TREE SURVEY

PROPOSED DEVELOPMENT

AT

RACECOMMON QUARRY
MORTIMER ROAD
PENISTONE
SHEFFIELD

PM/03/08/09

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1.0 INTRODUCTION

1.1 Professional Details

1.1.1 My name is Peter Murray and I have been working and studying in the Arboricultural Industry since 1989. I have many years practical and consulting experience as a Local Authority arboriculturalist and more recently as a private sector practitioner.

1.1.2 I so far hold the Higher National Diploma in Arboriculture and am a professional member of the Arboricultural Association. I regularly attend numerous conferences and seminars keeping up to date with latest research and best practices.

1.2 Tree Survey

1.2.1 The purpose of this report is to carry out a site visit at Racecommon Quarry, Mortimer Road, Penistone, Sheffield and survey all trees likely to be affected by proposed development in accordance with *BS 5837:2005 Trees in relation to construction - Recommendations* in order to support development proposals on the site.

1.2.2 The survey on which the findings of this report are based was undertaken on Thursday 30th July 2009.

1.2.3 This report should be read in conjunction with the attached location plan off Appendix Two.

1.2.4 The trees were inspected from ground level only and all comments and recommendations made have taken into account their location, surroundings and their likely impact on persons or property.

1.2.5 The limitations of this report are restricted to the persons, time, information made available and purpose for which this report has been prepared.

2.0 FINDINGS

2.1 Trees Surveyed

A total of twenty-seven individual trees were surveyed and plotted in order to assess their health and dimensions. To give assistance in reading the findings the following glossary has been produced.

2.2 Arboricultural Glossary of Terms

The following terms are concurrent with best Arboricultural practice and within the guidelines set by the International Society of Arboriculture (ISA), the Arboricultural Association (AA) and the British Standards Institute (BSI).

Dbh: Diameter at Breast Height is measured at 1.5m and recorded in metres. Where a tree becomes multi-stemmed below 1.5m the diameter is measured above the root flare at the base of the tree.

Height: Height was measured using a clinometer and recorded in metres.

Age Range: Age is site specific and categorised:

Young (Y)	Out-planted trees that have not yet established.
Semi-Mature (SM)	Established trees up to 1/3 of expected height and crown.
Early Mature (EM)	Between 1/3 and 2/3 of expected height and crown.
Mature (M)	Between 2/3 and full expected height and crown.
Fully Mature (FM)	Full expected height and crown.
Over Mature (OM)	Crown beginning to break-up and decrease in size.
Senescent (S)	Crown in advanced stage of break-up.

Crown Spread: Measured in metres at four cardinal points (N, E, S & W).

Crown Clearance: Measured in metres from the ground to the first branch tip on development side only.

Condition - Assessment of current physiological condition and structural morphology incorporating vigour and vitality and categorised:

A - Tree needing little, if any attention
B - Tree with minor, but rectifiable defects, or in the early stages of physiological stress
C - Tree with significant structural and physiological flaws and/or extremely stressed
D - Tree that is dead, biologically/physically moribund or dangerous

Desirability To Retain – As Outlined in Table 1 of BS 5837:2005 Trees in Relation to Construction – Recommendations (see Appendix One).

Definition of Physiological & Morphological Terms

Adaptive Growth - The process whereby wood formation is influenced both in quantity and in quality by the action of gravitational force and mechanical stresses on the cambial zone.

Bifurcation – Forked or divided union.

Brown Rot - Form of decay where cellulose is degraded, while lignin is only modified.

Cankers (target or tumerous) - A localised area of dead bark and cambium on a stem or branch, caused by fungal or bacterial organisms, characterised by woundwood development on the periphery. This may be annual or perennial.

Cavity - An open wound, characterised by the presence of extensive decay and resulting in a hollow.

Chlorotic Leaf - Lacking in chlorophyll, typically yellow in colour.

Compartmentalisation - The physiological process that creates the chemical and mechanical boundaries that act to limit the spread of disease and decay organisms.

Crack - Longitudinal spilt in stem or branch, involving bark and/or underlying wood. These may be vertically and horizontally orientated.

Decay - Process of degradation of woody tissues by fungi and bacteria through decomposition of cellulose and lignin.

Deadwood - Deadwood is often present within the crown or on the stems of trees. In some instances is may be an indication of ill health, however, it may also indicate natural growth processes. If a target is present beneath the tree, deadwood may fall and cause injury or damage and should be removed, otherwise deadwood can remain intact for conservation purposes (insects, fungi, birds etc.).

End Weight - The concentration of foliage at the distal ends of stems and deficient in secondary branches.

Girdling Root - Root which circles and constricts the stem or roots causing death of phloem and/or cambial tissue.

Hazard Beam - An upwardly curved branch in which strong internal stresses may occur without the compensatory formation of extra wood (longitudinal splitting may occur in some cases).

Included Bark Union - Pattern of development at branch junctions where bark is turned inward rather than pushed out. Potential weakness due to a lack of a woody union.

Ivy Growth - Ivy growth may ascend into the tree's crown, increasing wind resistance, concealing potential defects and reducing the tree's photosynthetic capacity. Ivy growth is often acceptable in woodland areas as a conservation benefit.

Live Crown Ratio - The relative proportion of photosynthetic mass (leaf area) to overall tree height.

Reaction Wood - Specialised secondary xylem, which develops in response to a lean or similar mechanical stress, attempting to restore the stem to the vertical.

Root Plate Lift - The physical movement of the rooting plate causing soils to shift and crack. May occur during adverse weather conditions. Trees may become unstable.

Structural Defect - Internal or external points of weakness, which reduce the stability of the tree.

Suppressed - Trees which are dominated by surrounding vegetation and whose crown development is restricted from above.

Topping - A highly disfiguring practise, likely to cause severe xylem dysfunction and decay in major structural parts of the wood.

White Rot - Form of decay where both cellulose and lignin are degraded.

Wound - Any injury, which induces a compartmentalisation response.

Woundwood - Wood with atypical anatomical features, formed in the vicinity of a wound and a term to describe the occluding tissues around a wound as opposed to the ambiguous term "callus."

Woodland Structure - The vertical and horizontal arrangement of trees within a group or woodland i.e. Dominant - trees with a crown above the upper layer of the canopy, Co dominant - trees that define the general upper edge of the canopy, Intermediate - trees that have been largely overgrown by others, Suppressed - trees that have been overgrown and occupy an under storey position and grow slowly, often severely asymmetrical.

Note: The definitions described above, may not necessarily be included within the Arboricultural Survey Data.

2.3 Arboricultural Data Tables

Arboricultural Data Sheet: Racecommon Quarry , Penistone													
					Date of Survey: 30/07/09						Surveyor: PM		
Tree No.	**Species**	**Dbh (mm)**	**Height (m)**	**Age**	**Crown Spread (m)**				**Crown clearance (m)**	**Condition rating**	**Comments and preliminary management recommendations**	**Estimated remaining contribution**	**Tree quality category rating**
					N	**E**	**S**	**W**					
T1	Birch	680 at base	8.8	EM	4.8	5.2	2.6	4.6	1.0	B	Co-dominant multi-stemmed specimen located on undulating ground on boundary of site. Exhibits reasonable form.	20+	B2
T2	Sycamore	560 at base	7.8	EM	3.2	5.1	5.6	4.8	1.0	B	Co-dominant multi-stemmed specimen located on undulating ground on boundary of site. Exhibits reasonable form.	20+	B2
T3	Sycamore	700 at base	9.6	M	5.3	6.2	9.2	7.0	1.0	B	Co-dominant multi-stemmed specimen located adjacent boundary wall exhibiting reasonable form. May affect wall in future.	20+	B2
T4	Goat Willow	400 at base	9.4	EM	5.6	2.9	5.6	4.3	1.0	B	Co-dominant multi-stemmed specimen located in scrub area exhibiting reasonable form. Several included unions at base.	10+	C2
T5	Goat Willow	280 at base	7.8	EM	4.9	3.9	5.0	1.6	1.0	C	Co-dominant twin-stemmed specimen located in scrub area exhibiting poor form.	10+	C2
T6	Goat Willow	250 at base	7.8	EM	3.6	4.2	4.8	1.8	1.0	C	Co-dominant twin-stemmed specimen located in scrub area exhibiting poor form.	10+	C2
T7	Sycamore	500 at base	11.4	M	8.8	5.4	7.4	4.6	1.5	B	Co-dominant multi-stemmed specimen located in scrub banking area adjacent yard exhibiting reasonable form.	20+	B2

Arboricultural Data Sheet: Racecommon Quarry , Penistone											Date of Survey: 30/07/09	Surveyor: PM
Tree No.	**Species**	**Dbh (mm)**	**Height (m)**	**Age**	**Crown Spread (m)**				**Crown clearance (m)**	**Condition rating**	**Comments and preliminary management recommendations**	**Estimated remaining contribution**	**Tree quality category rating**
					N	**E**	**S**	**W**					
T8	Oak	600 at base	9.2	EM	6.5	7.8	5.6	4.4	0.0	B	Co-dominant multi-stemmed specimen located on top of bank exhibiting reasonable form. Several rope swings and other debris can be found within the crown.	40+	B2
T9	Goat Willow	450 at base	10.8	EM	1.2	5.3	5.8	5.9	0.0	B	Co-dominant multi-stemmed specimen located at base of quarry exhibiting poor form.	10+	C2
T10	Goat Willow	600 at base	11.4	EM	6.8	6.0	0.5	5.8	0.0	B	Co-dominant multi-stemmed specimen located at base of quarry exhibiting poor form.	10+	C2
T11	Birch	100	4.8	SM	2.2	2.4	2.4	2.3	1.0	B	Co-dominant young specimen located at base of quarry exhibiting good form.	30+	C2
T12	Goat Willow	380 at base	8.6	EM	6.8	3.4	4.0	3.8	2.0	B	Co-dominant multi-stemmed specimen located at base of quarry exhibiting reasonable form.	10+	C2
T13	Goat Willow	200 at base	8.4	EM	2.0	0.5	3.6	0.6	2.0	C	Co-dominant multi-stemmed specimen located at base of quarry exhibiting poor form.	10+	C2
T14	Goat Willow	420 at base	8.6	EM	5.0	4.8	4.1	2.2	2.0	B	Co-dominant multi-stemmed specimen located at base of quarry exhibiting reasonable form.	10+	C2
T15	Goat Willow	200 at base	5.6	SM	2.6	2.5	2.0	1.9	2.0	C	Co-dominant multi-stemmed specimen located at base of quarry exhibiting poor form and health.	5-10	R

Arboricultural Data Sheet: Racecommon Quarry , Penistone											Date of Survey: 30/07/09	Surveyor: PM
Tree No.	**Species**	**Dbh (mm)**	**Height (m)**	**Age**	**Crown Spread (m)**				**Crown clearance (m)**	**Condition rating**	**Comments and preliminary management recommendations**	**Estimated remaining contribution**	**Tree quality category rating**
					N	**E**	**S**	**W**					
T16	Goat Willow	480	7.8	EM	4.2	6.3	4.6	4.7	2.0	B	Co-dominant multi-stemmed specimen located at base of quarry exhibiting reasonable form.	10+	C2
T17	Thorn	80	4.6	SM	2.1	0.8	2.2	1.9	2.0	C	Co-dominant specimen located at base of quarry exhibiting poor form.	10+	C2
T18	Goat Willow	380 at base	7.4	EM	5.4	5.9	4.9	0.0	0.0	B	Co-dominant multi-stemmed specimen located at base of bank exhibiting poor form.	10+	C2
T19	Goat Willow	410 at base	6.0	EM	6.2	6.1	5.6	0.5	0.0	B	Co-dominant multi-stemmed specimen located at base of bank exhibiting poor form.	10+	C2
T20	Goat Willow	500 at base	8.2	EM	6.7	1.2	8.3	6.4	2.0	B	Co-dominant multi-stemmed specimen located at base of bank exhibiting poor form.	10+	C2
T21	Goat Willow	390 at base	7.8	EM	4.2	4.3	5.4	3.9	2.0	B	Co-dominant multi-stemmed specimen located at base of bank exhibiting reasonable form.	10+	C2
T22	Goat Willow	250	6.6	EM	3.2	0.0	5.0	6.8	2.0	C	Co-dominant specimen located at base of bank exhibiting reasonable form.	10+	C2
T23	Elderberry	200 at base	5.0	M	3.6	4.1	2.8	3.3	0.0	B	Co-dominant multi-stemmed specimen located at top of bank exhibiting reasonable form.	5-10	C2
T24	Rowan	110 at base	6.4	SM	2.2	1.2	1.6	2.6	1.0	B	Young co-dominant multi-stemmed specimen located at top of bank exhibiting reasonable form.	20+	C2

Arboricultural Data Sheet: Racecommon Quarry , Penistone											Date of Survey: 30/07/09	Surveyor: PM
Tree No.	**Species**	**Dbh (mm)**	**Height (m)**	**Age**	**Crown Spread (m)**				**Crown clearance (m)**	**Condition rating**	**Comments and preliminary management recommendations**	**Estimated remaining contribution**	**Tree quality category rating**
					N	**E**	**S**	**W**					
T25	Sycamore	120	9.0	SM	3.6	2.4	2.6	2.8	0.0	A	Young co-dominant specimen located at base of bank exhibiting reasonable form.	40+	C2
T26	Birch	140 at base	6.2	SM	2.8	2.9	3.0	3.1	0.0	B	Young co-dominant multi-stemmed specimen located at base of bank exhibiting reasonable form.	30+	C2
W1	Woodland strip of Sycamore & Willow	300 av	10.0	EM	-	-	-	-	1.5 av	B	Linear strip of woodland fronting the site adjacent Mortimer Road. Densely populated with Sycamore and Willow providing a good screen. In the long term it would benefit from some thinning of Sycamore and introduction of more diverse species such as Oak & Birch.	40+	A2

Recommended works should be carried out to the *British Standard Recommendations for Tree Work, BS 3998:1989*

3.0 RECOMMENDATIONS

3.1 Tree Assessment

In general the trees were found to be in reasonable condition for their age and species.

3.2 Development

The above data table clearly details the condition of the trees and identifies their worthiness for retention. However, the Arboricultural Implications Assessment and Method Statement will fully assess development impact on each tree, proposed tree works and tree protective measures. This can be found in Section 4.0 onwards.

3.3 Standard of Work

All tree work undertaken should be done in accordance with British Standard 3998:1989 and by competent contractors insured with public liability cover of at least two million pounds.

3.4 Statutory Controls

If the trees on site are subject to any Tree Preservation Orders (TPO's) or are encompassed within a Conservation Area then statutory permission from the Local Planning Authority (LPA) will be required before any tree works take place.

3.5 Wildlife

All operations should take account of wildlife needs and be planned to take advantage of weather conditions and time of year for minimum damage and disturbance. If any protected species or nesting birds are present or discovered while the works are taking place all work should cease until contact has been made with English Nature for further advice. English Nature can be contacted on 01942 820342 or by e-mail to: northwest@english-nature.org.uk. Specific consideration should be given to the possible presence of roosting bats, which are protected by the Wildlife and Countryside Act 1981 (schedule 5) and included in schedule 2 of the Conservation Regulations 1994. Ideally, a survey should be carried out to identify any potential roost sites and if bats are found to be present advice should be sought form a person qualified and experienced in handling such matters and fully conversant with the implications of the Act.

APPENDIX ONE

Table 1 of BS 5837

Table 1 — Cascade chart for tree quality assessment

TREES FOR REMOVAL				
Category and definition	**Criteria**			**Identification on plan**
Category R Those in such a condition that any existing value would be lost within 10 years and which should, in the current context, be removed for reasons of sound arboricultural management	• Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other R category trees (i.e. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby (e.g. Dutch elm disease), or very low quality trees suppressing adjacent trees of better quality NOTE Habitat reinstatement may be appropriate (e.g. R category tree used as a bat roost: installation of bat box in nearby tree).			DARK RED
TREES TO BE CONSIDERED FOR RETENTION				
Category and definition	**Criteria — Subcategories**			**Identification on plan**
	1 Mainly arboricultural values	**2 Mainly landscape values**	**3 Mainly cultural values, including conservation**	
Category A **Those of high quality and value:** in such a condition as to be able to make a substantial contribution (a minimum of 40 years is suggested)	Trees that are particularly good examples of their species, especially if rare or unusual, or essential components of groups, or of formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands which provide a definite screening or softening effect to the locality in relation to views into or out of the site, or those of particular visual importance (e.g. avenues or other arboricultural features assessed as groups)	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	LIGHT GREEN
Category B **Those of moderate quality and value:** those in such a condition as to make a significant contribution (a minimum of 20 years is suggested)	Trees that might be included in the high category, but are downgraded because of impaired condition (e.g. presence of remediable defects including unsympathetic past management and minor storm damage)	Trees present in numbers, usually as groups or woodlands, such that they form distinct landscape features, thereby attracting a higher collective rating than they might as individuals but which are not, individually, essential components of formal or semi-formal arboricultural features (e.g. trees of moderate quality within an avenue that includes better, A category specimens), or trees situated mainly internally to the site, therefore individually having little visual impact on the wider locality	Trees with clearly identifiable conservation or other cultural benefits	MID BLUE
Category C **Those of low quality and value:** currently in adequate condition to remain until new planting could be established (a minimum of 10 years is suggested), or young trees with a stem diameter below 150 mm	Trees not qualifying in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater landscape value, and/or trees offering low or only temporary screening benefit	Trees with very limited conservation or other cultural benefits	GREY
	NOTE Whilst C category trees will usually not be retained where they would impose a significant constraint on development, young trees with a stem diameter of less than 150 mm should be considered for relocation.			

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ARBORICULTURAL IMPLICATIONS ASSESSMENT AND METHOD STATEMENT

PROPOSED DEVELOPMENT

AT

RACECOMMON QUARRY
MORTIMER ROAD
PENISTONE
SHEFFIELD

PM/03/08/09

4.0 ARBORICULTURAL IMPLICATIONS ASSESSMENT

4.1 The purpose of this report is to: -

a) Assess the implications, if any, the proposed development will have on the trees identified in the Tree Survey of 30th July 2009 carried out by Mulberry Tree Management.

b) Advise on arboricultural measures, which would be likely to mitigate any damage resulting from the proposed development

4.2 All background information from which this report is based has been taken from the initial survey, as stated in point 4.1 (a), by Mulberry Tree Management.

4.3 The limitations of this report are restricted to the persons, time, information made available and purpose for which this report has been prepared.

5.0 ASSESSMENT

5.1 The Site Layout Plan within Appendix Four identifies the trees to be retained/removed in relation to the proposed development.

5.2 In order to fully assess the impact of the proposals an Implications Table has been created, which gives details of the proximity of the associated works to the trees.

5.3 The below Implications Table details the Root Protection Area (RPA) in accordance with the British Standard 5837:2005 *Trees in relation to construction – Recommendations*. This is an area that should be left undisturbed in order to provide adequate rooting area for the retained trees.

5.3 This information can then be used in accordance with BS 5837:2005 to determine whether the development will have a detrimental impact on the health of each tree. Once this has been determined remedial measures can be detailed to reduce the impact the proposals will have on the trees.

5.4 Implications Table: -

Tree No	Root Protection Area identified in Table 2 of BS 5837:2005	Distance of Root Protection Area less 20% (m) as identified in BS 5837:2005 Section 5.2.4 (a)	Distance to any proposed construction or surfacing (m)	Can the Tree be Successfully Retained
T1	145.27m^2 = Circle with a radius of 6.80 metres	5.4	4.0	Yes (see 7.2)
T2	98.52m^2 = Circle with a radius of 5.60 metres	4.5	4.5	Yes (see 7.2)
T3	153.94m^2 = Circle with a radius of 7.00 metres	5.6	12.0	Yes
T4	50.27m^2 = Circle with a radius of 4.00 metres	3.2	4.0	Yes
T5	Fell for development			
T6	Fell for development			

Tree No	Root Protection Area identified in Table 2 of BS 5837:2005	Distance of Root Protection Area less 20% (m) as identified in BS 5837:2005 Section 5.2.4 (a)	Distance to any proposed construction or surfacing (m)	Can the Tree be Successfully Retained
T7	78.54m^2 = Circle with a radius of 5.00 metres	4.8	3.0	Yes (see 7.2)
T8 - T27	Fell for development			
W1	40.72m^2 av = Circle with a radius of 3.60 metres av	2.9	5.0 (closest)	Yes

6.0 IMPACT ASSESSMENT

6.1 To assess the implications of the proposed development each tree can be categorised in the following way: -

	Trees to be Retained		Trees to be removed	
	With No Impact	With detailed methodology	Due to Condition	Due to Development
Tree No.	T1, T2, T3, T4 & W1	n/a	n/a	T5, T6 & T8 to T27

7.0 MITIGATING PROPOSALS

7.1 Tree Losses and Replacements

7.1.1 The loss of any tree is always regrettable although in this instance the majority of the trees to be lost are Goat Willow, which are all self seeded scrub trees that are not of significant visual benefit to their locality. For this reason they have been graded as C2 trees. The only better quality tree to be lost is T8 (Oak) although of reasonable condition is still not that visual due to Woodland on west boundary and scrub on north.

7.1.2 The site is well populated with trees mainly on the western boundary, which is a wooded strip (W1). However, there is plenty of scope for replacement planting on the eastern boundary, which is currently quite open.

7.1.3 Heavy Standards are to be recommended with a girth of 12-14cm measured at 1m, a clear stem of 1.75 to 2m and an overall height of at least 3.5m. Recommended species choice as follows:

Small Leaved Lime *(Tilia cordata)*
Whitebeam *(Sorbus aria)*
Rowan *(Sorbus aucuparia)*
Silver Birch *(Betula pendula)*
Wild Cherry (*Prunus avium*)
English Oak (*Quercus robur*)

7.2 New Access and Driveway

7.2.1 As shown above, the Implications Table identifies the potential impact that the proposed new access could have on the long term retention of T1, T2 & T7.

7.2.2 The proposed access is shown to be slightly within the RPA of T1 & T2. However, they are squat early-mature multi-stemmed trees, which have been measure at base with quite a large stem diameter considering their age. They are also situated in raised ground so it is considered that the development is far enough away not to significantly affect their root systems. Careful excavation as detailed in the Method Statement will ensure their retention.

7.2.3 The proposed new access comes close to T7. However, there is existing hard standing in this area already so it is considered that there will not be any significant impact on this tree due to development. However, some lower branches will need pruning.

7.3 Tree Protection/Fencing

7.3.1 In order to protect retained trees on site during development it is usual to specify fencing. Therefore, a clear tree works specification and details of all tree protective measures can be found in the following Arboricultural Method Statement (Section 9.0).

8.0 DISCUSSION

8.1 The majority of the root system, of a tree, is in the surface 600mm of the soil, extending radically for distances frequently in excess of the trees height. Beyond the main structural roots (close to the base of the trunk), the root system rapidly sub-divides into smaller diameter roots: off this main system, a mass of fine roots develops.

8.2 The shape of the main structural roots develops in response to the need for the tree to have physical stability. Beyond these major roots, root growth and development is influenced by the availability of water and nutrients. Unless conditions are uniform around the tree, which would be unusual, the extent of the root system will be very irregular and difficult to predict. It will not generally show the symmetry seen in the branch system.

8.3 The parts of the root system, which are active in water and nutrient uptake, are very fine, typically less than 0.5mm diameter. They are short lived, developing in response to the needs of the tree, with the majority dying each winter. It is *essential* that conditions in the soil remain conducive to the healthy growth of these fine roots so that the water and nutrients necessary for healthy tree growth can be absorbed.

8.4 All parts of the root system, but especially the fine roots, are vulnerable to damage. Once they are damaged, water and nutrient uptake will be restricted until new roots have regenerated. Vigorous young trees will be capable of rapid regeneration but over mature trees will respond slowly, *if at all*.

8.5 In order to live and grow, roots need oxygen from the soil. Respiration by the roots and other soil organisms depletes this oxygen and increases carbon dioxide levels in the soil; a correct balance of these gases is normally maintained by diffusion between the soil and the atmosphere. Anything, which disturbs this balance, will affect the condition of the root system.

8.6 The factors that most commonly affect this diffusion adversely, and therefore damage roots, are the following: -

a) Compaction of the ground, which reduces the space between soil particles. This is particularly important on clay soils. A single passage by heavy equipment on clay soils or storage of heavy materials can cause significant damage.
b) Changing soil levels, even for a few weeks.
c) Covering the root area with impervious surfaces.
d) A rise in the level of the water table. Roots can tolerate submersion for short periods. But a permanent rise will deplete the soil of oxygen.

8.7 Serious damage is often caused during preliminary site works by stripping the topsoil. For this reason, such works should be avoided until protective fencing has been erected.

8.8 Excavations in the rooting area can sever roots. As the majority of roots are in the surface 600mm, even shallow excavations can cause damage.

8.9 Excavations for foundations, landscaping or service trenches are usually sufficiently deep to sever most of the roots, and it should therefore be assumed that all parts of the root system beyond the excavation would no longer serve the tree.

8.10 Excavation or soil stripping which severe or damage the roots may impair the stability of the tree and make it dangerous.

9.0 METHOD STATEMENT

Before any form of development commences on the site the following works should be undertaken: -

9.1 Tree Works

Tree No.	Proposed Works
T5, T6 & T8 to T27	Fell
T7 & W1	Crown lift over access road to gain a clear height of approximately 6m from ground level.

Recommended works should be carried out to the *British Standard Recommendations for Tree Work, BS 3998:1989*

9.2 Excavation in Root Protection Area's

9.2.1 The construction of the new access is within the Root Protective Area (RPA) of Tree no.'s T1 and T2. This is illustrated on the plan of Appendix Four. In those areas the following specification will be applied: ***Any excavations which have to be undertaken within the root protection area should be carried out carefully by hand and any roots encountered in those areas should be severed cleanly with a sharp tool avoiding ripping or snagging. Prior to backfilling any retained roots should be surrounded with sharp sand (builders sand should not be used because of its high salt content which is toxic to tree roots), or other loose granular fill, before soil or other material is replaced. This material should be free of contaminants and other foreign objects potentially injurious to tree roots.***

9.3 Protective Fencing

9.3.1 All fencing used on the site should fully comply with *BS 5837:2005 Trees in relation to construction - Recommendations*.

9.3.2 The fencing should be strong and suitable for local conditions. It should also take into account the degree of construction activity on the site.

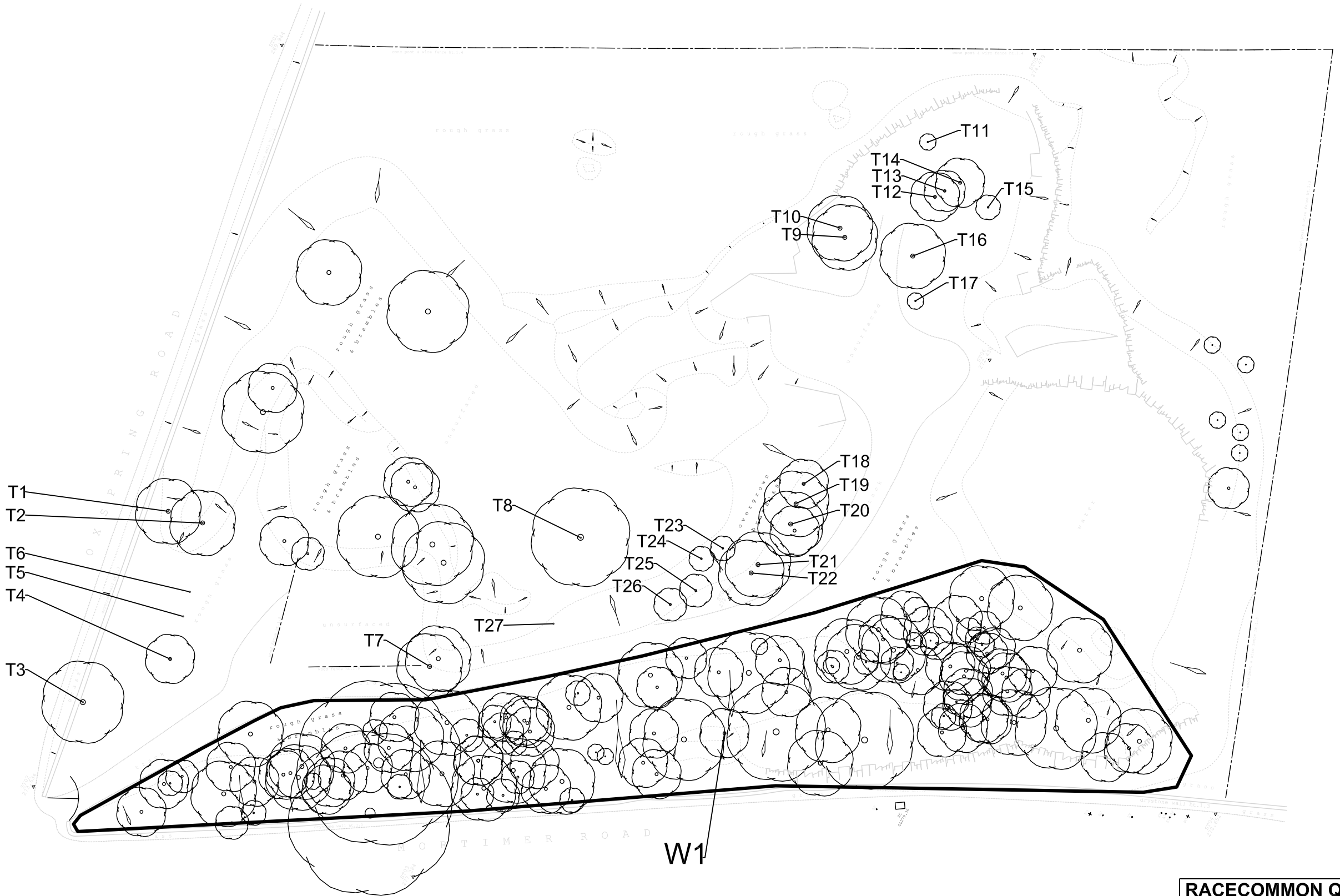
9.3.3 In this circumstance the location for the protective fencing should be as shown on the Tree Protection Plan of Appendix Four and of the following specification:

1.2m Chestnut Paling securely fastened to a ridged framework as outlined below.

APPENDIX

TWO

Tree Location Plan



RACECOMMON QUARRY, PENISTONE	
TREE LOCATIONS	
SCALE: 1/500 @ A3	**DATE:** AUG 09
DRAWING: M83/RQP/TREE	

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Posts: 75-100 mm round top fence posts or 100 mm x 100mm fence posts 1.8m high at 2m spacing, securely driven in by 0.6m.
Top and Bottom Rails: 50 mm x 75 mm softwood nailed to the uprights.
Support Struts: 50 mm x 75 mm softwood nailed to the uprights at every third post and at each corner or change of direction.

Or

Herras type temporary fencing with the bases pinned to the ground securely.

9.3.4 No storage of materials or any construction operations should occur within the fenced area. Additionally, when designing the site layout, account should be taken of the route/installation method of underground services/drains and, the route/construction method of new access roads/driveways in relation to the retained trees. It would be advisable to mark out the optimum position of the protective fencing on the ground prior to finalisation of any design proposal.

9.3.5 Notices should also be erected on the fencing stating 'Protected Area - No operations within fenced area'.

9.3.6 The positioning of the protective fencing is also very important and should be erected in the proposed location identified on the site plan of Appendix Three. Once the fence has been erected it should never be crossed and particular care should be taken not to store any materials or soil within the protected area.

9.4 Additional Precautions Outside Fenced Areas

9.4.1 Oil, bitumen, cement or other material likely to cause damage to the tree will not be stacked or discharged within 10m of the trees stem or within the protective area. Also materials in general will not be stacked or discharged within the exclusion zone.

9.4.2 Concrete mixing and washing will not be carried out within 10m of any retained trees.

9.4.3 Fires will not be lit beneath the foliage or in a position where the flames could extend to within 5m of the foliage, branches or trunk. If the fire is large then this may necessitate a distance of at least 20m.

9.4.4 Trees that are to be retained will not be used as anchorage for equipment.

9.4.5 Notice boards, telephone cables, or other services will not be4attached to any part of the retained tree.

9.4.6 Care should be taken when using cranes or other equipment near the canopy of the retained trees. Also any trees to be felled in proximity to the retained trees should be done so with particular care.

9.5 Services

9.5.1 Where possible all service trenches should be dug outside of the Root Protection Area.

9.5.2 Should this not be possible then the guidelines within 'NJUG 10' *Guidelines for the Planning, Installation and Maintenance of Utility Services in Proximity to Trees* should be adopted, in particular Section 4.0, which is included within Appendix Three of this report.

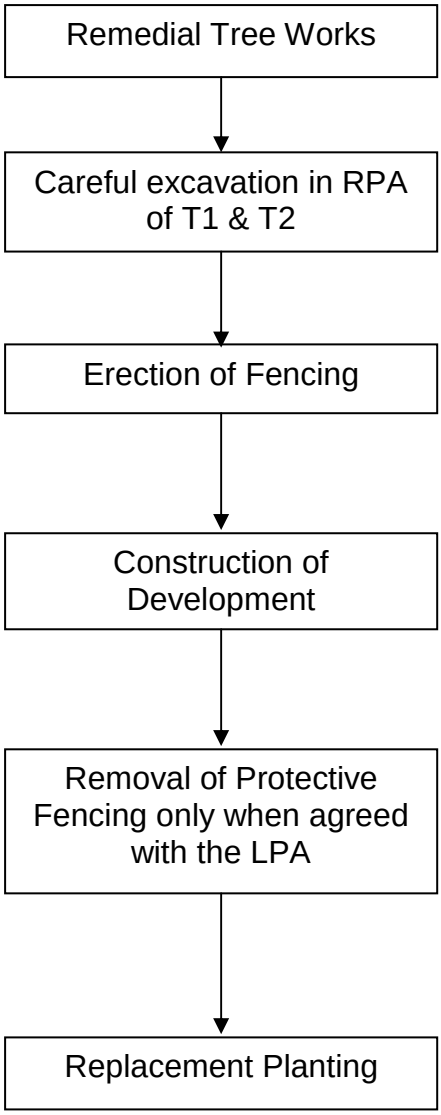
9.6 Replacement Planting

9.6.1 Replacement planting should be of standard stock of a size not less than 10 –12cm girth measured at 1 metre from base and planted in a pit 1000mm (w) x 1000mm (b) x 600mm (d) of the species and in location as illustrated on plan of Appendix Four.

9.6.2 Bare root stock shall be supported by a single stake and tie whilst root-balled stock shall have low double staking with a bar and tie.

9.6.3 A 0.5m radius of bark chip mulch shall be applied at a thickness of at least 50mm.

9.7 Summary of Methodology for the Protection of the Trees



APPENDIX THREE

NJUG 10
Section 4.0

 Telecommunications Code (Schedule 2). Paragraph 19 of the Telecommunications Code enables operators to require the lopping of trees which overhang the street and obstruct or interfere with the working of their lines.

4. HOW TO AVOID DAMAGE TO TREES

This section gives general guidance on methods of work to minimise damage to trees. The local authority (or for privately owned trees, the owner or their agent), should be consulted at an early stage prior to the commencement of any works. This will reduce the potential for future conflict between trees and apparatus.

4.1 Below Ground

Wherever trees are present, precautions should be taken to minimise damage to their root systems. As the shape of the root system is unpredictable, there should be control and supervision of any works, particularly if this involves excavating through the surface 600mm, where the majority of roots develop.

4.1.1 **Fine Roots**

Fine roots are vulnerable to desiccation once they are exposed to the air. Larger roots have a bark layer which provides some protection against desiccation and temperature change. The greatest risk to these roots occurs when there are rapid fluctuations in air temperature around them e.g. frost and extremes of heat. It is therefore important to protect exposed roots where a trench is to be left open overnight where there is a risk of frost. In winter, before leaving the site at the end of the day, the exposed roots should be wrapped with dry sacking. This sacking must be removed before the trench is backfilled.

4.1.2 **Precautions**

The precautions referred to in this section are applicable to any excavations or other works occurring within the Prohibited or Precautionary Zones as illustrated in Figure 1 – ‘Tree Protection Zone’.

4.1.3 **Realignment**

Whenever possible apparatus should always be diverted or re-aligned outside the Prohibited or Precautionary Zones. Under no circumstances can machinery be used to excavate open trenches within the Prohibited Zone.

The appropriate method of working within the Precautionary Zone should be determined in consultation with the local authority (or for privately owned trees the owner or their agent) and may depend on the following circumstances;

- the scope of the works (e.g. one-off repair or part of an extensive operation)
- degree of urgency (e.g. for restoration of supplies)
- knowledge of location of other apparatus
- soil conditions
- age, condition, quality and life expectancy of the tree

Where works are required for the laying or maintenance of any apparatus within the Prohibited or Precautionary Zones there are various techniques available to minimise damage.

Acceptable techniques in order of preference are;

a) Trenchless
Wherever possible trenchless techniques should be used. The launch and reception pits should be located outside the Prohibited or Precautionary Zones.
In order to avoid damage to roots by percussive boring techniques it is recommended that the depth of run should be below 600mm. Techniques involving external lubrication of the equipment with materials other than water (e.g. oil, bentonite, etc.) must not be used when working within the Prohibited Zone. Lubricating materials other than water may be used within the Precautionary Zone following consultation and by agreement.

b) Broken Trench - Hand-dug
This technique combines hand dug trench sections with trenchless techniques if excavation is unavoidable. Excavation should be limited to where there is clear access around and below the roots. The trench is excavated by hand with precautions taken as for continuous trenching as in (c) below. Open sections of the trench should only be long enough to allow access for linking to the next section. The length of sections will be determined by local conditions, especially soil texture and cohesiveness, as well as the practical needs for access. In all cases the open sections should be kept as short as possible and outside of the Prohibited Zone.

c) Continuous Trench - Hand-dug

The use of this method must be considered only as a last resort if works are to be undertaken by agreement within the Prohibited Zone. The objective being to retain as many undamaged roots as possible.

Hand digging within the Prohibited or Precautionary zones must be undertaken with great care requiring closer supervision than normal operations.

After careful removal of the hard surface material digging must proceed with hand tools. Clumps of roots less than 25mm in diameter (including fibrous roots) should be retained in situ without damage. Throughout the excavation works great care should be taken to protect the bark around the roots.

All roots greater than 25mm diameter should be preserved and worked around. These roots must not be severed without first consulting the owner of the tree or the local authority tree officer / arboriculturist. If after consultation severance is unavoidable, roots must be cut back using a sharp tool to leave the smallest wound.

4.1.5 **Backfilling**

Any reinstatement of street works in the United Kingdom must comply with the relevant national legislation (see: **Volume 6 – 'Legislation and Bibliography'**). In England this relates to the requirements of the code of practice – 'Specification for the Reinstatement of Openings in Highways' approved under the New Roads and Street Works Act 1991. Without prejudice to the requirements relating to the specification of materials and the standards of workmanship, backfilling should be carefully carried out to avoid direct damage to roots and excessive compaction of the soil around them.

The backfill should, where possible, include the placement of an inert granular material mixed with top soil or sharp sand (not builder's sand) around the roots. This should allow the soil to be compacted for resurfacing without damage to the roots securing a local aerated zone enabling the root to survive in the longer term.

Backfilling outside the constructed highway limits should be carried out using the excavated soil. This should not be compacted but lightly "tamped" and usually left slightly proud of the surrounding surface to allow natural settlement. Other materials should not be incorporated into the backfill.

4.1.6 **Additional Precautions near Trees**

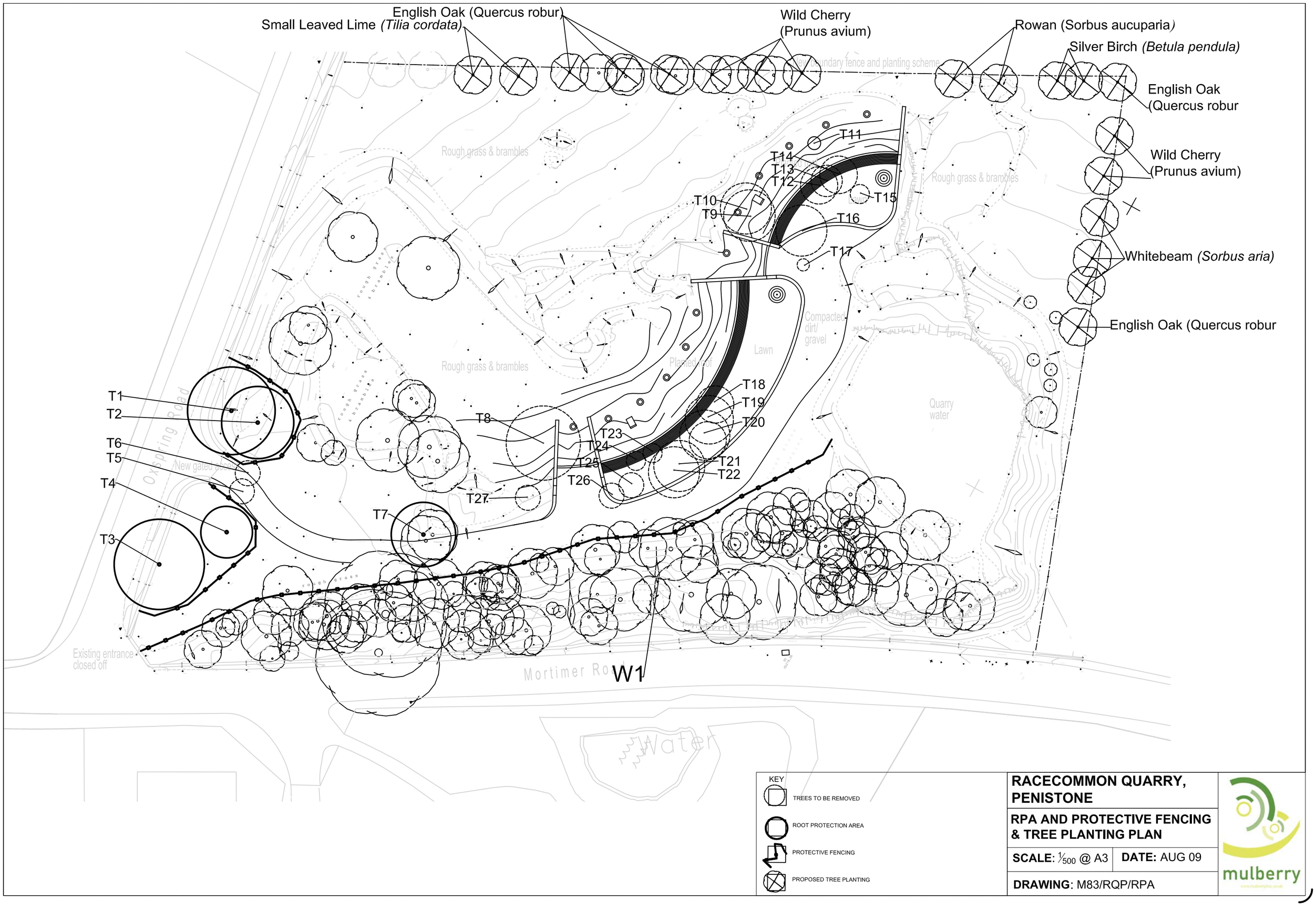
Movement of heavy mechanical plant (excavators etc.) must not be undertaken within the Prohibited Zone and should be avoided within the Precautionary Zone, except on existing hard surfaces, in order to prevent unnecessary compaction of the soil. This is particularly important on soils with a high proportion of clay. Spoil or material must not be stored within the Prohibited Zone and should be avoided within the Precautionary Zone.

Where it is absolutely necessary to use mechanical plant within the Precautionary Zone care should be taken to avoid impact damage to the trunk and branches. A tree must not be used as an end-stop for paving slabs or other materials nor for security chaining of mechanical plant. If the trunk or branches of a tree are damaged in any way advice should be sought from the local authority tree officer / arboriculturist.

See TABLE 1 –'Prevention of Damage to Trees Below Ground' below for summary details regarding causes and types of damage to trees and the implications of the damage and the necessary precautions to be taken to avoid damage.

APPENDIX FOUR

Tree Protection/ Proposed Layout Plan



KEY

- TREES TO BE REMOVED
- ROOT PROTECTION AREA
- PROTECTIVE FENCING
- PROPOSED TREE PLANTING

RACECOMMON QUARRY, PENISTONE

RPA AND PROTECTIVE FENCING & TREE PLANTING PLAN

SCALE: 1/500 @ A3 | **DATE:** AUG 09

DRAWING: M83/RQP/RPA

mulberry