## Simon Pryce Arboriculture

# Report

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|---|---|
| **Client:** | **BSD Partnership** |
| **Site:** | **1 - 5 Agar Grove, London, NW1 9SL** |
| **Instruction:** | **Neil Hawes & Associates Ltd** |
| **Subject:** | **Trees and other vegetation near the building and their effects on it. Specification for necessary or appropriate work.** |
| **Inspection date:** | **21 March 2019** |
| **Report date:** | **31 March 2019** |
| **Reference:** | **18/108** |
| **Author:** | **Simon Pryce, BSc, FArborA, RCArborA, CBiol, MICFor** |

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## 1 Introduction

1.1 This report has been prepared on the instructions of Neil Hawes & Associates Ltd in connection with the investigation of building damage at 1 - 5 Agar Grove, London, NW1 9SL. I have been asked to inspect trees growing nearby, to assess their condition and possible effects on the building and to specify any necessary or appropriate work.

1.2 This report is based on supplied information and a site visit and inspection on 21 March 2019. The inspections were visual and made from ground level.

1.3 General matters are discussed below. The attached schedule contains comments and recommendations for individual trees and they are shown on the site plan. Left and right are used as if facing the houses from the front, unless noted otherwise.

## 2 Background

### The site

2.1 Numbers 1 - 5 Agar Grove are three four storey houses, 1 and 3 being a semi-detached pair and no.5, to the right attached to no.7. They are reported to date from about 1830 and were originally family houses, converted to form three flats in each building. When converted they had three storey side additions and staircases added, the exact date of this work is unknown, but it is not recent.

2.2 The site is more or less level and there are light wells across the front and rear of the houses. The rear garden of no.1 has been retained as original, while the gardens of 3 and 5 have been combined. The local planning authority is Camden Council and the site is in Camden Square Conservation Area.

2.3 Cracking and signs of foundation movement have occurred and are being investigated by Neil Hawes and Associates Ltd, their reference MH/SD/1935. Their report and those of the other specialists involved contain a full account of the case but some points are summarised below.

### Damage

2.4 The damage consists of internal and external cracking, mainly at the front and left of no.1, with the general pattern indicating downward movement and rotation outwards relative to the rest of the building. It is not clear when this started; the report notes that it seems to have been present for some time but that some movement probably occurred during the dry summer of 2018.

2.5 The damage is considered to be in Category 2 of BRE Digest 251 - Assessment of damage in low-rise buildings.[1] The surveyors have recommended repairing the cracks using HeliFix or a similar strengthening system.

### Foundations

2.6 In January 2018 Soil Consultants Ltd dug five trial pits in the locations shown on the site plan, four in the light wells next to the building and one next to the side boundary wall. Foundations details are below, depths are from the bases of the light wells which are 1 - 1.2m deep.

| TP | Location | Depth + description |
|---|---|---|
| 1 | No. 1 front L | 50mm concrete footing, overall depth 150mm |
| 2 | LH boundary wall | 100mm brick step, overall 580mm |
| 3 | No.1 rear central | 70mm brick, overall 370mm |
| 4 | No.3 front R | 100mm concrete, overall 300mm |

[1] Building Research Establishment (1995) Digest 251 Assessment of damage in low-rise buildings

| | | |
|---|---|---|
| 5 | No.5 front L | 2mm concrete, overall 250mm |

**Ground conditions**

2.7 The online 1:50,000 scale British Geological Survey [2]shows that the local subsoil is London clay and this is confirmed by the site investigation which found an orange brown silty clay subsoil in all five locations. Samples had plasticity indices 35 and 43%, all but one being 40% or higher, indicating a high potential for shrinkage and swelling with changes in moisture content.

2.8 Moisture contents of samples from TP1, 3 and 4, all next to nos.1 and 3 were relatively low and were less than 0.4x liquid limits, which is commonly regarded as indicating desiccation, i.e. the clay being drier than would be anticipated under normal equilibrium conditions.[3] Sample liquidity indices were also lower in those samples than those from TP2, next to the side wall and TP5, front L of no.5.

**Roots**

2.9 Roots were found in all five locations and samples identified as below

| TP/BH | species |
|---|---|
| 1 | 1 root Leguminosae (false acacia, broom, wisteria & others). |
| | 2 others similar under low magnification. |
| 2 | 1 root Caprifoliaceae, shrubs including viburnum. |
| | 3 others similar under low magnification. |
| 3 | 1 root *Tilia* (lime). |
| | 1 root *Fraxinus*) ash + 4 similar under low magnification. |
| | 1 root Caprifoliaceae, similar to TP2 + 6 similar under low magnification. |
| 4 | 1 root Caprifoliaceae, although possibly different species from above. |
| | 1 root a shrub, lack of bark prevented further identification + 3 similar. |
| 5 | 1 root a shrub, possibly yet another Caprifoliaceae. |

**Drains**

2.10 A CCTV survey of the drain runs revealed localised displaced joints and circumferential cracking and a collapse pipe with root intrusion in section 7, to the front left of no.1. The surveyors recommended that these are repaired to make them watertight.

**3 Observations - trees and other vegetation**

3.1 Vegetation near the houses includes some small and medium sized trees at the front together with evergreen shrubs which have been close planted in placed and trimmed to form a dense screen from the road. There are some larger trees to the rear including a mature eucalyptus in the rear garden of no.1 and a Leyland cypress and deodar cedar to the rear of no.3. The only lime is some distance away in front of some garages to the right of the houses.

3.2 These are described individually in the schedule forming the second part of this report, with recommendations for any necessary or appropriate work. They are numbered on the attached site plan.

[2] British Geological Survey (BGS) online 1:50,000 map
[3] Driscoll (1983) "The Influence of Vegetation on the Swelling & Shrinking of Clay Soils in Britain". Geotechnique. Vol. 33.

## 4 General comments

4.1 Tree roots grow with little force, but can cause significant soil drying. Most clay soils shrink when dried and swell as they rehydrate, so this combination can cause subsidence in nearby buildings if their foundations do not extend below the affected zone. This usually starts during dry summers and shows a seasonal cycle, with downward movement in summer followed by recovery through the winter when the weather is cooler and wetter and the vegetation inactive.

4.2 The size, age and vigour of an individual tree all influence its drying effect on the soil, but there is also considerable variation between species. Most of the species here are regarded as low or moderate water demanders but grow well in urban conditions and on clay sub soils so are quite commonly associated with subsidence in nearby buildings. Coniferous trees have more compact root systems, so the drying effect is more localised, but can be intense with the higher water demanding species such as cypresses. Large shrubs and climbing plants can also cause significant soil drying and are frequently planted near buildings.

4.3 Pruning to reduce leaf area also reduces water uptake. The small roots that absorb water die each winter, then new ones develop in spring and grow according to the tree's need so, over the long term, pruning a tree's crown regularly reduces the extent and water uptake of the root system. However healthy trees respond by sprouting vigorously, so it is essential that regrowth is recut regularly and even then this is not always effective with large vigorous trees rooted close to buildings. This kind of management can also harm trees, although some species tolerate pruning better than others. Removing trees will eliminate any threat associated with them, provided there is not a potential for heave. It is sometimes possible to replace trees with other species that present a reduced risk without the need for intensive maintenance.

4.4 Frequently soil movements caused by trees are purely seasonal, so felling stabilises the building almost immediately if done during the dormant season and within one winter at most. However large vigorous trees, especially high water demanding species such as oaks, can cause a persistent moisture deficit at depth where the soil does not rehydrate fully in winter. If these are removed the resulting soil rehydration and swelling can lead to heave damage in buildings nearby, especially if they were built after the moisture deficit established. This movement can take several years if the desiccation is deep and severe, although it tends to start rapidly then tail off.

## 5 Discussion

### Causation

5.1 Site investigation to date shows that the sub soil is a highly shrinkable clay. Despite the site investigation being done in late winter there was evidence of desiccation in the samples from trial pits 1, 3 and 4, all of which were dug next to the left hand building. This is consistent with the building surveyor's observation that the main affected area is the front and left of nos.1 and 3. Roots were found just under the foundations in all five trial pits, but bore holes were not sunk, so it is not clear how far below that they extend or the quantities present in each location.

5.2 Identified roots largely correspond to the existing vegetation near the pits concerned, although the nearest lime and ash trees are some distance from TP3. The most likely source of the Caprifoliaceae roots in TP1 is the viburnum in the planting bed next to the pit, while the ones in TP4 are from the viburnums in front of 1 and 3 and probably the lonicera hedge at the edge of the light well. The ones in TP5 are probably form a small wiegela growing under the magnolia near the pit.

5.3 There were also defects in most of the drain runs that were surveyed by CCTV and root ingress in section 7 to the front left of no.1. Drain leakage can cause foundation movement by eroding granular material and occasionally by softening clay, but none of the trial pits found evidence of high soil moisture. Repairing the drains, as recommended by the surveyor will stop any current leakage. Roots frequently get in through any existing cracks or displaced joints and will proliferate inside if conditions are favourable, but do not grow with enough force to break into drains directly, particularly with modern materials.

5.4 If required this could be investigated further by monitoring for signs of seasonal movement and possibly sinking bore holes to assess deeper soil conditions.

**Remedial / precautionary measures**

5.5 Repairing the drains would remove them as a possible cause. The crack repairing and reinforcing the cracks in the walls will make those parts of the buildings more resistant to further movement, but would not necessarily resist the effects of any major soil shrinkage, particularly under other parts. A moderate amount of work and routine management on the trees and shrubs near the houses would reduce any current effect and future risk.

5.6 The attached schedule contains detailed recommendations for work on the trees and other vegetation near the houses. This is based on the available information and the most suitable arboricultural management of the species concerned. It will reduce any drying effect on the sub soil under the foundations significantly, although it might need to be reviewed if the problems persist or in the light of further investigation.

**Heave**

5.7 Without more information about soil conditions at depth it is not possible to draw firm conclusions about any heave potential. However all the trees and shrubs in the vicinity are much younger than the houses, which indicates that any removals are highly unlikely to cause any problems.

**Restrictions**

5.8 The lime and ash trees, 16 and 17, appear to be in other ownership, so there is no direct control over them. Tree owners can be liable for any reasonably foreseeable damage that they do not take suitable steps to prevent. This applies particularly to councils and similar bodies as they are considered more expert in this area than most private individuals.

5.9 Under the conservation area legislation Camden Council must be given six weeks notice of any proposed felling or pruning of trees over 75mm diameter at 1.5m. They can allow that either by confirming that they do not object or by letting the six weeks lapse without making a tree preservation order (TPO). There is no set definition of a tree or shrub, so large shrubs can be covered if they have a stem greater than 75mm at 1.5m. However most of the shrubs and some of the younger trees are too small to be covered. This has been indicated for each one in the schedule.

5.10 If the council make a TPO or trees already protected it is necessary to make a formal application for the work. If that is refused there is a right of appeal to the Secretary of State.

**Tree work**

5.11 Any treework should be carried out in accordance with BS 3998: 2010, Recommendations for Treework. It is essential that the contractor doing the work has appropriate third party and public liability insurance. The Arboricultural Association has a list of approved contractors, published on their web site at www.trees.org.uk.

5.12 When trees are felled it is advisable to remove the stumps and main roots or to kill them with a suitable herbicide in order to prevent them sprouting and regrowing or sending up sucker shoots. Removing them also avoids colonisation by honey fungus, which can spread and infect other vegetation nearby, either killing plants or decaying structural roots and making them unstable.

**6 Conclusions**

6.1 Investigation findings to date are consistent with the damage being at least partly due to soil drying caused by the nearby vegetation. There are also defects in the drains, which could cause or contribute to foundation movement, although there was no firm evidence of high soil moisture contents.

6.2 Repairing the drains will eliminate them as a possible cause of further foundation problems. Repairing and reinforcing the cracks will make those areas stronger, but would not necessarily safeguard against any major soil shrinkage.

6.3 A moderate amount of work and ongoing maintenance of the trees and shrubs will lessen any risk to the houses. The work in the schedule will reduce any drying effect on the soil, although it might need to be reviewed if the problems continue or in the light of further investigation.

6.4 The site is in a conservation area, but the shrubs and smaller plants are beyond the scope of that legislation.

6.5 Some of the trees belong to other parties so there is no direct control over them.

[redacted]

Simon Pryce, BSc, FArborA, RCArborA, CBiol, MICFor

*Trees inspected by Simon Pryce, 21 March 2019*

| Tree no. | Species | Distance | Height | Trunk dia. | Est. age | CA | Comments and recommendations |
|---|---|---|---|---|---|---|---|
| The trees are described in sequence starting in front of no.5 and going round clockwise. In the CA column Y indicates that they are protected by the Conservation Area, so the council should be notified of proposed work, N indicates tree or shrubs with no restrictions. Asterisks in the first column denote those in other ownership, with house numbers in brackets or [c] denoting council owned trees. m/s = multiple stemmed. | | | | | | | |
| 1 | Lawson cypress | 2m | 8m | 160mm | 30+ | Y | Golden foliaged form, multiple trunked from about 2.5m, indicating that it was topped in the past, top is starting to lean. Not an imminent or major threat, capable of more growth, but not particularly vigorous.<br>• *Reduce to about 5m, similar to the ones in front 1& 3, and maintain at that height.* |
| 2 | Variegated holly | 3m | 3m | 50mm | 30+ | N | Small, low water demanding species.<br>• *No work needed to safeguard the building.* |
| 3 | Shrubs | 5m | 1.5m | m/s | 30+ | N | Mixture of lonicera and other shrubs planted along the front boundary and trimmed informally to form a screen. Not an imminent or major threat but will grow larger if left.<br>• *Trim regularly to keep them to 2 - 2.5m high.* |
| 4 | Lawson cypress | 3.5m | 9m | 160mm | 30+ | Y | Similar to tree 1, also has a large rose growing through it.<br>• *Reduce to about 5m, maintain at that height.* |
| 5 | Buddleia | 3.5m | 4m | m/s | 30+ | N | Vigorous shrub, cut back regularly to about 1.5m, not conclusively implicated. Stands pruning well.<br>• *Reduce back to former pruning points each winter.* |
| 6 | Magnolia | 3m | 9m | 270mm | 40+ | Y | Southern evergreen magnolia, low water demanding species, but is a large healthy specimen rooted close to the fronts of nos. 3 and 5 and capable of some more growth. Roots in TP5 were probably from the wiegela growing near its base.<br>• *Reduce height and spread by up 1m, trim regrowth every 1 - 2 years.* |
| 7 | Aucuba | 2m | 1.5m | m/s | 10+ | N | Small growing shrub, trimmed regularly.<br>• *Trim annually to keep it to this size or smaller.* |
| 8 | Lawson cypress | 3m | 6m | 100 + 130mm | 30+ | Y | Gold foliaged form, similar to the trees in front of 5 but has been reduced in the past and is trimmed regularly.<br>• *Reduce to about 5m, trim annually.* |
| 9 | Holly | 2.5m | 4m | 80mm | 30+ | Y | Small specimen being suppressed by the others. Slow growing, low risk species, but not likely to improve appreciably.<br>• *Remove.* |

*Trees inspected by Simon Pryce, 21 March 2019*

| Tree no. | Species | Distance | Height | Trunk dia. | Est. age | CA | Comments and recommendations |
|---|---|---|---|---|---|---|---|
| 10 | Viburnum | 3m | 5m | m/s | 30+ | N | Three plants of one the larger growing viburnum species. All healthy and have merged to |

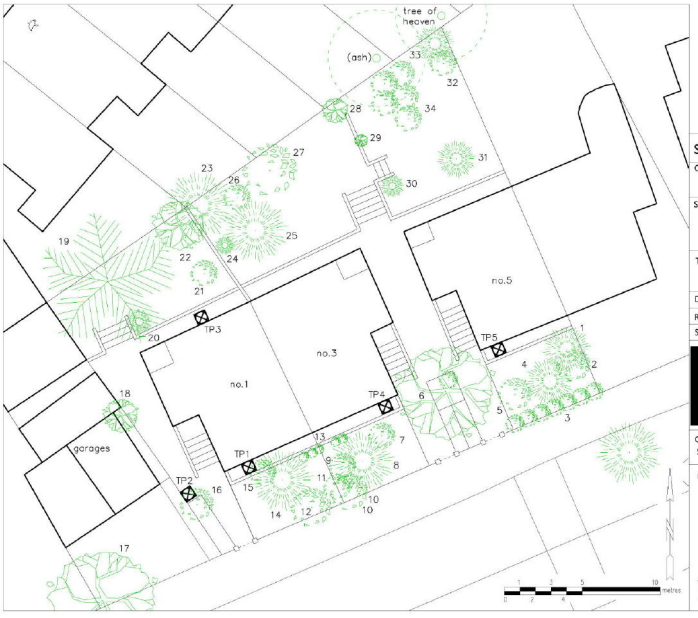
[redacted]

| Tree no. | Species | Distance | Height | Trunk dia. | Est. age | CA | Comments and recommendations |
|---|---|---|---|---|---|---|---|
| [redacted] | | | | | | | |
| 23 | Lawson cypress | 4m | 8m | 100mm | 20+ | Y | Small and severely suppressed by the others.<br>• *Remove* |
| 24 | Deodar cedar | 4.5m | 19m | 350mm | 40+ | Y | Healthy specimen, slightly drawn up due to growing between the buildings and other trees. Has heavy ivy spreading up the trunk and into the crown. Not implicated by the current evidence but capable of some more growth.<br>• *Kill ivy by cutting stems round the trunk leaving a gap of about 1m.*<br>• *Would stand light pruning if the need arose.* |
| 25 | Laurel | 6.5m | 5m | 100mm | 30+ | Y | Poor specimen suppressed by larger trees and leaning heavily.<br>• *Remove.* |
| 26 | Laurel | 6.5m | 3m | m/s | 30+ | N | Dense bushy specimen, not an imminent problem but will grow larger.<br>• *Reduce and trim to keep it to this size or smaller OR*<br>• *Remove.* |
| 27 | Loquat | 9m | 7m | 90mm | 20+ | Y | Healthy but well away from the houses, develops into a small to medium sized tree.<br>• *No work needed at present, could be reduced if the need arose.* |
| 28 | Ash | 6.5m | 10m | m/s | 5+ | N | Self seeded next to the low retaining wall, has been cut to near ground in the past and regrown. Will grow much larger if left, damaging the wall and possibly affecting the houses.<br>• *Remove.* |
| 29 | Lawson cypress | 3m | 4m | m/s | 20+ | N | Dying.<br>• *Remove* |

*Trees inspected by Simon Pryce, 21 March 2019*

| Tree no. | Species | Distance | Height | Trunk dia. | Est. age | CA | Comments and recommendations |
|---|---|---|---|---|---|---|---|
| 30 | Lawson cypress | 3m | 8m | 3 x 100mm | 30+ | Y | Healthy, but not an imminent or major threat.<br>• *Reduce and keep to about 5m high.* |
| 31 | Variegated holly | 9m | 7m | 110mm | 30+ | Y | Small growing low risk tree, well away from the houses.<br>• *No work needed to safeguard the houses.* |
| 32 | Lawson cypress | 10m | 8m | 90mm | 30+ | Y | Healthy, capable of more growth, but well away from the houses.<br>• *No work needed to safeguard the building.* |
| 33 | Shrubs | 8 - 10m | 5 - 6m | m/s | 30+ | N | Mixture if shrubs, most in fair condition and not very large growing, although a long dead, small ivy covered tree has snapped off.<br>• *Remove snapped off dead tree.* |

[redacted]
Simon Pryce, BSc, FArborA, RCArborA, CBiol, MICFor




Simon Pryce Arboriculture

Client:
BSD Partnership

Site:
1-5 Agar Grove, London, NW1 9SL

Title:
Trees and subsidence

Date: 21 March 2019

Ref: 18/108 | Rev:

Scale: 1:200 at A4

[redacted]

Original drawing:
Simon Pryce on OS base plan

Notes: