**Date:** 11-Feb-25 13:11:15
**From:** [redacted]
**To:** [redacted]
**CC:** [redacted]
**Subject:** R[redacted], Insurer Claim Ref: 4502876646

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Hi Dyana,

Further to your recent email, please find my further comments below.

The mere presence of vegetation standing within influencing distance of a property, is not sufficient in itself to suggest that it is having any material influence on the property, nor that removal of that vegetation is necessary.

When considering the potential for vegetation (trees and perennial woody shrubs) to be extending roots proximate to a building, we consider a number of factors such as the species in question, maturity (overall 'mass' i.e height canopy spread etc), any previous pruning history, overall vitality (health), distance from the building and site topography.

Reference is also made to published guidance, most notably the '*Kew Tree Root Survey*' within Tree Roots and Building (Cutler & Richardson (1989)) will also be considered.

The above research provides data relating to tree rooting distance and incidents of subsidence damage involving various tree species; importantly this work was subsequently vindicated by MERCER, G, REEVES A E, & O'CALLAGHAN, D P (2011) in "*The Relationship between Trees, Distance to Buildings and Subsidence Events on Shrinkable Clay Soil*" Arboricultural. J 33 (4): 229-246 and O'CALLAGHAN, D P & MERCER, G (2019) in "*Tree-related risk to structures*" Journal of Building Survey, Appraisal & Valuation. Volume 8 Number 1: 38-52.

Only once we are satisfied that there is the *potential* for roots from any individual element of vegetation to be present at/below the property will *any* works be advocated to restore stable soil conditions (current claim works noted in table 6.1) or future risk mitigation advice, if necessary which will appear in table 6.2.

The anatomy, function and structure of tree root systems is widely understood (see Reynolds & Brown (1978), Coutts, (1983), Lawson, (2004) & Hirons & Thomas, (2018)) who all confirm that roots are a dynamic, hydraulic system, acting as a '*biological pump*' within the soil. A trees root system and its canopy are also intrinsically linked because the roots supply water and dissolved nutrients, up through the xylem system to the canopy where it is required to produce energy via photosynthesis; the water is essentially split and the Hydrogen molecules combined with Carbon (taken from Carbon Dioxide in the air) to form simply sugar (Ch4), Oxygen is released back into the air as a biproduct. The resultant stored energy (sugar) is then transported back down the tree (through phloem cells) to be converted / stored as starch within various cells (including those in the roots) and used to sustain growth and biological function.

Clearly then, the rate of photosynthesis (water loss) is completely dependent upon how much water can be supplied by the roots, hence why overall mass / species is of primary consideration when determining the likely role of vegetation in clay shrinkage subsidence damage; the larger the canopy (and tree) the larger the root system must be to support it; overall height is frequently not as important as overall mass (and species type / pruning history).

All trees, require water, air and nutrients in order to survive, the highest concentration of these elements will be in the upper soil horizons; therefore, it is generally advised that *up to* 90% of a trees root mass will be located in the upper 1m (3ft) of the soil.

Unfortunately, rooting depth has been greatly underestimated, see Canadell *et al.* (1996), Cutler *et al.* (1990), Crow (2005), Dobson (1995), Foxx *et al.* (1984), Fraser *et al.* (2020)), Gasson & Cutler (1990), Hirons & Thomas (2018) and Schnelle *et al.* (1989) who all highlight the fact that tree roots can/do exceed depths of >2m. Lawson, (2004) writes that '*subsidence investigations clearly suggest that tree species regularly root to depths greater than 3m',* much below 3m the soil is generally too dense and the conditions too anaerobic for significant root activity to occur (Barry, 2017); this corroborates the findings of Fraser *et al.* (2020).

A reasonably accurate depiction of a root system can be seen below; however, it must be noted that every tree is different and root zones will vary with factors such as soil type, tree health and climatic conditions, however a root spread of 1.25 x height would accord with that suggested by NHBC. Image: Richardson & Gale (1994), '*Tree Recognition'*

In this instance, we note that x2 Trial Pits were excavated at the subject property (please see below).

The Trial Pit (TP1) was hand excavated in order to reveal the foundation depth and specification and then a Borehole (BH1 & BH2) was sunk in order determine the nature of the subsoil.

Foundation depths in this instance are noted to extend to 500mm below ground level.

The physical characteristics of the soil were logged and in-situ testing was carried out to determine the Shear Strength and/or the Consolidation of the soils.

Soil samples are retrieved during the investigation process and analysed by a UKAS accredited Laboratory (to relevant BS, EN and ISO standards).

I note that *only* roots from the trees identified as being causal (T2, T4, T5, T6 & T7) i.e *Prunus spp., Fagus spp.* and *Acer spp.* were recovered below the advised area of damage, confirming that ONLY these trees are causal and that any other vegetation simply poses a future risk and does not need any management as part of the current claim.

Trust the above assists.

Kind regards,

Andrew

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Senior Arborist
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