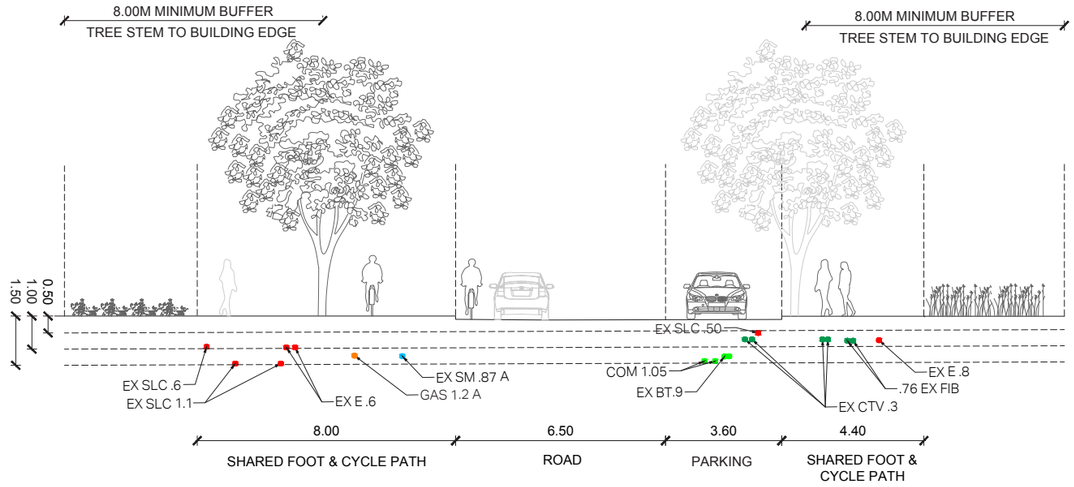
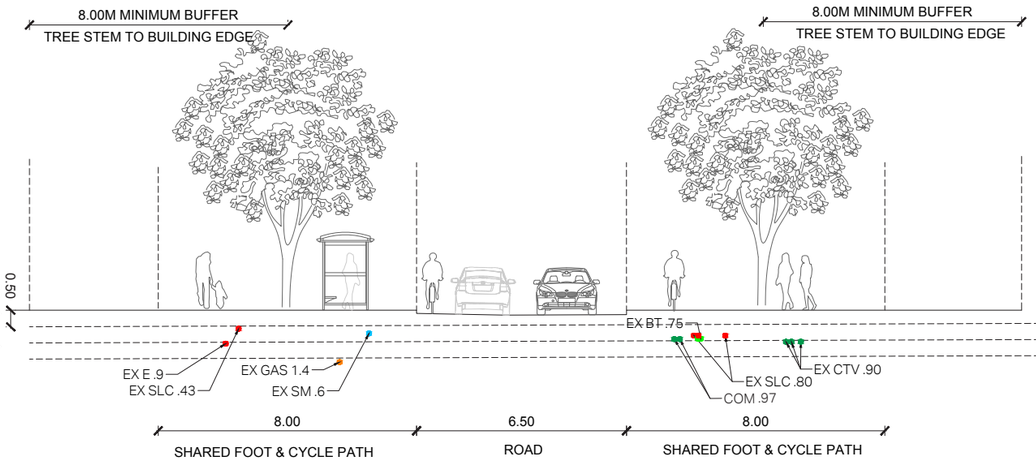
Charles Babbage Road: Utilities

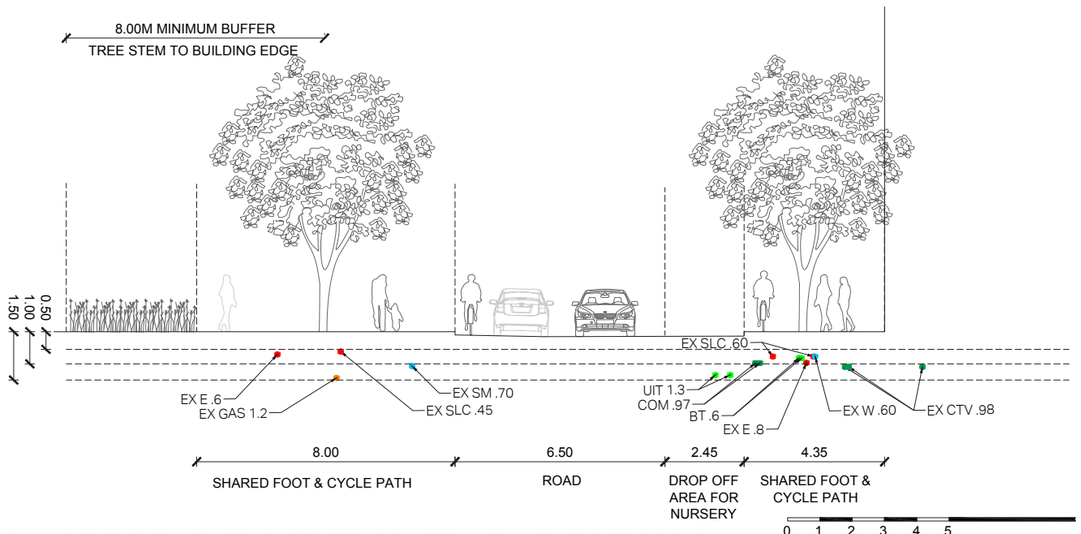
KEY PLAN



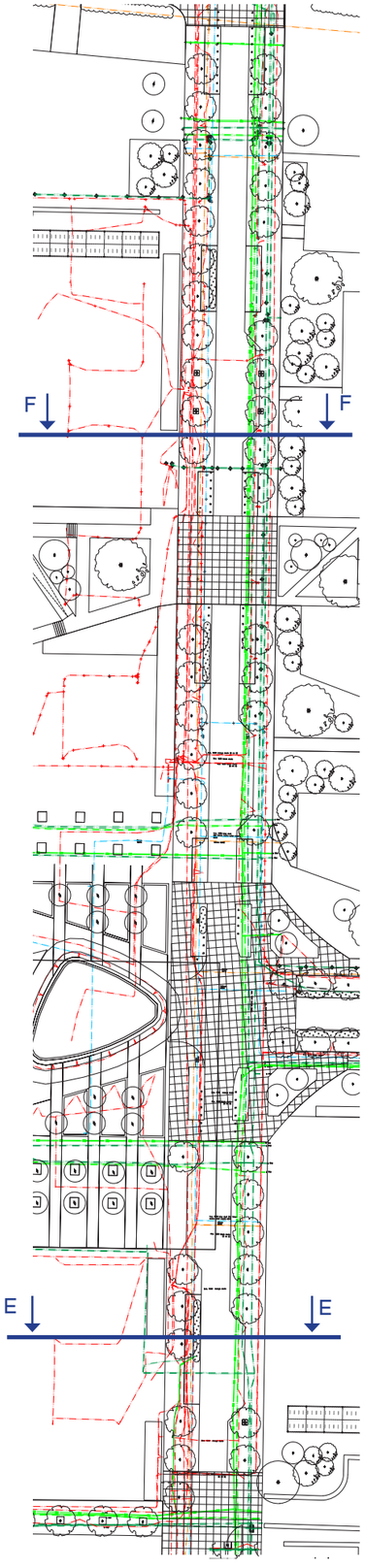
183. Proposed Charles Babbage Road Section D-D' (with existing utility overlay, subject to detailed design)

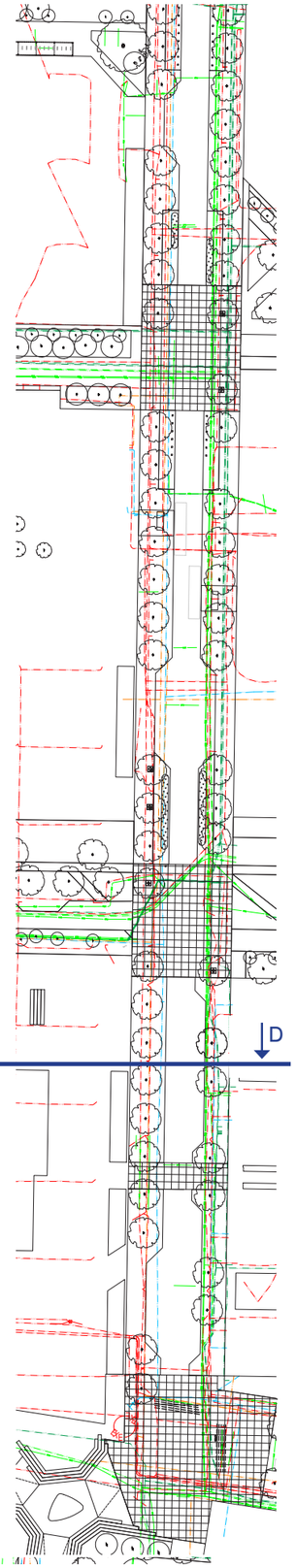


181. Proposed Charles Babbage Road Section E-E' (with existing utility overlay, subject to detailed design)



182. Proposed Charles Babbage Road Section F-F' (with existing utility overlay, subject to detailed design)



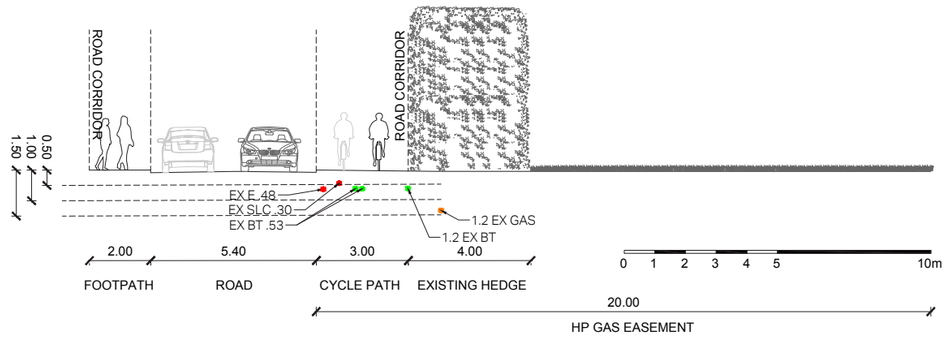


184. Charles Babbage Road Plan with utility overlay

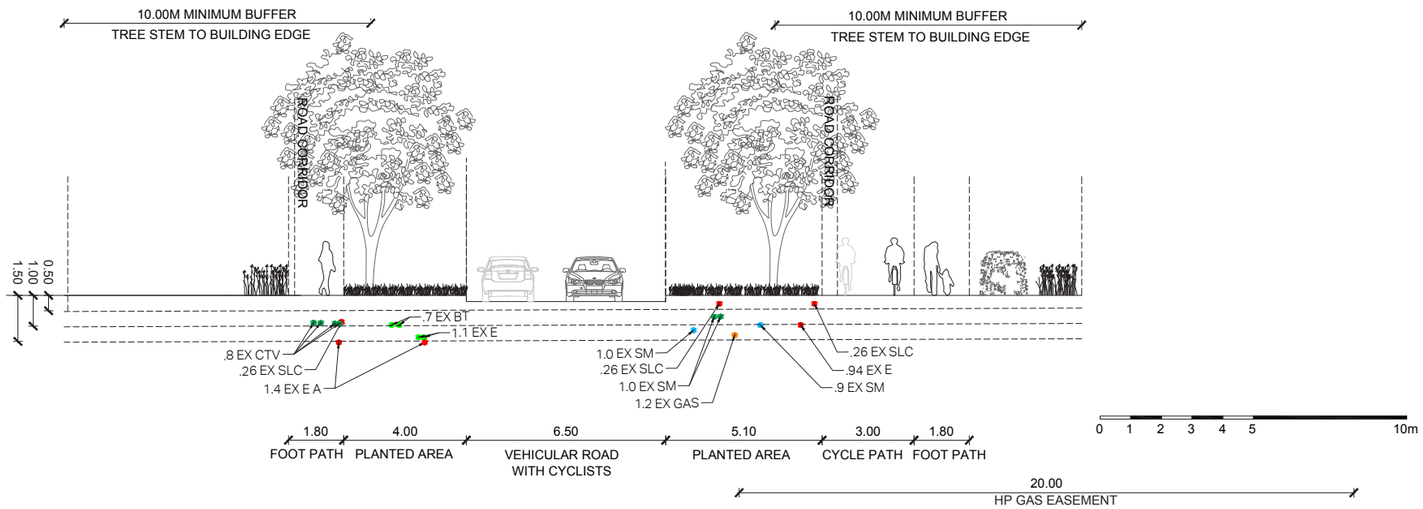
UTILITIES KEY

- *BT CABLES*
- *COMMUNICATIONS CABLES*
- *CABLE TV CABLES*
- *ELECTRICAL CABLES*
- *FIBREOPTIC CABLES*
- *GAS MAIN*
- *GAS SERVICE*
- *GPR TRACE*
- *HOT WATER PIPE*
- *LIGHTING CIRCUIT*
- *SECURITY CABLING*
- *UNIDENTIFIED TRACE*
- *WATER MAIN*
- *WATER SERVICE*

Western Access Road/Ada Lovelace: Utilities



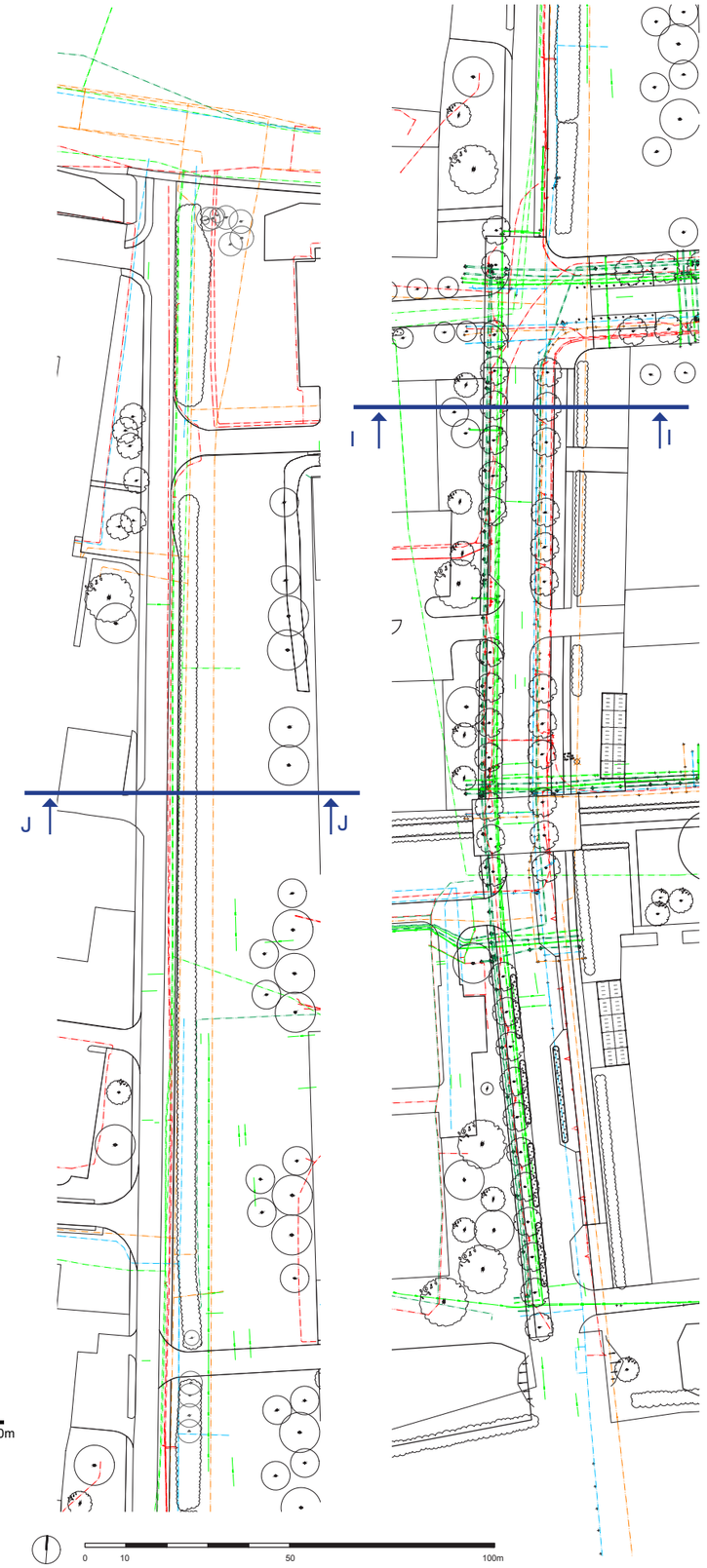
186. Proposed Western Access Road / Section J-J' (with existing utility overlay, subject to detailed design)



185. Proposed Ada Lovelace Road / Section I-I' (with existing utility overlay, subject to detailed design)

UTILITIES KEY

- *BT CABLES*
- *COMMUNICATIONS CABLES*
- *CABLE TV CABLES*
- *ELECTRICAL CABLES*
- *FIBREOPTIC CABLES*
- *GAS MAIN*
- *GAS SERVICE*
- *GPR TRACE*
- *HOT WATER PIPE*
- *LIGHTING CIRCUIT*
- *SECURITY CABLING*
- *UNIDENTIFIED TRACE*
- *WATER MAIN*
- *WATER SERVICE*



187. Western Access / Ada Lovelace Road Plan with utility overlay

5.3. Street tree investigation reports

Matt Allen
University of Cambridge Estate Management
Greenwich House
Madingley Road
Cambridge
CB3 0TX

24th October 2016

Dear Matt

Re: High Cross Access Road, West Cambridge Site – Oak Trees

Following our meeting on site to inspect the pit and rootball of one of the dead or dying Oak trees along the West Cambridge Site access road I write to report my findings, opinion and recommendations.

I understand that the English Oak (*Quercus robur*) trees were planted as 30-35cm rootballed stock in Winter 2013/14 by Pro-scape and that the stock was sourced through Double Yew Nurseries but supplied directly from a continental nursery to site. This formed part of the West Cambridge Phase 4 landscape designed and specified by Grontmij. Topsoil supply and placement was carried out by Breheny.

Google streetview contains images taken in August 2014 which show that the Oaks were already dead and dying stock at that time. I inspected the Oaks on August 4th 2014 at the request of Pro-scape, who were concerned about the deaths and dieback on the Oaks. Photographs taken by Pro-scape at the beginning of July 2014 show the trees beginning to flush into leaf.

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Phone: 01366 381128 Email: david@dbld.co.uk

DAVID BROWN LANDSCAPE DESIGN

At the time of my visit in August 2014 the tree pit soils appeared to be dry and there had been two weeks of dry weather. The damage appeared to be consistent with lack of water due to drought conditions and I recommended watering to make soil water available. No trees were lifted at that time.

I visited site again on 24th October 2016 and the condition of the trees had further declined. Some trees had already been replaced by slightly smaller stock of Oak, which seem to be in reasonable condition for newly planted trees. A sample tree had been lifted to allow inspection of the pit and the root system. The topsoil surrounding the tree was of good quality and of an open sandy clay loam texture. It appeared to be somewhat dry. There was no evidence of compaction and the soil was friable. The pit details appeared to be as shown on the Grontmij drawing with underground guying evident and the irrigation pipe present.

The rootball was of a dense blue-grey with orange flecks (gleyed) clay which was somewhat stiff but still plastic. It was less than 600mm in diameter. When the clay was peeled back, the exposed root system showed extensive soft rot with blackening beneath the dead cortex in places, which was slimy to touch. There was an absence of discernible fine root and the root system was of short severed roots 15-25mm diameter.

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From observation of the decayed root system within the small clay rootball it seems likely that the stock was already in poor condition when supplied to site. If the trees were undercut and lifted in Winter 2013/14 then the inadequate root systems would not have been stressed before planting and would have enough energy to flush into leaf, albeit rather late and weakly in many cases as can be seen below.

Photograph taken by Pro-scape in the first week of July 2014

The dry and sunny spell which followed in late July was sufficient to place a demand on the root system for water which it was not in any condition to meet. Irrigation could not be effective as the weak link was the root system itself, which lacked fine fibrous roots and was contained within a dense clay rootball.

The only likely causal factor in the decline and death of the Oak trees is therefore the original stock quality as delivered to site. The nature of the defect is that, other than the small size of the rootballs, it would not be evident at the time of delivery to site. The surrounding soils are of very good quality for a landscape site and are not a contributory factor. The dry conditions in July 2014 were not prolonged and although the surrounding soils were relatively dry, the scale of effect and the slow coming into leaf shown in the July photograph indicate that the trees were already failing to thrive.

So much for the causes. There is now an avenue of trees where the majority have failed or are failing. Some trees have already been replaced by smaller stock which seems to be establishing well. Decisions need to be taken on how to proceed. Oak is a relatively slow-growing tree species which is noted for transplanting poorly at large stock sizes. The slow growth means that the species is generally more expensive at large sizes as it must spend more time in the nursery to make size. Given the scale of replacement required it is worth looking at either smaller Oak trees or trees of another species altogether (which may be less expensive and available at larger sizes at the same cost). Container grown trees are also more likely to thrive as the container growing medium encourages fibrous root development and there is no

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DAVID BROWN LANDSCAPE DESIGN

disturbance or severance of the root system. The safest course of action, in my view, would be to replace with container grown trees of another species at a smaller stock size but to the original tree pit and furnishings specification. Regular watering and monitoring of soil water (moisture content) using Frequency Domain Reflectometry is becoming more widely used. This equipment can take the guesswork out of watering landscape planting beds, which for expensive materials is probably justified. Suitable species which are worth considering for the avenue are:

Gleditsia triacanthos f. inermis 'Skyline'
Juglans nigra
Liriodendron tulipifera
Platanus orientalis 'Digitata'
Tilia cordata x mongolica 'Harvest Gold'

The final decision will also be driven by the availability of the numbers required in the preferred species and sizes. If I can be of further assistance in this matter please let me know.

Yours sincerely

Dr David Brown PhD DipLD MCIHort FArborA

c.c. Richard Hardwick, Peter Brett Associates

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Tree Condition Survey

Charles Babbage Road
Cambridge

August 2008

Contents

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thelandscapepartnership

Registered in England No. 2709001

The Landscape Partnership is registered with the Landscape Institute, the Royal Town Planning Institute, and is a member of the Institute of Environmental Management and Assessment

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1.0 Introduction

1.1 The Landscape Partnership has been commissioned by Hannah-Reed to carry out an inspection of planted trees at Charles Babbage Road Cambridge. The trees have been planted in several phases as part of the development of the infrastructure for the site. Concerns regarding the health of the trees have been raised as a significant number of trees have died and the remainder are in a poor or declining condition.

2.0 Site Description

2.1 The site is part of an ongoing scheme of infrastructure development. The area is dominated by hard paving and the potential rooting volume of each tree is restricted by the adjacent road and a significant reduction in level to the adjacent car park. The trees access to moisture is restricted to percolation through the sloping paving around each tree pit and the tree pit opening. Applied watering is achieved via a perforated pipe placed in the bottom of the tree pit and capped at the tree pits surface. There is no apparent method of application measurement or indeed watering methodology. The second phase of planting (Planes) appears to have no water pipe system installed. No records of timing or volumes for applied watering were available nor indeed any regime for assessing rainfall.

3.0 Assessment of Trees (Methodology)

3.1 It is clear from a visual inspection of the trees that they are dead, dying or declining. The cause of the visual symptoms can be surmised but in order to aid the diagnosis three courses of action were taken:

1. Excavation of the tree pit and removal of the tree
2. Probing of the tree pit to assess soil moisture levels
3. Excavation of the root/stem collar to assess depth of planting

Phase 1: Plane Tree Planting

3.2 The trees in this phase are in the poorest condition several of which are completely dead. The trees which are alive vary in terms of their condition and it is unlikely that any trees within this phase of planting will develop into acceptable specimens. Two trees were excavated from this phase of the planting as follows:

Tree 1 is a severely damaged example with total canopy death and some vigorous re-growth around the trees main stem. Removal of the tree pit exposed a partially dead root system and a largely dry root ball. Root growth in the top 300mm of the root ball was alive and had extended beyond the original root ball into the tree pit back fill (Amsterdam Tree Soil). Root activity below 300mm appeared to have been good but was dead. Current growth appeared to be being sustained but was beginning to show signs of drought stress as some leaves were browning at the edges.

It would appear from the size and development of roots outside the original root-ball that for at least two growing seasons root growth was sustained by the tree. Root activity then declined and a significant proportion of the trees root system declined or died. At this point the tree probably defoliated early and produced less and fewer leaves during the following spring flush. The edges of the canopy then died back, resulting in a tree which was severely damaged. During this period of drought stress the upper part of the trees root system was able to survive on the prevailing rainfall and perhaps an erratic watering regime. Recent rainfall appears to have boosted growth which is now dense but restricted to the trees main stem. Despite this apparent renewed vigour the tree will not provide a satisfactory specimen.

Photographs in the appendix below show the condition of the tree and its root-ball.

Tree 2 is a completely dead tree. Removal of the tree from the tree pit exposed a completely dead root system. As with tree 1 there is evidence of good root growth which occurred during the first two growing seasons. Drought stress caused by the erratic availability of soil moisture appears to have lead to a more dramatic decline and eventually the failure of the tree. It was noted during the excavation process that the base of the tree pit appears to have been waterlogged sufficient for the anaerobic conditions to have developed. The volume of soil affected is relatively low and is unlikely to have contributed to the demise of the tree. The pit was not waterlogged when it was excavated despite higher than average rainfall in August and the fact that the tree was not removing moisture form the tree pit because it was dead.

Photographs in the appendix show the root ball of tree 2.

Phase 2: Plane Tree Planting

3.4 The trees in the second phase of planting are in leaf but are showing signs of stress, leaf density and size are reduced and the leaves are becoming slightly yellow. As none of the trees have yet died an alternative approach to excavation was used to investigate the condition of the trees. Careful excavation of the surface of several tree pits was carried out and the root ball probed to assess the moisture level within the soil. The following observations were made:

- The material excavated from the top of the tree pit appeared to be railway ballast mixed with topsoil.

- The tree was planted to a depth such that the root/stem collar was 200mm below the surface. New roots had developed from the buried main stem of the tree.

- The area adjacent to the trees root ball was probed with a ranging rod. Virtually no soil adhered to the pole and the material that did was dry.

- There was no evidence of water logging or anaerobic conditions.

- It would appear that a combination of incorrect planting depth and erratic watering is contributing to the current condition of the trees.

Hornbeam Planting North of Charles Babbage Road

3.5 Whilst on site a hornbeam was also looked at. The tree appeared to have been planted 75mm deeper than is appropriate.

4.0 Conclusion

4.1 The current phases of planting have failed completely in the case of phase 1 Plane trees and appear to be failing in the case of phase 2. It would appear from the evidence of the excavated trees that the main cause of failure has been a lack of managed watering at appropriate times to supplement prevailing rainfall. The erratic nature of the availability of moisture to the trees has been exacerbated by the paving which surrounds each tree pit. This paving is largely impervious although the joints between slabs will allow small volumes of water to percolate, however the slope of the paving to a drain along its edge will remove much of the rainfall before it has the opportunity to soak through the joints. Rainfall availability to the trees is therefore largely restricted to that which falls on the open surface of each tree pit. Moisture availability is further affected by the change in level to the south of the tree pits where the footway is supported by a retaining wall. This creates a moisture gradient which is likely to be increased by the adjacent holly hedge.

5.0 Recommendations

5.1 All of the trees in phase 1 should be replaced once a maintenance regime has been devised that provides the information outlined at 5.2 and enables an appropriate watering regime to be implemented.

5.2 It is important that trees receive an adequate supply of water to their root systems. Too little and they will not be able to sustain their leaf crop and too much where drainage is poor the roots may die by being waterlogged. In order to make appropriate decisions with regard to watering three important pieces of information are needed as follows:

Tree pit drainage rates

Tree pit drainage rates can be assessed by excavating the pit, measuring the volume, filling it with water and measuring the rate at which it drains. Variations in drainage rates can then be used to inform watering rates. If the applied water does not drain and the pit remains waterlogged, positive drainage may be required or perhaps the location of the tree pit abandoned or moved.

Local rainfall as it happens

Measurement of rainfall on site will provide live information on how much natural water is available to the tree and how much artificial watering may be needed.

The volume of water required by the tree

This information may be available from the nursery based on the volumes that they apply when they are growing the tree. It would need to be increased as the tree increases in size and of course would need to account for the rate at which the tree pit drained.

5.3 The trees in phase 2 appear to be suffering from an erratic watering regime and being planted too deep. The impact of the back fill material has not been considered. The origin of the material should be confirmed by the landscape contractor and if the answer is unsatisfactory the material should be screened and the PH checked. In order to improve the current condition of the trees the following action should be taken:

- Fill levels within the tree pit should be reduced to the top of the root ball. The resultant void between root ball and tree grill could be filled with an inert course material.

- The watering regime should be assessed and adjusted to take account of rainfall and tree pit drainage.

- Roots which have developed form the main stem of affected trees should be removed.

5.4 Soil levels around trees planted in open beds should be checked and adjusted as necessary.

Michael Roseveare ND Arb M Arbor A
Associate Director

Appendix
Photographs

Tree 1 partial re-growth around trees main stem

Tree 2 discoloration indicating some water logging of root-ball base

Tree 1 fibrous root growth in top 300mm of root ball
Dead roots at base of root ball

Tree 2 showing reduced root activity than tree 1

Tree with growth restricted to main stem, some evidence of drought stress ir browning of leaf margins.

Phase 2 planting showing development of roots on main stem of tree planted too deep

Phase 1 planting showing die back and re-growth

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