

# 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



The Clay Research Group

November 2012

# The Clay Research Group

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Issue 90, November, 2012

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## NEXT MONTH

Reviewing the South London Borough of Sutton in terms of Risk, Geology, Terrain and Trees.

Policy life and claims made. Evidence off the adage, “Time is Money” plus a review of the SwissRe report on risk.

## Hortlink II

Neil Curling reports that he has secured a contribution from the ABI towards Hortlink II. Matched with the contribution from The Forestry Commission (negotiated by Jim Smith) we understand that the project can now proceed and look forward to reporting on progress.

Stage 1 will determine the feasibility of using existing claims data to understand the impact of tree pruning on water uptake and we understand that OCA will be contributing a sample of their records.

## Met Office Summary

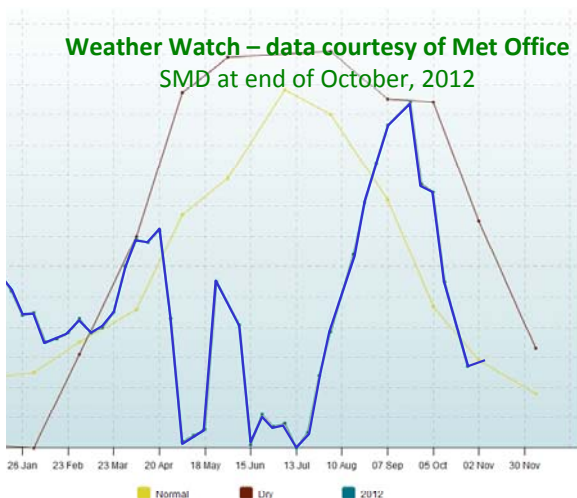
September & October, 2012

“The UK mean temperature was 0.7 °C below the 1981-2010 average, and it was provisionally the coolest September since 1994. Despite all the rain during 23rd to 26th, rainfall totals for the whole month were only close to average for many regions.” October was close to the average in terms of rainfall and hours of sunshine, but was the coldest since 2003.

## This Edition

We look at the real cost of saving money. When we do need a site investigation, money spent ensuring we gather the evidence we are seeking is well spent and can reduce the final indemnity spend, or assist in obtaining a recovery of insurers outlay. Sending teams to site, and then missing the evidence to save a few pounds isn't an economy.

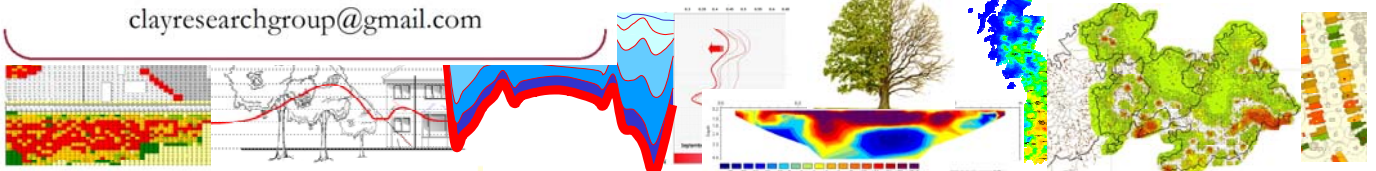
We re-visit Triage, and assess the value of using UK averages to determine the probability of the operating peril. They vary widely by geology and climate, and our study provides guidance on (a) the likelihood of a claim being valid and (b) the cause.



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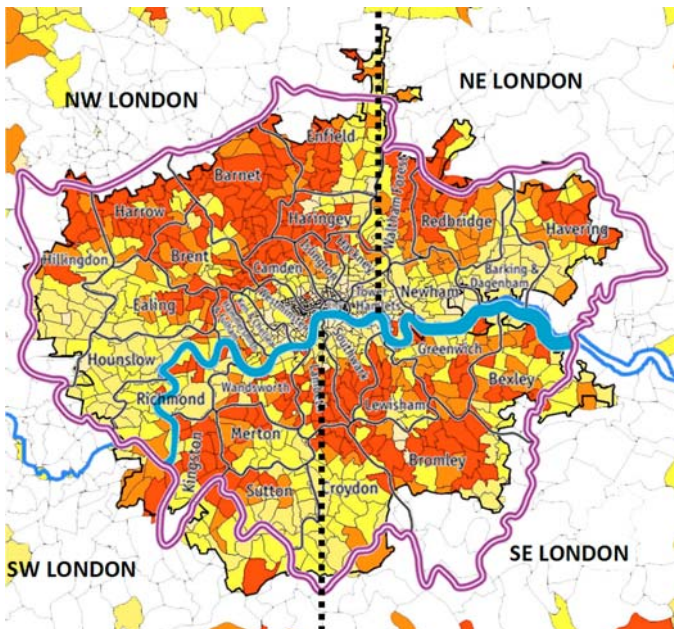
[clayresearchgroup@gmail.com](mailto:clayresearchgroup@gmail.com)



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## What are the chances of ... Clay Shrinkage, EoW, Valid, Repudiated?

We have compared two samples from different sources to try to understand the comparative risk by area within the M25. Our findings suggest that it is between 23 and 30 times more likely that any claim in NW London will be due to clay shrinkage than subsidence caused by water leaking from the drains or 'other'.



This is by count, and very broad brush from two relatively small samples, which combined, total around 1,500 claims.

For illustrative purposes the above map plots a five year frequency distribution and shows the divisions into sample areas. It hopefully has some value in Triage and particularly so when used at postcode sector level.

In contrast, in NE London it is between 5 and 7 times more likely that the subsidence has been caused by root induced clay shrinkage.

The figures drop to between 2 and 3.7 in SW London, and 2.5 and 3.5 in SE London.

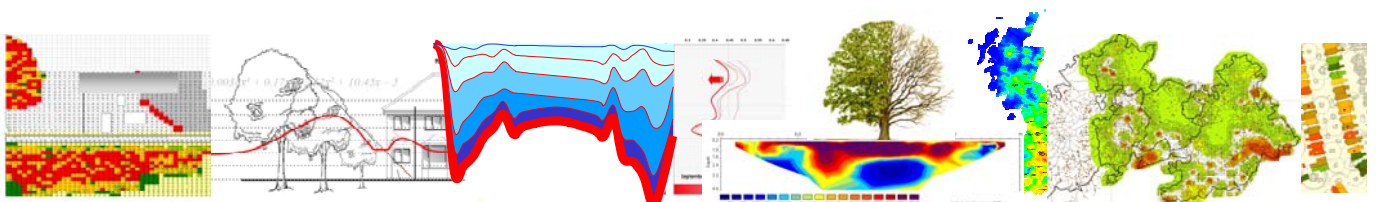
This level of data becomes far more useful at postcode sector level, and its use in Triage is amplified if account is taken of the month the damage was first noticed.

Although the industry quote figures for the percentage of valid claims notified in the winter as being perhaps 25%, and increasing to 70% in the summer (maybe 80% in a hot, dry summer), the reality is, UK averages are largely useless for Triage.

In a high risk sector in North London, there will be fewer valid claims on a sector situated on London clay in the winter. There will be more valid claims notified in September; far more than the UK average suggests. In fact, in a high risk sector, it wouldn't be surprising to see valid claims exceeding 90%.

Properties elsewhere, on non-shrinkable soils are, in contrast, less climate dependant. The valid/repudiation rate is more consistent irrespective of the season.

In short, the change in the percentage of claims that are valid or repudiated fluctuates more on clay soils, and UK averages are almost meaningless for our probabilistic model.

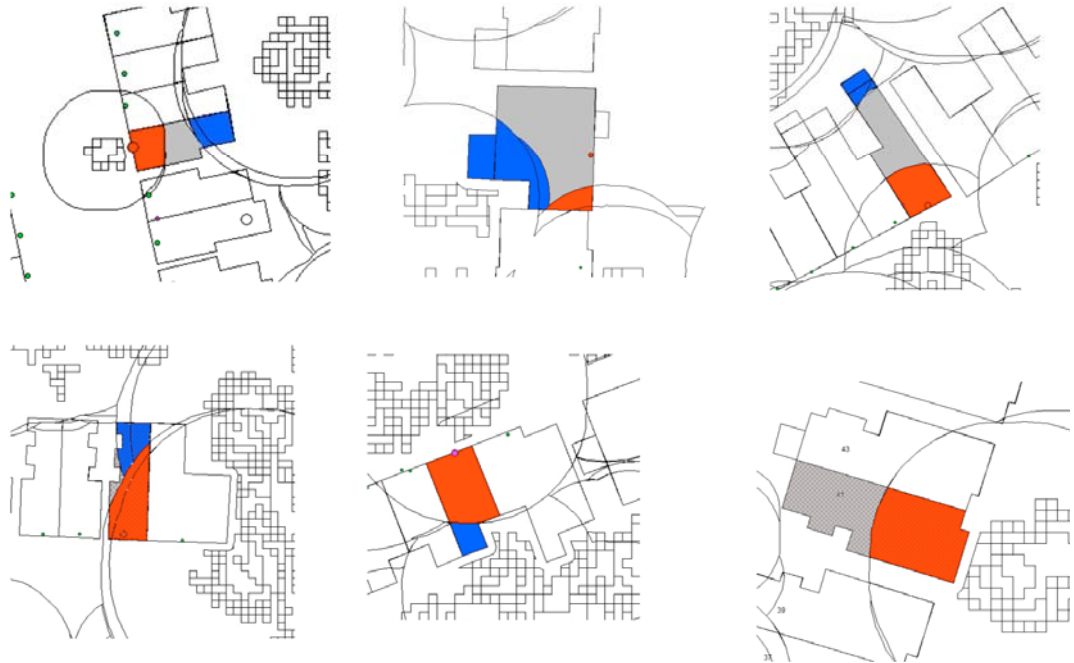


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## Permutations & Combinations

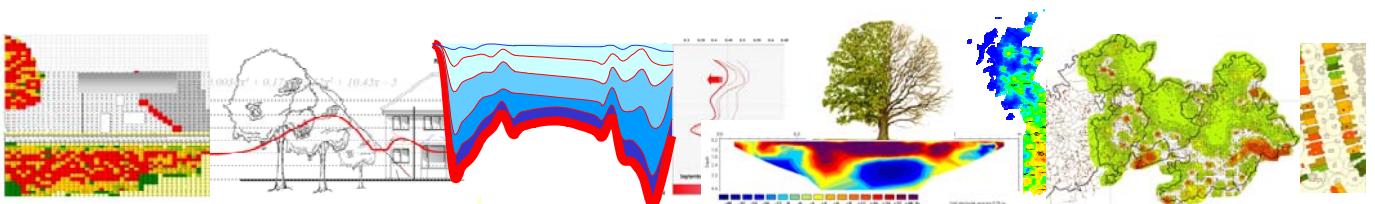
Using the modelled root zone, actual claims are being examined to see if there is a pattern matching damage to root overlap, location and building style.



*The building outline is shaded grey, notional root overlap zones are superimposed – red indicates a Third Party tree, and blue a tree in private ownership.*

Of the six examples above, 2 have 100% root cover, 5 have trees front and rear and only 1 has root activity on one elevation only. The sum of the individual cases (8) exceeds the total because some characteristics are shared in 2 of the claims – the ones where we have 100% cover and trees front and back.

All of the above examples are claims – a similar exercise involving undamaged houses would be an essential control and we are hoping to work with colleagues in the industry to study a small selection of streets where more complete claims records can be built. Are there any patterns that are risk indicators, or is it simply the fact that there are more examples of certain categories, and the frequencies will be similar?



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## The Value of Soil Testing

**How saving a few hundred pounds can cost thousands.**

How can saving money increase claim costs? As claims handling professionals come under increasing pressure to drive down costs, it is tempting to look at soil testing with a view to reducing the number of samples that are analysed.

Below we have an example of how sampling and testing at increased intervals can save a little, but end up costing a lot.

Samples were retrieved at 500mm centres for the purposes of the exercise, and the suction test carried out at 1.5mtrs ctrs, as were the Atterberg tests. This would have produced savings of something like £300 compared with testing all of the samples.

The laboratory was then asked to test the interval samples, which can be seen as a bold black line in the graph.

The first tests – the ones at 1.5mtrs ctrs that saved £300 – missed the suctions altogether. Because there were no intermediate Atterbergs, the moistures were of little use.

The true cost of saving £300?

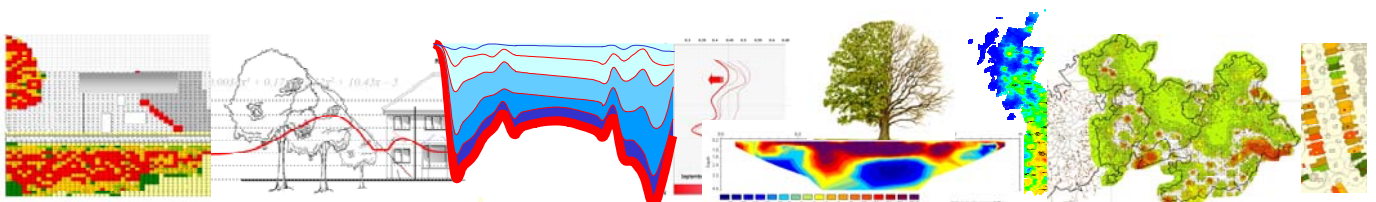
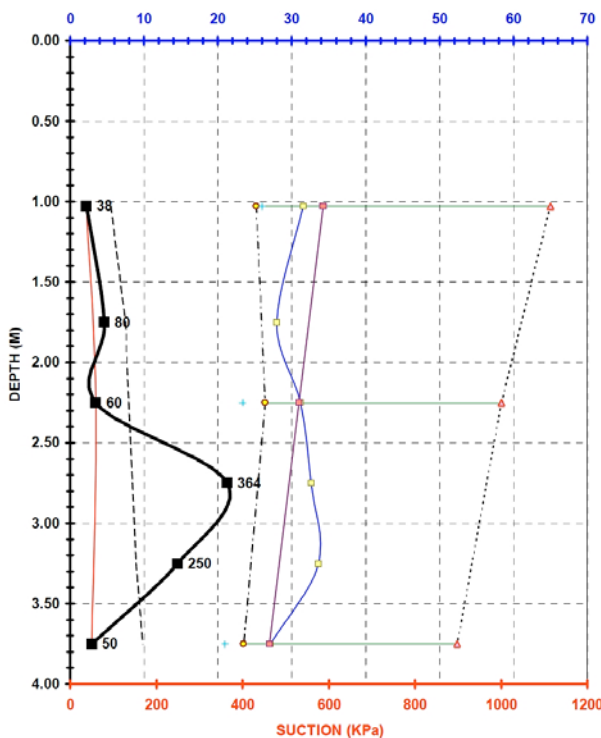
The entire cost of the SI and the soils testing would have been completely wasted. If the suctions were caused by a Third Party tree, there would be no prospect of a recovery and persuading the owner to abate the nuisance. Wasted costs – excluding an incorrect claim settlement – could easily amount to several thousand pounds.

Not counting delays and the impact on service delivery and a wrong diagnosis leading to underpinning perhaps.

In next month's newsletter we see the real cost of extending the claim duration under the 'Time is Money' heading. On the following page we see other examples of wasteful testing.

A good way of saving money is to stop testing soils in the winter, unless of course the tree is large and we anticipate its roots are exerting an influence. Most investigations show that the soil rehydrates around the end of November, through December.

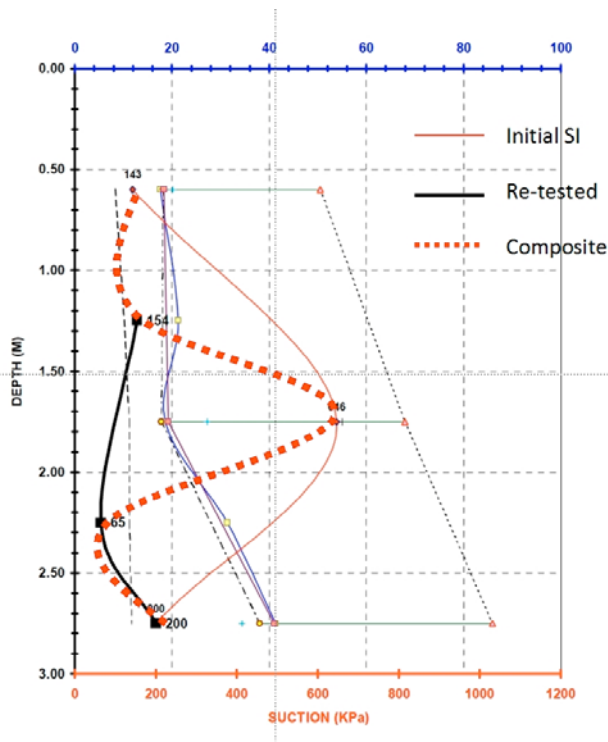
Precise levels are far better in such cases.



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## Incorrect Diagnosis

Continuing the theme of cutting corners to lose money, the results below formed part of our research and the engineer might look at the thin solid red line (joining samples at 1.5mtr intervals) and assume that removing the tree could result in damaging heave. The engineer might go on to recommend wholesale piling of the property.



The black line plots the intermediate results – the ones that were missed due to sampling at intervals that were too far apart.

The bold red dotted line tells the story, and halves the estimate of swell. Tree removal would be the correct response, and would save the cost of wholesale piling. Spending £300 could have saved £60k or more.

Good quality investigations to prove or disprove the influence of tree root activity is essential.

Delivering a professional service will save money, speed up claim settlements and enhance service.

To avoid wasting money, it would be advisable to assess the soils as they are retrieved. If they are stiff when inserting the thumb, or register on the penetrometer, then testing is worthwhile.

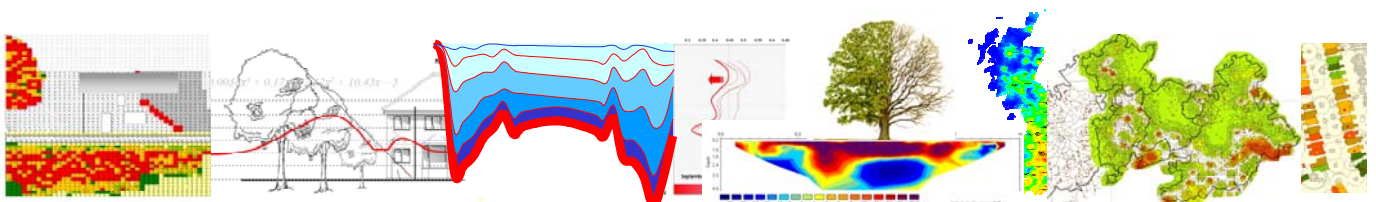
Investigations are only useful when they can deliver meaningful results; in the summer months, when the tree is in leaf.

## Trees within influencing distance of domestic properties, on clay soils out to the M25.

Our estimate of the number of trees within influencing distance of properties on clay soils out to the M25 is as follows:-

- Council Ownership = 170,645
- Private Ownership = 1,256,330

This is a relatively broad-brush estimate, but provides some idea of the relative risk presented by each category. It also has some relationship to the number of claims by ownership.



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## BGS Mapping

The UK Geology viewed in Google Earth



The BGS continue with innovative offerings and they now have 1:625,000 geology mapping of the UK ready for viewing in Google Earth. Visit their site (below) and download a range of KML files to display using Google Earth. Files cover both solid and drift. Visit :...

<http://www.bgs.ac.uk/data/services/digmapgb625kml.html>

### Is nowhere safe?

If you have a phobia about subsidence, and would be willing to move, then try one of the Isles. Scilly, Orkney or maybe Western or even Shetland. If you prefer to remain on the mainland, then consider Berwick-on-Tweed, Teesdale or West Devon. Rocky perhaps, but as safe as you can be in the UK.

## Methane Emissions

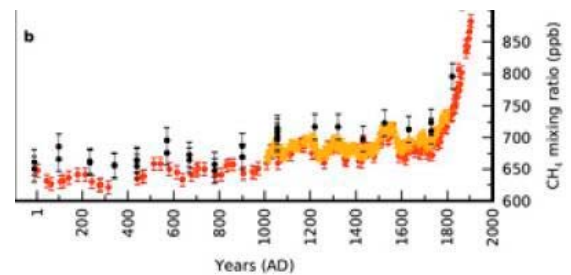
Sapart *et al*

### Natural and Anthropogenic Variations in Methane Sources during the past two Millennia.

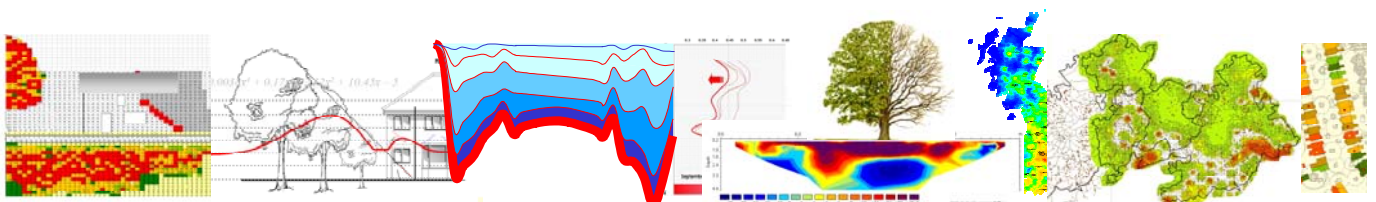
*Nature*, 2012

A team of researchers from the Niels Bohr Institute, Copenhagen, have measured methane trapped in gas bubbles retrieved from the Greenland ice cap.

The objective was to try and distinguish emissions from natural sources from those that are associated with industrial processes.



The research team explain the above graph as follows: “*The isotope curve shows that the emissions of the greenhouse gas methane had several peaks in the last 2,100 years. 1: During Roman times, where a lot of wood was burned for heating and for the processing of metals. 2: During the warm Middle Ages, where forests caught on fire. 3: In the "Little Ice Age", which was a very cold and dry period. 4: The methane concentration has increased dramatically since approx. the year 1800, when industrialization took off and triggered energy and food production, for example, rice fields.*”



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## ASH DIE BACK ASH TREES UNDER THREAT

Confirmed cases of ash dieback have been concentrated in East Anglia and the East Midlands but the disease is spreading. The Forestry Commission describe the disease as follows:

*“Chalara dieback of ash is a serious disease of ash trees caused by a fungus called Chalara fraxinea (C. fraxinea). The disease causes leaf loss and crown dieback in affected trees, and it can lead to tree death.”*

Earlier this week the Department for Environment, Food and Rural Affairs announced that the disease had been confirmed in ash trees at 52 locations across the UK, up from 29 locations last week.

“The Food & Environment Research Agency (Fera) have produced a video describing the symptoms.

<http://www.forestry.gov.uk/chalara>

An article in the press says *“A senior scientist advising the Government warned that the fungus will destroy ‘almost all’ the ash in the country. And campaigners said that the destruction of infected trees could affect wildlife which is reliant on hedgerows and hedgerow trees such as ash to survive.”*

*“Britain has about 80million ash trees and they make up 30 per cent of the indigenous deciduous woodland. They are the UK’s third most common tree and the second most common hedgerow tree.”*

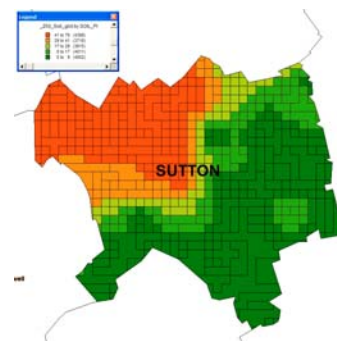
## MatLab Newsletter

MatLab have issued their first newsletter after exhibiting at the Subsidence Forum Training Day. To receive a copy contact Lisa Thomas at [lisa@mat-lab.com](mailto:lisa@mat-lab.com)



## Next Months Edition

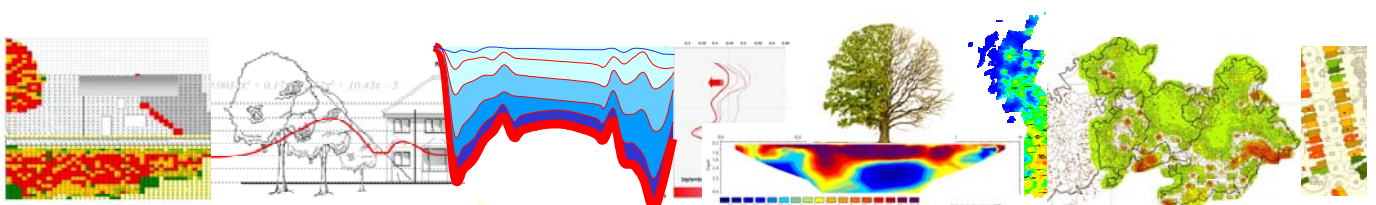
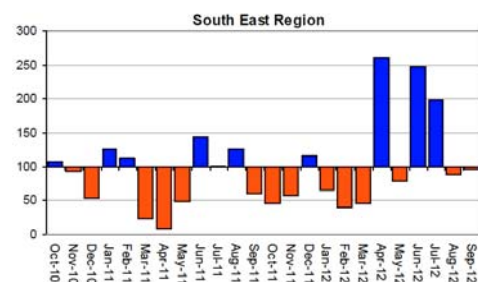
December’s edition will be devoted to mapping the London Borough of Sutton.



It will be one of the most detailed appraisals, including mapping the geology (above), claims distribution and so forth, before drilling down to sector and then street level to look at individual properties.

## Rainfall Anomaly Graph

Courtesy the Met Office





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Subsidence Forum Training Day  
BRE, 17<sup>th</sup> October, 2012

Neil Curling and Alan Cripps are to be congratulated for organising another very enjoyable and successful training day. This year, each presentation featured an electronic question and answer session which proved a great way to generate instant feedback and prompt debate.

Despite a very quiet year for claims the event was very well attended, possibly reflecting the interest generated by the much awaited Berent case. Keith Gaston managed to neatly summarise both the case and the changing landscape of recoveries following the decision.

Derry Baxter started the day explaining the role and function of the FOS, reassuringly the FOS try to take a pragmatic view and welcome clear, well presented, claim files.

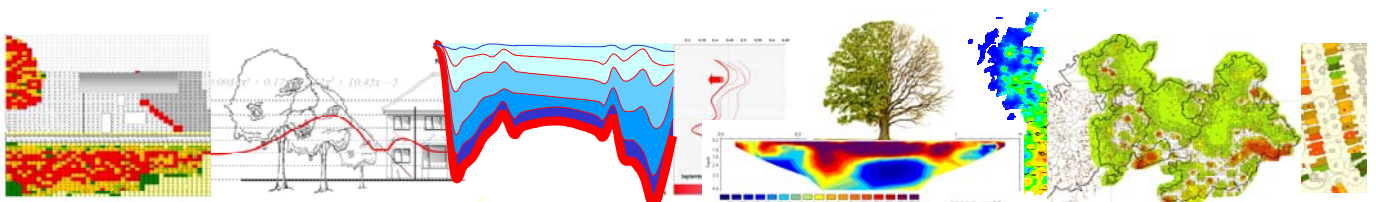
Neil Hipps then brought the Hortlink project to life by explaining the physiology of trees and how they respond to pruning. It now looks as if Neil has secured the initial funding to extend this research and we look forward to seeing the results.

Andrew Thompson reminded us all of the importance of the Party Wall Act and in particular how it might be used to help secure a contribution to the cost of remedial work.

Post lunch fatigue was swept aside by Bill Steven's (Uretek) talk about grouting, its practical application and how it might become available for use in clay soils.

A talk entitled 'indemnity' looked like a good opportunity for a little sleep but Richard Rollit managed to provoke some interest and discussion. There was a question about whether the audience would buy an underpinned house (a little like asking those who work in a sausage factory if they would eat sausages?) reassuringly, 70% of the audience would (buy an underpinned house - we don't know about sausages).

The day was entertainingly concluded by Owen Edwards and Neil Crawford from Crawford & Co., with various practical examples and the often awkward question of "what would you do?" we just hope the answers remain anonymous.



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## Identification of Tree Species using Remote Sensing

Geocato International

Several papers in this journal relating to the identification of tree species using a variety of techniques, including linear regression analysis and machine learning.

Zhang *et al* used LiDAR and a Support Vector Machine classifier and achieved an accuracy of 92.8% with two species.

Im J., *et al* describe the use of hyperspectral imaging in another paper, which refers to leaf nutrition concentrations.

Whether this area of research will ever be extended to the Urban Street scene of UK cities with its rich variety of trees is another matter, but the technology could soon be available as we see below.

Jensen R., *et al* identified (through fieldwork) 500 urban trees in the built-up zone of Provo-Orem, Utah, USA. Visible and near infrared airborne hyperspectral imagery was collected over the same area. The 500 trees were identified on the images, and spectral features of each tree were extracted.

The authors explains *“Visible and near infrared airborne hyperspectral imagery was collected over the same area. The 500 trees were identified on the images, and spectral features of each tree were extracted. Principal components, vegetation indices, band means, and band ratios were all used as features to discriminate between different tree species. The tree classification was 82% accurate when just the six principal components were used. Classification accuracy increased to 91.4% after combining vegetation indices, band mean values and band ratios.”*

## Anti-Transpirants

Reducing Water Uptake of Trees

Richard Rollit has been exploring the use of anti-transpirants as part of our work into retaining trees that have caused subsidence damage to houses.

This follows on from a meeting with Professor Williams Davies some time ago at Lancaster University.

Professor Davies explained that spray coating the leaves of trees can reduce water loss without causing harm.

The difficulty is that trees would have to be sprayed at regular intervals throughout the early part of the year and it was thought that costs would be prohibitive.

However, compared with the cost of routine maintenance, we do wonder what the implications would be for a Local Authority.

Would this be a cheaper treatment when compared with crown reduction? Would it be appealing in cases that follow Berent, leaving Councils to target the so called ‘hot spots’?

A limited trial would be useful if a Local Authority would be willing to join with us by providing a test site.

