

Consultant's Advice Note – Bowden Hall - Tree Safety RevA

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Attention

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Structural Safety Assessment of Residual Sycamore Trees



BACKGROUND – It is understood that Nigel Webb was undertaking measures to protect the listed fabric of the original hall building at Bowden Hall (SK23 0QP) by removing a number of mature sycamore trees close to the building and which were, at the time, unprotected by TPO / TPZ status. These works were then reported to High Peak Borough Council, and subsequently temporary TPOs were put in place in order to allow a period of review as to what best to do with the remaining trees (see photograph below).

OBSERVATIONS ON SITE – originally there appears to have been a stand of 6 mature sycamore trees, of which only 1 now remains. As a result of the partial removal of the stand the one remaining tree is now more exposed to potential storm damage.

A structural engineering philosophy calculation-based risk study has been carried out looking at the increased exposure of the remaining tree, its estimated size, drag coefficients, etc.

Whilst this follows a different approach to the Cheshire Woodlands QTRA (Quantified Tree Risk Assessment) method, it does actually involve a more numerical analysis.

Trial pitting was also carried out in February 2023 following increased concern as to the integrity of the tree anchorage.

July 2023 photograph showing the trees location above and close to the hall. Root anchorages are inevitably compromised by the visible steep slope, believed once to have been faced in masonry.

PREDICTED AUTUMN STORM WIND LOADING – even taking into account load reduction factors for a short, sub-annual return period, and assuming realistic drag and porosity coefficients for the residual trees (assumed still foliated) a reasonable autumnal storm event wind shear load applied to the tree canopy can be shown to be in the order of 24kN. This has also been calculated using a directional factor which accounts for lower probability winds blowing from the east. For a 20m lever arm this would give an overturning ('wind throw') basal bending moment in the order of 480kNm.

PREDICTED RESISTANCE – sycamores are renowned for their ability to resist high wind loads, however even under favourable conditions resistances are unlikely to be in excess of 600kNm. Reference to the British Geological Survey Map suggests that there are no significant superficial soil deposits overlying the site at Bowden, and that the bedrock consists of the Millstone Grit formation (mudstones, siltstones and sandstone). This has been verified on site during the 2023 trial pitting. It was observed that the ground was very difficult to excavate by hand due to the presence of well bedded sedimentary rock with only a marginal layer of topsoil. It is therefore considered reasonable to assume that the presence of shallow bedrock has restricted root penetration and adversely affected the potential root structure and anchorage of the residual tree.

An inspection of the sloping and shallow soil structural root zone (SRZ), the location of the tree close to the edge of an old retaining wall (now removed) and the knowledge that the trees were closely spaced, all combine to suggest the actual SRZ overturning resistance could well be no more than say 2/3 of an 'ideal scenario', ie in the order of say 400kNm. It should be noted that this is very difficult to estimate accurately, and that load testing is the only way to determine this with any real degree of certainty.

PROBABLE OUTCOMES OF WIND THROW – the weight of the residual tree has been estimated as being in the order of 8Tonnes. With the close proximity to the now occupied hall building, failure could result in significant damage to the roof and walls, and possible serious injury / fatality of one or more occupants, especially if collapse is onto the upper, bed chamber accommodation.

DUTY OF CARE – whilst statistics indicate that only a few people in the UK each year are killed by falling trees, a landowner still has a legal obligation to protect both life and property – in this case the latter being a Listed Building. The original stand of 6 sycamores was clearly too close to the original hall to be safe in the longterm. Now that a sole tree remains, what little historic context there was in the proximity of the trees to the back of the hall has now been significantly altered, indeed compromised.

In respect of written advice from Historic England:

"... , no expert can guarantee that a tree is 100% safe. Trees can be quite seriously decayed with no visible signs. Otherwise healthy trees can collapse in severe weather conditions. It is even possible that perfectly healthy trees can suddenly shed branches in windless conditions in a well-documented (but poorly understood) phenomenon known as 'Summer Branch Drop'...."

CLIMATE CHANGE - Advice from the UK Meteorological Office:

"...More winter storms, including disproportionately more severe storms, are projected to cross the UK in the future, with fewer to the north, over Iceland, and fewer to the south, over central and southern Europe...."

CONCLUSIONS & RECOMMENDATIONS – There is a small but arguably significant risk to both listed fabric and human life during a storm event. As climate change accelerates it can also be argued that this risk will increase. The single remaining tree is also of limited value and could be replaced by planting several new trees, better located and using approved indigenous species.



View looking north with the rear (NE corner) of the original hall building visible to the left



Locations of trial pits dug in February 2023. Weak sedimentary bedrock was found at shallow depth.