BRUCE CASTLE OAK
TOTTENHAM
LONDON

Condition, Landscape Assessment and Management Recommendations

Prepared at the request of

Woodland Trust

on

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By

Luke Steer BSc.(Hons) Dip.Arb.(RFS) F.Arbor.A. MICFor.

Treescapes Consultancy Ltd.

Executive Summary

This report has been prepared at the request of Woodland Trust. Treescapes Consultancy Ltd. have been instructed to inspect nine trees in the UK that were nominated for National Tree of the Year in 2018. Bruce Castle Oak, a native oak tree growing in the grounds of Bruce Castle Museum, Tottenham, was nominated for England Tree of the Year 2018. Bruce Castle Museum is owned and managed by Haringey Council. The tree and certain features are depicted on Photographs 1 to 17.

The specification for my reports stated that they should contain information about the points included in Section 1.1

I inspected Bruce Castle Oak on 17 December 2018. It is around 16.5m high and its trunk diameter is 207.86cm at its narrowest point which is at an angle between the heights of 1.2m to 1.7m above ground level. I consider that it is an ancient tree.

I assessed the tree to be in the 'Moderate Vitality' health class.

Bruce Castle Oak appears to be part of a historic parkland 'treescape' which contains other old and veteran trees.

The tree is a native species that will be of benefit to many native organisms.

I consider that there is a low risk that branches may break during windstorms or heavy snowfall. I also consider that few people will be in the vicinity of the tree during these weather conditions so the associated risk of harm is low. I also consider that the tree is unlikely to suffer basal failure.

At present I consider that the greatest risk posed to Bruce Castle Oak is soil compaction caused by pedestrians and grass cutting equipment.

I recommend that the roots of the tree and soil they are growing through should be protected from compaction during busy periods, especially when the soil is wet.

I also recommend that soil texture and bulk density should be assessed and if the bulk density is above root growth limits remediation work may be required. Treescapes Consultancy Ltd. have a Soil Pick and could assist if required.

I recommend that no vehicles should drive on vegetated soil within 30m of Bruce Castle Oak and there should be no excavations within 30m of it.

When it is

There are other old trees growing within the grounds of Bruce Castle Museum. I recommend that these should be surveyed and added to the Ancient Tree Inventory (https://ati.woodlandtrust.org.uk/ accessed 21/05/19). This could be done by volunteers.

Due to the importance of Bruce Castle Oak, its size and location in a historically important public park, I recommend that it should be inspected every two and a half years and after tree altering weather events, such as drought, extended periods of summer waterlogging, or windstorms, by a suitably qualified, experienced and insured arboriculturist.

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1 INTRODUCTION

1.1 Instruction

This report has been prepared at the request of Woodland Trust. Treescapes Consultancy Ltd. have been instructed to inspect nine trees nominated for National Tree of the Year. Two of the nominated trees are in England, two in Wales, two in Scotland and three in Northern Ireland. Bruce Castle Oak was nominated for England Tree of the Year 2018 and was a runner up. Bruce Castle Oak is growing in Bruce Castle Park. Bruce Castle is a museum. The tree and certain features are depicted on Photographs 1 to 17.

The specification for my reports stated that they should contain the following:

- the results of detailed tree inspections;
- assessments of habitat, heritage, landscape or other environmental or arboricultural values;
- assessment of signs of plant, insect and animal species associated with veteran trees;
- assessment of tree viability;
- assessment of tree risk to include pests and diseases;
- specification of veteran tree work for long-term management;
- analyses and reports on findings;
- easy to read schedules of survey findings; and
- prioritised works schedules.

1.2 Qualifications and experience

I have based this report on my site observations and I have come to conclusions in the light of my experience. I have experience and qualifications in arboriculture and list the details in Appendix 1.

1.3 Limitations

This report is only concerned with assessing the condition and management requirements of Bruce Castle Oak which is depicted in the Photographs 1 to 17 included in this report. This report includes an assessment based on observations made during my site visit.

This report contains recommendations that should be carried out to manage significant identified risks posed to and by the tree responsibly and reduce them to an acceptable level. Even after the recommended work has been carried out the tree could still fail but it is unlikely to cause significant harm unless the weather conditions are extreme and/or there are major hidden defects.

This report does not take into account extreme weather events not normally expected in this locality. Such events could include, but are not restricted to, severe windstorms, floods or drought. This report also does not take account of potential outbreaks of tree pests or diseases.

Operations carried out in the vicinity of the tree, either in the past or future, could affect its health and/or stability. Such operations could include, but are not restricted to, trenches excavated for the installation or repair of underground utilities.

No decay detection equipment was used to help obtain the data presented in this report.

2 SITE VISIT AND TREE LOCATION

2.1 Site visit

I visited Bruce Castle Park, and inspected Bruce Castle Oak on 17 December 2018. All my observations were from ground level without detailed investigations and I estimated all dimensions unless otherwise indicated. The weather at the time of my site visit was breezy and dry with good visibility.

2.2 Site location

Bruce Castle Oak is growing in the grounds of Bruce Castle Museum and is around 140m to the north, north-east of the building.

2.3 Identification of the tree

Bruce Castle Oak is illustrated on Photographs 1 to 17 in this report.

3 BACKGROUND INFORMATION

3.1 Bruce Castle – history (from Wikipedia, accessed 21/05/19)

Bruce Castle *(formerly the Lordship House) is a Grade I listed 16th-century manor house in Lordship Lane, Tottenham, London. It is named after the House of Bruce who formerly owned the land on which it is built. Believed to stand on the site of an earlier building, about which little is known, the current house is one of the oldest surviving English brick houses. It was remodelled in the 17th, 18th and 19th centuries.*

The house has been home to Sir William Compton, the Barons Coleraine and Sir Rowland Hill, among others. After serving as a school during the 19th century, when a large extension was built to the west, it was converted into a museum exploring the history of the areas now constituting London Borough of Haringey and, on the strength of its connection with Sir Rowland Hill, the history of the Royal Mail. The building also houses the archives of the London Borough of Haringey. Since 1892 the grounds have been a public park, Tottenham's oldest.

3.2 Bruce Castle – historic maps and ancient trees

(www.oldmapsonline.org accessed 21/05/19)
Early Ordnance Survey maps of the area show trees at or near to where Bruce Castle Oak is growing and I expect one of them is that tree.

3.3 Soil

The Cranfield Soil and Agrifood Institute 'Soilscapes' website (www.landis.org.uk/soilscapes/ accessed 21/05/19) describes the type of topsoil and its agricultural potential. The Soilscapes map shows Bruce Castle Park within one area of topsoil but close to another. I consider that there may be inaccuracies in where boundaries between topsoil types are plotted on this map so I will describe both types. The topsoil in Bruce Castle Park is described as:

- General description – Freely draining slightly acid loamy soils;
- Texture – loamy;
- Drainage – freely draining;
- Fertility – low;
- Habitats – neutral and acid pastures and deciduous woodlands; acid communities such as bracken and gorse in the uplands;
- Landcover – arable and grassland;
- Carbon – low;
- Drains to – local groundwater and rivers.

The Soilscapes map shows Bruce Castle Park to be close to an area where the topsoil is described as:

- General description – slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils;
- Texture – loamy and clayey;
- Drainage – impeded drainage;
- Fertility – moderate;
- Habitats – seasonally wet pastures and woodlands;
- Landcover – grasslands and arable some woodland;
- Carbon – low;
- Drains to – stream network.

The British Geological Survey; Geology of Britain viewer website (http://mapapps.bgs.ac.uk/geologyofbritain/home.html accessed 21/05/19) states that the bedrock geology is:

> *London Clay Formation - Clay, Silt And Sand. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas.*
>
> ***Setting:** deep seas. These sedimentary rocks are marine in origin. They are detrital and comprise coarse- to fine-grained slurries of debris from the continental shelf flowing into a deep-sea environment, forming distinctively graded beds.*

It therefore appears that the topsoil could contain a significant amount of clay and this overlies London clay subsoil

Clay soils compact easily. Soil compaction occurs when pressure applied to the soil reduces the volume and size of pores within it. Pedestrians can compact clay soil. Water percolates slowly into clay soil, particularly if compacted, and surface-water runoff and associated soil erosion can be consequential issues. Gases also diffuse slowly in compacted soil, particularly clay soil. This can lead to a build-up of carbon dioxide in the soil which is toxic to tree roots. People walking over clay soil when it is wet can cause compaction.

4 OBSERVATIONS AND DEFECTS

4.1 Observations

- Leaves lying on the ground near Bruce Castle Oak indicate that it is a sessile oak (*Quercus petraea*).
- I assessed the tree to be in the 'Ancient' age class (see Appendix 2).
- Using a Truepulse laser rangefinder I measured the height of the tree to be 16.5m.
- The trunk diameter is 207.5cm at its narrowest point, which is at an angle between heights of 1.2m to 1.7m above ground level.
- I assessed the tree to be in the 'Moderate Vitality' health class (see Appendix 2).
- Two of the branches have been propped and one of these is propped in two places.
    - The long lower branch to the north (see Photographs 5, 6, 7 and 8)

      This branch is propped 9.4m from the trunk. This branch is 16.2m long. Good annual twig extension and few dead twigs. This branch has been reduced and there are some pruning wounds with diameters up to around 10cm. There are also some older, occluding branch wounds. There are no epicormic shoots on the main part of this branch. The wooden prop is up to around 19.4cm in diameter. I do not know what species of tree it came from, but it may be oak. There is part of a tyre protecting the branch where it is propped.
    - Branch growing to the west, north-west (see Photographs 5 and 8)

      This branch divides into two secondary branches at a union that is 3.5m from the trunk. This branch is around 14.1m long and there are no epicormic shoots growing on it. Each of the two side branches is propped and I am not sure of the species of wood. The southern of the two props is up to around 19cm in diameter and 7.3m from the trunk. Part of a tyre is protecting the branch. The northern prop has a diameter of up to around 17.5cm and is 8.1m from the trunk. There is no protection between the prop and where it is touching the branch.

      There is a decaying wound on the upper-side of this branch from 4.6m to 5.7m from its union with the trunk (see Photograph 9). This wound holds water.

      There are dark exudations from an occluded branch wound 0.6m to 1m from the union with the trunk (see Photograph 10).

      The southern part of the branch has been reduced in the past. Some of the wounds have occluded but some recent ones have not. Recent wounds with diameters of 6cm, 10cm and 3cm.

      The northern part of the branch contains old occluding branch wounds.

      Both the northern and southern parts are shaded by higher branches.

Recent annual twig extension is good.

- There are worm casts on the soil near to the tree. Worm activity is considered beneficial.
- The tree is standing in a mulched square (see Photographs 2 and 6). The distance between the base of the tree and the edges are:
  - northern edge – 6.15m;
  - eastern edge – 6.3m;
  - southern edge – 6.4m; and
  - western edge – 6.15m.
- There is a tarmac path 10m to the west of the tree (see Photograph 2).
- There is a semi-mature ash tree 19.6m to the west of Bruce Castle Oak. The gap between the canopies of the two trees is around 3m.
- There is a semi-mature oak 27.1m to the south of Bruce Castle Oak. The gap between the canopies of the two trees is around 10m.
- There is a woodpecker hole in a branch to the south, south-west around 6.8m from the trunk (see Photograph 16). This indicates that the branch contains decay.

4.2 Defects

- There were recent tyre tracks under that canopy of the tree on the east that were 9.7m from its trunk. Vehicle movements could compact the soil. Compacted soil can be detrimental for tree health and reduces tree longevity.
  Significance – Unknown, potentially Moderate
- There is a major branch wound in the trunk on the south between 0.9m and 3.3m above the ground (see Photograph 6). I understand that the branch failed around eight years ago. There is brown rot, potentially caused by sulphur fungus (*Laetiporus sulphureus*) and the cavity has been filled with mortar and logs to reduce the risk of fires being started in it. This wound is up to around 1.25m wide and there is dead bark below it.
  Significance – Moderate
- There is a branch wound in the trunk on the east between 1.4m and 3.5m above the ground (see Photograph 6). This wound is around 75cm wide and I understand that the branch failed around 28 years ago. There are fungal remains in the wound, potentially of sulphur fungus (*Laetiporus sulphureus*). There are small black tar-like exudations.
  Significance – Moderate
- A branch has failed around 5.5m from the trunk of the tree on the south at an acute union (see Photograph 15). The wound is up to around 30cm wide and 1m long and is occluding.
  Significance – Minor
- There are numerous old pruning wounds on this tree (see Photographs 11 to 14). Some appear very old with only heartwood. Below some of these are

longitudinal occluding dead areas some of which have formed cavities.
Significance – Moderate

- Concrete has been deposited between two pronounced root buttresses (see Photograph 17). This may be to fill a cavity.
Significance – Unknown, probably Moderate

- There is a woodpecker hole in a branch to the south, south-west around 6.8m from the trunk (see Photograph 16). This indicates that the branch contains decay. This is below a branch wound at an area that appears to be swollen.
Significance – Minor

4.3 Tree size - girth

Tree Register of Britain and Ireland (TROBI) maintains a database of large trees. Bruce Castle Oak is recorded as a *Quercus petraea*. Three trees of this species are listed as Champions for girth within the county of Greater London. According to TROBI, Bruce Castle Oak was measured to have a trunk diameter of 198cm in 2008. The sessile oak recorded with the greatest trunk diameter in Greater London, had a trunk diameter of 203cm in 2001. On 17 December 2018 I measured the trunk diameter of Bruce Castle Oak to be 207.8cm. If the other *Q. petraea* trees recorded in the TROBI database have not grown, or have died, it would leave Bruce Castle Oak as the champion *Q. petraea* for trunk girth in Greater London.

Within the TROBI database there are around 173 *Q. petraea* trees in the UK and Ireland with trunk diameters greater than Bruce Castle Oak.

4.4 Associated wildlife

Decaying wood in living trees, is an important habitat. Some of the decaying wounds on Bruce Castle Oak may be decades old. There may have been decaying wood within this tree for much of its life

Decaying wood within the trunk of this tree will have provided continuity of deadwood habitat – saproxylic habitat. This continues in the existing dead wood and will be added to when the new wood, produced annually, is eventually converted to heartwood.

The roots of the tree will have formed mycorrhizal associations with native fungi.

Bats may use cavities within the tree as roost-sites.

There is a cavity in a branch to the south, south-west around 6.8m from the trunk that appears to be a woodpecker hole.

Finally, birds may build nests in the tree, other than the woodpecker hole I did not see any during my site visit but this is not surprising as it was in mid-December.

4.5 Other trees

There are lots of other old trees growing within Bruce Castle Park. Many of these appear to have been established either in the eighteenth or early nineteenth centuries. These are now showing signs of their age: some have lost branches, are damaged and contain decay. These features make them very important habitat trees as well as 'living archaeology'.

5 DISCUSSION

5.1 Tree age

White (1998) provides a method to estimate ages of ancient and veteran trees (https://www.forestresearch.gov.uk/research/archive-estimating-the-age-of-large-and-veteran-trees-in-britain/ accessed 21/05/19). White (1998) recognises that site conditions – soil and climate – affect growth rate. Site classifications for native oak trees are shown in Table 1.

Potential ages for Bruce Castle Oak, based on the method described by White (1998), are included in Table 1. I consider that the site is 'Average' to 'Good'. If this is correct the tree is probably between 464 and 493 years old and was established sometime between 1525 and 1554.

Table 1
Age estimations for Bruce Castle Oak depending on site quality (White, 1998).

Site quality	Estimated age (years)	Estimated year of establishment
Champion Tree Potential (ideal site conditions);	346	1672
Good site, open grown, sheltered;	464	1554
Average site, garden, parkland;	493	1525
Churchyard;	No data	No data
Poor ground and/or some exposure;	562	1456
Woodland boundary pollard, or open woodland; and	493	1525
Inside woodland.	1278	740

5.2 Tree health

At the time of my site visit I assessed the tree to be in the 'Moderate Vitality' health class (see Appendix 2). Tree health may improve or deteriorate over time.

5.3 Failure mode

I did not observe any signs, symptoms or features that could indicate that the remaining parts of this tree have recently suffered partial failure – it has withstood recent windstorms.

I consider that if this tree experiences a windstorm that will cause it to fail, it could lose some dead branches and twigs, or live branches.

5.4 Propped branches

There are three wooden props supporting two branches. The props are made from what appear to be forked tree branches. It appears that cut tyres have been used as cushions between two of the props and the branches they support. The bases of the props appear to be inserted into the ground.

I do not know how reliant the branches are on the props that are supporting them.

If the props are providing a significant amount of support to the branches, localised pressure may kill patches of bark.

The props do not appear decayed at present. Over time I expect the props will decay and become increasingly fragile. At some point they will have to be replaced.

5.5 Risk of harm

I consider that Bruce Castle Oak poses a low level of risk. If it were to fail during an extreme windstorm I consider that few people will be near to it, so the associated risk of harm is low.

5.6 Tree work to reduce the risk of failure

I consider that the risk that the tree may fail is low. I therefore recommend that it is not necessary to prune the tree.

5.7 Reaction to previous pruning and branch failures

There are some very old pruning wounds on the tree. There are small dead stubs associated with some of these that are baked heartwood with no sapwood. I consider that these are decades old – potentially over fifty years. It appears that dieback occurred into the parent stem of some of these either before or after the branches were pruned. This may indicate that the health of the tree was worse at that time than it is today.

5.8 Epicormic shoots

Many oak trees have epicormic shoots growing on their branches. These can provide focal points for growing a replacement crown after branch failure. There are few epicormic shoots growing on Bruce Castle Oak which is a concern.

5.9 Prognosis

Bruce Castle Oak is a large specimen assessed to be in the 'Moderate Vitality' health class.

The tree has previously lost branches and some have been propped. None of the remaining branches appear to have partially failed during the recent past.

The trunk of the tree contains decay, but I consider that there is a very low risk that it will fail.

During extreme windstorms I consider that there is a low risk that twigs or branches may break from Bruce Castle Oak.

The topsoil that the roots of Bruce Castle Oak are growing through is likely to be loam containing a significant amount of clay. This is overlying clay subsoil. Bruce Castle Park is a busy public park and people visiting the park may have compacted the soil. If the soil is compacted it may be the reason for the slightly reduced vitality of the tree.

6 RISKS POSED TO THE TREE

6.1 Risks posed to the tree

Risks posed to trees are often associated with:

- the activities of people;
- extreme weather;
- pests; or
- diseases.

I will discuss these in order.

6.1.1 Risks posed by people

Inappropriate tree work has the potential to reduce the leaf area and photosynthetic capacity of the tree. Bruce Castle Oaki is a special tree appreciated by many people. I suggest that pruning this tree should be resisted unless it is judged that there is a serious and imminent risk of failure, especially if failure would remove a significant portion of the tree's canopy and pruning could enable some of this to be retained.

Global trade has increased the movement of plant and animal pests and diseases around the world.

People, plant and vehicles driving in the rooting area of the tree may compact the soil. This would reduce the tree's ability to obtain sufficient water and mineral nutrients from the soil. It may also cause the soil to become anaerobic for periods and this would be harmful for tree roots and may cause some to die.

6.1.2 Extreme weather;

Extreme weather has the potential to damage the tree. However, extreme weather events are relatively rare. Extreme weather events include windstorms, drought, unseasonable frost, extreme cold and waterlogging.

Tree damaging windstorms are, thankfully, relatively rare. They are, however, often the reason cited to justify proposals to prune trees. I suggest that such proposals should be strongly resisted unless made by a highly qualified and experienced arboricultural consultant.

Other types of extreme weather events are thankfully rare, so rare that I suggest work is not required in their anticipation.

6.1.3 Pests

Native and long-established insect pests of oak trees do not normally cause significant harm unless the health of the tree is already compromised for another reason.

6.1.4 Diseases

Native and long-established diseases of oak trees do not normally cause significant harm unless the health of the tree is already compromised for another reason such as drought or waterlogging, particularly for extended periods during the growing season.

Areas of the trunk of the tree and its branches are decaying. Most fungi that cause wood decay are not able to colonise live wood. They can colonise heartwood as this does not contain live cells. Organisms that are unable to affect living cells, strictly speaking, are therefore not diseases.

Healthy trees with large canopies produce large amounts of carbohydrate by photosynthesis and some of this can be allocated for growth of additional wood to compensate for mechanical weaknesses caused by decay. Should the health of a tree deteriorate its ability to do this will be compromised and decay may expand quicker than the tree is able to grow sufficient new wood.

At present, I consider that decay has not significantly compromised the stability of the tree.

Oak leaf powdery mildew is a disease that is detrimental to oak leaves. Sexually produced spores of the fungus that causes the disease can overwinter on fallen leaves and initiate new infections in the following year. Removing fallen leaves will reduce potential infection from sexually produced spores. However, unfortunately, sexually produced spores are not the main sources of new infections and removing leaves is unlikely to significantly reduce the incidence of the disease in subsequent years (Lonsdale, 2015).

7 RECOMMENDATIONS

7.1 Soil

I recommend that no vehicles should drive within 30m of Bruce Castle Oak.

I recommend that there should be no excavations within 30m of Bruce Castle Oak.

I consider that there is a risk that the soil within Bruce Castle Park is compacted and sub-optimal for healthy tree growth. The risk of soil compaction may be higher around Bruce Castle Oak due to it being the largest tree in the park and an obvious attraction. I recommend that the soil should be assessed for:

- texture;
- bulk density;
- pH;
- organic matter content; and
- mineral nutrients (phosphorus, potassium, magnesium and calcium)

Results from the soil analysis will guide soil management. Figure 1 shows root growth limiting bulk density contours for different soil textures. If the soil is compacted to near these densities work may be required to de-compact it.

Soil remediation can potentially harm tree roots and symbiotic mycorrhizal fungi. Soil remediation should only be undertaken if assumed benefits to the tree outweigh the problems. Soil remediation should be based on advice from suitably knowledgeable arboriculturists and soil scientists.

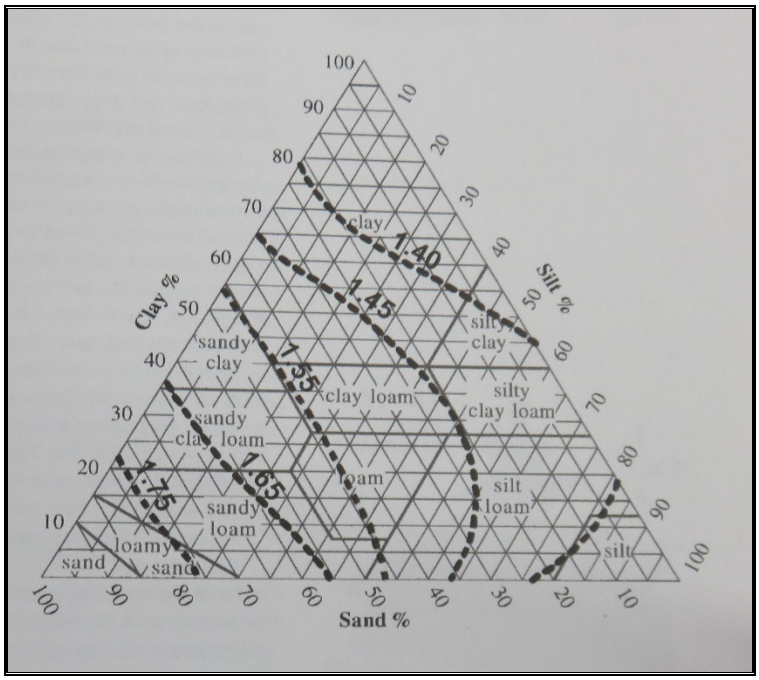

Figure 1
Soil texture triangle chart with contours showing root growth limiting bulk densities (gm/ml or mg/m³). (Urban, 2008)

7.2 Foliar mineral content

Mineral content of foliage gives an indication about whether roots and associated mycorrhizal fungi are obtaining enough of these for healthy tree growth. Forest Research are able to assess foliage for mineral nutrients (https://www.forestresearch.gov.uk/services/plant-tree-soil-and-water-testing/foliar-analysis/ accessed 21/05/19). Should foliar assessment indicate that the tree is deficient in certain mineral nutrients work to remediate the soil may be necessary.

Soil remediation can potentially harm tree roots and symbiotic mycorrhizal fungi. Soil remediation should only be undertaken if assumed benefits to the tree outweigh the problems. Soil remediation should be based on advice from suitably knowledgeable arboriculturists and soil scientists.

7.3 Mulch

Currently there is an area around the tree mulched with wood-chips that is roughly 12m square. I consider it likely that expanding this will cause an improvement in the soil for tree roots. This will be confirmed by the soil assessment. If the soil assessment confirms that it would be beneficial to extend the mulched area, I suggest extending it to 2m outside the canopy of the tree should be considered.

The layer of wood-chip mulch should be no more than 10cm deep. Over time the wood chips will degrade, and it will be beneficial to 'top-up' the mulch. I recommend that the combined layer of degraded wood-chips and new wood-chips should be no more than 10cm deep.

7.4 Propped branches

There are three wooden props supporting two branches. The props are made from what appear to be forked tree branches. It appears that cut tyres have been used as cushions between two of the props and the branches they support. The bases of the props appear to be inserted into the ground.

I do not know how reliant the branches are on the props that are supporting them.

If the props are providing a significant amount of support to the branches, localised pressure may kill patches of bark.

The props do not appear decayed at present. Over time I expect the props will decay and become increasingly fragile. At some point they will have to be replaced.

When it is judged that the props should be replaced, I suggest that a suitable engineer should be instructed to work with an arboriculturist to ensure that the props will provide necessary support without killing patches of bark where they touch the tree. MacLeod and Cram (1996) suggest that trees can exert around 800kPa. I suggest that pressures above this may prevent growth and eventually lead to bark death. I recommend that props should be designed to exert much less than 800kPa to the branches they are supporting.

7.5 Pruning

I consider that this tree does not require pruning to improve its stability or reduce its risk of failure. Moreover, I consider that, with the noted absence of epicormic shoots, retaining as much foliage as possible will give Bruce Castle Oak the best chance to remain alive for as long as possible.

7.6 Other trees near to Bruce Castle Oak

There are some young trees growing close to Bruce Castle Oak that, in time, as they grow, will cast shade onto its branches. In particular there is a semi-mature ash tree 19.6m to the west of the tree. Trees that grow to cast shade onto branches of Bruce Castle Oak should be pruned or felled.

7.7 Future inspections

Due to the national importance of this tree, its size, condition and location in a public park, I recommend that it should be re-inspected every one and a half years and after tree damaging weather events, such as windstorms, drought and extended periods of waterlogging during the summer months, by a suitably qualified, experienced and insured arboriculturist with experience of managing ancient oak trees.

7.8 Other ancient and veteran trees in Bruce Castle Park

Growing within Bruce Castle Park are many old trees. These are important landscape features that are providing increasing amounts of important habitat. These include many old oak trees. Of these, at present, only Bruce Castle Oak appears to be recorded on the Ancient Tree Inventory (https://ati.woodlandtrust.org.uk/ accessed 21/05/19). I recommend that the old trees growing in Bruce Castle Park should be surveyed and added to the Ancient Tree Inventory. This could be done by volunteers.

8 LEGAL CONSIDERATIONS

8.1 Protected trees

If this tree is protected by a Tree Preservation Order or is growing in a Conservation Area, it will be necessary to obtain permission from the Local Planning Authority (LPA) before any work, other than certain exempted operations, are to be carried out to it. This includes work that could affect its roots and the soil they are growing through.

8.2 Wildlife conservation legislation

The nests of most birds are legally protected while they are in use (Pepper, 2006). Bats are also legally protected and their roosts are protected whether or not they are in use. Tree work contractors should be aware of their duties under legislation enacted to protect wildlife and carry out their site assessment and work accordingly. If bats are suspected Natural England should be consulted. The Forestry Commission and others produced the leaflet: *Woodland Management for Bats* (2005) which contains some useful advice and is freely available to download from:

https://www.forestresearch.gov.uk/research/woodland-management-for-bats/ (accessed 21/05/19).

On page 14 this publications states:

> *'The Wildlife and Countryside Act 1981 makes it an offence to disturb, damage or destroy bats or their roosts (even if bats are not present in the roost at the time of any incident). The Act applies in both England and Wales, and requires consultations with the appropriate Statutory Nature Conservation Organisation* [Natural England] *before carrying out activities which might harm or disturb bats or their roosts (even if unoccupied).'*
>
> *'The Act is amended by the Countryside and Rights of Way Act 2000 in England and Wales. This adds 'reckless' to the offence of damaging or destroying a place a bat uses for shelter or rest, or disturbing a bat while using a roost. Under EU Regulations damaging or destroying a breeding site or resting place is an absolute offence, regardless of whether the act of doing so may be considered reckless or deliberate.'*

8.3 Forestry legislation

A felling licence is required from the Forestry Commission to fell more than a small amount of timber in any calendar quarter unless the trees fall into one of the exempted categories. Information about felling licences is available on the website: https://www.gov.uk/guidance/tree-felling-licence-when-you-need-to-apply (accessed on 21/05/19). A felling licence may be required if more than 2m³ of timber is to be felled and sold, or more than 5m³ felled for personal use.

9 CONCLUSIONS

My observations of Bruce Castle Oak, and my conclusions, are summarised below.

- I inspected Bruce Castle Oak on 17 December 2018.
- I consider that it is in the 'Ancient' age class and I measured it to be 16.5m high.
- The trunk diameter of Bruce Castle oak is 207.5cm at its narrowest point, which is at an angle between heights of 1.2m to 1.7m above ground level.
- The trunk diameter of Bruce Castle Oak, a sessile oak (*Quercus petraea*), is larger than others recorded in the Tree Register of Britain and Ireland (TROBI) database for this species in Greater London.
- I assessed Bruce Castle Oak to be in the 'Moderate Vitality' health class.
- There are relatively few epicormic shoots growing on Bruce Castle Oak.
- I consider that Bruce Castle Oak poses a low level of risk. If it were to fail during an extreme windstorm, I consider that few people will be near it, so the associated risk of harm is low.
- I recommend that plant or vehicles should not drive within 30m of Bruce Castle Oak.
- I recommend that there should be no excavations within 30m of Bruce Castle Oak.
- I consider that there is a risk that the soil within Bruce Castle Park is compacted and sub-optimal for healthy tree growth. The risk of soil compaction may be higher near to Bruce Castle Oak because it is the largest tree in the park and an obvious attraction. I recommend that the soil should be assessed for:
    - texture;
    - bulk density;
    - pH;
    - organic matter content; and
    - mineral nutrients (phosphorus, potassium, magnesium and calcium).
- Results from the soil analysis will guide soil management. If the soil is compacted to near or above the root growth limiting densities shown in Figure 1, work may be required to de-compact it.
- Mineral content of foliage gives an indication about whether roots and associated mycorrhizal fungi are obtaining sufficient amounts of these for healthy tree growth. Forest Research are able to assess foliage for mineral nutrients.
- Trees that grow to cast shade onto Bruce Castle oak should be felled or pruned.
- I recommend that other old trees growing within Bruce Castle Park should be surveyed and added to the Ancient Tree Inventory (https://ati.woodlandtrust.org.uk/ accessed 21/05/19). This could be done by volunteers.
- Due to the national importance of Bruce Castle Oak, its size and location in a historically public park, I recommend that it should be inspected every one and a half years and after tree altering weather events, such as drought, extended periods of summer waterlogging, or windstorms, by a suitably qualified, experienced and insured arboriculturist.

Luke Steer BSc.(Hons), Dip.Arb.(RFS), F.Arbor.A. MICFor.

10 BIBLIOGRAPHY

Anon, 2005. *Woodland Management for Bats*. Forestry Commission, Wetherby. 15 pages.

Castle, G. and Mileto, R. 2005. *A veteran tree site assessment-protocol.* English Nature Research Reports, No. 628. English Nature,

Ellison, M.J. 2005. *Quantified Tree Risk Assessment used in the Management of Amenity Trees*. Journal of Arboriculture. 31(2), 57-64.

Lonsdale, D. 1999. *Principles of Tree Hazard Assessment and Management.* The Stationary Office, London. 388 pages.

Lonsdale, D. 2013. *Ancient and other veteran trees: further guidance on management*. Ancient Tree Forum. 212 pages.

Lonsdale, D. 2015. *Review of oak mildew, with particular reference to mature and veteran trees in Britain.* Arboricultural Journal: The International Journal of Urban Forestry. 37 (2), 61-84.

MacLeod, R. D. and Cram, W. J. 1996. *Forces Exerted by Tree Roots.* Arboriculture Research and Information Note, Arboricultural Advisory and Information Service. 134/96/EXT. Alice Holt Lodge, Farnham, Surry. 8 Pages.

Matheny, N.P. & Clark, J.R. 1994. *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas.* 2nd Edition. International Society of Arboriculture, Urbana, USA. 84 pages.

Mattheck, C. 2004. *The Face of Failure.* Karlsruhe Institute of Technology – Campus North. P.O. Box 3640, D-76021 Karlsruhe, Germany. 248 pages.

Mattheck, C. 2011. *Thinking Tools After Nature.* Forschungszentrum Karlsruhe GMBH Postfach 3640, D-76021 Karlsruhe. 208 pages.

Mattheck, C. 2015. *The Body Language of Trees – Encyclopaedia of Visual Tree Assessment.* Karlsruhe Institute of Technology – Campus North. P.O. Box 3640, D-76021 Karlsruhe, Germany. 548 pages.

Mitchell, A. 1978. *Trees of Britain and Northern Europe.* Collins Field Guide, Collins, UK. 416 pages

Pepper, H.W. 2006. *Trees, Hedges and the Law – they won't go away!* Tree Damage Alert No 108, Arboricultural Advisory and Information Service, Farnham, Surrey, UK.

Roberts, J. Jackson, N. & Smith, M. 2006, *Tree Roots in the Built Environment*. The Stationary Office, London. 488 pages.

Urban, J. 2008. *Up by Roots – Healthy Soils and Trees in the Built Environment.* International Society of Arboriculture, Champaign, Illinois, USA. 479 pages.

White, J. 1998. *Estimating the Age of Large and Veteran Trees in Britain.* Forestry Commission Information Note 12, Forestry Commission, Edinburgh, UK. 8 pages.

Photograph 1
Bruce Castle Oak from the west, north-west.

Photograph 2
Bruce Castle Oak from the south.

Photograph 3
Bruce Castle Oak from the south-east. Two large branch wounds can be seen in its trunk.

Photograph 4
Bruce Castle Oak from the east. A large branch wound is visible in its trunk and the low branch to the right has been propped.

Photograph 5
Bruce Castle Oak from the north, north-west.

Photograph 6
The trunk of Bruce Castle Oak from the east. The two large branch wounds are decaying and wound-wood is forming around their margins. The left-hand wound was created around eight years ago and the right-hand one around 28 years ago. The low branch to the right is growing to the north and is propped 9.4m from its union with the trunk.

Photograph 7
The prop supporting the low branch to the north. The prop is 9.4m from the branch union with the trunk of the tree. Parts of a tyre have been used to cushion the branch.

Photograph 8
Props supporting the branches. The red arrow is pointing to the prop supporting the low branch growing to the north. The blue arrow is pointing to the prop supporting the southern secondary branch of the branch growing to the west, north-west. The yellow arrow is pointing to the prop supporting the northern part of the secondary branch of the branch growing to the west, north-west.

Photograph 9
A decaying and occluding wound on the upper-side of the propped low branch growing to the west, north-west.

Photograph 10
Exudations from an occluded wound in the branch growing to the west, north-west. Decay associated with this wound may be the same as that in the cavity shown in Photograph 9.

Photograph 11
Old, decaying pruning wounds.

Photograph 12
An old decaying elongated cavity. Bats could potentially roost in this cavity. The cavity may have resulted from a pruning wound initiating dysfunctional bark and sapwood below it, especially if the health of the tree was compromised.

Photograph 13
An old decaying pruning wound.

Photograph 14
An old pruning wound and occluding dysfunctional area below its base.

Photograph 15
An occluding branch failure wound. This occluding wound is around 5.5m from the trunk on the south. It appears to be the result of the failure of an acute union.

Photograph 16
A woodpecker hole in a branch on the south, south-west of the tree below an old pruning wound. This indicates that there is internal decay.

Photograph 17
Concrete between pronounced buttresses at the base of the tree. This may be filling a decaying cavity.

The qualifications and experience of Luke Steer

1. Qualifications

- Luke Steer was awarded a National Diploma in Arboriculture in 1989.
- In 1998 he graduated with an honours degree in Arboriculture and Amenity Forestry from the Forestry Department of the University of Aberdeen.
- In 1999 he passed the Royal Forestry Society's Professional Diploma in Arboriculture.
- In 2001 he passed the final examination of the Institute of Chartered Foresters and become a member of that institute in January 2002.
- In 2001 his application to become a Fellow of the Arboricultural Association was assessed to fulfil all the necessary requirements and he became a Fellow of the association later that year.

2. Practical experience

Luke Steer has been working and studying within the field of arboriculture since 1984, first as a tree surgeon and in an advisory capacity since 1998 when he started work on a short term contract reviewing Tree Preservation Orders for Chelmsford Borough Council. He stayed in this post until May 2000 after which time he become a Lecturer in Arboriculture and Forestry at Askham Bryan College, York. Between July 2002 and March 2006 Luke Steer was practicing part time as an arboricultural consultant and between January 2003 and March 2006 he was also working part time for the Lake District National Park Authority as one of their Landscape and Woodland Advisors responsible for all types of forestry and arboricultural issues within the national park. Since March 2006 Luke Steer has been working fulltime as an arboricultural consultant for his company Treescapes Consultancy Ltd. While acting as an arboricultural consultant he has completed a number of commissions covering a variety of different aspects of arboriculture:

- Carrying out an inspection of over 3000 street trees within a borough and making recommendations about their safety and management requirements;
- Inspecting all the trees and the risks they pose within a busy tourist venue in Lake District and making recommendations about how to manage those risks responsibly;
- Putting tree work out to tender and managing the resulting contracts;
- Developing proposals to bring back into management a neglected woodland garden in a popular part of the Lake District;
- Assessing whether trees may be affected by proposed construction work, and if so making recommendations about how to mitigate against such damage.
- Compiling arboricultural reports to advise both property owners and prospective property buyers about any risks which trees may pose to a property.

3. Continuing professional development

Luke Steer attends many conferences, seminars and workshops run by forestry and arboricultural organisations, colleges or universities.

4. Relevant experience

During his career Luke Steer has worked a lot with trees that are thought to be dangerous, firstly by judging how much of a risk the trees may pose, then how to make a tree safe and lastly by either carrying out the work or instructing others to carry out the required work.

5. Membership of professional organisations

In addition to the Arboricultural Association and the Institute of Chartered Foresters Luke Steer is also a Professional Member of the International Society of Arboriculture; a member of the Continuous Cover Forestry Group and the Royal Forestry Society of England, Wales and Northern Ireland; and Cumbria Gardens Trust.

Explanatory notes for some of the terms used in this report

Mathematical abbreviations: > = Greater than: < = Less than; # = Estimated.

Compass Bearing: N = north; S = south; E = east; W = west; NE = north-east; NW = north-west; SE = south-east; SW = south-west; NNE = north, north-east; NNW = north, north-west; ENE = east, north-east; WNW = west, north-west; SSE = south, south-east; SSW = south, south-west; ESE = east, south-east; WSW = west, south-west.

Species: The species identification is based on visual observations and the common English name of what the tree appeared to be

Age Class: Assessed as either:

- Sapling or newly established = a size which could be easily transplanted;
- Semi-mature = prior to seed bearing age and could be transplanted with care;
- Juvenile Mature = young and if healthy growing rapidly, not yet achieved full mature height;
- Young Mature = early maturity, not fully grown but of seed bearing age and may have achieved mature height;
- Mature = fully grown, annual growth is much reduced;
- Old Mature = old for the species, possibly starting to decline;
- Ancient = exceptionally old for the species, the crown may be retrenching, provides many opportunities for wildlife and is likely to be an important habitat.

Trunk diameter: The diameter of the trunk 1.3m above ground level, recorded in centimetres measured with a diameter tape. If, for whatever reason, the height was measured at a different height above the ground it will be mentioned. More than one figure indicates that the tree has a number of stems. Many stems are indicated 'Multi'.

Height: The height class of the tree was measured with a Truepulse laser rangefinder.

Health

- Normal Vitality = normal growth and twig extension;
- Moderate Vitality = reduced twig extension but other than that few signs of ill-health. Health could return to 'Normal Vitality'.
- Early Decline = reduced twig extension and some dead twigs in the outer canopy. If tree health is declining decay fungi could be colonising increasing volumes of wood. Health unlikely to return to 'Normal Vitality'.
- Mid-decline = small internodes, the canopy may be thinning and contain dead twigs and/or branches in the outer canopy. Older branch wounds that haven't occluded may be decaying and forming cavities. If tree health is declining decay fungi could be colonising increasing volumes of wood. Health unlikely to return to 'Normal Vitality'.
- Severe Decline = sparse crown, numerous dead twigs and branches in the outer canopy, older branch wounds likely to be decaying and forming cavities. Health unlikely to return to 'Normal Vitality'.
- Dead.

Defect Significance: A subjective assessment of the likelihood of failure or the health of the tree declining. The defect shall be categorised as either:

- Observation, a feature that isn't significant;
- Minor, of little significance;
- Moderate, of some significance; or
- Major, a major defect that could cause the tree to fail at any time.

Treescapes Consultancy Ltd.

Melbourne
17 Millans Park
Ambleside
Cumbria
LA22 9AG

Mobile: 07734 113964

Email: luke.steer@treescapesconsultancy.co.uk
Website: www.treescapesconsultancy.co.uk