Leaking Drains the Real Cause of Subsidence Damage

A personal view by Jeremy Johnson of Johnson Austin Partnership LLP

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This is an updated account of how I believe subsidence damage occurs, following on from a presentation to the London Insurance Officers Group in 2005 and a presentation to the London Tree Officers Association October 2006.

I have investigated many claims of subsidence and alleged tree root nuisance following and since the exceptionally hot and dry summer and autumn 2003. The weather conditions of 2003 resulted in a significant increase in the number of subsidence claims made against Tree Owners and Local Authorities. Trees alleged to have caused subsidence damage can be in adjoining or adjacent gardens, parks or the highway verge.

As a result of my investigations, I believe there is a common factor to all subsidence claims where trees have been implicated as causing nuisance and subsidence damage on clay- based subsoils.

There are situations where a fairly innocuous sized tree has apparently caused considerable subsidence damage. Conversely I have seen cases where there are very large deciduous trees close to buildings and there is no subsidence damage.

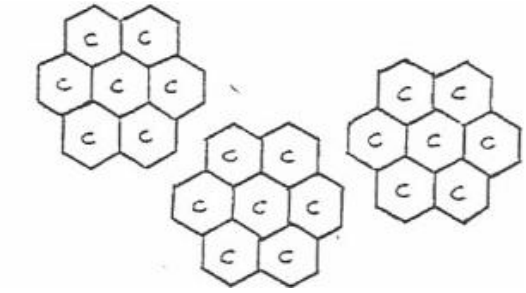
I believe the real cause of subsidence damage, where tree roots are implicated is leaking drains. In every single subsidence claim I have investigated, where a tree has been implicated as the cause of subsidence, I have found a drain or some other water containing vessel to be in very close proximity to the area of damage.

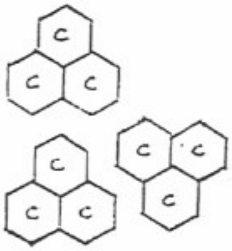
Looking at this from a slightly different perspective, where there is a building with trees nearby and there are no drains and no other artificial accumulation of water, there is usually no subsidence!!

There follows a very basic illustration and an explanation so one can visualise where leaking drains are likely to be causing unnatural root growth.

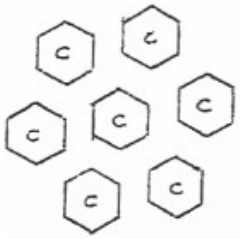
The effect of an over-wet clay subsoil.

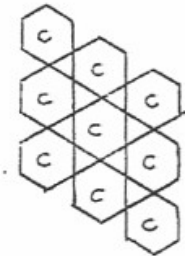
The optimum moisture content of London Clay is approximately 32% (see below left). If the moisture content of London Clay is increased to approximately 42%, the London Clay particles have more water around them (see below right).





If the moisture content of London Clay is increased to approximately 55%, the London Clay particles have even more water around them (see below left). The subsoil volume has increased again and decreased in density. If the moisture content of London Clay is decreased from 55% to 25%, the subsoil decreases in volume significantly (see below right).



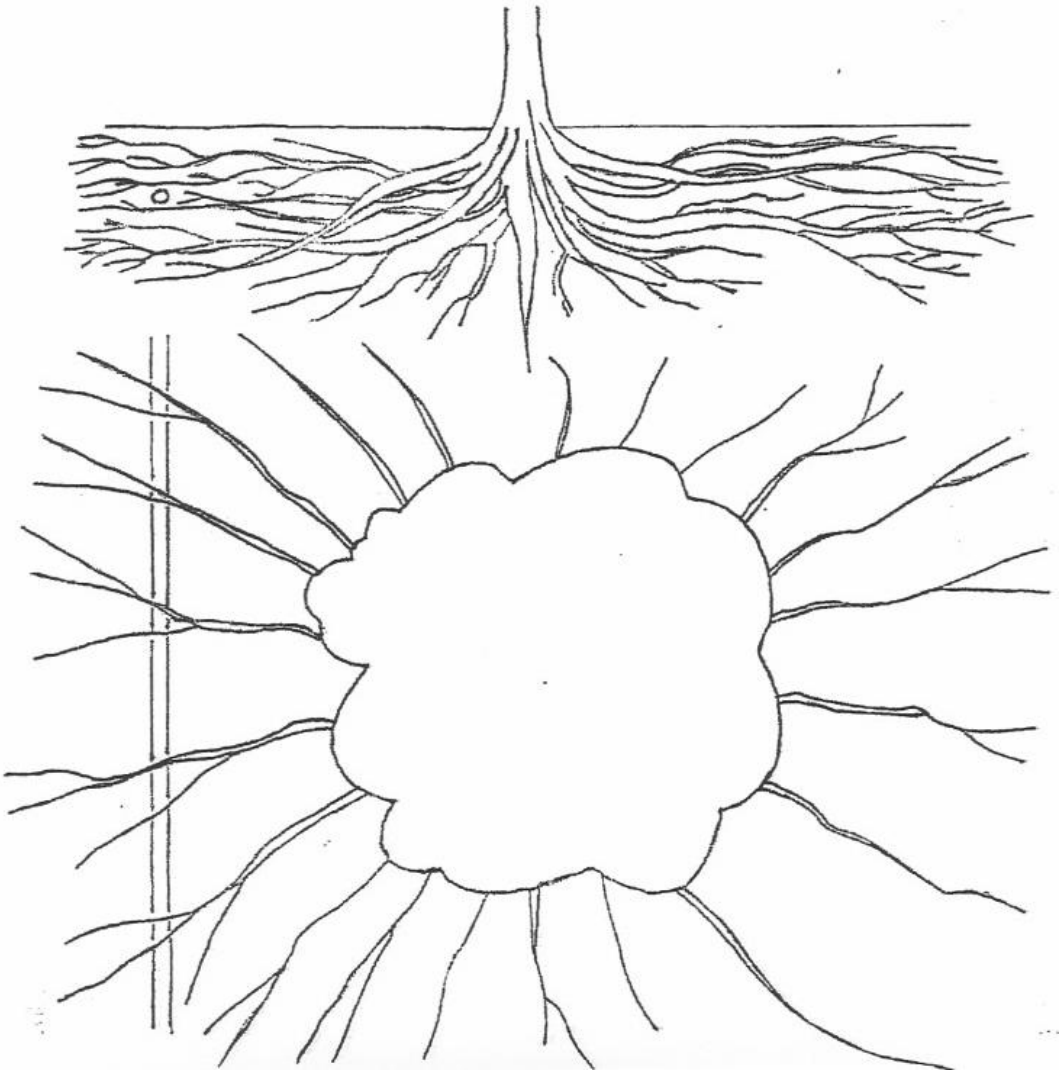


Two-dimensionally, a reduction in moisture content from 32% to 25% represents approximately a 7% reduction in subsoil volume. Whereas, a reduction in moisture content from 55% to 25% represents over a 30% reduction in subsoil volume. I believe this degree of subsoil shrinkage would have dramatic results.

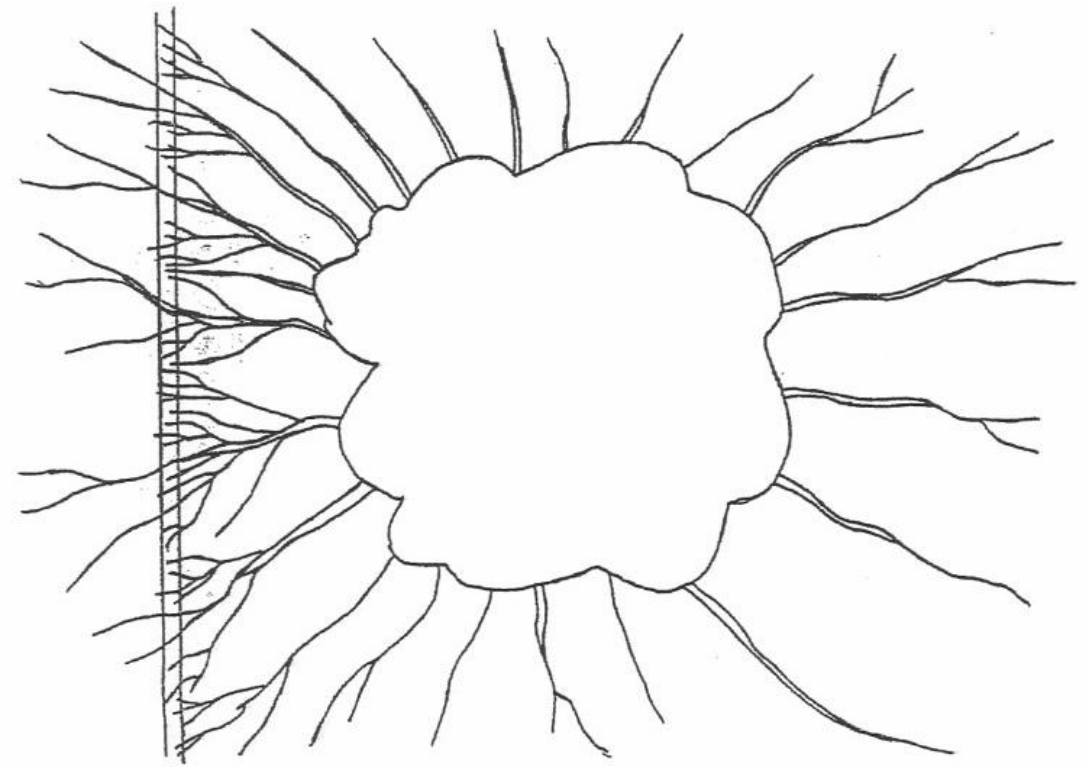
I consider the basic illustration above of the over-wet state of London Clay and other clay based subsoils is representative of the condition of the subsoil below leaking drains generally after the Winter and before the Summer months.

The interaction of leaking drains and tree roots

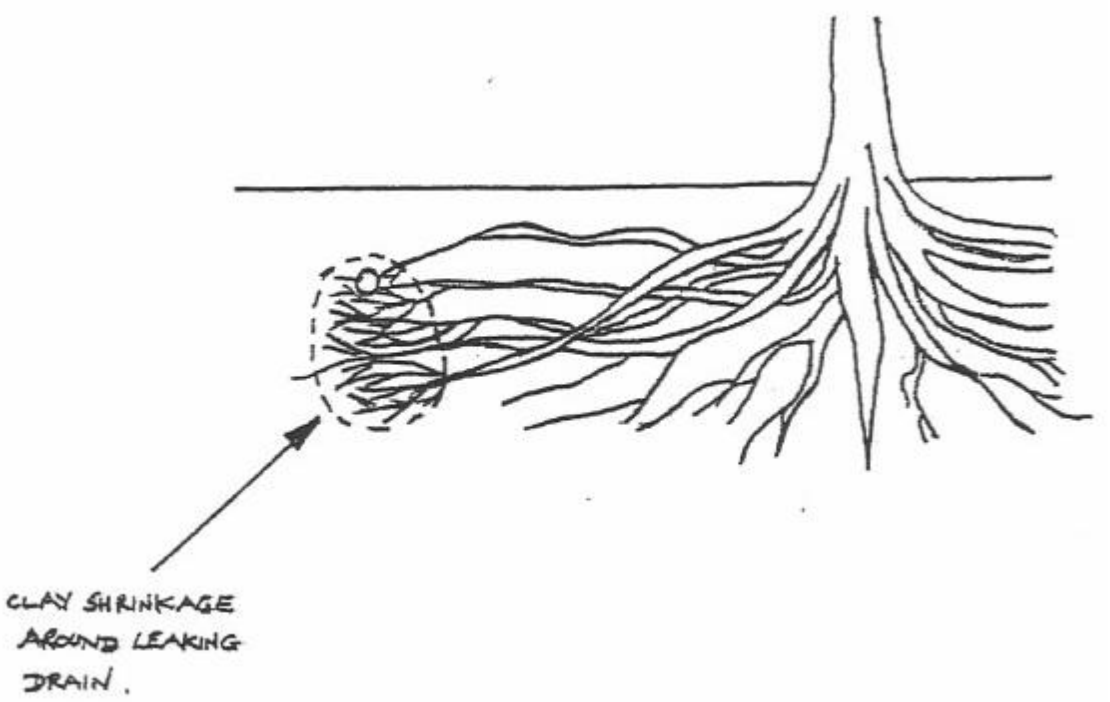
Now consider a drain passing through the Feeding Roots of a tree. Assume the drain to have no leaks. The location of the drain would have no effect on the natural growth of the Feeding Roots. If the drain was in the way, the Feeding Roots would simply grow around the drain and carry on growing laterally.



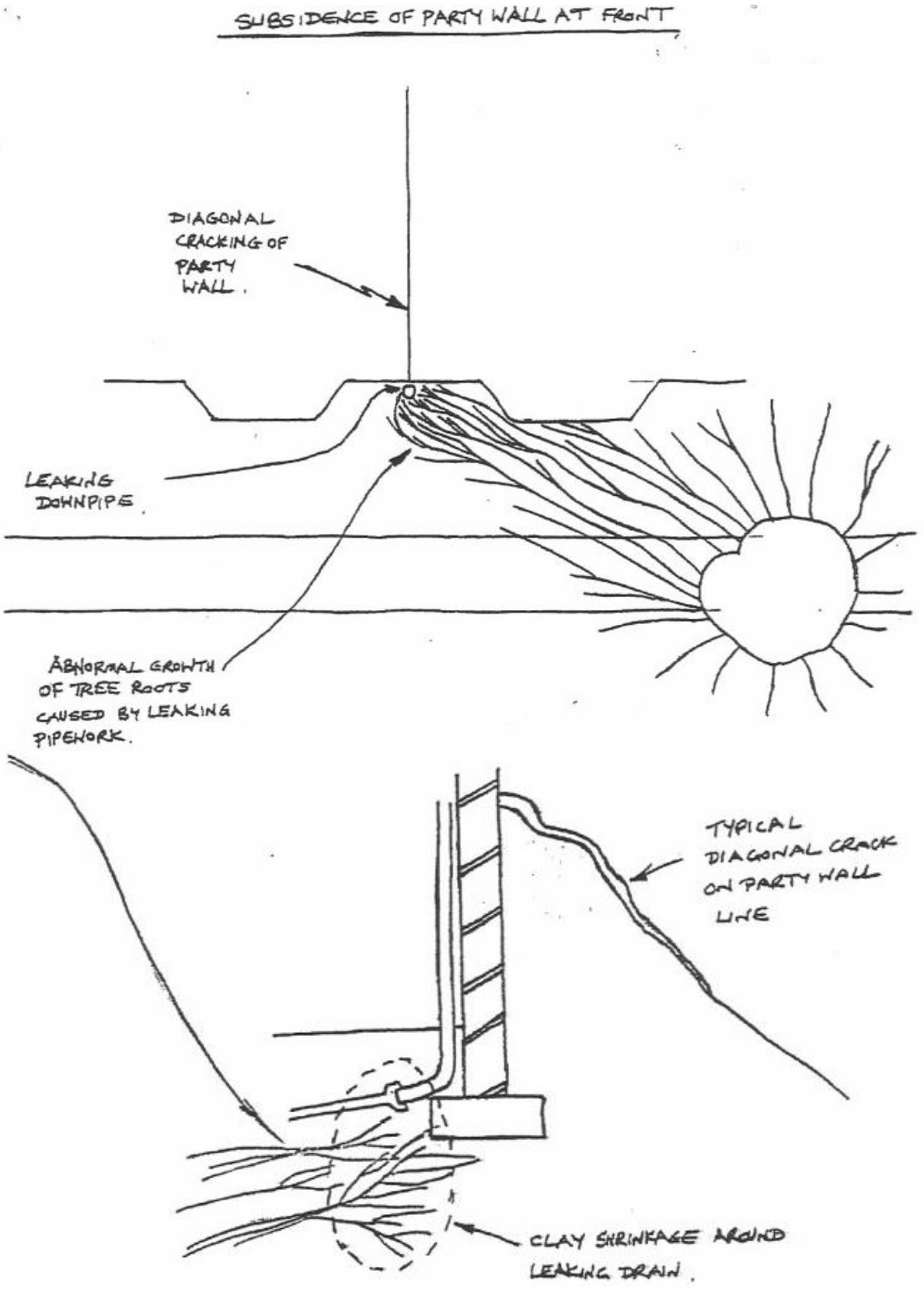
Now consider the drain passing through the Feeding Roots where leakage is occurring. If the drain has been leaking into the subsoil for many years this has an effect on the growth of the Feeding Roots. The roots would congregate in the vicinity of the leaking drain to exploit the increased moisture content of the subsoil. The moisture content of the subsoil in the vicinity of the leaking drains could be as high as 60%. With sufficient water passing through the leaking drains and into the subsoil to satisfy the demands of the Feeding Roots, there is no damage to clay subsoils. This point in time would be generally analogous to the spring months or when there has been a particular wet Summer.



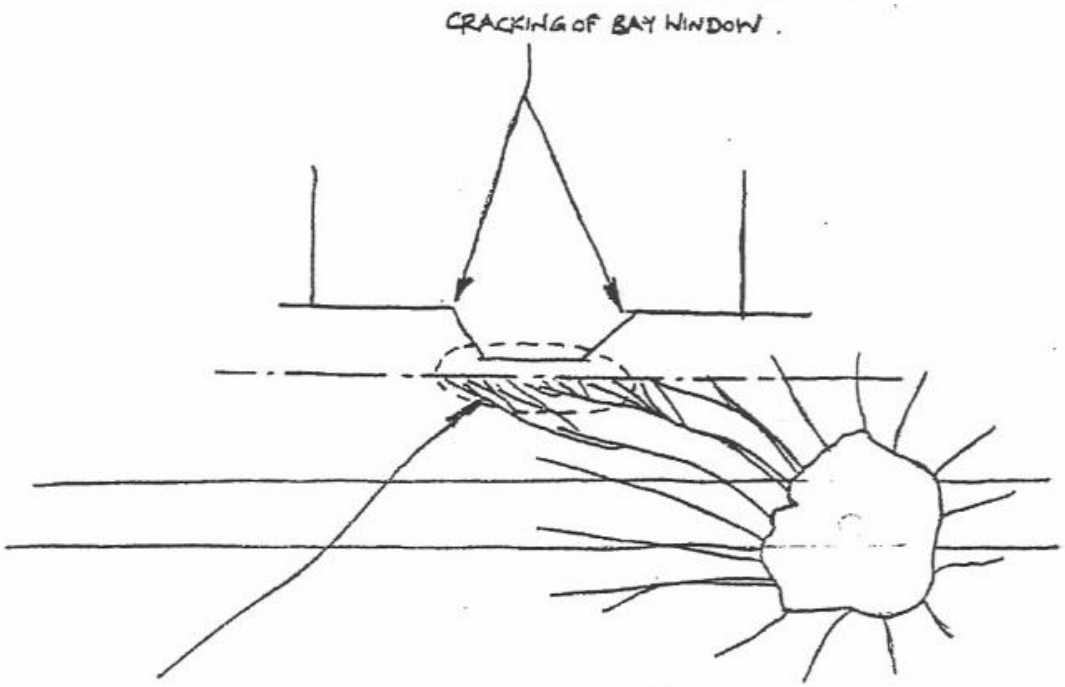
If the supply of water from the leaking drain dries up, the leakage into the subsoil would then stop. As the Feeding Roots that had relied upon the leakage from the drain for so long are congregated in the vicinity of the drain, the Feeding Roots attempt to extract as much moisture from the subsoil as possible, to keep pace with the supply they previously had from the plentiful leaking drain. In a clay subsoil, over-extraction of moisture would lead to exceptional localised shrinkage of clay. This would be analogous to a dry Summer and Autumn.

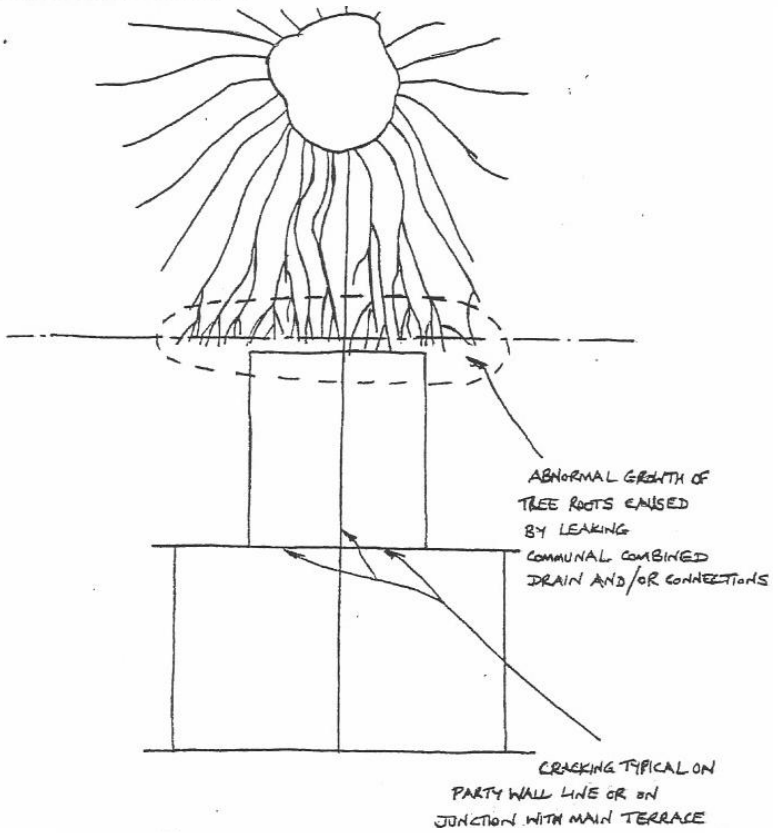


We need to apply the foregoing theories to real life situations.


SUBSIDENCE OF PARTY WALL AT FRONT
DIAGONAL CRACKING OF PARTY WALL.
LEAKING DOWNPIPE.
ABNORMAL GROWTH OF TREE ROOTS CAUSED BY LEAKING PIPEWORK.
TYPICAL DIAGONAL CRACK ON PARTY WALL LINE
CLAY SHRINKAGE AROUND LEAKING DRAIN.

SUBSIDENCE OF BAY WINDOW AT FRONT.





SUBSIDENCE OF REAR ADDITION

In summary, the primary cause of subsidence damage is leaking drains.

A clay-based subsoil, passing from an over-wet state in excess of 50% moisture content caused by leaking drains, to a greatly reduced moisture content of say 25%, undergoes significant shrinkage.

I believe that leaking drains are causing trees and shrubs to grow in an unnatural fashion. Leaking drains are having a similar effect to an underground irrigation system.

If Feeding Roots from a tree find a very good source of moisture this can lead to a tree growing or re-growing unnaturally quickly.

I believe the answer to subsidence problems associated with tree root nuisance is good tree management and pipe repair. I have come across many situations where drains have not been repaired following a previous subsidence claim, only for subsidence to occur again a few years later.

We need to put third party adjusters, third party owners and the relevant Statuary Undertakers for water disposal services on notice of the effect leaking drains have on root growth from trees and shrubs. If the relevant third party fails to rectify leaking drains, on the basis of my subsidence causation theory, the Tree Owner or Local Authority would be in a strong position to resist any future claims for subsidence damage which is alleged to have been caused by tree root nuisance.

I believe that the excessive removal of moisture from the subsoil by tree roots will only occur if there is an increase in subsoil moisture content in the first place. I believe roots from trees and shrubs are designed to collect water passing down through the subsoil. Roots would not normally congregate beneath buildings, due to a lack of rainfall passing down through the subsoil due to the footprint of the structure.

There are a number of legal aspects which should be reappraised.

Firstly, I believe the Foreseeability Test is too simple. How would a Tree Owner or Local Authority know if third party drains were leaking in the first place. Without knowing if the drains are leaking it would not be possible to foresee if subsidence damage would occur.

Secondly, I would suggest that tree roots ‘taking their victim as they find them’ is only correct up to a point: after a third party has been put on notice and made aware of leaking drains, they should take action to stop drain leakage. Recurring subsidence claims where the tree has been previously reduced, but the drains have not been repaired, could result in the loss of a tree, which would otherwise be retained and maintained.

I am not aware of any cases where adequate tree control and drain repair undertaken together have failed to prevent further subsidence damage.

Buildings Insurers must begin to realise that the repair of drains as accidental damage, will significantly reduce the risk of further subsidence damage occurring in the future at any given property.

Third party arboriculturalists have in the past referred to the Horticultural Link Project 212. This is a research project carried out on behalf of the Building Research Establishment. I believe the project delivered a final report May 2004. One of the conclusions of the project was that tree pruning was not an effective method of tree growth control. It was suggested that a pruned tree would grow back more vigorously than before.

I believe the report made no references to how tree roots grow and re-grow after pruning . The report did not make any connection between leaking drains and tree growth.

I feel that the report conclusions with regard to tree control are largely irrelevant to real life situations found in urban areas. For example, if a pruned tree still has Feeder Roots in the vicinity of a leaking drain, there would be a plentiful supply of moisture for rapid re-growth. However, if drains are repaired the spread of Feeder Roots through the subsoil would be more uniform and the rate of re-growth after pruning would be slower.

All my investigations into claims of tree root nuisance have been connected with third party properties and after subsidence damage has occurred. If we were able to investigate the condition of clay subsoils beneath foundations close to leaking drains during the spring and early summer months, we would find the subsoil to be locally over-wet before drying and shrinkage sometimes occurs in late summer as previously indicated in this report.

My theory of the real cause of subsidence damage has arisen purely as a result of my own investigations. It is supported by the sheer number of situations where the theory applies and fixing the cause has fixed the problem. My theory has also been supported by ultrasound root investigations.

If you have a leaking roof, you get it fixed .

If you have a leaking incoming water supply, foul or surface water drain, get it fixed .

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