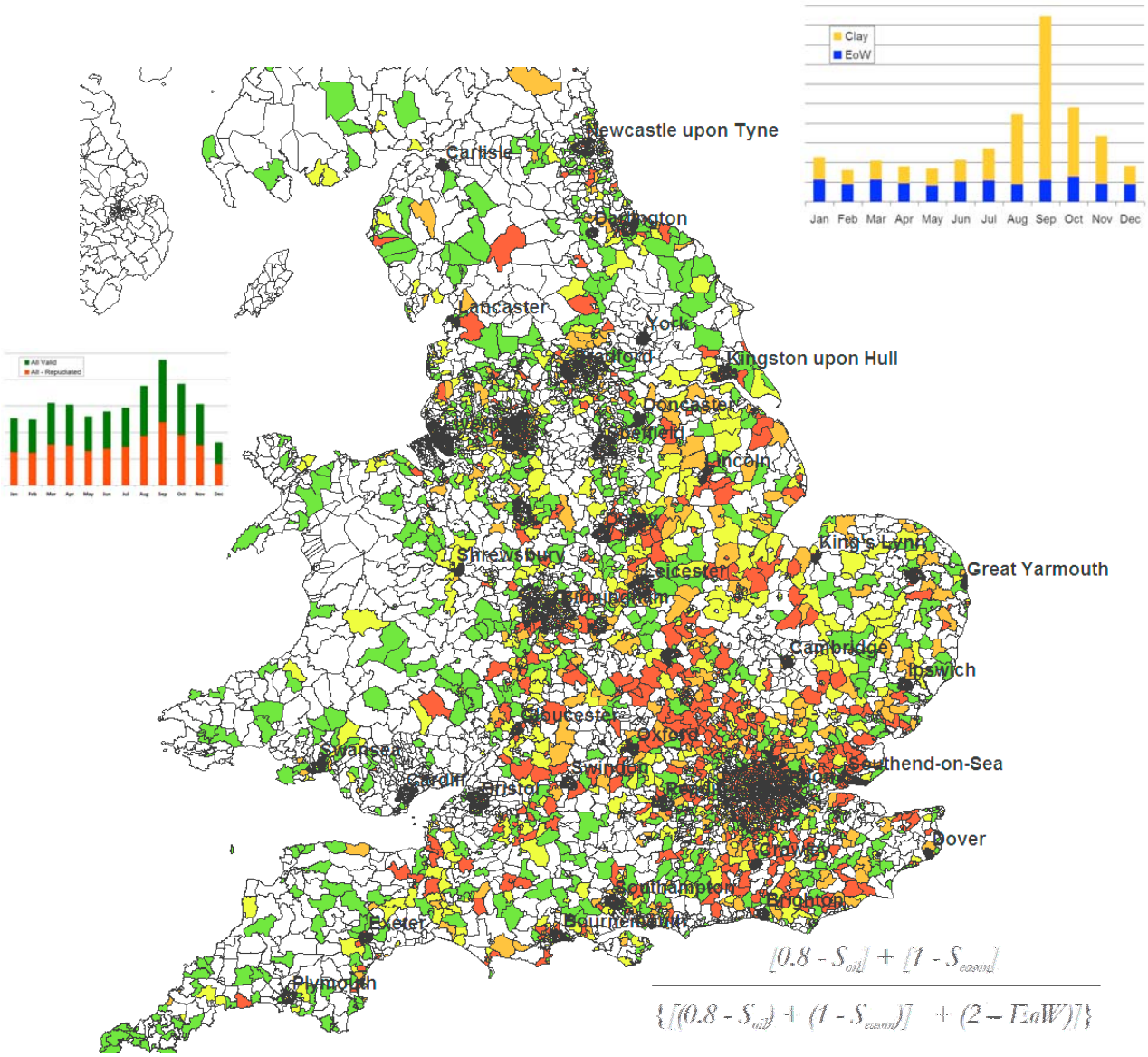
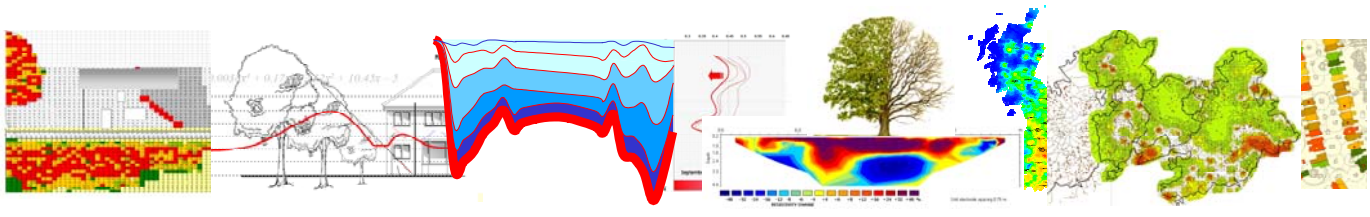
PROBABILITY of VALID CLAIM - TRIAGE



Knowing the probability of whether a claim is likely to be valid or not at the time of first notification of loss is useful at the Triage phase in terms of allocation of resource, and the above map plots, at postcode sector level, a value that takes account of soil type, time of year, historic claim data and climate. The values change by month, linked to the SMD data.



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GLOBAL WARMING

Climate Change, June 2011

A team from Stanford University have concluded that many tropical regions in Africa, Asia and South America might see "the permanent emergence of unprecedented summer heat" in the next two decades. Middle latitudes of Europe, China and North America - including the United States - are likely to undergo extreme summer temperature shifts within 60 years, the researchers found

"According to our projections, large areas of the globe are likely to warm up so quickly that, by the middle of this century, even the coolest summers will be hotter than the hottest summers of the past 50 years," said the study's lead author, Noah Diffenbaugh, Assistant Professor of Environmental Earth System Science and Fellow at the Woods Institute for the Environment at Stanford. The study is co-authored by Stanford research assistant Martin Scherer

According to both the climate model analysis and the historical weather data, the tropics are heating up the fastest. "We find that the most immediate increase in extreme seasonal heat occurs in the tropics, with up to 70 percent of seasons in the early 21st century (2010-2039) exceeding the late-20th century maximum," the authors wrote.

Tropical regions may see the most dramatic changes first, but wide swaths of North America, China and Mediterranean Europe are also likely to enter into a new heat regime by 2070, according to the study

TREES & INSURANCE

Reece, (1979), Arboricultural Journal,
Vol 3, pp 492 – 499

The above paper outlines the state of root induced clay shrinkage claims following the introduction of subsidence cover to domestic dwellings in the early 1970s, and following the drought of 1976.

The findings were based on sample size of 10,604 claims and contained a list of risk in rank order, placing NW London first, followed by North London, Harrow, West London and South East London etc., a position that remains unchanged today.

Reece recorded that 76% of claims related to houses built before 1940, and noted that 88% of claims were tree related and most of the claims from the sample were on clay soil. The average repair costs where trees were involved was £3,650, compared with £2,611 for 'other' subsidence claims.

He notes "various uninformed comments have been made to the effect that the insurance industry demand that trees should be felled if in the vicinity of a dwelling. This "anti-tree" image is totally inaccurate as not one single insurer would contemplate such an approach and are equally horrified at the prospect of a treeless urban environment. Where however, experts indicate that damage or further damage can be anticipated if a particular tree is not removed, it becomes necessary to heed the advice if subsidence insurance cover is to be continued and the policyholder protected against major damage in the future."