

ATTACHMENT E

**DR GREG MOORE – PEER REVIEW
REPORT ON THE REVIEW OF PAST AND
FUTURE MANAGEMENT OPTIONS**

ATTACHMENT E

Burnley Campus
University of Melbourne
500 Yarra Boulevard
RICHMOND 3121

Attention Ms M Flick
City of Sydney
GPO Box 1591
SYDNEY 2001

27 June 2013.

Dear Ms Flick:

**Re: Peer Review of Past and Future Management Options
Central Avenue Hill's Figs at Hyde Park North and South, Sydney**

I have had the opportunity to review the documents that you provided including the most recent report on resistograph data prepared by Urban Tree Management (UTM). In particular, I have reviewed the report entitled: Past and Future Management Options Central Avenue Hill's Figs at Hyde Park North and South, Sydney, prepared by Tree Wise Men (TWM) Australia Pty. Ltd. My final review is attached.

I have undertaken a peer review of the report, which I consider to be professionally written, clear and concise. I consider that the report is thorough and addresses the pertinent issues in relation to the central avenue of trees in Hyde Park. The arboricultural content of the report is of a high standard and reports currently accepted and relevant practice for tree management under the circumstances pertaining to the trees in Central Avenue, Hyde Park.

My report is still quite short and I have presented this final report as numbered dot points for both clarity and brevity. This final report also addresses the points which you raised in an email that I received on Monday, 24 June 2013 in relation to the draft that I had provided dated 3 May 2013.

I have attached the text of the email as an appendix to this covering letter. To make navigation of the report easier, I have numbered the points made and the following will allow you to locate the responses, additional comment and further information relevant to your email. In relation to point 1 of you email, I have made alterations to paragraphs 21 and 28, for point 2 see paragraph 34, for point 3 paragraph 12, for point 4 paragraph 25, for point 5 paragraph 14, for point 6 paragraph 9, for point 7 paragraph 27, for point 8 paragraph 29, and for point 9 a new paragraph has been added to the Conclusion.

ATTACHMENT E

I hope the review is of value to the City of Sydney and those who are faced with a very difficult management situation. I can only wish the best for those concerned and for a successful outcome from this process.

Yours sincerely,

Dr Gregory M Moore B Sc(Ed), B Sc(Hons), PhD, MBA
Senior Research Associate
Burnley Campus, University of Melbourne.

ATTACHMENT E

Dr Moore

Thank you for providing your draft review report. Can you please provide your final report, and expand on the following points?

1. At dot point 22 (top of page 4 of the report) the paragraph starts 'The report recommend a period of 15 years over which the block replacement is implemented'. It would be appreciated if this paragraph (and others similar in the report) are reviewed and clarified, as Tree Wise Men (TWM) has not recommended such a timeframe. We understand any confusion, as the TWM report mentions several timeframes:
 - § 2.1.1 recommends removal 'without further delay'
 - § SULE rating is 5 to 15 years
 - § 3.5.2 discusses a 15 year timeframe based on the Hyde Park Tree Management Plan (TMP).
2. At dot point 3 on page 6 you state that 'the data from the resistograph testing is compelling'. Can you clarify whether this statement refers to the resistograph testing by UTM, or also include the other drill test by TWM?
3. Can you comment generally on the avenue in Hyde Park and its heritage significance?
4. Is the TWM recommendation for block removal and replacement the only way to achieve the same sort of avenue that is currently in Hyde Park?
5. We note your comments on the Hitchmough graph, can you advise what other proof of senescence may be available? What are the other characteristics of senescence (other than branch or whole tree failures)?
6. We note your comments about managing risks to public safety and that scaffolding over seats and walkways is costly and not appropriate for a park of Hyde Park's significance – can you suggest any other options?
7. In your opinion, what is the smallest size block of trees that could be effectively replaces which would lead to the re-creation of the Hyde Park avenue?
8. If tree replacement by attrition is used, how will the avenue differ from the current Hyde Park avenue?
9. Can you provide examples of the other situations where decisions have not been made about tree replacement?

UTM has carried out further resistograph testing of the figs and their final report is attached for your information

Your final peer review of the Tree Wise Men report will be forwarded to Tree Wise Men to produce an addendum to their report.

Can you please advise how long you will need to finalise your report?
Please contact myself or Kirsten Morrin on 9264 9361 if you have any queries.

Regards

Mardi Flick

Peer Review of Past and Future Management Options Central Avenue Hill's Figs at Hyde Park North and South, Sydney

INTRODUCTION:

I was asked by the City of Sydney and have subsequently peer reviewed the report entitled: Review of Past and Future Management Options, Central Avenue Hill's Figs at Hyde Park North and South, Sydney, and its attachments that were supplied to me by Ms M Flick on 24 April 2013. I have also responded to matters raised by Ms Flick in an email received on Monday, 24 June 2013, which raised matters from my draft report dated 3 May 2013

At the outset, I remind anyone reading my report that it is a peer review of the documents provided to me and not a report on an inspection of the trees, which I know but have not inspected. Overall, I have found the report thorough, comprehensive and professional. I consider that it is balanced, consistent and, where appropriate and possible, supported by available evidence. That said I have a number of comments which I hope are of value.

REVIEW:

I have presented these in point form, but I am happy to expand upon any matter that I have raised should it be required:

- 1 In relation to the structure of the report, it should be made clear from the start that Peter Castor is the author, as in several places the author is referenced and it is not clear until later in the report that it is Peter.
- 2 There are no Conclusion or Recommendation sections to the report, which make clear the link between the report's content and the recommendations that are subsequently made. This is disappointing as there is a good Executive Summary and clear Recommendations (Section 2). However, without the Executive Summary it is not clear why some of the recommendations have been made and on what basis.
- 3 It should be made clear throughout the report that the term *inclusions* is meant to denote included bark in branch unions. On this matter, it would have been helpful to know if the included bark was in co-dominant stems or branches. However, if the branches are large (as the report suggests) it may be of little real consequence.
- 4 In the Executive Summary 1.1.5, dot point 3, the data on *inclusions* are presented but their meaning is not interpreted. There is an increase from 6% to 14% despite remedial action being undertaken in the interim. In dot point 4, it is not clear what is meant by *prevailing forces*, the implication is that it is intensity of sunlight leading to sunscald, but it might also refer to prevailing wind.

ATTACHMENT E

- 5 In the Executive Summary 1.1.6, is the 2011 reference to decay for below ground decay or for decay anywhere in the trees?
- 6 In the Executive Summary 1.1.8, there is a statement about *a true avenue* needing to be of the same size, age and form. I do not think this is correct as avenues can be of different types and designed with different intent. However, I think the point that is being made is that if you want the same type of avenue that currently exists in Hyde Park, then you do need trees of the same species, size, age and form. In horticulture and landscape design, the usual convention is that an avenue consists of two rows of trees while a boulevard consists of four rows of trees
- 7 In the Executive Summary 1.1.9, the comment about *20% reduction pruning* needs justification.
- 8 In the Executive Summary 1.1.11, I am not convinced that there is evidence to support the contention that *Trees not currently infected are likely to be infected with Phellinus sp, Armillaria luteobulbalina or Phytophthora as they age and decline*. There is an increased potential for infection but that is as far as it goes.
- 9 In Recommendations 2.1.3, I presume what is meant is that there are no cost effective and aesthetically acceptable mitigating procedures to ensure public safety. You could put steel scaffolding along walkways and over seats, but this is both very costly and unacceptable in any park of significance. You could use modern arboricultural webbing constraint systems (such as the Cobra systems) to mitigate the risks from major limb failure, but this too can be costly, unsightly and the form of these trees does not always lend itself to the use of the systems. The systems are not designed to hold dead or dying trees together, but rather to hold major limbs in position should they fail, thereby reducing risk to pedestrians. Furthermore, they do not deal with whole tree failure of windthrow. You could also re-direct pedestrian traffic by altering pathways, but again this is unlikely to be acceptable within the context of Hyde Park.
- 10 In Recommendations 2.1.4, there is a clear and concise recommendation for a block removal, which is based on Section 9 Block Removals and Alternative Strategies. I comment on this section later in this review, but it is clearly argued as to why a 3 block removal is preferred over a 4 block removal.
- 11 I found Section 3 Background and Section 4 Methodology, clear, concise and helpful. The use of PoM in 3.1.3 without definition and the reference to the author (P Castor) in 4.2.1 and 4.7.1 are disappointing but minor matters in otherwise good sections. The methodology is clear, professional and appropriate.
- 12 In The Central Avenue 5.1.2, there is a statement that *The planting is amongst the oldest Avenue plantings in Australia*. As it stands, I do not think this is correct. There are several Avenues of Honour that I know of that would be a decade older

ATTACHMENT E

- and some avenues on streets that pre-date the Hyde Park avenue planting by between 30 to 50 year depending on the avenue and streets. If the point is that they among the older *F hillii* plantings, then I have no difficulty with that contention. There is no doubt that the Central Avenue of Trees in Hyde Park is of great heritage value and significance. In my role as Chair of the National Trust of Australia (Victoria)'s Register of Significant Trees, I would have no hesitation in recommending the classification at State level (the highest available) of the avenue if it occurred in Victoria on the basis of its historical value, unique location and context, size, connection with the community and impact on and appropriateness to the landscape (Moore, 2001)
- 13 In The Central Avenue 5.1.3, the last sentence reads *We understand that the Driver Avenue planting is under constant monitoring*. The questions arise as to by whom and for what? Can I assume that is by an arborist for risk to the public?
 - 14 In The Central Avenue 5.3.3, there is an appropriate reference to Hitchmough (1994). This is a stylized age versus costs and benefits diagram. The positioning of the Hyde Park trees on the age line is not unreasonable, but more proof of senescence could be required to justify the position of the line. It is not just branch or whole tree failures that characterize senescence. Other indicators of senescence that could be considered and which are relatively easily measured include, reduced tip extension, reduced stem and branch increment growth, loss of foliage density, greater rates of accumulation of canopy dead wood and reduced photosynthetic efficiency. Other symptoms of senescence include changes to root tip extension, loss of root mass and changes in protein synthetic efficiency, but measurement of these in a field situation is not practical.
 - 15 I found Section 6 Below Ground Defects, Section 7 Above Ground Defects and Section 8 Current Tree Monitoring & Maintenance, clear, concise and helpful. I am not sure what is meant by a *bulk number of dead branches...was recorded in 7.3.1*.
 - 16 I accept the content of Sections 7.2.6 - 7.2.9 as being reasonable and consistent with AS 4373, but I do so with some reservations. The evidence in favour of reduction pruning is scant and based on the application of a simple lever and weight model of a branch. I am not aware of any data that supports the efficacy of its application (Moore, 2003; 2010). Furthermore the recent work of James (2003; 2006) suggests that foliage has a significant mass damping effect when trees are under a wind load, which further raises concerns about reduction pruning. However, I do accept that the report correctly refers to the work of Mattheck and the Australian Standard and that what is contained in sections 7.2.6 – 7.2.9 is currently regarded as reasonable and professional current arboricultural practice. More research may take such management practices in different directions in future.

ATTACHMENT E

- 17 In Section 7.6.3, I would prefer a more consistent use of terminology and clarification on what is precisely meant by *Crown pruning*.
- 18 In Section 8.1.5, I would assume that the AS 4970 Protection of Trees on Development Sites is being used for all and any public events held in Hyde Park, or any other public park managed by Sydney City Council. It affords a management framework for minimizing damage to tree roots, trunks and canopies and mitigating some risk to the public. If it is not in widespread use then I would recommend that it be utilized forthwith.
- 19 Section 9 Block Removals and Alternative Strategies provides an excellent and concise summary of comparisons between block removal of trees and replacement by natural attrition. I consider that in Section 9.2, the report addresses the issues of block replacement compared to natural attrition or infill planting very well indeed and makes clear the advantages and disadvantages of each management approach. The report is also clear and concise in its support for block replacement.
- 20 I consider that in Section 9.3, the report addresses the issues of a so called mini-block replacement compared to larger block and natural attrition or infill planting very well and again makes clear the advantages and disadvantages of each management approach and the reasons for its support for larger block replacement.
- 21 By supporting the block replacement strategy advocated in the Tree Management Plan (TMP, 2006) in section 3.5.2, it can be inferred that the report recommends a period of 15 years over which block replacement could be implemented. This is not clearly stated and perhaps it should be, considering that the 4 block replacement has been abandoned with a recommendation of replacement in 3 blocks. There is no justification for this period (see later in this review), but there is a general consensus among heritage landscape advisors (based on my role with the National Trust of Victoria since 1988 in dealing with significant trees) that replacement over a 15-20 year period is sensible in that it gives a significant difference in age class and the public will not differentiate between trees of different ages planted over such a period as they approach maturity. This seems fair and reasonable given appropriate tree management through the planting and establishment phases. I would expect a very high level of competence in the management of these trees by the City of Sydney considering their prominence and the significance of the central avenue. I would thus be confident of the outcomes of block replacement achieving the goal of a cathedral like canopy, but such good arboricultural management would have to be assured.

- 22 I consider that in Section 9.4, the report addresses the issues of mitigation strategies concisely and well. It makes clear what can be done and the limits of what might be possible from an arboricultural perspective.
- 23 The report also comprehensively addresses the issues of trying to establish new and younger plantings within existing avenues, and the difficulties faced in general when young trees are planted under existing mature canopies. This is a well-documented and researched problem (Parker *et al*, 2004) that this report professionally considers
- 24 I am disappointed that the report ends so abruptly at this point. I would have like to have seen a conclusion that links the report content with the recommendations that are made. It clear that the report recommends block removal and provides many good reasons for the recommendations, but it should not be assumed that readers of the report will make the necessary logical links between the content of Sections 3 to 9 and the recommendations. I suspect that given the significance of Hyde Park and the importance of the trees, many people will read no more than the Executive Summary and the Recommendation and so be unaware of the strength of the analyses provided in the report.

BLOCK REMOVAL AND INFILL PLANTING:

At the heart of the management issue that is faced by the Sydney City Council and which is addressed by the report is the replacement of avenues/boulevards of older trees while at the same time trying to maintain the amenity vale of the site. I hope the following comments are of some value:

- 25 The method of tree replacement is ultimately determined by the design and outcome intent. If Sydney City Council wishes to replace like-with-like in Hyde Park, then you require trees of the same species, age height and form. This point is well made in the report and there is no option but to block remove trees. This is the crux of the whole issue. You cannot get an avenue of even-aged trees like the avenue at Hyde Park, by tree replacement through either attrition of individual trees or by in-fill planting. Both the TMP, 2006 and the TWM report recognize this reality. Replacement by attrition or in-fill will give you an avenue (see point 29) but it will be different in character and ambience from the avenue that has existed for over 80 years. Whether this difference is acceptable is not really an arboricultural matter but rather depends on the design intent of the avenue, the importance of heritage and history, the expectations of the local community and, of course, the political reality of what can be achieved.
- 26 How big the blocks removed might be is canvassed in the report. One option would be to remove all trees in a single replacement action. This would have a profound effect on current amenity and at some time in the future another generation would face the same issue of total avenue replacement. In short you

ATTACHMENT E

- would perpetuate and create an ongoing problem. There is merit then in replacing trees in blocks so that there is retention of current amenity and the creation of avenues of different age classes to avoid future problems. This is consistent with the recommendations of the report.
- 27 I cannot comment on whether a three block replacement is a better option than a four block replacement, but I can say that the report's recommendation for a three block replacement based on the reports than have been provided is logical and reasonable. I cannot comment further on what the smallest block size for replacement could be to recreate the Hyde Park avenue of trees. This would require a site analysis and a clear statement of the objectives of the replacement. Both the TMP, 2006 suggestion of four blocks and that of TWM for three blocks seem to be reasonable from the reports that I have seen as they come to different conclusions based on different criteria, but the merits of both sets of criteria could be argued.
- 28 The report appears to accept that a period of 15 years over which block replacement is implemented, as recommended in the TMP, 2006, is reasonable, although it is not clear on this matter. There is no clear guideline or research to support a 15 year period, however, there is a general consensus that replacement over a 15-20 year period is sensible in that it gives a significant difference in age class and that after a period of about 40 years, trees will be of similar stature and so capture many of the benefits of an even aged planting, which might then persist for a period of around 50 years or more depending on species and site conditions. This is based on the not unreasonable assumption that members of the public will not differentiate between trees of different ages planted over a 15-20 year period as they approach maturity.
- 29 Replacing trees by attrition is an alternative approach, as the report makes clear. However, while it will see retention of an avenue/boulevard with its associated amenity values, it will have a different ambience and characteristics from the avenue/boulevard that currently exists. Some of the difference will be that trees will be of different sizes which will affect girth, canopy spread and height. The differences in girth and the loss of trunk uniformity will be evident from ground level as people walk through the avenue and so the ambience will be different. There will also be breaks in the connections in the over-arching canopies as younger tree take time to establish and so the cathedral ceiling effect will be compromised. There is also the high probability risk, as rightly highlighted in the report, that older, established trees will provide strong competition to younger trees which may result in the distortion of their form, including trunks and canopies as well as strong root competition which may reduce the vigour and growth rates of younger establishing trees (Parker et al, 2004)
- 30 In-fill planting or replacement by attrition suffer from similar tree establishment problems which I have alluded to earlier and which are well considered in the report.

COMMENT ON APPENDICES:

In general I have found the appendices provided with the report to be useful and relevant, as was the other documentation provided to me. It was not part of my brief to review these documents, but on selected matters, comment might prove helpful:

- 31 The aerial photograph from 1943 is useful in that it gives some indication of the rate of establishment of the planting. This would also give some idea of rates of growth should a block removal replacement be undertaken. However, I would anticipate a more rapid establishment given the horticultural expertise and technology that would be applied to the Hyde Park site.
- 32 The tree schedules, photographs and plans were helpful, consistent and as far as I can tell from the documents provided accurate.
- 33 The photograph also gives indication that the some planting of the central avenue of Hyde Park south occurred after the more general 1930 date.
- 34 The data from the resistograph testing by UTM in both their reports is compelling as it quantifies levels of decay and provides an objective measure against which judgments can be made. The data suggest that the lower trunks of most trees are largely free of decay, that some trees have low levels of decay and that only a few trees contain a significant level of decay (level c or d) which might be considered in their removal. On the basis of these data, it is both reasonable and professional that the author recommends retention of all trees.
- 35 It should be noted that UTM resistograph testing study and that of TWM are not necessarily in contradiction. They addressed different criteria, with the TWM report looking at a broader range of criteria than the UTM resistograph study.
- 36 The Hyde Park Tree Management Plan Tree, Assessment Schedules are informative and concise. They clearly show how many trees have been removed and how many are considered to have a short SULE. It is not clear from the documented provided why so many trees have a short SULE. Over the years, I have found that arborists tend to underestimate the SULE, often because they adopt a very conservative approach to risk and hazard.
- 37 It is possible that some of the trees will have a longer SULE than is currently estimated, but others will not. This means that gaps in the avenue will continue to appear as trees are removed and so the integrity of the avenue will be further diminished.

CONCLUSION:

The replacement of heritage and significant avenues and boulevards of trees is a very difficult management issue. Replacement by attrition and in-fill plantings are very difficult to establish and the ambience of the avenue and its overall impact will differ from an even aged avenue/boulevard. However some level of amenity value is maintained throughout the replacement process. Block replacement can see a loss of amenity value but re-establishes a similar avenue/boulevard.

In other situations, with which I am very familiar, a failure to make decisions about tree replacement has led to replacement by attrition and in-fill planting. In some instances the avenues have changed character, but in others so many trees have failed and been replaced over a relatively short time (15-20 years) that there has been a *de facto* block replacement in sections of the avenue. This latter approach is costly, invariably has gaps and leads to stunted and distorted trees from competition with larger established trees.

One of the best examples of the difficulty of the management of these issues has been the on-going debate about tree replacement in the town of Camperdown, Victoria. This matter was first raised in the mid-1990s and through changes in local government several different policies of replacement have been adopted, including a mass replacement which was approved by council but never implemented. Subsequently, there has been replacement by attrition. Another interesting case study has been the management of the elms in Royal Parade, Parkville by the City of Melbourne. A number of these trees, particularly at the northern end of the street have failed over the past two decades and have been replaced. It should be pointed out that the surviving trees, some of which have been seriously stressed and are in decline have been intensively and very well-managed to reduce risk and hazard by the City of Melbourne. A smaller rural council may not have the resources or arboricultural expertise for this level of management.

This report and the earlier ones to which I have had access have provided good and consistent advice. If you want to replace what you have had in the central avenue of Hyde Park with a cathedral-like mature canopy then block replacement as recommended is the most effective and efficient means of achieving that goal and outcome. If you replace by attrition and in-fill where trees are lost you will still have a central avenue, but it will be different from the one that has existed since 1930.

The arborists have provided good advice and it now resides with decision makers to decide what option to take and what they want future generations to see in the central avenue of Hyde Park in the decades and perhaps a century ahead. We have inherited and benefited from a legacy of bold decisions made about parks, gardens, streets and boulevards in the past by a generation who would never see the landscapes that they planned and planted in maturity, but did it with future generations in mind. Perhaps it is time for the current generation to look to the future and make some bold decisions.

ATTACHMENT E

REFERENCES:

- James K (2003) *Dynamic Loading of Trees*, Journal of Arboriculture, 29 (3), 163-171
- James K R, Haritos N and Ades P K (2006) *Mechanical Stability of Trees under Dynamic Loads*, American Journal of Botany, 93 (10),1522-1530
- Moore G M (2001) *Ancient and Significant Trees: Protecting Community Assets and Heritage*, in Management of Mature Trees, Proceedings of the 4th National Arborists Association of Australia, Sydney
- Moore G M (2003) *Crown Thinning Versus Weight Reduction: Beginning the Analysis*, Proceedings ISAAC Conference 2003, Australian International Society of Arboriculture, 8pp
- Moore G M (2010) *Crown Thinning and Weight Reduction*. The Bark, Arboriculture Australia 12(2), 8-10
- Parker M, May P.B. and Moore G M (2004) *The Challenge of Mature Tree Replacement: Contemporary Approaches to Amenity Tree Replacement in Mature Landscapes*, Proceedings of the Fifth National Street Tree Symposium, 122-133, University of Adelaide/Waite Arboretum, Adelaide, ISBN 09775084-4-7

Dr Gregory M Moore B Sc(Ed), B Sc(Hons), PhD, MBA
Senior Research Associate
Burnley Campus
University of Melbourne
500 Yarra Boulevard
RICHMOND 3121

27 June 2013