

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



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February 2013

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NEXT MONTH

Amended Risk Models – Taking
Account of Local Authority Housing.
InterTeQ – monitoring data from a
treatment site.

Ash Die Back Disease

Chalara fraxinea

The Forestry Commission are asking for members of the public to notify them of any trees with this disease. Symptoms and further information is available on their web site at <http://www.forestry.gov.uk/chalara> for further information. They advise that "The disease causes leaf loss and crown dieback in affected trees, and usually leads to tree death"

Hortlink II

Jim Smith and Neil Curling have secured funding from the Forestry Commission and the ABI respectively and the next stage is a meeting to agree the project method and timeframe.

The meeting is to be held on Friday, 8th February 2013, chaired by Jim Smith at the London offices of Freeth Cartwright.

The CRG hope to assist by identifying 'hot spots' to target the area of research in association with Local Authorities. OCA have already agreed to release their extensive tree database of claims dating from 2003.

MatLab Training Day

Monday, 28th January 2013.

An excellent turn-out and an enjoyable day held at the Civic Centre, Sutton, London.

Clive Richardson gave the opening talk, explaining that not all cracks are due to subsidence.

Nic Harrison from MatLab followed, outlining the various tests and revealing details of their new suction sensor that promises to deliver reliable results quickly.

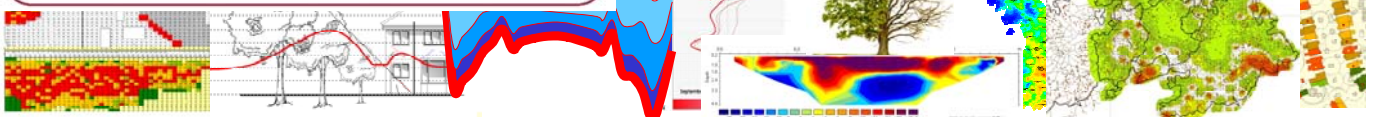
Accenture outlined their work on remote monitoring. Something the industry has been looking at for many years but with little success so far. Accenture hope to change this.

Finally Sne Patel and Neil Crawford gave a staged production of the problems we all encounter when dealing with trees, and how we might work together to avoid the delay and costs associated with the disputes that sometimes arise.

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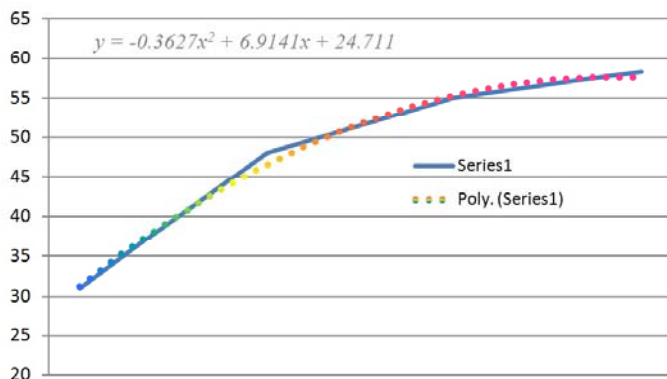
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Event Years and Climate Change

Modelling Claim Numbers

Modelling claim numbers against temperature and hours of sunshine for normal and surge years suggests that initial views on the risk of ever increasing claim numbers associated with Climate Change might be pessimistic.

Instead (see graph below), the relationship between increasing temperatures and decreasing precipitation when plotted against claim numbers ('y' scale below x 1,000) suggests claims might peak at around 60,000 p.a.



Increasing Temperature and Decreasing Precipitation

Graph plotting claim numbers ('y' axis) against climate ('x' axis) for various years.

This would still produce an annual loss of something like £500m at today's figures. That loss could continue year on year, as opposed to the current irregular return period.

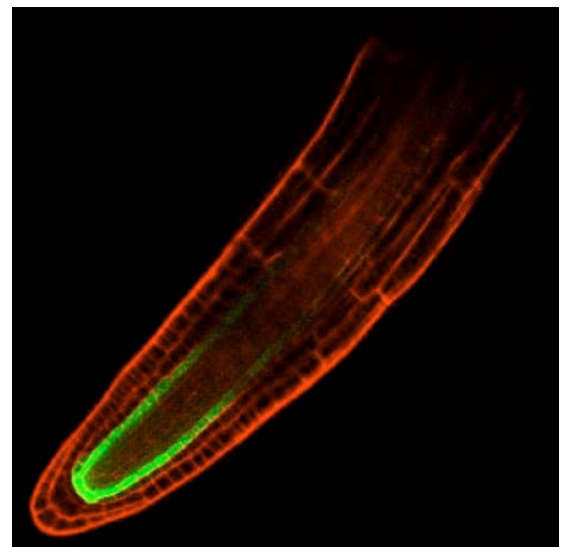
In fact this scenario seems unlikely. Increased precipitation accompanying climate change suggests that claim numbers could reduce significantly, as we have seen in 2011 and 2012.

Salt, Roots & Hormones

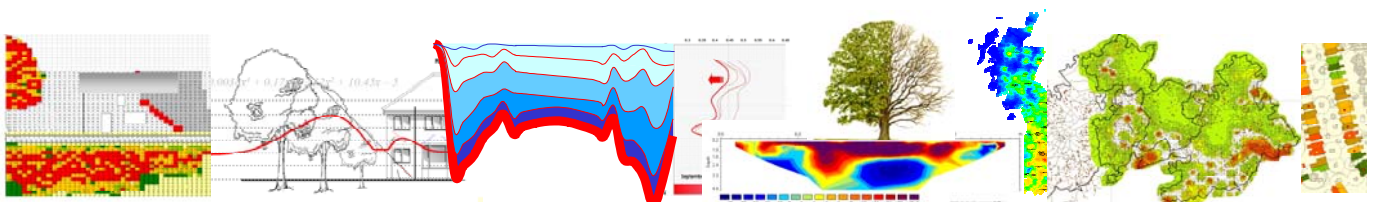
The effect of salt on roots has been demonstrated by scientists from the Carnegie Institution in a paper by Duan, L *et al*, entitled "Endodermal ABA Signalling Promotes Lateral Root Quiescence during Salt Stress in Arabidopsis Seedlings." The Plant Cell, 2013.

The team discovered that an inner layer of tissue (the endodermis) in the branching roots that anchor the plant is sensitive to salt and activates a stress hormone, Abscisic Acid.

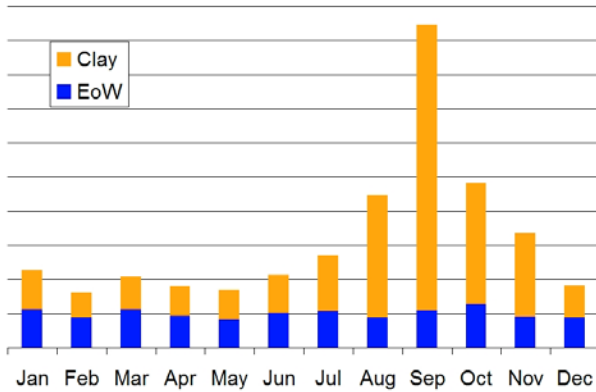
Apparently, the combined effect – i.e. root sensitivity and the subsequent trigger of the stress hormone – stops root elongation.



"Our results mean that in addition to acting as a filter for substances in the soil, the endodermis also acts as a guard, with Abscisic Acid, to prevent a plant from growing in dangerous environments," explained one of the authors.



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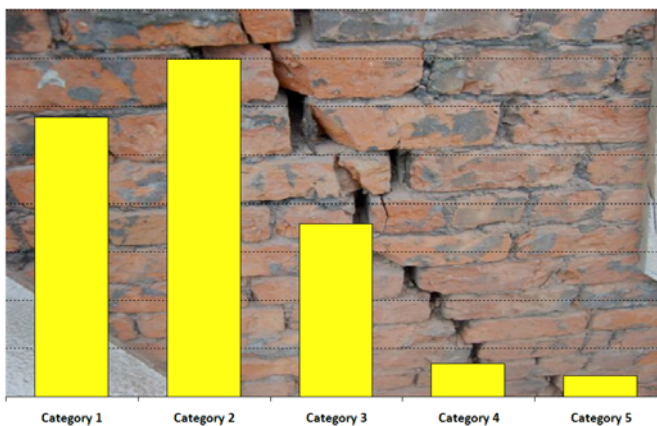
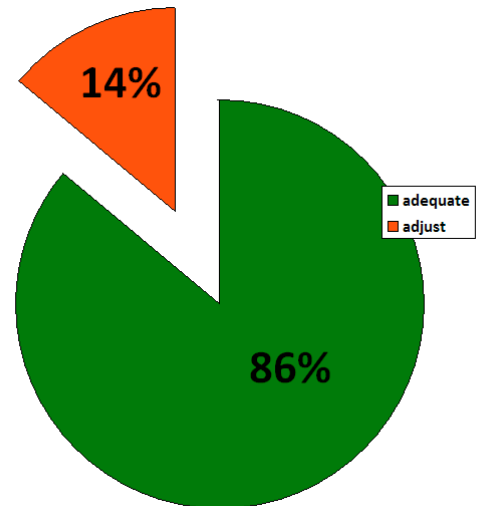


By Month and by Peril.

The combination of notifications taken from last months edition produces the graph left, with increases in August, September and October, reflecting a five year claims sample, including one event year.

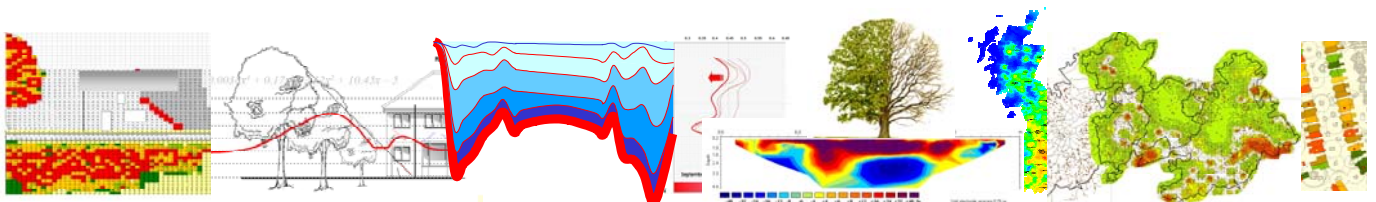
Adequacy of Sum Insured.

14% of cases from a sample of 15,000 claims required adjustment to the Sum Insured. Of those claims that required an increase, the average figure was in excess of £27,000. The average (pre-adjusted) Sum Insured was £120,000, suggesting that the 14% of claims notified (including repudiations) were under-insured by 18% - on average.



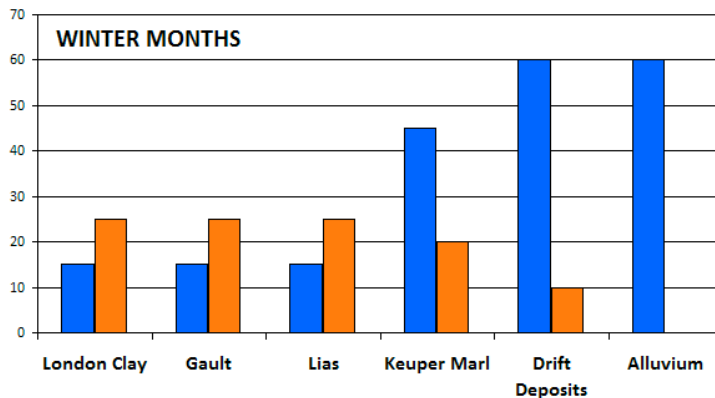
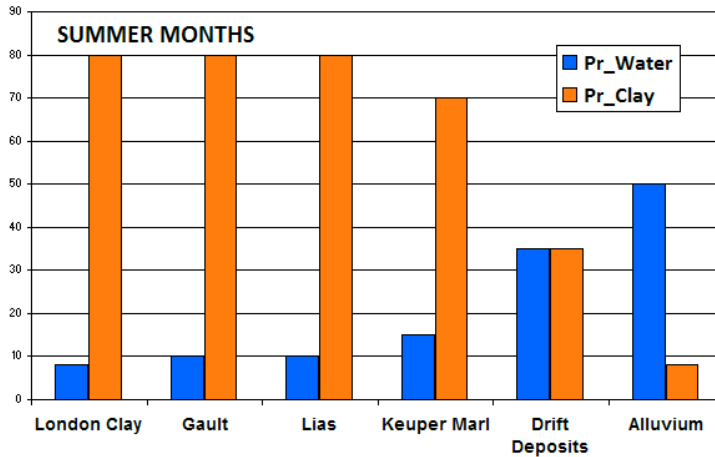
Cracks by BRE Category.

The majority of damage is minor, even in the case of valid claims, and the suggestion in BRE Digest 251 is that the most suitable repair might not be major strengthening or underpinning, but filling the cracks and decorating, which would apply to the majority of cases. Assuming of course that the cause has been dealt with.



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Peril by Geology – Analysis of Valid Claims by Season - 1995



1995 was a busy year for subsidence claims.

The bar graph, top left, plots claims experience in the summer months on several soil types.

It reveals the difference in valid claims between clay shrinkage and those associated with an escape of water (EoW).

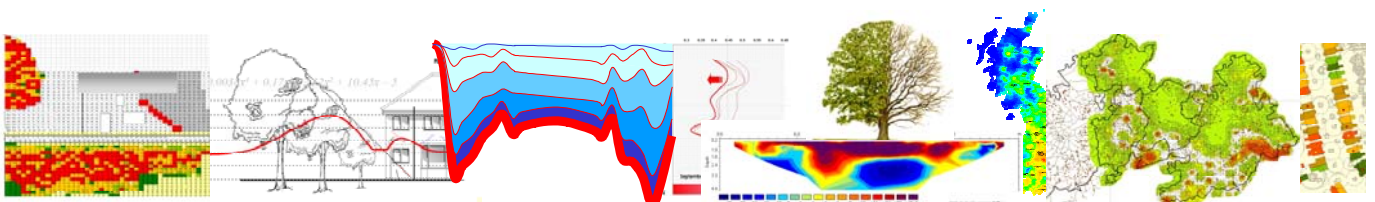
For example, the probability of a valid claim being due to clay shrinkage in the summer of 1995, on London clay, is 80%.

This compares with a probability of 8% for EoW. In the winter months, the difference is far less – see bottom graph.

Clearly if the soil was homogenous and without imperfection, we would only register clay shrinkage claims on the clay series. The data are a reflection of variability. The exceptions might be localised erosion due to foundations on fill, misdiagnosis or local geological variations.

On Drift with a clay fraction (Boulder clays for example), the chances of a claim being clay shrinkage or EoW are even, and in the case of Alluvial soils, it is far less likely as one would expect and the value reduces to something like 0.16. Again this could be due to localised variations in the geology, misdiagnosis or lowering of the water table by root activity resulting in nominal settlement.

From a systems point of view and designing Triage applications, this analysis helps in arriving at “the probability of ‘x’ is ... type statements.

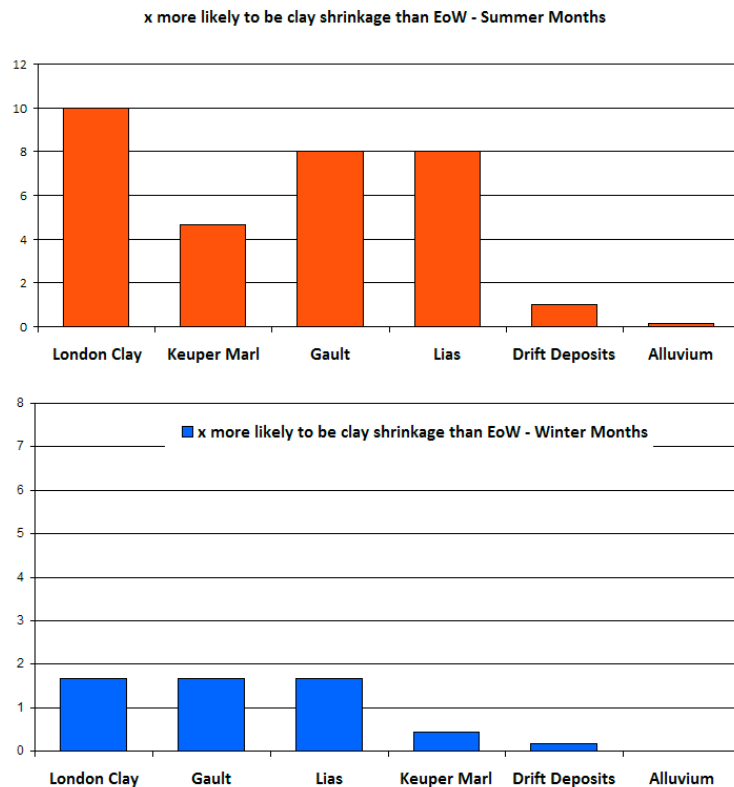


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Increased Risk on Clay Soils - 1995

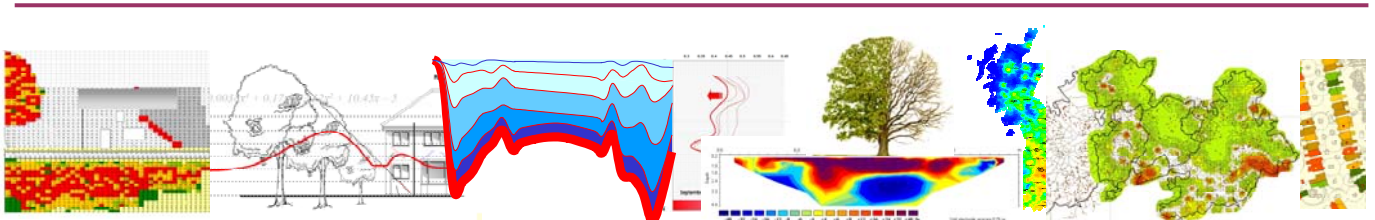
Looking at the same data in a slightly different way, the graph below illustrates the 'times more likely' for clay shrinkage than EoW claims for a variety of soils.

In the summer of 1995, on London clay, the prospect of a claim being due to clay shrinkage was 10 times that of EoW.



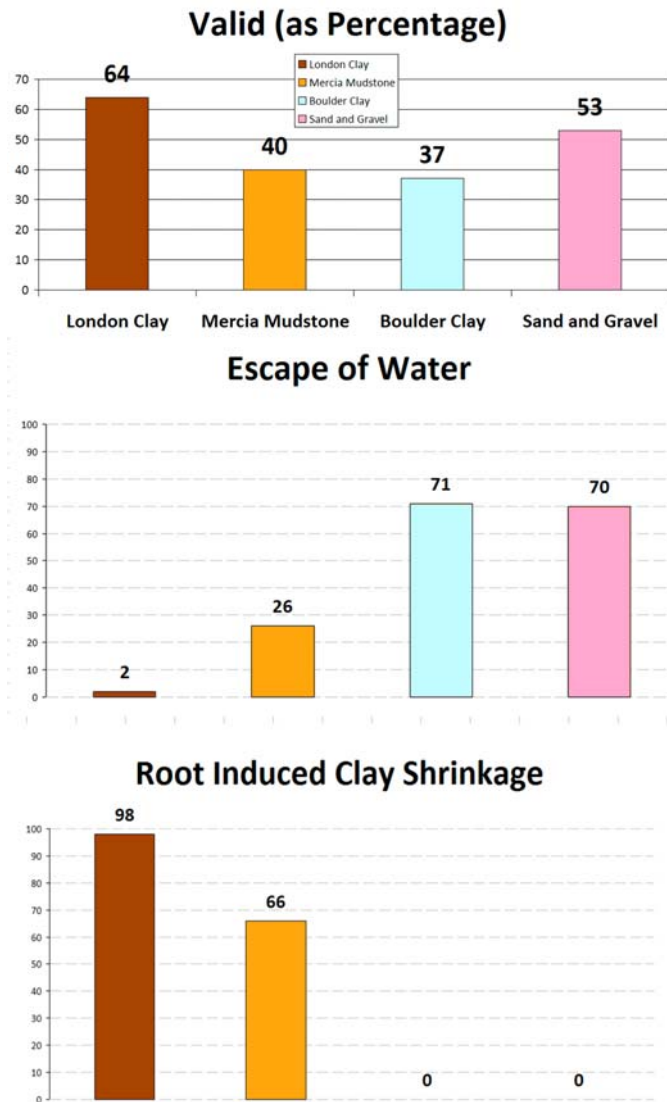
In the winter, the likelihood of the claim being clay shrinkage was 1.5 times more likely than EoW.

In the lower graph, the prospect of the claim being clay shrinkage in, for example, Mercia Mudstone is 0.4, suggesting that in the winter at least, drains and leaking services etc., were riskier and indicating the variability of this series at shallow depth.



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Increased Risk on Clay Soils - 1995



A small sample from a five year database (including one surge year), selected by plotting claims onto the 1:50,000 scale BGS map and selecting those on a specified geological series.

Top graph, 64% of claims on London Clay are likely to be valid, compared with 40% of claims on Mercia mudstones series. 53% of claims on sands and gravels are likely to be valid, and 37% on Boulder clay.

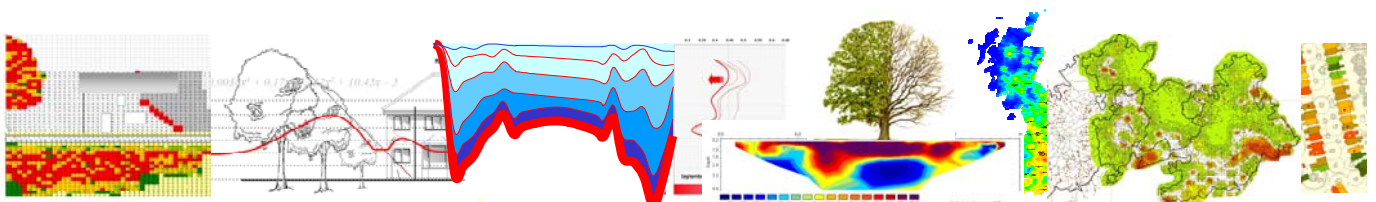
The middle graph shows the probability of any valid claim being caused by water escaping from drains or water services, on the geological series from the graph above.

EoW is unlikely to be the cause of damage in the London clay series for example, but very likely to be responsible on Alluvial soils and Boulder clays.

Conversely, root induced clay shrinkage is (as the name implies), responsible for around 98% of claims in the London clay series, and 66% on the less shrinkable Mercia mudstones.

The figures exclude 'other perils' – heave, sulphates, landslip etc., - and may not total 100%. They reflect a small sample taken from North West London and the Midlands – not the UK.

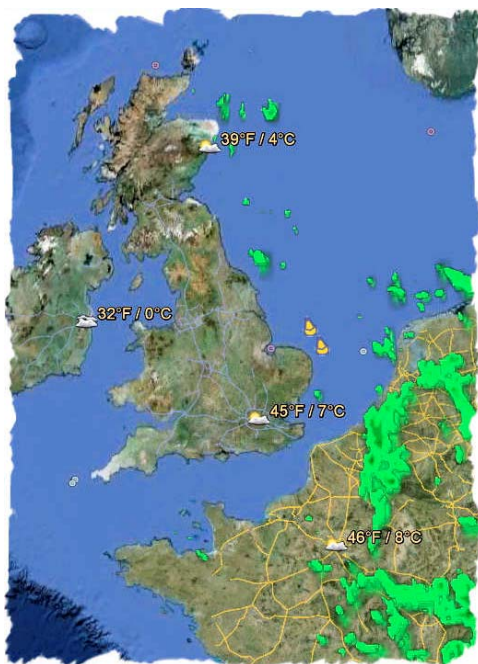
Interesting from a claims point of view, and confirms the value of the BGS mapping at this scale.



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Web Sites

Google Earth have added the facility to check rainfall, 'live' on their web application. After opening Google Earth, check the 'weather' and 'radar' buttons to the bottom left of the screen to see what is happening anywhere in the world. The data is updated every 5 or 6 minutes.



Rainfall is shown green on the above image taken from Google Earth. It is also possible to view temperatures etc.

WWII Bomb Sites

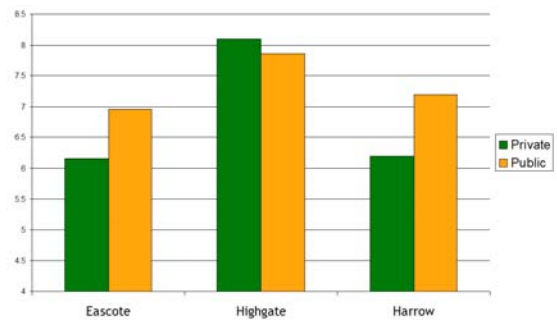
Our thanks to Jon Heuch for bringing the following web site to our attention. The site plots the location of bombs that were dropped on London in WWII.

<http://bombsight.org/#14/51.5050/-0.0900>

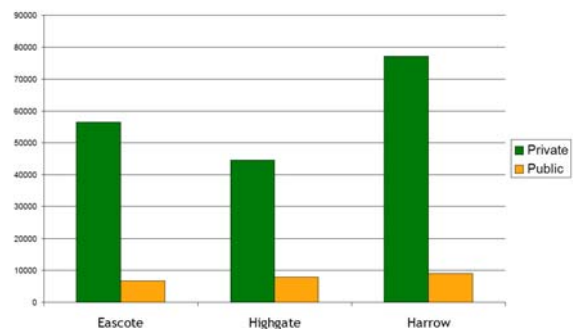
TREE DATA

The data below, have been plotted from our LiDAR database. Top, the mean height of trees in both public and private ownership, by district.

Trees in Highgate are a little taller (on average) than in Eastcote or Harrow. Private trees are slightly taller than those in the ownership of the Council.



Sample 'Mean Height of Tree' from 5km Grid



Sample 'Count of Tree' from 5km Grid

square sample in the 3 Districts. Harrow has more than the others, and the number of trees in Council ownership is far less than privately owned trees.

Which Borough is the riskiest, and does the score relate to the tree metrics? Does the height of trees influence risk, or the count?

