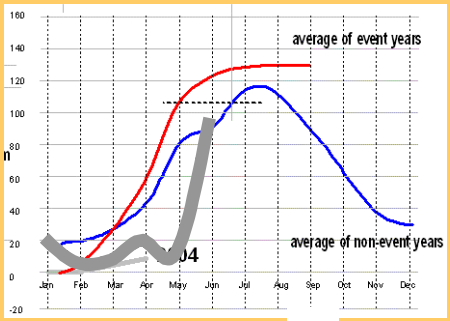
Newsletter of The Clay Research Group

July 2006.

Monthly Bulletin of **The Clay Research Group**

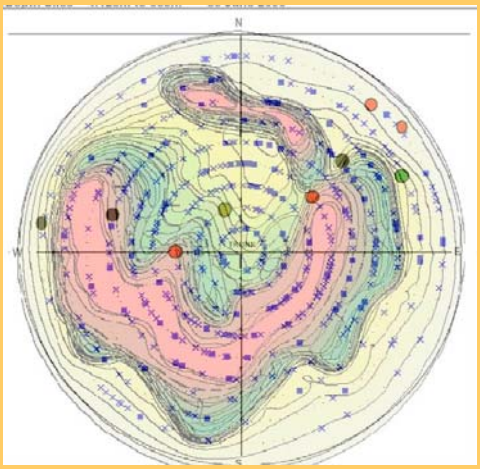
## WEATHER

The prediction using statistical techniques suggests 2006 will not be an event year, although it is hard to believe given the recent temperatures and humidity. We are studying the slope of the line against absolute values to further refine the model as necessary



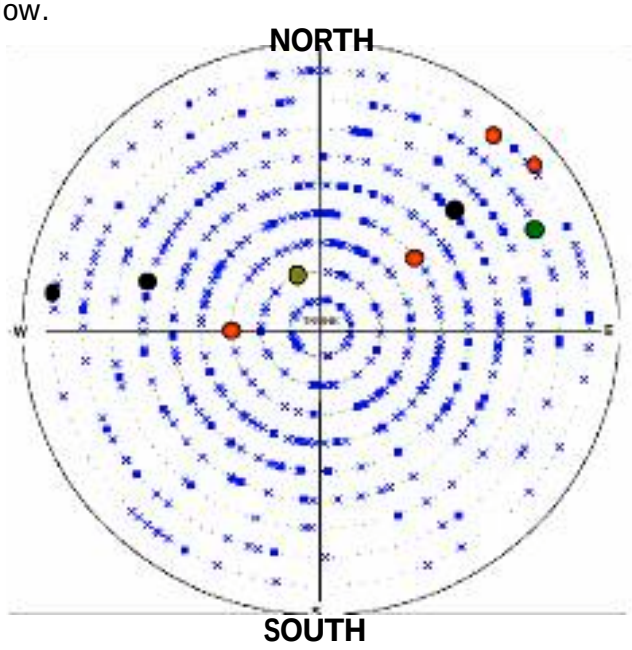

## ROOT IMAGING

As we gather data we hope to see correlations between the various datasets and here we have superimposed Jon's root radar image onto an earlier ERT simulation to show what we are aiming to achieve.

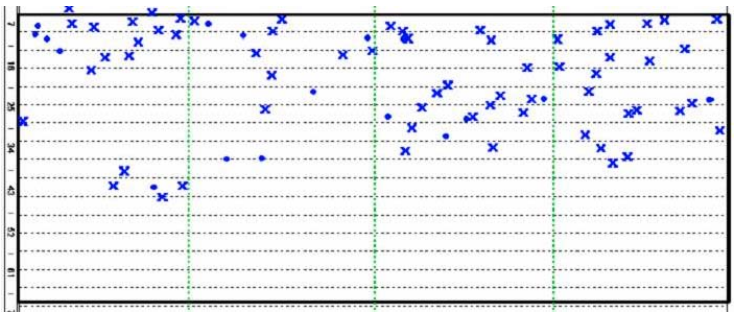


# Root Imaging

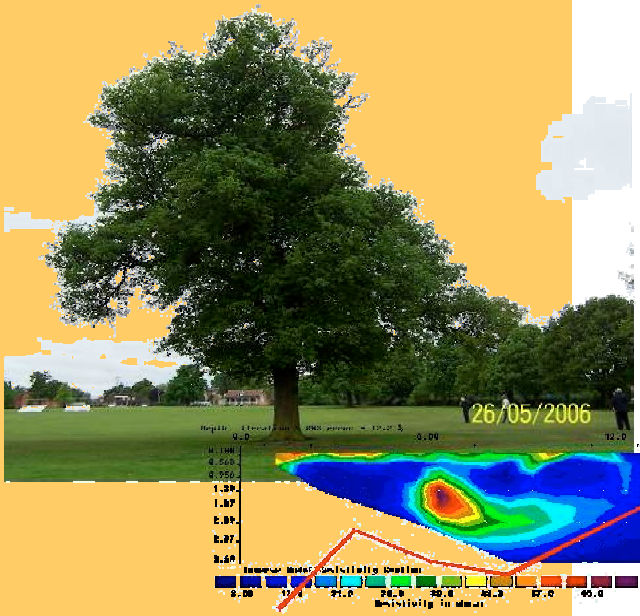
Jon Heuch of Duramen Consulting visited the site in June, to image the root system using radar. The assessment will be invaluable in correlating ERT values with ground movement with the presence (or absence) of roots. His initial scan is reproduced below.




Using interpretative software, Jon is able to create 'virtual sections' through the root zones, in four grids representing Norh, East, South and West. The image below shows where the large roots might be, and their depth below ground level.



We will be able to plot the root zone density against the other techniques to see if there is a pattern emerging.




## Preliminary Correlation

We have superimposed the precise level readings onto the ERT image to see how the two techniques compare and we see that ground has subsided in the vicinity of maximum drying in two locations.

Early days but the hot weather should help us define the value of the various tests we are undertaking.

At the moment we have the following instrumentation on site, or being installed. ERT cabling, precise levels, TDR moisture sensors, neutron probes, root imaging and the weather station.

We hope to add dynamic probing shortly.

## JULY PROGRAM

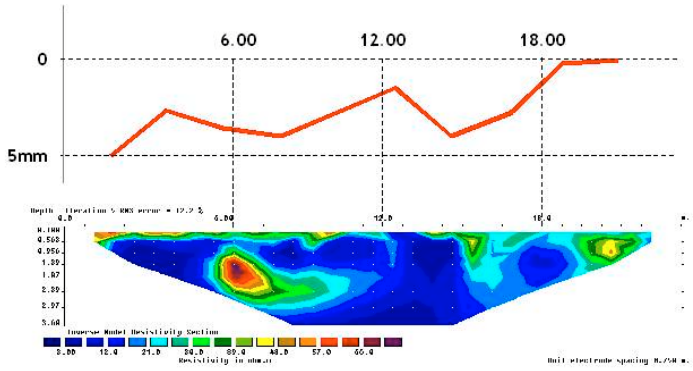
We have collected the TDR moisture sensors and hope to have these installed shortly, along with the datalogger to receive and transmit information from site via the web.

Southampton will be installing the neutron probe tubes and taking the first readings.

Our programmers are working on automating the interpretation of data from the electrolevels and moisture sensors to build a diagnostic application that will be web based. This will be using 'fuzzy pattern matching' to get the best fit in terms of profile, rather than units of measurement.

Our plans to treat the ground are now well advanced – more details shortly.

This has all been supplemented with soil testing. See the following page for the initial results from bores sunk in May.




Note the good correlation between the precise levels and the images with the ground dipping in response to soil drying.

This work will help subsidence engineers understand how moisture moves in fine grain soils in response to root activity and we hope to produce a moving slideshow for training purposes at the end of the year.

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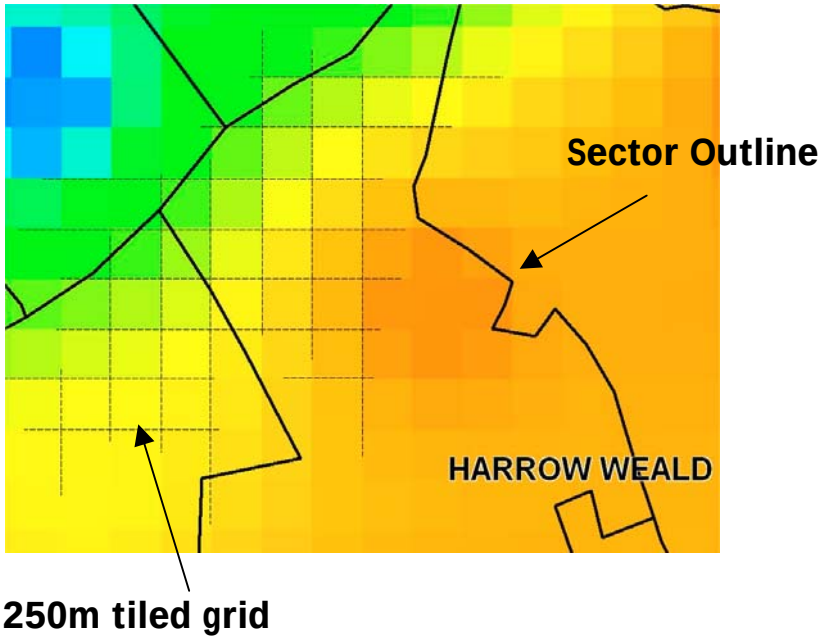
## Risk Mapping

We have developed an entirely new geology for Addressology which further refines their understanding of risk. The coloured image shows the shrink/swell properties of the underlying clay, and we have produced a 250m square tiled grid superimposed onto the more traditional postcode sector outlines (bold) to show the benefit.

These, and related developments, hopefully demonstrate the practical value to the industry of the work being undertaken by The Clay Research Group.

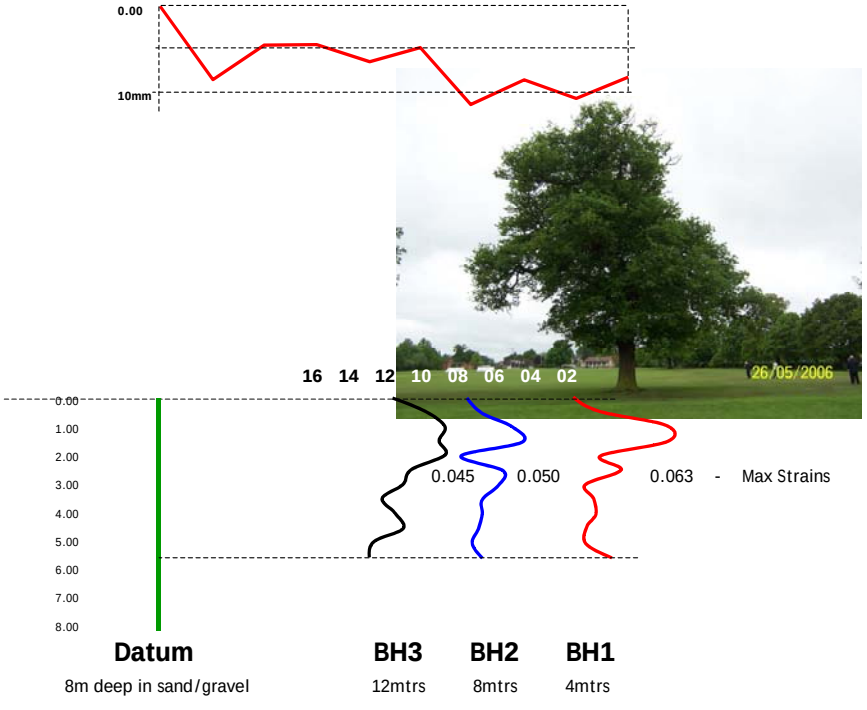



## BOREHOLES

Soils testing has produced some interesting data. BH1 (red line) is driest, and is closest to the tree and boreholes 2 and 3 are further away, at 8m and 12m respectively.

The datum (vertical green line) is well clear and has been sunk 8mtrs into a gravel band of Bracklesham Beds. No soil testing here given the granular nature of the soil, and this also acts as the datum for the precise levels.

The precise levels are shown at the top of the picture and the ground sinks as it gets nearer the tree as we would expect.



## Sampling & Soil Testing Techniques

We have retrieved disturbed samples and tested them using both the filter paper soil suction technique and oedometer test. The solid red line – see right - is the oedometer and the suction test is the red broken red line.

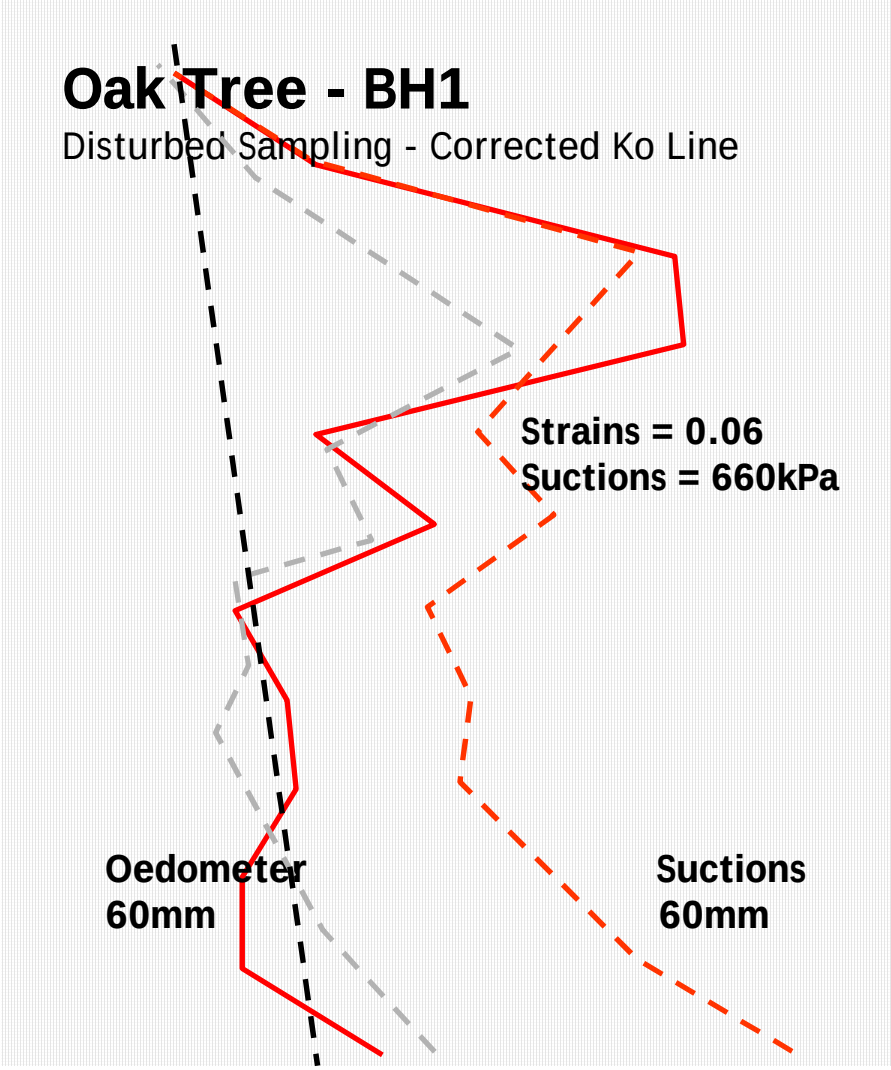
By adjusting the Ko line to a sensible position (with the suction plotted as the grey broken line) we see a close correlation between the two sets of readings.

Both record a maximum bulge at between 1 – 2mtrs bGL, reducing with depth.

The estimate of swell are in agreement. In BH1 they are around 60mm.

If there is a difference it is the fact we do not have to compensate for the Ko line using the oedometer, whereas we do using the filter paper technique but disturbance doesn't seem to make a significant difference.

The estimates of heave do not correspond directly with the precise levels of course, because we have a persistent moisture deficit and the only way to verify if the estimate is correct would be to fell the tree!

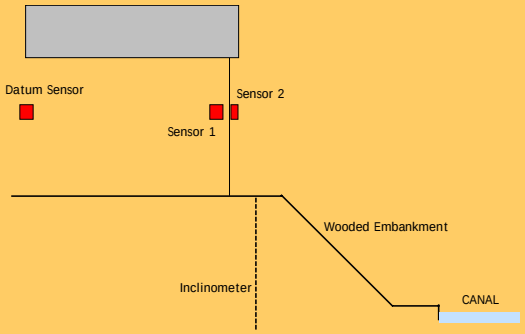



## Sample Disturbance

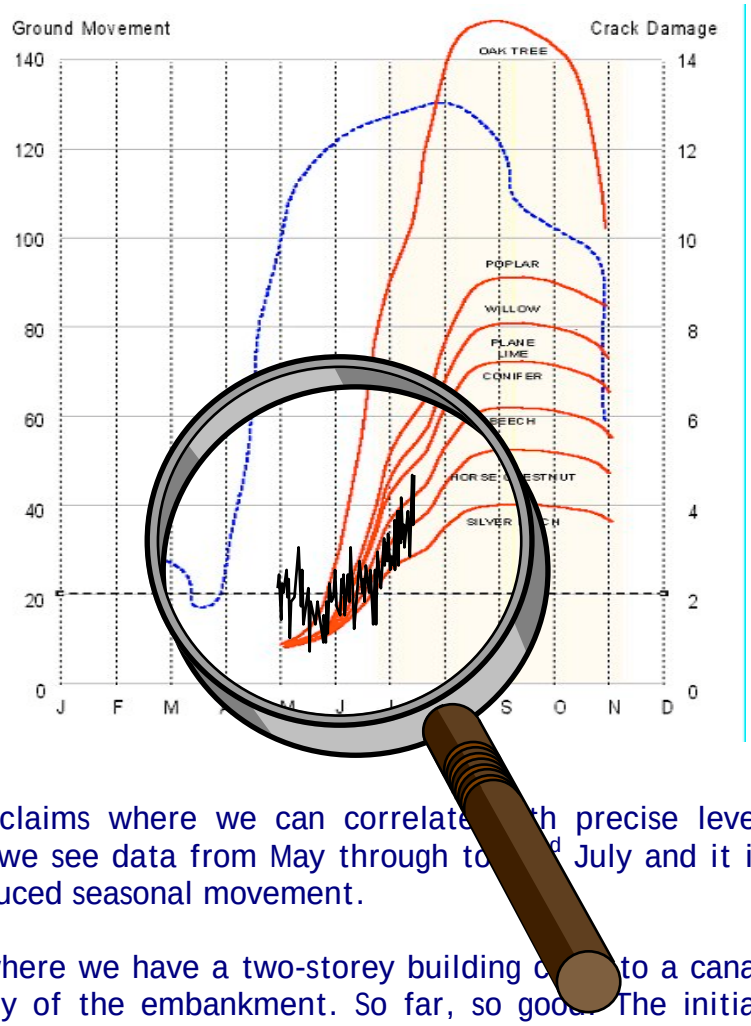
Hand augering is an economic and efficient method of retrieving soil samples. In September we hope to compare the results from disturbed and non-disturbed sampling using the oedometer test.

## The Claim

Issue 9 showed the sensor location, and the plot below relates to Sensor 2.



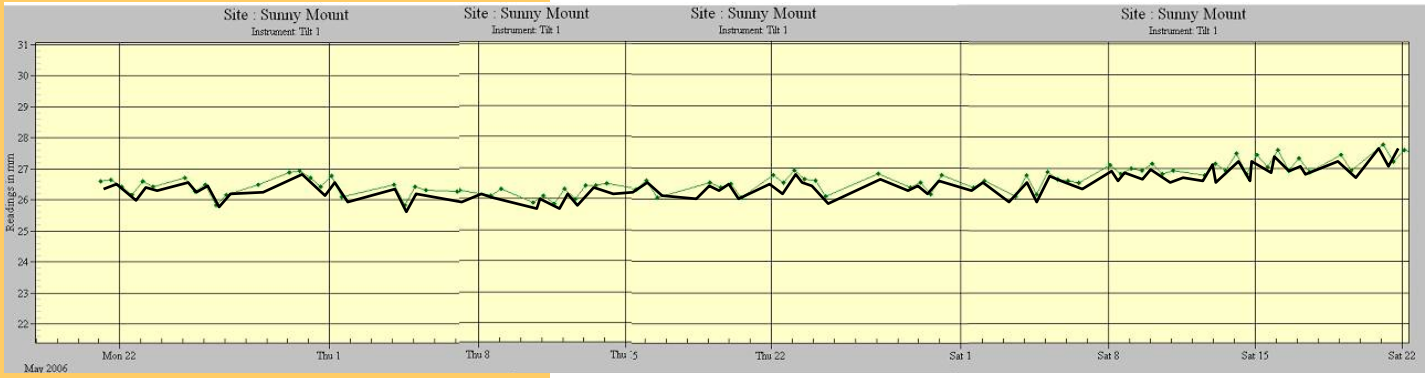

The clockwise direction tells us the rear wall has moved outward by just over 1mm between May and July.




## ElectroLevel Sensors

We are validating electrolevels on actual claims where we can correlate with precise level readings and understand the output. Below we see data from May through to July and it is following the characteristic curve of root induced seasonal movement.

This is the claim we outlined in Bulletin 9 where we have a two-storey building close to a canal and there was a concern about the stability of the embankment. So far, so good. The initial results suggest we have a problem, but possibly not with the embankment.




Telemetry is ideal for this sort of claim where we need long-term data (possibly over several years) and the cost of going to site every few months would be prohibitive.. It is also useful where we need to keep an eye on the structure given its circumstances and the fact it is occupied.