

## Simon Pryce Arboriculture

### Report

**Client:** [REDACTED]

**Site:** 115 Frognal, Hampstead, London, NW3 6XR

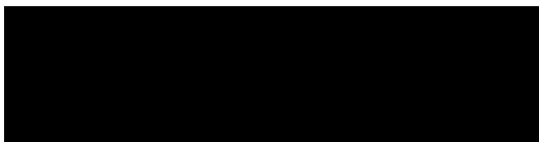
**Subject:** Safety inspection of lime tree

**Inspection date:** 16 January 2020

**Report date:** 14 February 2020

**Reference:** [REDACTED]

**Author:** Simon Pryce, BSc, FArborA, RCArborA, CBiol, MICFor



## **I Introduction**

- 1.1 This report has been prepared for [REDACTED] the owners of 115 Frognal, Hampstead, London, NW3 6XR.
- 1.2 I have been asked to make a detailed inspection of a lime tree growing in the front garden, to assess its condition and to recommend any necessary or appropriate work.

## **Background**

- 1.3 Arborists pruning the lime tree recently reported that decay in the main limbs and trunk appeared to be structurally significant and advised a more detailed inspection and assessment. This report was commissioned to address that and is based on a site visit and inspection on 16 January 2020. The tree was climbed to make a close inspection of former pruning points and a cavity opening in the top of the trunk and was test drilled to assess internal decay.

## **2 The tree**

- 2.1 The tree is a mature lime growing in the garden of no.115 Frognal next to Oak Hill Way, which runs past the side. It is approximately 20m high and has a single vertical trunk about 1050mm in diameter just above the root buttresses. Photograph 1 shows the tree crown with the points described below indicated.
- 2.2 The trunk divides at about 5m into two main stems that ascend steeply to form the main framework of the crown. This appears to be where it was topped or pollarded when younger, as there were originally three main stems from this point, but one was removed leaving a cavity that is not readily visible from the ground and is one of the concerns raised by the arborists.
- 2.3 The branch structure shows that the two main stems were topped at 10 - 12m and lateral branches shortened in the past, probably several decades ago. Smaller upright limbs that subsequently developed from them have also been reduced at least once.

## **Previous work**

- 2.4 Camden Council's online records confirm that the tree is protected by a tree preservation order (TPO), their reference 11H - T17. The site lists a consent for the recent work, ref 2018/5792/T, which was to remove epicormic growth from the trunk up to 5m and to re-reduce the crown by about 2m back to previous points.
- 2.5 There is also a consent in 2013 ref 2013/6844/T to remove trunk growth and lift the crown to 5m and to reduce height and spread by 33%.
- 2.6 There are also records of consents for various works dating back to 1986, but no documents are online, so only a few notes are available. Crown reductions for a lime or limes were approved in 1998 and 1999, but in earlier records trees are not identified and the notes simply state "agree to pruning". The major reductions of the main stems might have been done during the 1980s, but the removal of the third stem would have been well before that, probably at least 60 years ago and the original pollarding at 5m even further back, possibly not long after the tree was planted.

### **3 Climbing inspection**

#### **Trunk cavity**

- 3.1 This is the result of a third main limb being removed in the past. There has been some callus growth round the edges, but the original cut was too large to be occluded fully and the decay is spreading down the trunk. Leaf litter and small twigs have been collecting in the cavity, composting and mixing with the decayed timber. The top of this material is about 1m down from the opening, but the base of it could not be reached with a 0.9m long probe held at arm's length down into the cavity. On one side of the opening a small adventitious root has developed and is growing into the composted material and exploiting it for nutrients. (photo 4)
- 3.2 About 1m below the opening on the north side decay in a small cut where a branch was removed in the past has spread and connected with the main cavity, so it is possible to insert the probe for the full depth with no resistance. (photo 3)

#### **Upper crown**

- 3.3 The cuts from the major crown reduction in the past are between about 250 and 300mm across and all of them have well established decay. This is extending down into the upper parts of the main stems and callus growth round the edges is limited or absent in places. These cuts all face upwards and some were full of water, but it had rained during the previous week, so that will not be permanent. Most of them slant, indicating that they were cut to leave a downward slope and have V shaped notches at the lower side, indicating that the final part tore away before the cut finished. That is common in lime, which has tough, fibrous bark.

### **4 Test drilling**

- 4.1 There is a complete ring of callus growth round the top of the trunk cavity, but the shell of sound wood below that is clearly narrower, so the trunk was test drilled in five places in order to investigate that and the depth to which the decay had spread. This was done with an IML PD microdrill, a purpose built instrument that measures and plots the resistance to a small diameter drilling needle, giving an accurate picture of the tree's internal condition. The annotated readings for each tree are attached and discussed below. The drill is 50cm long, so this reached about half way through the trunk.
- 4.2 The instrument takes separate readings of the drag on the rotating drill (drilling curve) shown as a single black line, and the linear resistance to penetration (feed curve), shown as a filled blue line. Of these the feed curve is more important as it measures any decay directly.
- 4.3 Readings 1 - 3 were done about 3m above ground, i.e. about 2m below the cavity opening. All three show that the shell of sound wood is 18 - 20cm thick. On the south side of the trunk there is a sharp transition between the sound and decayed wood. Trees cannot cure decay or grow new wood in the same place to replace lost timber directly, but they can form reaction zones which resist the spread of the decay. This process is known as compartmentalisation and the sharp transition indicates that the tree has done this on the south side of the trunk. However this has not occurred on the east and west sides, where the transition is gradual, indicating that the decay is advancing.
- 4.4 Readings 4 and 5 were taken 2m above ground and show sound wood for the full depth of the drill on the south side, while on the west side there is a soft section between 35 and 44cm, indicating that the decay is spreading down the trunk.

## 5 Discussion

### Condition of the tree

- 5.1 Limes are naturally long lived and this one has produced some new growth since the recent crown reduction indicating that it is in reasonable physiological health. However it has severe structural defects, the most significant being the hollow trunk, which has been weakened considerably by the decay. Research on tree failures by Mattheck <sup>(1)</sup> and others indicates that, with a typical full crowned tree, the risk of a trunk failing increases significantly once the thickness of sound wood wound falls to less than 0.3 of the trunk radius, sometimes referred to as  $t/R$ . This tree's trunk does not taper much and is about 1m in diameter at the critical point, so the radius is 50cm and a sound wall thickness of 18cm gives a figure of 0.36. The mathematics is sound but, like anything natural, this is a long way from being an exact matter, in particular the trunk is not a regular circle, the thickness of the sound wood varies, as does its strength, and the decay is advancing. In a remote location, such as a wood, that risk might be acceptable, but the safety margin here is inadequate, given the potential for harm in the event of a major failure.
- 5.2 It was not possible to assess the decayed reduction points in the same way as the trunk and it would not be applicable. In particular most of them are heavily loaded from one side and have notches and deeper decay on the other side, which will increase the risk of them failing. That would be less damaging than a trunk failure, but could still cause major damage.

### Tree management

- 5.3 Crown reduction will lessen the load on decayed trees <sup>(2)</sup>, which could be why this one was reduced severely in the past and might have prevented failure before now. However to make an appreciable difference the tree would need to be reduced severely again, back to about the same points as the previous major reduction shown by the red circles in photograph 1. Limes tolerate pruning better than many other species and it would no doubt survive that, but would be left much smaller and, even if pruned to as high a standard as possible, it would still be unnatural looking. New growth would make that less obvious in time, but the tree would need regular inspection and recutting in order to retain it with a reasonable safety margin. This would also create a new set of large wounds high in the crown, which would be counter to recognised good practice and, in the long term, would increase the number of potential failure points.
- 5.4 The alternative would be to remove the tree. This would have a significant visual impact, although that would be localised and mitigated by the other large mature trees nearby. A suitable new tree at or near the same place would also compensate for the loss as it established and matured. That would not necessarily need to be a lime, there are other species that would achieve a comparable stature and contribute to local amenity.

### TPO

- 5.5 As the tree is protected by a TPO Camden Council's consent would be needed for pruning or removing it and they can impose conditions covering the standard of work and any new planting. If that is refused there is a right of appeal to the Secretary of State via the Planning Inspectorate.

## 6 Summary and conclusions

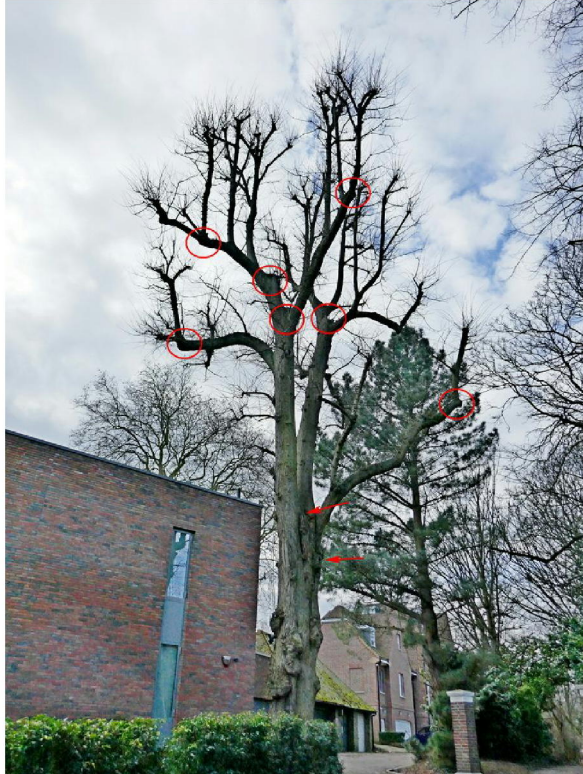
- 6.1 The tree is a mature specimen, but limes are naturally long lived and it is in reasonable physiological health.
- 6.2 However it has major structural defects caused by previous management, particularly the extensive decay in the trunk caused by removal of a major stem many years ago and in large cuts in the upper crown caused by a severe crown reduction.
- 6.3 The most severe problem is the trunk, but the decay in the upper crown is also advancing. This is not an exact matter, but in this location the potential for harm in event of a major failure is unacceptably high and the risk needs to be addressed.
- 6.4 Crown reduction would lessen the failure risk, but would need to be severe and repeated regularly, which would disfigure the tree with little prospect of its condition or appearance improving.
- 6.5 The alternative is to remove the tree, which would have a significant visual impact, but that would avoid the risk and other problems associated with retaining it. The other mature trees would mitigate the immediate effect and in the longer term a suitable new tree would compensate for the loss.

  
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## References

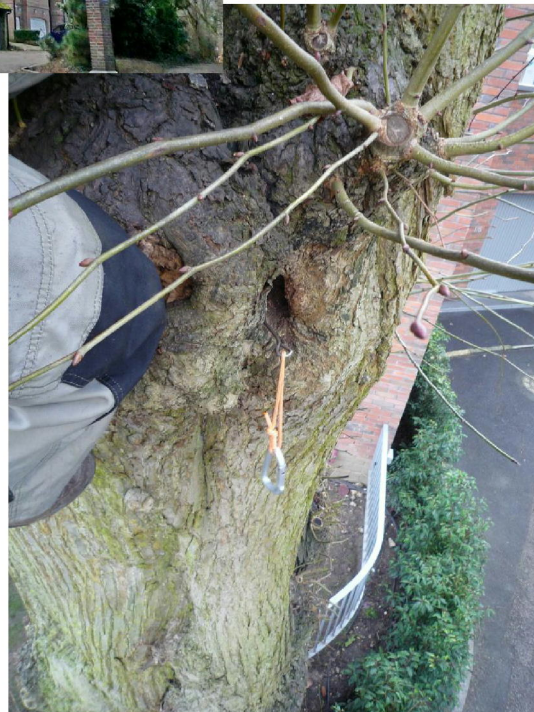
- 1) Mattheck C & Breloer H (1998) The body language of trees Research for Amenity Trees no.4, HMSO, ISBN 0 11 753067 0
- 2) Rinn F (2013) Shell wall thickness and breaking safety of mature trees, Western Arborist, Fall 2013

Photographs



1) View of the tree. Circles in the crown indicate the major crown reduction cutting points. Upper arrow shows the large cavity between the main limbs and the lower one shows the location of the small hole in photo 2 below.

2) Hole in the trunk below the large cavity opening. The probe is 0.9m long and most of the way in, i.e. most of the way through the trunk.







3) Cavity where a third main stem was removed in the past.

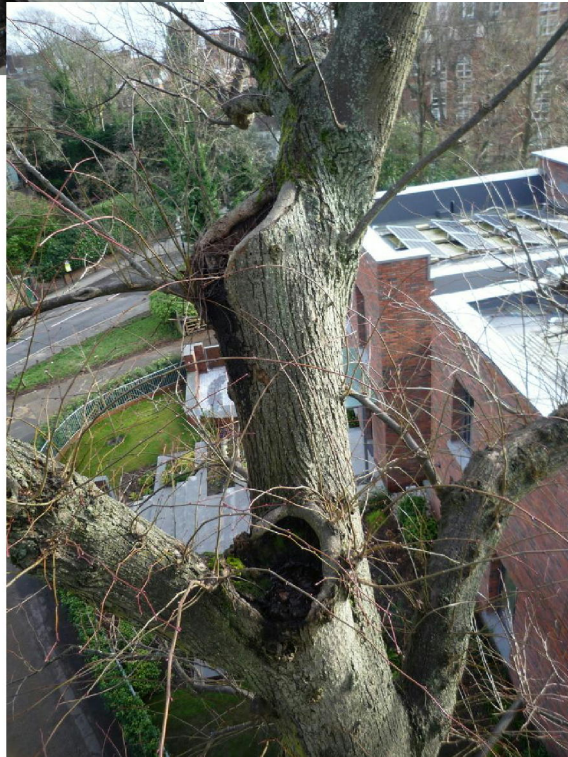


4) Closer view showing decaying side walls and accumulated leaf litter / compost. Arrow shows an adventitious root growing into this material.





5) Cut from major reduction, probably done 30 or more years ago. Significant decay and callus growth round the edges is narrow and absent in places. Note notch on the lower side facing the viewer, and on the two in the picture below.



6) Two similar cuts at about the same height on the other main stem.