

**Arboricultural Impact Assessment
Arboricultural Method Statement
Tree Protection Plan**

BRETBY BUSINESS PARK



On behalf of

The Landmark Practice

Sue Rankine BSc (hons), Dip Arb L4, TechArborA
Arboricultural Consultant

December 2021

Version No	Checked by	Date
1.0	AR	10/12/2021

1.0 Introduction

1.1 Brief

This report is prepared by Hillside Trees Ltd on behalf of The Landmark Practice

1.2 Purpose of the Report

1.2.0 This report is intended to accompany a planning application relating to proposed development at Bretby Business Park. This document has been produced to demonstrate that the implications of the proposed development in relation to the arboricultural and landscape value of the trees on the site have been fully considered during the detailed design process.

1.2.1 This report and the accompanying information is supplied in order to:

- Identify trees to be removed and those to be retained and requiring protection during the site preparation and construction phase of the project.
- Present information regarding the location of protective barriers (Construction Exclusion Zones) and temporary ground protection on a Tree Protection Plan.
- Identify special engineering measures
- Provide a Detailed Arboricultural Method Statement for the recommended works related to trees to be retained during and after the development.

1.3 Documents Provided to Hillside Trees Ltd.

- Topographical Survey. Axis Surveys Ref No: 2149-2021-3D
- Site Layout. Webb Gray Ltd Drawing No: SK-10-11-21-01

1.4 Tree Survey Methodology

1.4.1 A tree survey was undertaken on 29th November 2021 by an Arboricultural Consultant of Hillside Trees Ltd.

1.4.2 The survey took place from ground level aided by the Visual Tree Assessment method (Mattheck and Breloer, 1994).

- 1.4.3** This survey is not a tree risk assessment but takes into account any observed structural defects of the trees in order to inform conclusions with regard to their retentive worth.

1.5 Data Collection

- 1.5.1** Data collected includes designated tree number, tree species, height, number of stems, stem diameter, crown clearance (height of periphery of crown spread above ground level), branch spread (to N, S, E and W), age class, physiological condition, useful life expectancy, tree structural condition, site notes (where this has a bearing on the present or future health or structural condition of the tree), and tree category.

1.6 Presentation of the Data Collected

- 1.6.1** Data collected regarding individual trees and groups of trees are presented in the Tree Schedule table in Appendix A in accordance with BS5837:2012 'Trees in relation to design, demolition and construction – Recommendations'. The tree schedule also gives scientific names for all trees mentioned in the report.
- 1.6.2** The data significant to the proposed site layout is also presented on the Tree Protection Plan Drawing Number 211209-BBP-TPP-NB contained within the Detailed Arboricultural Method Statement (Appendix B).
- 1.6.3** All other relevant data are presented within the main body of this report.
- 1.6.4** Trees have been allocated an individual tree number. This tree number is used to identify individual trees, groups of trees and woodland throughout this report, within the Tree Schedule and on the Tree Protection Plan presented in the appendices of this report.

2.0 Arboricultural Constraints

An assessment of the trees surveyed presented in the Tree Schedule table in Appendix A, is also considered in the main body of the report below.

An Arboricultural Impact Assessment Plan has been produced showing the root protection areas (RPAs) for the individual trees, groups of trees and woodland identified in the Tree Schedule (Appendix A). This represents the minimum area in m² which, ideally should be left undisturbed around each tree, groups of trees and woodland were it to be retained. The RPA has been calculated in accordance with Section 4.6 of BS5837:2012 'Trees in relation to design, demolition and construction – Recommendations'.

The Arboricultural Impact Assessment Plan also shows a representation of the crown spread of each tree, groups of trees and woodland measured in four cardinal directions.

A search of South Derbyshire District Council's online mapping service on 7th December 2021 confirmed that none of the trees in the vicinity of the development are subject to Tree Preservation Orders.

2.1 Trees Identified for Retention and Removal

The proposed development involves the construction of a new 4,180m² unit and 4 smaller units with associated access and parking.

The following on site trees will be retained

Tree / group / hedge nos	Common name
G1	Mixed species
T2	Deodar cedar
G6, T7	Lawson cypress
G8	Blue atlas cedar
G9	Mixed evergreens
G10, G11	Scots pine
G12	Western red cedar
H13	Leyland cypress
W14	Beech (partial retention)
G15	Sycamore

T20 – G40 will also be retained but are outside the influence of the proposed development

The following trees will be removed:

Tree / group / hedge nos	Common name
T3	Juniper
T4, T5	Silver birch
W14	Beech (partial removal)
H16	Leyland cypress

2.2 Mitigation

The removal of the aforementioned trees is necessary in order for the project to go ahead and will be mitigated by the establishment of a detailed landscaping scheme

2.3 Trees Outside The Site Boundary

There are 2 trees outside the site boundary which are affected within the current proposals:

Tree nos	Common name
T18, T19	Oak

3.0 Tree Protection

The trees to be retained on and adjacent to the site during and after development as listed in Sections 2.1 and 2.3 will require protection.

Below ground protection measures based on the RPA's presented in the Arboricultural Impact Assessment Plan, will involve the erection of tree protection barriers as discussed in the Detailed Arboricultural Method Statement (Appendix B). Where the proposed site layout requires the breaching of these ideal areas, measures are recommended in order to minimise the damage to the roots and the root environment of the tree in question. Such measures acknowledge the fact that the extent, distribution and actual position of roots of a tree within the RPA are not known.

The tree protection barriers are illustrated in the Tree Protection Plan contained within the Detailed Arboricultural Method Statement.

REFERENCES

Mattheck, C. and Breloer, H. (1995). The Body Language of Trees: A handbook for failure analysis. Research for Amenity Trees 4. HMSO, London, 240pp.

STANDARDS PUBLICATIONS

Trees in relation to design, demolition and construction – Recommendations (BS5837), British Standards Institution, London (2012)

Tree Work Recommendations (BS3998), British Standards Institution, London (2010)

Appendix A

Tree Schedule

Table 1 Cascade Chart taken from BS5837:2012 Trees in relation to design, demolition and construction – Recommendations.

Appendix A - Tree Schedule

Client:

Surveyor:

Date of Survey:

Bretby Business Park, Burton on Trent

The Landmark Practice

Alister Rankine

29th November 2021



Tree Number	Single or Group	Number in group	Common Name	Scientific Name	Height (m)	Calculated Stem Diameter (mm)	Number of Stems	Root Protection Area (Radius, m)	Crown Clearance (m)	N - Radius (m)	S - Radius (m)	E - Radius (m)	W - Radius (m)	Age Class	Physiological Condition	ULE (Years)	Tree Structural Condition and Site Notes	BS Category
G1	G		Grey poplar, Lombardy poplar, cherry, beech, sycamore, Lawson cypress	<i>Populus canescens</i> , <i>Populus nigra</i> 'Italica', <i>Prunus</i> sp, <i>Fagus sylvatica</i> , <i>Acer pseudoplatanus</i> , <i>Chamaecyparis lawsoniana</i>	17	580	1	6.96	8	7	8	6	5	M	G	40+	Good	B2
T2	S		Deodar cedar	<i>Cedrus deodara</i>	13	540	1	6.48	4	4	4	4	4	M	G	40+	Good	B1/2
T3	S		Juniper	<i>Juniperus</i> sp	7	347	2	4.16	2	3	3	3	3	M	F	20-40	Fair	C1
T4	S		Silver birch	<i>Betula pendula</i>	14	550	1	6.60	3	6	4	6	4	M	G	20-40	Good	B1/2
T5	S		Silver birch	<i>Betula pendula</i>	13	450	1	5.40	5	5	5	4	3	M	G	20-40	Good	B1/2
G6	G	2	Lawson cypress	<i>Chamaecyparis lawsoniana</i>	11	1058	7	12.70	0	2	2	2	2	M	G	40+	Good	C1/2
T7	S		Lawson cypress	<i>Chamaecyparis lawsoniana</i>	9	693	12	8.31	0	1	1	1	1	M	F	40+	Fair	C1
G8	G	2	Blue atlas cedar	<i>Cedrus atlantica</i> 'Glaucous'	7	150	1	1.80	0	1	1	1	1	SM	P	20-40	Poor	C1
G9	G		Mixed evergreens including blue atlas cedar, deodar cedar, laurel and Leyland cypress	<i>Cedrus atlantica</i> 'Glaucous', <i>Cedrus deodara</i> , <i>Prunus laurocerasus</i> , <i>X Cupressocyparis leylandii</i>	16	340	1	4.08	2	2	2	2	2	M	F	40+	Fair	C1/2
G10	G	2	Scots pine	<i>Pinus sylvestris</i>	8	180	1	2.16	3	3	3	3	3	SM	F	40+	Fair	C1
G11	G	9	Scots pine	<i>Pinus sylvestris</i>	17	500	1	6.00	5	4	2	3	4	M	G	40+	Good	B1/2
G12	G	2	Western red cedar	<i>Thuja plicata</i>	6	424	8	5.09	0	1	1	1	1	M	F	20-40	Fair	C1
H13	H		Beech	<i>Fagus sylvatica</i>	9	380	1	4.56	0	2	2	2	2	M	F	40+	Fair	C1
W14	W		Beech	<i>Fagus sylvatica</i>	18	500	1	6.00	3	4	4	4	4	M	F	40+	Fair	B2
G15	G	12	Sycamore	<i>Acer pseudoplatanus</i>	15	680	1	8.16	5	6	7	6	7	M	G	40+	Good	B1/2
H16	H		Leyland cypress	<i>X Cupressocyparis leylandii</i>	6	150	1	1.80	0	1	1	1	1	M	G	40+	Good	C1
G17	G	3	Ash	<i>Fraxinus excelsior</i>	18	600	1	7.20	4	4	4	4	4	M	F	<10	Fair. Off site	U
T18	S		Oak	<i>Quercus robur</i>	19	700	1	8.40	5	8	8	8	8	M	G	40+	Good. Off site	B1/2
T19	S		Oak	<i>Quercus robur</i>	17	650	1	7.80	5	8	5	6	7	M	G	40+	Good. Off site	B1/2
T20	S		Oak	<i>Quercus robur</i>	17	850	1	10.20	3	9	7	9	9	M	G	40+	Good. Off site	A1/2
G21	G	3	Ash, oak, sycamore	<i>Fraxinus excelsior</i> , <i>Quercus robur</i> , <i>Acer pseudoplatanus</i>	18	600	1	7.20	6	4	4	4	4	M	F	40+	Fair. Off site	C2
G22	G	9	Austrian pine	<i>Pinus nigra</i>	13	560	1	6.72	5	5	4	4	4	M	G	40+	Good	C2
G23	G	4	Golden ash	<i>Fraxinus ornus</i>	12	610	1	7.32	3	4	4	4	4	M	F	<10	Fair	U

Tree Number	Single or Group	Number in group	Common Name	Scientific Name	Height (m)	Calculated Stem Diameter (mm)	Number of Stems	Root Protection Area (Radius, m)	Crown Clearance (m)	N - Radius (m)	S - Radius (m)	E - Radius (m)	W - Radius (m)	Age Class	Physiological Condition	ULE (Years)	Tree Structural Condition and Site Notes	BS Category
T24	S		Cherry	<i>Prunus</i> sp	10	880	1	10.56	5	7	5	6	5	M	F	10-20	Fair	C1
G25	G	4	2 x Austrian pine, 2 x sycamore		10	450	1	5.40	4	4	4	4	4	M	F	40+	Fair	C1/2
G26	G	3	2 x Hornbeam, 1 x ash		11	420	1	5.04	4	5	5	5	5	M	F	40+	Fair	C1/2
T27	S		Cherry	<i>Prunus</i> sp	10	470	1	5.64	2	6	5	3	5	M	F	10-20	Fair	C1
T28	S		Hubei rowan	<i>Sorbus glabrescens</i>	9	310	1	3.72	4	2	3	3	3	M	F	10-20	Fair	C1
T29	S		Silver birch	<i>Betula pendula</i>	12	420	1	5.04	2	5	4	5	5	M	G	20-40	Good	B1/2
T30	S		Hubei rowan	<i>Sorbus glabrescens</i>	8	290	1	3.48	5	3	2	3	3	M	F	10-20	Fair	C1
T31	S		Cherry	<i>Prunus</i> sp	11	620	1	7.44	2	6	3	4	2	M	F	10-20	Fair	C1
T32	S		Austrian pine	<i>Pinus nigra</i>	13	490	1	5.88	5	3	3	3	3	M	F	40+	Fair	C1
G33	G	8	Norway maple, sycamore, ash	<i>Acer platanoides</i> , <i>Acer pseudoplatanus</i> , <i>Fraxinus excelsior</i>	14	320	1	3.84	7	4	4	4	4	M	F	20-40	Fair	C1
T34	S		Ash	<i>Fraxinus excelsior</i>	13	400	1	4.80	3	5	5	5	5	M	F	<10	Fair	U
T35	S		Oak	<i>Quercus robur</i>	18	1100	1	13.20	5	6	6	6	6	M	G	40+	Good	A1/2
T36	S		Oak	<i>Quercus robur</i>	16	900	1	10.80	3	6	6	6	6	M	G	40+	Good	B1/2
T37	S		Austrian pine	<i>Pinus nigra</i>	13	850	1	10.20	7	4	4	4	4	M	F	40+	Poor	C1
T38	S		Ash	<i>Fraxinus excelsior</i>	17	790	1	9.48	6	5	4	4	4	M	P	<10	Poor	U
G39	G	2	Ash	<i>Fraxinus excelsior</i>	15	460	1	5.52	5	5	5	7	6	M	F	<10	Fair	U
G40	G	4	Cherry	<i>Prunus</i> sp	7	400	1	4.80	2	3	3	3	3	M	F	10-20	Fair	C2

Table 1 – Cascade chart for tree quality assessment

TREES FOR REMOVAL				
Category and definition	Criteria			Identification on plan
Category U Those in such condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	- Trees that have a serious, irremedial, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) - Tree that are dead or show signs of significant, immediate, and irreversible overall decline - Trees infected by pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing other trees of better quality <i>NOTE Category U trees can have existing potential conservation value which might be desirable to preserve; see 4.5.7</i>			DARK RED RGB code 127-000-000 AutoCAD 246
TREES TO BE CONSIDERED FOR RETENTION				
Category and definition	Criteria - Subcategories			Identification on plan
	1 Mainly arboricultural qualities	2 Mainly landscape qualities	3 Mainly cultural values, including conservation	
Category A Trees of high quality with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	LIGHT GREEN RGB code: 000-255-000 AutoCAD 90
Category B Trees of moderate quality with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	MID BLUE RGB code: 000-000-255 AutoCAD 170
Category C Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	GREY RGB code: 091-091-091 AutoCAD 252

Appendix B

Detailed Arboricultural Method Statement

Arboricultural Method Statement Tree Protection Plan

BRETTY BUSINESS PARK



On behalf of

The Landmark Practice

Sue Rankine BSc (hons), Dip Arb L4, *TechArborA*
Arboricultural Consultant

December 2021

Arboricultural Method Statement

INTRODUCTION

*The purpose of this document is to give a step by step guide to protecting trees on and adjacent to this site. It is vital that all members of the team are familiar with it so that they not only understand **why** trees need protecting but also **how** they are to be protected and their own role in protecting them.*

THE IMPORTANCE OF TREES

- Trees play a crucial role in the fight against climate change. One mature tree can absorb in the region of 1 tonne of carbon during its lifetime – the world needs all the trees it can get
- Trees are an important wildlife habitat, for example many insects and birds rely on them for food and shelter
- Trees are an integral part of human habitat. People like trees for their landscape value and for their shading and sheltering properties

WHAT WILL CAUSE DAMAGE TO A TREE?

- Wounds to the trunk or limbs of a tree can let in pathogens which could go on to infect and eventually even kill a tree
- Removal of branches decreases the number of leaves a tree has. Leaves are vital to the tree for manufacture of the energy they need through photosynthesis
- Compaction of the soil around a tree will damage its roots making it unable to absorb water or oxygen which can result in the tree's death. The extent of the roots are shown on the Tree Protection Plan in the document below as Root Protection Areas or RPA's

HOW YOU AND YOUR TEAM CAN PREVENT DAMAGE TO TREES

- Ensure all members of the team read this document before work starts
- Follow the instructions given, don't cut corners
- Take pride in protecting trees – treated well they will outlive you and continue to give benefit for years to come

Planning permission for this project depends on this method statement being followed. Dealing with breaches of condition is far harder, more time consuming and costly than following the instructions. Failure to comply could even result in prosecution.

THE PROJECT ARBORICULTURALIST IS ON HAND TO HELP. IF IN DOUBT, PLEASE RING FOR ADVICE. 01761 233244

Hillside Trees Ltd.
2 Hillside, Bowden Hill, Chilcompton, Radstock, BA3 4EN
Tel: 01761 233244 E: enquiries@hillsidetrees.co.uk

Directors: A Rankine BSc (Forestry), Tech Cert (Arbor A), *ProfArborA*, S J Rankine BSc (Hons), Dip Arb L4, *TechArborA*

Registered in England No. 07175569
Registered Office: Broadway House, Third Avenue, Westfield Industrial Estate, Radstock. BA3 4XD

This Method Statement Comprises:

- 1. Method Statement Document**
- 2. Appendices:**
 - I. Schedule of Tree Removal**
 - II. Protective Barrier Specification and Tree Protection Site Notice**
 - III. Temporary Ground Protection**
 - IV. APN 12 'Through the Trees to Development', CellWeb Confinement Systems**
- 3. Tree Protection Plan (211209-BBP-TPP-NB)**

THESE DOCUMENTS ARE TO BE KEPT TOGETHER**Full Site Address:**

Bretby Business Park
Bretby
Burton on Trent
DE15 0YZ

Proposed Development:

The proposed development involves the construction of 1 new 4,180m² unit and 4 smaller units with associated access and parking.

Contacts:**Client:**

J&K Property Consultants

Project Manager (for the client):

To be confirmed

Contractor / Builder:

To be confirmed

Site Manager:

To be confirmed

Arboricultural Officer:

South Derbyshire District Council

Telephone: 01283 228706

Project Arboriculturalist:

Sue Rankine

Hillside Trees Ltd.

Telephone: 01761 233244

Email: sue@hillsidetrees.co.uk

Works Requiring Tree Protection / Works:

Development Operations	Tree Number	Type of Protection / Works	Reference
General Construction	T3, T4, T5, H16	Remove	Appendix I
	W14	Partial removal	Appendix I
	W14, G15, T18, T19	Protective barriers Site notices	Appendix II Appendix II
	G1, G15	Temporary ground protection	Appendix III
Construction of parking spaces	G1, G15	'No-dig' construction methods	Appendix IV

Sequencing of Operations:

The tree protection measures appropriate for the site operations below, if required by the Local Planning Authority will be monitored by the Project Arboriculturalist. It will be the responsibility of the Project Manager and / or the Site Manager to inform the Project Arboriculturalist if site visits and reports are required and to arrange them accordingly

1. Pre-commencement site meeting

- a. The Appointed Contractor will co-ordinate with the Project Arboriculturalist to discuss and agree the site operations programme and tree protection.

2. Carry out tree removal (See Appendix I)

- a. All tree removal works will be carried out by a suitably qualified and experienced tree surgeon
- b. All works will be carried out to industry best practice and will be in accordance with BS3998

3. Install tree protection barriers

- a. Tree protection barriers will be installed in the locations shown on the Tree Protection Plan
- b. The area between the tree protection barriers and the trees will be construction exclusion zones (CEZ's)
- c. Tree protection barriers will be constructed to specification described in Appendix II or 'Heras' weldmesh panels secured in robust bases and tightly clamped. Final specification to be agreed with the Project Arboriculturalist and the Local Planning Authority Tree Officer
- d. If tree roots are encountered during the erection of the scaffold framework for the tree protection fencing uprights will be realigned to avoid damage.
- e. Site notices will be securely fixed to the tree protection barrier panels (Appendix II)
- f. There will be no movement of tree protection barriers unless it is overseen by the Project Arboriculturalist
- g. No activity is planned to take place within the CEZ's; however, any work that does take place within a CEZ will require approval of the Local Planning Authority and will be overseen and approved by the Project Arboriculturalist.

4. Installation of temporary ground protection

- a. Temporary ground protection will be installed in the locations indicated on the Tree Protection Plan.

- b. Ground protection will consist of scaffold boards or heavy duty chip board placed on top of a compression-resistant layer (e.g. 100mm depth woodchip) laid on to a geo-textile membrane.

5. Construction of new parking spaces

- a. Where the new parking spaces breach the root protection areas of G1 and G15 as indicated on the Tree Protection Plan, construction will be in accordance with Arboricultural Practice Note (APN) 12 'Through the trees to Development' using a 'No-Dig' Cellular Confinement system such as 'CellWeb' or Green Grid Systems (Appendix VI).
- b. The position of the new parking spaces will be marked out. This area will then be cleared of vegetation and a general level created using hand tools and clean sand where necessary. A geo textile membrane will then be laid across the surface.
- c. The 'Cellular Confinement System' (CCS) will then be laid across the area. This will provide a load-bearing and permeable structure. The cellular design and perforated cell walls reduces the vertical load pressure on sub soils to tree roots and prevents damage.
- d. Once the CCS is in place it will be backfilled with clean angular stone which will enable air and moisture to reach the roots and encourage healthy growth. A porous wearing course will then be applied, to a depth of 30-40mm as the finished surface. The edges of the driveway will be retained using tannalised wooden retaining boards staked into the ground tapering down to the existing ground level with top soil.
- e. If required a watching brief will be kept by the Project Arboriculturalist during the construction of the southern-most parking spaces to ensure that roots from the remaining woodland are not damaged.

6. Construction of new units

- a. Construction of the new units will not require access to the CEZ's.

7. Installation of services

- a. Installation of services will not require access to the CEZ's

8. Removal of tree protection barriers and ground protection

- a. Tree protection barriers and ground protection will only be removed once all works associated with the development have been completed. These include:
 - Construction and fitting out of the new units
 - Installation of services

General Precautions

1. Any site office, welfare facilities and site storage compound will be positioned outside the CEZ's. The location will be agreed between the Site Manager and the Project Arboriculturalist prior to commencement of the project.
2. Any crane or plant for the manoeuvring of materials will be sited on locations to be agreed between the Site Manager and the Project Arboriculturalist prior to commencement of the project. All crane operations should be conducted under the supervision of a banksman to ensure adequate clearance from the retained trees is maintained at all times.
3. No materials that are likely to have an adverse effect on tree health will be stored or discharged within 10 metres of the trunk of a tree that is to be retained. Consideration will be given to the implications of storing materials upslope of this exclusion zone in order to avoid the risk of potential spillages leaching down-slope and contaminating the Root Protection Area of a tree. Such materials include:
 - Oil
 - Bitumen
 - Cement
4. No fires will be lit unless the site of the fire is agreed with the Project Arboriculturalist.

5. Concrete will not be mixed or transported over unprotected ground, within 10 metres of the trunk of any tree.
6. In the event of unforeseen incidents occurring that may adversely affect or threaten the welfare or security of the trees, the Site Manager shall inform the Project Arboriculturalist at the earliest opportunity and not more than one working day following the incident.
7. The Project Arboriculturalist will visit the site to inspect and assess the circumstances and make any appropriate recommendations. The Local Planning Authority Tree Officer will be informed by the Project Arboriculturalist of such incidents and recommendations will be submitted for approval by the Local Planning Authority, initially verbally, and then in writing.
8. A record of any emergency incidents and works shall be maintained by the Project Arboriculturalist.
9. Incidents which may merit such contingency plans include:
 - Accidental / unauthorised damage to the limbs, roots or trunk of trees
 - The spillage of chemicals within or adjacent to a Root Protection Area
 - The discharge of toxins / waste within or adjacent to a Root Protection Area
 - The un-scheduled breaching of a tree protective barrier or Construction Exclusion Zone.

This Method Statement has Been Informed by the Following Information

- Arboricultural Site Survey carried out by Hillside Trees Ltd on 29th November 2021
- Topographical Survey. Axis Surveys Ref No: 2149-2021-3D
- Site Layout. Webb Gray Ltd Drawing No: SK-10-11-21-01
- BS5837: 2012 'Trees in relation to design, demolition and construction – Recommendations'

Appendix I

Schedule of Tree Works

Tree Number	Work Specification
T3, T4, T5, H16	Take down to ground level. Remove roots
W14 – 5 trees on northern edge. See Figure 1 below	Take down to ground level. Remove roots

All tree surgery works will be carried out by a suitably qualified and experienced tree surgeon

All works will be carried out to industry best practice and will be in accordance with BS3998:2010 'Works to Trees'



Figure 1

Appendix II

Specification for Protective Barriers

Tree Protection Site Notice

**BS 5837:2012 – TREES IN RELATION TO DESIGN, DEMOLITION AND
CONSTRUCTION – RECOMMENDATIONS**

PROTECTIVE BARRIER DETAIL

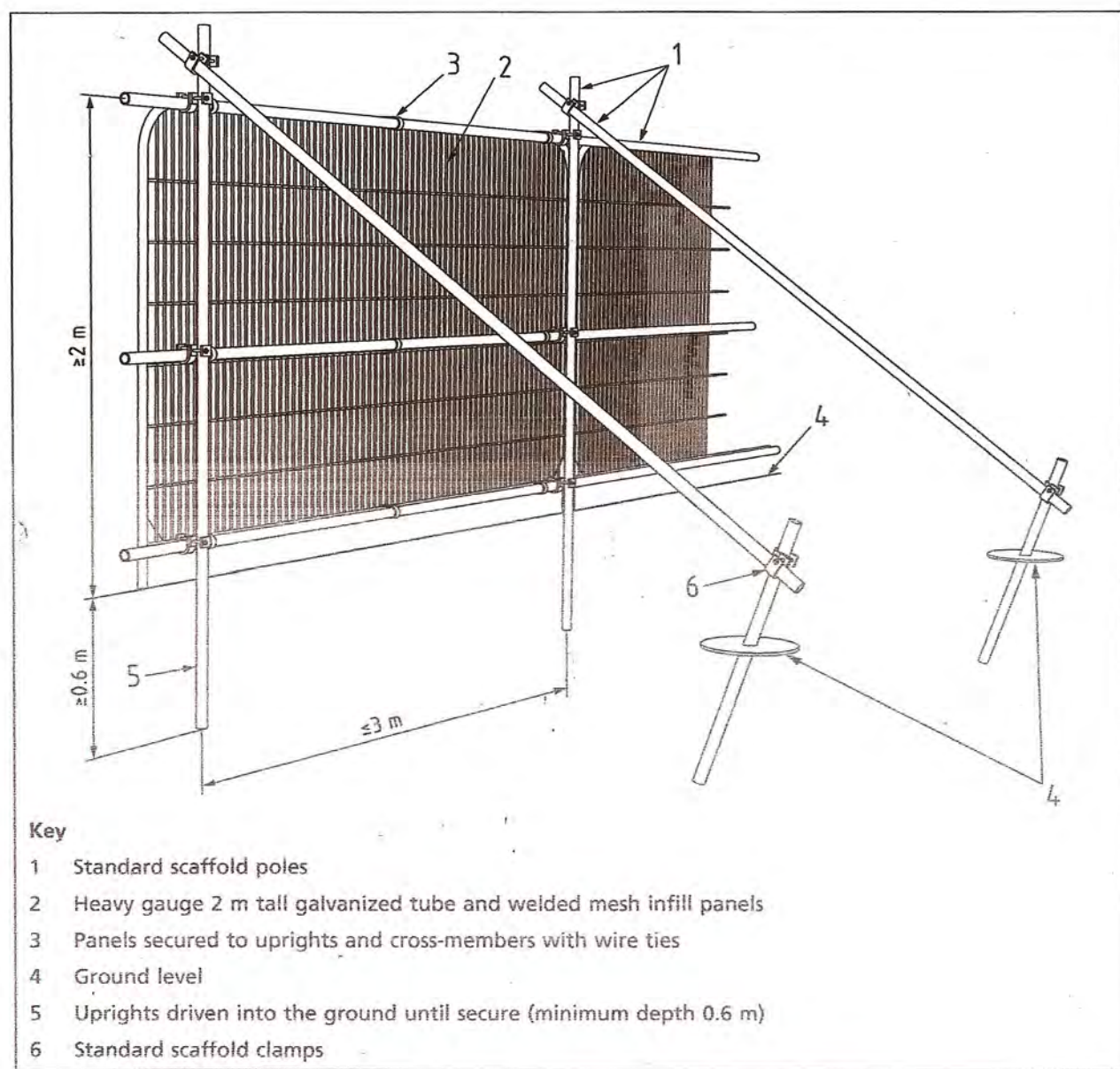


Figure 2 Default specification for protective barrier



**PROTECTIVE FENCING. THIS
FENCING MUST BE
MAINTAINED IN ACCORDANCE
WITH THE APPROVED PLANS
AND DRAWINGS FOR THIS
DEVELOPMENT.**



**TREE PROTECTION AREA
KEEP OUT !**

**(TOWN & COUNTRY PLANNING ACT 1990)
TREES ENCLOSED BY THIS FENCE ARE PROTECTED BY
PLANNING CONDITIONS AND/OR ARE THE SUBJECTS OF A
TREE PRESERVATION ORDER.
CONTRAVENTION OF A TREE PRESERVATION ORDER MAY
LEAD TO CRIMINAL PROSECUTION**

**ANY INCURSION INTO THE PROTECTED AREA MUST BE
WITH THE WRITTEN PERMISSION OF THE LOCAL
PLANNING AUTHORITY**

Appendix III

Temporary Ground Protection

Temporary Ground Protection Method and Specification

BS5837 recognizes that incursions in to the construction inclusion zones will be required at times during some developments.

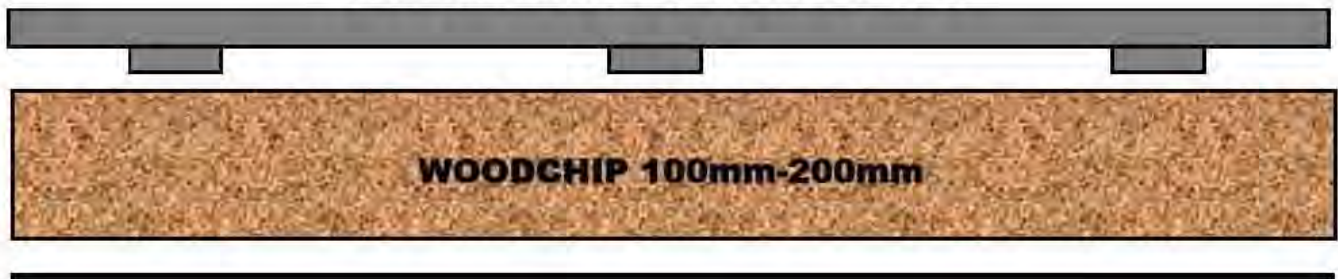
The objective is to minimize soil compaction

Example 1 - *for pedestrian movements only, a single thickness of scaffold boards places either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g.) 100mm depth of woodchip), laid on to a geotextile membrane.*

Example 2 - *For pedestrian-operated plant up to a gross weight of 2 t, proprietary inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150mm depth of woodchip), laid onto a geotextile membrane;*

Example 3 - *For wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.*

WOODEN BOARDING/TRACK-WAY



GEOTEXTILE MEMBRANE

Appendix IV

APN 12 ‘Through the Trees to Development’

‘CellWeb’ Confinement Systems

Green Grid Systems

Trees in focus

Through the Trees to Development

Derek Patch and Ben Holding

Arboricultural Advisory and Information Service

Summary

The majority of tree roots grow in the upper metre of soil and they may spread outwards in any direction a distance equal to the tree's height. Any disturbance of the ground within the root spread of a tree can damage its roots and may severely injure the tree. Damage to roots will interrupt the supply of water necessary to keep the tree alive and may cause decline in vigour, dieback or even death of the tree. The tree may also be made unstable and so pose an unacceptable threat to the safety of people and property. Development of a site, including construction of access routes, driveways and parking areas can result in substantial root severance of trees. Techniques for the construction of access drives, which may avoid or lessen the damage caused to trees, are described.

This note embraces the principles first published by The Tree Advice Trust as "Driveways Close to Trees" (Arboricultural Practice Note No. 1¹) and reviews where the principles may be applied in practice.

Trees: A Cause of Conflict

Development of a site is sometimes hampered or prevented because of the presence of trees. Local authorities and residents may wish to see trees 'preserved' whilst developers seek permission to build close to them - often ignorant about the damage this may cause to trees. Even developments such as access drives and parking areas can threaten existing nearby trees.

Traditional driveway construction (excavation and backfilling with a compactable load-bearing sub-base material) can seriously damage tree roots. Such damage occurs because of a lack of understanding that roots mainly grow outwards from a tree's trunk, near to the soil surface, rather than downwards (Dobson 1995). Where there is a significant risk of damage to trees by root severance, or changes in soil conditions during construction, local planning authorities may sometimes refuse permission for installation of an access driveway or parking area close to trees - especially if the trees are subjects of Tree Preservation Orders.

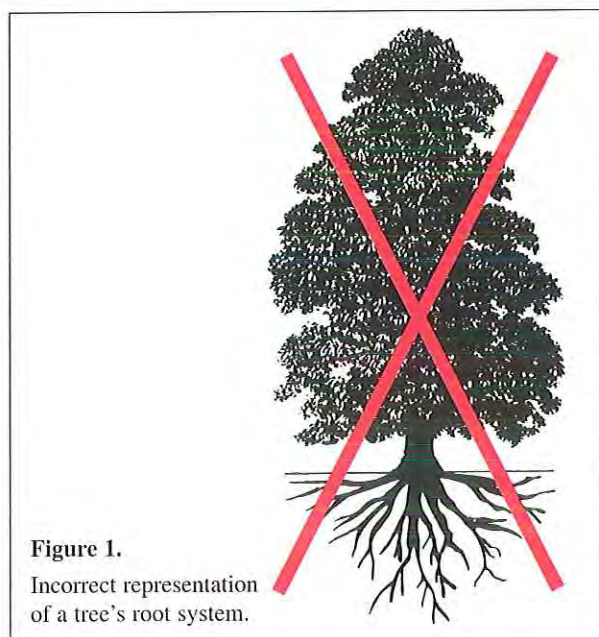


Figure 1.
Incorrect representation
of a tree's root system.

However, if the potential for damage to the tree's root system (e.g. by severance or soil compaction) can be avoided during construction, development may be more easily accepted. A technique is described below which should reduce the risk of significant damage to tree roots while enabling access and parking for light vehicles to be constructed close to trees.

Where Do Tree Roots Grow?

Survival of a tree depends on its roots being able to absorb enough water from the soil to sustain the foliage (an estimated 1,000 litres per day in summer for a fully grown forest tree in a rural area) and on developing a strong root system capable of keeping the tree upright through autumn and winter gales. To achieve this the tree's roots must exploit a very large volume of soil. However, the assumption that these requirements are met by a system of roots growing predominantly downwards (Figure 1), and that anchoring roots are very thick and descend into the soil for many metres (like the base of a lamp post) is incorrect. In reality tree roots:

¹ Driveways Close to Trees, Arboricultural Practice Note No. 1 is withdrawn and superseded by this wider text.

- grow in any direction more or less parallel with the soil surface rather than vertically (Figure 2). This is also true for trees growing on sloping land.
- are usually relatively shallow - most of a tree's roots are in the upper metre of soil.
- usually radiate outwards from a tree for a distance equivalent to at least the tree's height (which for a mature tree may be 20 m or more).
- can be 30 cm or more in diameter at the base of the trunk.
- sub-divide and taper rapidly as they extend out from the trunk.
- are only 2-3 cm in diameter, and often much less at 3-4 m distance from the trunk.

The small woody roots (those less than 3 cm diameter) taper very little but they may spread out for long distances. Smaller, non-woody roots (sometimes described as white, feeder, fibrous, fragile or absorbing roots) grow outwards and usually upwards from the woody roots and subdivide to exploit the better aerated surface soil. Although generally short lived they (and the fungi associated with them - called mycorrizas) are the principal absorbers of moisture and nutrients.

Most roots (both thick and fine) are situated close to the soil surface, forming a thin layer less than 1m deep, but some small roots (usually only a few mm in diameter) may reach 2 m or more deep.

Roots and the Soil

Roots are living and, like all plants and animals, must have oxygen if they are to survive. Without oxygen roots are unable to function properly or grow, and when they are starved of oxygen for prolonged periods, they die.

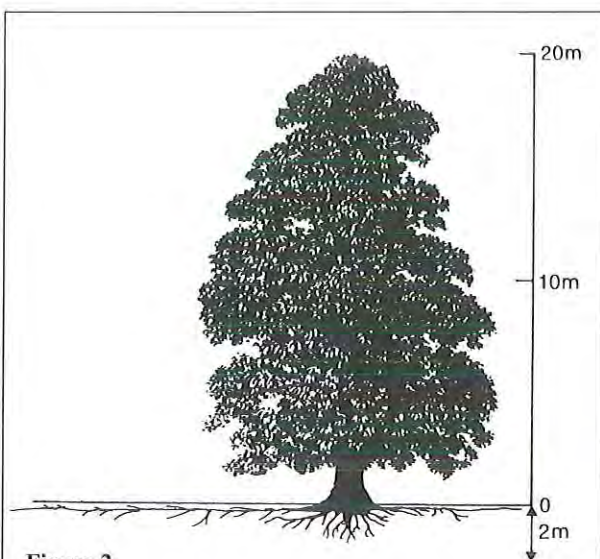


Figure 2.

Trees have a relatively shallow but wide spreading root system.

Both oxygen and water are held in the pores between the soil particles. Where the pores are large (e.g. in coarse or sandy soils) the soil will generally be freely draining and well-aerated, but where the pores are small (e.g. in heavy clays or soils which have been compacted) they may be full of water and have a poor supply of oxygen.

Most trees that have been growing undisturbed on a site for many years will have developed an extensive root system with the roots growing where the soil conditions are most favourable. There will be a balance between the development of the crown (which demands water) and the roots (which supply it). Any sudden alteration of the soil conditions within the tree's rooting area (a circle of radius equal to the tree's height) will therefore upset this balance. For example, the single passage of a machine will 'squeeze' the soil closing up the pores (causing compaction - especially in the upper levels) and so reduce the amount of oxygen available to roots which prevents them from growing through the soil. With each additional machinery movement the compaction increases and so do the problems for the tree and its roots.

Placing soil or other materials over the root system of a tree will impede air movement into and out of the soil around the roots and consequently reduce the availability of oxygen to the roots. The effect on the tree is usually progressive shoot and branch dieback until a new balance has been reached between the reduced capacity of the damaged root system to absorb water and the demands of the leaves. If damage is progressive or so severe that such a balance cannot be achieved, the tree will ultimately die.

Excavations - **even stripping the topsoil** - within the rooting area will sever roots. The closer the excavation is to the trunk of the tree the larger will be the roots lost and the greater the significance for the health and stability of the tree. Once the excavation is a metre deep virtually all of the roots growing into the excavated area will have been severed. The tree may then either be unable to absorb sufficient water to sustain the foliage and dieback will occur, or anchorage will be so reduced that the tree is unsafe and has to be severely pruned or even felled for safety.

Soil compaction, excavations and soil level increases will all damage roots and the closer to the trunk they occur the greater the damage inflicted on the tree. Nevertheless, healthy trees are generally able to withstand the loss of some roots (a maximum of about 20% of the rooting area, Helliwell and Fordham (1992)) without noticeable adverse effects.

Development Near Trees

British Standard BS 5837:2005 *Trees in Relation to Construction – Recommendations* recommends that on construction sites an area around a tree should be left undisturbed (the Root Protection Area) so that unacceptable damage to the root system is avoided. In the British Standard the Root Protection Area is calculated as

the equivalent of a circle about 12x the diameter of the tree's trunk (measured at 1.5m above ground level). The distance from the trunk extending to the branch spread, or half the tree's height, whichever is the greater (Figure 3) is a useful indicator of the typical Root Protection Area for a given tree.

The Root Protection Area is an area of protected ground around a tree within which any activity that could damage roots should be prohibited without the prior agreement of an arboriculturist.

However, if the principles and guidelines set out below are followed, installation of access driveways and parking for light vehicles within the Root Protection Area may, in many situations, be possible without causing significant, permanent damage to trees. Nevertheless, expert arboricultural advice should be sought to determine whether the tree and the site conditions lend themselves to the principles described in this Note. Any assessment of a site should include consideration of the health and overall condition of the tree(s). That is because old and declining trees may be vulnerable to sudden changes in the site conditions and so they may warrant a larger area than the minimum recommended in the British Standard.

Engineering Needs

Driveways, footpaths and car parking areas must be built on a firm, stable base. Engineers usually achieve this by excavating the soil to a depth of about 0.5 m, compacting the base if necessary, and backfilling with an inert material that can be compacted to form a stable platform. This usually involves progressive placement of layers of inert material with each being compacted by repeated passes of a powered roller or whacker plate. Each pass of a machine creates increasing compaction at depth in the soil. The edges of the excavation act as the supporting formation and kerbs or other edgings may be used to retain the surface material.

Any such excavations or soil stripping will sever roots and should be avoided within the Root Protection Area.

Compacting the base of an excavation can change the bulk density of the subsoil creating conditions unsuitable for the survival of any roots, particularly the water absorbing fine roots, contained in that volume. Placement and particularly compaction of load bearing construction materials will contribute to this creation of conditions unsuitable for root survival

On many sites it is possible to construct an adequately supported access driveway suitable for limited usage by light vehicles while retaining healthy, stable trees, by adoption of three principals particularly when construction is within the Root Protection Area as determined in consultation with an arboriculturist.

Where the finished structure will be adopted by the Highway Authority a more robust specification may be required. Provided the same principles are embraced construction across the root systems of trees should still be feasible.

Protection and Construction

For tree roots to be retained undamaged there must be *no excavation, no soil stripping and no grading of the site within the Root Protection Area* - in other words, **NO DIGGING**. This means that construction will have to be above the existing ground level.

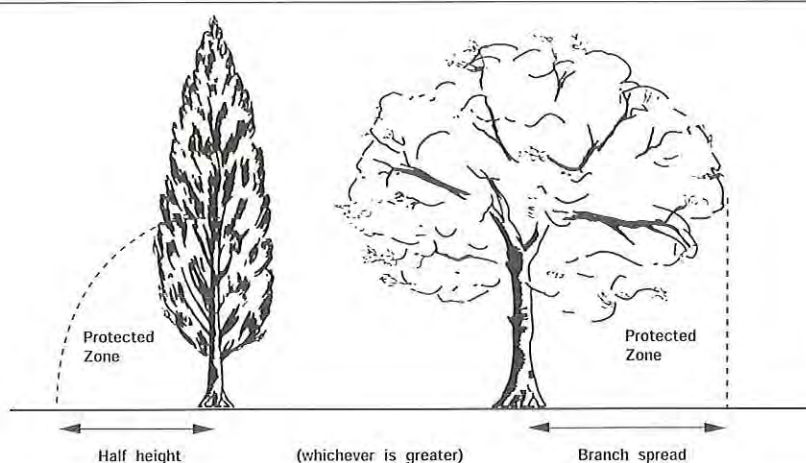
Passage of vehicles across an unprotected soil surface must also be avoided, particularly where the soil is wet, as this will cause breakage of surface roots, soil compaction and consequently reduced soil aeration. These problems are heightened on clay soils. Most vulnerable to soil compaction are the fine white roots (those roots that are generally difficult to find when soil is examined) essential for water absorption. Surviving roots may not be able to grow through the compacted soil.

To reiterate there must be **NO COMPACTION** of the soil.

Where trees are to be retained on a site it is essential, therefore, that all but the immediate area of the development is protected from access and construction operations by fencing as recommended in BS 5837.

Figure 3.

Distance from a tree which constitutes the zone in which roots should be protected - i.e. no digging.



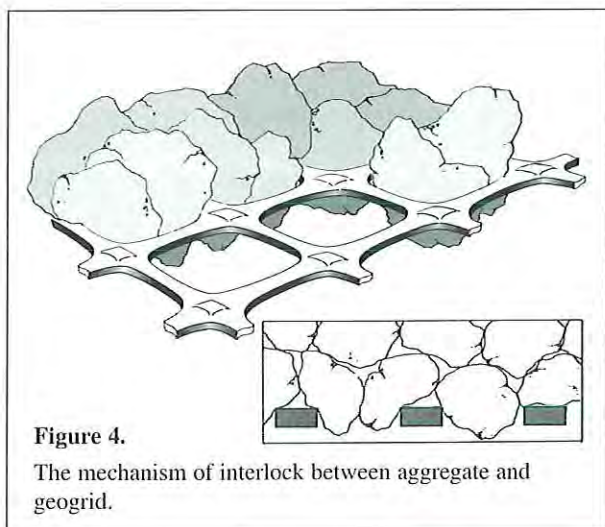


Figure 4.
The mechanism of interlock between aggregate and geogrid.

No-Dig Construction

Successful retention of trees, even when adopting a no-dig method, depends upon the condition (health and vigour) of the tree(s), which should be assessed by a qualified arboriculturist, and on adherence to three simple rules within the Root Protection Area:

- roots must not be severed, cut or broken – **no digging**
- ground levels must not be changed - **no digging, no soil level raising**
- **soil must not be compacted** – **no tracking of vehicles**
- oxygen must be able to diffuse into the soil beneath the engineered surface – **no tracking of vehicles**

Meeting the Engineering Needs

Damage to trees can be avoided only if the construction embraces the above simple principles and, within the fenced Root Protection Area, is no more than 5m wide.

Construction should incorporate two main components:

- a synthetic load spreading material
- a no-fines aggregate sub-base

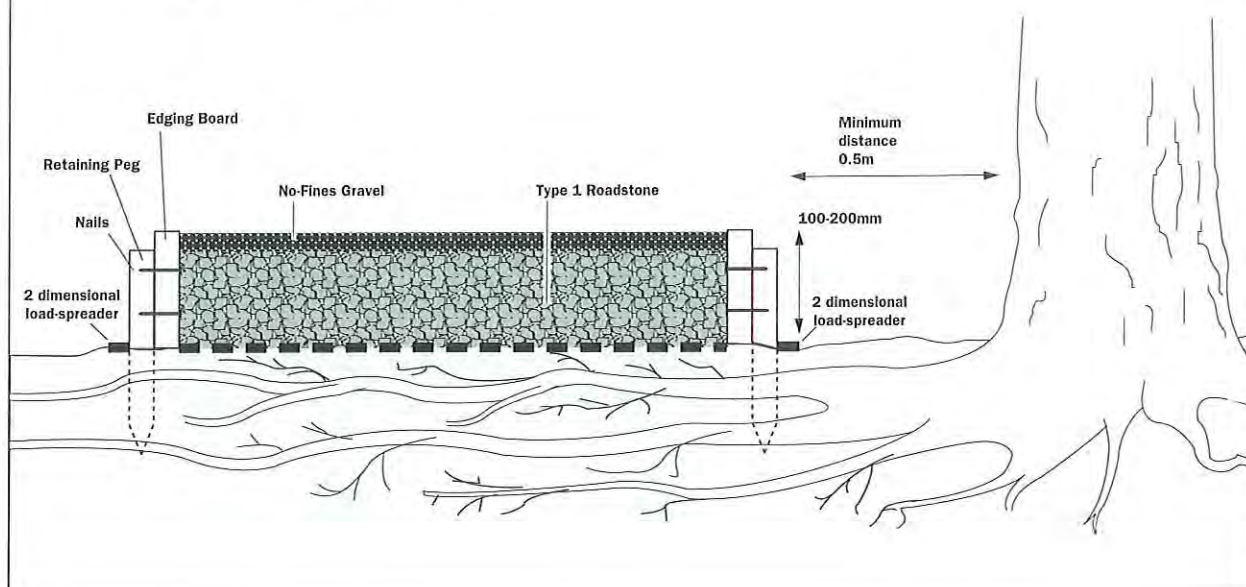
Note: a geotextile, which is usually used to prevent layers of different mineral materials mixing while allowing water to pass through, is not designed to be load bearing.

'Load spreading' materials, are synthetic grids/webs designed to support roads on soft ground by distributing the load of a wheel over a larger area than would normally occur. They may be 2- or 3-dimensional.

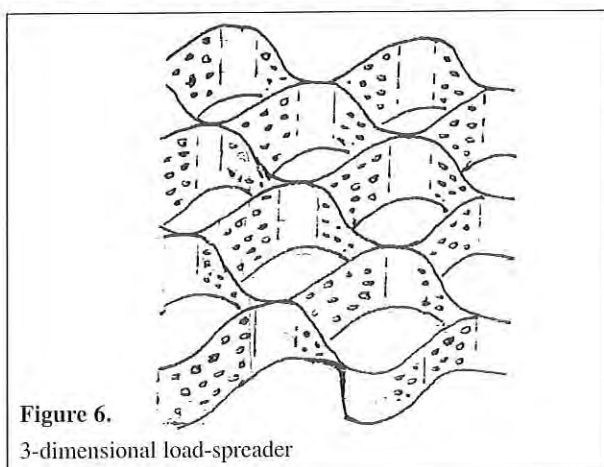
When placed on a 2-dimensional grid, appropriate, no-fines granular sub-base material penetrates the mesh, but is unable to pass through it, forming a positive interlock (Figure 4). This interlock between aggregate and grid provides a reinforced platform and efficient load spread into the underlying ground over a wider area than the footprint of the wheel on the surface. A suitable geogrid/aggregate combination constructed with the grid under tension should prevent rutting of the ground beneath the construction (Figure 5).

The 3-dimensional load spreading products (Cellular Confinement System) create cells into which the sub-base material is placed (Figure 6). Such a construction does not support the sub-base material, it confines the material in discrete cells. Manufacturers recommended, therefore, that a geotextile (see note above) is placed between the ground

Figure 5. Diagram of a 'no-dig' method for constructing access drives and parking near to trees in order to minimise damage to tree roots. (*Not to scale*)



and the load spreader to prevent the cell-contained mineral material being pressed down into the underlying soil.



A no-dig construction, that is a construction above ground level, will need to be contained to prevent outward creep under the weight of vehicles. This may be achieved with an edging support provided its construction does not involve excavation. A suitable material may be long-life timbers pinned through the load-spreader into the underlying soil. This could add strength to the structure because the pressure of vehicles forcing the sub-base downwards and outwards will tend to increase the tension on the grid and any tendency to rutting.

Note: some manufacturers specify that their product should be placed in a 100mm or greater depth of formation (i.e. excavation). It is important that before such a construction is adopted the agreement of an arboriculturist who has considered the circumstances of the tree's health and evaluated the site conditions, should be obtained. Failure to do so could result in breach of a Tree Preservation Order and Conservation Area legislation because roots will inevitably be damaged by an excavation of as little as 100mm.

The granular sub-base material should have a no 'fines' content which means that even when it is compacted it should be freely draining and will allow oxygen to diffuse into, and damaging gases (e.g. carbon dioxide and methane) out of the soil.

For site-specific prescriptions and materials specifications advice should be sought from a qualified geotechnical or civil engineer who should work in consultation with an arboriculturist.

Putting the Principles into Practice

Is the site suitable for a no-dig construction? (see next section)

Construction should ideally be undertaken in dry weather between May and October when the ground is likely to be driest and least prone to damaging compaction.

There must be a method of working that does not require movement of machinery or heavy plant within the branch spread of the tree before the ground is protected by a load spreader and the sub-base. Then the movements must be only along the construction.

For example when making a new access into a site construction should commence at the entrance to the site and 'roll out' the driveway in front of the machinery which always remains over the sub-base.

Ground vegetation should be killed using a translocated herbicide such as glyphosate². (This may be most appropriately done in consultation with an experienced arboriculturist to ensure that the chemical and application method do not result in damage to retained trees.) After allowing time for the chemical to be absorbed and kill the plants, including their roots, gather up the dead organic material - this will prevent the build up of anaerobic conditions beneath the construction which might otherwise occur as dead vegetation decomposes.

Carefully remove major protrusions such as rocks.

Remove tree or shrub stumps (stumps should be ground out rather than excavated to minimise soil disturbance).

Fill major hollows with clean sharp sand – **DO NOT GRADE-OFF HIGH SPOTS.**

If necessary, for example when using a three dimensional cellular confinement product as a load spreader, a geotextile should be spread over the area of the driveway or car park.

With a two dimensional load spreading product into which the no-fines sub-base stone forms a lock a geotextile may be used but it is not essential.

Lay the synthetic load spreader directly onto the levelled ground or the geotextile as appropriate.

Secure the synthetic load spreader under tension using long pins driven into the ground through the grid.

Note: Before driving pins into the ground check for underground services that could be damaged.

Construct an edging which is secured through the load spreader so that pressure on the running surface will force the edging outwards and so increase the tension on the load spreader.

Cover the load spreader with a minimum of 100 mm of no-fines aggregate. This should not be tipped straight onto the synthetic material, but should be placed at one end and then pushed onto the load spreader between the retaining edges so that machinery is supported by the spread sub-base material rather than directly on the load-spreader and not on the ground either side of it.

Compact the sub-base to ensure binding with the load spreader and to minimise future rutting.

² When selecting a herbicide care must be taken to select a product which does not damage the roots of desirable vegetation that may extend into the treated area. Always read the product label before use.

A further geotextile may be placed over the sub-base to prevent dry bedding materials or surfacings merging with the sub-base.

Place the final surface. In the main it is likely that this will consist of gravel or tarmacadam, although paving slabs and brick paviours may be acceptable provided they are dry bedded on the sub-base and the joints are not sealed with grout, to allow for infiltration of water and gaseous diffusion³.

Where a mass concrete, or impervious surface material is required the specification for an adoptable road (see below) should be used.

Sites are not all the Same!

The principles detailed above, if applied sensibly, should permit access to be constructed across the root system of a healthy tree. That is where the construction passes through the Root Protected Area retained around a tree as recommended by British Standard BS 5837:2005 *Trees in relation to construction - Recommendations*.

Why the 'sensibly'? No two sites are the same, in fact some are totally unsuitable for a no-dig construction and it may be necessary to admit that access to the site cannot be achieved if certain trees are so important/valuable that their retention is essential. For example, where trees grow on an old hedge bank excavation to cut through the bank may be unavoidable and so an unacceptable proportion of the root system would be severed. In contrast ditches that can be filled/piped/bridged (Figure 7) should be less problematic.

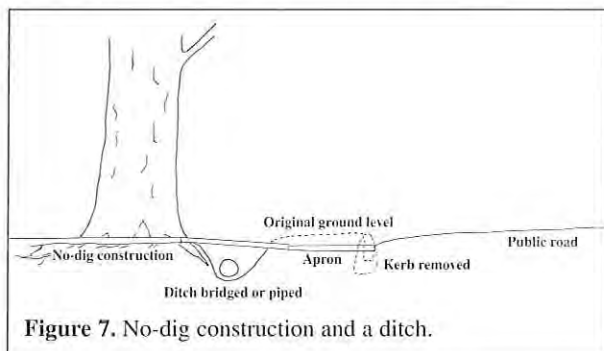


Figure 7. No-dig construction and a ditch.

When planning a driveway it is important to consider the ground levels on site and to relate them to the fixed level on the public thoroughfare into which the drive must connect and be tied. Where a roadside verge within the root protection area around a tree cannot be crossed without excavations then a different access point may be needed if the tree is deemed to be of very significant value to the amenities of the area.

Highway Authorities generally seek an 'apron' (upto 4m long), with a shallow or no gradient and a sealed surface at the entrance to a site where the drive joins the highway. This is to reduce the risk of loose material migrating onto

the footpath and road where it could become a hazard. Such an apron may involve excavation thus reducing the scope for a drive constructed using the no-dig principles.

The simplest site on which a no-dig construction can be used is where the ground falls into the site from the edge of the road. Level sites should not pose significant problems provided there is an adequately wide verge/pavement to accommodate the 'apron' without severing roots.

It is also important to remember that the no-dig construction needs to tie onto the road and also the levels of the garage or damp proof course of a building.

The roots of a tree will generally grow parallel with the ground surface – they do not grow preferentially up, down or across the slope! As such trees growing on a slope do not present any problems different from those of trees growing on a flat site – it is the engineering requirements that differ! Where the drive crosses the contours at a gentle angle, there is no reason why the depth of a no-dig construction should be constant across its width of a drive. The engineering problem may be how to retain the structure. The scope for increasing the lift on one side of a drive is not unlimited – probably 1:3 should be a maximum (Figure 8).

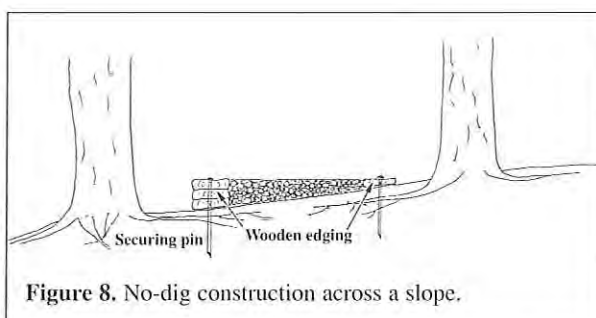


Figure 8. No-dig construction across a slope.

Permanently wet areas of ground should normally be drained, or they may be filled with no-fines stone, or if the water is flowing, they may be partially piped. In contrast, seasonally wet areas may benefit from drainage and building up the ground with coarse stone with a low fines component over which the drive is constructed.

The depth of each layer in the construction of a no-dig drive will be influenced by the bearing capacity of the ground over which the drive will pass. Also there must be consideration of the weight of traffic that will use the drive. The final design should, therefore, be achieved in discussion between a civil engineer and an arboriculturist.

A Potential Benefit

Inclusion of a load spreader in a construction should offer resistance to direct damage often caused to drives and car parks by diameter growth of roots under the structure.

³ For drives less than 5m wide the finished surface may be constructed of a less permeable material such as asphalt/or reinforced mass concrete.

Adoptable Highways

The above construction is generally unacceptable where the finished structure is to be adopted by a Highway Authority - a more robust specification will be required for example pre-rutting, that is compaction of the ground under the driveway before construction commences, will be required. Such an engineering requirement will usually involve a vibrating roller or repeated tracking of heavy machinery, which is totally unacceptable for the welfare of the tree. The repeated tracking needed to deliver and consolidate layers of aggregate is likely to severely compact the underlying soil at increasing depth. A single pass of a vehicle can cause significant changes in the pore structure in the soil. Repeated passes will further compact the soil which will favour the needs of the engineer, but will eventually create conditions in the soil that are totally unsuitable for root activity and root death will result.

In such circumstances consideration must be given to designing and constructing a running surface which does not require either excavation, or direct compaction of the material under the construction and which does not place a dynamic force on the soil around tree roots. Further, an adopted road is likely to have a width greater than the 5m driveway considered above. The wider the construction the greater the impedance to gaseous exchange between the atmosphere and the soil around roots.

Where a load spreader is acceptable to the Highway Authority there will be need for a greater thickness of no-fines sub-base to support the loads carried by the finished structure⁴. It is then practical to include a system of perforated pipes laid in the sub-base material with venting either at the road surface or in the verges at the edge of the road. The finished surface over the sub-base may then be impermeable to gases (e.g. hot rolled asphalt, or concrete). Inclusion of a 'clay board', or similar over the sub-base may be appropriate to aid casting of the surface.

In the more extreme circumstances a construction to bridge the root system of a very high value tree could be based on an elevated 'board walk' or causeway. That is a series of pads sunk into the ground (causing only localised damage to the root system) supporting beams across which reinforced concrete beams are placed (c.f. a suspended floor in a building). Such a construction would not apply pressure to the ground and so there would not be any threat to underlying tree roots. This removes the need for a load spreader and specialized anchors and edgings.

Final Remarks

Adoption of the no-dig principles for creating access and parking for light vehicles near to trees, which avoids root severance, should help to overcome concerns about possible adverse effects on trees. Nevertheless, successful retention of a tree will depend upon the site in relation to

the adjacent highway and strict adherence to the above principles, and upon the tree's condition - indicative of its ability to withstand changes in its rooting environment. This should be assessed by a qualified arboriculturist.

On completion a no-dig construction will be at least 300m above the original ground level.

Acknowledgement

The authors acknowledge the valuable comments and suggestions made by colleagues and members of the Arboricultural Association.

References and Further Reading

Biddle, P.G. (1998). Tree Roots and Foundations. *Arboriculture Research and Information Note 142/98/EXT*. Arboricultural Advisory and Information Service, Farnham, UK.

British Standards Institution (2005). *BS5837 Trees in Relation to Construction - Recommendations*. BSI, London, UK.

Dobson, M.C. (1995). Tree Root Systems. *Arboriculture Research and Information Note 130/95/ARB*. Arboricultural Advisory and Information Service, Farnham, UK.

Helliwell, D.R. and Fordham, S.J. (1992). *Tree Roots and Tree Growth*. Reading Agricultural Consultants, Didcot, UK.

Highways Agency (2004). *Manual of Contract Documents for Highway Works Volume 1. Specification for Highway Works*. HMSO, London.

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⁴ Type 1, as specified by the Highways Agency (2004) is not a recommended aggregate for use around tree roots because it contains a significant proportion of 'fines'.



CellWeb™



CellWeb™ Confinement Systems



Geosynthetics Limited

CellWeb™

CellWeb™ Confinement Systems



Initially developed by the U.S. Army Corps of Engineers to construct unpaved roads over weak ground, CellWeb™ dramatically improves the performance of infill materials across a range of applications including:

Applications:

- Load support
- Erosion control
- Retaining walls
- Channel protection
- Tree root protection

CellWeb™ is a three-dimensional cellular confinement system manufactured from high-density polyethylene (HDPE) strips that are ultrasonically welded together to create a strong, lightweight expandable panel.

Its unique hoop strength and interconnecting cell walls form a durable composite mattress that can be filled with common materials for the most demanding load support and erosion control applications.

As the distributor for CellWeb™ in the United Kingdom, Geosynthetics Limited can provide next day delivery to site as standard from stock.



Versatile, effective and economical CellWeb™ gives you the following benefits:

- Savings of up to 50% on infill materials compared to other load support systems.
- Reduces the need for excavation.
- Reduces sub base thickness.
- Simple, speedy installation saving on construction costs.
- Environmentally friendly.
- Protection for germination on vegetated slopes.



Quality assurance

Certified quality

Cellweb™ is manufactured in accordance with an ISO 9001 Quality Management System with perforated walls, and a comprehensive range of cell diameters and depths. The perforated system improves the frictional interlock of infill material giving greater stability and facilitating lateral drainage.



Civil engineering, construction and landfill:

- Road/rail stabilisation
- Pipeline/sewer support
- Temporary site access
- Structural supports
- Foundations
- Car parks
- Retaining walls
- Footpaths
- Tree root protection

Erosion control:

- Slope protection
- Slope stabilisation
- Channel lining
- River lining
- Scour aprons
- Revetments
- Coastal protection
- Slipways
- Water crossings
- Balancing ponds

Landscape architecture:

- Tree root protection
- Driveways
- Footpaths
- Grass car parks
- Maintenance
- Cart paths
- Slope protection



Geosynthetics Ltd is committed to offering the best solutions for soil stabilisation, erosion control, drainage and environmental protection problems.

Well trained staff are always available to discuss which materials are best suited to any particular application.

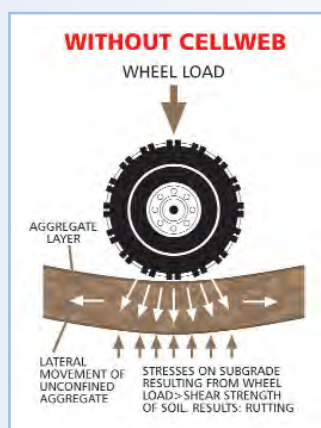
Product function



Millions of square meters of CellWeb™ systems have been successfully installed across the globe, answering many of today's challenging technical design problems.

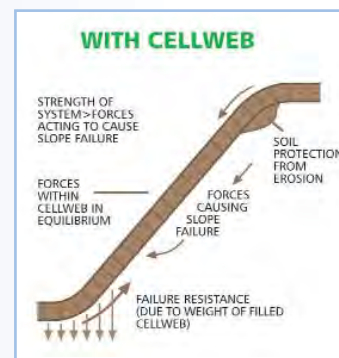
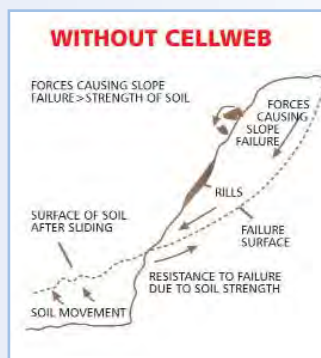
Load support

Providing reinforcement to infill materials, CellWeb™ performs like a semi-rigid slab. This effectively distributes loads laterally reducing sub grade pressures. This means that CellWeb™ can help you to reduce the sub-base thickness by up to 50% saving time and material costs.



Erosion control and slope stabilisation

CellWeb™ confines and reinforces vegetation on steep slopes by increasing the soils natural resistance to erosion and protects the rootzone layer during germination. Similarly on non-vegetated slopes it prevents the down slope migration of granular infill resulting in greater stability. Perforated CellWeb™ panels increase lateral drainage and reduce hydrostatic build up.



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or email sales@geosyn.co.uk
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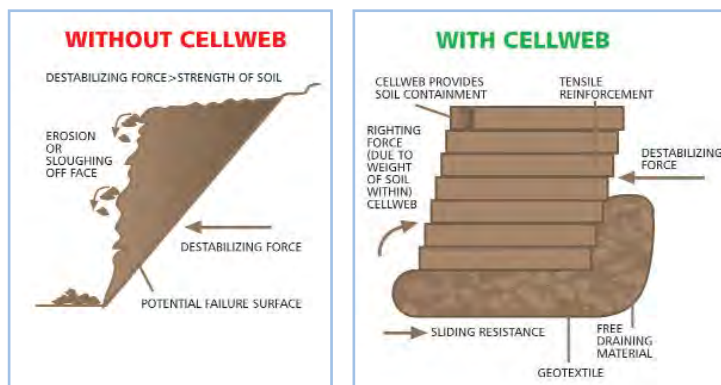
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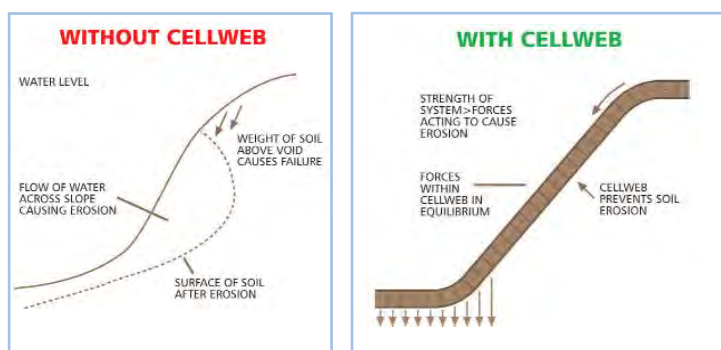
Retaining walls

When used to construct a retaining wall, CellWeb™ functions as both the face protection and the reinforcing element. Its structure confines the soil and prevents it from falling or being eroded, resulting in a longer life and less maintenance. CellWeb™ panels significantly increase the thickness of the wall; which in turn increases the weight of the wall and its retaining ability.



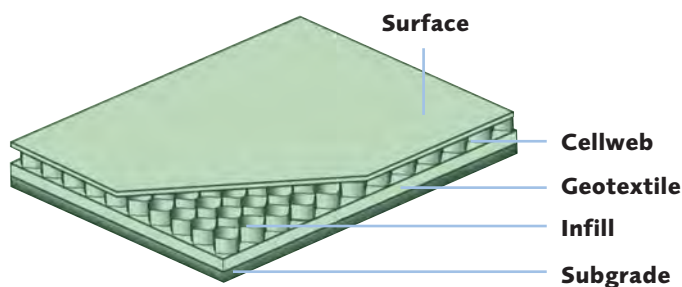
Channel protection

CellWeb™ reinforces and protects channels, riverbeds and swales by increasing the shear strength of the selected infill. Water is directed above the infilled cellular structure, leaving the rootzone undisturbed, providing a more attractive and cost effective solution to concrete lined channels. In watercourses with high velocities a granular or concrete infill can be used to further increase performance.



Tree root protection

Because CellWeb™ reduces the need for excavation, this makes it ideal for stabilising access roads and car parks around tree root systems. What's more it reduces compaction of sub soils above the roots and promotes the migration of water and nutrients, ensuring the long-term preservation of the tree itself.



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Technical specification



Product Specifications

Properties	Standard Cell	Large cell
Material	Virgin HDPE	Virgin HDPE
Wall thickness	1.25mm	1.25mm
Seam welding	Ultrasonic to 100% of seam length	Ultrasonic to 100% of seam length
Cell depth	75, 100, 150, 200 and 300mm	75, 100, 150, 200 and 300mm
Width of expanded panel	2.56m	2.56m
Length of expanded panel	8.1m	13.72m
Cell diameter (expanded)	259 x 224mm	508 x 475mm

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Fax: 0870 850 6572

Email: sales@geosyn.co.uk



Introducing a modular
load supporting system that
integrates into any development
to protect existing trees.

ROOTBRIDGE

Green Grid Systems

Mapping a Greener Future for Construction



GREEN GRID SYSTEMS
INNOVATIVE TREE ROOT PROTECTION

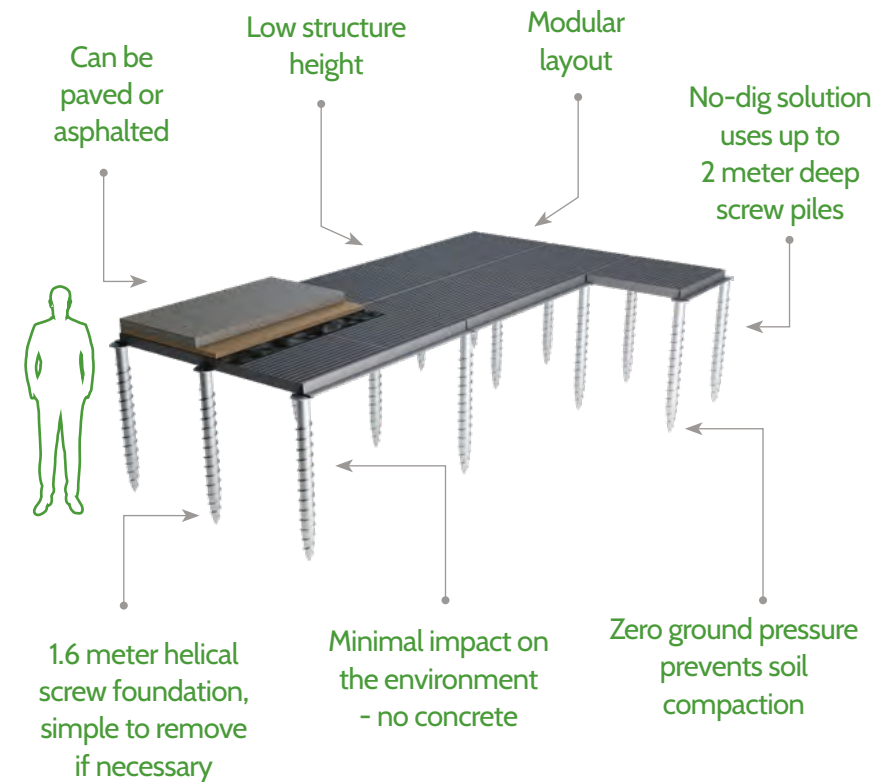


Enhance value and reduce liability

Green Grid Systems place tree preservation at the heart of responsible construction by providing a low impact, no dig solution, no concrete solution that prevents soil compaction.

Consisting of an adaptable modular steel lattice construction that is supported on robust foundation screws. A network of piles is typically fixed two meters into the substrate and carefully positioned between the main roots in the RPA.

With a low structure height, the system can be implemented with minimal impact. Subsequent loads of up to 57kN are then absorbed by the structure rather than the roots.



The innovative, load supporting system, RootBridge, delivers credible protection in urban developments where TPOs currently exist, helping move projects through planning.

Typical applications:

- Carparks
- Walkways
- Driveways
- Access roads
- Ramping onto a geocellular system



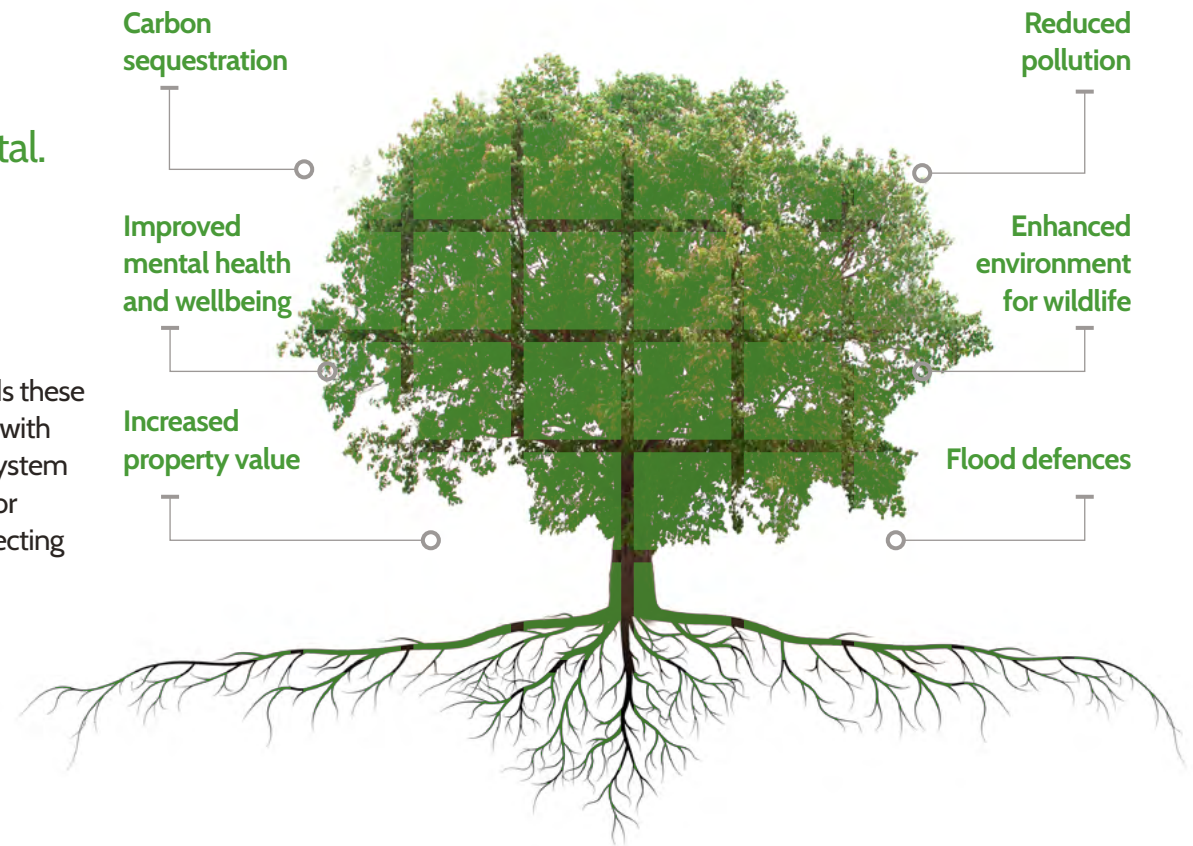
Laying the foundation for tree preservation

Appreciating the value of trees and understanding the long-term benefits that they bring to the environment and the local community is fundamental. The risk of soil compaction poses a real threat to the longevity of trees, which in turn can have serious impact on your construction project.

Any urban site furnished with mature trees brings enormous environmental benefits, the trees rightly deserve protection. Systems like CAVAT and iTree have helped to calculate the asset value of trees. Failure to comply with TPO requirements can be incredibly costly; proven negligence can land developers with substantial fines.

Implementing RootBridge avoids these issues, providing peace of mind with its easy to install solution. Our system uniquely satisfies the demand for housing and services while protecting the high amenity value of trees.

Trees are an essential natural asset.
Their presence in urban areas is priceless.



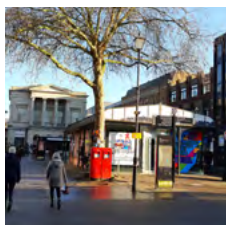


Pedestrian Duty - SS7.5

Designed for use in pedestrianised areas and to create pedestrian access across otherwise underutilised space in the RPA. This variant is the thinnest option, adding just 65mm to the existing ground level. It can be finished with heel-safe mesh grids for a contemporary look or can be overlaid with paving or asphalt.

Possible scenarios are as follows:

- Walkways between trees
- Around trees in paved areas such as city centres
- Use in pavements
- Benches and seating



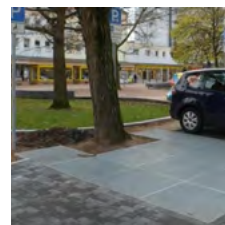
Depth	65mm
Configuration	1m x 1m sections
Loading capacity	up to 3.5kN or bespoke
Surface finish	Heel-safe mesh, pave over or resin bound, timber benching

Light Duty - SS15

Designed for light traffic of vehicles up to 4 ton. This system is primarily used for parking spaces and driveways. This version is the most cost effective, balancing capability and price.

Possible scenarios are as follows:

- Car only access roads between trees
- Car parking spaces
- Pedestrianised areas that need vehicular capability



Depth	85mm
Configuration	1m x 1m sections
Loading Capacity	15kN point load / 3 ton axle load
Surface Finish	Heel-safe mesh or pave over



Heavy Duty - SS50

Designed to take a point load of 50kN (approx. 5 ton). This makes it best suited to access roadways through trees or in pedestrianised areas that require emergency vehicle access.

Possible scenarios are as follows:

- Access roads between trees
- Pedestrianised areas requiring emergency vehicle access



Depth	111mm
Configuration	1m x 1m sections
Loading capacity	50kN point load / 10 ton axle load
Surface finish	Pave or Asphalt over

Extra Heavy Duty - SS57

The heaviest variant available, able to take axle loading vehicles of up to 11.5 ton. This capability makes it suitable for articulated lorries up to 40 ton.

Possible scenarios are as follows:

- All heavy duty access requirements
- Access roads between trees
- Site entrances



Depth	112mm
Configuration	1m x 1m sections
Loading capacity	57kN point load / 11.5 ton axle load
Surface finish	Pave or Asphalt over



Technical data

Grid Finishes

Standard 30 x 30mm Mesh

Heel-safe 11 x 33mm Mesh

The system is finished with press-lock grating panels. The 30x30mm mesh grids can be covered with a membrane, and an extra surface finish such as asphalt can be laid on top. Alternatively, heel-safe grating can be supplied with anti-slip serrations as the final finish.

Compliance information:

- BS5837:2012 Trees in relation to design, demolition, and construction
- Eurocode 1: BE EN 1991-1-1:2002 Actions on structures
- Eurocode 3: BS EN 1993-1-1:2005 Design of steel structures
- BS 4592-1:2006 Industrial type flooring and stair treads





Case Studies

Innovation tree protection in action

York development access road

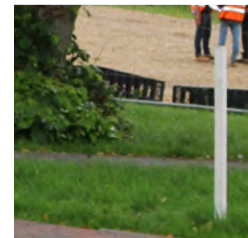
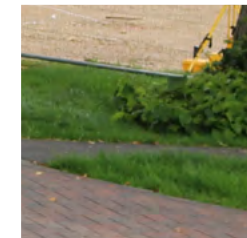
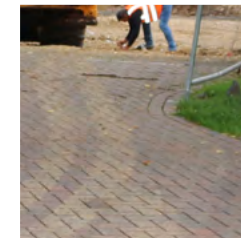
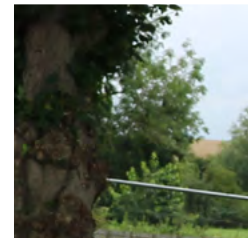
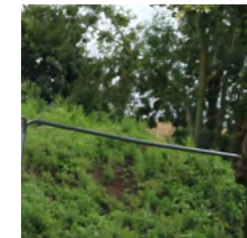
RB heavy duty used to create a new access road for nine dwellings and a public house in York

At this development in Yorkshire, planning constraints called for the protection of three mature and established lime trees. The project required a heavy duty solution where the new access roads connected the existing highway. It consists of two 10m sections at a slight gradient into the site.

Due to the gradient, a pivot system was used which allows flexible adjustment in the final angle (based on the pile heights) and contributes to greater flexibility in the pile placement.

Consisting of 148 piles with an approx. combined weight of 10 ton, the entire structure was raised off of the ground to ensure there is no compaction in the RPA. This robust system of anchoring ensures the roadway will not be pushed by growing tree roots. Following the install, the steel frame was overlaid with block paving. Curved edging was supplied to support the paving and provide the form for the finished road.

Here are projects where RootBridge has been successfully integrated in the UK. You can find further case studies online - www.greengridsystems.com/case-studies



RESULTS

The final structure is completely porous - water can flow between the joints in the paving, through the grit base and the membrane, then out through the mesh grids that sit on the beams. This ensures the construction has minimal impact on the trees and their environment.



Case Studies

Innovation tree protection in action

New Driveway for Housing Development

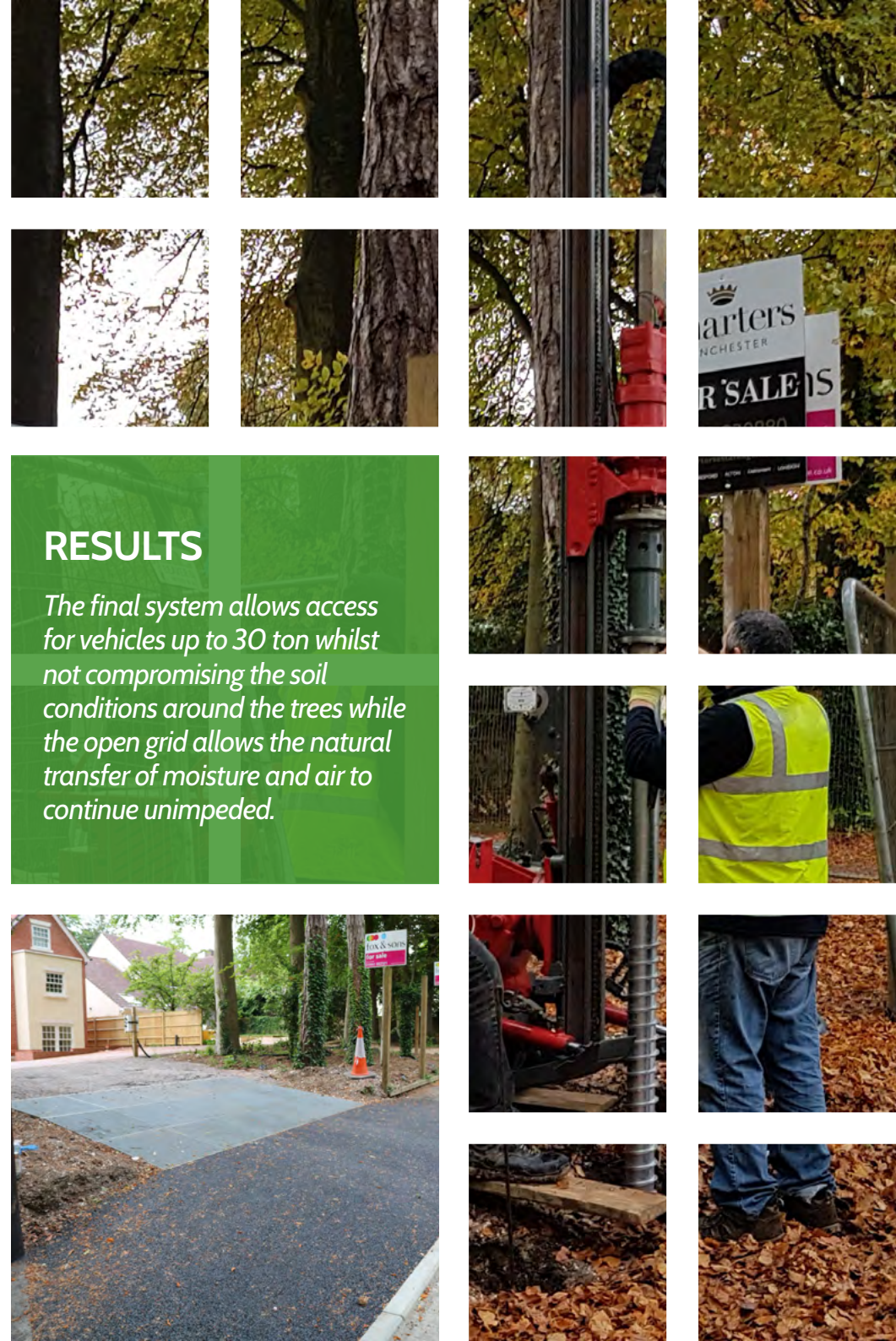
RB heavy duty used to create a driveway for five dwellings at a project in Winchester, Hampshire.

The basis of this project was a driveway through the RPA – this being the access granted at planning stage to the five new dwellings onsite. Our involvement didn't start until the houses were completed, it was at this point they found that their original plan to use a concrete slab set on concrete piles wouldn't work. There is a gradient across two planes where the driveway slopes up from the road, and we were able to modify our heavy duty system to accommodate this – something that wasn't achievable with the concrete option they had originally chosen.

The final solution consisted of our heavy duty system, which is rated to take vehicles up to 30 ton, with stub legs set at specific angles and heights to connect to the piles and manage the gradients.

The system in this project was left as a mesh finish at the client's request, with a heel friendly mesh size and anti-slip serrations. The remaining RPA area between the system and the rest of the driveway was finished with 200mm deep geocells. Temporary ground protection was used onsite when tracking the machine through to install the screws. These were 2100mm long to meet the high load requirement of the system and wound into the underlying chalk.

Here are projects where RootBridge has been successfully integrated in the UK. You can find further case studies online - www.greengridsystems.com/case-studies



RESULTS

The final system allows access for vehicles up to 30 ton whilst not compromising the soil conditions around the trees while the open grid allows the natural transfer of moisture and air to continue unimpeded.



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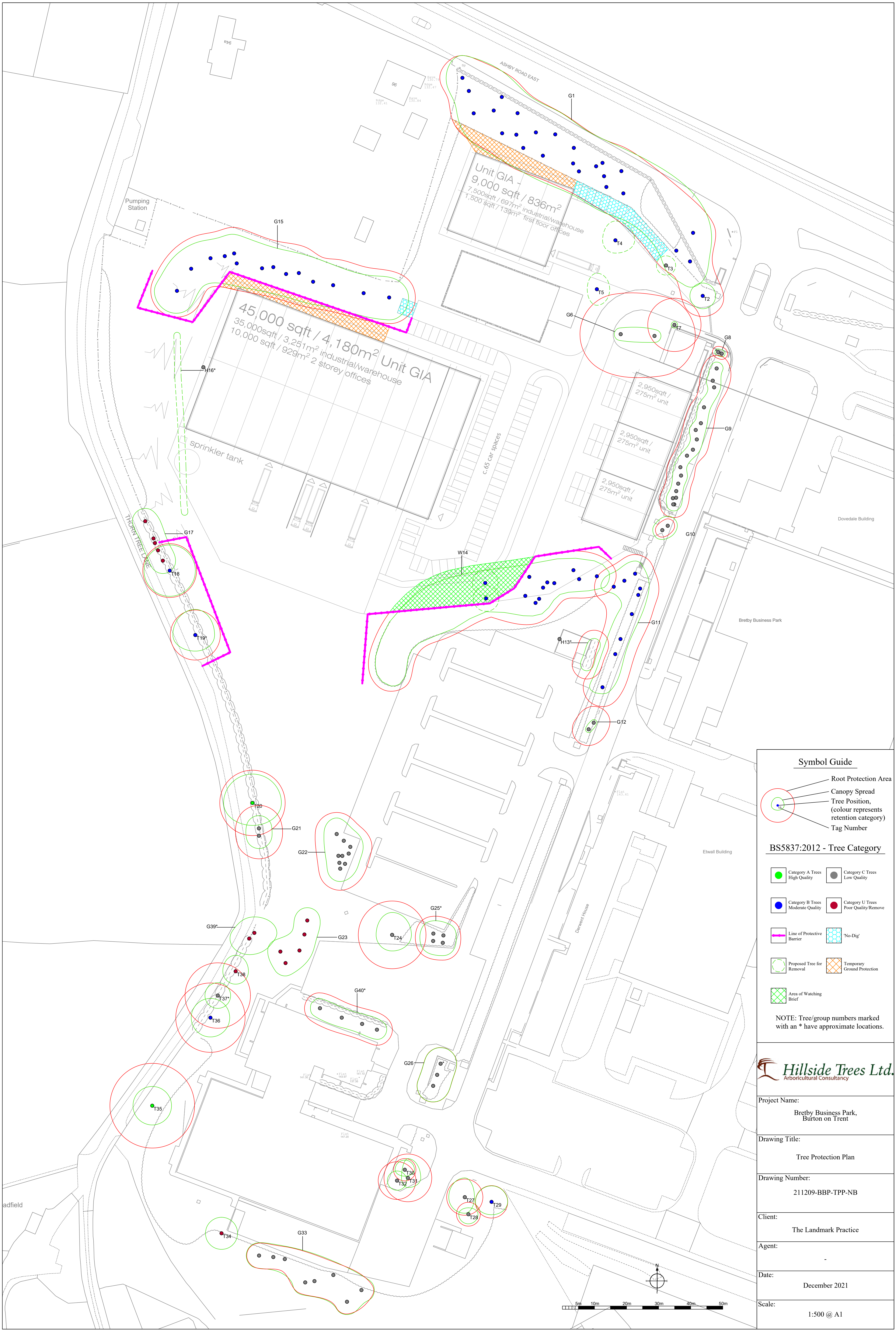
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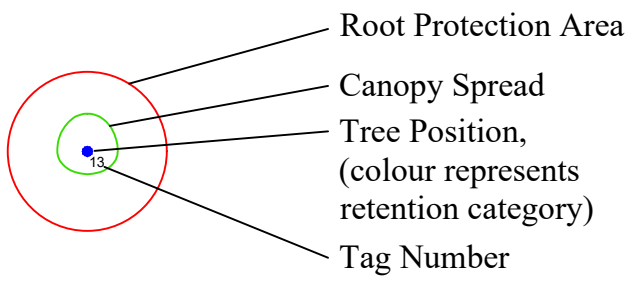
The Nursery, Littleton Lane, Nr
Sparsholt, Winchester, SO21 2LS

Tree Protection Plan

Drawing no: 211209-BBP-TPP- NB



Symbol Guide



BS5837:2012 - Tree Category

- | | |
|--------------------------------------|---|
| Category A Trees
High Quality | Category C Trees
Low Quality |
| Category B Trees
Moderate Quality | Category U Trees
Poor Quality/Remove |
| Line of Protective
Barrier | 'No-Dig' |
| Proposed Tree for
Removal | Temporary
Ground Protection |
| Area of Watching
Brief | |

NOTE: Tree/group numbers marked with an * have approximate locations.



Project Name:
Bretby Business Park,
Burton on Trent

Drawing Title:
Tree Protection Plan

Drawing Number:
211209-BBP-TPP-NB

Client:
The Landmark Practice

Agent:

Date:
December 2021

Scale:
1:500 @ A1