Arboricultural Appraisal Report

Subsidence Damage Investigation at:

26 Ashville Avenue
Eaglescliffe
Stockton-on-Tees
TS16 9AX

CLIENT:	Crawford & Company
CLIENT REF:	SU2207230
MWA REF:	SUB230524-13138
MWA CONSULTANT:	Richard Percival (TechArborA)
REPORT DATE:	07/07/2023

SUMMARY

Statutory Controls			Mitigation (Current claim tree works)	
TPO current claim	Yes – T6, TG7		Policy Holder	Yes
TPO future risk	Yes – TG3, TG5 (cypress)		Domestic 3rd Party	No
Cons. Area	No		Local Authority	No
Trusts schemes	No		Other	No
Local Authority: -	Stockton on Tees Borough Council			

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Introduction

Acting on instructions from Crawford & Company, the insured property was visited on 25/05/2023 to assess the potential role of vegetation in respect of subsidence damage.

We are instructed to provide opinion on whether moisture abstraction by vegetation is a causal factor in the damage to the property and give recommendations on what vegetation management, if any, may be carried out with a view to restoring stability to the property. The scope of our assessment includes opinion relating to mitigation of future risk. Vegetation not recorded is considered not to be significant to the current damage or pose a significant risk in the foreseeable future.

This is an initial appraisal report and recommendations are made with reference to the technical reports and information currently available and may be subject to review upon receipt of additional site investigation data, monitoring, engineering opinion or other information.

This report does not include a detailed assessment of tree condition or safety. Where indications of poor condition or health in accessible trees are observed, this will be indicated within the report. Assessment of the condition and safety of third-party trees is excluded and third-party owners are advised to seek their own advice on tree health and stability of trees under their control.

Property Description

The property comprises a two-storey detached house of traditional construction built C.1880. There is a cellar below the house which can be accessed via a door in the garden to the right of the building. The extent of this cellar is unknown to us at present. There is a two-storey extension to the front left-hand side and two further single storey extensions, one to the rear left-hand side and another to front right-hand side. We have no further information regarding the exact age of these additional structures.

External areas comprise a large gravel driveway to the front with extensive gardens surrounding the property. The site on which the house sits is generally level, however the land drops away to the rear towards a river at the far end of the garden. The house is in an elevated position in relation to the land to the right flank. There is a retaining wall in this area which offers the access to the cellar.

Damage Description & History

Damage has been noted throughout the property.

At the time of the engineer's inspection (07/12/2022) the structural significance of the damage was found to fall within Category 2 (slight) of Table 1 of BRE Digest 251. For a more detailed synopsis of the damage please refer to the surveyor's technical report.

A claim was previously registered in April/May 2022. The extent of cracking presented at the time was deemed to be non-progressive thermal shrinkage of plasters and renders and the claim was subsequently repudiated. We have not been made aware of any previous claims.

Site Investigations

Site investigations were carried out by Auger on 08/03/2023, when 3 trial pits were hand excavated to reveal the foundations, with a borehole sunk through the base of the trial pit to determine subsoil conditions. A drainage survey was also undertaken.

Foundations:

Ref	Foundation type	Depth at Underside (mm)
TH1	Concrete	800
TH2	Concrete	400
TH3	Unknown	1200

Soils:

Ref	Description	Plasticity Index (%)	Volume change potential (NHBC)
TH1	Fine to medium gravelly clayey SILT becoming Brown fine to medium gravelly silty CLAY	36 - 41	Medium - High
TH2	Fine to medium gravelly silty CLAY	28 - 34	Medium
TH3	Slightly sandy fine to medium gravelly silty CLAY	31 - 34	Medium

Roots:

Ref	Roots Observed to depth of (mm)	Identification	Starch content
TH1	1300	*Aesculus*	Present
TH2	400	*Aesculus*	Present
TH2	900	*Cupressaceae*	Present
TH2	1400	*Acer*	Present
TH3	1200	*Vitaceae*	Absent
TH3	1200	*Clematis*	Present

Aesculus *is a genus of trees commonly known as horse chestnut.*
Cupressaceae *is a large group of closely related trees and shrubs which includes cypress, thuja & juniper.*
Acer *is a genus of trees and shrubs which includes sycamore, Norway maple & field maple.*
Vitaceae *is a family of climbing shrubs which includes Virginia creeper, Boston ivy & grape vine.*
Clematis *are climbing plants which are commonly referred to using their botanical name.*

Drains: The drains have been surveyed and no significant defects identified.

Monitoring: Level monitoring commenced on 11/01/2023.

Discussion

Opinion and recommendations in this report are made on the understanding that Crawford & Company have identified clay shrinkage subsidence as a cause of building movement and damage.

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 1.3m bgl in TH1, 1.4m bgl in TH2 & 1.2m bgl in TH3. Recovered samples have been positively identified (using anatomical analysis) as *Aesculus*, *Cupressaceae, Acer, Vitaceae & Clematis.* The origin of these roots will be the associated vegetation recorded in Table 1 (see below) confirming their influence on the soils below the foundations. This includes T6 horse chestnut, TG1 cypress, TG7 sycamore, CG1 Virginia creeper & the clematis in G1.

Irrespective of the identification of recovered root samples, the roots of the remaining vegetation detailed in Table 1 are also likely to be present below foundation level in proximity to the area of movement/damage and influencing soil moisture and volumes.

Level monitoring began on 11/01/2023 and two subsequent readings have recorded downward movement between 14/03/2023 & 23/05/2023. This pattern of movement is considered too early in the year to be wholly attributable to a seasonal volumetric change in a clay soil, although the relatively dry start to 2023 could be a factor in these readings. Future level monitoring data will give a clearer understanding as to the nature and significance of the current movement.

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. Having considered the information currently available, we suggest that an initial phase of mitigation works be completed (Table 1) with the efficacy of these works measured by level monitoring. Additional works maybe required if movement were to persist.

Recommended tree works may be subject to change upon receipt of additional information.

Conclusions

- Conditions necessary for clay shrinkage subsidence to occur related to moisture abstraction by vegetation have been confirmed by site investigations and the testing of soil and root samples.
- Engineering opinion is that the damage is related to clay shrinkage subsidence.
- There is significant vegetation present with the potential to influence soil moisture and volumes below foundation level.
- Roots have been observed underside of foundations and identified samples correspond to vegetation identified on site.
- Replacement planting may be considered subject to species choice and planting location.

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

Tree No.	Species	Ht (m)	Dia (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
T6	Horse Chestnut	18	680 *	14	18	Older than extension(s)	Policy Holder
Management history		No past management noted.					
Recommendation		Reduce height to 12m and crown radius to 5m leaving balanced crown. Prune on a biennial cycle to maintain at broadly reduced dimensions. Subject to review if movement persists.					
TG1	Cypress	17	300 Ms	8	2.3	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		Remove (fell) all stems that are within the 8m of the property to near ground level.					
S1	Viburnum	6	130 Ms *	4	4	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		Remove (fell) to near ground level and treat stump to inhibit regrowth.					
CG1	Virginia Creeper	5 *	160 Ms *	15	0	Younger than Property	Policy Holder
Management history		Subject to past management/pruning.					
Recommendation		Remove (fell) all elements of climbing group to near ground level and treat stumps to inhibit regrowth.					
G1	Ornamental shrub & climber group	0.8 *	20 Ms *	1.5 *	0.5 *	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		Remove (fell) all elements in group that are growing in the shrub boarder adjacent to the house walls. Maintain remaining elements broadly at no more than current dimensions by periodic pruning.					
H1	Yew	3.6	120 Ms *	1.5	2.8	Younger than Property	Policy Holder
Management history		Regularly trimmed.					
Recommendation		Remove (fell) all stems within 6m of building to near ground level and treat stump to inhibit regrowth.					

Ms: multi-stemmed * Estimated value

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

Tree No.	Species	Ht (m)	Dia (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
TG7	Including sycamore, horse chestnut	18	700 *	16	21	Older than extension(s)	Policy Holder
Management history		No recent management noted.					
Recommendation		Reduce sycamore to 12m and crown radius to 5m. Prune on a biennial cycle to maintain at broadly reduced dimensions. Subject to review if movement persists.					

Ms: multi-stemmed * Estimated value

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	Yew	3.5 *	300 *	6	3	Younger than Property	Policy Holder
Management history		Subject to past management/pruning.					
Recommendation		Remove (fell) to near ground level and treat stump to inhibit regrowth.					
T2	Birch	13 *	100 *	4	14 *	Younger than Property	Third Party 19 Tees Bank Avenue TS196 9AY
Management history		No past management noted.					
Recommendation		No works at present. Subject to review if movement persists.					
T3	Cherry	5 *	170 *	5	10	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		No works at present. Subject to review if movement persists.					
T4	Deodar	17 *	550 *	12	24 *	Younger than Property	Third Party 19 Tees Bank Avenue TS196 9AY
Management history		No recent management noted.					
Recommendation		No works at present. Subject to review if movement persists.					
T5	Birch	18 *	440 *	9	12 *	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		Maintain broadly at no more than current dimensions by periodic pruning. Subject to review if movement persists.					
TG2	Including whitebeam, maple (Norway)	10 *	100 *	5	13 *	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		No works at present.					

Ms: multi-stemmed * Estimated value

Table 2 **Future Risk** - Tree Details & Recommendations Cont'd

Tree No.	Species	Ht (m)	Dia (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
TG3	Cypress	Up to 19	Up to 300 Ms	6 *	6.7	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		Reduce height to 10m. Prune on a triennial cycle to maintain at broadly reduced dimensions. Subject to review if movement persists.					
TG4	Beech	3 *	300 *	6	5.8	Younger than Property	Policy Holder
Management history		Subject to past management/pruning.					
Recommendation		Do not allow to exceed current dimensions. Subject to review if movement persists.					
TG5	Including cypress, sycamore, hawthorn	12	300 Ms *	6	20 *	Younger than Property	Policy Holder
Management history		Recently reduced/pruned.					
Recommendation		Maintain broadly at no more than current dimensions by periodic pruning. Subject to review if movement persists.					
TG6	Sycamore	18 *	600	12	20 *	Older than extension(s)	Third Party Teeside High School TS16 9AT
Management history		No recent management noted.					
Recommendation		No works at present. Subject to review if movement persists.					
TG8	Fruit tree group	2 *	60 *	1.8 *	4 *	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		No works at present. Subject to review if movement persists.					
SG1	Laurel	8	180	7	12.5	Younger than Property	Policy Holder
Management history		No recent management noted.					
Recommendation		No works at present. Subject to review if movement persists.					

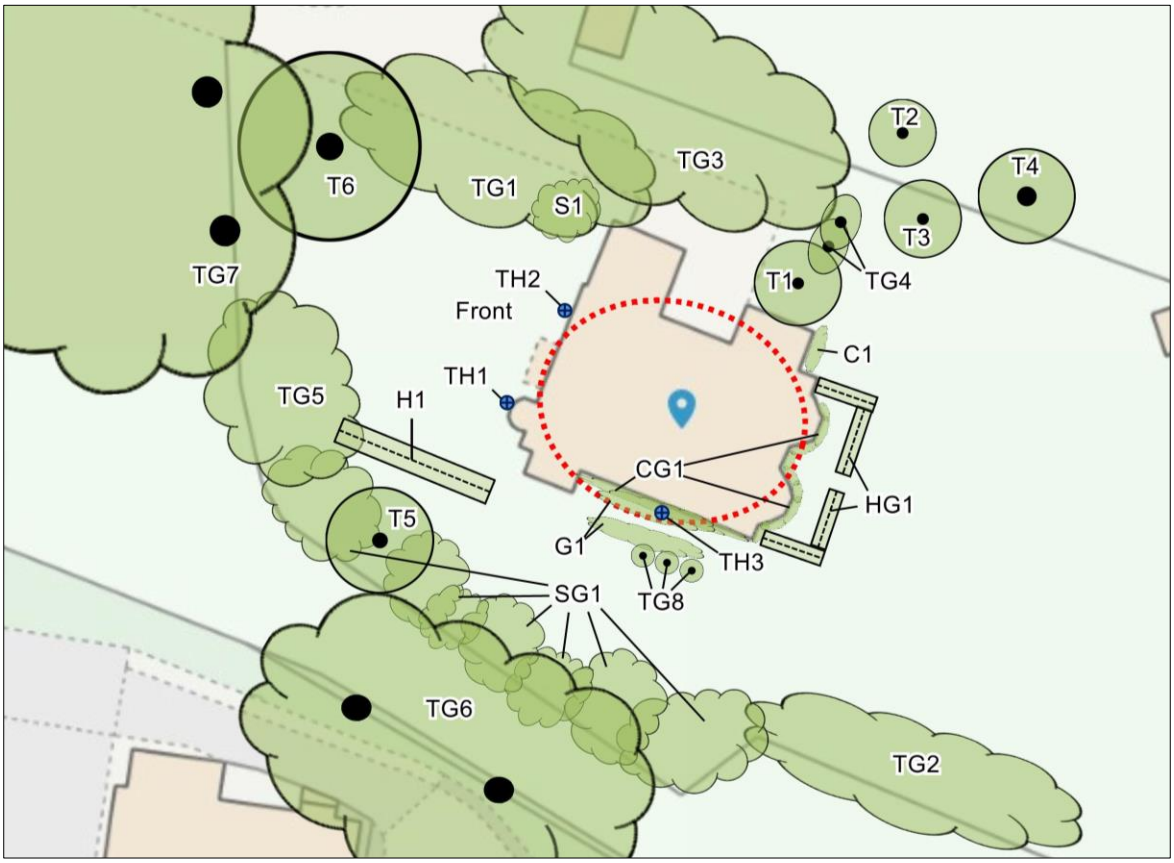
Ms: multi-stemmed * Estimated value

Table 2 **Future Risk** - Tree Details & Recommendations Cont'd

Tree No.	Species	Ht (m)	Dia (mm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
C1	Hydrangea	1 *	50 Ms *	3.2	0.2	Younger than Property	Policy Holder
Management history		Subject to past management/pruning.					
Recommendation		Remove (fell) to near ground level and treat stump to inhibit regrowth.					
HG1	Including jasmine, ivy, holly	1.8	40 Ms *	2	0.6	Younger than Property	Policy Holder
Management history		Regularly trimmed.					
Recommendation		Remove (fell) all stems that are within 3m of the building to near ground level and grub out stumps to inhibit regrowth.					

Ms: multi-stemmed * Estimated value

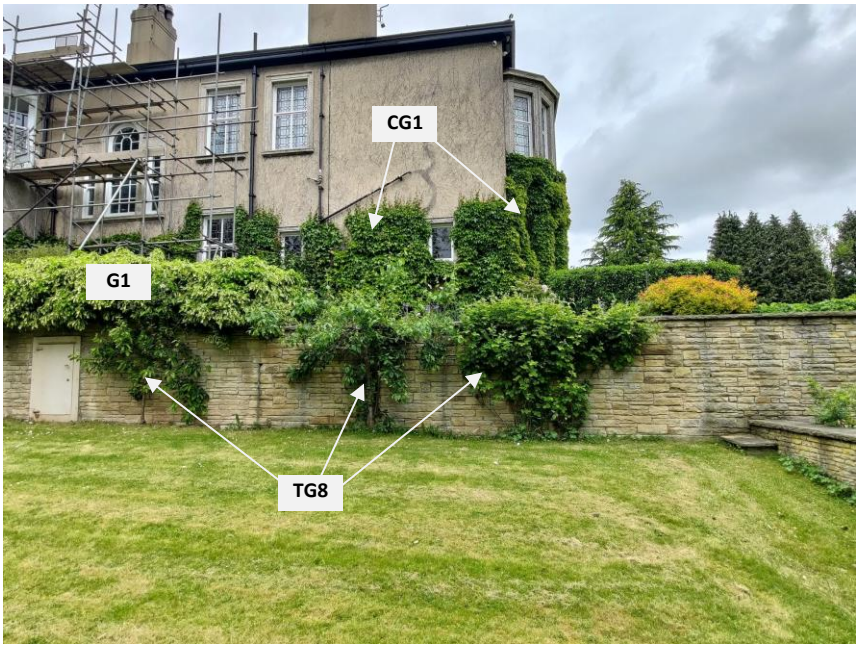
Site Plan



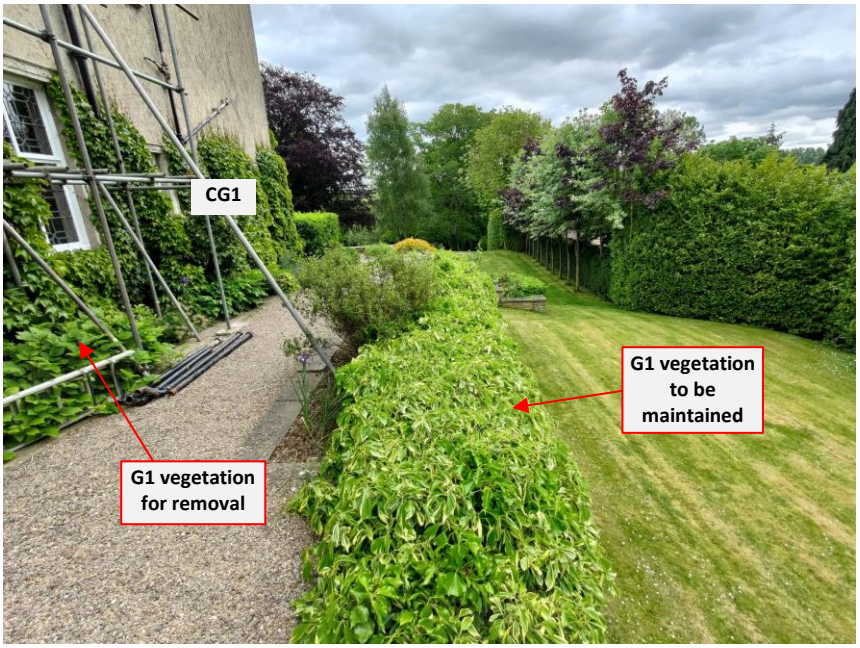
Plan not to scale – indicative only

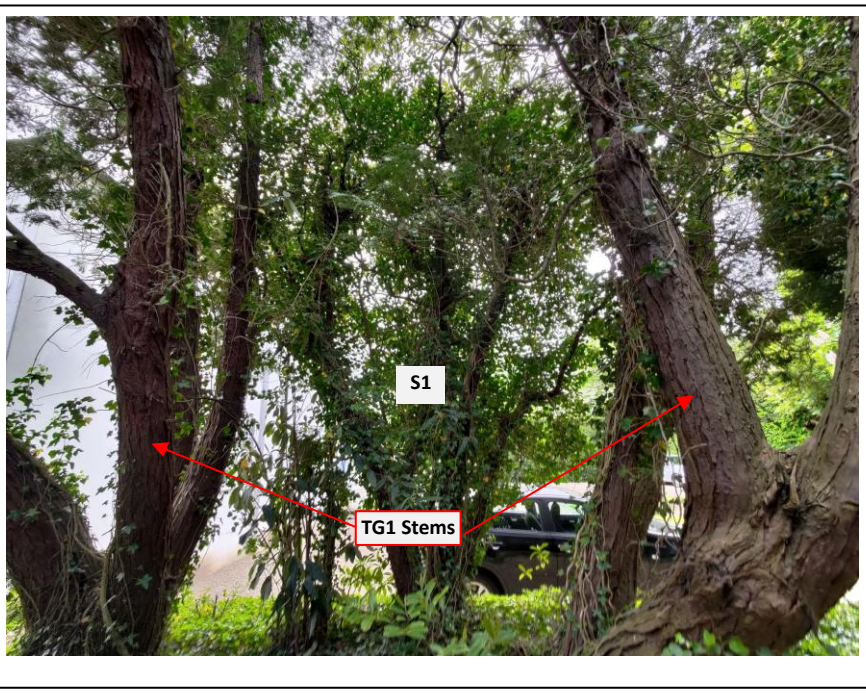
Approximate areas of damage

Images


CG1
G1
TG8


CG1
HG1


CG1
G1 vegetation to be maintained
G1 vegetation for removal


S1
TG1 Stems

Management of vegetation to alleviate clay shrinkage subsidence.

All vegetation requires water to survive which is accessed from the soil. Clay soils shrink when water abstracted by vegetation exceeds inputs from rainfall, which typically occurs during the summer months. When deciduous vegetation enters dormancy and loses its leaves and rainfall increases during the winter months, soil moisture increases and the clay swells. (Evergreen trees and shrubs use minimal/negligible amounts of soil water during the winter).

Buildings founded on clay are susceptible to movement as the clay shrinks and swells which can result in cracking or other damage.

Where damage does occur, pruning (reducing leaf area) can in some circumstances be effective in restoring stability however, removal of the influencing vegetation (trees, shrubs, climbers) causing the ground movement offers the most predictable and quickest solution in stabilising the clay and hence the building and for this reason is frequently initially recommended as the most appropriate solution.

Often this is unavoidable due to the size or number of influencing trees, shrubs etc and their proximity to the building. Very heavy pruning of some species to a level required to effectively control its water use can result in the trees decline and ultimately death and is one factor considered when making recommendations for remedial tree works. Pruning alone, whilst reducing soil moisture uptake is often an unpredictable management option in restoring building stability either in the short or long term.

In some circumstances however, where vegetation initially recommended for removal is subsequently pruned and monitoring indicates the building has stabilised, removal becomes unnecessary with decisions based on best evidence available at the time.