1-38-4952

REPORT

on trees in relation to
13a Mornington Place, London, NW 1 7RW
for PBA Consulting

[redacted]

INSURED : Mr. B. Romeo
(21st November 2019)

JOHN CROMAR'S
ARBORICULTURAL
COMPANY LIMITED

[redacted]

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Registered Consultant of the Arboricultural Association

AA Registered CONSULTANT trees.org.uk

[redacted]

1 Introduction and instructions

This is a tree and building subsidence matter. I am instructed by PBA Consulting on behalf of Insurers. I consider my instructions in essence to be to report on the applicability of tree pruning or removal to control a reported subsidence problem at 13a Mornington Place, London, NW1 7RW. Accordingly, I visited the property on 12th November 2019 in order to carry out an inspection.

2 Report limitations

2.1 Client use

This is a report for the sole use in connection with the above matter only of the client named above and the client's professional advisors. It may be copied and used by the client. Its reproduction or use in whole or in part by anyone else without the written consent of the writer is expressly forbidden. ***The appended schedule of tree work, and the plan, may, without the written consent of the writer, be reproduced to contractors for the sole purpose of tendering.***

2.2 Preliminary nature

This report is preliminary in nature in that further investigations may be identified as necessary in order to reach firm conclusions and/or recommendation(s) for action.

2.3 Not a full safety survey

This is primarily an arboricultural report. Whilst comments relating to matters involving built structures or soil data may appear, any opinion thus expressed should be viewed as qualified, and confirmation from an appropriately qualified professional sought. Such points are usually clearly identified within the body of the report.

This is not a full arboricultural safety survey. This can be supplied but will be subject to a further fee. Where matters of tree condition with a safety implication are noted during an inspection they will of course appear in the report.

2.4 Tree management recommendations

It will be appreciated, and deemed to be accepted by the client, that the formulation of recommendations for the management of trees will be guided by:

1. the need to address reasons for damage;
2. the cost-benefit analysis (cost being in terms of amenity), of tree work that would remove all risk of tree related damage; and
3. the arboricultural considerations—safety, good practice and aesthetics.

2.5 External sources

The client is also deemed to have accepted the limitations placed upon any recommendations by the sources quoted at 3 and 4 below and, especially in view of the inherent uncertainties of climate to accept recommendations in respect of indirect damage as formulated to reduce risk rather than as a guarantee of zero risk. Where sources are limited by externally imposed time or cost restraints this will be identified in the report and may lead to an incomplete quantification of risk. No responsibility can be accepted for the consequences in such a case.

2.6 Re-inspection timescale

Conclusions and recommendations in respect of trees retained on site are valid for a period of three years from the date of inspection, after which a re-inspection is recommended. This is important if new risks such as from trees growing from wind-sown seeds are to be identified, and risks that may be developing as a result of changes to the site, e.g. trees that start to grow at an increased rate due to alterations in immediate environs.

3 Sources and Documents

3.1 Documents supplied

A ground level external inspection was made. Documents supplied and to hand are as follows:

Data	Source
Soil condition report	**Auger**
Root analysis report	**Richardson's Botanical Identifications**
Consulting engineer	**PBA Consulting**
Consulting engineer report type	**Interpretive**
Description of damage	**PBA Consulting**
Geotechnical report	**Soiltec**
Drain report	**Auger**
Monitoring records	**PBA Consulting**
Loss adjusters	**IAS**

3.2 Matters reported by documents

Factor	Trial pit/ borehole	Depth (m)	Comments
Cracking			Dwelling built c. *No report received* Extension built c. *No report received* Internal and external cracking of rear extension(s)
Date of onset			First noticed 18 months to two years ago, worsened through the summer of 2018
Footings/Soil	TH1	>1.2	Flagstones over made ground then obstruction Foundation depth not verified (16.7.19)
	TH2	0.5	Artificial grass over made ground. Terminated due to hard clay (made ground); could not bore any deeper (16.7.19)
	TH3	>1.3	Tiles over made ground overlying clay (4.9.19)
P.I. range	TH1		20%
	TH3		10-29%
Desiccation	TH1		Report received states comparison of the Moisture content with the Atterberg Limits indicates that the soil was desiccated. (Date of investigation 16.7.2019.)

<table>
<tr><th>Factor</th><th>Trial pit/ borehole</th><th>Depth (m)</th><th>Comments</th></tr>
<tr><td></td><td>TH3</td><td></td><td>Report received states comparison of the moisture content with the Atterberg Limits indicates desiccated conditions for the depth of the borehole. (Date of investigation 4.9.2019.)</td></tr>
<tr><td>Roots</td><td colspan="3">
<table>
<tr><td colspan="3">TH1, 0.2-0.5m</td></tr>
<tr><td>5 no.</td><td>Examined root: a conifer, could well be the family CUPRESSACEAE (cypresses ('macrocarpa', 'Leylandii' etc.), Thuja (Western Red Cedar), Junipers).</td><td>Dead*.</td></tr>
<tr><td>1 no.</td><td>Examined root: similar in many ways to AILANTHUS (Tree of Heaven).</td><td>Dead*.</td></tr>
<tr><td>1 no.</td><td>A piece of BARK only, insufficient material for identification.</td><td></td></tr>
<tr><td colspan="3">TH1, 1.0-1.2m</td></tr>
<tr><td>6 no.</td><td>Examined root: the family CUPRESSACEAE (as listed above).</td><td>Dead*.</td></tr>
<tr><td>3 no.</td><td>Examined root: PINUS (Pine).</td><td>Alive, recently*.</td></tr>
<tr><td>1 no.</td><td>Examined root: again, could be AILANTHUS (Tree of Heaven).</td><td>Dead*.</td></tr>
<tr><td>4 no.</td><td>Unfortunately all with insufficient cells for identification.</td><td></td></tr>
<tr><td colspan="3">BH2, 0.2-0.4m</td></tr>
<tr><td>6 no.</td><td>Examined root: the family CUPRESSACEAE (as listed above).</td><td>Alive, recently*.</td></tr>
<tr><td>1 no.</td><td>Examined root: PINUS (Pine).</td><td>Alive, recently*.</td></tr>
<tr><td>2 no.</td><td>Both samples revealed too few cells for microscopic identification.</td><td></td></tr>
</table>
<table>
<tr><td colspan="3">Trial hole, 1.3m</td></tr>
<tr><td>1 no.</td><td>Examined root: a conifer, similar in many ways to CEDRUS (Cedar).</td><td>Alive, recently*.</td></tr>
<tr><td>1 no.</td><td>Microscopic examination showed insufficient cells for recognition.</td><td></td></tr>
<tr><td colspan="3">Trial hole, 1.8m</td></tr>
<tr><td>2 no.</td><td>Examined root: again, could be CEDRUS (Cedar). A very IMMATURE sample.</td><td>Alive, recently*.</td></tr>
<tr><td>1 no.</td><td>Microscopic examination showed insufficient cells for recognition.</td><td></td></tr>
<tr><td>1 no.</td><td>A piece of BARK only, insufficient material for identification.</td><td></td></tr>
<tr><td colspan="3">Trial hole, 2.3m</td></tr>
<tr><td>1 no.</td><td>Examined root: as above, we cannot rule out CEDRUS (Cedar). This sample had NO BARK.</td><td>Alive, recently*.</td></tr>
<tr><td>1 no.</td><td>Examined root: too DECAYED for identification.</td><td></td></tr>
<tr><td>2 no.</td><td>Both pieces of BARK only - insufficient material for recognition.</td><td></td></tr>
<tr><td>1 no.</td><td>Microscopic examination showed insufficient cells for recognition.</td><td></td></tr>
<tr><td colspan="3">Trial hole, 2.8m</td></tr>
<tr><td>1 no.</td><td>Examined root: a CONIFER. Less than 0.2mm in diameter.</td><td>Dead* (note this 'dead' result can be unreliable with such thin samples).</td></tr>
</table>
The lower table assumed to refer to TH3/BH3
</td></tr>
<tr><td></td><td>TH1</td><td>To 1.5
0.2
1.0</td><td></td></tr>
<tr><td></td><td>TH3</td><td>To 3.0
1.3
1.8
2.3
2.8</td><td></td></tr>
</table>

Factor	Trial pit/ borehole	Depth (m)	Comments
Drains			No defects were found within the drainage running along the rear of the extension and continuing under the extension and hall to the manhole at the front.
Monitoring			Records to hand for period: 16/7/19 to 17/9/19.

4 Appraisal

4.1 Mechanism

A consideration of the matter of trees and the subsidence of buildings requires some discussion of the processes involved. *Transpiration* is the process by which water is lost to the atmosphere from living plants. This process demands water uptake from the soil into the roots, from where it passes into the vessels of the plant, and is conducted to various parts of the plant and is finally lost to the plant mainly through pores in the leaves. This process can dry clay soils so that they shrink and allow foundations resting on them to sink or move. (This can be termed 'indirect damage'). There is a higher risk of this happening in very low rainfall periods. The buildings constructed on those footings may then crack. Removal of trees involved in subsidence almost always arrests further cracking, whereafter the previously dried clay will, usually fairly rapidly (i.e. within a season or two) return to its normal proportions by the natural action of rainfall, and consequently will lift the footings back to the position they were in prior to the damage, thus closing or nearly closing the cracks. Redecoration internally is often all that is then required. What may be termed 'direct damage' is caused by physical pressure of parts of a tree, such as roots or trunk, on a structure, and this can occur on any soil type.

4.2 Footings

The footings were not noted to be shallow. Information supplied indicates that foundations are pad and beam, and that hit and miss underpin was used, perhaps generally to around 1.5m below GL. On heavily-worked agricultural clay soils, obvious cracking related to drying can open up to a metre or perhaps more in depth during droughts, but this depth of cracking is rarely seen in other circumstances. It can therefore safely be concluded that a root system would be needed to cause any soil drying below the footings.

4.3 State of borehole

Made ground was noted in the excavations extending to unknown depth. Movements can occur in such material allowing foundations founded in it to sink. Such movements are typically associated with saturation of the soil, but can occur unpredictably under other conditions. I will of course defer to the appropriate professionals on all purely structural and geotechnical matters.

4.4 Drains

All trial pits/boreholes encountered subsoil that was reportedly "dry / very stiff" indicating that drain failure is unlikely to be significant in the damage.

4.5 Root identification

The root identification indicates that vegetation near the property (cedars 1, 3 , 4, Lawson cypress 2, Ailanthus 6) has developed roots close to or under the footings. Some significance should be attached to the report of the Ailanthus roots being 'dead' on test : this is rather remote from the trial pit locations, and may well not relate to tree 6, but notionally to a tree now removed. Questions therefore arise over how such vegetation could be managed in order to reduce soil drying near the footings. Practical difficulties arise. DNA matching of root samples to twig samples might identify which tree had generated the root in the trial pit(s). However, three or four samples of root are a practical minimum on which to base the tests. The failure of the test to make a match between twig and root sample does not mean that no roots of the non-matched tree can be present in the area of the trial pit. In this case it is unreasonable to remove all possible sources of cedar roots.

4.6 Monitoring

Monitoring confirms that cracks have generally opened toward the end of the summer. This is consistent with soil drying being involved. If crack monitoring confirms a seasonal pattern of damage with cracks opening in summer and closing in winter, or level monitoring show levels falling in summer and rising in winter, it can safely be concluded that vegetation is involved in the damage.

4.7 Pruning

Pruning to trees to reduce soil drying near buildings is generally unreliable unless repeated frequently. It is most likely to be effective when there is considerable separation between the affected building and the tree. This is not the case here. A *very regular* pruning regime to trees near buildings *over an extended time and at close intervals* may reduce both the likelihood of damage and limit the scale of damage if it does occur. Cedars and cypresses in this part of the country are usually of high vitality, able to regenerate new leaves very quickly and in considerable density and numbers. This means that although transpiration will be reduced temporarily by a *severe* pruning, it will very rapidly recover as new leaves grow, which can in summer be a matter of a very few weeks. Research has demonstrated that a 50% loss of leaf does not reduce the water uptake by as much as 50% as remaining leaves generally transpire greater amounts than previously. A single heavy pruning will not succeed in my view in remedying the situation reliably. Sometimes a single pruning may be followed by a period of normal or wet weather, which may allow more credit to be given to the pruning as having effected a 'cure' than is strictly due. 'Hortlink' project 212 'Controlling Water Use of Trees to Alleviate Subsidence Risk' (2004) established that the reduction in water use following heavy pruning of trees is lost after two seasons.

4.8 Tree removal

In this case I consider that removal of certain trees will be necessary in order to reliably control soil drying. It is reasonable for this to proceed step-wise, with sufficient monitoring to determine effectiveness between the initial and any further removals, in view of the very high amenity and screening value of the trees from the perspective of the property owner. Recommendations for vegetation management are as outlined in section 6 below.

4.9 Heave

Trees may pre-date the foundation works (apparently 2002) supporting some or all of the structure.

4.10

Heave, as far as tree/building relationships are concerned, is the (usually upward) movement of structures founded on clay soils, this becoming of general relevance when damage also occurs, when clay soil absorbs moisture after it has been desiccated, often by tree roots. Such desiccation can cause problems if trees that have caused the desiccation are removed, as swelling of the subsoil can occur, forcing some structures upward. Heave can only occur in certain fairly precise circumstances. For there to be even a potential for heave, an adjacent building (in whole or in part) must at least postdate the tree or have been previously distorted by the action of the tree, then patched and repaired, perhaps over many years, and there must be a significant persistent moisture deficit in a shrinkable soil below the property.

4.11

One of these factors may apply in this case. Formal quantification of any swell potential in the soil could perhaps take place by a study of geotechnical investigations, although it should be noted that even a formal heave assessment as per guidelines in BRE Digest 412 (Feb 1996), and as noted therein, can only give an approximation of the magnitude of potential heave. It is also noted therein that the implications of desiccation are as dependent on the thickness of soil that has been desiccated as on the severity of desiccation. In this case the difficulties encountered in penetrating the subsoil would severely limit such a formal assessment.

4.12

For this reason, records or other evidence of whether the structure has, before the current incident, previously been damaged by the tree(s) may be of best practical value in assessing whether a true threat of heave applies. Several previous incidents, or reports of more or less continual slight movements, could indicate a heave potential. It may be possible to establish from the history of the property that before the present incident, there had been *no* previous occurrence of damage. If a heave risk applied at the time of construction due to roots present below the structure at that time, some heave would likely have occurred soon after construction, due to root severance. It may also be concluded that the trees are extremely poorly sited for growth to maturity and would require removal when or before the tissue of the trunks come into contact with the superstructure, so the matter of heave risk would have to be faced at that time if not now.

4.13 Tree replacement

The amenity provided by trees is often of general public benefit. The precise locations of trees and 2 are not favourable for any tree. I can only suggest, that subject to structural calculations some roof-borne planter might host some screening climbing plants and these could be trained onto a ground-placed frame supporting trellis.

4.14 Root barrier

A root barrier has been considered and rejected as inapplicable owing to potential for tree damage, etc.

4.15 Statutory constraints

Camden's web site has informed me that the property is in a Conservation Area.

Conservation Area restrictions do apply and therefore a formal notification of intent should be given to the local planning authority and the notification period allowed to expire, before carrying out work to any such protected trees.

5 Conclusions

Prospects for control by vegetation management are good if vegetation is confirmed as involved and if vegetation considered significant can be removed: much less certain if pruning alone is relied upon.

Further information on swell / heave potential / cracking history may be useful.

Further information is needed via crack or level monitoring in order both to confirm causation and to determine the response of the building to any initial tree control measures.

6 Recommendations/ Summary

6.1 Tree Data

Please read in conjunction with the plan 1-38-4952/P. All dimensions are approximate and are in metres/millimetres.

Tree number	Tree type	Height	Stem diameters	Proximity	Comments	Now	Repeat (Y/N +any repeat in years)	Reason	Cost - £
1	blue Atlantic cedar	14	300	0.8	No access. Remove to ground level.	Y	N	Suspect	950
2	Lawson cypress	12	200	0.4	Remove to ground level.	Y	N	Suspect	550
3	blue Atlantic cedar	14	382	3.64					
4	blue Atlantic cedar	11	213	6.19					
G5	evergreen magnolia	4	<120	8.3					
6	tree of heaven	13	300	14.5	No access.				

Proximity is the distance from the specified property or structure.
Cost is solely a guide to industry charges; it is neither a quote nor an estimate.

6.2 Tree work standards

Any tree work should be carried out to BS 3998:2010 'Tree work—Recommendations'.

7 General

All trees growing close to life and property require regular inspection and sometimes maintenance to minimise conflict between the arboreal and human spheres of existence. This should be carried out yearly by a properly qualified arboriculturist, such as a Fellow of the Arboricultural Association, or registered consultant of that body.

8 Signature

Date of completion: 21st November 2019

Signed:

John C. M. Cromar, Dip. Arb. (RFS), F. Arbor. A., RCArborA
on behalf of John Cromar's Arboricultural Company Limited.

9 Schedule - 13a Mornington Place, London, NW 1 7RW

Please read in conjunction with appended plan ref: 1-38-4952/P

Please note that this a provisional schedule of works considered necessary if vegetation control alone is adopted as a remedial measure.

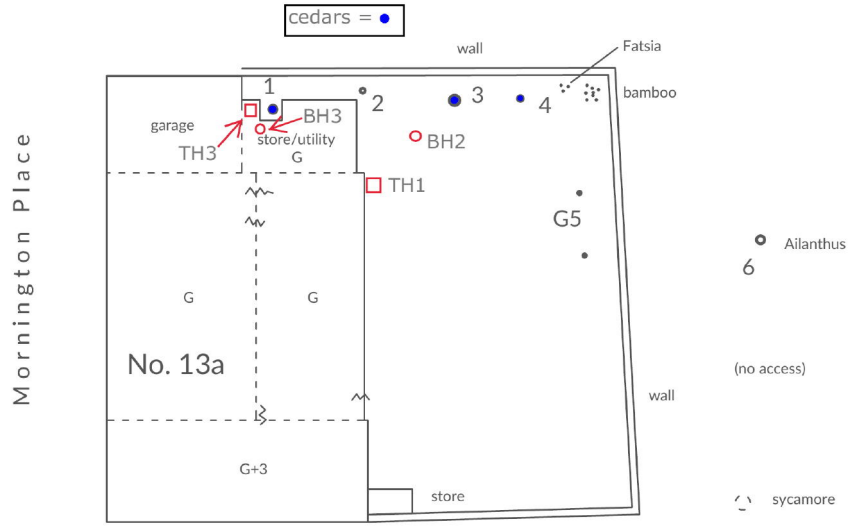
Tree number	Tree type	Height	Stem diameters	Proximity	Comments
1	blue Atlantic cedar	14	300	0.8	Remove to ground level.
2	Lawson cypress	12	200	0.4	Remove to ground level.

NOTES:

All tree work should be carried out to BS 3998 : 2010 'Tree Work – Recommendations'. The Wildlife and Countryside Act 1981 protects with certain exceptions all birds and their nests. It is an offence to destroy such nests or take or injure such birds in the course of tree works operations. If a tree is a bat-roost, a licence to work on the tree must first be obtained from the relevant Statutory Nature Conservation Organization (in England : Natural England 0845 601 4523.) Acting without a licence is likely to be justifiable only in acute emergencies threatening human life and where all other legally available option such as footpath diversion, fencing and warning signs cannot be applied.

'Crown cleaning' – an umbrella term now covered by several separate sections in BS3998:2010 – should be understood to mean : removal of foreign objects (section 7.13) ; removal of ivy to the extent needed to facilitate inspection (section 7.12) typically trimming back (e.g. with a hedge cutter or secateurs) to near the line of the trunk or branches, and/or removing selected stems so that the structure of the tree can be seen sufficiently. Dead wood can be an important ecological feature. Treatment of dead wood under 'crown cleaning' shall mean (section 7.3.2); shorten and retain if safe to do so, thus retaining some resource for invertebrates, etc.

10 Plan



0 5 10

Plan drawn to approx. scale 1:200 @A4

Trees in relation to 13a Mornington Place, London, NW1 7RW
1-38-4952/P

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