

DESKTOP STUDY ON INVOLVEMENT OF TREES

AS CAUSE OF SUBSIDENCE DAMAGE TO

THE OLD RECTORY,

LITTLE GRANSDEN, CAMBS, SG19 3DU

Our ref: 2951

15 March 2012

Instructions

1. I am instructed by the Parish Clerk of Little Gransden to advise on the proposed felling of a cedar and Wellingtonia tree in the grounds of The Old Rectory.
2. I understand that the felling of the trees was the subject of a Conservation Area notification, and that as a result of representations by the Parish Council the South Cambridgeshire District Council made a TPO on the two trees, despite concern by the Council's Legal Department about the possible risk of litigation.
3. I understand that The Old Rectory is a listed building, and that the trees form part of the setting for the building.
4. This report is produced against this background. I attach as Appendix 1 a summary of my qualifications and experience. I draw particular attention to my experience in all aspects of tree root damage to buildings (as the author of the definitive work on this subject) and also that I have acted for the past 24 years for the Planning Inspectorate and its predecessors in determination of TPO appeals. I am therefore very familiar with all aspect of dealing with TPOs.
5. I have not visited the site. This report is primarily on the basis of the information provided with the Conservation Area notification, namely:
 - i. Crawford Addendum Technical Report, dated 4/5/10.
 - ii. Writtle Park Ltd report, dated 5/10/11
 - iii. Matlab Site Investigation Report, dated 23/3/10
 - iv. Letter from Crawford to Mrs Seabright, dated 23/1/12, with results of level monitoring.
 - v. Email from Crawford to Mrs Seabright, dated 6/3/12.

I have also taken account of the details on the Council's website of a planning application submitted in 2008 for extension of the cellar (S/2002/08/LB).

6. It should be noted that interpretation of the available information is complicated by the major differences between the plans in the various documents. I assume the block plan submitted with the 2008 planning application is reasonably accurate, but this differs considerably from the plan attached to Crawford Addendum Report, which in turn differs from the plan showing the location of the level monitoring markers.

Information from level monitoring.

7. Level monitoring invariably provides the most useful information on the cause of damage. If vegetation is involved, there is a characteristic and highly diagnostic pattern of the foundations subsiding in the summer (from about May to September) and recovering in the winter months.
8. Crawford have presented their results relative to station 1 as the datum. From inspection of the results I consider that using station 3 as the datum provides slightly more plausible results, and therefore attach 3 graphs showing the results relative to station 3. (Comparison of this with the Crawford results shows that use of a station 3 makes only a very slight difference).
9. I draw attention to the following features:
 - i. There is a clear pattern of seasonal movement at station 6, 7 and 8, diagnostic of the involvement of root activity of vegetation. The greatest movement, with a seasonal amplitude of 12.3mm, is at station 6.
 - ii. Stations 9 – 11 show possible very slight seasonal subsidence in 2011, but there is no clear pattern in 2010.
 - iii. Movements at stations 1 – 3 are very small and not indicative of any pattern.
10. The 12mm movement at station 6 would be sufficient to cause damage. Although I have not seen any detailed description of the damage, I understand that it is in this area.
11. The crack monitoring also shows a pattern consistent with the influence of vegetation.

Information from soil investigations.

12. The British Geological Survey website shows that the subsoil at The Old Rectory should be Woburn Sands Formation, which is part of the Lower Greensand. In the immediate area of The Old Rectory it shows no superficial deposits, but closely surrounding areas (to SW of Church Walk and a similar distance to NE) have superficial deposits of mid-Pleistocene Till.
13. The site investigations by Matlab have demonstrated a moist brown sand below 1.5m, consistent with weathered Woburn Sands. The soil above 1.5m is described as a slightly sandy clay with occasional fine/medium gravel, including chalk, which is consistent with the Till deposits (and demonstrating that these are present at shallow depth).
14. The plasticity index of the clay is only 27 – 39, indicating that it would only have a moderate shrinkage potential if dried by root activity. The underlying sand soil would not be subject to any volumetric change if dried by root activity.
15. Crawford suggest that the slightly elevated oedometer strain value at 1.25m is indicative of desiccation. In my experience, where clay soils overly sand, there are commonly elevated suction and oedometer stain values as a result of under-drainage into the sand. They are not necessarily indicative of root-induced desiccation.

16. The penetrometer values are not relevant for determination of desiccation in a soil of this type (only relevant in London Clay, and certainly not in a soil with gravel inclusions).
17. The Matlab investigations were undertaken in March, at which time of year any seasonal drying by root activity is likely to have been corrected by seasonal rehydration. The investigations are therefore of no value in determining whether root activity is involved.

Root identification.

18. A single root was identified as cedar, and with abundant starch indicating that it was alive.
19. The depth from which it was taken was not defined, apart from being between 0.27 to 3.5m (i.e. from an unspecified depth in the borehole).
20. However, roots are described down to 3.5m. The condition or identity of these deep roots was not determined.

DISCUSSION.

Cause of damage.

21. The level monitoring clearly demonstrates that root activity of vegetation is causing seasonal movements of the foundations in the vicinity of stations 6, 7 and 8.
22. The Matlab trial shows that the foundations are very shallow (270mm) in that location. However Matlab have provided no plan showing the location of their trial pit. The trial pit by P.J. Tarrant in 2008 exposed the foundations of the cellar at 1260mm, the larder as 300mm and the playroom as 450mm. The proposed extension to the cellar would have increased the depth to about 2000mm, and also involved underpinning the wall between the cellar and the rest of the house. It is not clear to me whether the work to the cellar was ever implemented. If it was, it has created about 1550mm difference in level between in foundation depths between the front and flank walls of the playroom. More significantly, the cellar is founded on the underlying sand, whereas the front wall of the playroom is at very shallow depth on the clay. Even if the cellar extension was not implemented, there is considerable variation in foundation depth to the old cellar.
23. The very shallow (270mm) foundation revealed by the Matlab trial pit, and the shallow foundations of the playroom (450mm) will make these foundations very vulnerable to seasonal movement from root activity, whereas the cellar foundations will be static. As damage is caused by differential movement, the variation in foundation depth will make this part of the building even more vulnerable.
24. The identification of a cedar root in the Matlab borehole indicates that roots from this tree are capable of extending the 18m distance of the tree from the building.
25. I am however concerned that Writtle Park Ltd have only described some of the larger trees. Their schedule of trees is certainly not exhaustive, as Google satellite view clearly shows other vegetation around the building. In particular there is no reference to any shrubs that might be growing in proximity to the building.
26. The borehole from which the root was identified appears to have been in proximity to station 8. However, with the inaccuracies between the various plans this is not entirely clear. It is however

clear that the borehole and identification of roots was well removed from station 6, which is the area of maximum foundation movement, and appears to be closest to the cellar.

27. I would therefore be concerned to know whether there is any other vegetation in proximity to station 6 that might account for the movement. In this respect it must be emphasised that large shrubs and climbers, such as wisteria, can easily cause seasonal movement of this magnitude, particularly with the very shallow foundations.
28. It is also pertinent to note that the cedar is a mature tree, which will have been having a similar influence for many decades. If it were capable of causing damage, I would have expected it to develop long ago, whereas a shrub or climber might be a newcomer that is suddenly exerting an influence. Alternatively, the construction of the cellar extension and the resulting differences in foundation level might account for the sudden development of damage.
29. The cedar is at a distance from the building where the risk of damage is considered to be extremely remote. However, if there is no other possible vegetation, I would agree that the cedar would be the most likely cause of the movement and damage, with this exacerbated by the differences in foundation depth,
30. There is no evidence to suggest the involvement of the Wellingtonia.

Remedial action.

31. If it is definitely established that the cedar is the cause, I agree that felling would prevent any further seasonal movement. There is no risk of long-term heave. If the tree is felled any time before seasonal drying recommences in May, the foundations would immediately be stable.
32. However, in this situation it would appear that underpinning to correct the variations in foundation depth would be a more appropriate remedy. Increasing the depth of the foundations in the area of movement so they bear on the underlying sand at 1.5m should prevent any further seasonal movement. The level monitoring shows that the movements are restricted to the area of stations 6, 7, and 8. Localised partial underpinning of the shallow foundations in that area would correct their inherent inadequacy, and should prevent any further root-induced damage.
33. In the absence of any detailed description of the building, I am unable to assess whether this might be feasible, or to comment on the possible costs involved.
34. With the possibility that the cedar is rooting to unusual depths in the underlying sand, I consider that a root barrier is unlikely to provide an effective remedy.

Implications of Tree Preservation Order.

35. I agree that making the TPO was entirely appropriate. The advantages of doing so are twofold:
 - i. It now requires the tree owner (or Crawford as their agent) to make an application to fell in accordance with the TPO regulations. The advantages of doing so are set out further in paragraph 36 below.
 - ii. If consent is subsequently granted for the tree(s) to be felled, it would enable the LPA to impose a condition requiring the planting of replacement(s). Replanting could not have been secured in response to Conservation Area notification.

36. If Crawford are now considering applying to fell, the LPA should make it clear that they will give careful and rapid consideration to an application to fell, provided this is accompanied by additional information as required under the Town and Country Planning (Trees) (Amendment) (England) Regulations 2008 (SI2008 No. 2260) and paragraph 6.40C of the September 2008 Addendum to 'Tree Preservation Order – A Guide to the Law and Good Practice'. In particular the following information should be provided
- i. Any additional technical Reports. In this respect I note Writtle Park refer to:
 - a. Initial Structural Report of Gawn Associates, 18 December 2009.
 - b. Crawford Technical Report (initial), 12 February 2010.
 - ii. An accurate plan of the building showing the location of the Matlab trial pit and the level monitoring markers, and location of single and multi-storey elements of the building.
 - iii. Confirmation whether the cellar extension was constructed.
 - iv. Update of the level monitoring results (there is reference to further readings being taken in February 2012).
 - v. Proposals and estimated costs of options to repair the damage. This should include:
 - a. Costs and details for partial underpinning of the affected area (vicinity of stations 6, 7, 8 and associated areas, to depth of 1.5m, stepped to level of existing foundations if appropriate).
 - b. Estimates for the costs of tree felling.
 - vi. Information on the presence of any shrubs or climbers in the vicinity of monitoring stations 6, 7 and 8. (see paragraph 25 above).
 - vii. Any evidence that might implicate the Wellingtonia as the cause of the damage.
37. Submission of this information will enable the LPA to make a more informed decision on whether the cedar or some other shrub or climber is involved as the cause of the damage, and whether partial underpinning of the affected area would be a viable alternative remedy.
38. As there appears to be no technical reason to fell the Wellingtonia, a TPO would at least protect this tree.
39. If consent to fell the tree(s) is refused, the LPA would be liable to pay compensation for the costs consequence upon this refusal. If the cedar is involved and consent to fell is refused, the alternative remedy would be to underpin, and there could be liability for the costs of such work. However, as it would not be necessary to fell the trees, the estimated costs of doing this could be deducted from the cost of underpinning. As felling the trees would be an expensive exercise, and partial underpinning a fairly modest cost, the potential claim for compensation might be deemed acceptable. However, a decision on this cannot be made in the absence of this information.
40. I confirm that I have no objection to a copy of this report being forwarded to the Council, and if they wish to make a TPO the Council could also provide a copy to Crawford, so that Crawford are fully aware of the reasons for such action.
41. If it is of any assistance, I anticipate being in Cambridge on April 3 dealing with work for the Planning Inspectorate, and could visit the site that afternoon. For a brief visit to site I would anticipate further fees of £120. If required I would be pleased to meet anyone on that occasion.

Qualifications and Experience of Dr. P.G. Biddle

I was appointed an OBE in New Year's Honours 2001 for services to arboriculture and the environment. I have a degree in Forestry and a Doctorate of Philosophy from Oxford University.

I am a past Chairman of the Arboricultural Association, a Fellow and a Registered Consultant of the Association, and a holder of the Arboricultural Association Award. I am an Honorary Fellow of the Institute of Chartered Foresters.

Since 1978 I have been undertaking various research projects into the effects of trees on clay soils, on behalf of the Department of the Environment, National House-Building Council and Milton Keynes Development Corporation. Arising from this, I was consultant to National House-Building Council for the revision of Practice Note 3, "*Building near trees*" (now Standards Chapter 4.2). This included the provision of all technical recommendations on foundation depth, the classification of trees and categorisation of clay shrinkage. I acted as Consultant on the Department of the Environment Research Steering Committee into "*Tree Roots and Built Developments*", and was a member of the task group revising the Institution of Structural Engineer's report on "*Subsidence of Low Rise Buildings*" including drafting the chapter on 'Site Investigations'.

I represented the Arboricultural Association on the British Standards Committee for BS 5837:1991 "*Trees in relation to Construction*", and I was Chairman of the panel which undertook the 1991 revision of this Code of Practice.

I was a member of the consortium which sponsored the Hortlink 212 Project by Horticulture Research International into 'Pruning Trees to Reduce Water Use'.

I act for the Planning Inspectorate as an Arboricultural Inspector for Tree Preservation Order appeals by written submissions, and have undertaken this work for previous government bodies since 1988.

I am author of the book "*Tree Root Damage to Buildings*" (1998), and have also written articles in several books and journals on this subject, as listed below. I also frequently lecture to various professional bodies on the problems of trees and buildings, and was invited to present the Keynote address to the Geotechnical section of the American Society of Consulting Engineers annual conference in Houston Texas, in 2001.

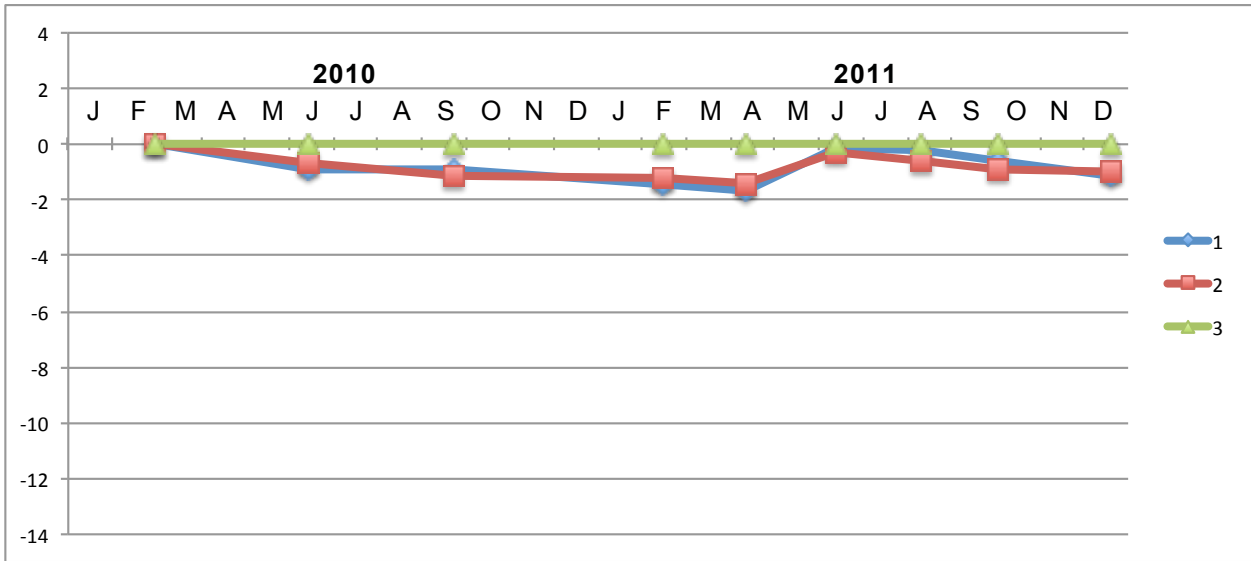
I have been involved in forestry and arboriculture for 46 years. From 1972 to 1989 I was Managing Director of Tree Conservation Ltd., but I am now self-employed. Work in both these capacities has been in arboricultural consultancy with particular reference to problems of structural damage to buildings.

Relevant Publications by P.G. Biddle

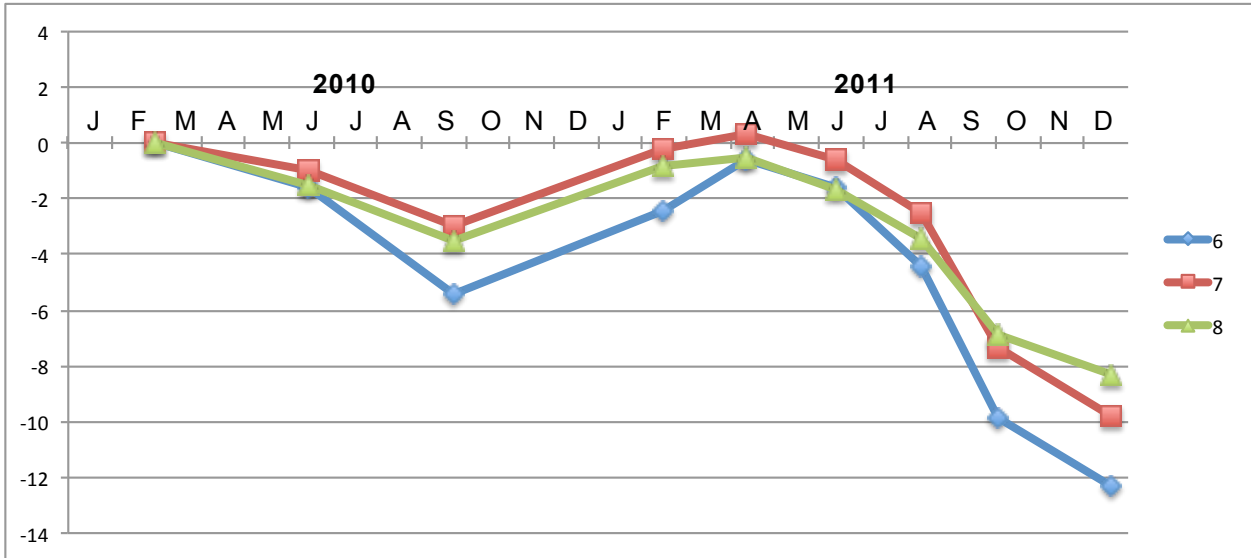
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The Old Rectory, Little Gransden
Results of level monitoring relative to station 3.

Stations 1 - 3.



Stations 6 - 8.



Stations 9 - 11.

