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Site Details: 24 Belsize Lane, London, NW3 5AB

Prepared for: Mr. S. Ganguly

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Title: GAN_24BL_LAIA_001

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Report Index

1.0 – Summary of Instruction

An Arboricultural Impact Assessment (AIA) in accordance with *BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations* was commissioned by our client, Mr. S. Ganguly to be undertaken at 24 Belsize Lane, London, NW3 5AB.

The AIA is required to accompany an application for the discharge of Condition 7 Hard and Soft Landscaping pursuant to planning approval 2017/6969/P dated 30.5.18. The AIA will demonstrate that the proposed landscaping works will not adversely impact on the physiological health or structural condition of trees being retained at the site.

The scheme relates to the proposed:

- Hard and soft re-landscaping in the front and rear gardens.

Instructions were to:

- Carry out a tree survey in accordance with the British Standard *BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations* to:
    - Undertake an Arboricultural Impact Assessment (AIA) to evaluate the potential direct and indirect effects of the proposed landscaping scheme and associated construction activity on nearby retained trees;
    - Categorise the trees at and adjacent to the site to ascertain their suitability for retention;
    - Provide all relevant tree data including species identification, dimensions, life stage, condition assessments and make Preliminary/General Management Recommendations where necessary;
    - Identify the above and below ground tree constraints to the development to assist with scheme feasibility, conception and design;
    - Highlight the arboricultural implications that the development process may have on the retained trees and provide a method statement to show the necessary controls required to mitigate identified implications;
    - Make recommendations for measures to be taken to protect the retained trees above and below ground level during the development process, to safeguard their short and long term health and condition;
    - Produce findings of the AIA survey in a written report including an Arboricultural Method Statement (AMS) for submission to the Local Planning Authority for approval.

The British Standard Institute publication *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations* is referred to throughout this report. This is a nationally recognised standard typically used by Local Planning Authorities to assess planning applications. It is frequently referred to in planning conditions to enforce protection or control of works that may be harmful to trees both on and off the site.

This report has been produced in accordance with *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations* for the sole use of our client (as detailed on the Title Page). All information provided by third parties used in the preparation of this report is assumed to be correct.

2.0 – Report Limitations

- *Assessments of all trees have been conducted using Stage 1 of the Visual Tree Assessment (VTA) method of inspection. (See Section 2.4).*
- *All observations of tree condition were undertaken from ground level, a visual assessment of external features only, assisted as required by the use of binoculars, a metal probe and a rubber mallet (used for audible resonance testing) where necessary. Below ground tree roots and buried parts were not inspected.*
- *The Front and Back Garden Concept drawing of the proposal, (Drawing No.VS 8) provided by KR Garden Design has been used to create the Tree Protection Plan in Section 7.4 of the AIA report.*
- *Locations of existing tree positions at the site were included on the Front and Back Garden Concept drawing (Drawing No.VS 8).*
- *All supplied plans and technical information provided by third parties and used in the preparation of this AIA report are assumed to be correct.*
- *All measurements of tree heights, crown spreads and crown clearance from ground level were recorded to the nearest half metre for dimensions up to 10m and to the nearest metre for dimensions over 10m.*
- *Stem diameters were measured to the nearest 10mm, or where inaccessible, estimated based on the visible features and characteristics of the tree in question.*
- *Stem diameter measurements were recorded in accordance with methods detailed in Annex C (fig.C.1a-C.1f) as applicable for each individual tree and adjusted in accordance with Table D.1 of Annex D in BS 5837:2012 as required.*
- *Detailed background information is not known concerning the past history of the site, the soil type, geology or hydrology of the environs. No inspection material has been acquired by Tree Sense Arboricultural Consultants for assessment by a laboratory.*
- *Assessing the potential influence of trees upon load-bearing soils beneath existing and proposed structures, resulting from water abstraction by trees on shrinkable soils, was not included in the contract brief and is not, therefore, considered in any detail in this report. Tree Sense Arboricultural Consultants cannot be held responsible for damage arising from soil shrinkage or heave issues related to the retention or removal of trees on site.*
- *The author of the AIA report does not have formal qualifications in the areas of structural engineering or law. However, making comment on such matters from an arboricultural perspective is both within the normal scope of our instructions and also within the range of the author's experience. Notwithstanding this, specialist professional advice must be sought to clarify/confirm any engineering specification/methods, or legal considerations that this report may contain.*
- *Treatment recommendations assume that the client understands that tree management is a continuing process, requiring regular attention and that as part of this process the condition of the trees should be thoroughly reassessed at regular, timely intervals, with hazard checks after periods of likely tree stress, e.g. after periods of severe weather.*
- *Where a tree is subject to a Tree Preservation Order (TPO) and/or stands within a designated Conservation Area, it will be necessary for the tree owner or his/her appointed agent to ensure appropriate compliance with planning requirements, before any recommended, non-urgent treatments can be undertaken. (See Section 12.0).*
- *The AIA report is provided to detail impartially the potential tree constraints posed to the development proposal as identified at the site and advise on the tree protection measures and methodologies to be employed, in the interest of safeguarding the short and long term health of significant nearby trees.*
- *The AIA does not provide any guarantees that the associated Local Planning Authority (LPA) will agree with the opinion of the Consulting Arboriculturist, or grant planning consent based on the content and findings of the AIA report.*
- *This report is compiled into a single PDF file designed for electronic release. If printing this document, please note that the plan drawings may be a different size or orientation to the standard A4 / portrait of the rest of the report. Some PDF reader software may also automatically adjust the size of drawings included in this report.*
- *The Tree Protection Plan (TPP) is drawn to the scale indicated in Section 7.5 and features a scale bar for cross reference purposes.*

2.1 – Time Limits

It should be understood that trees are not static objects, but growing, living organisms; and their condition, size and relationship to buildings and other trees can change significantly and sometimes unpredictably over a period of time. Therefore, this report has a validity period of 12 months from the date of publication and is subject to any suggested management recommendations being undertaken within the correct time frames.

2.2 – Severe Weather Limitations

Impacts of severe drought, storm, inundation, land slip or subsidence are not covered by this report.

2.3 – Tree Safety Matters / Tree Risk Assessment

The Arboricultural Impact Assessment (AIA) in accordance with *BS 5837:2012 (Trees in relation to design, demolition and construction - Recommendations)* is carried out in sufficient detail to gather data for and to inform the current project.

Our appraisal of the structural integrity of trees on and adjacent (if applicable) to the site is of a preliminary nature and sufficient only to inform the current development proposal. The tree assessment is carried out from ground level as is appropriate for this type of survey, without invasive investigation.

The disclosure of hidden tree defects cannot therefore be expected. Whilst the survey is not specifically commissioned to report on matters of tree safety, we report obvious visual defects that are significant in relation to the existing and proposed land use. As such, General Management Recommendations (GMR) or Preliminary Management Recommendations (PMR) may be made regarding the assessed trees, in respect of good urban tree management.

2.4 – Visual Tree Assessment (VTA)

The Visual Tree Assessment (VTA) method of inspection is an internationally recognised tree hazard assessment method developed by Prof. Claus Mattheck: *Body Language of Trees – a handbook for failure analysis (HMSO, 1994).*

The basis of VTA is the identification of (external) symptoms which a tree produces in reaction to a weak spot or area of mechanical stress. These can then be interpreted in terms of potential direct impact hazard features within a tree.

The VTA method of inspection does not allow for opinions to be made concerning the risk of a trees potential to cause indirect impact on nearby structures. Indirect impact refers to potential problems caused by changes in soil moisture content in shrinkable soils (i.e. those soils with a high clay content); to which trees can be a contributing factor.

The tree inspection survey undertaken at the above site was conducted in accordance with Stage 1 of the VTA process.

3.0 – Process

The front and rear garden re-landscaping proposal at 24 Belsize Lane is currently in the feasibility, planning and design stage. The Arboricultural Impact Assessment (AIA) in accordance with *BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations* was commissioned to be undertaken as part of the feasibility study at the planning stage of the process.

The elements of the AIA at this stage in the process were to undertake the tree survey, categorise the trees and identify the tree constraints to the development, with a view to assisting with the conceptual design and feasibility of the landscaping proposal.

The identified tree constraints should inform and assist with the landscaping design, including advising on any necessary engineering solutions and demolition/construction methods which will need to be explored to minimise potential damage to retained trees in the short and long term, both above and below ground level. Additionally, the identified constraints will also later help to determine the specification and positioning of tree protection measures to be employed at the site, to safeguard the trees above and below ground throughout all development phases to completion.

Following the identification of tree constraints, the AIA evaluates the identified direct and indirect effects of the proposed design in relation to nearby trees. The assessment will consider the effect of any tree loss or damaging activities proposed in the vicinity of retained trees. Activities such as:

- *Removal of existing structures or hard surfacing;*
- *Installation of new hard surfacing;*
- *The location and dimensions of all proposed excavations or alterations in ground levels;*
- *Construction of any new structures above ground level.*

In addition to the permanent works, account should be taken to the buildability of the scheme in terms of access, plant machinery use, adequate operational space and provision for the storage of materials including topsoil, without inflicting damage to the retained trees. Post development pressure on nearby trees must also be closely considered and assessed.

As well as an evaluation of the extent of the impact on existing trees, the AIA includes and details within this document:

a) The tree survey data;

b) Trees selected for retention, clearly identified (e.g. by number) and marked on a plan with a continuous outline;

c) Trees to be removed, also clearly identified (e.g. by number) and marked on a plan with a dashed outline or similar;

d) Trees to be pruned, including any access facilitation pruning, also clearly identified and labelled or detailed as appropriate;

e) Areas designated for structural landscaping that need to be protected from construction operations in order to prevent the soil structure being damaged;

f) Evaluation of impact of proposed tree losses (if applicable);

g) Evaluation of tree constraints and production of a draft tree protection plan including details of tree protection measures;

h) Issues to be addressed by an arboricultural method statement where necessary in conjunction with input from other specialists associated with the project.

4.0 – General Site Observations

The property at 24 Belsize Lane is currently nearing completion of a phase of development works to the main house, which were previously permitted under a separate planning application.

Some hard landscaping works were approved as part of the original approval, but the current condition discharge application provides the necessary detail for all of the proposed hard and soft landscaping works.

At present, the front garden is predominantly hard surfaced with large paving slabs, with steps leading up to the ground floor level of the house. The east side of the front garden is populated with shrub vegetation and one Pear tree (T7) is located on the western side, close to the front gate.

The rear garden features an existing paved patio surface which extends centrally throughout most of the garden. A raised planting bed is located beyond the dominant Coast Redwood tree (T4) which is located centrally within the garden lawn. The raised bed is approximately 200mm higher than the natural ground level of the rear garden.

In addition to on site trees, at the time of the original tree survey undertaken in November 2017 (in respect of the AIA to support the house development proposal), the rear garden was over run by an abundance of heavily overgrown, mixed species shrubs and other under storey vegetation. The rear garden was largely unmanaged and vegetation predominantly growing along the east and west side boundaries had extensively spread into the central parts of the garden.

A re-assessment survey was undertaken on the 8th March 2019 and the tree data has been updated accordingly in this AIA report following the reassessment. It was noted that a large amount of the overgrown shrubs and vegetation in the rear garden had been cleared since the original tree survey, including the removal of T3, but the stump of this tree remained. It is understood from Mr. Ganguly, that T3 was wind thrown during a period of severe windy weather in February 2018 and was subsequently removed.

In terms of significant trees to be assessed as part of the Arboricultural Impact Assessment (AIA) for the re-landscaping proposal, six trees were originally identified in the rear garden and one tree at the front at the time of the tree survey in November 2017. These trees were therefore reassessed on the 8th March 2019.

Following the reassessment survey on the 8th March 2019, revised details of the seven individual trees surveyed for inclusion in the AIA can be found in the Individual Tree Data Table in Section 5.0 below, with additional tree data notes provided in Section 5.2.

5.0 – Individual Tree Data

Tree No.	Species	Height (m)	Stem Diameter (mm)	Branch Spread (m)	First Significant Branch Height and Direction of Growth (m)	Canopy Height (m)	Life Stage	General Comments Inc. Physiological and Structural Condition	Preliminary / General Management Recommendations	Estimated Remaining Contribution (Years)	Category
1	*Flowering Cherry (Prunus.sp)*	9	125	N – 3 E – 2 S – 3 W – 3	4 – E	4	Y	Physiological Condition – Fair Structural Condition – Fair Sparsely populated crown framework, only 2 main scaffold branches. Some minor sized deadwood visible. Subject to a Tree Preservation Order (TPO)	_	10+	C 1
2	*Apple (Malus.sp)*	6	150	N – 3 E – 3 S – 2 W – 1	1 – E	1.5	SM	Physiological Condition – Fair Structural Condition – Fair Western crown spread reduced back to the boundary line where branches would have been overhanging the boundary. Some minor sized deadwood visible.	SEE SECTION 7.3 BELOW.	10+	C 1
3	*Purple Leaved Plum (Prunus cerasifera)*	_	_	N – - E – - S – - W – -	_		_	_ Tree removed since the original tree survey in November 2017. *It is understood that T3 was wind thrown during a period of severe windy weather in February 2018.*	_	_	_
4	*Coast Redwood (Sequoia sempervirens)*	15	400	N – 3 E – 3 S – 3 W – 3	4 – E	3	Y	Physiological Condition – Good Structural Condition – Good Dominant tree in the rear garden. Single, tapering stem. Good buttressing and a well balanced crown. Some minor sized deadwood visible internal to the evergreen foliage, which is a typical occurrence in many evergreen coniferous species.	_	20+	B 1
5	*Flowering Cherry (Prunus.sp)*	11	200	N – 3 E – 1 S – 2 W – 2	8 – NW	9	SM	Physiological Condition – Fair Structural Condition – Fair Major and minor sized deadwood visible in the crown including broken out suspended branches. Southern crown framework limb broken and died off. Ivy on stem from base to 3m restricting close assessment of stem condition.	SEE SECTION 7.3 BELOW.	10+	C 1

Tree No.	Species	Height (m)	Stem Diameter (mm)	Branch Spread (m)	First Significant Branch Height and Direction of Growth (m)	Canopy Height (m)	Life Stage	General Comments Inc. Physiological and Structural Condition	Preliminary / General Management Recommendations	Estimated Remaining Contribution (Years)	Category
6	*Purple Leaved Plum (Prunus cerasifera)*	10	1 – 175 2 – 175 SE - 250	N – 2 E – 1 S – 3 W – 3	2 – E	3	SM	Physiological Condition – Fair Structural Condition – Poor Twin stemmed below 1.5m. Included bark at stem unions at 300mm – 800mm. Major and minor sized deadwood visible in the crown. Northern crown framework limb died off. Ivy growing on the co-dominant stems from base of stems and into the crown framework, restricting close assessment of stem condition.	SEE SECTION 7.3 BELOW.	10+	C 1
7	*Pear (Pyrus.sp)*	9	125	N – 2 E – 1 S – 1 W – 2	2 – E	2	SM	Physiological Condition – Good Structural Condition – Good Some minor deadwood visible in the crown.	SEE SECTION 7.3 BELOW.	20+	B 1

5.1 - Key to Table 5.0

1) Height describes the height of the tree from ground level in metres.
2) Stem Diameter is the diameter of the trunk in millimetres, measured at 1.5m from ground level. For multi stemmed trees, a single stem diameter equivalent (SE) is calculated and indicated beneath the measurements of each separate stem. (Est.) indicates the stem diameter was estimated due to the tree being obscured and/or inaccessible to measure.
3) Branch Spread is the average length of branch spread from the centre of the tree in the direction of each cardinal point in metres.
4) First Significant Branch Height and Direction of Growth – Clearance height from the ground of the first major structural branch of the trees' crown and its direction of growth.
5) Canopy Height is the distance between the lowest visible canopy branches and ground level in metres.
6) Life Stage is represented as: Y= young (*in first third of life expectancy*), SM = Semi Mature (*in second third of life expectancy*), M= Mature (*final one third of life expectancy*). Trees considered to be beyond their likely life expectancy are normally classed as OM = Over Mature or V = Veteran.
7) Physiological Condition relates to the vitality of the tree, Structural Condition relates to the presence of structural defects. *(i.e. dead branches, cavities, splits, included bark etc.)*
8) Estimated Remaining Contribution is an indication of the minimum useful contribution the tree will provide.
9) Preliminary Management Recommendations detail any additional arboricultural practices to be undertaken before construction activity begins. General Management Recommendations (GMR) may also be indicated and relate to tree surgery management works which are recommended in respect of good tree management and are not made in the context of a potential development project. (See Section 5.2).
10) Category grading is based on tree categorization guidelines provided within The British Standard 5837:2012 Trees In relation to design, demolition and construction - Recommendations (See 6.0 below)

- Major deadwood = over 25m diameter, Minor deadwood = under 25mm diameter.

PMR = Preliminary Management Recommendation - i.e. VTA Stage 2/3, semi invasive tree condition investigations (Tomography/Resistograph testing etc.) or climbed tree inspection.

GMR = General Management Recommendation – i.e. Tree surgery management works (pruning, felling etc, including Access Facilitation Pruning). ***For on site trees which are under the management control of the applicant.***

GMR ADVISORY = General Management Recommendation – i.e. Tree surgery management works (pruning, felling etc, including Access Facilitation Pruning). ***For off site trees which are NOT under the management control of the applicant.***

5.2 – Tree Data Notes

The trees detailed individually in Section 5.0 above are those which were considered in the Arboricultural Impact Assessment (AIA).

*General Management Recommendations – (GM*R) for tree surgery works may have been made in the interest of good tree management and are not necessarily required in relation to the proposed development project.

Preliminary Management Recommendations – (PMR) may have been made where *further investigation into tree health and condition is required before a decision can be made concerning the safe retention of a tree.

**Further investigation normally refers to (but is not restricted to):*

- *Stage 2/3 of the Visual Tree Assessment (VTA) process, which involves semi invasive testing with Tomography, Resistograph and Fractometer equipment on areas of the tree where a significant internal structural defect is suspected following the Stage 1 VTA.*
  Stage 2/3 VTA can determine in much greater detail the extent and severity of suspected internal wood decay and/or structural defects and also determine the strength of supporting wood tissue.

- *Recommendations for a climbed inspection to be undertaken, to assess the upper sections of the tree stem or crown, where a significant structural defect is suspected but could not be quantified during the Stage 1 VTA undertaken from ground level.*

Any tree surgery work recommended must be undertaken following the correct procedures relating to trees protected by Tree Preservation Orders (TPO), or which are growing within a designated Conservation Area, where applicable to both on site and off site trees. (See Section 12.0).

Any works recommended to be undertaken to off site trees which are outside of the management responsibility of the applicant, must also be permissible by the tree owners, except in situations where Common Law allows. (The Statutory Protection process as above still applies where relevant).

Any *General Management Recommendation (GMR)* which may have been made to remove hazardous trees, deadwood from crowns, or removal of invasive climbing vegetation (such as Ivy) from TPO or Conservation Area trees does not require permission from the Local Authority before actioning. However, it is considered good practice to inform the Local Authority of any intended emergency tree removals and/or deadwood and Ivy removal works. In the case of complete tree removal emergencies, taking before and after photographs is strongly recommended.

Advisory GMRs are made in the interests of good tree management and should be brought to the attention of those who own or have the responsibility to manage the trees concerned.

All recommended tree work must be undertaken in accordance with guidelines set out in *BS 3998:2010 Tree work – Recommendations (As updated). (See Section 10.3).*

The following sections provide information regarding the categorisation of the surveyed trees and the tree constraints which have been identified at the site.

6.0 – Tree Categorisation

The purpose of Tree Categorisation as detailed in *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*, is to identify the quality and value of existing tree stock, allowing informed decisions to be made concerning which tree(s) should be retained or removed should development occur. This process is the starting point of the tree survey, following a land survey and should ideally, be undertaken before any site design or layout is proposed.

Trees are given a category grading based on individual tree assessment, in line with the categorisation methodology as detailed in Table 1 of *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations.* Table 1 is reproduced as an informative below:

Table 1 **Cascade chart for tree quality assessment**

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a 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, irremediable, 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) • 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, or very low quality trees suppressing adjacent trees of better quality *NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see 4.5.7.*			See Table 2
	1 Mainly arboricultural qualities	**2 Mainly landscape qualities**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
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)	See Table 2
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 though remediable 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	See Table 2
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 150 mm	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	See Table 2

To easily identify the category grading for each tree assessed for inclusion in the AIA, all tree identification numbers on the Tree Constraints Plan(s) and Tree Protection Plan(s) are shown in a colour which represents the tree's category grading. Table 2 below, again reproduced from *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*, details the identification colours to be used for each category grade:

Table 2 **Identification of tree categories**

Category (from Table 1)	Colour [A)]	RGB code [A)]
U	Dark red	127-000-000
A	Light green	000-255-000
B	Mid blue	000-000-255
C	Grey	091-091-091

[A)] Colours verified against http://safecolours.rigdenage.com/palettefiles.html#files [viewed 2012-03-26].

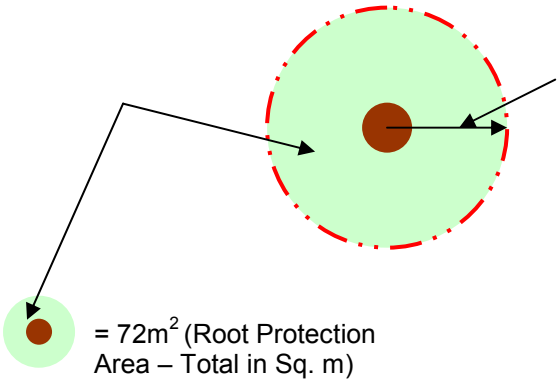
Once it has been established which trees can and are suitable to remain and are worthy of retention, necessary measures to protect them throughout the course of the development project must be undertaken.

7.0 - Tree Constraints

The tree constraints are the influences the trees will have below and above ground level in relation to the development proposal. The below ground constraints are represented by the trees Root Protection Area (RPA), the above ground constraints are represented by the trees size and position, including shading patterns caused by crown density and spread which may affect light into newly developed buildings.

7.1 - RPA (Root Protection Area) – (Below Ground Constraints)

The nominal RPA radius is taken from the centre of the tree stem, encircling the tree to give the RPA Area (example based on T4 shown below) **:



** Tree root systems do not necessarily show the symmetry indicated in the above example, the development of all roots is influenced by the availability of water, nutrients, oxygen and soil penetrability. As far as these conditions allow, the root system tends to develop sufficient volume and area to provide physical stability.

The following table indicates the calculated Root Protection Areas (RPA) for the trees which were assessed as part of the Arboricultural Impact Assessment (AIA) and are to be retained.

The RPAs have been calculated using stem diameter measurements (taken at 1.5m above ground level) collected at the time of the tree survey and are detailed in Table 5.0. RPA calculations are made using formulae detailed in *BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations* – Section 4.6 and Table D.1.

Tree No.	RPA Radius (m)	RPA Area (m^2)
1	1.5	7
4	4.8	72

7.2 – Above Ground Constraints

The above ground constraints caused by tree heights and the spread of branches can pose constraints to the development project in respect of demolition work, new building design, position and operational space requirements.

For example, if the lateral branch spread of a tree extends into areas where development activity is likely, there is a risk of potential direct impact from site machinery and construction activity on the tree crowns which may cause damage to limbs and branches. Tree stems and exposed buttress roots are also above ground constraints which need to be considered in respect of possible impact damage to them. Post development pressure is also of material consideration in respect of future tree pruning requirements and frequency following completion of the development.

Shading issues should also be considered in respect of tree size, form and position in relation to the proposed new structure.

Species characteristics such as density of foliage, and whether trees are deciduous or evergreen are important factors to consider in respect of shading issues, which may affect light levels into buildings.

Any proposals for above ground service installations such as telecommunication cables should also be considered with close reference to the above ground constraints posed by the trees at the development site, their location and their crown spreads.

The Tree Protection Plan (TPP) in Section 7.4 below indicates the above and below ground constraints of all relevant trees at and adjacent to the site, with comments relating to the identified constraints in Section 7.3. Canopy heights (ground clearance) and crown spread measurements are recorded in the Individual Tree Data Table in Section 5.0.

7.3 – Tree Constraints Assessment

Following the re-assessment tree survey undertaken on the 8th March 2019 of the seven originally recorded trees at the site, and with due consideration paid to certain factors relating to the re-designed landscaping concept at the front and rear of the dwelling, T1 and T4 are proposed to be retained.

Tree Removals

- At the time of re-assessment on the 8th March 2019, T3 had already been removed to ground level along with numerous overgrown shrubs and other vegetation within the rear garden;
- *(It is understood from Mr. Ganguly that T3 had been wind thrown during a period of severe windy weather around February 2018).*
- T7 is proposed to be removed to facilitate repairs to underground drainage (see below);
- T2, T5 and T6 are proposed to be removed in the context of the proposed re-landscaping scheme and are supported for the following reasons:

    - **T2 –** Unremarkable Category C grade tree which is in poor overall condition. T2 has been managed poorly in the past, including low branch removals on all sides of the tree resulting in a minimal crown framework and poor structure.

    - **T5 & T6** – Both trees are Category C grade, growing in close proximity to each other and tight along the eastern boundary line of the rear garden. Both trees are directly impacting on the existing boundary fencing, causing physical damage. T5 & T6 are unremarkable individual trees, due to historical suppression from abundant, overgrown shrubs and vegetation in the rear garden, which had been largely unmanaged for a long period of time. Both trees feature structural defects such as visible crown die back and both exhibit low vitality with only a small amount of live shoots and buds visible. *(Not in leaf at the time of inspection).*

    - **T6 –** In addition to the above, where the new soakaway is proposed to be constructed beneath the Dining Terrace, the excavations required would impact greatly on the RPA calculated for T6, which would further result in declining physiological health of the tree, due to root severance inflicting an adverse impact on its extended feeder root network and subsequently reducing the trees' ability to perform essential life processes. It was therefore recommended that T5 and T6 should be removed, with additional replacement trees planted to mitigate their loss and also improve the long term amenity value of the tree stock in the rear garden.

    - **T7 –** Although T7 was originally categorised as a B grade tree and in generally good physiological and structural health, it is understood from the Development Team that a drainage pipe running beneath the trees' root plate is severely damaged and cannot be repaired without the need to remove the tree. The decision to remove T7 was not made by Tree Sense AC, or as a factor for the re-landscaping of the front garden. It has been advised by the building contractors that the reason for T7 to be removed is to facilitate the necessary drainage repairs, which cannot be successfully achieved with the tree being retained. An additional replacement tree is proposed to be planted as part of the front garden re-landscaping scheme, to mitigate the loss of T7.

7.3 – Tree Constraints Assessment – Cont'd

Following the re-assessment tree survey undertaken on the 8th March 2019 of the seven originally recorded trees at the site, and with due consideration paid to certain factors relating to the re-imagined landscaping concept at the front and rear of the dwelling, T1 and T4 are proposed to be retained.

Retained Trees

- T1 (Cherry) is subject to a Tree Preservation Order (TPO);
- T4 (Coast Redwood) is the dominant tree in the centre of the rear garden.

  - T1 is to ultimately feature new soft landscaping around it on the western side of the rear garden adjacent to the Dining Terrace.
  - During the hard landscaping phases to construct the Dining Terrace, Seating Terrace and Astro Turf area, T1 must be excluded from all site activity by installing fencing to create a Construction Exclusion Zone (CEZ) to encapsulate the stem and the RPA (1.5m radius), as well as to protect the soil structure for the proposed mixed planting bed from soil compaction in this area. (See Tree Protection Plan in Section 7.4).
  - Being central to the rear garden, T4 and its calculated RPA cannot be wholly excluded by installing a fenced CEZ based on the extent of RPA, as this would be unworkable due to the operational and access restrictions this would cause as new hard and soft landscaping will be being undertaken on all sides of the tree.
  - T4 is to be afforded a reduced CEZ using fencing which encapsulates the stem and a significant portion of the RPA, to prevent as much as possible, any adverse impact above or below ground level without restricting access and operations.
  - Temporary ground protection is to be installed outside of the CEZ fencing around T4 where sectors of the RPA would otherwise be exposed within areas of currently unmade ground and be susceptible to soil compaction and contamination. The ground protection will also serve to protect the soil structure where new trees, shrubs and plants are to be planted to ensure they are able to become established and survive. (See Tree Protection Plan in Section 7.4).

  - Where the calculated Root Protection Area (RPA) for T4 is shown to be affected by the new Seating Terrace to the south, the following engineering controls and construction measures are proposed:

    Seating Terrace:

  - The use of a Three Dimensional Cellular Confinement System (CCS) sub base, with a permeable surface finish is recommended to be used in the construction of the Seating Terrace surface. (See Tree Protection Plan in Section 7.4).
  - The specification of the CCS sub base which is to be installed over the affected RPA sector for T4 is to be accurately determined as fit for purpose by a suitably qualified specialist.
  - Full, detailed specification and construction methodology of the Seating Terrace detailing the CCS specification and extent of use will be supplied separately by the Development Team. *(See Section 9.4 below for more information on CCS sub base systems).*
  - The Tree Protection Plan in Section 7.4 indicates the area where the CCS must be used over the RPA sector for T4.
  - Where the new retaining wall is to be installed across the width of the garden at the north western end of the new Seating Terrace, excavations required for a maximum 250mm deep wall foundation are to be undertaken using hand tools only.
  - Should any tree roots be encountered during excavation works measuring over 25mm in diameter, they must not be severed without prior consultation with the Project Arboriculturist.

7.3 – Tree Constraints Assessment – Cont'd

- Where the calculated Root Protection Area (RPA) for T4 is shown to be affected by the new Astro Turf lawn to the northwest, the following engineering controls and construction measures are proposed:

  Astro Turf Lawn:

- Lowering the ground level of the raised planting bed to the main garden level is deemed unacceptable, due to the fact that the extended feeder root network for T4 will be highly concentrated in this area, which presents an excellent rooting environment where moisture and base nutrients will be readily available in the upper (A&B) soil horizons.
- It is likely that root ingress into this area will be extensive, as adventitious feeder roots would have shallowed out and concentrated within the A&B soil horizons of the raised bed, where moisture and base nutrients will be easily obtainable.
- As such, any excavations to lower the level of the raised bed would result in root severance and the loss of a significant percentage of the feeder root network.
- Considering this constraint, the alternative solution for the Astro Turf area was decided to increase the ground level northwest of T4, up to that of the existing raised planting bed, a ground level increase of approximately 200mm to create an extended, raised surface where the Astro Turf Lawn is to be constructed.
- Timber railway sleepers are to be installed at ground level to extend the existing raised planting bed to the northwest of T4, where the calculated RPA is shown to be affected. No excavation to install the railway sleepers are required, but will be secured using stainless steel support rods.
- Existing vegetation within the raised planter and at garden level will be cleared using hand tools only.
- Plantex membrane is to be installed over the vegetation cleared soil, then clean stone gravel and sharp sand laid, before installing the final Astro Turf Surface. (Full specification to be provided separately by the Development Team).

The above assessment summarises the above and below ground level tree constraints identified at the site, with consideration paid to the relevant elements of the re-landscaping proposal. A summary of required tree protection controls and measures is also provided.

The Arboricultural Method Statement (AMS) in Section 10.1 provides further details of the tree protection and control measures to be employed at the site, to ensure the trees are safeguarded above and below ground level throughout the course of the project and in the long term. Detailed specifications of special engineering recommendations will be supplied in detail separately by the Development Team where necessary.

7.4 – Tree Protection Plan (TPP)

ASTRO TURF LAWN:

The calculated RPA for T4 is shown to extend into the area where the new Astro Turf lawn is proposed. No ground level lowering or soil stripping is to occur in this area, as the rooting environment needs to be maintained. Lowering ground levels within the RPA will result in the loss of a significant proportion of the tree root network.

The existing ground level (which in part is raised approx. 200mm behind a low stone retaining wall to the northwest of T4) is to remain unaltered, other than the removal of surface level vegetation using hand tools only, to prepare for the turf installation.

The proposed railway sleeper edging (to extend the area for the Astro Turf) is to be laid at ground level and secured with Stainless Steel support rods. The sleepers are not to be excavated into the soil to prevent root severance.

The extended area is to be in filled, raising the ground level to the height of the existing raised planting bed to create a level surface for the Astro Turf to be installed. Existing vegetation within the raised planter and at garden level will be cleared using hand tools only. Plantex membrane is to be installed over the vegetation cleared soil, then clean stone gravel and sharp sand laid, before installing the final Astro Turf surface.
(Full detailed specification to be provided separately by the Development Team).

ASTRO URF LAWN:

The proposed railway sleeper edging is to be laid at ground level only and not excavated into the soil to prevent any root severance.

The edging is to be installed 2.5m inside the RPA and to within 2.5m of the stem base, where major woody roots are likely to be present as well as the extended network of feeder roots. As such, no excavations at this close distance from the tree stem are to occur to prevent severance and loss of major roots and the extended feeder root network.

The existing turf layer and any other surface vegetation can be removed as necessary using hand tools only, to allow the individual railway sleepers to be laid to create the extended raised bed edging.

NORTHWEST TERRACE WALL AND SEATING TERRACE:

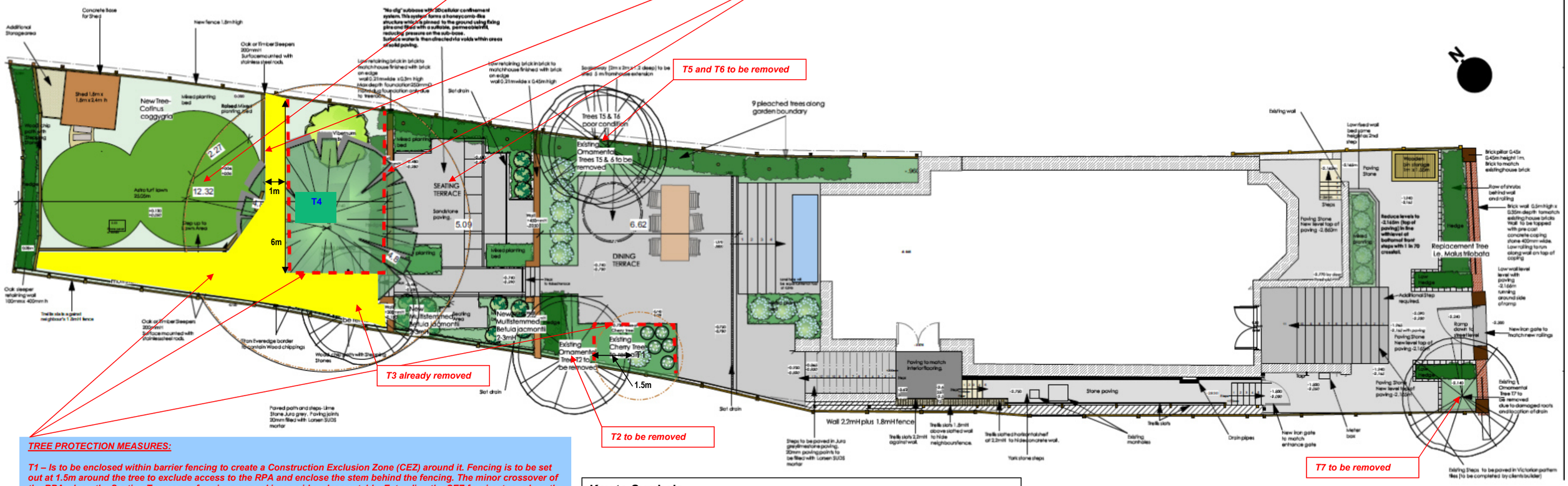
The terrace wall is also proposed to be constructed within the calculated RPA of T4 and the seating terrace surface will also extend within the RPA.

The retaining wall is to be constructed using shallow foundations of no more than 250mm in depth, excavated using hand tools only. Any tree roots exposed during excavations which measure over 25mm in diameter must not be severed without prior consultation with the Consulting Arboriculturist.

The seating terrace is to be constructed with the use of a 3 Dimensional Cellular Confinement System (CCS) sub base. The full specification for which is to be determined by a suitably qualified specialist.

Full specification and installation methodology will be supplied separately by the Development Team.

Following the removal BY HAND of any existing hard standing and/or turf layer, the CCS is laid at existing ground level as the sub base for the surface. CCS is designed for "no dig" sub bases where surfacing is required over tree root areas. The surface finish must also be of a permeable nature to allow aqueous and gaseous exchange to underlying tree roots. (See Section 9.4)



TREE PROTECTION MEASURES:

T1 – Is to be enclosed within barrier fencing to create a Construction Exclusion Zone (CEZ) around it. Fencing is to be set out at 1.5m around the tree to exclude access to the RPA and enclose the stem behind the fencing. The minor crossover of the RPA where the Seating Terrace surface is proposed is considered acceptable. Extending the CEZ fencing to enclose the area for proposed new planting will also ensure the soil structure is protected from compaction and contamination.

T4 - Due to the awkward location of T4 in the centre of the rear garden with proposed works intended on all sides of the tree, exclusion of the calculated RPA cannot be wholly achieved by CEZ fencing due to access and operational restrictions.

As such, CEZ fencing is to be set out to exclude as much as possible the RPA of T4 without restricting site access. The fencing is to extend from the northeast boundary fence line and enclose the stem and a significant portion of the RPA.

Where RPA sectors will feature outside of the CEZ fencing, temporary ground protection must be installed as shown in YELLOW on the Tree Protection Plan. The ground protection measures must be fit for purpose to prevent soil compaction and contamination in the central portion of the garden, which is mainly unmade ground (lawn).

The specification of the CEZ fencing and temporary ground protection required is detailed in Sections 9.2 and 9.3 respectively.

ALL TREE PROTECTION MEASURES MUST BE INSTALLED PRIOR TO COMMENCMENT OF THE DEVELOPMENT WORKS AND REMIAN IN SITU UNTIL COMPLETION OF THE HARD LANDSCAPING PHASE.

WHERE NECESSARY, TREE PROTECTION MEASURES WILL NEED TO BE ADJUSTED / REMOVED TO ALLOW FOR SOFT LANDSCAPING WORKSTO BE UNDERTAKEN, INCLUDING NEW TREE PLANTING.

SOFT LANDSCAPING WORKS SHOULD ONLY BE UNDERTAKEN AFTER ALL HARD LANDSCAPING WORKS HAVE BEEN FULLY COMPLETED.

Key to Symbols

T# = Category A Tree
T# = Category B Tree
T# = Category C Tree
T# = Category U Tree

= Barrier Fencing – Construction Exclusion Zone (CEZ)

= Temporary Ground Protection

= Nominal Root Protection Area (RPA)

SCALE BAR

7.5 - Tree Protection Plan (TPP) Notes:

The Tree Protection Plan (TPP) in Section 7.4 is shown to approximate 1:100 scale based on the Front and Back Garden Concept drawing *(Drawing No.VS 8)* provided by KR Garden Design.

The TPP is provided only to indicate the position, category and numbering of the surveyed trees and provide an indication of the tree constraints by showing a graphic of the calculated Root Protection Areas (RPA) and relevant tree crown spreads.

Positions of barrier fencing and temporary ground protection measures are shown on the plan as required and are to conform to the specifications detailed in Sections 9.2 and 9.3 respectively.

Do not scale from this drawing, all dimensions to be checked on site using tree RPA radius details provided in Section 7.1.

Measurements annotated on the TPP are to be used to measure out and determine the positioning and installation of the Construction Exclusion Zone (CEZ) fencing and ground protection at the site, unless otherwise detailed or advised.

The indicated barrier lines to create the CEZs and temporary ground protection measures are suggested as the simplest and most effective layout to exclude all construction activity from the retained trees above and below ground level, throughout all development phases to completion, without restricting access and operations at the site.

All required tree protection measures are to be installed before development work begins and after any Preliminary or General Management Recommendations have been completed. All tree protection measures are to remain in place and undisturbed throughout all development phases until completion.

8.0– Project Phasing

The following phasing of the re-landscaping project is proposed:

- **Pre-development Phase 1** – Undertaking of all General Management Recommendations (GMR) (Tree surgery works – See Section 9.0 below).
- **Pre-development Phase 2** - Installation of all required tree protection measures in the rear garden (i.e. barrier fencing to create the on site Construction Exclusion Zones (CEZ) and all temporary ground protection measures as detailed).
- **NO DEVELOPMENT WORKS ARE TO COMMENCE BEFORE ALL TREE PROTECTION MEAUSRES ARE FULLY AND CORRECTLY INSTALLED.**

- **Development Phase 1** –Hard Landscaping - (Including installation of the CCS sub base for the Seating Terrace, the north west retaining wall construction, and the Astro Turf area construction).
- **Post Phase 1 Development** – Remove all hard landscaping construction tools, machinery, waste, materials, skips, and any other hard landscaping construction related apparatus.
- **Development Phase 2** –Soft landscaping including new tree planting (Tree protection measures to be adjusted where necessary to allow for soft landscaping works to be undertaken).
- **Post Phase 2 Development** – Dismantle and remove the Construction Exclusion Zone (CEZ) fencing and temporary ground protection measures.
- **TREE PROTECTION MEASURES MUST BE THE LAST APPARATUS TO BE REMOVED FROM SITE ON COMPLETION OF ALL DEVLEOPMENT PHASES**.

All tree surgery works recommended must be undertaken prior to commencement of the development phases and prior to the installation of the Construction Exclusion Zone (CEZ) fencing and temporary ground protection.

9.0 – Tree Surgery Works

The following section summarises the recommended tree surgery works which should be undertaken prior to commencement of the development phases.

- *Tree Removals:*
    - *T2, T5, T6 and T7 are to be removed to ground level and the stumps removed using a stump grinder.*
    - *The stump which remains following the previous removal of T3 is to be removed using a stump grinder.*

9.1 – Construction Exclusion Zone (CEZ) – (General)

Retained trees on and/or in close proximity to the site must be protected by barriers and/or suitable ground protection before any materials or machinery are brought onto the site, and before any demolition or construction work commences.

Where all activity can be excluded from the tree's Root Protection Area (RPA), vertical barriers are to be erected to create a Construction Exclusion Zone (CEZ). Where, due to site constraints construction activity cannot be fully or permanently excluded in this manner from all or part of a trees' RPA in unmade ground, suitable temporary ground protection is to be installed over exposed RPA sectors.

The RPA measurements of the surveyed trees (as shown in section 7.1 above) are used to help determine the Construction Exclusion Zone (CEZ) around the trees, protecting them during the construction phases to eliminate the possibility of damage above or below ground level.

The CEZ is created by fencing off the area and/or installing suitable ground protection that is fit for purpose, using the calculated distance of the trees' RPA Radius as shown in the table in section 7.1 above.

The CEZ is required so that the calculated RPAs of trees remain undisturbed during the development process by excluding all activity from the area, or by protecting any exposed RPA sectors from pedestrian and vehicular traffic with suitable ground protection, if exposed outside of the barrier fencing. The CEZ should also be positioned to protect tree stems, buttress roots and any low tree branches which may travel beyond the calculated RPA. In these cases, barrier fences should be extended to incorporate low hanging crown branches behind them if possible.

The storage of building materials also must not occur within the CEZ. An area for storage of materials, fuels, spoil and the mixing of cement and concrete will be determined during the planning phase to ensure the RPAs of the trees are not affected. (See Arboricultural Method Statement (AMS) 10.1 below).

Materials which can be considered as contaminates such as cement, concrete mixings, spoil and fuels, whose accidental spillage would cause damage to a tree, should be stored and handled well away from the outer edge of any tree RPA. This also includes vehicle washings and care must be taken to ensure that sloping ground will not allow for contaminates to travel into the CEZ.

Fires on site should be avoided if possible. Where they cannot be avoided, they should not be lit where heat could affect foliage or branches. The potential size of the fire and wind direction should be taken into account when determining the fires location and it should be attended at all times until safe enough to leave. Notice boards, cables or other services must not be attached to the tree stems.

The CEZ must be considered as sacrosanct and not removed or altered without prior consultation with a Tree Sense Arboriculturist. The fencing should also display a sign with words to the effect of "Construction Exclusion Zone – Keep Out".

Care must also be taken to ensure that any site activity involving any cranes or vehicles with booms, jibs and counterweights can operate without coming into contact with the protected tree(s). CEZ fencing should be extended to encapsulate low spreading branches if they travel beyond the calculated RPA.

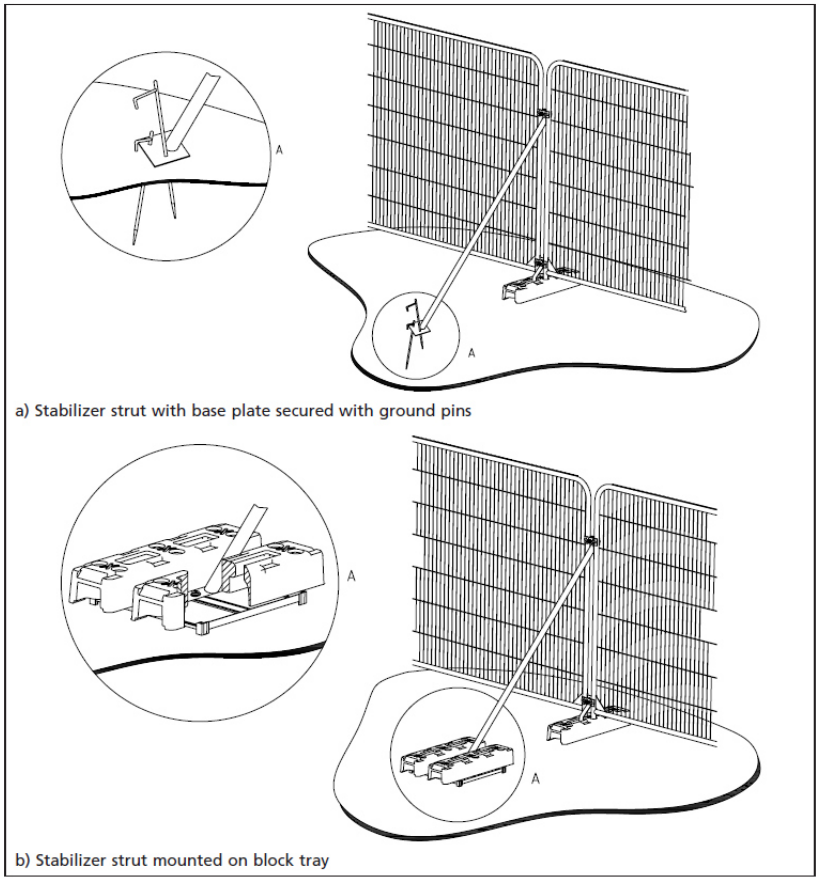
Direct impact from vehicles with tree crowns and stems can cause irreparable damage and may make their safe retention impossible. Consequently, any transit or traverse of plant in proximity to trees should be conducted under the supervision of a banksman, to ensure that adequate clearance from trees is always maintained.

The following sections detail the Construction Exclusion Zone fencing and ground protection specifications as detailed in BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations.

9.2 - Protective Barrier Specification

N.B - Barrier fencing should be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work being undertaken around them.

Figure 3 Examples of above-ground stabilizing systems



a) Stabilizer strut with base plate secured with ground pins

b) Stabilizer strut mounted on block tray

For the re-landscaping proposals at 24 Belsize Lane, with consideration paid to the development intensity and prevailing ground conditions, barrier fencing to the specifications shown in Figure 3a will be the most suitable to create the Construction Exclusion Zone (CEZ) at the rear of the site.

Steel mesh "Heras" type fencing (minimum 2m height) with stabilizer struts and base plates secured with ground pins (as shown in Figure 3a above), will be used to create the Construction Exclusion Zones (CEZ) in the rear garden, where it is predominantly lawn surfaced.

The CEZ fencing is to be installed to the layout as shown on the Tree Protection Plan (TPP) in Section 7.4.The CEZ is to be set back around T4 as shown, to allow adequate space for site access and operational space around the tree, which is located centrally within the rear garden.

Where the fencing is to be set back, temporary ground protection is necessary over the RPA sectors for T4 shown to feature outside of the CEZ. (See Tree Protection Plan (TPP) in Section 7.4 and ground protection specification details in Section 9.3 below).

No site related access is permitted beyond the fence lines or inside the CEZs once installed, throughout all development phases.

The CEZ fencing must be installed prior to any site works commencing and must be the last apparatus to be removed from the site on completion, along with the temporary ground protection.

9.3 - Ground Protection Specification

Where construction working space or temporary construction access is justified within the RPA, this should be facilitated by a set-back in the alignment of the tree protection barrier.

In such areas, suitable existing hard surfacing that is not proposed for re-use as part of the finished design should be retained to act as temporary ground protection during construction, rather than being removed.

Where the set-back of the tree protection barrier would expose unmade ground to construction damage, new temporary ground protection should be installed as part of the implementation of physical tree protection measures prior to work starting on site.

New temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.

The ground protection might comprise one of the following:

a) **For pedestrian movements only**, a single thickness of scaffold boards placed 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. 100 mm depth of woodchip), laid onto a geotextile membrane;

b) 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. 150 mm depth of woodchip), laid onto a geotextile membrane;

c) 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.

In all cases, the objective should be to avoid compaction of the soil, which can arise from the single passage of a heavy vehicle, especially in wet conditions, so that tree root functions remain unimpaired.

For wheeled or tracked movements, within a tree RPA, the ground protection should be designed by an engineer to accommodate the likely loading. A “no dig” solution must be used to avoid root loss due to excavation. In addition the structure of the hard surface should be designed to avoid localized soil compaction. The use of a three dimensional cellular confinement system (CCS) acting as a load suspension layer is recommended and will avoid localized soil compaction by evenly distributing the carried weight over the track width and wheelbase of any vehicles that will use the access.

Temporary ground protection measures are necessary at the site, as due to operational and access restrictions; the calculated RPA for T4 cannot be wholly excluded by CEZ fencing alone.

CEZ fencing at the rear of the site around T4 will be adjusted to allow adequate operational and access space and as such, the RPA sectors exposed outside of the CEZ fencing must be afforded adequate protection against soil compaction and contamination.

The ground protection specification detailed in Point A above is recommended and is fit for use only by pedestrian operatives (Highlighted Blue).

NO WHEELED OR TRACKED PLANT MACHINERY IS PERMITTED TO OPERATE OVER THIS SPECIFICATION OF GROUND PROTECTION.

9.4 - Cellular Confinement System Sub Base (CCS)

It should be understood that trees are not static objects but living, growing organisms and this is true of all component parts of a tree, including its root system. Tree roots will continue to increase in diameter on an annual basis in the same fashion as the trunk, stems, limbs, branches and shoots. Each season a new layer of cambium tissues are produced beneath the protective bark and as the tree grows over the years the previous year's cambium becomes less functional and ultimately ceases to function as part of the translocation process, ultimately forming the heartwood of the tree. The annual rings on a cut log indicate this growing process, where the wood growth between each distinctive ring represents a past season's growth of cambium tissue.

With this in mind, it must be appreciated that following the laying of a surface over tree roots, allowance must be given for the future development, functionality and increase in size and spread of the underlying tree roots.

CCS sub base and surface solutions are recommended for temporary and permanent surfacing over areas where tree RPAs have been calculated.

A CCS sub base is designed to be installed without the need for excavation into the soil, therefore, eliminating the need for severance of tree roots.

The CCS system comprises of an expandable cellular mattress that is then filled with a clean stone sub base above a geotextile membrane. The honeycomb-like structure is made of robust high density polythene (HDPE) that is simply stretched out and filled with clean angular material. The strength of the structure comes from the binding together of the infill, but with a CCS system this is achieved without compaction and without reduction in permeability.

Perforated cell walls allow the infill to bind with the contents of the adjacent cell, but with sufficient space for movement of water and air to nearby underlying tree roots. As the infill contains no fines and the geotextile layers prevent clogging from particles washing into the system, the structure remains permeable and protects the roots for the lifetime of the tree.

Quick and easy to install, CCS systems also dramatically cut down the depths of sub base required by as much as 50% and significantly reduce surface rutting, increasing the long term performance of the finished surface and ensuring that tree roots remain protected from vertical weight loads.

A permeable surface finish over a CCS sub base for permanent surfaces will also ensure aqueous and gaseous exchange can still occur in the underlying soil, which is vital for tree root survival, development and function.

The following web link to Greenfix Soil Stabilisation and Control Ltd. provides further details and information regarding this type of sub base system, which is specifically designed for surface installations over areas where tree roots are present:

http://greenfix.co.uk/product/geoweb-tree-root-protection-system/

The Development Team will submit a detailed specification and methodology for the use of the CCS in the Seating Terrace construction.

10.0 – Arboricultural Implications

The potential direct and indirect impacts on trees which may arise from the proposed landscaping proposal and related construction activity, (identified following the tree constraints assessment are as follows:

- **Root severance inside tree Root Protection Areas (RPA);**
- **Soil compaction inside tree Root Protection Areas (RPA);**
- **Soil contamination inside tree Root Protection Areas (RPA);**
- **Direct damage to trees above ground level (stems, buttressing and crowns);**
- **Restriction of aqueous and gaseous exchange in soils (new hard surfaces).**

Site specific controls relating to mitigation measures to be implemented in respect of these implications can be found in the Arboricultural Method Statement 10.1 below.

10.1 – Arboricultural Method Statement (AMS)

Arboricultural Method Statement for tree protection throughout the duration of the proposed landscaping works.

Control measures must be implemented as detailed below to safeguard all assessed retained trees above and below ground level against the potentially damaging effects of construction works and related site activity.

The Arboricultural Method Statement (AMS) below is to be read and implemented with reference to the Tree Protection Plan (TPP) in Section 7.4, to identify:

- Trees to be retained – identified by a tree graphic and individually numbered in their Category Grade colour on the plan;
- Existing trees to be removed - Annotated on the TPP;
- Protective fence positions - (Therefore, the Construction Exclusion Zones);
- Areas where temporary ground protection measures are to be installed.

A copy of this AMS and the Tree Protection Plan (TPP) shall be maintained on site at all times and must be made available to all site personnel to read and acknowledge.

A Site Personnel Induction Form (Template provided in Appendix B) must be completed and kept on file for all individual operatives working at the site, including sub contractors.

T2, T5, T6, T7 are to be removed prior to commencement of the re-landscaping project.

Stumps for T2, T5, T6, T7 and for T3 (which was previously removed prior to the reassessment tree survey), are to be removed using a stump grinder.

Construction Exclusion Zone (CEZ)

- No site related access, material storage, waste storage, or construction works are to be undertaken inside any fenced Construction Exclusion Zone (CEZ) at the site. The Construction Exclusion Zones (CEZ) are to be afforded protection at all times and will be dictated by barrier fencing to the correct specification as detailed in Section 9.2.

- The protective fencing is required to be sited in accordance with the Tree Protection Plan (TPP) in Section 7.4, based on measurements annotated on the plan, to ensure CEZ fencing is installed in the correct locations to offer effective protection.

- The CEZ fence line is to be set back inside the nominal RPA calculated for T4, to allow the necessary access and operational space, with temporary ground protection measures installed over the RPA sectors which are shown to be exposed outside of the CEZ fencing. (See Tree Protection Plan (TPP) in Section 7.4).

- All protective fencing shall be erected and all temporary ground protection measures must be fully installed prior to the commencement of any site works. (E.g. before any construction materials, tools, or machinery are brought on site).

- The specification of protective fencing to create the CEZs in the rear garden will be minimum 2m high, steel mesh “Heras” panels with stabilizer struts secured with base plates and ground pins as detailed in Section 9.2 – (Figure 3a).

- The CEZ fencing must have weatherproof signs attached stating that this is a **Construction Exclusion Zone and that ALL ACCESS IS PROHIBITED within the fenced off area.**
- Once installed the CEZ fencing must remain in place and undisturbed until completion of Development Phase 1 (Hard landscaping phase), only being adjusted as is necessary to allow soft landscaping works to be undertaken in Development Phase 2.

10.1 – Arboricultural Method Statement (AMS) – Cont'd

- Temporary ground protection measures must be installed where necessary as detailed on the Tree Protection Plan (TPP) in Section 7.4, to the specification detailed in Section 9.3, without deviation.
- Ground protection measures are necessary as detailed, due to the awkward location of T4 in the central portion of the rear garden. CEZ fencing is to be set back inside the RPA for T4 to allow access and operational space to the north and west of the tree within the rear garden. The specification of temporary ground protection advised is suitable only for **pedestrian operative use only. No wheeled or tracked plant machinery is permitted to operate over the ground protected area.**
- The CEZ fencing and temporary ground protection measures must remain in place and undisturbed throughout Development Phase 1 (Hard landscaping phase) to completion.
- The CEZ fencing and temporary ground protection measures may only be adjusted/removed following completion Development Phase 1 (Hard landscaping phase), to allow for soft landscaping works in Development Phase 2 as is necessary.
- Tree protection measures (CEZ fencing and temporary ground protection) must be the last apparatus to be removed from the site on completion of all development phases.

Access Details

- No personnel or plant/vehicle access is permitted beyond the installed CEZ fencing at any time throughout the course of the development phases.
- The purpose of the CEZ fencing is to prevent all site access and operations from occurring inside tree RPAs or near trees above ground level. Where operational access would be unacceptably restricted by CEZ fencing, the fencing is to be set back and temporary ground protection installed, as detailed above.
- All site access into the rear garden will be via the side access passage on the western side of the dwelling from the front garden.

Contractors car parking

- No on site car parking is available.

Site Welfare Facilities

- All temporary site welfare facilities, site office and storage areas for materials can be located within the curtilage of the front and rear garden, but must not enter the CEZ at any time.

Storage Space & Waste Management

- No storage of bulk construction materials or construction waste is permitted inside any nominal RPA shown for retained trees at the site, or beyond the installed CEZ fencing, or on the temporary ground protection at anytime.
- The ground protected areas are fit for the purpose of site operative access only, **not for bulk material or waste storage** and must be kept clear of obstruction at all times throughout all phases of the development to completion;
- No dry or liquid waste is to be stored or discarded inside any nominal RPA shown for retained trees at any time.
- Contaminate materials such as oils, fuel, chemicals and gases will be stored and handled away from the CEZs and must be stored and handled in accordance with the *Control of Substances Hazardous to Health Regulations 2002 (COSHH).*
- No soil, demolition debris, or any other waste materials will be stored beyond the CEZ fencing, within the RPAs or under canopies of the retained trees, whichever is the greater. All construction related waste is to be removed from the site at the earliest opportunity.

10.1 – Arboricultural Method Statement (AMS) – Cont'd

Demolition works

- The existing shed located towards the rear boundary is to be dismantled by hand and all resulting debris and waste materials removed from the rear garden at the earliest opportunity.

Construction within RPAs of retained trees

- Seating Terrace:
  - The use of a 3 Dimensional Cellular Confinement System (CCS) sub base is to be used for the construction of the Seating Terrace, due to the incursion into the nominal RPA calculated for T4 as shown on the Tree Protection Plan (TPP) in Section 7.4.
  - The full specification and construction methodology for the Seating Terrace using the CCS is to be designed by a suitably qualified specialist and supplied separately by the Development Team.

- Northwest retaining wall (Seating Terrace):
  - The retaining wall to the northwest of the Seating Terrace is to be constructed with a shallow foundation, no deeper than 250mm below the existing ground level.
  - **All excavations for the foundation must be undertaken using hand tools only.**
  - Should any woody tree roots over 25mm in diameter be exposed during the course of any hard surface removals or excavation works, they must be immediately wrapped or covered in hessian cloth to prevent desiccation and protect from temperature changes whilst exposed and the project Arboriculturist advised immediately.
  - Any roots exposed over 25mm in diameter must not be severed without prior consultation with the project Arboriculturist.

- Astro Turf area:
  - The area to the northwest of T4 is to feature a new Astro Turf surface.
  - An existing planting bed raised approx. 200mm higher than the main rear garden ground level features within this area and the nominal RPA for T4 is shown to incur into this area.
  - Lowering the ground level of the raised planter is not considered acceptable for reasons detailed in the Tree Constraints Assessment Section 7.3.

  - Railway sleepers laid at ground level are to be used to extend the raised area and the ground level inside the extended area will be raised to that of the existing planting bed (approx. 200mm).
  - Vegetation inside the planter and at garden ground level is to be removed using hand tools only.
  - Where the Astro Turf area is proposed to extend closer towards T4 and inside the RPA, The extended area is to be in filled, raising the ground level to the height of the existing raised planting bed, to create a level surface for the Astro Turf finish to be installed.
  - **Existing vegetation within the raised planter and at garden level will be cleared using hand tools only.**
  - Plantex membrane is to be installed over the vegetation cleared soil, then clean stone gravel and sharp sand laid, before installing the final Astro Turf surface. (Full detailed specification to be provided separately by the Development Team, which was not available at the time of writing).

10.1 – Arboricultural Method Statement (AMS) – Cont'd

Other Proposed new outside hard surfaces

- A negligible crossover of the proposed Dining Terrace surface is shown inside the nominal RPA for T1.
- The incursion is minor at the extremity of the RPA and does not pose a significant constraint to the installation of the new Dining Terrace surfacing.

Underground Services

- No new underground services are proposed to be installed inside calculated RPAs for the retained trees.

Additional Precautions

- All Preliminary / General Management Recommendations for tree surgery works to on site trees must be undertaken prior to commencement of the development phases and prior to the installation of the Construction Exclusion Zone (CEZ) fencing and temporary ground protection.

- Fires at the site are not permitted at any time.

- No notice boards, cables or other services will be attached to any tree stem, limb or branch.

- Should any woody tree roots over 25mm in diameter be exposed during the course of any hard surface removals or excavation works, they must be immediately wrapped or covered in hessian cloth to prevent desiccation and protect from temperature changes whilst exposed and the project Arboriculturist advised immediately.

- Any roots exposed over 25mm in diameter must not be severed without prior consultation with the project Arboriculturist.

- Consideration will be given at all times to ensure that sloping ground will not allow for any contaminating substances to travel into areas where tree RPAs may be affected.

- Should spillages of contaminates occur, water is readily available on site and will be used to flush spilt materials through the soil and avoid contamination to tree roots. At the time of any spillage the main contractor will immediately contact the Consulting Arboriculturist for advice.

- Any significant build up of dust or particulate material on tree foliage should be hosed down to prevent clogging of stomata in the leaves.

- No cranes or vehicles with extending booms/jibs are proposed to be in use at the site where tree canopies may be affected.

- Skips (if required) must be positioned where lorry lifting gear can operate without coming into contact with tree branches.

- A Construction Management Plan (CMP) was not available at the time of writing and should be requested from the Development Team, if required.

10.2 - Responsibilities

- It will be the responsibility of the main contractor to ensure that the planning conditions attached to planning consent are adhered to at all times and that a monitoring regime in regards to tree protection is adopted on site.
- The main contractor must further assign tree protection monitoring duties to one or more individuals working at the site, who will be responsible for regular tree protection monitoring and supervision.
- The individual(s) assigned tree protection monitoring duties must:
    - Be present on site for the majority of the time;
    - Be aware of (a) the Tree Protection Plan and (b) the tree protection measures to be installed and maintained throughout the build;
    - Be responsible for ensuring all tree protection measures are adhered to as detailed in the Arboricultural Impact Assessment (AIA) report and Arboricultural Method Statement (AMS);
    - Ensure all site operatives without exception read and understand the tree protection and control measures detailed in the AIA and AMS;
    - Keep on file all individual Site Personnel Induction forms which must be signed by all site operatives indicating they have read and understood the control measures detailed in the AIA report and AMS;
    - Maintain a written record of regular Tree Protection / Construction Exclusion Zone inspections, to be kept up to date by the person(s) who have been designated the inspection and monitoring duties;
    - Have the authority to stop any work that is causing, or has the potential to cause, harm to any retention trees;
    - Be responsible for ensuring that all site operatives including sub contractors are aware of their responsibilities toward on/off site trees and the consequences of the failure to observe these responsibilities;
    - Make immediate contact with the Consulting Arboriculturist in the event of any tree related problems occurring, whether actual or potential. *(Contact details including telephone number and email address is listed on the Title Page)*
- The Construction Exclusion Zone fencing, temporary ground protection and all signs must be maintained in position at all times and checked on a regular basis by the on site person(s) who have been designated that responsibility.
- The main contractor will be responsible for contacting the Local Planning Authority and the Consulting Arboriculturist at any time issues are raised relating to the trees on site.
- If at any time pruning works are required permission must be sought from the Local Planning Authority first and then carried out in accordance with *BS 3998:2010 Tree Work – Recommendations* (As updated).
- The main contractor will ensure the build sequence and phasing is appropriate to ensure that no damage occurs to the trees during the construction processes. Protective fences will remain in position and undisturbed until completion of ALL construction works on the site.
- The main contractor will be responsible for ensuring sub-contractors do not carry out any process or operation that is likely to adversely impact upon any tree on site.

10.3 - Tree Work Standards

All recommendations for tree surgery works made within this report have been done so in the interests of sound arboricultural management and to ensure tree surgery works are performed to a professional standard in accordance with *BS 3998:2010 Tree work – Recommendations.* (As updated).

All remedial tree surgery work which is suggested in this report must be undertaken to conform to standards and procedures set out in *BS 3998:2010 BS 3998:2010 Tree work – Recommendations.* (As updated)

- Tree Sense Arboricultural Consultants are happy to recommend a trusted tree surgery contractor if required, to ensure that all recommended tree surgery work is performed to a high standard.
- Tree Sense Arboricultural Consultants only recommend contractors who are approved by The Arboricultural Association to ensure that the highest standards of tree surgery work are met at all times.

11.0 - Report Summary

This Arboricultural Impact Assessment (AIA) report has been produced following a tree survey conducted in accordance with BS5837:2012 Trees *in relation to design, demolition and construction – Recommendations*.

The information produced within this AIA report follows a reassessment tree survey conducted on the 8th March 2019, in relation to the updated hard and soft re-landscaping works proposed at the front and rear of the property at 24 Belsize Lane.

The AIA report provides an assessment of the trees associated with the above site, based on information supplied by the Development Team and observations recorded at the time of the tree survey.

If any further design changes are made to any aspect of the proposed re-landscaping project due to the identified tree constraints, operational restrictions, geotechnical concerns or otherwise, revisions or additions to tree protection, damage mitigation measures and site layouts will need to be made and a revised report produced.

This is a Development Control, not a Building Control focused document. In regard to the latter, this deals with foundation depth and design in relation to trees using NHBC/Zurich national guidance. For advice, consult with the local council Building Control Officer or an approved NHBC inspector in order to gain Full Plans Approval or a Completion Certificate. The latter are governed by the Building Act 1984 and Building Regulations 2010. As such the above Building Control issues are outside the remit of a Consulting Arborist.

Full detailed specifications of the development project and recommended engineering methods etc. will be supplied where necessary by the Development Team separately.

Detailed information regarding the site setup, plant use, waste management and construction methodology was not available at the time of writing.

If required, a Construction Management Plan (CMP) should be requested from the Development Team, for submission to the LPA. The CMP must take fully into consideration and adhere to all required tree protection control measures, as detailed in the AIA report.

12.0 – Legal and Planning Consents

- Appropriate legal and planning consent should be gained before undertaking any tree work; for example if the tree(s) are subject to a Tree Preservation Order (TPO), permission must first be obtained from the Local Authority. Permission is not required for emergency tree work on dead, dying or dangerous TPO trees; however the Local Authority should still be advised.
- Six weeks notice is required to be given to the local authority via a Section 211 Notice for any proposed tree surgery work on trees situated within a designated Conservation Area. Permission is not required for emergency tree work on dead, dying or dangerous trees situated within a Conservation Area; however the Local Authority should still be advised.
- Tree owners have a responsibility as a common law duty of care, as well as responsibilities under statutory law, to ensure that trees growing within the boundaries of their property are maintained to reduce to an acceptable level the risk of potential harm befalling other people or property.
- In the course of undertaking any tree work, the client is advised to ensure that operational assessments and procedures are in place, and to take due consideration of the legal requirements.

- Key legislation includes (but is not restricted to):

    - The Wildlife and Countryside Act (1981)
    - Occupiers Liability Act (1957/84)
    - Highways Act (1980/86)
    - Town and Country Planning Act (1990/Regulations 1999/Amendment 2008/09)
    - Anti-Social Behaviour Act (2003) – Part 8 (High Hedges)
    - The Countryside Rights of Way Act (2000)
    - The Conservation (Natural Habitats etc.) Regulations (1994)
    - The Badgers Act (1992)

13.0 - Publications

- Other publications which are relevant to the development proposal to which further reference is advised includes but is not restricted to:

    - National House Building Council (N.H.B.C) Chapter 4.2 – (Building near trees);

    - National Joint Utilities Group (NJUG) Volume 4 – (Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees).

Chris Wallis *Tech Cert (ArborA), AHort II (Arb.)*
Tree Sense Arboricultural Consultants

Appendix A – Construction Exclusion Zone Inspection Form

Construction Exclusion Zone Inspection Form
Site Address:_____ **Client Name**:_____ **Inspected By**_____ **Inspection Date & Time**:_____

Construction Exclusion Zone – Barrier Fencing
Comments: **Action:**
Construction Exclusion Zone – Temporary Ground Protection
Comments: **Action:**
General Observations and Comments

Appendix B – Site Personnel Induction Form

Name:

Site Address:

Date:

Declaration	**Tick to Confirm**
I have read and understand the Arboricultural Method Statement and the requirements to be employed / actioned at the site regarding tree protection.	
I understand that all tree protection measures (fencing and ground protection) must not be moved or disturbed throughout the development project without prior agreement with the Consulting Arboriculturist.	
I understand that certain operations must only be undertaken under supervision of the Consulting Arboriculturist and/or must not be undertaken without their approval.	
I acknowledge that any concerns I have regarding the protection of trees at and adjacent to the development site will be brought to the attention of the Site Manager/Supervisor.	
I acknowledge that I must not cause direct or indirect damage to any on site or neighbouring tree, either above or below ground level during the course of my daily operational duties.	

SIGNATURE: _____