



TECHNICAL REPORT ON A SUBSIDENCE CLAIM

Crawford Reference [REDACTED]

16 Fairhazel Gardens
London
NW6 3SJ

prepared for

Arch Insurance
Arch Insurance, 40 Mitre Street, London, EL3A 5DE

[REDACTED]

SUBSIDENCE CLAIM

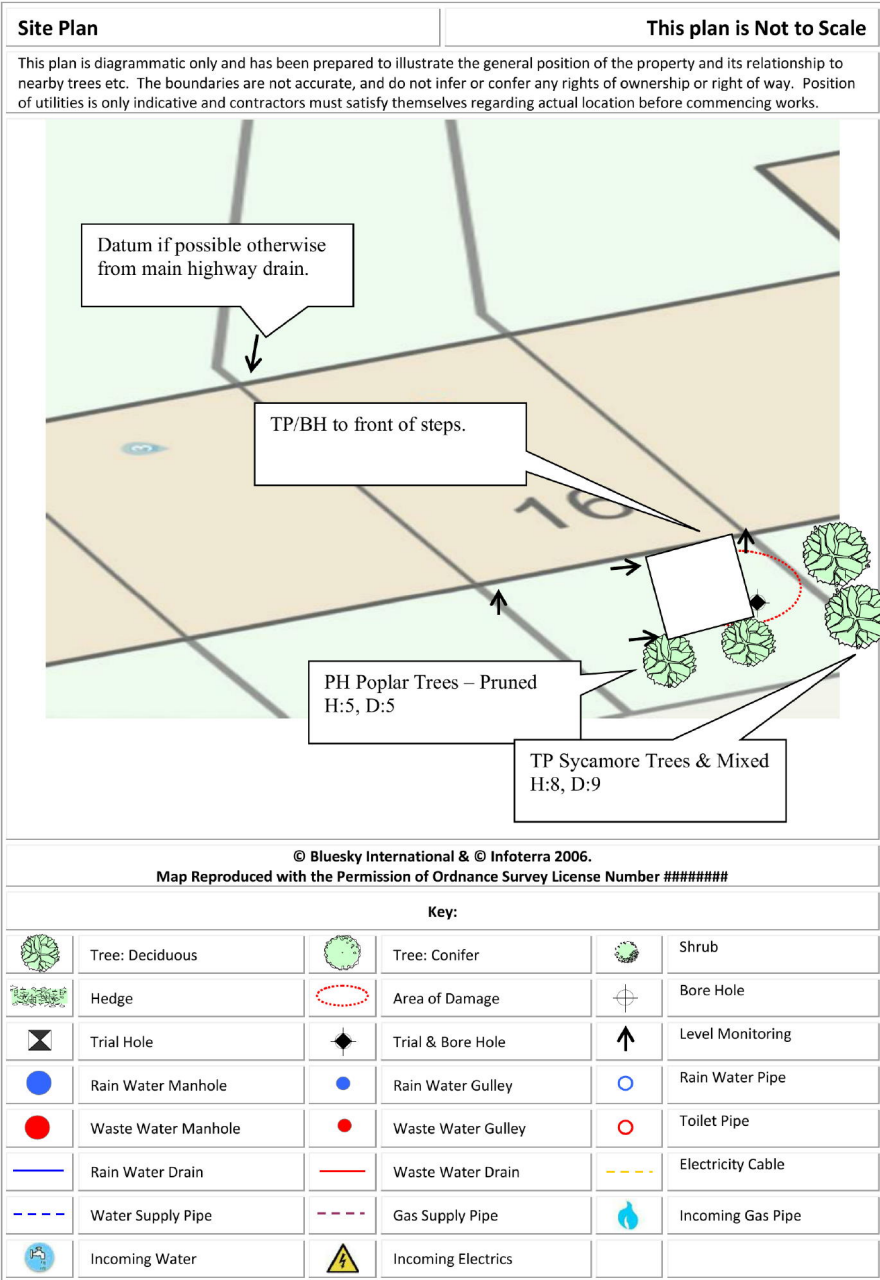
DATE 17 November 2023



[REDACTED]

Chartered Loss Adjusters

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INTRODUCTION

We have been asked by Arch Insurance to comment on movement that has taken place to the above property. We are required to briefly describe the damage, establish a likely cause and list any remedial measures that may be needed.

Our report should not be used in the same way as a pre-purchase survey. It has been prepared specifically in connection with the present insurance claim and should not be relied on as a statement of structural adequacy. It does not deal with the general condition of the building, decorations, timber rot or infestation etc.

The report is made on behalf of Crawford & Company and by receiving the report and acting on it, the client - or any third party relying on it - accepts that no individual is personally liable in contract, tort or breach of Statutory duty. Where works address repairs **that are not covered** by the insurance policy we recommend that you seek professional advice on the repair methodology and whether the works will involve the Construction (Design & Management) Regulations 2015. Compliance with these Regulations is compulsory; failure to do so may result in prosecution. We have not taken account of the regulations and you must take appropriate advice.

We have not commented on any part of the building that is covered or inaccessible.

TECHNICAL CIRCUMSTANCES

Tenant noted water ingress through ceiling of utility room. Concerned, they contacted the policyholder who instructed a Structural Engineer to inspect the property. The Report dated 8th November suggested investigations and probable cause being vegetational soil influences and subsidence of the front steps. Policyholder subsequently notified Insurer.

PROPERTY

Three storey mid-terrace house of traditional construction with brick walls surmounted by a pitched tiled roof. The property is divided into 4 flats.

HISTORY & TIMESCALE

Date of Construction	1900
Purchased	1975
Policy Inception Date.....	31/01/2022
Damage First Noticed	03/11/2022
Claim Notified to Insurer.....	11/11/2022
Date of our Inspection.....	26/11/2022
Issue of Report.....	05/12/2022
Anticipated Completion of Claim	Summer 2023

TOPOGRAPHY

The property occupies a reasonably level site with no unusual or adverse topographic features.

GEOLOGY

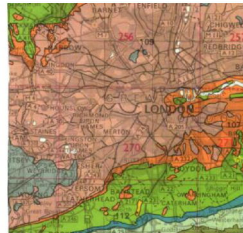
Reference to the 1:625,000 scale British Geological Survey Map (solid edition) OS Tile number TQNW suggests the underlying geology to be Clay Soils.

Clay soil superficial deposits are a cohesive soil characterised by their fine particle size and are usually derived from weathering of an underlying "solid geology" clay soil such as London Clay or Oxford Clay.

Like the solid geology sub-soil from which they are derived they shrink when dry, and swell when wet and can be troublesome when there is vegetation¹ nearby and Gypsum and selenite crystals can be encountered (particularly in the south east). Protection using Class II Sulphate Resisting cement is therefore recommended for buried concrete.

The superficial deposits are thought to be Silts. Silts occur as glacial, alluvial or windblown deposits. They are water bearing and soft in consistency, and therefore amongst the most troublesome soils in excavation work since they are vulnerable to slumping and 'boiling'.

They can also suffer from frost heave². In the south-east of England they are known as Brickearth, which are generally firm to stiff, where they are less troublesome. They do not suffer volumetric changes in the presence of vegetation in the way of clay soils, but can be a problem where there are leaking drains, water services or fluctuations in the water table, when consolidation settlement can occur. They can also suffer localised erosion and softening in the presence of water.



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VEGETATION

There are several trees and shrubs nearby, some with roots that may extend beneath the house foundations. The following are of particular interest:-

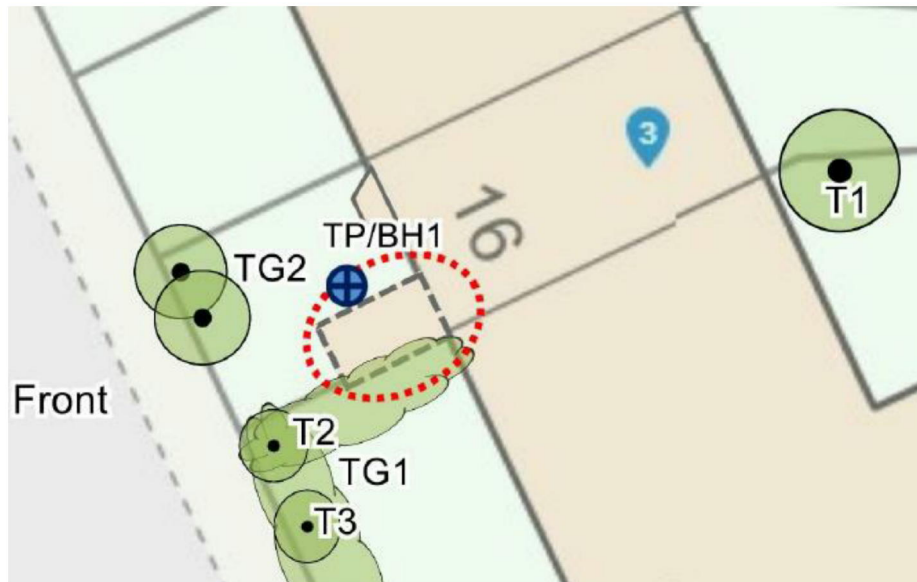
Table 1 **Current Claim - Tree Details & Recommendations**

Tree No.	Species	Ht (m)	Dia (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
TG1	Mixed spp. group of mostly Aucuba, Privet, Lime [T2] and Sycamore [T3]	4.5	350 Ms *	2.5	0.4	Younger than Property	Third Party Fairhazel Mansions NW6 3SH
Management history		Subject to past management/pruning - appears regularly trimmed.					
Recommendation		Remove (fell) all growth adjacent to right hand flank of steps to near ground level and treat stump to inhibit regrowth. Re-pollard Lime [T2] and Sycamore [T3] to previous points and re-pollard thereafter on a biennial cycle to retain at reduced dimensions.					
TG2	Lime [x2]	5.5	450 Ms *	5.5	6.0	Younger than Property	Policy Holder
Management history		Subject to past management/pruning - previously pollarded at approx. 3.5m.					
Recommendation		Re-pollard to previous points at approx. 3.5m and re-pollard thereafter annually.					

¹ Driscoll R. (1983) "Influence of Vegetation on Clays" Geotechnique. Vol 33.

² Tomlinson M.J. (1991) "Foundation Design & Construction" LONGMAN SCIENTIFIC
Chartered Loss Adjusters

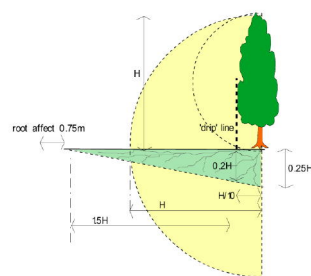
See sketch.



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.

Poplars (*Populus*) are deciduous and can reach heights between 20-30m depending on health, environment and soil conditions. They have a very fast growth rate of around 800mm per year and strong root activity³.

Maximum tree-to-damage distance recorded in the Kew survey was 30mtrs, with 50% of all cases occurring within 11mtrs⁴.



Typical proportions of a poplar, showing its possible rot zone.

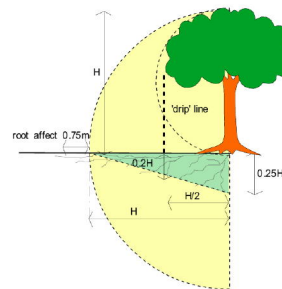
They are deep rooting in clay soils, and have a life expectancy > 100 years. They are tolerant of heavy pruning and crown reduction (both old and young trees).

³ Richardson & Gale (1994) "Tree Recognition" Richardson's Botanical Identifications

⁴ Cutler & Richardson (1991) "Tree Roots & Buildings" Longman Scientific

Sycamores (*Acer*) are deciduous and can reach heights between 20-30m depending on health, environment and soil conditions. They have a fast growth rate of around 600mm per year and medium root activity⁵.

The Sycamore is a hardy tree, and can withstand quite aggressive environments. Maximum tree-to-damage distance recorded in the Kew survey was 20mtrs, with 50% of cases occurring within 6mtrs⁶. They are deep rooting on clay soils and have a life expectancy > 100 years.



They can usually tolerate quite heavy pruning or crown thinning, although this can create large wounds which decay rapidly.

OBSERVATIONS

The lower ground floor flat utility room and, the main entrance steps to building are the focal area of damage in this Claim.

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

INTERNAL

No visible internal damages to suggest subsidence.

Tenant indicates water ingress from underside of ceiling at front to utility room.

EXTERNAL

Front Steps

Cracks 1-2mm wide noted to right side of steps at junction with main house.

There is a notable lack of pointing locally on the neighbours side of the wall to the right of the steps which is centrally to the steps and does not extend beyond area of 1 l/m. Damage is not indicative of subsidence in absence of other damage.

CATEGORY

In structural terms the damage falls into Category 2 of Table 1, Building Research Establishment⁷ Digest 251, which describes it as "slight".

Category 0	"negligible"	< 0.1mm
Category 1	"very slight"	0.1 - 1mm

⁵ Richardson & Gale (1994) "Tree Recognition" Richardson's Botanical Identifications

⁶ Cutler & Richardson (1991) "Tree Roots & Buildings" Longman Scientific

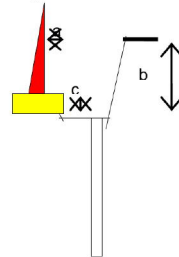
⁷ Building Research Establishment

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.

INVESTIGATIONS

The following investigations were undertaken to identify the cause of movement. One trial hole were excavated to expose the foundations. One 50mm diameter hand auger were sunk through the base of the trial hole to confirm the soil profile beneath the foundations and provide soil and root samples for laboratory testing - see site plan for location and the diagram below for details.



Foundation Details

No.	Borehole Depth	Footing (a)	Underside (b)	Thickness (c)
TH1	3.00 m.	200 mm.	450 mm.	300 mm.

SOIL SAMPLES

Soil samples were retrieved from the bore, wrapped in clingfilm before being bagged and deposited with a testing laboratory the same day. The laboratory have instructions to test the samples to determine if there is evidence of root induced desiccation.

ROOTS

Roots were retrieved from the trial hole and have been submitted to a botanist for identification.

The samples you sent in relation to the above on 21/02/2023 have been examined. Their structures were referable as follows:

TH1, 0.45m		
2 no.	Examined root: TILIA (Lime). Less than 0.08mm in diameter.	Dead* (note this 'dead' result can be unreliable with such thin samples).
2 no.	Both samples revealed too few cells for microscopic identification.	
TH1, 0.95m		
3 no.	Examined root: TILIA (Lime). Under 0.8mm in diameter.	Dead*.
1 no.	Microscopic examination showed insufficient cells for recognition.	
TH1, 1.45m		
1 no.	Examined root: very THIN - not more than 0.4mm in diameter. Could also be TILIA (Lime).	Alive, recently*.
1 no.	Examined root: too DECAYED for identification.	
3 no.	Unfortunately all with insufficient cells for identification.	

DRAINS

Investigations in the local drainage system identified joint displacements to lines 1,2,4,5 AND FROM Line 3. This damage has occurred due to ground movement.

Drain Survey	We carried out a CCTV survey of the below ground drainage system, our findings of which are as follows:
	Line 1,2,4 and 5 Our survey of these lines revealed joint displacements and fractures at multiple points throughout the line.
	Line 3 - From MHI upstream Our survey of line 3 revealed no significant defects to the pipework on this line which could be allowing an escape of water.
	The above mentioned defects to the below ground drainage system have been caused by ground movement.

ARBORIST REPORT

We appointed MWA (Arboricultural Consultants) to provide their recommendations in relation to necessary tree management works to be undertaken in order to return long stability to the property.

Site investigations and soil test results have confirmed a plastic clay subsoil susceptible to undergoing volumetric change in relation to changes in soil moisture.

Roots were observed to a depth of 1.45m bgl in TP/BH1 and recovered samples have been positively identified (using anatomical analysis) as *Tilia* spp.; the origin of which will likely be the Limes of TG2 group.

Irrespective of the identification of recovered root samples, our survey has identified vegetation within influencing distance of the building with a current potential to influence soil volumes below foundation level; the most significant in relation to the current damage is the vegetation of TG1 group directly adjacent to the right-hand side of the steps.

Based on the technical reports currently available, engineering opinion and our own site assessment we conclude the damage is consistent with shrinkage of the clay subsoil related to moisture abstraction by vegetation.

If an arboricultural solution is to be implemented to mitigate the influence of the implicated trees/vegetation we recommend that the nearby elements of TG1 group are removed, combined with re-pollarding of the limes of TG2 group.

Other vegetation recorded presents a potential future risk to building stability and management is therefore recommended. Recommended tree works may however be subject to change upon receipt of additional information.

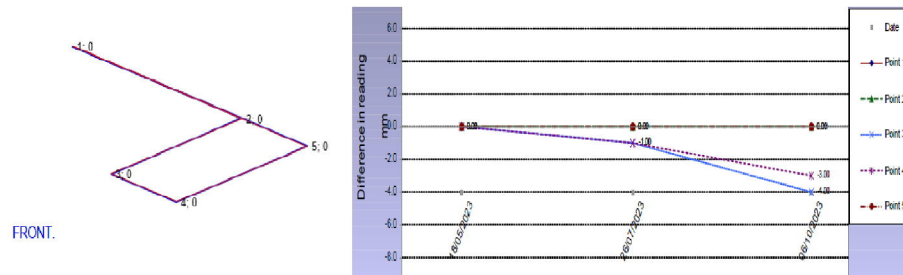
Table 2 Future Risk - Tree Details & Recommendations

Tree No.	Species	Ht (m)	Dia (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
T1	Sycamore	16.0 *	650 *	9.0	5.4	Younger than Property	Third Party Fairhazel Mansions NW6 3SH
Management history		Subject to past management/pruning - previously crown reduced. No access to rear – tree only viewed through ground floor rear bedroom window					
Recommendation		Maintain broadly at no more than current dimensions by periodic pruning.					

Consideration has been given to pruning alone as a means of mitigating the vegetative influence, however in this case, this is not considered to offer a viable long-term solution due to the proximity of the responsible vegetation.

MONITORING

Level monitoring has been implemented to provide further evidence to support our conclusions. Initial readings have been taken and further readings will be taken on a bi monthly basis.



DISCUSSION

The results of the site investigations confirm that the cause of subsidence is root-induced clay shrinkage. The clay is plastic and thus will shrink and swell with changes in moisture content. Roots have extracted moisture below the depth of the footings, thus causing differential foundation movement to occur. This is supported by the following investigation results:-

- The foundations are at a depth of 450 mm which is below the level that normal seasonal movement would be expected to occur.
- 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 TP/BH1 at depths beyond normal ambient soil drying processes such as evaporation indicative of the soil drying effects of vegetation.
- Atterberg limit testing indicates that the soil has a 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. Starch was present which indicates that the 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.
- Monitoring evidence has been provided to support our conclusions and recommendations.

RECOMMENDATIONS

As per the recommendations of the Arboricultural Report we recommend that the nearby elements of TG1 group are removed, combined with re-pollarding of the limes of TG2 group.

Localised superstructure repairs can be implemented following completion of the required tree management works. Should underpinning be required, we anticipate a cost exceeding [REDACTED]