

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



June 2015

Edition 121

The Clay Research Group

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Issue 121, June 2015

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Aston CPD Conference

16th June, 2015

Aston promises to be an enjoyable day with an opportunity to meet colleagues and learn about current developments in the field of site investigations and recoveries as well as examining the business process.

Is the future a world where we ask homeowners to serve themselves only to advise them that they have an "unidentified item in the bagging area", or is it brighter? Can we harness technology to deliver an improved and speedier service? Aston may deliver some answers.

See slightly modified program on Page 2.

THE CLAY RESEARCH GROUP

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Peril by City

On page 3, the peril (i.e. escape of water, clay shrinkage) per city in terms of frequency from the claim population is graphed to assist in building a probability model.

If a claim is received in 'x' location, what is the likelihood of it being (a) valid (see article in last month's edition) and (b) if it is valid, what is the most likely cause?

Neutron Probe Data from Aldenham

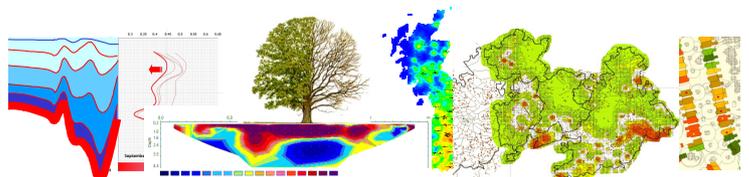
We re-visit the neutron probe data gathered by the research team from Southampton University in 2006 and 2007 to see the moisture change per month. How quickly does the ground rehydrate after a dry summer?

Weather Anomaly Data for Heathrow

Last month NOAA reported that 2014 exceeded the global average by 0.82 °C., but what does that mean for subsidence in the clay belts of the UK?

On pages 5 & 6, 2014 weather data is compared with the 30 year averages recorded at the Heathrow weather station and published by the Met Office.

The question arises, if the temperature was 1.4 °C warmer and there were 3hrs more sunshine than the 30 yr average, why were subsidence claim numbers so low?





Aston CPD Centre

BIRMINGHAM

presents a one-day Conference on Tuesday 16 June 2015
at Aston University

DOMESTIC SUBSIDENCE Challenge and Change

- 09.00 - 10.00 Registration and coffee
- 10.00 - 10.15 Opening by Chairman: **Stephen Plante**, Clay Research Group
- 10.15 – 11.00 *The Future of Subsidence Claims Handling.*
Tony Boobier, WW Executive for Insurance at IBM
- 11.00 - 11.30 *Time to let the evidence do the talking.*
Tim Freeman & Ian Brett-Pitt, Best Answer Subsidence Engineering
- 11.30 - 11.45 **Coffee**
- 11.45 - 12.15 *Stabilising Clay Soils – Update on the EKO project*
Prof. Ian Jefferson, University of Birmingham
- 12.15 - 12.45 Discussion
- 12.45 - 14.00 **Lunch**
- 14.00 - 14.30 *Meeting Customer Expectations*
Mike Mortished, Claims Team Controller, Ageas Insurance.
- 14.30 - 15.00 *Clay stabilisation and subsidence : Imaging and monitoring using time-lapse, azimuthal 3D Electrical Resistivity Imaging.* **Dr. Nigel Cassidy**, Keele University.
- 15.00 – 15.20 **Tea**
- 15.20 - 15.50 *Where do we go from here?*
Sne Patel, Head of Subsidence, Crawford & Company Adjusters (UK) Limited
- 15.50 – 16.20 Discussion
- 16.20 - 17.00 Tea & Disperse

(Directed by Stephen Plante, The Clay Research Group)

For conference availability: enquiries@astoncpdcentre.co.uk **Telephone Enquiries:** 0121 204 3606
Fax: 0121 204 5079 **Website & Mailing Subscription:** <http://www.astoncpdcentre.co.uk>
 Our conferences are intended to contribute towards the CPD requirements of the relevant professional institutions.
 The views expressed at the conference are personal to the speakers and are not necessarily those of Aston CPD.
 For terms & Conditions please refer to our Website. By completing this form you accept our terms & conditions.
 Conference Organiser: Dr M Sadeghzadeh 07788947658. Please note the programme is subject to change without prior notice

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correspondence to: Aston CPD Centre, Aston House, 6 Greville Drive, Birmingham B15 2UU

Please reservePlace(s) at the course, (subject to terms & conditions) **Domestic Subsidence– 26.6.14**

Delegate Name(s): Company:

Address:.....

Post Code: Email Address: Tel:

Have you any dietary, access or other requirements? **YES/NO** if **YES** please state

Do you wish to be invoiced? (VAT exempt) **YES/NO** Purchase Order No:

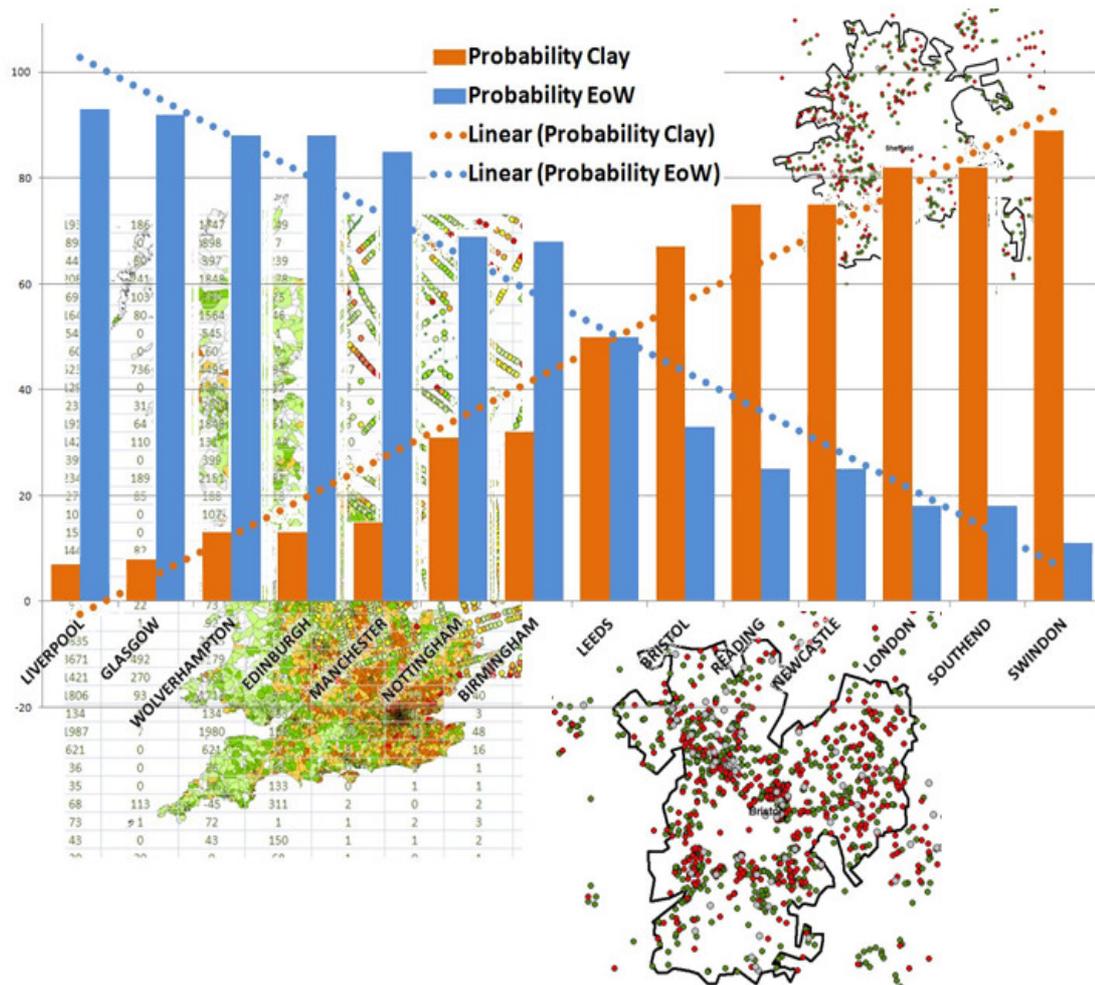
Invoice address if different from above:

Cost **£175** per delegate, VAT exempt, covering attendance, papers, lunch and refreshments during the day.
(Cheques should be made payable to **Aston CPD**)

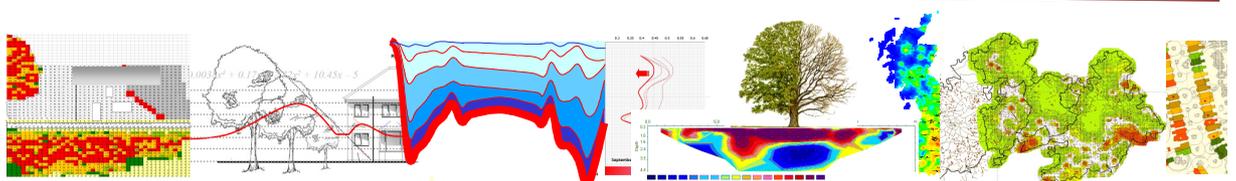
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Risk of Subsidence by City

The first stage of building an 'intelligent system' is to build a high level view of risk. We might want to understand how many claims of what peril by location and just how likely any claim is to be valid or repudiated. Using our claims database the 'by peril' analysis reveals the following distribution across the UK.



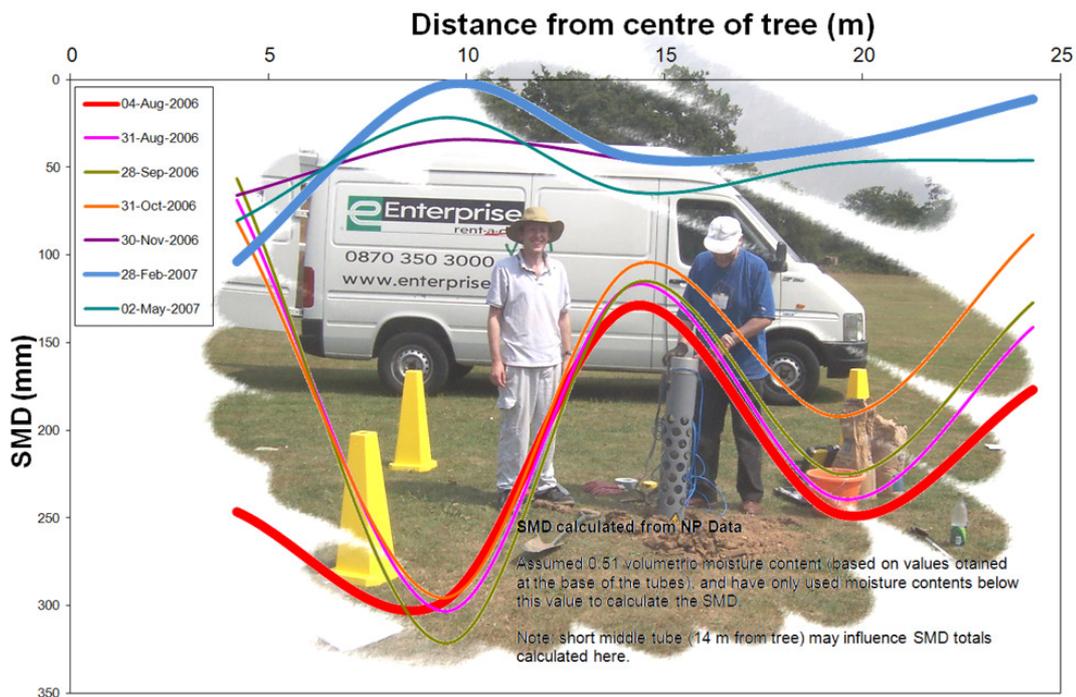
In Liverpool, the most likely peril will be water escaping from a drain. At the other end of the scale, in Swindon the most likely peril will be clay shrinkage. This is of value in triage as we will see later, but this information can be used to drive the initial conversation and subsequent audit. If 'x' claim doesn't fit the profile, it may be worth selecting for review. The benefit lies in having a comparable value ascribed to each location.



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Soil Rehydration - Aldenham Oak

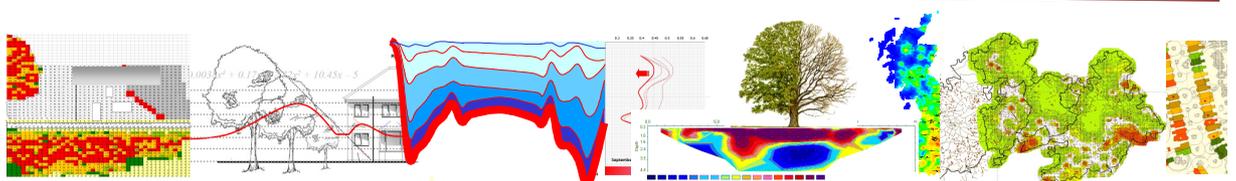
Below is a graph of the neutron probe data collected from the site of the Aldenham oak produced by Drs. Derek Clarke and Joel Smethurst from Southampton University, plotting the Soil Moisture Deficit across the root zone.



Moisture content measurement using the neutron probe from the site of the Aldenham oak. The research was undertaken by Drs. Derek Clarke and Joel Smethurst, from Southampton University.

The graph records moisture deficit by month. The bold red line is the initial reading taken in August 2006. The low deficit at 15mtrs from the tree is a product of the soil in the vicinity, which has a high gravel content. The SMD at 10 and 20mtrs from the tree are more representative of the sort of values the root system would generate in clay soil.

The deficit changed very little between August and October, but recovery took place quickly in November. Over the four week period from 31st October to 30th November, the moisture deficit 10mtrs from the tree reduced from 300 to 50mm. Joel points out that this value doesn't correspond to the rainfall in November. Perhaps the ground was being watered by the school - the site is close to the cricket pitch! Full recovery took place over the winter.



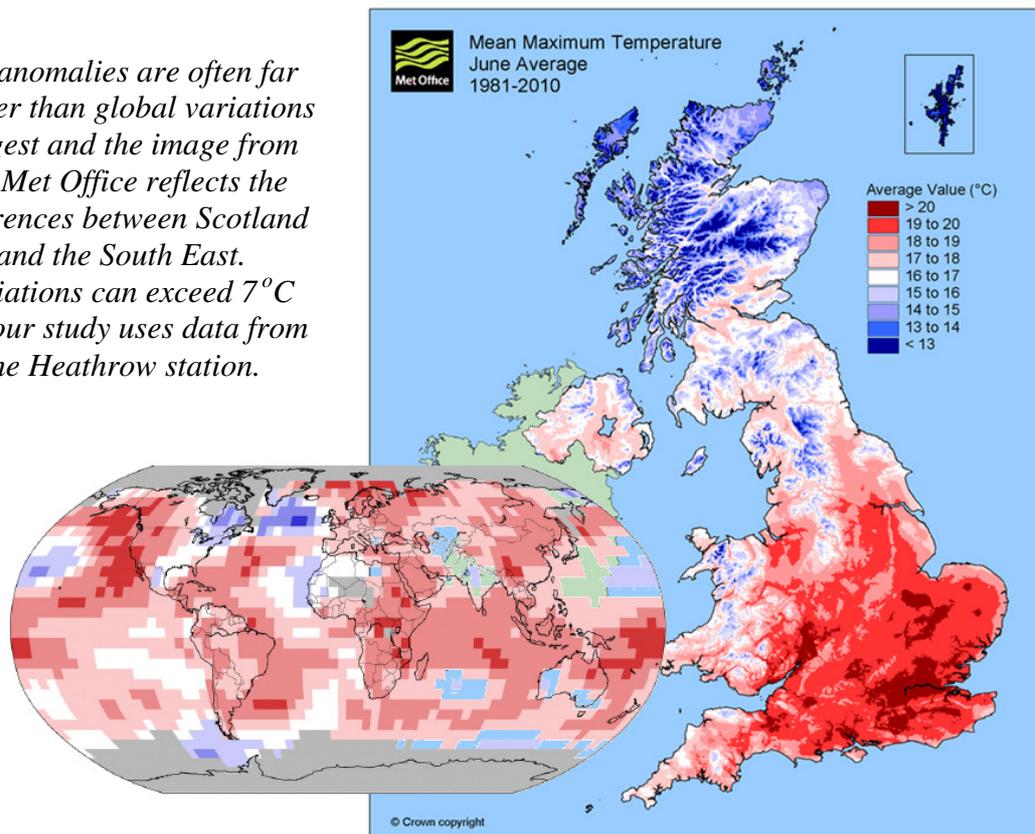
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Global -v- UK Weather Averages.

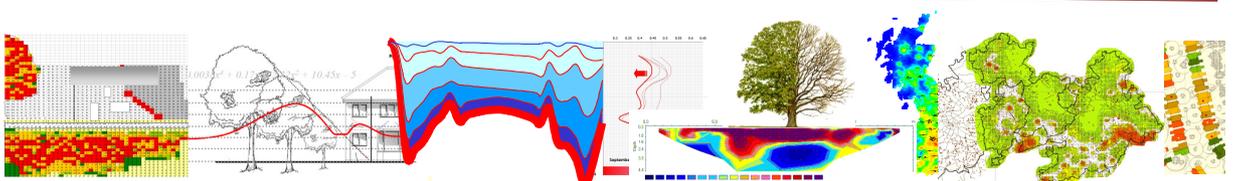
Wetter, dryer, warmer. Climate scientists make assessments based on comparisons with 30 year global averages. For example, the average global temperature increase in 2014 was 0.82 °C for the first three months of the year.

However global averages are of little use locally, but how do they compare? The difference from north to south across the UK can be 7 °C or more. Using the UK average is fine if you live in Derby but fortunately the Met Office supply site-specific data which can be more useful for our purposes.

UK anomalies are often far greater than global variations suggest and the image from the Met Office reflects the differences between Scotland and the South East. Variations can exceed 7 °C and our study uses data from the Heathrow station.

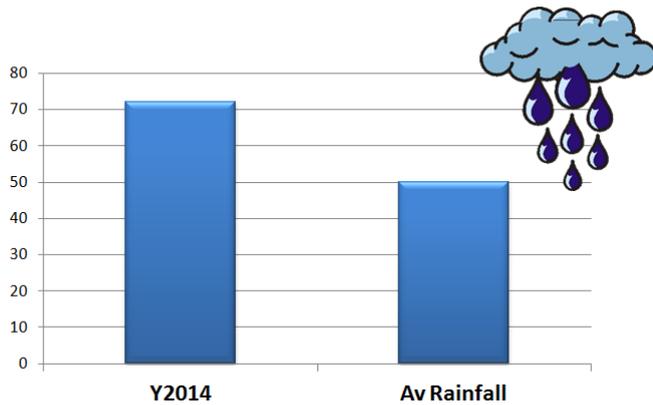


There are more claims on clay soils than any other and variance by year is linked to temperature, hours of sunshine and rainfall. For this reason we use data from the Heathrow station to make assessments on likely volumes and build predictive models. Using data from this station, the following page looks at how 2014 compared with the 30 year average.



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Comparing 2014 weather with 30 yr average at the Heathrow station as supplied by the Met Office.



2014 was wetter than the 30 year average looking at data from the Heathrow weather station and as supplied by the Met Office.

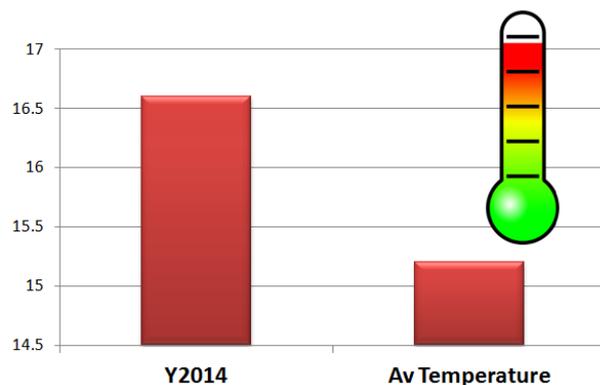
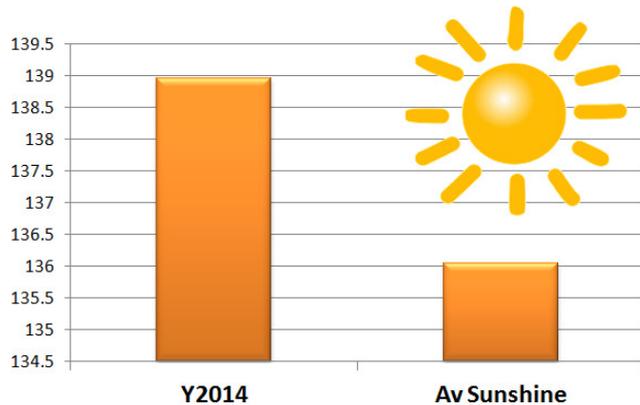
The 30 yr average was 50mm compared to 72mm for 2014.

An increase of nearly 22mm.

2014 was sunnier than the 30 year average.

The 30 yr average was 136 hrs of sunshine compared with the average of 139 hrs for 2014.

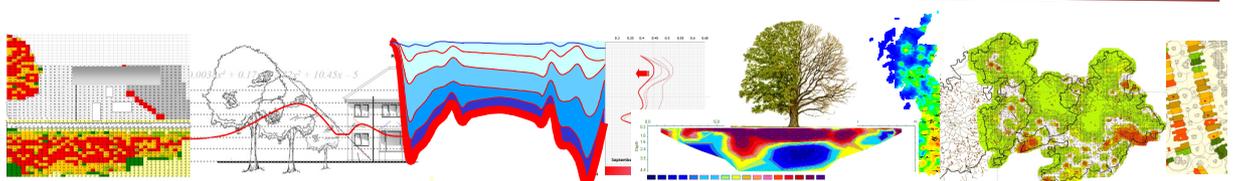
An increase of just 3hrs.



Finally, temperature. The NOAA global data records an increase of 0.82 °C in temperature for the first 3 months of the year.

The temperature at Heathrow has been even warmer, increasing from a 30 yr average of 15.2 to 16.6 °C.

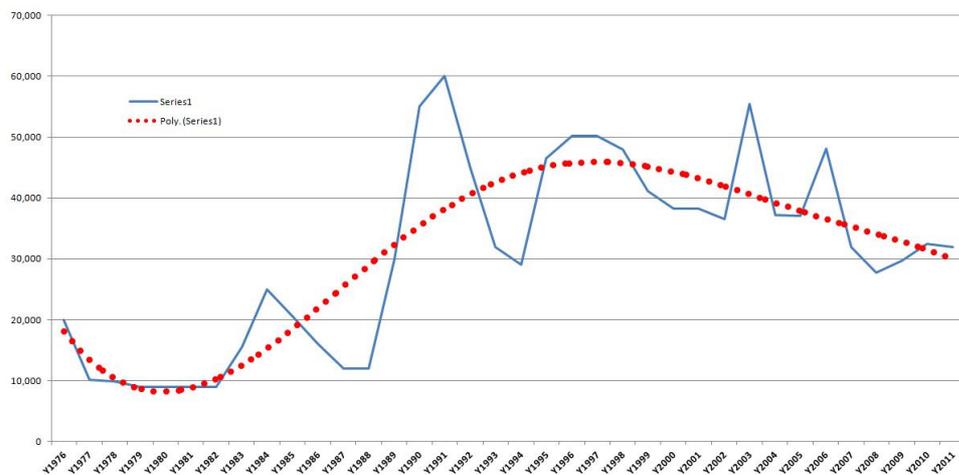
An increase over the year of 1.4 °C.



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Subsidence Claims - Trendline Analysis

Trendline analysis suggests a steady decline in subsidence claims after the high volumes peaking in 1990 and smaller episodes in 1995, 2003 and 2006. The hot summers of 1976 and 1984 alerted homeowners to the fact subsidence cover had been added to the policy, and 1989/90 tested the market and raised the profile of the peril.

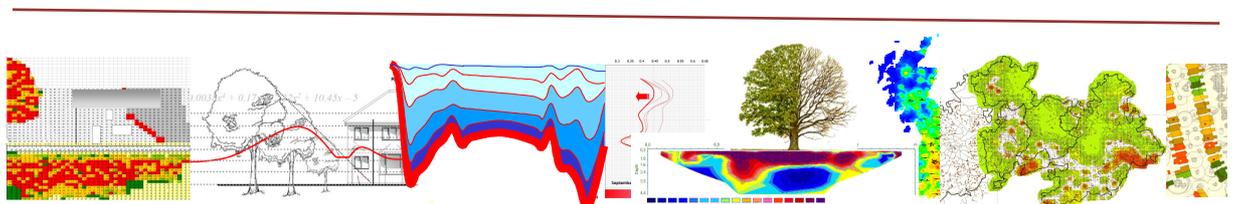


More recently, wetter weather and fewer claims has resulted in a decline in interest, despite the concerns that global warming could lead to increased losses by insurers. Whether the graph returns to pre-1990 numbers remains to be seen but the current trend suggests a levelling out at around 25,000 claims a year with a smaller percentage of those being valid.

The answer is 20%. What was the question?

Around 20% of postcode sectors have a shrinkable clay component. Around 20% of claims are valid in the winter and 20% are repudiated in the summer.

Clay shrinkage claims cost around 20% more to repair than those where damage has been caused by leaking drains. Turning now to our subsidence model, we find that 20% root overlap of the building footprint could be the riskiest. On average.



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A faster and cheaper method of detecting desiccation.

The work undertaken by Glenda Jones from Keele University whilst carrying out research towards her PhD under the direction of Dr Nigel Cassidy introduced us to the prospect of detecting moisture change over time using Electrical Resistivity Tomography (ERT)

Arrays set up in the vicinity of the Aldenham oak and willow recorded change over time with the minimum of disruption.

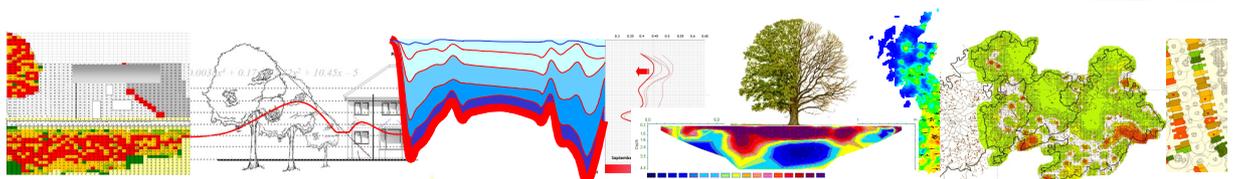
A simple hand-held meter being used to measure resistivity between two probes to determine moisture variance between samples.

The method is fast and requires little skill. Wetter soils have less resistance than dry soils and variance over the depth of the bore should deliver a profile as useful as other more elaborate tests.



ERT was perhaps thought to be too elaborate for smaller scale domestic subsidence claims and the absence of a specialist supplier who could deliver the service has hampered its adoption. Similarly, use of the Time Domain Reflectometry (TDR) sensor, although delivering first class data over the web, was perhaps too restrictive in only being able (economically) to take readings at a fixed depth over time.

We are currently considering a quick test that could be carried out on site by the contractor (and verified in the laboratory) using a simple hand-held multimeter of the sort shown above. Ideally each soil type would be characterised to determine the influence of different mineralogies but initially variance in resistivity over depth might provide a good indicator - equal to some other tests that are in use but delivering results faster and cheaper. Hopefully Nigel will advise on the practicalities and accuracy of this device.



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"A Decade of Change"

At first glimpse we were a little annoyed that CILA had stolen our headline, "A Decade of Change" - until we saw the date of their publication. It appeared on the cover of the Winter 2004 edition of their Claims Professional journal. 10 years ahead of our newsletter.

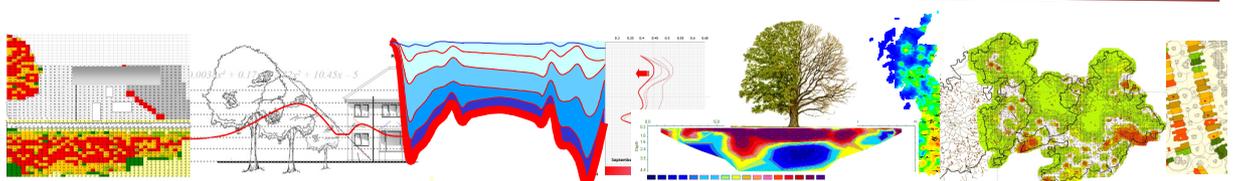
They asked the question of leading industry figures, "was 2003 an event year?".

Subsidence managers commenting at the journal included **Robert Sharpe**, then working for Crawford & Company and now COO with Innovation, reported a 300-350% increase in claim numbers and confirmed that nearly all of the increase was due to trees.

Gary Strong (then with GAB Robins and now Director of Practice Standards & Technical Guidance at the RICS), recorded a 250% increase through August, September and October and explained that the experience of individual insurers depended on their portfolio and distribution channels. Gary voiced concern about rushing to repair before the ground had fully recovered, reflecting on the approach being considered at that time by some insurers for a so-called Fast Track solution.

Nigel Barham (Cunningham Lindsey and now with GAB Robins/Crawford & Co) reported a three to fourfold increase in numbers when compared with 2002, again mostly in the south east. Nigel felt that reassurance at the time of the claim was the most important aspect as few cases were 'structurally threatening'. **Martin Gent** (Ashworth Mairs, now with Agrical), was clear that in his view, 2003 was an Event Year with "numbers presently running at 400 - 500% above the average". **Chris Hall** (Questgates) reported "in areas where the subsoil is predominantly clay, we saw a four-fold increase in claims during September and October against the same two months in 2002." **Richard Rouse** (Capita McLarens) reported a 30-50% increase in claim numbers, mostly in the South East. Claim predominantly related to bay windows and extensions, many involving trees. Claim costs were around average but fortunately, Richard explained there were no dramatic cases but many did involve a recurrence of damage from houses that were repaired in 1995.

What comes out of this - apart from an agreement that 2003 was indeed a surge - is the volatility of the market in terms of just how few of the managers are still with the same company. "A Decade of Change" in more ways than one. All but Chris Hall of Questgates have changed position but interestingly, those that have moved remain within the subsidence market.



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Water Flow through Vuggy Soil

Thanks to Jon Heuch for drawing attention to this article in the research press relating to water flow through soil. Apparently a team of researchers at Southampton University are using advanced mathematical modelling techniques to study water flow through soil.

They say "In order to measure the flow of water through soil, we first had to examine the flow of water around a single soil particle. Next we looked at the flow properties of a collection of soil particles, known as a soil aggregate. This multi-scale approach captured the underlying geometry through a series of targeted computer simulations."

Wikipedia defines 'vuggy' as "small to medium-sized cavities inside rock".

K. R. Daly, T. Roose (2013) "Multiscale modelling of hydraulic conductivity in vuggy porous media". Proceedings of the Royal Society.

Eco Housing

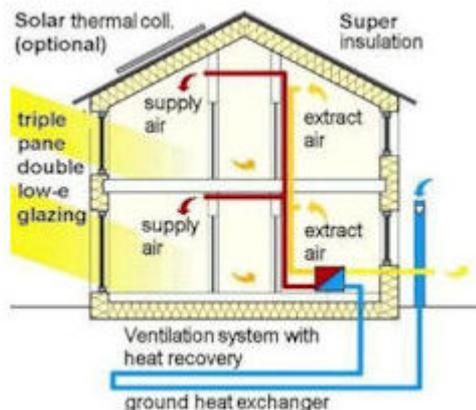


Image from the BRE web site explaining the Passivhaus system

Eco-homes are working - but in some instances perhaps too well. A headline in the Times reports "Residents roast in eco-homes' greenhouse effect". They go on to report that houses built to modern standards, and particularly the German Passivhaus standard, can cut heating bills by 90%, but at a cost. Temperatures rose above 25 °C in the summer and were uncomfortable for the occupiers who were unable to cool them using the ventilation systems.

This becomes even more relevant given the planned changes to the Building Regulations which aim to have all new homes complying with this standard from 2020. The study was undertaken by researchers at Coventry University. The Building Research Establishment have launched a project to examine the problem.

