CMK

Horticulture & Arboriculture Ltd.

Arboricultural Assessment, Arboricultural Impact and Tree Protection Strategy Report

Lucan Shopping Centre, Lucan, Co. Dublin

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Arboricultural Assessment

1.1 Client brief & Methodology

CMK Hort + Arb Ltd. were commissioned by Jennings Design Studio to undertake an arboricultural assessment of trees on sites located within Lucan Shopping Centre, Lucan, Co. Dublin (image 1). The fieldwork was undertaken on the 5th of October 2021.

The survey methodology and documentation follow the recommendations contained within BS 5837 (2012). The analysis of the trees was undertaken using the VTA methodology as developed by Mattheck and Breloer (1994).

Image 1. Red line outline of tree survey boundary located at Lucan Shopping Centre, Lucan, Co. Dublin (image © Google maps 2021).

1.2. General description of trees

A total of 102 trees were identified and assessed (38 were included within 2 groups - #501/502). Nine trees (#441-449) are outside the site boundary and were included due to proximity. The condition and categorisation of individual trees is contained within section 5 of this report and can be located within drawing TLUC001 101. For breakdowns of vigour refer to chart 1, and for species chart 2.

This survey concentrates on the trees either side of the boundary with Hillcreast Grove (images 2-3) on the north west site boundary.

The trees located here are primarily sycamore (*Acer pseudoplatanus*) and ash (*Fraxinus excelsior*), with a single pedunculate oak (*Quercus robur*). The trees on the Hillcrest Grove side predate the concrete boundary wall which was constructed circa 1990. These trees were likely part of a agricultural boundary hedge dating from the early 20th century as seen on 25 inch survey OS maps (ref. pg31).

The overall quality of these trees is moderate to poor (Table 1/#441-449; pg24), having suffered from a lack of appropriate management inputs. A mature sycamore (#445) has failed and is recommended for removal.

On the Lucan shopping Centre side of the boundary are 14 self-seeded sycamore (*Acer pseudoplatanus*) (#460-473). Many of these young trees risk undermining the adjacent boundary wall due to their proximity.

The trees within the main car park area consist primarily of small leaf lime (*Tilla cordata*), Norway maple (*Acer platanoides*) mountain ash (*Sorbus aucuparia*) and purple leaf plum (*Prunus Cerasifera Nigra*).

These trees are of is moderate to poor quality. With the mountain ash and purple leaf plum having failed in many cases (images 9-10).

Category	Number	% of total
A	2	1.9%
B	28	27.5%
C	57	55.9%
U	16	15.7%

Table 1. Tree Category breakdown (see page 6 for tree category explanations).

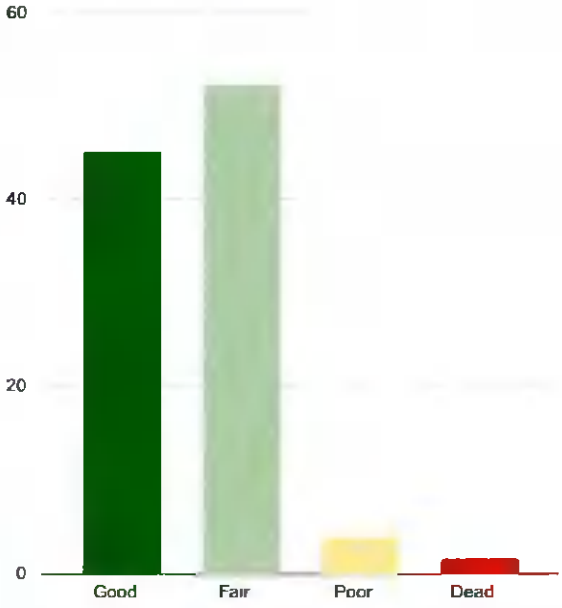


Chart 1. Tree vigour breakdown.

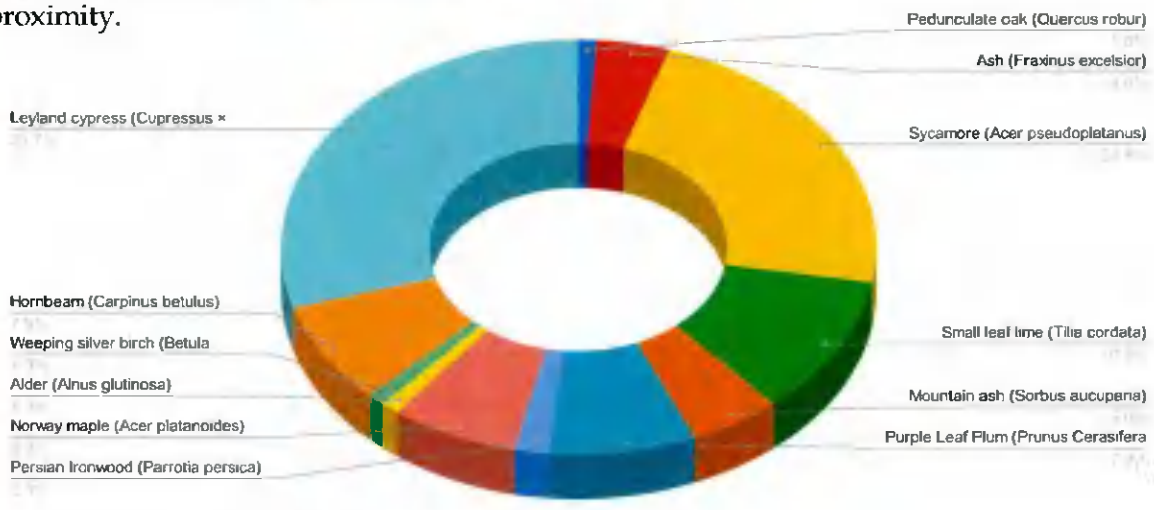


Chart 2. Tree species breakdown.

Image 2. Sycamore and ash trees on the boundary with Hillcrest Grove, viewed from within Lucan Shopping Centre car park.

Image 3. Sycamore and ash trees on the boundary with Hillcrest Grove, viewed from Hillcrest Grove.

Image 4. Small leaf lime at the north east entrance from Newcastle Road (#450-454).

Image 5. Norway maple within a central area of the Lucan Shopping Centre car park.

Image 6. Seven early mature hornbeams that form a gappy hedge parallel with Newcastle road (Group #501)

Image 7. Row of leyland cypress on the southern boundary with Westbury Drive (Group #502).

Image 8. Cantre of car park with Norway maple and small leaf lime centre (Group #479-481).

Image 9. Mountain ash (#486 & #487) in a state of decline due to pruning activity.

Image 10. Norway maple (#489) and Purple Leaf Plum (#490) which have failed.

Section 2. Arboricultural Impact and Mitigation

2.1 Arboricultural Impact

The direct impact of the proposed extension of Lucan Shopping Centre will necessitate the removal of three category 'C' trees. A further 15 category 'U' trees, which are recommended for removal due to having failed or having been compromised due to their potential to undermine an existing boundary wall.

Category	Number	% of total
A	0	0%
B	0	0%
C	3	5.3%
U	15	100%

Table 3. Tree Removal Categories

Two of these category C trees (#465, 466) are located at base of a wide 10m sloping open grass area adjacent to boundary wall with Hillcreast road. These will be impacted by level changes required for construction of a turn-around location for trucks (refer to drawing TLUC001 106).

The third (#461), is located directly east of an existing sub-station. The relocation of which will necessitate this trees removal. The location of this tree is shown on drawing TLUC001 106.

Nine category 'U 'trees are also located adjacent to boundary wall with Hillcreast road. These have been found to be unsuitable for retention in there existing location as they have potential to undermine the boundary wall in the long term.

The impact of the loss of these trees is not considered significant, as these self-seeded sycamore have not matured and have formed poorly due to neighbouring competition near the line of trees that formed a historic boundary the predates the construction of the boundary wall (#441-449).

There will be some loss of screening for the residents of Hillcreast Road that is afforded by these trees, however the retention of the mature and longer established public trees on the western side of the boundary wall compensates for this loss.

2.2 Mitigation

A Tree Protection Strategy (see page 8) is provided as part of the arboricultural element of the submission with the aim of ensuring retained trees are maintained for the duration of the construction stage of the development free of negative construction related impacts. Tree protection details and locations are shown on drawings TLUC001 109. These show locations were tree protection fencing is required to protect overhanging canopies during construction.

CMK Hort + Arb Ltd. recommend a new generation of trees to replace those lost by the proposed level changes necessary for construction. To populate any gaps in remaining screening, a single line of 10 downy birch (*Betula pubescens*) 12-14 cmg would be suitable at this location, with an understory of spindle (*Euonymus europaeus*) and guelder-rose (*Viburnum opulus*). Refer to Jennings Design Studio drawings for locations.

Section 3. Tree Protection Strategy

This section is designed to outline the procedures which will be undertaken to effectively retain trees free from adverse construction impacts for the duration of the construction period on the site of proposed car-park development at Lucan Shopping Centre, Lucan, Co. Dublin. The section is divided into sub-sections which begin at the pre-construction planning stage and follows on to post construction re-assessment of retained trees.

3.1 Key issues

Appointment of an arborist (Site Arborist) to oversee all works relevant to trees.

Scheduling of tree and construction works.

Establishment of tree protection (refer to drawings Tree Protection TLUC001 109).

Monitoring of tree protection (adherence to the Tree Protection Code of Practice).

Supervision of works in the vicinity of trees.

Post construction re-assessment of retained trees.

3.2. Consulting Arborist

A Site Arborist shall be appointed prior to the commencement of site construction works and will be responsible for the setting up and monitoring of tree protection, liaising with local authority tree/planning officers and providing feedback and advice to the design construction teams on issues relevant to trees. The Site Arborist shall be retained for the duration of construction works and should be appointed to carry out a post-construction tree survey/assessment.

3.3 Scheduling of works

3.3.1 Pre-construction meetings/tree works

- An onsite meeting will be held if required, with all relevant parties; including the Developer and or his Agents, Site Arborist and Local Planning Authority
- Remedial works to trees throughout the site where indicated as necessary within the Tree Works Schedule. All works will be undertaken to BS 3998 2010 Tree Work and/or to current best practice.
- Erection of tree protection fencing as per recommendations contained within BS 5837:2012 Trees in relation to design, demolition and construction -Recommendations. Tree protection to be erected under supervision of Site Arborist prior to main construction works being undertake on site (refer to drawings Tree Protection TLUC001 109).

3.3.2 Construction period

- The Site Arborist shall monitor tree protection.
- The Site Arborist shall specify any necessary remedial works to trees which may arise due to construction works.
- The Main Contractor shall carry out any instructions made by the Site Arborist with regard to the protection of retained trees and ensure where necessary that these instructions are followed by any sub-contractors.

3.3.3 Post construction works will consist of:

- Re-survey of retained trees and the implementation of measures contained with the survey document.

3.4 Preservation of Trees

3.4.1 Contractors obligations

The Contractor shall take all precautions to ensure that any trees which are not required to be taken down under the contract shall remain undisturbed and undamaged. All works to trees and all operations adjacent to trees should be undertaken in accordance with the Code of Practice. The Contractor must appoint a qualified arboricultural contractor to undertake all tree works subject to approval by the Consulting Arborist. The Contractor shall undertake no works to trees unless instructed by the Contract Administrator. All works on or within the Construction Exclusion Zone are to be supervised by the site arborist. Five working days notice of intention to undertake works to be given.

3.4.2 Setting out: Protected Tree Zone/Construction Exclusion Zone

The tree protection zone shall be set out in accordance with the Code of Practice (5) and as per drawings Tree Protection TLUC001 109. A notice 'Construction Exclusion Zone' shall be placed on tree protection fencing at regular intervals along the protective fencing. This notice shall include contact details for the Site Arborist. Strictly no access should be permitted to this zone unless instructed by the Site Arborist.

The Contractor is to maintain the protective fencing in good condition to the satisfaction of the Site Arborist for the duration of the contract. Any damage to fencing is to be reported to the Site Arborist immediately. Damaged fencing is to be repaired within 2 hours of the damage occurring. All works within the vicinity of the damaged fencing are to be suspended until the fencing is repaired.

3.4.3 Maintenance of Protected Tree Zone

The Site Arborist should be given 5 days notice of any works within or access required to this zone. The 'Protected Tree Zone' should under no circumstances be used for storage of materials, equipment, or site debris. No fires should be lit within the "Protected Tree Zone", or equipment washed or cleaned.

3.5. Code of Practice for the preservation of trees

The following specification is intended for the preservation of trees.

These guidelines will help sustain vigour and minimise adverse growing conditions for trees set out for retention.

3.5.1 Code of Practice notifications

The Code of Practice will be brought to the attention of all site personnel including those of the Main Contractor, Sub-Contractors and Engineering Specialists associated with the project.

All operations to be in accordance with BS 5837:2012 Trees in relation to design, demolition and construction -Recommendations.

The Contractor should purchase and make available on site a copy of the above

3.5.2 The Site Arborist:

- Supervise the installation of tree protection fencing.
- Supervise all tree works and assess on-going tree protection.
- Liaise with the relevant authorities during the project.
- Constantly monitor the project with regard to tree health to ensure that no damage is caused to the subject trees during the operational works.
- Report any negligent damage to trees which will prejudice their health.
- Monitor, where necessary, all works carried out by the Arboricultural Contractor and Main Contractor within the 'Protected Tree Zone'.

3.5.3 Arboricultural Contractor:

- Submit a full method statement containing machinery to be used, removal of wood etc. to the Site Arborist.
- Carry out works to the most up to date arboricultural practices available e.g. BS 3998. Recommendations for tree work (as amended).
- Undertake work only with suitably qualified operatives in constant consultation with the Site Arborist.
- Trees identified for removal will be section felled in wooded areas so as not to damage remaining trees.

3.5.4 Main Contractor:

- Appoint a member of staff to be responsible for tree protection and this person shall be the point of contact between the Main Contractor and the Site Arborist.
- Undertake all work in accordance with this specification.
- Ensure that all personnel, operatives, sub-contractors etc. are aware of this specification and operate accordingly
- Notify the Site Arborist of any potential conflicts that may affect the health, vigour and viability of trees.

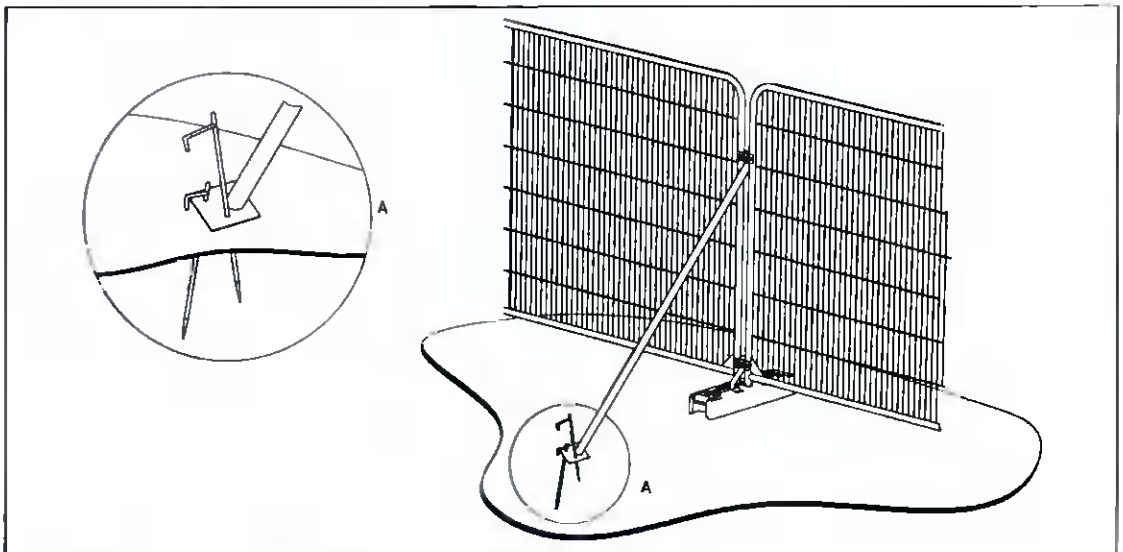
3.5.5 Access:

Access to the site and service roads shall be agreed with the Site Arborist prior to commencement of works. Where it is deemed necessary for heavy machinery access the contractor shall refer to the guidelines within BS 5837 2012 and liaise with the Site Arborist to instigate the most appropriate root protection system.

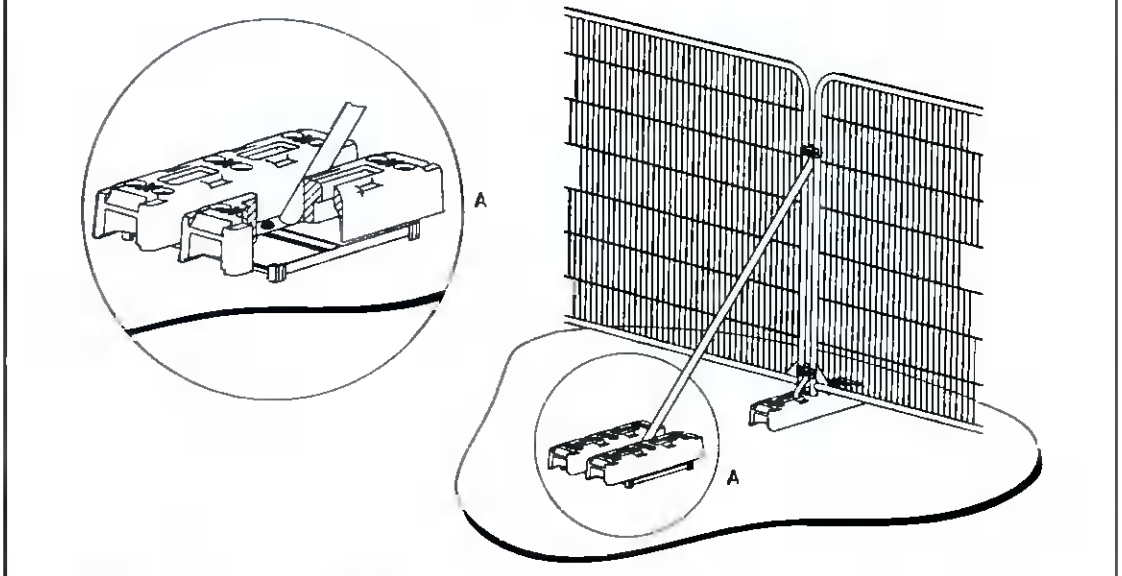
3.6 Post Construction

A post construction report on the condition of trees should be undertaken and all recommendations made within this report should be carried out to BS3998 Tree Works.

Examples of above-ground stabilizing systems



a) Stabilizer strut with base plate secured with ground pins



b) Stabilizer strut mounted on block tray

Image 10. Tree Protection Detail (Heras type fencing or similar approved).

4. Arboricultural Method Statement

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 works.

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.

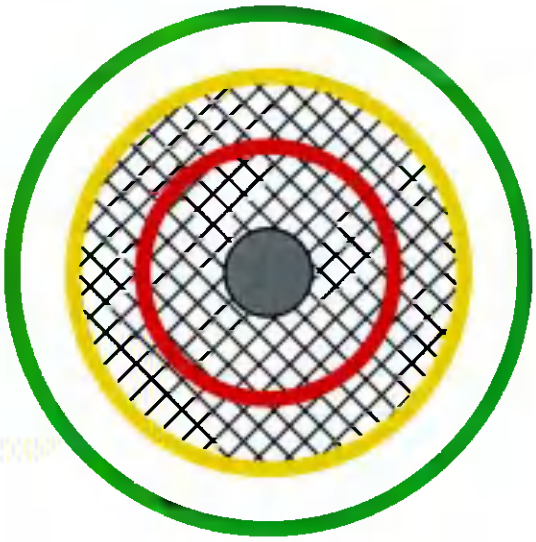
4.1.1 Fine Roots

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'.

FIGURE 1 – Tree Protection Zone



Key

Trunk of tree

Canopy or branch spread

PROHIBITED ZONE – 1m from trunk. Excavations of any kind must be avoided within this zone. Materials, plant and spoil must not be stored within this zone.

PRECAUTIONARY ZONE – 4 x tree circumference. Where excavations must be undertaken within this zone the use of mechanical excavation plant should be prohibited. Precautions should be undertaken to protect any exposed roots. Materials, plant and spoil should not be stored within this zone.

PERMITTED ZONE – outside of the precautionary zone. Excavation works may be undertaken within this zone, however caution must be applied and the use of mechanical plant limited. Any exposed roots should be protected.

4.1.3 Realignment

Whenever possible works 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;

6.1.3.1 the scope of the works (e.g. one-off repair or part of an extensive operation)

6.1.3.2 degree of urgency (e.g. for restoration of supplies)

6.1.3.3 knowledge of location of other apparatus

6.1.3.4 soil conditions

6.1.3.5 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 consulting arboriculturist. If after consultation severance is unavoidable, roots must be cut back using a sharp tool to leave the smallest wound.

4.1.4 Backfilling

4.1.4.1 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.

4.1.4.2 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.

4.1.5 Additional Precautions near Trees

4.1.5.1 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.

4.1.5.2 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 supervising 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.

TABLE 1 - Prevention of Damage to Trees Below Ground

Causes of Damage	Type of Damage	Implications to Tree	Precautions
Trenching, mechanical digging etc.	Root severance	• The tree may fall over • Death of the root beyond the point of damage • Potential risk of infection of the tree The larger the root the greater the impact on the tree.	Hand excavate only within the Precautionary Zone. Work carefully around roots. Do not cut roots over 25mm in diameter without referring to the consulting arborist. For roots less than 25mm in diameter use a sharp tool and make a clean cut leaving as small a wound as possible.
Trenching, mechanical digging, top soilsurface removaletc.	Root bark damage	• The tree may fall over • If the damage circles the root it will cause the death of the root beyond that point • Potential risk of infection of the tree The larger the root the greater the impact on the tree.	Do not use mechanical machinery to strip the top soil within the Precautionary Zone. Hand excavate only within the Precautionary Zone. Work carefully around roots. Do not cut roots over 25mm in diameter without referring to the consulting arborist. For roots less than 25mm use a sharp tool and make a clean cut leaving as small a wound as possible.
Vehicle movement and plant use. Material storage within the precautionary area.	Soil compaction & water saturation	Restricts or prevents passage of gaseous diffusion through soil, the roots are asphyxiated and killed affecting the whole tree.	Prevent all vehicle movement, plant use or material storage within the Precautionary Zone.
Top-soil scouring, excavation or banking up.	Alterations in soil level causing compaction or exposure of roots.	Lowering levels strips out the mass of roots over a wide area. Raising soil levels asphyxiates roots and has the same effect as soil compaction.	Avoid altering or disturbing soil levels within the Precautionary Zone.
Use of herbicides.	Poisoning of the tree via root absorption	• Death of the whole tree • Death of individual branches Damage to leaves and shoots.	The selection and application of herbicides must be undertaken by a competent person in accordance with COSHH regulations.

Causes of Damage	Type of Damage	Implications to Tree	Precautions
Spillage of oils or other materials.	Contamination of soil	Toxic and asphyxiation effects of chemicals, oils, building materials (cement, plaster, additives etc.) on the root system can kill the tree.	Never store oils, chemicals or building materials within the Precautionary Zone or within the branch spread of a tree, which ever is the greater.
Placement or replacement of underground apparatus.	Various	Death of all or part of the tree.	Effective planning and liaison with the consulting arborist, taking into consideration the position of trees, and their future growth potential and management.

4.2 Above Ground

4.2.1 Damage by Pruning

Trees (including shrubs and hedges) can be damaged by inappropriate or excessive pruning. The aim of pruning should be to achieve vegetation clearances in ways which minimise the aesthetic and physical impact on retained trees and shrubs.

Reasonable care should be taken to avoid unnecessary damage to flora and fauna and to access ways.

Work should comply with BS3998. Pruning is a skilled job which should be undertaken by appropriately trained and experienced staff.

Given constraints often imposed by others it is not always possible to prune in an aesthetically pleasing way. However an effective Utility Arborist adjusts the work carried out for each plant to achieve the best possible standard, given the prevailing constraints.

- Ideally vegetation is left well balanced with natural crown shapes
- Pruning must also take into account the vegetation re-growth expected in the interval between cuts. This will vary widely between plant species and sites.
- Vegetation management: tree selection for retention and replanting at an early stage can be used to prevent the need for much more intrusive and damaging work in the future when the vegetation grows closer to the overhead line. Good practice often involves interventions over a number of cutting cycles to manage trees and shrubs so that future conflict with local infrastructure is minimised.

Where reasonably possible avoid recognised injurious practices such as:

- o Topping or lopping to an arbitrary height or branch length
- o Unbalancing a tree crown by excessive one-sided pruning
- o Pollarding. Unless pollarding is the existing recognised management technique.
- o Inappropriate use of flailing.
- o Climbing damage - Care should be taken to avoid injuring thin and weak barked species by inappropriate use of rope access techniques.
- o Access damage - Vehicle access and treatment of arisings should avoid injury to low branches, stems, root buttresses and feeder roots.
- o Spreading Disease - Appropriate regard should be given to avoid spreading fungal diseases.

• If the only pruning option is to severely reduce or unbalance a tree, then coppicing, or felling and replacement planting are often better options.

See table 2 – 'Prevention of Damage to Trees Above 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.

TABLE 2 - Prevention of Damage to Trees Above Ground

Causes of Damage	Type of Damage	Implications for the Tree	Precautions
Impact by vehicle or plant Physical attachment of signs or hoardings to the trunk Storage of materials at base of tree Rubbing by winch or pulling cables	Bark bruising, bark removal, damage to the wood, damage to buttress roots, abrasion to trunk	Wounding with the potential for infection ultimately resulting in death of all or part of the tree. Structural failure of the tree	Surround the trunk with protective free-standing barrier. Exclude vehicles, plant or material storage from the Precautionary Zone. Ensure sufficient clearance of cables or ropes.
Impact by vehicle or plant Rubbing by overhead cables	Bark damage to branches, breakage and splitting of branches, abrasion to branches	Structural failure of the branch. Wounding or loss of a branch with the potential for infection ultimately resulting in death of all or part of the branch or tree.	Exclude vehicles, plant or material storage from the Precautionary Zone. Ensure sufficient clearance of cables or ropes. All pruning should be carried out in accordance with BS3998 (prune affected branches to give appropriate clearance from cables)
Inappropriate sitingof overhead apparatus, such as CCTV, lighting fixtures and communications masts and dishes.	Inappropriate pruning, unnecessary tree removal	Severely pruning tree to acquire line of sight signal for communications dish etc.	Effective planning and liaison with arboriculturist, taking into consideration the position of trees,and their future growth potential and management.
Lack of forethought in design and location of apparatus and services entries on new developments	Complete tree removal	The tree is removed unnecessarily	Agree the location and installation of services at the design stage. Consideration should be given to the creation of dedicated service routes wherever possible.
Use of herbicides	Poisoning of the tree via absorption throughbark, leaves and shoots	Death of the whole tree, death of individual branches, damage to leaves andshoots	The selection and application of herbicides must be undertaken by a competent person in accordancewith COSHH regulations.

4.2.1 Chemical Damage to Trees

Chemical damage to trees adjacent to utility premises and operational land can be avoided if;

- the risk is identified when planning any work involving herbicides or other chemicals ensuring that only appropriate chemicals are used. Particular care should be exercised when considering the use of herbicides recommended for "non crop areas" as many of these also specify "do not use where there may be roots of desirable plants",
- herbicides are applied only at the rate and in the manner recommended by the manufacturer,
- follow-up applications are not undertaken until weeds reappear on the operational land,
- alternative methods of weed control are considered.

5. Limitations of Survey

This survey should be regarded as a preliminary assessment of the trees and deals with the current condition as identified during this survey only.

Every attempt was made to identify hazardous trees in this report however this survey was carried out from the ground and therefore cannot be held to have identified elements of decay which may be hidden out of sight within the crown or beneath ivy or other obstructions. To counter this limitation in the survey process it is vital that during tree works any additional defects found by the climbing arborist are communicated to the consulting arborist to allow appropriate action to be taken.

The details within this survey are based on the condition of the trees during the survey period only. The findings in this survey cannot be held to be valid after any site disturbance, man-made or natural, which may have an adverse effect on any trees present.

6. Relevant legislation

There are no Tree Protection Orders (TPOs) on any of the trees on this site. However unless planning permission which clearly identifies trees for removal has been granted then under Section 7 of the Forestry Act 2014 a person wishing to fell trees must apply to the minister for a licence to do so.

Exempted trees: Section 19 states that the requirement for a felling licence for the uprooting or cutting down of trees does not apply where:

- The tree in question is standing in an urban area
- The tree is considered dangerous and hazardous.
- The tree is within 10m of a public road and regarded as hazardous
- The tree in question is less than 100 ft. / 30m from a dwelling other than a wall or temporary structure;
- The tree in question is a hazel, apple, plum, damson, pear, or cherry tree grown for the value of its fruit or any ozier;

Other exceptions apply in the case of local authority road construction, road safety and electricity supply operations.

The Act is administered by the Forest Service (Department of Agriculture, Fisheries and Food). The Felling Section of the Forest Service is based in Johnstown Castle, Co. Wexford (053-9160200 or 1890-200223).

If any queries arise re tree felling in general it is recommended that advice is sought from Felling Section of the Forest Service or the local forestry development officer for further information.

No Special Areas of Conservation (SACs) are in effect on the surveyed site or surrounding area.

Bats

Trees may contain bats. Bats are afforded legal protection under Irish and EU legislation and agreements (Wildlife Act (1976), Wildlife (Amendment) Act (2000), S.I. No. 94 of 1997 and S.I. No. 378 OF 2005 implementing the EU Habitats Directive, Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animal) and the Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats).

Trees provide roosting opportunities for bats. Mature trees are the most likely to have potential as roost sites. This may be provided by cavities, crevices, limb fractures, storm damage or mechanical damage and may even be by way of loose bark. Felling of mature trees and even surgery to large limbs may place bats at risk and both procedures remove roosting sites for bats.

Professional advice from a licenced surveyor should be sought prior to any works commencing on trees.

7. Terminology

Tree categories

A	Trees of high quality and value due to their size, age, condition, historical/visual merit and/or conservation potential (a minimum of 40 years).
A1	Mainly arboricultural values. Particularly good examples of species, essential components of groups or of formal or semi-formal arboricultural features.
A2	Mainly landscape values. Trees, groups or woodlands which provide a definite screening or softening effects to the locality in relation to views into or out of site, or those of particular visual importance.
A3	Mainly cultural values, including conservation. Trees, groups or woodlands of significant conservation, historical, comparative or other value (e.g. veteran trees or wood-pasture).
B	Trees of moderate quality and value (a minimum of 20 years).
B1	Mainly arboricultural values. Trees that might be included in high categories but are downgraded because of impaired condition (e.g. presence of remedial defects including unsympathetic past management and minor storm damage)
B2	Mainly landscape values. 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 features (e.g. trees of moderate quality within an avenue that includes better A category specimens) or trees situated internally to the site, therefore individually having little visual impact on the wider locality.
B3	Mainly cultural values including conservation. Trees with clearly identifiable conservation or other cultural benefits.
C	Trees of low quality and value (a minimum of 10 years).
C1	Not qualifying in higher categories
C2	Trees present in groups or woodlands but without conferring on them greater landscape value and/or trees offering low or only temporary screening benefit.
C3	Trees with very limited conservation or other cultural benefits.
U	Trees in such 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 are dead, dying or showing immediate and irreversible decline.

Terminology (cont.)

CMG: Centimetres girth

Comments: Refers to the tree's condition and suitability for the site.

Common name: Most widely used non botanical name.

Co-dominant: Two branches assuming the role of leading shoots. When growing close together may form a weak attachment (included bark) at their point of contact. Trees with this defect may be in danger of splitting at this weak attachment.

Crown Spread: Measured in metres north, east, south, and west.

Decay fungi: Refers to those species of fungi which degrade living wood and which may, depending on the degree of degradation, render the tree structurally unsound.

Defects: Refers to cracks, storm damage and any other damage mechanical or biological.

Diameter: Diameter of the trunk (millimetres) at 1.5m. M.S. after the measurement refers to the tree being multi-stemmed.

Genus & Species: Refers to the botanical names for the tree.

Height: Measured in metres.

Monitor: Refers to trees which need to be re-surveyed on a yearly basis to assess their condition. This timescale may be sooner where works or adverse weather conditions have impacted negatively on the trees.

Overhaul: A reference to standard tree surgery work which consists of the removal of deadwood, crossing branches and balancing where appropriate.

Recommendations: Indicates surgery work necessary for the retention or, where necessary, removal of the tree.

Tree No.: Refers to numbered tag fixed to tree during survey.

8. INDIVIDUAL TREE SCHEDULE

Tag Number	Species	Vigour	Age class	Category	Comments	Recommendations	Long Term Potential	DBH (mm)	Height (metre)	Clear Stem (metre)	Crown spread NESW (metre)
441	Pedunculate oak *(Quercus robur)*	Fair	Mature	B	Located 1m from 2.25m concrete wall that separates Hillcreast Grove and Lucan shopping centre. Detailed assessment obscured by heavy ivy growth to upper canopy. Light suppressed deadwood in lower canopy. Upper canopy lost from possible storm event or crown reduction for neighbouring property. Root flare covered by garden debris. Localised decay at severed branches at 1.75m east which is not significant at present.	Deadwood. Cut ivy. Clear area around root flare	20-30	780	7.5	1n	5;5;5;4
442	Ash *(Fraxinus excelsior)*	Good	Early mature	B	Located 1m from 2.25m concrete wall that separates Hillcreast Grove and Lucan shopping centre. Growth extended south east over wall into Lucan SC carpark due to neighbouring competition. No visible defects.	No action necessary	20-30	480	9	1w	4;6;4;5
443	Ash *(Fraxinus excelsior)*	Good	Early mature	C	Located 1.5m from 2.25m concrete wall that separates Hillcreast Grove and Lucan shopping centre. Growth extended south east over wall into Lucan SC carpark due to neighbouring competition. No visible defects.	Clear debris from root flare area	20-30	180	9	2n	2;2.5;2;2
444	Ash *(Fraxinus excelsior)*	Good	Early mature	B	Located 1.5m from 2.25m concrete wall that separates Hillcreast Grove and Lucan shopping centre. Multi stemmed from base. Ivy extended into lower canopy. No visible defects.	No action necessary	20-30	480	12	2n	4;3;1;3
445	Sycamore *(Acer pseudoplatanus)*	Poor	Mature	U	Located 1m from 2.25m concrete wall that separates Hillcreast Grove and Lucan shopping centre. Root flare covered with garden debris. Three stems from base. Bark damage from base to 3m on two stems with the associated fungus cramp balls (*Daldinia concentrica*) on central stem at 2m. Leaf tar in lower canopy west. Two eastern stems have greatly reduced leaf size due damage below. In a state of decline.	Fell	>10	660	13	3s	4;3;4;5
446	Sycamore *(Acer pseudoplatanus)*	Good	Mature	C	Located 1m from 2.25m concrete wall that separates Hillcreast Grove and Lucan shopping centre. Multi stemmed from 1.5m with stems bracing where they cross due to light suppression. Heavy ivy growth extended to mid canopy. Structure poorly developed. No visible defects.	No action necessary	10-20	620	11.5	2n	3;4;2;4

8. INDIVIDUAL TREE SCHEDULE

Tag Number	Species	Vigour	Age class	Category	Comments	Recommendations	Long Term Potential	DBH (mm)	Height (metre)	Clear Stem (metre)	Crown spread NESW (metre)
447	Sycamore *(Acer pseudoplatanus)*	Good	Mature	B	Located 1.5m from 2.25m concrete wall that separates Hillcreast Grove and Lucan shopping centre. Three stems from base with tight unions, though not significant at present. Ivy extended into lower canopy. Heavy garden debris built up to 0.5m against trunk. Leaf tar in lower canopy. Upper canopy developed and vigorous.	Clear debris from root flare area	30-40	640	14	2n	5;5;4.5;5
448	Sycamore *(Acer pseudoplatanus)*	Good	Early mature	B	Located 1m from 2.25m concrete wall that separates Hillcreast Grove and Lucan shopping centre. Two steams from base with a wide union. Canopy relatively well formed. Leaf tar in lower canopy. No visible defects.	No action necessary	30-40	730	14.5	4n	5;2;4;4
449	Sycamore *(Acer pseudoplatanus)*	Fair	Early mature	C	Located 1m from 2.25m concrete wall that separates Hillcreast Grove and Lucan shopping centre. Two steams from base with a close union that contains included bark though not significant at present. Leaf tar in lower canopy. Smaller leafs in upper canopy suggests physiological stress, though no defects visible at base.	No action necessary	10-15	700	16.5	3n	6;4;3;7
450	Small leaf lime *(Tilia cordata)*	Good	Early mature	B	Located within an open grass area at the main traffic entrance to Lucan shopping centre. Contains several wide diameter (15mm) pruning cuts at 1.5 east with no associated decay. No visible defects.	No action necessary	20-30	350	10	5n	4;4;2;2
451	Small leaf lime *(Tilia cordata)*	Good	Early mature	B	Located within an open grass area at the main traffic entrance to Lucan shopping centre. Contains several wide diameter (15mm) pruning cuts at 1.5 south with no associated decay. Minor bark damage to exposed roots east with no associated decay.	No action necessary	20-30	370	9	5s	2;4;4;2
452	Small leaf lime *(Tilia cordata)*	Fair	Early mature	C	Located within an open grass area at the main traffic entrance to Lucan shopping centre. Minor root girdling visible at base south though not significant at present. Limited canopy development due to local competition. Included bark at 1.75m where stems form a tight union.	Cut girdled root	15-20	240	8	4s	1;1;1.5;1

8. INDIVIDUAL TREE SCHEDULE

Tag Number	Species	Vigour	Age class	Category	Comments	Recommendations	Long Term Potential	DBH (mm)	Height (metre)	Clear Stem (metre)	Crown spread NESW (metre)
453	Small leaf lime *(Tilia cordata)*	Good	Early mature	B	Located within an open grass area at the main traffic entrance to Lucan shopping centre. Contains several wide diameter (15mm) pruning cuts at 1.5 east with no associated decay. Minor bark damage to exposed roots east with no associated decay.	No action necessary	20-30	290	8	5n	4;3;2;3
454	Small leaf lime *(Tilia cordata)*	Fair	Early mature	C	Located within an open grass area at the main traffic entrance to Lucan shopping centre. Contains several small diameter (10mm) pruning cuts at 1.5 south with no associated decay. No visible defects.	No action necessary	15-20	230	6	3s	3;2.5;3;2.5
455	Small leaf lime *(Tilia cordata)*	Good	Young	C	Located within an open grass area at the main traffic entrance to Lucan shopping centre. Young with good management inputs. No visible defects.	No action necessary	15-20	150	5	2.25s	1;1.5;1;1.5
456	Small leaf lime *(Tilia cordata)*	Good	Young	C	Located within an open grass area at the main traffic entrance to Lucan shopping centre. Young with good management inputs. No visible defects.	No action necessary	15-20	160	6	2.5s	2;2;1.5;2
457	Mountain ash *(Sorbus aucuparia)*	Good	Early mature	B	Located in carpark with a raised planting area. Well developed with no visible defects.	No action necessary	20-30	180	5	1.5s	2;2;2;2
458	Sycamore *(Acer pseudoplatanus)*	Good	Young	C	Located within carpark on a sloped planting area 1m wide. Numerous small diameter pruning cuts from 1-2m height. Basal suckers from base. Leaf tar in lower canopy.	No action necessary	10-15	200	5.5	2.25s	1;1;1;1.5
459	Sycamore *(Acer pseudoplatanus)*	Good	Young	C	Located within carpark on a sloped planting area 1m wide. Numerous small diameter pruning cuts from 1-2m height. Basal suckers from base. Leaf tar in lower canopy.	No action necessary	10-15	190	5.5	2n	1;1;0.5;1.5
460	Sycamore *(Acer pseudoplatanus)*	Good	Early mature	U	Located at base of a wide 10m sloping open grass area adjacent to boundary wall with Hillcreast road. Self seeded with potential to undermine concrete wall.	Remove	<10	230	10	3n	3;4.5;2;2
461	Sycamore *(Acer pseudoplatanus)*	Fair	Young	U	Located at base of a wide 10m sloping open grass area adjacent to boundary wall with Hillcreast road. Self seeded with potential to undermine concrete wall. Poorly formed as subdominant to neighbouring competition.	Remove	<10	190	7	4e	2;2;1;1
462	Sycamore *(Acer pseudoplatanus)*	Fair	Young	U	Located at base of a wide 10m sloping open grass area adjacent to boundary wall with Hillcreast road. Self seeded with potential to undermine concrete wall. Drawn up as subdominant to neighbouring competition.	Remove	<10	200	9	8e	2;2;1;1

8. INDIVIDUAL TREE SCHEDULE

Tag Number	Species	Vigour	Age class	Category	Comments	Recommendations	Long Term Potential	DBH (mm)	Height (metre)	Clear Stem (metre)	Crown spread NESW (metre)
463	Sycamore *(Acer pseudoplatanus)*	Fair	Young	U	Located at base of a wide 10m sloping open grass area adjacent to boundary wall with Hillcreast road. Self seeded with potential to undermine concrete wall. Drawn up as subdominant to neighbouring competition.	Remove	<10	200	9	3e	1;3;1;1
464	Sycamore *(Acer pseudoplatanus)*	Fair	Young	U	Located at base of a wide 10m sloping open grass area adjacent to boundary wall with Hillcreast road. Self seeded with potential to undermine concrete wall. Drawn up as subdominant to neighbouring competition.	Remove	<10	210	10	5e	1;3;1;1
465	Sycamore *(Acer pseudoplatanus)*	Good	Early mature	C	Located at base of a wide 10m sloping open grass area adjacent to boundary wall with Hillcreast road. Self seeded with growth extended east due to local competition. No visible defects.	No action necessary	10-20	250	10	3.5e	2;4;1;1
466	Sycamore *(Acer pseudoplatanus)*	Fair	Young	C	Located at base of a wide 10m sloping open grass area adjacent to boundary wall with Hillcreast road. Self seeded with canopy suppressed due to local competition. Trunk co-dominant from 0.5m with construction brick placed between union.	Remove bricks	10-20	190	8	3.5e	2;3.5;3;1
467	Sycamore *(Acer pseudoplatanus)*	Fair	Early mature	U	Located adjacent to boundary wall with Hillcreast road. Self seeded with potential to undermine concrete wall. Drawn up as subdominant to neighbouring competition.	Remove	<10	230	12	4e	2;4;1;1
468	Sycamore *(Acer pseudoplatanus)*	Good	Early mature	U	Located adjacent to boundary wall with Hillcreast road. Self seeded with potential to undermine concrete wall. Drawn up as subdominant to neighbouring competition.	Remove	<10	230	12	5e	1;4.5;1;2
469	Sycamore *(Acer pseudoplatanus)*	Fair	Early mature	U	Located adjacent to boundary wall with Hillcreast road. Self seeded with potential to undermine concrete wall. Drawn up as subdominant to neighbouring competition.	Remove	<10	220	10	4e	2;4;1.5;1
470	Sycamore *(Acer pseudoplatanus)*	Good	Early mature	U	Located adjacent to boundary wall with Hillcreast road. Self seeded with potential to undermine concrete wall. Drawn up as subdominant to neighbouring competition.	Remove	<10	210	10	3.5e	2;3;1;1

8. INDIVIDUAL TREE SCHEDULE

Tag Number	Species	Vigour	Age class	Category	Comments	Recommendations	Long Term Potential	DBH (mm)	Height (metre)	Clear Stem (metre)	Crown spread NESW (metre)
471	Sycamore *(Acer pseudoplatanus)*	Good	Early mature	C	Located 3m high metal fencing adjacent to substation. Self seeded with no visible defects. Access not possible at time of survey. Growth extended east as subdominant to neighbouring competition.	No action necessary	10-15	220	8	3e	2;4;2;1
472	Sycamore *(Acer pseudoplatanus)*	Poor	Young	U	Located south of sub station. Self seeded specimen that has potential to undermine adjacent concrete wall.	Remove	<10	170	5.5	2e	1;2;2;0.5
473	Sycamore *(Acer pseudoplatanus)*	Fair	Early mature	U	Located adjacent to the 'goods in' gate. Self seeded with potential to undermine adjacent concrete wall.	Remove	<10	220	8	2n	3;3;1;1.5
474	Purple Leaf Plum *(Prunus Cerasifera Nigra)*	Good	Young	C	Located within raised planting area at the end of a parking bay. Young with no visible defects.	No action necessary	10-20	110	3	2n	1;1;1;1
475	Purple Leaf Plum *(Prunus Cerasifera Nigra)*	Good	Early mature	C	Located within raised planting area at the end of a parking bay. Young with no visible defects.	No action necessary	10-20	100	3	2n	1;1;1;1
476	Persian Ironwood *(Parrotia persica)*	Good	Young	B	Located within raised planting area at the end of a parking bay. No visible defects.	No action necessary	10-20	190	6.5	2n	1;1;1;1
477	Purple Leaf Plum *(Prunus Cerasifera Nigra)*	Fair	Young	C	Located within raised planting area at the end of a parking bay. Young with no visible defects.	No action necessary	10-20	90	3	2n	1;1;1;1
478	Sycamore *(Acer pseudoplatanus)*	Good	Young	C	Located within raised planting area at the end of a parking bay. Young with leaf tar and a co-dominant stem from base that is likely to reduce long term potential.	No action necessary	10-20	100	2.5	1.5n	1;1.5;1.5;1
479	Norway maple *(Acer platanoides)* crimson king cv	Good	Early mature	B	Located within a raised planting area 1m wide between two lengths of parking bays. Ivy extended into lower canopy. New grow missing from top of canopy. No other visible defects.	No action necessary	20-30	270	9	2n	3;3;3;3
480	Norway maple *(Acer platanoides)* crimson king CV	Good	Early mature	B	Located within a raised planting area 1m wide between two lengths of parking bays. Ivy extended into lower canopy. No visible defects.	No action necessary	20-30	260	8	2n	3;3;3;3
481	Small leaf lime *(Tilia cordata)*	Good	Early mature	B	Located within a raised planting area 1m wide between two lengths of parking bays. Ivy extended into lower canopy. No visible defects.	Raise lower canopy over carpark spaces.	20-30	310	9	2n	3;4;3;3
482	Norway maple *(Acer platanoides)*	Good	Early mature	B	Located within a raised planting area 1m wide between two lengths of parking bays. Minor included bark at stem union at 2m which is not significant at present. No visible defects.	No action necessary	20-30	240	10	2n	4;3;3;4

8. INDIVIDUAL TREE SCHEDULE

Tag Number	Species	Vigour	Age class	Category	Comments	Recommendations	Long Term Potential	DBH (mm)	Height (metre)	Clear Stem (metre)	Crown spread NESW (metre)
483	Persian Ironwood *(Parrotia persica)*	Good	Early mature	B	Located within raised planting area at the end of a parking bay. No visible defects.	No action necessary	20-30	200	7	2n	2;2;1.5;1
484	Norway maple *(Acer platanoides)*	Fair	Young	B	Located within raised planting area at the end of a parking bay. No visible defects.	No action necessary	20-30	150	7	2s	1;2;1.5;1
485	Purple Leaf Plum *(Prunus Cerasifera Nigra)*	Fair	Young	C	Located within raised planting area at the end of a parking bay. No visible defects.	No action necessary	10-20	120	2.5	1.75s	1;1;1;1
486	Mountain ash *(Sorbus aucuparia)*	Poor	Early mature	U	Located within raised planting area at the end of a parking bay. Upper canopy missing with damage to central stem.	Remove	<10	180	2	1.75s	1;0;0.5;0
487	Mountain ash *(Sorbus aucuparia)*	Poor	Early mature	C	Located within raised planting area at the end of a parking bay. Damage to central stem, though vigour present in lower canopy.	No action necessary	10-20	190	4.5	1.75s	1;1;1;1
488	Sycamore *(Acer pseudoplatanus)*	Fair	Early mature	C	Located adjacent to a low stone wall that borders the Newcastle road. Has been topped to allow line of sight for security camera. No visible defects at present.	No action necessary	10-20	240	5	1s	2;2.5;2;2
489	Norway maple *(Acer platanoides)*	Fair	Early mature	U	Located within raised planting area at the end of a parking bay. Tree failed due to bark damage and decay.	Remove	0	220	5	2e	2;2;2;2
490	Purple Leaf Plum *(Prunus Cerasifera Nigra)*	Fair	Early mature	U	Located within raised planting area at the end of a parking bay. Tree failed due to bark damage and decay.	Remove	0	190	6	2e	0;2;2;0
491	Norway maple *(Acer platanoides)*	Good	Early mature	C	Located within raised planting area at the end of a parking bay. Bark damage north from 0-2m.	Monitor bark damage	10-15	160	6	2.5s	1;1;1;1
492	Purple Leaf Plum *(Prunus Cerasifera Nigra)*	Fair	Early mature	C	Bark damage east at 1.5m.	Monitor bark damage	10-15	180	6	1.5w	1;1;0;2
493	Norway maple *(Acer platanoides)*	Dead	Young	U	Failed	Remove	0			0	0;0;0;0
494	Purple Leaf Plum *(Prunus Cerasifera Nigra)*	Good	Early mature	C	Twiggy appearance in canopy though has maintained vigour.	Monitor/ consider for removal	10-15	190	5		2;2.5;1;1
495	Alder *(Alnus glutinosa)*	Good	Mature	A	Located within raised planting area at the end of a parking bay. Trunk co-dominant from 0.5m with a wide union present. Well developed with no visible defects.	No action necessary	40	370	13	4n	4.5;4;4;4
496	Mountain ash *(Sorbus aucuparia)*	Good	Early mature	C	Well developed with no visible defects	No action necessary	10-15	130	4	1.5n	1;1;1;1
497	Mountain ash *(Sorbus aucuparia)*	Good	Young	B	Well developed with no visible defects	No action necessary	15-20	170	5	2w	1;2;1;2

8. INDIVIDUAL TREE SCHEDULE

Tag Number	Species	Vigour	Age class	Category	Comments	Recommendations	Long Term Potential	DBH (mm)	Height (metre)	Clear Stem (metre)	Crown spread NESW (metre)
498	Weeping silver birch *(Betula pendula)*	Good	Mature	A	Located within raised planting area at the end of a parking bay. Exhibits a kink in the lower trunk that corrects at 3m. No visible defects.	No action necessary	40	320	13	2n	3;3;3;5
499	Purple Leaf Plum *(Prunus Cerasifera Nigra)*	Fair	Mature	C	Located within raised planting area at the end of a parking bay. Exhibits heavy ivy growth extended throughout canopy that obscures assessment. No visible defects at base.	Cut ivy	10-15	280	8.5	1.75n	2;3;3;2
500	Hornbeam *(Carpinus betulus)*	Good	Mature	B	Located on sloping area 2m from low stone wall adjacent to Newcastle road. Well developed with no visible defects.	No action necessary	30-40	280	7	N/A	3;2.5;3;2.5
501	Hornbeam *(Carpinus betulus)*	Good	Early mature	B	A group seven early mature hornbeam that effectively form a hedge on lower eastern boundary. Have had canopy maintained at a height of 6m. Well formed with no visible defects.	No action necessary	20-30	250 (avg.)	6avg	N/A	2;2;2;2
502	Leyland cypress *(Cupressus × leylandii)*	Fair	Early mature	C	A group of 31 Leylands on the surveyed sites southern boundary that form a hedge with the Westbury housing estate. Appear to be suffering drainage issues.	Review drainage	10-20	190 (avg.)	4	N/A	0.5;0.5;0.5;0.5
503	*Ash (Fraxinus excelsior)*	Fair	Young	C	Minor bark damage west with no associated decay.	No action necessary	10-15	200	7	2e	1;1.5;1;1
504	Small leaf lime *(Tilia cordata)*	Good	Early mature	B	Well developed with no visible defects.	No action necessary	20-30	190	7	3w	2;3;2;2
505	Small leaf lime *(Tilia cordata)*	Good	Early mature	B	Well developed with no visible defects.	No action necessary	20-31	180	7	3.25e	2;2;1;1
506	Small leaf lime *(Tilia cordata)*	Good	Early mature	B	Well developed with no visible defects.	No action necessary	20-32	160	6	3.5e	2;2;1;1

*Refer to drawing TLUC001 101-104 for locations of trees within report.

9. REFERENCES

BS 5837 (2012). Trees in Relation to Design Demolition and Construction

Mattheck and Breloer (1994). The body language of trees

Ordnance Survey Ireland 25 inch survey (1888 and 1913)
http://map.geohive.ie/mapviewer.html

CMK
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