

ADDENDUM ARBORICULTURAL REPORT

SUBSIDENCE CLAIM

Crawford Reference: [REDACTED]

2 Greenside

Crowthorne

Berkshire

RG45 6EX

Prepared for

AXA Retail

PO Box 7073, Willenhall, WV1 9ZW

Claim Reference [REDACTED]

15 November 2024



Crawford Claims Solutions – Subsidence

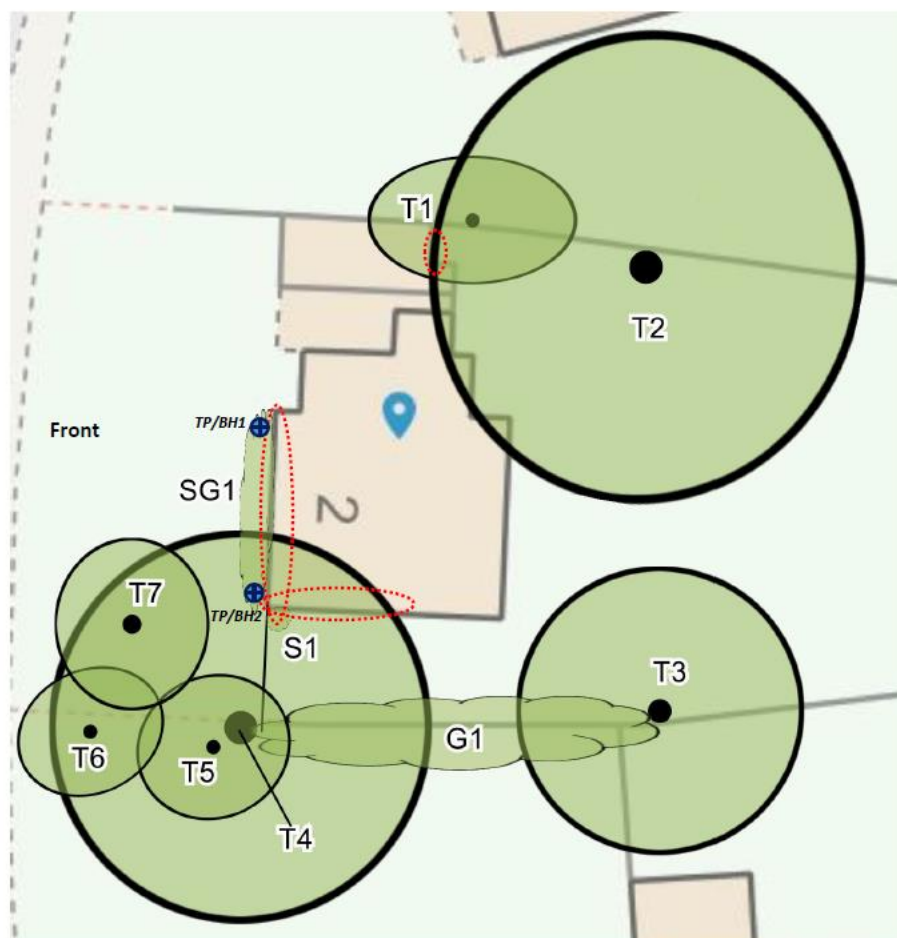
Cartwright House,

Tottle Road,

Riverside Business Park, Nottingham, NG2 1RT

Chartered Loss Adjusters

Site Plan



Plan not to scale – indicative only

 Approximate areas of damage

INTRODUCTION

We have been asked by insurers to comment on movement that has taken place to the above property. This report outlines the arboricultural issues and should be read in conjunction with our Technical Report dated 02 March 2023, the MWA Arboricultural Report dated 22/07/2024 and the site investigations including soil and root testing and level monitoring, which are summarised within this report.

TECHNICAL CIRCUMSTANCES

The damage was first noticed in July 2022 and hence Insurers were notified.

HISTORY & TIMESCALE

Date of Construction House Circa 1960's
 Damage First Noticed July/August 2022

TOPOGRAPHY

The property occupies a site which slopes gently up from front to rear.

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OBSERVATIONS

The area of damage is the front right with cracking also to the garage (unrelated to this application as garage damage is not due to subsidence).

The following is an abbreviated description. Photographs accompanying this report illustrate the nature and extent of the problem.

INTERNAL

There is no internal damage since the movement has occurred to the external walls below ground floor level.

EXTERNAL

Front Elevation

Horizontal crack 7 brick courses below dpc, extending from left corner of gable elevation tapering open to front right corner, max opening c.14mm, One vertical crack below this main horizontal crack about 2m from corner.

Right Flank Elevation

The horizontal crack noted above continues down the flank elevation, tapering to closure towards the rear but still open where the crack disappears below ground level (due to the sloping ground). The crack also shows there has been lateral movement to the right of c.5mm at the corner, tapering less to rear.

Garage

Stepped crack on rear wall at low level. Laser level indicates brick bed joints are level.

The damage to the garage has been confirmed as due to thermal movement and is not part of the TPO application.

CATEGORY

In structural terms the damage falls into Category 3 of Table 1, Building Research Establishment¹ Digest 251, which describes it as "moderate".

Category 0	"negligible"	< 0.1mm
Category 1	"very slight"	0.1 - 1mm
Category 2	"slight"	>1 but < 5mm
Category 3	"moderate"	>5 but < 15mm
Category 4	"severe"	>15 but < 25mm
Category 5	"very severe"	>25 mm

Extract from Table 1, B.R.E. Digest 251

Classification of damage based on crack widths.

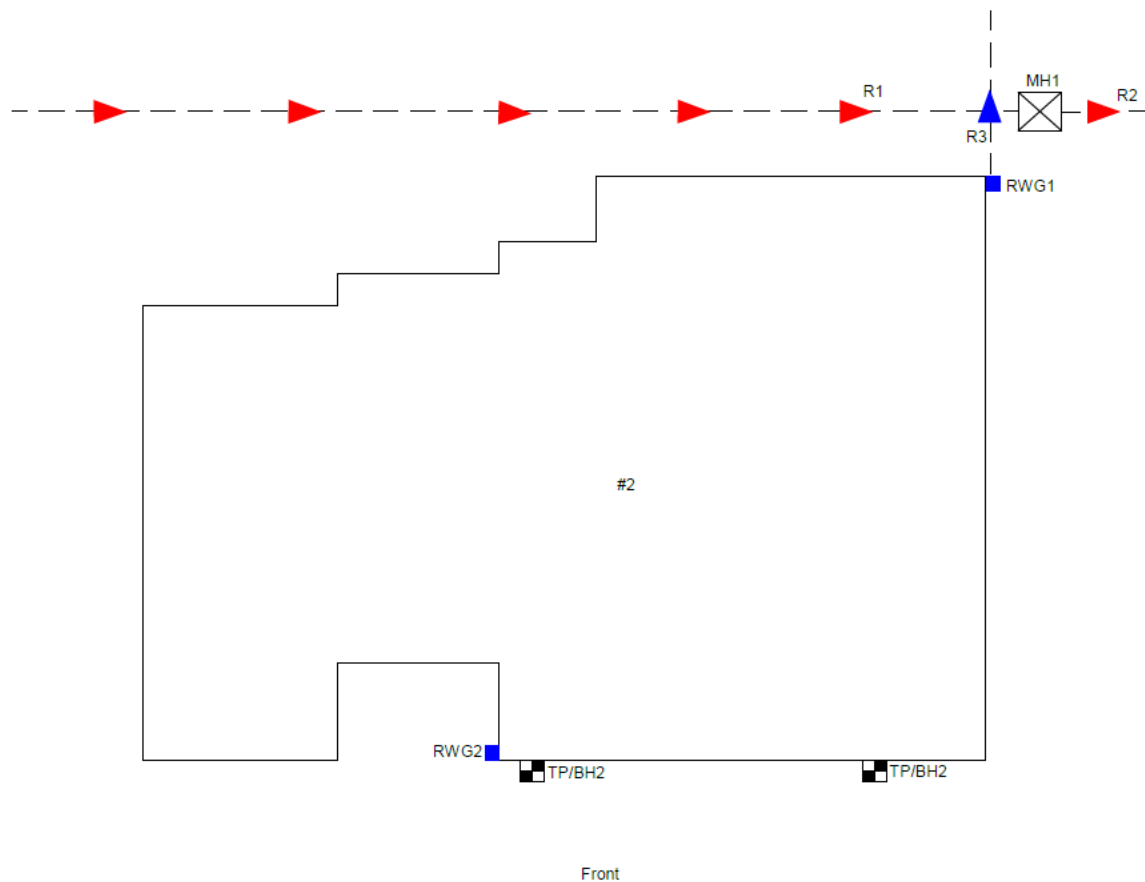
¹ Building Research Establishment, Garston, Watford. Tel: 01923.674040

GEOLOGY & SOIL

Reference to the 1:625,000 scale British Geological Survey Map (solid edition) OS Tile number SUNE suggests the underlying geology to be Bracklesham.

Site investigations confirm 600mm to 810mm deep foundations bearing on silty sandy clay that has intermediate to high plasticity, meaning it can significantly change in volume due to seasonal variations in moisture content, particularly if influenced by tree roots extracting moisture.

SITE INVESTIGATIONS



Laboratory tests confirm significant desiccation has occurred where roots were observed, the moisture contents being at or significantly less than 0.5x the Liquid Limit, this indicates abnormal soil drying in the presence of tree roots.

		Tel: 0844 3358908 Email: enquiries@fastrackgroup.co.uk		Appendix No: 3 FSI Ref:						
LABORATORY RESULTS										
Property Address:		2 Greenside, Crowthorne, Berkshire, RG45 6EX								
Client Claim Ref:		[REDACTED]								
BOREHOLE 1										
Depth (m)	MC (%)	Corr. MC (%)	LL (%)	PL (%)	PI (%)	Class	% Retained (425µm)	Soil Suction (kPa)	Condition of test	Soil Description
0.80	20.2	20.2	48	21	27	CI	0		Natural	Brown sandy, silty CLAY containing grey and orange mottle
1.50	15.5	15.5					0		Natural	Pale Grey / Brown sandy, silty CLAY containing orange mottle
2.00	22	22	74	29	45	CV	0		Natural	Pale Grey / Brown sandy, silty CLAY containing orange mottle
2.50	20.5	20.5					0		Natural	Pale Grey / Brown sandy, silty CLAY containing orange mottle
3.00	19.8	19.8	46	22	24	CI	0		Natural	Grey / Brown sandy silty CLAY containing orange mottle
						Tel: 0844 3358908 Email: enquiries@fastrackgroup.co.uk		Appendix No: 3 FSI Ref: 25253		
LABORATORY RESULTS										
Property Address:		2 Greenside, Crowthorne, Berkshire, RG45 6EX								
Client Claim Ref:		[REDACTED]								
BOREHOLE 2										
Depth (m)	MC (%)	Corr. MC (%)	LL (%)	PL (%)	PI (%)	Class	% Retained (425µm)	Soil Suction (kPa)	Condition of test	Soil Description
0.81	21.3	21.3	53	22	31	CH	0	155.14	Natural	Brown sandy, silty CLAY containing grey and orange mottle
1.50	15.4	15.4					0		Natural	Brown sandy, silty CLAY containing grey and orange mottle
2.00	15.4	15.4	41	19	22	CI	0		Natural	Brown sandy, silty CLAY containing grey and orange mottle
2.50	22.1	22.1					0		Natural	Grey sandy, silty CLAY containing orange mottle
3.00	19.5	19.5	43	22	21	CI	0		Natural	Grey sandy, silty CLAY containing orange mottle

Site investigations and soil test results have confirmed a plastic clay subsoil susceptible to undergoing volumetric change in relation to changes in soil moisture. A comparison between moisture content and the plastic and liquid limits suggests moisture depletion at the time of sampling in both excavations at depths beyond normal ambient soil drying processes such as evaporation indicative of the soil drying effects of vegetation.

A comparison of soil suction data with Table 1 of BRE Digest 412 suggests moderate desiccation (155.14kPa) in TP/BH2.

Roots were recovered from depths of up to 2m

ROOTS

The recovered roots were sent for laboratory testing and the results are as follows:

ROOT IDENTIFICATION

2 Greenside, Crowthorne, RG45 6EX

Client Reference: [REDACTED]
 Report Date: 22 November 2022
 Our Ref: [REDACTED]

Sub Sample	Species Identified		Root Diameter	Starch
BH1:				
FL	<i>Quercus</i> spp.	1	12 mm	Abundant
1.5m	<i>Pinus</i> spp.		1 mm	Absent
2m	<i>Quercus</i> spp.	2	2 mm	Abundant
BH2:				
FL	<i>Pinus</i> spp.	3	2 mm	Absent
FL	<i>Quercus</i> spp.		2 mm	Abundant
1.5m	<i>Pinus</i> spp.		1 mm	Absent
1.5m	<i>Quercus</i> spp.	4	1.5 mm	Abundant
2m	<i>Pinus</i> spp.		1.5 mm	Absent
2m	<i>Quercus</i> spp.	5	6 mm	Abundant

Comments:

- 1 - Plus 2 others also identified as *Quercus* spp.
- 2 - Plus 1 other also identified as *Quercus* spp.
- 3 - Plus 1 other also identified as *Pinus* spp. Decayed roots.
- 4 - Plus 1 other also identified as *Quercus* spp.
- 5 - Plus 1 other also identified as *Quercus* spp.

Quercus spp. are oaks (both deciduous and evergreen).
Pinus spp. are pines.

Roots were observed to a depth of 2500mm bgl in TP/BH1 and recovered samples have been positively identified (using anatomical analysis) as *Pinus* spp. and *Quercus* spp., the origin of which will be T7 and either T2 or T4 respectively, confirming their influence on the soils below the foundations.

Roots were observed to a depth of 2500mm bgl in TP/BH2 and recovered samples have been positively identified (using anatomical analysis) as *Pinus* spp. and *Quercus* spp., the origin of which will be T7 and T4 respectively, confirming the influence of T4 on the soils below the foundations.

VEGETATION

There are trees and shrubs nearby, some with roots that may extend beneath the foundations. The following are of particular interest and recommendations have been made to provide a remedy to the damage:-

Table 1 **Current Claim - Tree Details & Recommendations**

Tree No.	Species	Ht. (m)	Dia. (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
T4	English Oak	21	770	22 *	5	Older than Property	Joint Policy Holder & 1 Badgers Sett RG45 6EY
Management history		No significant recent management noted.					
Recommendation		Remove (fell) to near ground level. Owner to physically remove any regrowth (no chemical treatment due to translocation risk).					

Ms: multi-stemmed * Estimated value

Tree roots can be troublesome in cohesive (clay) soils because they can induce volumetric change. They are rarely troublesome in non-cohesive soils (sands and gravels etc.) other than when they enter drains, in which case blockages can ensue.

PHOTOGRAPHS



View of bases of trees to front right



View of trees to front right

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VEGETATION INFLUENCE

According to the standard published work on the subject (Cutler, D.F. and I.B.K. Richardson, (1989) further confirmed by Mercer, Reeves & O'Callaghan (2011) in shrinkable clay soils, Oak species are capable of causing subsidence damage at distances up to 30m, with 75% of cases occurring where the tree was within 18m.

The Oak T4, at only 5m is therefore well within its species' potential rooting and influencing distance of the building and would be capable of causing seasonal soil drying beneath foundations. The site investigations confirm significant rooting of Oak beneath foundations in any event.

Due to their relatively minor dimensions in comparison to the subject tree(s) and their species' characteristics, respective distances shrubs, climbers, hedges nearby are unlikely to affect soil moisture conditions beneath foundations.

PATTERN OF MOVEMENT

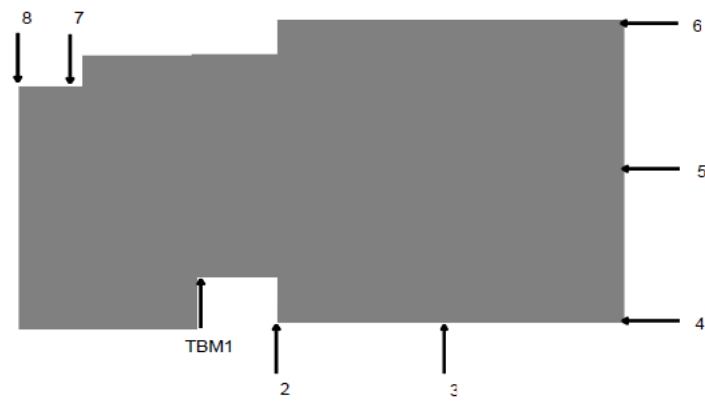
Damage was observed to worsen during summer 2022 during a time of year when soil moisture deficits due to tree root activity would be reaching their peak.

The area of movement and damage is consistent with the locations of the subject trees.

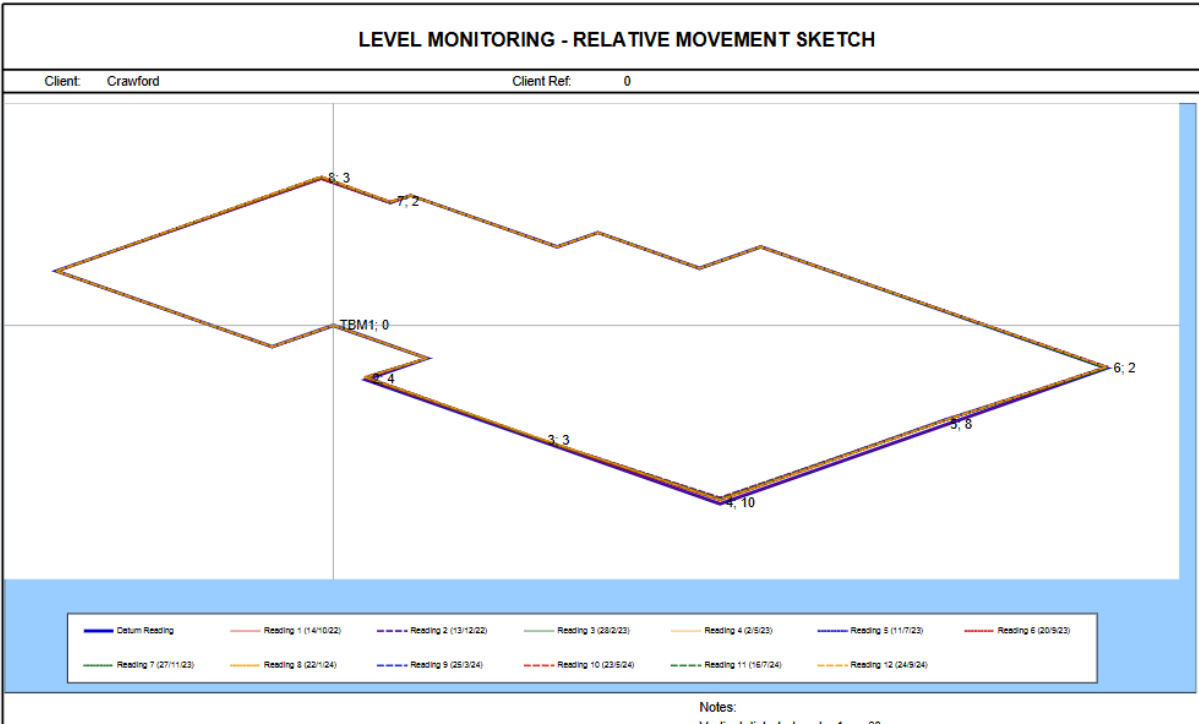
The pattern of movement is entirely consistent with the seasonal, cyclical influence of tree roots on soil moisture, foundations moving down during summer months when roots are active and extracting soil moisture, then returning to recovery and uplift as soil moisture increases during winter when tree roots are inactive.

Precise Level Monitoring

The results are as follows:

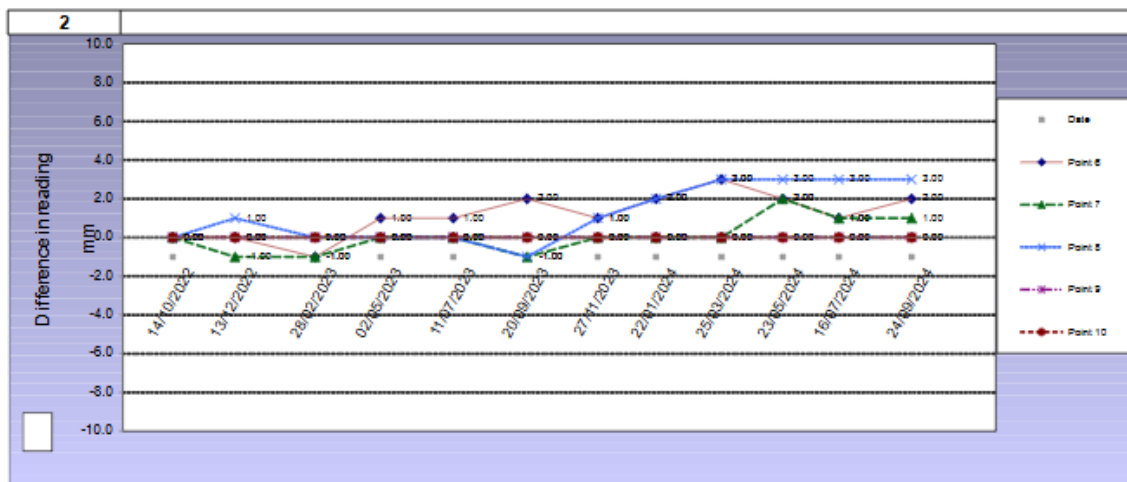
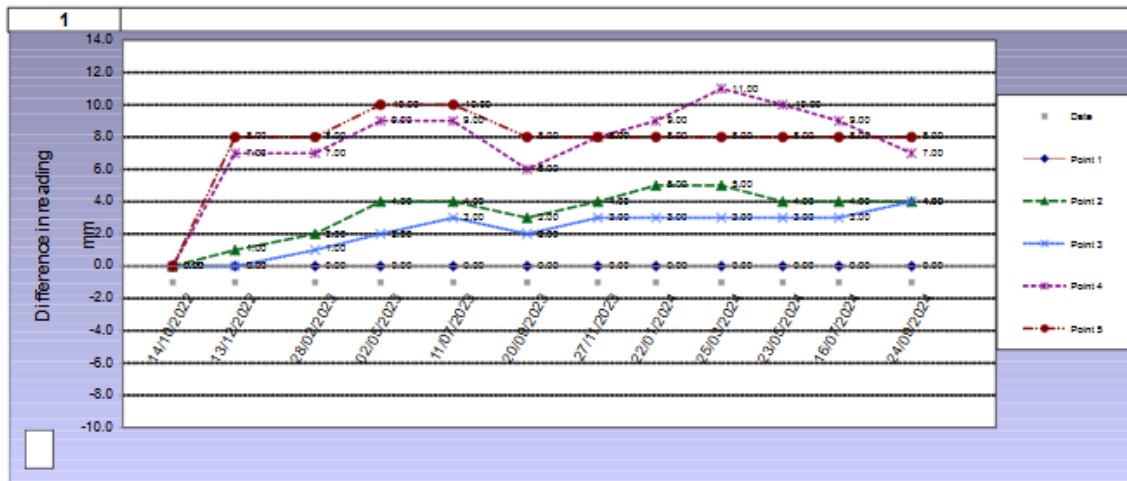


FRONT.



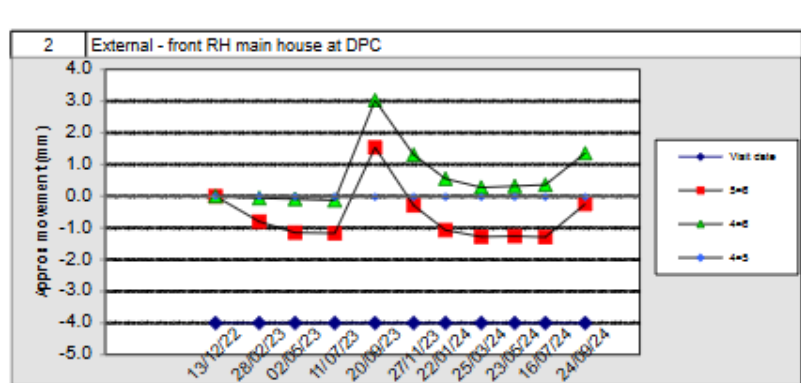
Chartered Loss Adjusters

LEVEL MONITORING - RELATIVE SURVEY READINGS			
Client: Crawford	Client Ref:	0	Chart Scale 1:1000



The level monitoring indicates a clear seasonal and cyclical pattern of movement consistent with root induced clay shrinkage with the greatest amplitude of movement being consistent with the location of Oak T4 being the main cause of the movement to the front / front right of the building.

Crack Monitoring



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The crack monitoring confirms a seasonal/cyclical pattern of movement consistent with root induced clay shrinkage subsidence with cracks opening during summer months when roots are active and closing during winter when root activity reduces.

DISCUSSION

The pattern and nature of the cracks is indicative of an episode of subsidence. The cause of movement is clearly attributable clay shrinkage exacerbated by tree root activity.

The timing of the event, at a time of year when soil moisture deficits due to tree root activity would be reaching their peak.

The presence of shrinkable clay beneath the foundations and the proximity of vegetation where there is damage indicates the shrinkage to be root induced. This is a commonly encountered problem and probably accounts for around 70% of subsidence claims notified to insurers. Root identification implicates Oaks and Pine, as the main cause of the damage.

This is supported by the following investigation results:-

- The foundations are at a depth of 810 & 600 mm which is below the level that normal seasonal movement would be expected to occur.
- Atterberg limit testing indicates that the soil has an intermediate-high plasticity and hence will shrink and swell with changes in moisture content.
- Roots were found to the underside of the foundation and were identified as Oak and Pine. Starch was present which indicates that the Oak roots were alive at the time of retrieval.
- An expert Arboricultural report has confirmed that nearby vegetation is the cause of the subsidence related damage to the property and identified tree management works required to stabilise the property.
- Level and crack monitoring evidence supports our conclusions and recommendations.

MITIGATION OPTIONS

Tree reduction option - Pruning is generally unreliable as a means of controlling water uptake. Whilst the tree remains, even if heavily pruned, damage is likely to continue or worsen, as the roots will continue to extract moisture from beneath foundations of the damaged building. In any event, the tree is sufficiently close to the structure that even heavy pruning is very unlikely to reduce root moisture uptake. There is no linear relationship between foliage volume and the amount of water lost. Being dynamic organisms, trees react to pruning by trying to restore the root to shoot ratio by producing as many leaves as they can. These new leaves are usually juvenile leaves with a larger surface area and generally more pores on the underside, these pores stay open for longer compared to an unpruned tree and increase the degree of water uptake by the roots. Research has shown that even a heavily pruned tree will quickly return to absorbing soil moisture and the seasonal movement and damage will continue. This is particularly the case with the subject Oak tree T4 due to its size, age and species characteristics, and this species grows back successfully following pruning.

Oak T4 is so close to the area of damage that root activity would continue even if the trees were to be heavily pruned.

The publication "CONTROLLING WATER USE OF TREES TO ALLEVIATE SUBSIDENCE RISK" © 2004 BRE on behalf of the Link Consortium for Horticulture Link Project No. 212 concluded that:

- For practical soil moisture conservation, severe crown-reduction 70-90% of crown volume would have to be applied. Reduction of up to 50% crown volume is not consistently effective for decreasing soil drying.
- To ensure a continued decrease in canopy leaf area and maximise the period of soil moisture conservation, crown reductions should be repeated on a regular managed cycle with an interval based on monitoring re-growth.

For Oak trees of the age and proximity of the subject tree T4, a severe crown reduction would diminish its amenity value and would cause decays in the large pruning cuts that would be required. Also, repeated regular pruning (bi-annually) would be an expensive but not necessarily effective means of controlling above ground growth of the tree that would not be guaranteed to negate root activity beneath foundations.

Therefore, if the tree remains (even in a heavily pruned state) roots beneath foundations will remain active and seasonal subsidence damage is likely to continue to the damaged part of the property (and possibly more extensively in future).

We would also refer to the "Pilot study to determine the feasibility of using existing claims data to determine the impact of tree pruning on subsidence incidents on swelling clay soils" Hipps & Atkinson 2014

Conclusions of that publication are as follows:

- "1. Nine cases were studied
2. In three cases pruning eliminated foundation movement
3. In four cases pruning reduced foundation movement
4. In two cases pruning had no effect

Pruning can be used as a reasonable way of minimising risk and preventing first instance of subsidence: (30% linear crown reduction every two years).

Once subsidence damage has occurred pruning is not a consistently reliable means of mitigation.

However, if pruning rather than felling is desirable then 40 – 50% linear crown reduction is required."

In six of the nine cases studied, foundation movement was not remedied by pruning, it was only successful in three of the nine cases.

Also, it is the case that when a building has suffered damage and its structural integrity has been compromised, the property remains at risk therefore (as in the "Delaware" judgement) measures need to be taken to ensure stability in the presence of active tree roots.

We would also refer to the comments made by Dr Biddle on page 5 of Arboriculture Research Note 108/92/EXT 'Tree Roots and Foundations', specifically *"Greatest benefits will be achieved if the building is near the outer limits of influence of the tree; pruning a large tree which is only a few metres from a building will probably have little benefit. If reducing the amplitude of movement is unacceptable, complete felling may be needed"*.

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Therefore, taking all reasonable tests the insured property is within the likely zone of influence of the subject trees. This is further verified by the fact that Oak roots were recovered from the underside of foundations, with further roots being noted to a maximum depth of 2 metres.

From Dr Biddle's comments it would appear that even an eminent proponent of pruning as a remedy to subsidence appears to agree that in instances where species, such as Oak T4, are growing within close proximity to damaged properties, felling is the only appropriate action.

Once subsidence damage has occurred pruning is not a consistently reliable means of mitigation.

On page 98 of the BRE publication "Has your house got cracks?" Second Edition Freeman, Driscoll & Littlejohn 2002 it states "Removing the tree altogether will have the greatest and most immediate effect on the levels of desiccation in the soil."

Also, from page 98 "In most cases there is no advantage in a staged reduction in the size of the tree and the tree should be completely removed at the earliest opportunity.

If the subject trees are not removed, then damage will almost certainly continue and worsen. Tree roots from these trees have almost certainly encroached beneath foundations and caused seasonal soil drying that has led to the damage.

Root barrier option - Root pruning as a form of mitigation is inherently unreliable as the level of excavation required could include many cubic meters of soil to be guaranteed to have removed all roots causing a nuisance, to effect such a remedy might materially make the tree unsafe or so biologically damaged as to destroy the amenity being the subject of the attempted remedy. Also, new roots will immediately seek to colonise the soil subject to the root cutting and the nuisance will recur. We have considered the potential to instal a copper impregnated root barrier, however due to the juxtaposition of the trees in relation to the damage, a root barrier would not be possible to instal as, due to its close proximity, the roots severance for Oak T4 would cause it to become unstable.

Underpinning – if the tree remains then the only appropriate solution would be underpinning to stabilise foundations, the cost of which is currently estimated at £60,000

Tree removal – The removal of any trees that are causal or contributory will allow the soil beneath foundations to rehydrate and to recover its original moisture content. Once trees are removed the activity of roots is negated and foundations will stabilize and repairs can be undertaken. If appropriate tree removal is not undertaken then the damage is likely to continue and worsen.

Drains - There are apparent issues in relation to drains, but soil softening/washing by an escape of water is not considered to be a factor in the damage.

Heave Potential – We are satisfied that the tree can be felled without risk of heave related damage occurring.

RECOMMENDATIONS

T4 Oak – Fell to near ground level (subject to consent being granted under the TPO)

Statutory Controls – The Oaks are covered by a Tree Preservation Order administered by Wokingham Borough Council, therefore an application is required and consent needs to be granted prior to any tree works occurring.

The trees are located as follows:

T4 – 1 Badgers Sett RG45 6EY

RESERVES

Superstructure repairs - **£7,500**

Estimated Engineering solutions and superstructure repairs - **£60,000**

Yours faithfully

Chris Davies Dip.Arb.(RFS), F.Arbor.A

Arboricultural Consultant - Subsidence Team

Crawford & Company

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Standard References:

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