The 7 Fundamentals of

Tree Planting In Paved Surrounds

A look at why trees in parking lots fail – and what to do about it

GreenBlue® URBAN

Establishing the future urban landscape

"A quick guide for busy people on how to avoid expensive tree planting failures and implement a successful urban tree planting strategy"

A publication by
GreenBlue Urban

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Establishing the future urban landscape

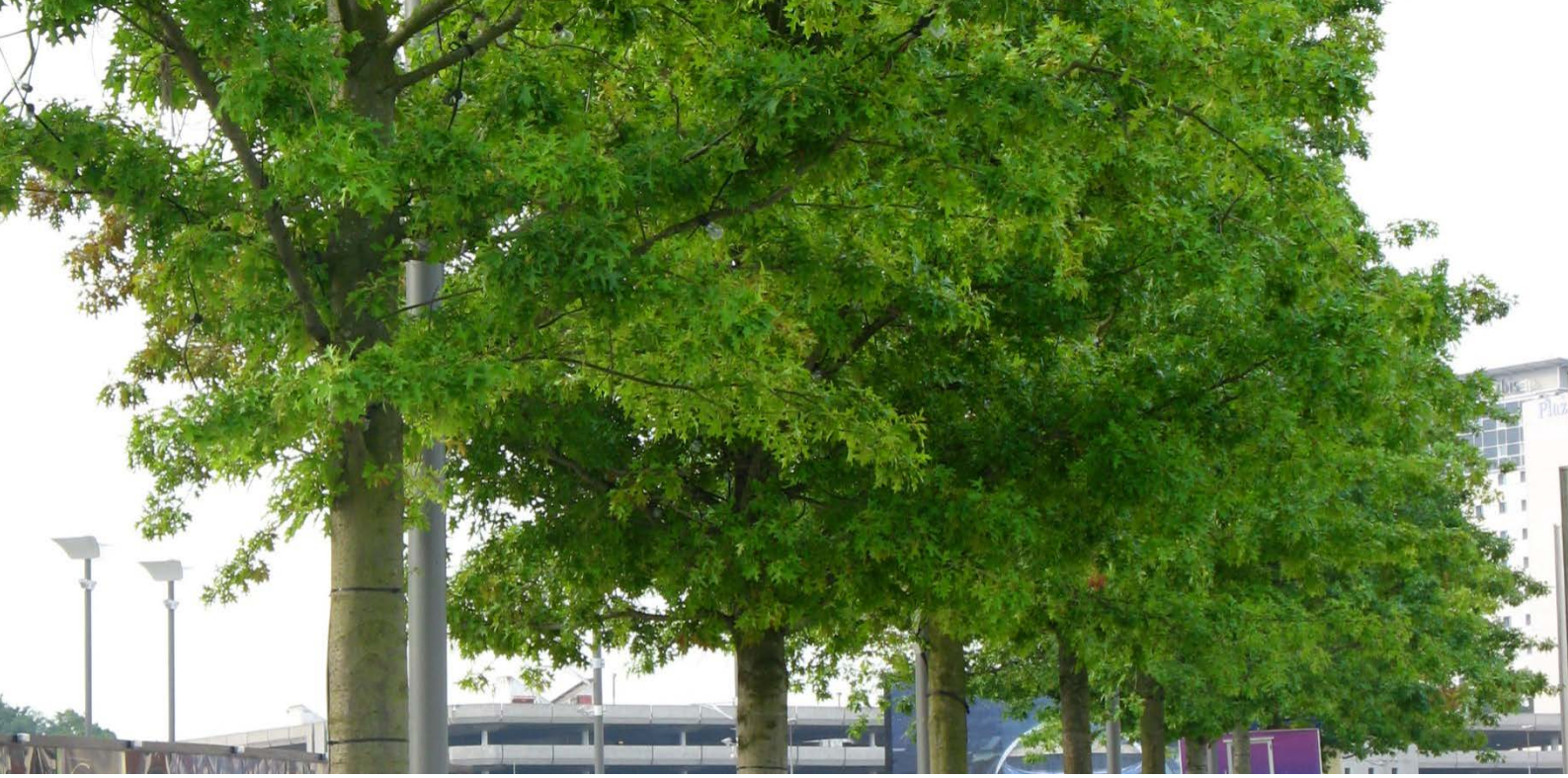
Introduction

The purpose of this publication is to provide facts and guidance to persons involved in the decision making process which is a part of any urban tree planting program. Planting trees in hard surfaces requires careful planning and interaction between differing professional disciplines.

Typically we see even planting a single street tree can involve engineers, landscape architects, highways departments, utility companies, urban foresters, landscape contractors, civil works contractors and of course the client.

This publication is for these people – reading it will not make you an arborist or tree expert, but it will mean you have a broad acquaintance with some of the key pitfalls and how to avoid them.

The information in this book is drawn from many sources and is not least the product of GreenBlue's accumulated wealth of experience of over 20 years as a global market leader in the Urban Tree Pit Design industry.



Trees are living woodland plants. This sounds obvious, but it isn't - otherwise we would not see so many tree pit designs for urban areas which are fundamentally flawed.

As woodland plants, trees need soil to grow into – and lots of it. After all, in a forest or woodland they can, and do, spread their roots a long way beyond the canopy spread. Why then do we still see trees planted in tiny tree pits or even concrete rings? Such trees are doomed to be short-lived from the moment they were drawn into the plans.

Furthermore, not only is a quality rooting medium required, but there must be the means of maintaining that quality. In parking lots, this is a particular challenge, as much of the root zone will be paved over.

What you provide the tree with below ground, will dictate how the tree will manage, grow, and thrive (or otherwise) above ground.

Please don't be surprised if due to budget constraints your tree pit size is reduced to a 35 cu. ft. (1 cu. m.) provision. This will be entirely predictable, and the dying, diseased and stunted tree will after a few short years will be joining the statistics.

Reasons for Failure

Now let's look at the main reasons for tree failure. These can be broadly grouped into seven aspects.

1. Lack of adequate un-compacted rooting volume

Roots need appropriate soil volume – failure to locate this will result in short lived trees.

2. Poor planting technique

Clumsy and careless planting technique can result in long term damage to trees prospects, allowing the roots to dry out during planting for example.

3. Vandalism – intentional and unintentional

Dogs, vehicle movements, trimmers, and intoxicated persons can all create survival challenges for trees.

4. Poor Drainage

Waterlogged ground conditions for longer than 48 hours can cause root to die back. Persistent anaerobic conditions will result in a dead tree – air is vital.

5. Drought

Statistically, one of the biggest killers of newly planted trees is lack of enough water to sustain plant life. Surface watering encourages surface roots and is only 25% efficient .

6. Design and species selection

The wrong tree species for the site.

7. Infrastructure remediation damage

Tree beginning to establish – and then highway engineers have to cut through the roots to remedy a trip hazard. This can destabilize the tree and create problems.

What You Can Do

What can be done?...

Client

Above all, be realistic. Trees can bring huge benefits and add value to property for years to come – but you need to budget appropriately. Get it wrong and the trees will not only look sickly, but will be visually unappealing and could create expensive damage to infrastructure.

Local Government

It's lovely to talk about the number of trees you plan to plant in the suburb, but challenge your team – would it be better to plant fewer trees, but to a higher standard? Think about a long range view and what will benefit the community for many more years.

What You Can Do

What can be done?… (continued)

Architect

Think about trees early on in your design. Used skillfully they can create successful public space that works. Trees are not just an 'add on' to attach green credentials – they bring innumerable benefits.

Civil Engineer

Trees in streets can extend pavement surface life through cooling shade. They need not cause damage but we would suggest that tree pit design is considered early on in new road schemes

What You Can Do

What can be done?... (continued)

Landscape Architect

Getting tree planting right can be your signature on a project. Visualize the site in 10 years' time – will you be proud to be associated with this project? Lancelot Brown was an eighteenth-century English landscape architect remembered as "England's greatest gardener". If his trees had died young, it is very unlikely that he would be referred to today in the same respectful tones that he is.

What You Can Do

What can be done?… (continued)

Utilities Engineer

Grouping utilities together in protected service trenches is a good way to create utility free root space for trees elsewhere. Find out what trees are going in before dissecting areas needlessly with trenches – there may be a more tree friendly route. After all, you don't want to have to excavate through roots for pipe maintenance so it is in your best interests to look ahead and plan for trees.

Quantity Surveyor

So the scheme calls for a large tree pit construction – looks expensive and is out of sight. Caution is needed when attempting to 'value engineer' tree planting. Subsequent remedial works to repair infrastructure or replant failed trees could swiftly dwarf apparent savings.

What You Can Do

What can be done?... (continued)

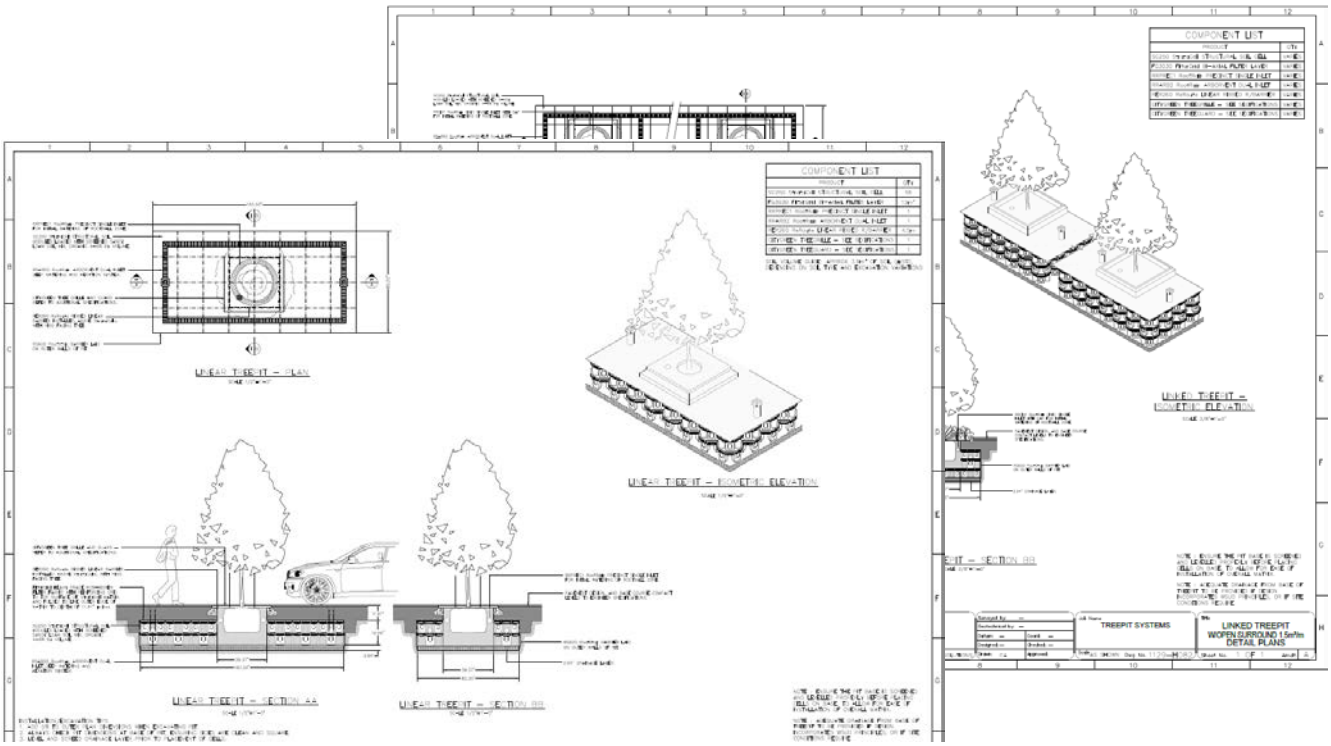
Arborist

If you are responsible for the standard of tree planting in your city, you need to give clarity to councilors, engineers and planning applicants as to the standards of tree planting expected. This is particularly important where roads are to be adopted on new schemes – are we planting a problem for later years, or a benefit for future generations?

Contractor

The single largest living element on your scheme will be the trees. Care in handling of trees, pre-planting, planning, planting and aftercare will result in schemes you are delighted to show to future clients.

Tree Pit Design



Products, solutions and methodologies to ensure success

The essence of good tree pit design is in the provision of quality rooting zone in adequate volume. Allied with this, proactive root management strategies are needed to direct root growth towards optimal root areas.

To make it simpler for specifiers and other authorities to incorporate a high quality tree pit design in their urban landscape project, take advantage of the range of professionally drawn tree pits created by GreenBlue Infrastructure Solutions.

They incorporating all the key elements of good practice to assist busy specifiers and project managers. These tree pit designs are proven to work well and are available in CAD format drawings.

Tree Pit Design

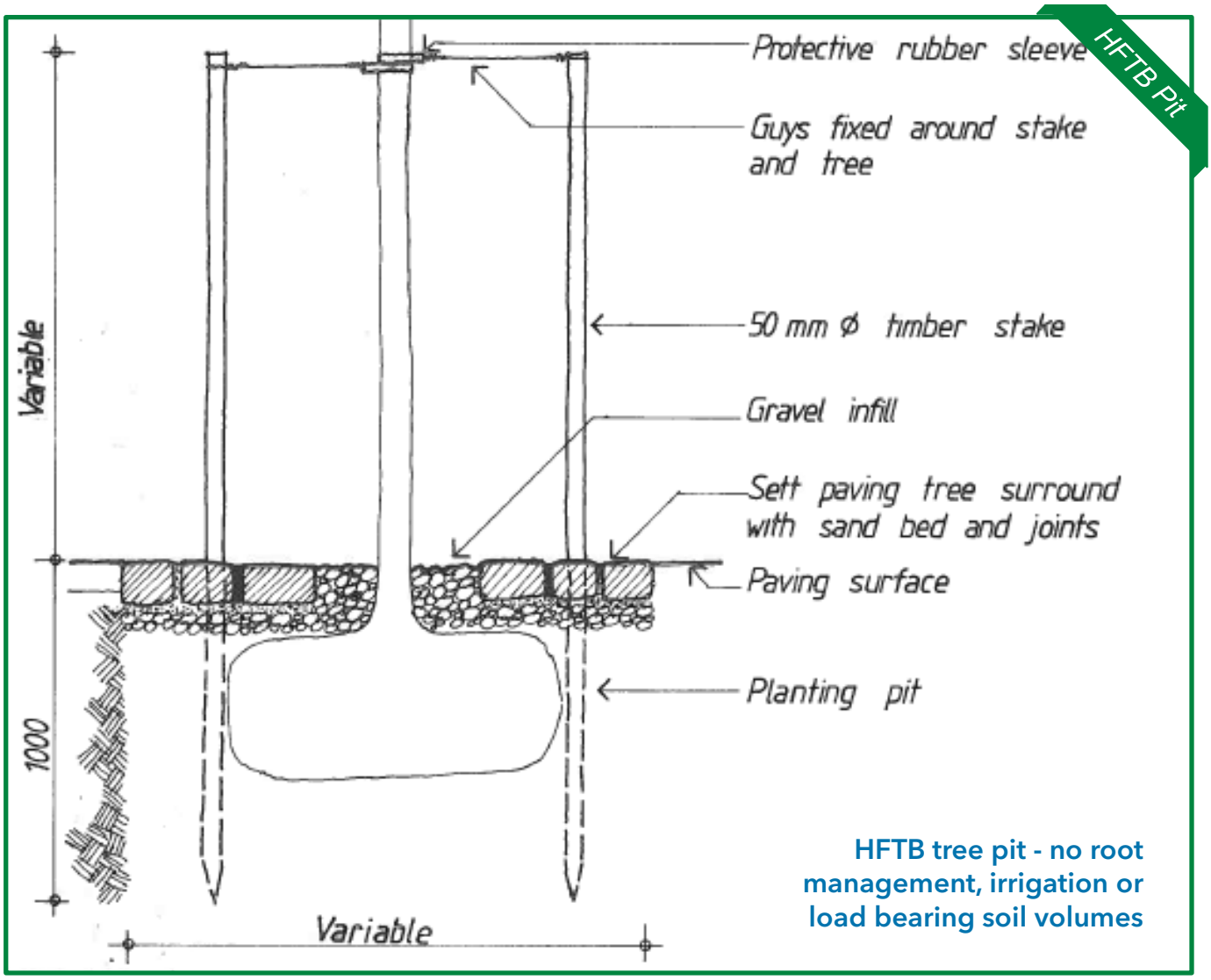
Without proper tree pit design…

It will end like this!

Tree Pit Classifications

Broadly speaking, the tree pit designs we see most commonly used in urban areas, can be classified as follows:

HFTB Tree Pits – Hope for the Best Tree Pits
Still very common, the tree is planted into the paved area without any root management, irrigation means, or soil cell provision. Some will live but the results will be completely random, everything depends on what the roots can discover to grow into in the longer term. Tragically many fail, furthermore a very high percentage of the trees that succeed in surviving for a few years will create paving heave and other hard surface damage – often leading to tree failure when the paved surface is reinstated for pedestrian safety.



HFTB tree pit - no root management, irrigation or load bearing soil volumes

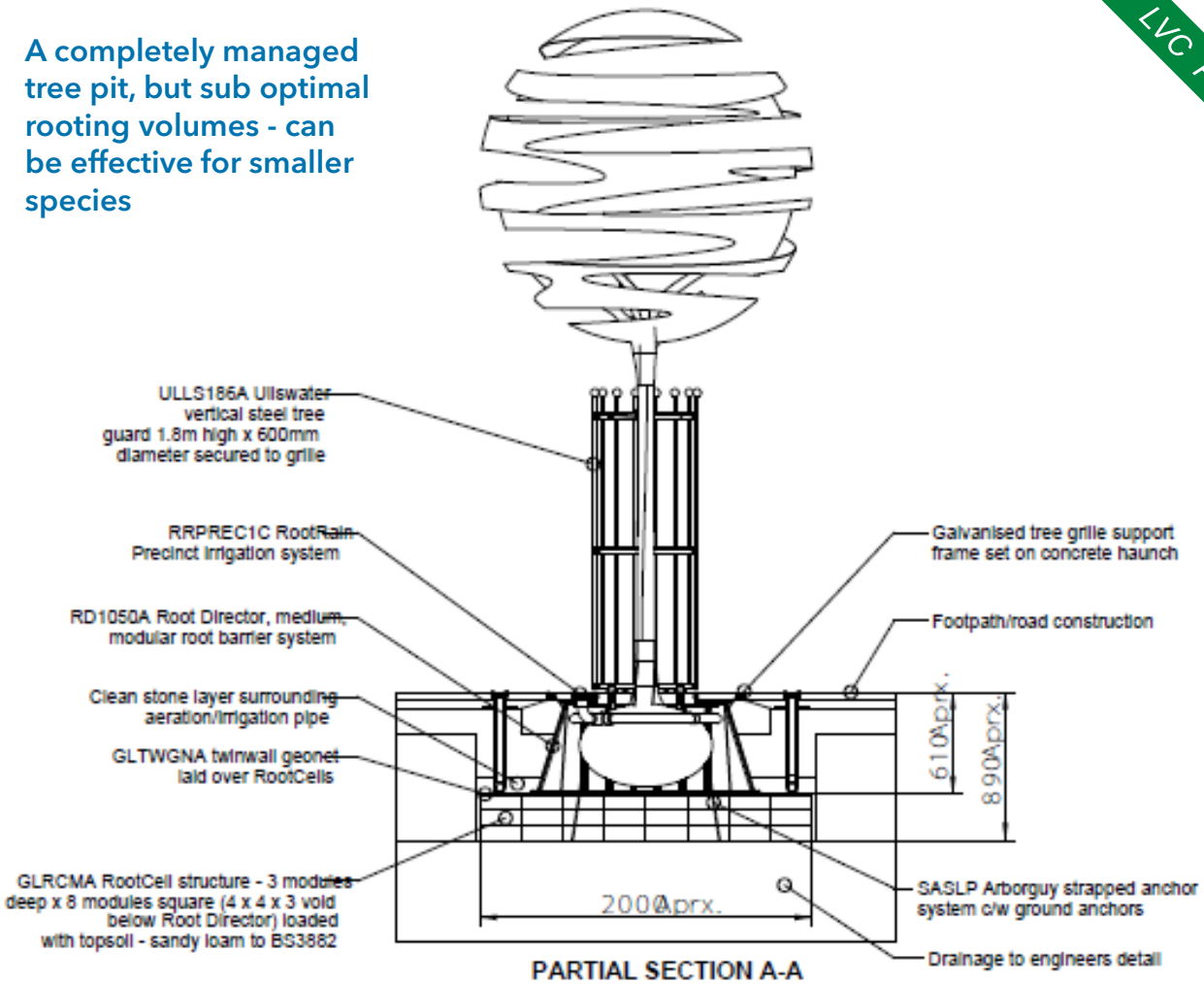
Verdict –
HFTB Pits tend to lead to a replacement tree cycle which is difficult to break. It can save money in the very short term, only to create heavy expense, and often tree loss for the future. Root damage can usually be detected within 3 to 5 years.

Tree Pit Classifications

LVC Tree Pits – Low Volume Contained Tree Pits
These tree pits are designed with root management - to prevent paving damage, an irrigation system, a small volume of soil cells and a root containing perimeter barrier. This tree pit design is frequently the only way of getting a tree into a very congested urban situation, with below ground space priority being given to service providers.

LVC Pit

A completely managed tree pit, but sub optimal rooting volumes - can be effective for smaller species



Verdict –
LVC Pits have a role to play in getting smaller trees into our streets and urban areas. In our experience these can achieve good results and give a tree in a managed situation, unlikely to create problems around but also restricted in how much it will grow and for how long.

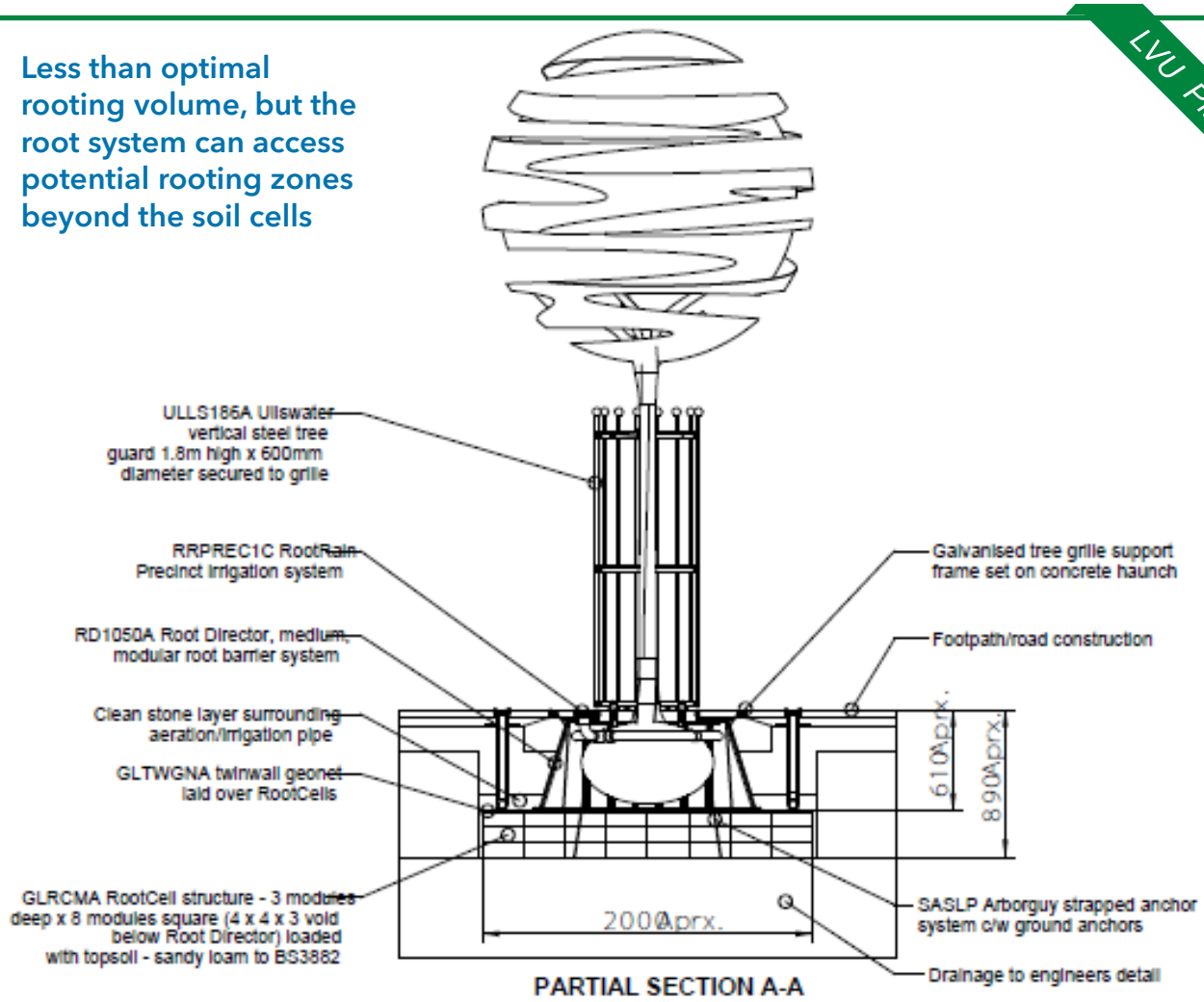
LVC tree pit after 11 years

Tree Pit Classifications

LVU Tree Pits – Low Volume Uncontained Tree Pits
Definitely preferable to the previous two – an LVU tree pit provides an excellent start for a trees life and the root are free to travel onwards beyond the initial pit size to exploit potential rooting volumes accessible elsewhere. We have seen this used to good effect in many urban schemes. However – the results after 10 years plus are likely to be variable and will depend on what further space and nutrient values the tree can locate. Compaction and anaerobic conditions are also highly likely to be detrimental to the tree in the longer term.

LVU Pit

Less than optimal rooting volume, but the root system can access potential rooting zones beyond the soil cells

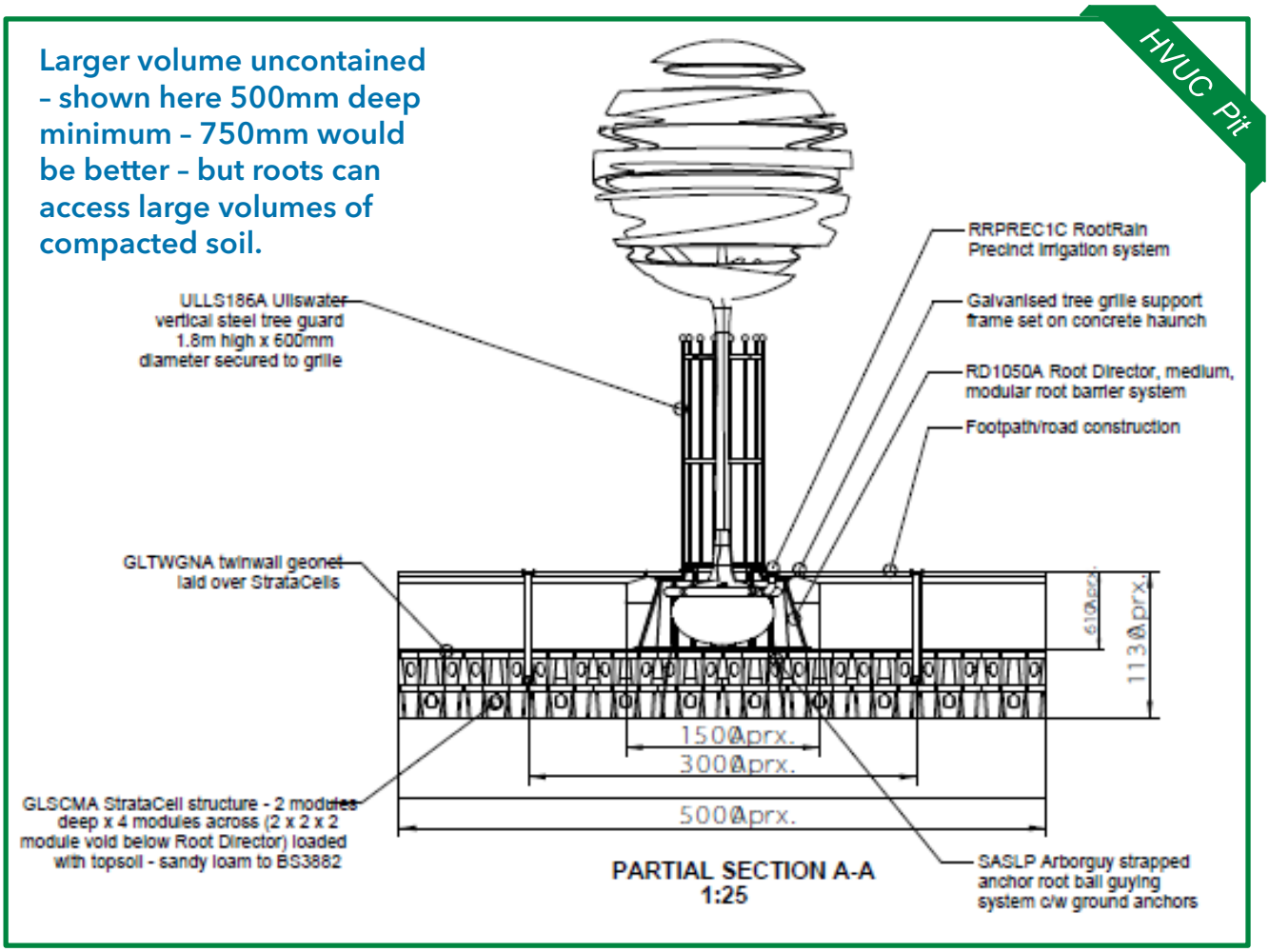


Verdict –
LVU tree pits should be regarded as a good option where original tree pit space is limited and / or the planting budget will not stretch to providing complete life tree pit volumes.

LVU tree pit after 7 years

Tree Pit Classifications

HVUC – High Volume Uncontained Tree Pits
This is the ultimate tree pit design. The designer has taken into account the long term value of canopy volume trees in urban space and has provided a large volume of load bearing, aerated soil cells, appropriate irrigation and drainage, shallow root management to prevent paving heave and a surface design which will accommodate a successful established tree.



Verdict –
The best solution for the client who is serious about getting mature trees into their project with predictable consistent results. This is particularly important when planting a series of trees within sight of each other to get uniformity in growth patterns.

Linked HLVU tree pits after 8 years

Conclusion

To summarize, if you are planting trees in a parking lot or similar continuous paved surround, the following seven areas must be addressed to achieve consistently successful results:

1. Soil volume & quality –
Enough good quality soil to give the tree an excellent start at least, if not a complete life provision. This must be protected from surface loading and vehicle overrun so use of load bearing soil cells is vital to protect the soil structure.

2. Root management –
Linear or surround, ribbed root barriers to divert lateral roots downwards, away from paving and into preferred root colonization zones. The ribs are important as they prevent root 'spiraling' and a pot plant effect.

3. Irrigation –
Provision of a deep watering device for charging up the field capacity of the tree pit quickly.

4. Aeration –
Provision of maintainable vented aeration inlets, preferably a minimum of two inlets per tree, to allow the soil in the load bearing soil cells to breathe.

5. Drainage –
If the tree pit is likely to become waterlogged, active drainage must be installed to prevent prolonged soil saturation.

6. Above ground protection –
Asses the site risks. Investing in a tree surround that does not inhibit the tree and protects from vandals, dogs and careless vehicles, will pay off.

7. Aftercare –
Adequate weeding and watering in the first 2-3 years should be enough to see the tree established in its tree pit construction, and then they should be low maintenance for many years to come.

Acknowledgments & Further Reading

Tree Roots in the Build Environment – John Roberts, Nick Jackson & Mark Smith
Landscape Below Ground – an ISA publication
The Benefits of Large Species Trees in the Urban Environment – a CIRIA publication

About GreenBlue Urban

GreenBlue Urban was set up in North America to research and provide solutions for assisting trees in their battle to establish in urban spaces. With the goal of drastically improving urban planting success and increasing leaf canopy in urban areas, GreenBlue Urban tirelessly analyzed the challenges, causes of failure, and the reasons for premature mortality in urban trees. We then examined the impact that poor planting can have on urban infrastructures. Having identified the key issues in both these areas, we systematically researched the solutions for those issues and designed practical products and systems to address them.

We are the global market leader in specialist urban landscape products. Our program of continuous product development, conducted in conjunction with overseas branches, and our world-class manufacturing processes, ensures that specifiers and clients can rest assured that the systems we offer for urban planting schemes represent the very best in the sector.

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