



City of Guelph Tree Technical Manual

December 2019

Foreword and acknowledgements

The development of this document is based on a review of best and current **practices, as well as consideration for the City of Guelph's biophysical and planning** context. The current document is the result of collaboration by City staff, a consulting team (original draft 2014), and key external stakeholders with consideration of feedback from the public.

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Important note: The Tree Technical manual is intended to be reviewed and updated as appropriate. Please forward any errors and omissions found within this document to the attention of Forestry at parks@guelph.ca for review for the next update. The manual is subject to changes as new policies and standards are incorporated. Check guelph.ca often to ensure you are using the most up to date document and related guidelines.

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Contents

Foreword and acknowledgements..... 1

List of tables 3

Section 1 – Introduction 4

 1.1 Purpose and objectives 4

Section 2 – General policy context 5

 2.1 General requirements 2

Section 3 – Tree-related plans and requirements..... 3

 3.1 Tree Inventory and Preservation Plan..... 3

 3.1.1 Tree inventory..... 4

 3.1.2 Mapping 5

 3.1.3 Data analysis and reporting 6

 3.2 Landscape Plan 7

 3.3 Vegetation Compensation Plan 7

 3.3.1 General Vegetation Compensation Plan Requirements 8

 3.4 Street Tree Plan 8

 3.4.1 Street tree plan requirements 8

Section 4 - Tree protection measures..... 10

 4.1 Transplanting..... 10

 4.2 Pruning, watering and mulching 10

 4.3 Establishment of Tree Protection Zones (TPZ) and Potential Rooting Areas (PRA) 11

 4.4 Soil compaction prevention 13

 4.5 Grade changes 14

 4.6 Root-sensitive excavation and installation of utilities..... 14

 4.7 Root pruning..... 14

 4.8 Tree removal measures..... 15

 4.9 Tree injury and mitigation 15

 4.10 Tree protection monitoring during and after construction or development . 16

Section 5 - Compensation 17

 5.1 Vegetation compensation formula..... 17

 5.1.1 Aggregate caliper formula..... 19

 5.1.2 Area based canopy compensation 19

 5.1.3 Mass planting approach..... 19

 5.1.4 Cash-in-lieu for tree establishment 20

 5.2 Unauthorized tree injury or removal..... 20

Section 6 – Monitoring and implementation..... 22

Section 7 – Tree establishment guidelines and standards.....	23
7.1 General principles for tree establishment.....	23
7.2 Design guidelines and standards	23
7.2.1 Tree location and spacing	24
7.2.2 Site soils	26
7.2.3 Tree species and nursery stock.....	28
7.2.4 Tree installation.....	33
7.2.5 Warranty, maintenance and inspection.....	37
Section 8 - Securities	40
Schedule A: Glossary.....	41
Schedule B: Tree protection standard drawings	44
Schedule C: Tree planting and establishment standard drawings	47
Schedule D: Recommended street trees.....	53

List of tables

Table 1 City of Guelph tree protection zones.....	13
Table 2 Compensation calculations based on type of tree removal	18
Table 3 Unauthorized tree injury or removal compensation.....	20
Table 4 Minimum soil volumes by tree size at maturity.....	27
Table 5 Tree genus diversity guidelines: Street tree or landscape plantings (development)	30
Table 6 Tree genus diversity guidelines: Parks, open spaces and other significant natural areas	30

Section 1 – Introduction

The City of Guelph recognizes that environmental sustainability is directly connected to the physical and economic health of our community, and that trees play a vital role in our continued sustainability. Trees in Guelph make numerous valuable contributions locally, some of which translate into broader regional and even global benefits. These include filtering air pollutants, reducing stormwater runoff, reducing urban heat island effects, providing shade, supporting local wildlife habitat and biodiversity, increasing the aesthetic value of neighbourhoods, and providing social, mental, spiritual, and physical benefits.

All the trees within **Guelph's** boundaries are part of the **City's tree** canopy cover. This includes trees in natural areas (e.g. forests or woodlots), tree plantations, and trees within manicured or built settings (e.g. parks, yards, along streets). Trees on both public and private lands make up the tree canopy. The City demonstrates its ongoing commitment to protection, enhancement and restoration of the tree canopy through policies, operational programs, and by supporting the numerous outreach and stewardship activities related to trees. These items are described in **the City's [Urban Forest Management Plan](#)** (September 2012).

1.1 Purpose and objectives

The purpose of this manual is to establish guidelines, standards and specifications for the preservation, protection and maintenance of trees as they apply to development and construction in various contexts throughout the City, on both public and private lands.

The specific objectives of this document are to:

- Promote best practices for tree management;
- Provide standardization for tree related plans and reports; and
- Promote effective, long-term retention, maintenance and enhancement of the **City's tree canopy**.

Section 2 – General policy context

The City of Guelph places a high priority on protecting existing trees, both within and outside of natural areas, and pursuing opportunities for tree canopy enhancement and tree establishment. This manual supports and supplements current City policy.

Notably, all trees equal to or greater than 10 cm in diameter measured at 1.4 m from the ground, diameter at breast height (DBH), on private properties of at least 0.2 hectares (0.5 acre) in size, are protected under the provisions of the [City's private tree by-law \(2010 – 19058\)](#) or its successor (the "Tree By-law").

A tree designated as a "Heritage Tree" under Part IV of the Ontario Heritage Act, RSO 1990, c. O18 may not be removed, injured or destroyed without approval from Council. The City of Guelph's [Official Plan](#) has identified cultural heritage resources and it is in the interest of the community to protect such resources from unnecessary alteration or destruction. **The City's first Heritage Conservation District (2015), [Brooklyn and College Hill Heritage Conservation District \(BCHCD\)](#),** recognizes trees as heritage assets and includes objectives directly related to the protection and management of trees within the designated boundaries:

- To protect and enhance heritage property in both the public and private realm including existing heritage residential buildings, institutional structures, road bridges, parks and open spaces, riverscape corridors and associated trees and vegetation;
- To protect, maintain and enhance parkland to the east and west side of Gordon Street by encouraging changes that respect the open space and the vegetative character of the public realm; and
- To manage trees, treelines and grass boulevards that contribute to the cultural heritage value of the District.

For more information regarding the heritage district plan and guidelines requirements for trees, Refer to [BCHCD Plan and Guidelines, 2015](#).

Special cases: species at risk

Butternut (*Juglans cinerea*) is a provincially designated Species at Risk (endangered) that occurs in the City of Guelph. Naturally occurring butternut are **protected under Ontario's Endangered Species Act (2007)**. Consult with the Ontario Ministry of Natural Resources and Forestry (OMNRF) where activities are proposed within 25 metres of a butternut (measured from the base of the trunk of the tree).

Furthermore, **the City's Official Plan aims to strike a balance between protection of the [Natural Heritage System \(NHS\)](#), trees outside of this system, and compatible development.** This is achieved through targeted policies for the NHS and the urban forest outside the NHS. The following text provides an overview of these policies as they relate to forested areas and urban trees within the City of Guelph.

The City of Guelph's NHS is comprised of:

- Significant natural areas;
- Natura areas; and

- Wildlife crossings.

Significant Natural Areas include Significant Woodlands, as well as other natural heritage features that may contain trees. These areas are intended to have long-term protection, and are to be maintained, enhanced and restored.

Significant natural areas also include ecological linkages and restoration areas to maintain or enhance functionality and connectivity within the NHS. The Official Plan identifies ecological linkages and restoration areas as potentially suitable locations for reforestation and habitat restoration activities. The Official Plan states that ecological linkages “**may be allowed to naturalize or be actively restored to allow regeneration into wooded areas**” while restoration areas are areas “**where replacement trees and shrubs will be focused**”.

Natural areas include cultural woodlands, as well as other natural heritage features that may contain trees. Development or site alteration is not permitted within Cultural Woodlands that are equal to or greater than one hectare in size, and not dominated by non-indigenous, invasive species (e.g. common buckthorn (*Rhamnus cathartica L.*)).

Wildlife crossings include locations across roads where wildlife movement has been confirmed or is anticipated based on the presence and configuration of natural features. In some cases, protection of existing trees and shrubs, or tree plantings, may be required (in conjunction with other measures such as warning signs, fencing, culverts, etc.) to ensure safe crossings and support wildlife movement.

Where proposed development may impact trees within **the City’s** NHS, additional requirements may apply. This includes requirements for determining the boundaries of Significant Natural Areas and Natural Areas, as well as mitigation measures such as buffer requirements. Refer to the NHS policies in the Official Plan for further detail.

Not just about trees

The Official Plan recognizes that there is a need to protect and restore a diversity of habitat types within the NHS, including woodlands, wetlands and meadows. Restoration objectives are determined on a site-specific basis, and may consist of a combination of trees, shrubs and herbaceous species, or may consist exclusively of indigenous forbs and grasses where the restoration objective is to establish meadow habitat.

Retention and protection of existing trees is always preferred to removal and replacement. Development of concepts and alternatives, including use of creative design and new technologies that support and maximize the preservation of existing trees (and associated vegetation) are strongly encouraged. However, it is recognized that this is not always possible in an urban or urbanizing setting, given competing land uses and the requirements of intensification. Furthermore, it is recognized that appropriate compensation for removed trees can also provide opportunities to create new green spaces and enhance existing protected natural areas.

Development and site alteration may be permitted to impact groups of trees, hedgerows and/or individual **trees provided it is demonstrated to the City's** satisfaction that:

- Plantation communities are not part of a Significant Natural Area or support an Ecological Linkage; and/or
- Hedgerows and trees cannot be protected and integrated into the urban landscape.

2.1 General requirements

The Official Plan includes detailed requirements for protection and removal of trees comprising the Urban Forest. Generally, this includes:

- a) The City will encourage the protection of forest resources including trees, hedgerows, wooded areas and significant woodlands, and encourage the integration of these resources into the urban landscape;
- b) In the preparation of development proposals, development proponents may be required to outline tree protection measures in a Tree Inventory and Preservation Plan, which addresses the feasibility of retaining trees and the protection measures required for these trees during site development and construction; and
- c) In instances where urban forest resources are to be removed as part of a development proposal:
 - i. Measures must be identified to ensure the orderly removal of trees or their possible relocation, where practical, and the effective preservation of any remaining trees; and
 - ii. A vegetation compensation plan must be provided that outlines appropriate compensation (through on and/or off-site plantings and/or cash-in-lieu) for all regulated trees that are not otherwise exempt **under the City's Private Tree Protection By-law** (Part IV – Permit Exemptions of By-law (2010) – 19058).

For more information, please see the urban forest subsection 4.1.6 within the Natural Heritage System policies of the Official Plan **and the City's Private Tree Protection By-law**.

Section 3 – Tree-related plans and requirements

The tree preservation and compensation review process must take place in tandem with the preparation and review of preliminary development, construction or tree removal and/or injury to be effective. Consideration is required for possible constraints that existing trees may place on such activities well before the plan review stage, and opportunities to maximize the protection, preservation and planting of trees on site are encouraged.

Four types of plans relating to the assessment, protection and planting of trees (and other vegetation) on site may be required as part of the development or site alteration process. These are:

1. Tree Inventory and Preservation Plan (TI PP): where wooded features and/or individual trees greater than or equal to 10 cm DBH may be destroyed or injured by proposed development on or within 6m of a property regulated by the Tree By-law;
2. Landscape Plan (LP): as part of Site Plan applications and other applications under the Planning Act;
3. Vegetation Compensation Plan (VCP): where an approved TIPP identifies trees to be destroyed or injured, or where trees located on City-owned property may be destroyed or injured by proposed development; and
4. Street Tree Plan (STP): when a small number of trees are to be planted on or fronting onto City streets and a general Landscape Plan is not applicable or required, or when street tree planting is proposed on a large scale.

Depending on the nature and scale of the proposal, the TIPP, LP and VCP may be combined. Compensation related to removal of trees must be provided in addition to the normal landscaping requirements, in accordance with the guidelines laid out in this document.

In accordance with the City of Guelph Site Plan Approval Procedures and Guidelines, current version, the requirement to prepare a TIPP as part of a formal Site Plan submission for review by the Site Plan Review Committee should be determined during a pre-consultation meeting with the Site Plan Coordinator.

Proponents of draft plans of subdivision, consents and site plans are required to provide an Environmental Implementation Study (EIS) if their properties fall within **the City's** NHS or lands defined as adjacent to it. In these cases, the TIPP would form part of the EIS, and the LP, VCP and STP provided as part of the Environmental Implementation Report (EIR).

Provision of these plans is to ensure that requirements and opportunities for protection of trees, and other vegetation are identified early in the planning process, and that appropriate compensation for permitted tree removals can be determined.

The following sections provide further requirements for the preparation of tree related plans.

3.1 Tree Inventory and Preservation Plan

Tree Inventory and Preservation Plans must:

- Inventory and assess all trees equal to or greater than 10 cm DBH;

- Determine the health and condition of trees, and prioritize them for protection;
- **Identify trees that are exempt from compensation according to the City's Tree By-law;**
- Identify opportunities for transplanting smaller specimens of trees (as well as other vegetation) where in-situ protection is not feasible;
- Identify trees that are proposed to be removed;
- Assess the feasibility of retaining existing vegetation;
- Specify measures required for tree protection and monitoring during construction or development; and
- Specify measures for avoiding disturbance to any breeding birds during construction or development.

The TIPP shall be prepared and stamped by an Arborist.

The TIPP will consist of both a written report (e.g. arborist report) and accompanying plans (maps and/or drawings) including:

- A surveyed inventory of individual trees equal to and greater than 10 cm DBH and vegetation units on the development site and on adjacent sites where driplines are within 6 m of property line;
- Mapping;
- Detailed analysis and discussion of inventory data and an assessment of potential impacts of proposed site development;
- Required and recommended tree protection measures;
- Monitoring and inspection report requirements for the duration of active development on the property;
- Mitigation and/or compensation for tree injury and/or removal (if required); and
- References to applicable standard drawings.

Trees equal to or greater than 10 cm DBH to be retained on or adjacent to the development site must be protected if development works have the potential to cause tree injury or mortality. Inspection reporting may be combined with EIR inspection report where applicable.

3.1.1 Tree inventory

The tree inventory shall include:

- Data for each individual tree greater than or equal to 10 cm DBH or vegetation unit, in chart format, including:
 - Identification number corresponding to plans (and tree tags on-site, if required);
 - Species (common and botanical name);
 - Size (DBH and height);

- Form (e.g. columnar, rounded) and spread of canopy and/or limits of vegetation unit(s);
 - Biological health (disease, pest, vigour);
 - Structural condition (hazards and/or structural defects);
 - Risk assessment;
 - Overall condition (considering biological health and structural condition);
 - Identification of Designated Heritage Trees protected under the Ontario Heritage Act;
 - Tree ownership (private; on or offsite, boundary and municipal);
 - Recommended action (retain, relocate or remove);
 - Compensation required (yes or no);
 - Notes and recommendations (e.g. treatments, vine removal, habitat tree, corrective pruning, etc.); and
 - Reason for removal or relocation, if proposed.
- Photographs of all City of Guelph-owned trees or groups of trees on or adjacent to the site which may be impacted by proposed development activities;
 - Include notes on plans regarding recommended timing windows or other mitigation measures for wildlife (e.g. breeding birds, species at risk, etc.);
 - Surveyed location, including dripline, of any trees designated as provincially or federally threatened or endangered along with the buffer/setbacks assigned to these trees by the Provincial or Federal Government; and
 - Data for all trees equal to and greater than 10 cm DBH off the subject site with driplines within 6 m of the property line which may be impacted by the proposed development, with same attributes as listed above. Where access to adjacent properties is restricted, information should be collected by visual estimation only, and trees off the subject site should not be tagged. Proponents of a TIPP are not expected to access adjacent properties or sites for purposes of data collection if access is restricted.

An inventory of individual trees may not be required in cases where areas within the NHS or other natural areas are being protected. In these cases, Ecological Land Classification (ELC) information may be sufficient and tree protection plans must show adequate protective buffers to demonstrate no negative impact, in accordance with Official Plan policies.

The City generally considers field data older than five years to be limited in its accuracy, and will generally request that updated field studies be completed in such cases. Older field data can, and should, still be used as sources of background information in the preparation of an updated TIPP.

3.1.2 Mapping

The TIPP shall include adequate and appropriate mapping, including, where applicable:

- A metric scale (same scale as used in other drawings in same application);

- Aerial photography (required for areas in or adjacent to NHS and other wooded or natural heritage features);
- Key plan;
- North arrow;
- Property limits;
- Limit of development or construction;
- Location of all existing or proposed features (buildings, walkways, curbs, roads, parking, retaining walls, slopes, berms, etc.);
- Stormwater management facilities and infrastructure, wetland, swale, top of bank and watercourse features;
- Existing and proposed grades;
- Individual trees equal to or greater than 10 cm DBH (including dripline), groups of trees (including dripline), and vegetation units on site or on adjacent properties with driplines within 6 m of property line to be retained, protected or removed;
- Designated Heritage Trees protected under the Ontario Heritage Act ;
- Location and description of type of tree protection fencing and other tree protection measures (e.g. wood fence, paige wire fence, root pruning, sensitive excavation, compaction prevention, etc.). The specifications will include applicable **City of Guelph's** standard drawings;
- Include monitoring notes and requirements for inspection reports for the duration of active development; and
- Identification and description of areas regulated by the Grand River Conservation Authority (GRCA).

The locations of inventoried trees shall be overlaid upon the existing and proposed grades. A site survey, prepared by a land survey professional licensed by the Association of Ontario Land Surveyors, is the preferred method of mapping tree and tree group locations. The City may, at its discretion, require surveyed tree locations, particularly in the event that trees on or near property boundaries may be impacted by the proposed development.

3.1.3 Data analysis and reporting

The analysis of inventory data and accompanying report shall:

- Describe physical site features such as soils, topography, drainage, surface and ground water;
- Describe areas on-site regulated by the GRCA, if applicable;
- Evaluate the development proposal (e.g. preliminary layout of structures, servicing, blocks, lots and streets; proposed land use designations; proposed grading, etc.) with specific regard to the potential effects upon existing vegetation and potential for tree retention and replacement (e.g. tree planting). Changes in drainage patterns, edge disturbance, sun scorch, wind throw, grading, etc., are to be considered;

- Indicate/specify measures that could reduce the need for vegetation removal, if applicable;
- Recommend management actions to enhance the health and diversity of remaining vegetation; and
- Provide a summary of recommendations.

3.2 Landscape Plan

Landscape Plans are required for all development applications (e.g. site plan, subdivision) and Capital construction projects regardless of whether or not trees are present on the subject site.

Landscape Plans must, as required:

- Provide details of all landscape screening, street tree plantings, parking lot landscaping, and other landscaping needs on site;
- Show location and description of type of tree protection fencing;
- Describe methods and extent of removal of invasive plants within areas to be protected and replacement with appropriate non-invasive species;
- Provide details of replacements for removed invasive species;
- Indicate transplanted tree locations;
- Include references to applicable standard drawings;
- Describe watering maintenance requirements during plant material warranty; and
- Provide construction or development details for all planting work.

The LP shall be prepared and stamped by a full member of the Ontario Association of Landscape Architects (OALA). Additional details regarding the preparation of an LPs for Site Plan applications are available in the City of Guelph Site Plan Approval Procedures and Guidelines, current version.

Mapping and details for the TIPP and the LP can typically be combined. Separate TIPP mapping and/or details are required when a site contains a large number of trees equal to or greater than 10 cm DBH impacted by the proposed development, and when indicating preservation requirements on the LP may become confusing.

3.3 Vegetation Compensation Plan

Compensation shall be provided to the City of Guelph when development requires the removal of trees equal to or greater than 10 cm DBH that are not exempt under the Tree By-law. Compensation enables the City to undertake re-establishment, promote sustainability of the tree canopy, and to support the achievement of the **City's canopy cover objectives**. Compensation may also be required in the event of unanticipated tree injury or loss. While the primary intent of a VCP is to support tree re-establishment (preferably of large-canopy shade trees), alternative forms of vegetation compensation, may be considered on a case-by-case basis in consultation with the City.

VCP's must provide details of compensation plantings for all trees regulated by the Tree By-law that may be damaged or destroyed. Compensation is in addition to the

normal landscape and street tree plantings required as part of development approval.

As stated in the Official Plan, “re-vegetation may consist of a combination of trees, shrubs and herbaceous species, or may consist exclusively of native herbaceous species where the restoration objective is to establish a meadow habitat”. The VCP will identify, to the satisfaction of the City, where and how compensation vegetation will be established. It shall also include a plant list indicating size, species and quantity of proposed plant material, as well as details about the recommended planting layout and techniques. If vegetation establishment is not proposed, the VCP shall outline the total amount of funds to be conferred to the City in order to compensate **as required by the City’s Tree By-law**. Where compatible the VCP can be combined with the LP.

3.3.1 General Vegetation Compensation Plan Requirements

Acceptable forms of compensation for approved tree removal may include, but is not limited to:

- Vegetation establishment on or off the subject site;
- Cash-in-lieu of tree establishment using a standardized formula to determine the value of replacement plantings to fund the establishment of trees off-site; or
- Mass plantings of smaller stock in areas suitable for naturalization and restoration, where appropriate.

Details on these compensation forms are set out in [Section 5](#). Compensation for on site plantings will be considered before off-site planting locations and cash-in-lieu.

The VCP shall include a plant list indicating size, species and quantity of proposed plant material, as well as details about the recommended planting layout and techniques. The VCP must also include references to applicable standard drawings.

3.4 Street Tree Plan

In certain circumstances, street trees may be the primary or sole tree establishment component of a site development project. This may be the case during streetscape renovation, large-scale utility works or other capital projects. In such cases, a STP shall be prepared, generally in a similar manner to a LP.

The City may require a letter of credit to secure the implementation of the STP, and may draw upon the letter of credit to conduct tree plantings and/or subsequent inspections.

3.4.1 Street tree plan requirements

All STPs must be prepared and stamped by an OALA. **STP’s** must, at a minimum:

- Provide a list of proposed street tree plantings;
- Be supported by detailed drawings of the proposed planting; and
- Outline a warranty and maintenance schedule for street trees.

STP’s are considered normal landscape requirements in addition to, not part of, the VCP.

The estimated cost of implementing proposed tree plantings must also be outlined in the STP. All STPs shall, at minimum, contain and clearly display the following information:

- Proper street names; lot configuration and lot numbers;
- Key map (full key on overall drawings);
- Title block including: north arrow; original drawing date; date of any and all revisions; scale of drawing (bar scale and written scale); name, address, phone number and e-mail of person or firm preparing the plan;
- All municipal services, gas, telecom & hydro;
- Locations and tree species proposed;
- Plant list including code, common name, botanical name, size, and quantity;
- References to applicable standard drawings;
- Watering and maintenance schedules; and
- Planting details.

When appropriate, and with approval from the City, STPs and LPs (or other appropriate plans) can be combined if this will facilitate the review process.

Section 4 - Tree protection measures

Measures to prevent damage to vegetation and encourage optimal tree health must occur before, during and after construction or development to prevent site degradation and to minimize or eliminate the negative impacts from related activities. Impacts on trees must consider the potential for immediate injury, as well as chronic stress (long-term).

Typical types of injury during construction or development activities may include:

- Mechanical injury to trunk and crown;
- Cutting of roots;
- Soil compaction;
- Grade changes in soil over root system; and
- Alteration of surface drainage and water table.

Protection measures before, during and after construction or development may include, but are not limited to:

- Pruning, watering and mulching;
- Establishment of Tree Protection Zone (TPZ) and identification of Potential Rooting Area (PRA) (refer to Table 1);
- Soil compaction prevention in construction or development access areas;
- Soil remediation;
- Limiting and minimizing effects of grade changes;
- Root-sensitive excavation;
- Transplanting;
- Edge thinning (pre-stressing);
- Root pruning; and
- Monitoring.

4.1 Transplanting

In some cases, it may be possible to transplant existing trees on-site to avoid injury or removal. Transplanting and injury mitigation should be considered, and any recommendations to implement these measures shall conform to appropriate arboricultural standards and best practices. Transplanting should consider the tree size, tree species, site conditions, and time of year.

4.2 Pruning, watering and mulching

Activities such as pruning, watering and mulching in advance of construction or development reduce the potential for physical tree injury, promote hardiness, and mitigate the possible adverse health effects on trees. Proper branch pruning will also promote worker safety during site development. Prune all overhanging branches, which may interfere with the movement of equipment prior to commencement of on-site operations using arboricultural best practices. All pruning must be conducted by or under the supervision of an Arborist.

4.3 Establishment of Tree Protection Zones (TPZ) and Potential Rooting Areas (PRA)

The purpose of tree and root protection is to prevent physical damage and mechanical injury to trees, as well as soil compaction and soil contamination. To prevent access and ensure that protection is effective, the following steps are required:

1. Design specifications for tree protection signage and hoarding, locations of all TPZs, and other tree protection measures should be clearly identified on grading plans, and/or tree removal/preservation plans if such plans are part of the application package;
2. The TPZ shall be enclosed by tree protection hoarding. Hoarding shall be **constructed of 1.2 m (4 ft) plywood sheets on a 'T-bar' post or 2" x 4" wood frame**, and shall be supported upright using L-shaped supports to prevent root damage. All supports and bracing shall be installed to minimize damage to roots;
3. **Paige wire fencing supported by 'T-bar' posts may be installed if traffic or pedestrian visibility is a safety concern, which may be impeded by solid hoarding. If such fencing is used for this reason, it must be a minimum of 1.2 m (4 ft) high and supported by a solid 2" x 4" frame;**
4. **Paige wire fencing supported by 'T-bar' posts may be installed around large tree groupings or in areas of low construction or development equipment and machinery traffic only if approved by the City. Paige wire fencing must be a minimum of 1.2 m (4 ft) high and posts must be spaced a maximum of 2.4 m on centre (O.C.). Paige wire is to be tied to supporting 'T-bars' at a minimum of 3 evenly-spaced points;**
5. All tree protection hoarding shall be set at the edge of the TPZ or at the edge of **the subject tree's dripline plus 1 m, whichever is greater**. The size of the TPZ is determined **by the subject tree's diameter, as shown in Table 1. The City may** require larger TPZs if determined appropriate for high-value or otherwise significant trees. TPZ size and fencing location may be limited by existing hardscape surfaces if those surfaces are to remain intact throughout and following construction or development activities on the site;
6. PRA distances are to be measured from the outside edge of the tree base towards the drip line. Ideally, these are twice the TPZ (as shown in Table 1), but in built-up environments these may be limited by hard infrastructure, such as an existing paved surface, provided the existing paved surface remains intact throughout the development or construction work;
7. Grouping of trees should be protected by shared tree protection hoarding. Hoarding shall be set at the dripline plus 1 m of the tree group, or at the limit of the largest TPZ for any tree in the grouping;
8. Plywood hoarding shall be used wherever fill or excavated materials must be temporarily located near a TPZ, to ensure that no material enters the TPZ;
9. Any area designated for stockpiling of excavated soil must be fenced with sediment control fencing. Sediment control fencing shall be installed as indicated

in a City-approved TIPP. The sediment control fencing can be attached to the tree protection hoarding;

10. All hoarding is to remain in place and in good condition throughout the entire duration of the project. No hoarding is to be removed, relocated or otherwise altered without the written permission of an Arborist or the City;
11. No fill, equipment, supplies or materials of any kind are to be stored within the TPZ at any time, and there shall be no personnel access into the TPZ unless permitted by the City and supervised by an Arborist;
12. A sign similar to that in [Schedule B](#) shall be mounted on each side of the tree protection zone hoarding for the duration of the project. The sign shall be a minimum of 40 cm × 60 cm. The sign shall be constructed from metal, corrugated plastic, Gatorboard or plywood, and shall be installed in an appropriate manner such that it will be able to withstand inclement weather conditions. Signs shall be affixed no more than 20 m apart;
13. All contractors and site supervisors should be informed of the tree protection requirements at a pre-construction meeting;
14. Trees and TPZs should be regularly monitored by or under the supervision of an Arborist throughout the duration of the project;
15. If injury should occur to retained trees during construction or development, an Arborist should evaluate the trees immediately so that appropriate treatment can be performed in a timely manner; and
16. Written verification from an Arborist that all of the required tree protection measures have been installed in accordance with the TIPP, as approved by the City, is required prior to any demolition, ground-breaking or grading activities taking place on site.

Table 1 City of Guelph tree protection zones

Diameter of Trunk, Centimetres at 1.4 m above grade (DBH)	Minimum Tree Protection Zone (TPZ), Distance from trunk, measured in metres. ¹	Potential Rooting Area (PRA) for all trees, and TPZ for trees in NHS, parks, open spaces and other significant natural heritage areas. ^{1,2}
< 10	1.2	2.4
10-29	1.8	3.6
30-40	2.4	4.8
41-50	3.0	6.0
51-60	3.6	7.2
61-70	4.2	8.4
71-80	4.8	9.6
81-90	5.4	10.8
91-100	6.0	12.0
> 100	6 cm per 1 cm DBH	12 cm per 1 cm DBH

Notes:

1. Or dripline plus 1 m whichever is greater.
2. Works in PRA are subject to guidelines and standards outlined in [Section 4](#) of this document.

Encroachment of the TPZ should be avoided. However, in circumstances where this cannot be avoided, the area of encroachment should be determined and the work supervised by an Arborist with approval from the City.

4.4 Soil compaction prevention

Construction or development access should be diverted as far away from trees as possible and keep the movement of equipment and materials across root zones to an absolute minimum.

Soil compaction protection must be installed over area of potential impact when temporary encroachment is required to facilitate work within a TPZ. The type and frequency of encroachment determine which compaction protection is required, as specified below:

1. Limited non-vehicular (e.g. foot traffic)
 - Installation of non-woven permeable geotextile fabric;
 - Minimum of 150 mm of wood chip mulch laid over geotextile fabric; and
 - Installation of 25 mm plywood.
2. Frequent non-vehicular or occasional light vehicle
 - Non-woven permeable geotextile fabric;

- Minimum of 300 mm of wood chip mulch laid over geotextile fabric; and
 - Installation of 25 mm plywood.
3. Regular vehicular access
- Non-woven permeable geotextile fabric;
 - Installation of 100 mm of 19 mm clear stone laid over geotextile fabric;
 - Non-woven permeable geotextile fabric over stone;
 - Minimum of 300 mm of wood chip mulch laid over the landscape fabric; and
 - Installation of 25 mm plywood or steel plate over mulch.

The City must approve all TPZ encroachments. Treatments are temporary and must be removed once access is no longer required.

4.5 Grade changes

Grade changes, both raising and lowering, can negatively affect the ability of a tree to survive. The effects of placing fill over tree roots and around the trunk of a tree can be similar to soil compaction by reducing the oxygen exchange area available to tree roots while lowering the grade even 150 mm may lead to the exposure and/or removal of sensitive feeder roots.

Hydrological changes, such as the diversion of drainage or alteration of the groundwater table, at both a lot and/or landscape scale must not negatively impact trees or vegetation.

4.6 Root-sensitive excavation and installation of utilities

Efforts should be made to route all underground utilities around the TPZs. When site development works necessitate excavation within the TPZ or PRA, if feasible, undertake root-sensitive excavation to a minimum depth of 1.6 m, as traditional trenching methods will cause significant root damage to the preserved trees.

Prior to commencement of any excavation within the TPZ, an exploratory excavation shall be undertaken using hand tools, an air-jet tool, a hydro-vac system, or an equivalent method of root-sensitive excavation. Exploratory excavation shall be done under the supervision of an Arborist. Exploratory excavation may also be required for excavation outside the minimum TPZ depending on the tree and surrounding environment.

Excavation work performed beyond the TPZ, but within the PRA, and where there is potential to damage structural roots, roots are to be cut a maximum of 300 mm from the edge of excavation (grading or removals). Damaged, exposed roots should be pruned once the excavation is completed. Minimize the limit of excavation, grading or removals to the greatest extent possible and include the use of excavation shoring, smaller excavation equipment or rubber tired machines.

4.7 Root pruning

Root pruning can help ease the stresses experienced by a tree with root damage, encourage the growth of new fine and feeder roots, and prevent the spread of decay. Proper root pruning should be performed by or under the supervision of an Arborist in advance of anticipated root-damaging excavation, or immediately afterwards if such injury was unforeseen. Root pruning guidelines are as follows:

- Only clean hand tools shall be used to prune roots. Shovels, picks or other construction tools shall not be used to prune roots;
- Severed, exposed, or diseased roots that are greater than 60 mm in diameter shall be pruned in a similar fashion as branches, taking care to maintain the integrity of the root bark ridge;
- Wound dressings or pruning paint shall not be used to cover the ends of any root pruning cut; and
- Avoid prolonged exposure of tree roots. Keep all exposed roots moist and covered with soil, mulch, irrigation, or at least moistened burlap.

4.8 Tree removal measures

Efforts shall be made to minimize the number of tree removals on proposed development sites. When tree removal is necessary, the following guidelines shall be implemented:

- Tree(s) approved for removal must be clearly marked on-site, preferably with orange or yellow spray paint at breast height (1.4 m) and at the base of the stem (stump height) as per the Ontario Tree Marking Guide;
- Tree removal cannot proceed until written approval of the TIPP has been granted by The City;
- Approved tree removals shall be carried out prior to site works and in such a manner as to minimize site disturbance and damage to trees to be retained;
- Approved tree protection fencing must be installed and inspected prior to tree removals unless otherwise approved by the City;
- Removal of all trees and tree parts from Termite Management Areas shall adhere to procedures of Guelph's [Termite Control Program](#) for removal and disposal of termite infested material and soils; and
- The Canadian Food Inspection Agency (CFIA) restricts the movement of any part of trees infested with or host to a regulated pest or disease. For more information about transporting regulated material, contact your local [CFIA office](#).

4.9 Tree injury and mitigation

In some development situations, injury to trees may be unavoidable despite best efforts to plan tree injury mitigation in advance. Additional removals may become necessary due to site conditions or unanticipated circumstances. However, where work may impact trees equal to or greater than 10 cm DBH approved for retention and protection, authorization from the City is required. Activities such as TPZ or PRA encroachment, grading or excavation within the TPZ or PRA, or physical damage to any above ground or below ground parts constitute tree injury. In the event of unauthorized injury to, or removal of trees, additional compensation in the form of tree establishment or monetary penalty will be required as outlined in Table 3, [Section 5](#).

Tree injury mitigation may be required in cases where damage can be reversed. In the event of injury, mitigation measures shall be recommended by an Arborist. The development proponent is expected to contact an Arborist and the City of Guelph

immediately to report unforeseen tree injury and undertake mitigation measures. All injury to trees (mechanical or chemical) must be reported in inspection reports including method used to mitigate damage.

Mitigation for tree injury may include:

- Soil de-compaction, aeration, vertical mulching or mulching of the root zone;
- Pruning of damaged branches;
- Bark tracing around stem wounds;
- Root pruning;
- Fertilization; or
- Other arboricultural treatments, as required.

4.10 Tree protection monitoring during and after construction or development

In order to ensure the accepted and approved tree protection measures are successfully implemented, they must be monitored throughout construction and development. Post-construction / development monitoring may be required in addition to monitoring during construction or development activities in order to evaluate the ultimate success of tree protection measures and provide for any final tree injury mitigation. Post-construction monitoring may include the need for an Arborist to return to site post-construction (e.g. could be a year following construction) to assess the tree and determine whether any further action is required.

Monitoring will be required in circumstances where trees are retained and protected with medium to high risk of potential injury (e.g. work within the TPZ due to extreme site limitations) and/or when trees are unexpectedly injured during construction or development.

Where monitoring provisions are to be established they will need to include:

- Frequency and timing of monitoring inspections;
- The type and format of information that will be collected during monitoring inspections (e.g. tree condition notes including tree injuries and mitigation, photos of protection measures/tree injuries, recommendations for repairs, etc.);
- Measures and protocols that will be followed in the event that tree protection measures have failed or been damaged (e.g. immediate repairs); and
- The format and types of information that will be provided back to the approval authority as part of the monitoring.

Section 5 - Compensation

Compensation is required for removal or injury of regulated trees as defined by the Tree By-law. On-site compensation planting areas are to be identified in the VCP. Off-site planting, if required, will be undertaken in consultation with the City. In such cases, vegetation establishment and maintenance following installation will be the responsibility of the proponent and require approval from the City. Off-site planting locations for compensation vegetation will typically include City-owned lands, such as parks, or areas identified for restoration or as ecological linkages (through the NHS), but in some cases may include lands owned by the GRCA or other parties who will need to be included in corresponding agreements.

The following requirements pertain to trees planted as compensation for tree removal:

- Small stock (in lieu of standard stock size) may be acceptable as compensation and for naturalization and other mass plantings;
- All plant material shall conform to the latest edition of the Canadian Nursery Trades Association Specifications and Standards;
- The spacing of plant material should account for the ultimate size and form of the selected species; and
- Deciduous shade trees are preferable, and coniferous trees shall not account for more than one-quarter of proposed trees.

All replacement vegetation should be compatible with the site conditions for which it is proposed, and preferably indigenous. In some cases, re-vegetation may consist of a combination of trees, shrubs and herbaceous species, or may consist exclusively of native herbaceous species and grasses where the restoration objective is to establish a meadow habitat. Appropriate planting compensation ratios for naturalization plantings must follow the mass planting method described in [Section 5.1.3](#) below and is to be determined in consultation with City of Guelph staff.

5.1 Vegetation compensation formula

The formula used to calculate required vegetation compensation differs depending upon the type or nature of the trees being removed. The vegetation compensation plantings proposed in a VCP do not replace or supplement the normal landscape planting requirements (e.g. STPs) as part of the approval of a Site Plan or other development application.

Standard replacement tree and shrub sizes for compensation are as follows:

- a) A caliper of 60 mm shall be considered as the standard replacement size for deciduous trees;
- b) A height of 250 cm shall be considered as the standard replacement size for coniferous trees; and
- c) One 250 cm coniferous tree shall be considered as equivalent to one 60 mm deciduous tree when using the aggregate caliper formula to determine required compensation caliper.

The wholesale cost (including applicable taxes) of a representative standard replacement tree shall be determined using the following method:

1. Three local wholesale nurseries shall be canvassed by the Developer or Contractor to determine the average cost of a representative standard replacement tree.
2. The cost of a standard replacement deciduous tree shall be determined by averaging the wholesale cost of a 60 mm silver maple (*Acer saccharinum*), sugar maple (*Acer saccharum*), white oak (*Quercus alba*) and red oak (*Quercus rubra*).
3. The cost of a standard replacement coniferous tree shall be determined by averaging the wholesale cost of a 250 cm larch (*Larix laricina*), white spruce (*Picea glauca*) and white pine (*Pinus strobus*).
4. The cost of a standard replacement shrub shall be determined by averaging the wholesale cost of a 3-gallon red osier dogwood (*Cornus sericea*), American hazelnut (*Corylus americana*) and nannyberry (*Viburnum lentago*).
5. The wholesale cost of both trees and shrubs shall be multiplied by a factor of 2.5 to account for the cost of the plant material, installation, watering, mulching, maintenance and a minimum two-year warranty period – all of which shall be required to ensure successful establishment.

Table 2 Compensation calculations based on type of tree removal

Type of trees	On-site compensation	Off-site compensation
Trees located in small woodlands that do not meet criteria for protection as per the Official Plan	Aggregate Caliper Formula (5.1.1) and may be combined with mass planting approach (5.1.3)	Off-site plantings following Aggregate Caliper Formula and may be combined with mass planting approach (where NHS sites are available) or cash-in lieu (5.1.4)
Plantation communities and units outside of the NHS as per the Official Plan	Aggregate Caliper Formula (5.1.1) or Area Based Canopy Compensation (5.1.2) and may be combined with mass planting approach (5.1.3)	Off-site plantings following Aggregate Caliper Formula or Area Based Canopy Compensation and may be combined with mass planting approach (where NHS sites are available) or cash-in lieu (5.1.4)
Individual trees and hedgerows	Aggregate Caliper Formula (5.1.1)	Off-site plantings (where sites are available) or cash-in lieu (5.1.4)

Establishment of vegetation (e.g. tree planting) proposed in the VCP will also conform to the standards outlined in [Section 3.3](#) of this document.

5.1.1 Aggregate caliper formula

When vegetation compensation is to be provided in the form of on-site or off-site tree establishment, the extent of compensation shall be calculated using an aggregate-caliper formula, whereby the total DBH of trees requiring compensation shall be replaced in whole by an equivalent caliper of replacement trees.

Compensation using the aggregate caliper formula shall be determined using the following equation:

Required compensation caliper = Total DBH removed = DBH Tree 1 + DBH Tree 2 + DBH Tree n = caliper replacement tree 1 + caliper replacement tree 2 + caliper replacement tree n

DBH and caliper are both measured in centimetres.

For example, if a total of three trees of 30 cm DBH each are to be removed from a development site, a total of 90 cm (3 x 30 cm) in required compensation caliper shall be provided. This may be provided by the establishment of any combination of differently sized replacement trees provided their combined caliper totals no less than 90 cm and that the minimum size of replacement trees is 60 mm caliper.

Thus, the establishment of fifteen 60 mm caliper trees would be equally acceptable to the establishment of ten 90 mm caliper trees.

The aggregate caliper formula may need to be combined with a mass planting approach where shrubs, herbaceous species or grasses are to be provided as part of an overall compensation plan (see [Section 5.1.3](#)). In such cases, further consultation with the City shall be required.

5.1.2 Area based canopy compensation

Where vegetation compensation is to be provided in the form of on-site tree establishment for the removal of areas of plantation communities that do not form part of the NHS, an area based calculation for replacement of the canopy may be used. This method is specifically for treed communities that may be difficult to inventory due to stand density and tend to be dominated by dense conifers.

The area of the plantation community is to be measured at the dripline of the unit(s). To determine the compensation required a factor of one tree for every 10m² is to be applied. This is shown in the equation below:

Area being removed (m²)/10 m² = number of compensation trees required.

For example, if a total of 250 m² is being removed, a total of twenty-five (25) trees would be required to be planted (250 m²/10 m²).

The area based canopy compensation method may need to be combined with a mass planting approach where shrubs and herbaceous species are to be provided as part of an overall compensation plan. In such cases, further consultation with the City may be required.

5.1.3 Mass planting approach

A mass planting approach may be provided to support on-site tree establishment by incorporating a combination of shrubs and herbaceous species, where the **compensation plantings are being used to restore or enhance the City's NHS** or used to support ecological restoration goals on other sites. Mass plantings are not intended to wholly replace tree compensation, but are intend to allow flexibility to

complement restoration and management goals and directions relating to Significant Natural Areas, Natural Areas and Wildlife Crossings, as well as site conditions.

The number of plantings is based on the equivalent wholesale value of the proportion of the required compensation tree plantings from the compensation method being used (aggregate caliper or area based canopy compensation). This is shown in the equation below:

Outstanding wholesale value of aggregate caliper or area based canopy compensation/wholesale value of mass planting proposed = number of plantings

For example, a site requires the equivalent of thirty compensation trees that are 60mm caliper in size – based on an aggregate caliper method. Fifteen of these trees are to be provided and the applicant would like to substitute shrubs in place of the other fifteen trees. The wholesale value of fifteen trees was determined to be \$9375 (15 x 250 x 2.5). In this example, the average wholesale value of the proposed shrubs is \$125 (50 x 2.5). Therefore, 9375/125 = seventy-five shrubs.

5.1.4 Cash-in-lieu for tree establishment

In some instances, development may preclude the re-establishment of vegetation on-site. In such cases, the City may require compensation in the form of funds as a permit condition of the Tree By-law. These funds are allocated for tree planting and naturalization projects that support the tree canopy, and natural heritage system goals and objectives.

5.2 Unauthorized tree injury or removal

Removal of trees approved for retention and protection require prior authorization from the City before deviating from approved plans. Activities such as TPZ or PRA encroachment, grading or excavation within the TPZ or PRA, or physical damage to any above or below ground parts constitute tree injury. In the event of unauthorized injury or removal, additional compensation may be required as shown in Table 3.

Table 3 Unauthorized tree injury or removal compensation

Type of tree injury	Compensation required for injury
Unauthorized injury to any tree part (above or below ground)	Establishment of one 60 mm deciduous tree
Unauthorized encroachment of TPZ by materials, equipment or personnel	Establishment of two 60 mm deciduous trees
Unauthorized encroachment of TPZ for utility installation, grading or other works	Establishment of two 60 mm deciduous trees

Type of tree injury	Compensation required for injury
Unauthorized tree removal or significant injury ¹	Proponents may be subject to penalties under the City of Guelph Private Tree Protection By-law (2010) – 19058 and / or forfeiture of Securities for non-compliance of Site Plan Agreement, or other development conditions

¹ Refer to Glossary for definition of significant injury

Section 6 – Monitoring and implementation

The development proponent is responsible for ensuring full and effective implementation of all tree-related plans, and full compliance with the guidelines and standards outlined in this document. The project consulting Arborist shall be on-site during critical stages of the development process to ensure effective monitoring and implementation during critical stages of development.

Critical stages may include, but are not limited to:

- Tree marking and tree removal;
- Branch and limb pruning;
- Installation of tree protection hoarding and other tree protection measures;
- Excavation or grading within TPZ or PRA, and root pruning, if required;
- Occurrences of physical tree injury;
- Site preparation for planting;
- Tree planting and maintenance; and
- Final (as-built) inspection.

The City of Guelph may require written inspection and monitoring reports bi-monthly, or at any of the critical stages of development, to be completed by the project consulting Arborist. Additional reporting, typically in the form of a letter of opinion addressed to the development proponent and provided to the City of Guelph, may also be required.

Section 7 – Tree establishment guidelines and standards

7.1 General principles for tree establishment

The following general principles should be applied in the design and implementation of tree establishment in the City of Guelph, both on streets and in other areas (e.g., parks, natural areas, private property, etc.). Where appropriate, these guidelines shall be supported by more detailed specifications.

1. **The principle of “the right tree, in the right place, for the right reason” should be applied to the design and implementation of all tree establishment activities, including street and landscape tree establishment.** For example, select smaller-stature trees for establishment beneath overhead utilities. Conversely, small trees should not be established where above- and below-ground space is sufficient to enable the development of large-stature shade tree species.
2. Species and structural diversity should be considered in all tree establishment **activities, with the overall objective of maintaining a “10-20-30 percent”** distribution of tree species, genera and families. Design or heritage considerations may necessitate deviation from this objective, but must be justified and reasonable.
3. Tree establishment should be forward-looking and proactive. Future land uses, site design changes, utility installation and other potentially conflicting activities should be considered when planning for the establishment of the future tree canopy; trees should not be planted where their long-term future may be uncertain.
4. Identify and fill available plantable locations on a priority basis. Proactive tree establishment in areas dominated by mature trees (e.g. underplanting) will contribute to the sustainability of the tree canopy and the provision of benefits derived from trees.

7.2 Design guidelines and standards

The Tree Establishment Guidelines and Standards described in the following section cover the requirements for the supply and installation, including all labour, equipment and materials, of street tree planting and tree planting in parks, open space and natural areas in the City of Guelph. Unless otherwise specified, the installation of trees by contractors and/or City staff shall be understood to include the initial layout; site modification (if required); tree installation, pruning, staking, mulching, watering; and restoration of the work site to its original conditions or as specified by the City. These guidelines and standards are to be used by both private **contractors and the City’s own workforce.**

This section also outlines general design guidelines for the development of STP’s and other tree establishment plans.

Variation from these guidelines and standards may be acceptable if justified to the satisfaction of the City of Guelph.

7.2.1 Tree location and spacing

Street trees

1. All street tree planting shall be undertaken in the public right-of-way (R.O.W.) where possible. If space is sufficient, the preferred tree planting location shall be between the sidewalk (if applicable) and the R.O.W. boundary (e.g. trees shall be planted in lawns wherever possible).
2. Where the R.O.W. boundary is less than 1 m from the sidewalk, the preferred location shall be in a boulevard between the curb and sidewalk with minimum 1.5 m width.
3. The minimum dimension of the boulevard planting area shall be no less than 1.5 m. In addition, street trees may be planted in an area defined by two curbs, curb and fence, curb and property line, or sidewalk and fence, providing the minimum dimension of available planting space between any combinations is no less than 1.5 m wide.
4. Where it is not possible to plant trees within the R.O.W., trees will be planted on private property set back 1.0 m from property line, assuming no utility conflicts.
5. Tree plantings proposed within a sidewalk area (e.g. downtown area) must have a minimum of 2.25 m² cut out permeable area (1.5 m x 1.5 m standard dimension).
6. Where the dimension of the planting strip is between 1.5 m and 2.5 m, street trees shall be centered within the planting strip, assuming no utility conflicts.
7. All street trees and tree groupings must be established in a manner and location that does not interfere with the designated sightline triangles of any municipal intersection (one deciduous tree is permitted within the sight line triangle).
8. Special consideration of street tree plantings should be given to major **`gateways` and `entrances` to the City, and** minor gateway neighbourhoods or districts.
9. However, there are additional considerations for more targeted tree plantings in urban areas to achieve specific benefits. These include tree establishment directed to areas:
 - a) Of known urban heat island effects and/or poor air quality;
 - b) Where trees will provide shading to residents and visitors in key locations such as bus loops, walkways, trails, cycling paths, parks and other places where people gather for social/cultural activities;
 - c) Intended for stormwater management; or
 - d) Close enough to buildings to provide cooling in the summer (deciduous trees, south aspect) and buffer against winds in the winter (evergreen trees, north aspect).

Residential lots

1. Street trees shall be planted at a minimum rate of one tree per single detached or semi-detached dwelling (in new subdivisions) and spaced as appropriate for the ultimate size of the species being established.

2. Where lot frontage is constrained preventing the establishment of street trees, consolidated planting areas shall be implemented elsewhere in the development.

Parking lots

1. Surface parking lots shall have trees planted around the perimeter, offset in accordance with provisions of the Zoning By-law.
2. Surface parking lots exceeding two lanes of stalls should have consolidated planting areas to enhance tree growing conditions, maximize canopy benefits and break up the expanse of paved area.
3. Surface parking lots should have interior trees planted at a ratio of one tree for every five parking spaces. Distribute the internal planting so that no parking space is more than 30 m from a tree.
4. Trees should not be planted in areas designated for snow storage.

Spacing between trees

1. Spacing must account for tree species characteristics, site conditions, and design parameters such as safety and accessibility regulations, ornamental alternatives, and overall design aesthetics. Spacing will affect the overall health and form of planted trees.
2. Spacing should not be less than 6 m nor greater than 15 m, with the standard spacing being 12 m where applicable. Corner lots may require one tree on the frontage and more than one tree on the property frontage to conform to the above spacing requirements.
3. Park and open space blocks, school, commercial, industrial, institutional and multi-family frontage and reverse-lot residential frontages shall be planted at spacing and density determined by the City on a site-by-site basis.
4. **Groupings and 'mass plantings' of street** and landscape trees can make for interesting and effective design elements. Groups of trees can be mutually beneficial by way of increased shading, reduced evapotranspiration, reduced soil compaction, shared soil volume and reduced reflective heat on single trees. Trees spaced closely develop a dense canopy and upright form. Trees spaced further develop an open canopy with lower branching.

Siting

The following minimum offsets are recommended for use in planning for tree siting:

- Buildings and building entrances – 4 m;
- Overhead utilities – 4.5 m, except for low growing species that do not normally attain a height greater than 6 m;
- Underground services – 1.5 m;
- Utility and telecommunications trenches – 1.5 m;
- Water hydrants – 4 m;
- Hydro transformer – 3 m from opening side (door), 1.5 m from other sides;
- Light standards/utility poles – 3 m;
- Residential driveways – 1.5 m or in conformance with sight triangle;

- Commercial driveways – 3 m or in conformance to sight triangle;
- Stop signs/intersections – 15 m or in conformance with sight triangle;
- Drainage swales – 1.5 m or in conformance with grading design (top of slope);
- Property lines – 1 m;
- Sidewalk edge – 1.5 m; and
- Curb face – 0.75m.

Trees and other vegetation are not permitted to be planted in transmission corridors unless deemed compatible as determined in consultation with the regulating authority. The location of trees shown on plans may be relocated as required under the direction of City staff.

7.2.2 Site soils

In terms of its physical and chemical properties, quality and volume, soil is perhaps the most critical determinant of the success of urban tree establishment. The following section provides guidelines for effective management of soils to ensure the greatest likelihood of long-term urban tree success.

Soil preservation

The protection of native soils is an important consideration for all types of development, except where soils are contaminated or otherwise compromised. As such, soil preservation strategies should be a component of any site design or development process.

Key considerations for effective soil preservation include:

- Detailed testing of on-site soil conditions;
- Conclusive and relevant soil test results;
- **Implementation of 'soil protection zones'** (e.g. areas where heavy equipment access will be limited or restricted and where chemical storage will not be permitted);
- Identification of areas where native soil/vegetation will be retained;
- Identification of areas where native soil will be improved (amended);
- Identification of areas where topsoil will be stripped and stockpiled to enable development;
- Identification of opportunities to reuse/redistribute topsoil on-site;
- Identification of areas where foreign soil will be applied;
- **Implementation of innovative 'soil-friendly' site development, including reduced grading, stripping, stockpiling, etc.;** and
- Implementation of erosion and sediment control measures (e.g. siltation barriers, covers, etc.).

Use existing on-site soil, of acceptable quality, for tree establishment rather than imported foreign (e.g. off-site) soil. Additionally, avoid exporting soil off-site. Test site soils prior to tree establishment and amended on-site as required to

compensate for inadequacies in quality, such as insufficient organic matter, bulk density or drainage.

Soil volume

Adequate available soil volume is a critical factor for the development of root structure, nutrient availability, water storage, tree growth and long-term viability. Soil volume must be sufficient to support the expected tree size at maturity.

The soil volume available for root growth is directly related to tree size. Table 4 below details the soil volume requirements for individual trees and trees planted in groups. Establish smaller-stature trees if minimum allowable soil volume is unavailable for the expected or desired tree size at maturity.

Table 4 Minimum soil volumes by tree size at maturity

Expected tree DBH at maturity (cm)	Minimum soil volume for one tree (m ³)	Minimum soil volume per trees sharing soil volume (m ³)
Small (20)	15	10
Medium (40)	23	15
Large (60)	30	20

A minimum soil depth of 1 m is required for standard plantings, and deeper as required for larger root balls.

1. The STP must include soil volume requirements for expected tree growth and a comparison with the designed soil volume available to the tree considering the tree opening, existing or prepared soil under pavement, soil adjacent to the rooting space, as well as competition for resources in shared root spaces and soil volume utilized by utilities or aggregates in structural soils.
2. Street tree planting in hardscapes and other areas of poor-quality, high water table or compacted native soils should, where possible, incorporate site-specific designs on a case-by-case basis to provide increased soil volume and quality (e.g. root paths, continuous soil zones, raised planting features, structural soils, structural soil cells, breakout zones, rubber sidewalks, etc.).
3. A minimum topsoil depth of 750 mm should be specified for tree planting beds, provided that root ball is placed on a compacted base where the root collar will be flush with or slightly above the finished grade.
4. Only the soil portion (20 percent) of engineered soil counts towards minimum soil volume requirements.

Soil quality

Soils shall be considered adequate to enable healthy tree growth provided they have the basic characteristics described below:

- 50-60 percent sand, 20-40 percent silt, 6-10 percent clay and 2-5 percent organic matter content;
- pH between 6.5-7.0;
- Adequate porosity for air and water holding capacity;
- Bulk density not in excess of 1.3 g/cm³;
- Soil nutrients: Nitrogen 20-40 micrograms, Phosphorous 10-20 micrograms, Potassium 70-120 micrograms; and
- Free of growth inhibiting herbicides.

More than one soil type may be required to support specific needs on a site (e.g. trees, stormwater management). A qualified soil expert should determine soil parameters.

Excavated soils

- Native site soil that has been stockpiled or altered through development shall be tested for suitability of use as a planting substrate, and shall be protected from contamination from construction material, debris, rocks, wood and compaction;
- Soil amendment may be required to improve fertility, drainage and aeration, and to reduce compaction. Amendment may include the addition of sand, organic matter, or specific fertilizer. Generally, amendment to change soil pH levels should not be undertaken. Soil amendment shall only be undertaken if determined appropriate based upon results of soil testing done by a laboratory accredited with the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA);
- On-site soil handling should be minimized, and shall take soil quality into account; and
- Soils shall not be screened through screens smaller than 50 mm, in order to maintain different-sized soil pedes (aggregates) and good soil structure. Avoid movement of soil with large machinery or dropping soil into place. Ruted and compacted soil shall be de-compacted, and shall not be simply covered **with a thin layer of 'fresh' soil to create apparently un-compacted landforms.**

Planting soils

- Soils for soil systems shall be in accordance with manufacturer's specifications.

7.2.3 Tree species and nursery stock

Species selection

Trees must be able to withstand difficult growing conditions and as such, the selection of species needs to consider current and future site conditions. Factors to be considered when selection tree species include, but are not limited to:

- Site conditions, including soils, microclimate, aspect, drainage, traffic;

- Utilities above and below grade;
- Desired environmental, social and economic benefits for the planting site and surrounding areas;
- Existing trees and land uses adjacent to the site;
- A wide range of tree species characteristics, including:
 - Light, moisture, maintenance, and soil requirements;
 - Potential adverse characteristics (e.g. biogenic VOC emissions, messy fruit, etc.);
 - Size and form at maturity; and
 - Long term maintenance requirements;
- Species allelopathic tendencies;
- Species and structural diversity targets; and
- Aesthetics and urban design.

Furthermore,

- Species indigenous to central and southern Ontario are preferred;
- Species and horticultural varieties with known invasive properties should be avoided, and are strongly discouraged in areas adjacent to the NHS; deciduous, non-fruit trees are generally preferred, except in special circumstances where evergreen or smaller-stature trees are more appropriate based on site conditions or other considerations;
- It is advantageous to select tree species that have a higher resilience and resistance to pests and diseases; and
- Tolerance to the stresses of urban and roadside environments is critical to tree survival.

Tree species, age and structural diversity are important elements in the sustainability and health of the **City's tree** canopy, promoting resilience against pests, diseases and other stressors. As a general principle, diversity targets should **achieve a "10-20-30 percent" distribution of tree species, genera and families at the neighbourhood level** (e.g. the STP planting list for a given site must conform to this distribution) (Table 5).

Genus diversity should be distributed in a way to prevent homogeneous plantings. However, it may be impractical to adhere to this rule in smaller plantings, or when design or heritage considerations may necessitate more homogenous plantings. Regardless, any deviation from this rule must be justified and reasonable. Table 5 provides a guideline for determining the minimum species composition for any given site.

Refer to [Schedule D](#) for a list of recommended tree species suitable for use as street trees throughout the City. The list is extensive, though not exhaustive, of tree species suitable for use as street trees. Consideration for tree species not included in the list is given on a case-by-case basis.

Tree genus diversity guidelines

Table 5 Tree genus diversity guidelines: Street tree or landscape plantings (development)

Number of Trees to be Established	Maximum Percentage of any Single Genus
1-15	75 percent
16-50	50 percent
51-100	30 percent
100+	20 percent

Table 6 Tree genus diversity guidelines: Parks, open spaces and other significant natural areas

Number of trees to be established	Maximum percentage of any single genus
1-15	60 percent
16-50	40 percent
51-100	30 percent
100+	20 percent

Nursery stock selection and minimum stock requirements

Quality of tree and plant material stock is essential to the success of any project.

Quality requirements are as follows:

- Only planting stock which meets the latest size and quality standards outlined by Canadian Nursery Landscape Association in the Canadian Standards for Nursery Stock, latest edition, shall be established;
- Planting stock shall be of uniform high quality, true to name and type, and representative of its species, variety and/or cultivar;
- Planting stock shall have been nursery-grown for a minimum of 2 years in climatic conditions similar to those of the City of Guelph. The tree establishment contractor shall provide a list of the proposed sources of nursery stock to the City of Guelph upon request. When available, the City of Guelph prefers stock grown from source-identified seed where the seed source is comparable in climate to Guelph;
- Planting stock shall be healthy, vigorous, well branched, densely foliated (if in-leaf), and wholly free of disease and insect pests;
- Trees shall have healthy, well-developed root systems and shall be free from physical damage or other conditions that may prevent healthy long-term growth; and
- Planting stock with damaged leaders, poorly attached branches, sunscald, bark damage, decay, unhealed wounds and/or other objectionable disfigurements are unacceptable and may not be established. Trees with

multiple leaders are acceptable if clump-type forms are specified for establishment.

The following stock types are acceptable, provided the characteristics described below are present:

1. Balled and burlapped/wire-basket: root balls shall be tight, solid and of appropriate size relative to caliper. Root balls will be tightly wrapped with untreated, non-synthetic fully biodegradable burlap and non-synthetic biodegradable rope or twine. The root collar or flare shall be visible at the root-soil interface (e.g. surface of the soil ball);
2. Container: Container-grown trees must be well established in the container prior to planting. Root systems must not be container-bound, and shall not display circling, kinked, girdling or bent roots. The root collar or flare shall be visible at the root-soil interface; and
3. Bare-root: Bare-root stock shall display a vigorous and well-formed root system, with no circling, kinked, girdling or bent roots. Bare-root trees must be dug and planted during the dormant season only. Anti-desiccant hydrogel may need to be applied to bare-root stock in between digging and transplanting if necessary to prevent root drying. Given the low costs and potentially high quality of bare-root planting stock, consideration should be given to its use, particularly in conjunction with enhanced rooting environment techniques.

The following size requirements are applicable to all tree establishment activities approved by the City:

- Any deciduous trees planted on streets shall be at least 60 mm caliper. Caliper shall be measured in accordance with standards of by Canadian Nursery Landscape Association;
- The minimum height of the lowest branch of any deciduous tree to be established on City of Guelph streets shall be 1.75 m
- Any coniferous trees planted on City of Guelph streets shall be a minimum height of 250 cm; and
- The size (caliper or height) of trees planted in parks, open spaces and natural areas is to be determined on a case-by-case basis, for approval by the City of Guelph.

The following guidelines shall be used to guide the selection of acceptable nursery stock:

- Planting stock must be inspected in the nursery, prior to shipping to the planting site, to ensure conformance with these guidelines and standards, including the presence of a visible root flare at the root-soil interface;
- The north side of the trunk should be marked in the nursery to enable planting in the same orientation, thereby reducing the likelihood of frost cracking or sun scald;
- In development scenarios, **the development proponent's** Landscape Architect or Project Consulting Arborist shall be responsible for ensuring that all planting stock meets or exceeds the guidelines and standards laid out in this document;

- Trees established as part of capital projects or other non-development (e.g. non- Site Plan or Subdivision) works shall be inspected by the contractor to ensure that all planting stock meets or exceeds the guidelines and standards laid out in this document;
- The City of Guelph reserves the right to conduct sample-based or complete inspections of all planting stock to ensure conformance with the guidelines and standards laid out in this document. Planting stock failing to conform to these standards may be rejected by the City, and will be replaced with acceptable planting stock **at the development proponent's or contractor's sole expense**;
- The City of Guelph must be provided with the opportunity to inspect planting stock before it is installed; and
- **Acceptance of planting stock does not limit the City of Guelph's right to** inspect and reject stock during the course of works, or during the warranty and maintenance period.

The following guidelines relate to proper packaging, transportation, handling and storage of planting stock to and on the planting site:

- Planting stock should not be dug, balled and burlapped or moved with a spade during the active growth period, unless the root ball is large enough to ensure survival;
- During transportation, the contractor shall take all necessary precautions to prevent physical injury or drying out of planting stock, and shall handle all material in such a manner as to avoid any damage;
- Ball and burlap, or wire-basket planting stock shall always be handled by the soil ball. Under no circumstance should trees be dragged, lifted or pulled by the trunk or canopy. Trees should never be thrown or bounced off a truck or loader. Trees with broken or cracked root balls will be considered as unacceptable planting stock;
- If necessary, branches shall be tied with rope or twine only, and in such a manner as to prevent damage to branches or bark;
- In cases where trees may have their trunks scarred during the planting operation, the trunks shall be protected with wrap or padding, which is to be removed after planting;
- On the planting site, all material should be handled, secured and shaded or covered so as to prevent damage from wind, sun, vibration or exposure to freezing temperatures. Bare-root stock shall at all times be covered by an appropriate moisture-retaining, heat-reducing medium and tarps (Silvicool type);
- Trees which cannot be planted on the day of delivery shall be stored as described above, and root balls shall be stored in soil or mulch and kept well-watered. No planting stock shall remain unplanted for longer than three days following delivery; and

- Any abrasions of the bark or branches, or broken limbs caused during the planting operation shall be immediately treated in an arboriculturally correct manner.

7.2.4 Tree installation

This section outlines guidelines and standards for the process of tree installation, beginning with layout and ending with post-planting treatments.

Initial layout

1. The proponent responsible for the installation of trees will lay out locations of all trees by use of wooden stakes and/or paint, as appropriate based on site condition. Locations will indicate species to be planted, using code corresponding to the approved LP or STP;
2. Locations laid out on site shall conform to locations proposed in the approved plans. All utility locates, including but not limited to public and private underground electric or telephone lines, gas lines, waterlines, or any other utilities, shall be secured prior to initial layout;
3. The proponent shall notify the City of Guelph no later than three business days prior to beginning the installation of any street trees or trees in parks, open spaces or natural areas. The City of Guelph shall reserve the right to inspect the on-site layout for conformance with approved plans and potential on-site conflicts, as well as any planting stock for conformance with the guidelines and standards laid out in this document. No planting pits shall be dug or prepared until their location is approved by the City of Guelph, or until the City has declined the opportunity to inspect the layout;
4. Upon receipt and approval of the submitted LP or STP, the proponent will be provided with written authorization from the City of Guelph to proceed with the installation of the street, park, open space or natural areas trees during the next available planting season; and
5. The proponent shall be responsible for all costs associated with transplanting plant material that is deemed to have been installed in conflict with utilities, setback requirements, or the approved plan(s).

Timing of planting

Appropriate timing of tree installation depends upon species, type of planting stock, climate, weather conditions and other factors. The following section provides guidelines and standards for the timing of tree planting activities. Timing of tree planting should be outlined in the LP or STP, and should be based upon the recommendations of an Arborist.

1. Generally, spring is the best time to plant most species. Spring planting should be undertaken after the ground thaws and before tree buds break;
2. Summer planting should be avoided, but can be undertaken if extreme care is taken to prevent drying and to ensure adequate water is provided before, during and well after planting;

3. Fall planting is also acceptable, provided that trees are planted before soil is frozen in order to permit some root development (species that require spring planting will not be accepted for fall planting); and
4. Planting seasons may be longer or shorter, depending upon prevailing weather conditions.

Planting hole preparation

1. The developer or contractor shall ensure that planting layout has been reviewed and accepted by the City of Guelph prior to preparing the planting hole;
2. The developer or contractor shall ensure that all public and private utility locates are secured prior to preparing the planting hole. The developer or contractor shall be responsible for any damage to utilities resulting from a failure to secure or understand utility locates;
3. Holes shall be dug at the time of planting, and shall not be left empty or uncovered at the end of the working day. If the site is temporarily vacated during the working day, the planting hole shall be filled with soil, covered or barricaded with warning devices that conform to the Highway Traffic Act and the Manual of Uniform Traffic Control Devices, and re-excavated upon returning to the site;
4. Circular pits with sloping sides shall be excavated for all ball and burlap, wire-basket and container-grown trees. Excavation shall be done by hand (e.g. shovel), backhoe, or stump grinder. Hydraulic excavation (e.g. Hydro Vac) can be used provided that native topsoil can be returned as backfill without becoming contaminated in the process. A soil auger or tree spade shall not be used;
5. All planting pits should be at least three times the diameter of the soil ball, unless otherwise specified (e.g. spade transplants). The glazed and compacted walls of the planting pit shall be scarified by a shovel or rake to enable improved root penetration into the parent soil. Alternately, a planting hole at least two times the diameter of the soil ball shall be dug and the soil shall be loosened at **least one ball diameter's distance beyond the hole to a minimum depth** of 200 mm using a rotary tiller;
6. The planting hole shall be dug to a depth such that the top of the root collar will be no lower than level with or a maximum of 50 mm above the surrounding grade after planting and settling. The bottom of the planting hole should be firm and undisturbed to minimize or eliminate settling. Planting hole depth should account for possible settling of the soil ball after watering. Bare-root trees may require sculpting of the bottom of the planting hole to enable adequate root distribution;
7. For trees to be planted in soil that is deeper than the root ball depth, such as in the case of disturbed soils or fill, compact the soil under the root ball to assure firm bedding for root ball;
8. Proper drainage shall be assured. The developer or contractor shall notify the City of Guelph, in writing, of any soil conditions or other obstructions that the developer or contractor may consider detrimental to tree growth. Such conditions, as well as suggestions for correcting them shall be described; and

9. Where soil conditions or below-ground obstructions which cannot be remedied are encountered, the City of Guelph shall designate alternate planting locations. The City of Guelph shall not bear any costs associated with such relocation.

Tree planting

1. Trees shall be installed plumb and centred in the planting hole. Trunk position shall be visually confirmed from at least two perpendicular directions. Trees with appreciable sweep (e.g. stem curvature) will not be acceptable;
2. Trees shall be positioned in the same cardinal orientation as in the nursery;
3. Ball and burlap, and wire basket trees shall have all foreign materials removed from at least the top half of the root ball. Wire baskets shall, at minimum, be cut or bent back from the top half of the root ball. The root ball shall be in the hole and well supported before the material is removed;
4. Container-grown trees shall have containers removed entirely before planting. Roots shall be gently separated from the surface of the soil-root mass. Circling roots shall be cut, and excessively girdled or pot-bound planting stock shall be rejected;
5. Bare-root trees shall have their roots spread to a natural position. No root pruning shall be conducted unless girdling roots are present;
6. For all trees moved with a tree spade, all holes and cavities between the ball and the surrounding soil should be filled;
7. All plastic ties, ropes, strings, and other wrappings must be removed from the tree;
8. The root collar must be exposed prior to backfilling, and must be at or no more than 50 mm above final grade. If the root flare is not visible, excess should be removed from around the trunk by hand or using a hand trowel;
9. Planting holes shall be backfilled with excavated native topsoil. Refer to [Section 7.2.2](#) for soil specifications. Soil shall be tamped in the hole in 150 mm lifts. When holes are approximately two-thirds full, they shall be watered thoroughly;
10. A 100 mm high ring of soil shall be formed around the perimeter of the planting hole. No soil shall be backfilled to within 100 mm of the root collar or around the trunk; and
11. The entire planting area should be thoroughly watered after planting.

Tree support systems

Support, typically in the form of staking, may be required to stabilize newly-planted trees in a vertical position and to provide anchorage to enable root establishment. The following guidelines and standards pertain to the design, installation and maintenance of tree support systems:

1. Staking shall be required when soil conditions will not enable newly-planted trees to maintain their vertical position without support;
2. If required, trees shall be staked with two wooden stakes a minimum of 2 m long. Stakes shall be driven in to the ground at the outer edge of the root ball

(outside planting hole) to a depth sufficient to prevent shifting or movement. Stakes shall be aligned in the direction of the prevailing winds or parallel to the curb for street plantings;

3. Trees shall be tied to stakes using Arbortie or approved equivalent in a figure-8 pattern that shall remain tight, soft and pliable under all weather conditions;
4. The condition of tree support systems shall be monitored throughout the warranty and maintenance period;
5. Unless otherwise specified or required based on site inspections, tree support systems should be removed at the end of the next growing season following installation of tree; and
6. Alternative methods of tree support, such as guying, root ball anchorage or three-point staking may be approved by the City of Guelph on a case-by-case basis, if required due to site conditions.

Trunk protection

Trunk protection is required when damage from sun scald, frost cracking, and lawn maintenance equipment damage are likely. The following guidelines and standards pertain to the proper installation of trunk protection:

1. Trunk guards shall be white spiral plastic, or approved alternative, unless otherwise specified. Tree guards shall be loosely installed around the trunk to a maximum height of 500 mm. Tree bark protectors may be specified in streetscapes and parks where tree trunks may be subject to mechanical injury (Specification: black extruded resin mesh, 1200 mm wide, 1500 mm long as manufactured by Industrial Netting, Minneapolis, MN, USA or approved equal). Beaver guards may be specified for installation on trees within 50 metre of a body of water (Refer to [Schedule E](#));
2. Trunk guards must be kept free of mulch and soil to prevent trunk rot, and must allow adequate air circulation;
3. Burlap trunk wrap shall only be used for trees with known predisposition to frost cracking in areas with a strong south and west exposure. Burlap trunk wrap shall be removed after the first winter following tree installation;
4. The condition of all trunk protection materials must be regularly inspected and monitored to ensure no interference with tree growth (e.g. girdling or bark scraping); and
5. Unless approved by the City of Guelph, all trunk protection material shall be removed at the end of the warranty and maintenance period.

Mulching

Mulching is required for all trees planted on streets and in parks, open space and natural areas, unless otherwise specified. Mulch provides organic matter, retains soil moisture, reduces soil temperature fluctuations, and provides protection against physical damage from lawn maintenance equipment. The following guidelines and standards pertain to the proper installation of mulch:

1. Mulch shall consist of loose composted wood chips (except in designated Termite Management Areas) and shall be free of weed and grass seeds or rhizomes, or other materials which may be harmful to tree growth;
2. Only mulches listed as Approved on the City of Guelph Approved Top Mulch and Soil Amendment Materials list shall be applied in designated Termite Management Areas;
3. Mulch shall be spread in a 'donut-shaped' ring around the planting hole to a depth of no less than 100 mm and no more than 200 mm. Mulch shall be spread over the root ball and planting hole area, but shall be kept back a minimum of 100 mm from the trunk;
4. Under no circumstances shall mulch be piled up around the trunk **in a 'volcano' shape**;
5. Mulch should be kept weed free throughout the course of the warranty and maintenance period; and
6. Mulch should be replenished as required during the course of the warranty and maintenance period.

7.2.5 Warranty, maintenance and inspection

All street, park, open space and natural area tree planting undertaken by developers, or contractors when on behalf of the City of Guelph, shall be supported by a warranty, as well as a maintenance period during which time the developer or contractor will endeavour to ensure the establishment, survival and good health of planted trees. The following sections outline the guidelines, standards and requirements for warranty and maintenance periods, and outline inspection and acceptance procedures. These requirements are to be incorporated on to all planting plans.

Acceptance, warranty and inspection

1. Upon completion of installation of all street, park, open space or natural area tree plantings, the developer or contractor shall submit a certificate from the project Arborist or OALA to the City that certifies that the tree was from quality nursery stock, was planted following our specifications and that the tree is healthy. All deficiencies will be noted in site inspection minutes and sent to all parties involved (e.g. city staff, contractor, developer). Deficiencies will be corrected as soon after notification as possible. Initial acceptance shall be provided in writing by City staff following the results of the inspection;
2. The warranty period shall begin at the time of acceptance of works by the City of Guelph (typically after final inspection and correction of any deficiencies), and shall terminate no sooner than two full calendar years after the time of acceptance;
3. Any trees determined by the City of Guelph to be in unsatisfactory condition during the warranty period shall be replaced in the next planting season at the sole expense of the developer or contractor to the satisfaction of the City of Guelph. Unacceptable defects and deficiencies may include, but are not limited to:
 - a) Slow growth (typically less than 50 mm annual twig growth);

- b) Crown dieback;
 - c) Clear loss of overall vigour; or
 - d) Disease and decay related to conditions prior to planting;
4. The guarantee is not expected to cover losses or damage related to vandalism, storms, animals or mechanical damage not related to the developer's or contractor's activities;
 5. Unless otherwise specified by the City of Guelph, all replacement trees shall be of the same species, variety, cultivar (if applicable), stock type and size as the initial planting. All replacement costs shall be borne by the developer or contractor. The guidelines and standards relevant to the initial planting shall apply in whole to the replacement planting;
 6. The guarantee period for replacement trees shall be for the greater of the remainder of the guarantee period or an additional period of one year from the date of acceptance after replacement; and
 7. Final acceptance of plantings will be completed through an inspection at the end of the warranty period and will be provided in writing by City staff.

Maintenance during the warranty period

The developer or contractor is expected to adequately and regularly maintain newly-planted trees throughout the warranty and maintenance period, in accordance with the maintenance plan outlined in the planting plans. Each site will have specific maintenance requirements. However, the following guidelines and standards pertain to maintenance during the warranty and maintenance period for all plantings:

1. Trees shall be regularly and adequately watered. Watering shall be more frequent for new plantings, which should be regularly monitored for signs of drought or overwatering. In general, newly-planted trees should be watered every 10 days between early May and late August, and every 20 days between September and mid-November. Water shall penetrate the full depth of the growing medium, and frequency shall be increased or decreased based upon the frequency and intensity of natural rainfall. During periods of extreme heat and humidity, root feeding with watering probe is the preferred method of watering;
2. Soil moisture must be monitored to ensure the tree has sufficient water. Check soil moisture and root ball moisture with a soil moisture meter on a regular basis. Record moisture readings. Do not over-water;
3. If there are issues with tree condition during the warranty period City staff may request records of maintenance, including watering;
4. Watering of trees must be carried out in compliance with the City's Outside Water use and Water By-law;
5. Trees shall only be fertilized if soil test results or foliar conditions suggest nutrient deficiencies;
6. Mulch shall be periodically maintained and reapplied to suppress weed development, improve soil moisture conditions, and improve general appearance of the planting area. If determined necessary by the City of Guelph during the

course of regular inspections, the developer or contractor shall undertake mulch maintenance at his or her sole expense;

7. Unless otherwise determined during site inspections, tree support systems should be removed at the end of the next growing season following their installation. Stakes should be removed earlier if trees are stable. No stakes shall remain in place at the end of the warranty and maintenance period;
8. All trees must be maintained in a plumb position throughout the warranty period. Straighten all trees that move out of plumb. Plants to be straightened should be excavated and root ball moved to a plumb position, and then re-backfilled;
9. All trunk protection should be removed before the end of the warranty and maintenance period unless otherwise determined;
10. Newly-planted trees should be carefully pruned, if necessary, to encourage the development of good canopy structure. Co-dominant unions, crossing and broken branches, and other defects should be removed by pruning. Pruning must be conducted by an Arborist at the appropriate time according to species requirements. Proper pruning during the warranty and maintenance period is critical to the development of well-formed and healthy trees; and
11. All newly-planted trees should be inspected for pests and diseases throughout the warranty and maintenance period. Integrated Pest Management (IPM) and Plant Health Care (PHC) principles should be applied to the control of all pests and diseases.

Section 8 - Securities

As a condition of development application approvals, the City of Guelph may require the applicant to enter into an agreement to provide securities, in the form of a Letter of Credit or a cheque made payable to the City of Guelph, to ensure that site works are completed in a timely manner and in accordance with approved plans.

Generally, the amount of the securities required is determined from a detailed cost estimate for the site works, listing items, quantities, unit costs and total costs. The value of securities for trees to be protected, landscaping trees and/or compensation trees to be established on-site shall be determined using the appropriate methodology outlined in [Section 5](#) of this document, accounting for the cost of plant material, installation and maintenance until establishment. The cost estimate is to be prepared by the applicant and submitted to the City for approval.

Upon approval of the cost estimate by the City, the applicant will be required to provide a Letter of Credit. The Letter of Credit must remain in effect until site works have been completed in accordance with approved plans and no further threats to tree protection or the survival of newly-established trees are evident (refer to [Section 7.2.5](#)).

Securities for tree preservation or compensation may be held by the City in part, or in whole, for up to five years from the date of the final inspection of the development project. Securities may be released prior to the expiry of the five year period provided the City is satisfied that the subject tree(s) have not been damaged, or that landscaping trees and/or compensation trees are adequately established. It is the responsibility of the applicant to request that the City carry out a final inspection of the site; thus obtaining City approval to release the securities. Applicants for the early release or reduction of securities shall submit a report from an Arborist, preferably the project consulting Arborist, certifying that the subject trees are in a state of vigorous health and have not been injured or destroyed as a result of the site development activities.

Further details regarding the collection of securities are outlined in the City of Guelph [Site Plan Approval Procedures and Guidelines](#), current version.

Schedule A: Glossary

Arborist – Is an expert in the care and maintenance of trees and includes an arborist qualified by the Ontario Ministry of Training, Colleges and Universities, a Forest Technician, a Forestry Technologist with an applicable college diploma and a minimum of two years of forestry experience, a certified arborist qualified by the International Society of Arboriculture (ISA), a consulting arborist registered with the American Society of Consulting Arborists (ASCA) or a Registered Professional Forester as defined in the Professional Foresters Act, 2000, S.O. 2000, c. 18, as amended or replaced from time to time.

Buffer - Area identified adjacent to some natural heritage features or areas that are intended to be protected and provide a separation between the protected feature or area and the adjacent development, and mitigate negative impacts to the natural heritage feature or area and/or its ecological function(s).

Caliper – Measurement of trunk diameter of transplantable deciduous trees. Measured in millimetres (mm). In accordance with the Canadian Nursery Landscape Association (CNLA) standards, caliper must be the determining measurement when the caliper exceeds 40 mm. It must be measured no less than 15 cm above the ground level for trees with a caliper up to 100 mm. Trees 100 mm and larger caliper are to be measured 30 cm above the ground level.

Canopy cover - Geographic area covered by the horizontal projection of the dripline of a tree or group of trees, which may be measured directly from aerial photography and/or the field.

Compensation – The planting and establishment of tree(s) and /or shrub(s) to recompense for the injury or removal of a tree(s).

Construction – The building, installation and maintenance of a structure, infrastructure, utilities or highway.

Designated Heritage Tree – Any tree (or trees) identified as a heritage attribute of a property designated under Part IV of the Ontario Heritage Act, or any tree (or trees) identified as a heritage attribute within a Heritage Conservation District designated under Part V of the Ontario Heritage Act.

Developer or contractor – Means the landowner, or a **landowner’s agent who** represents and acts on behalf of and with consent of the landowner.

Development –

- a) The creation of a new lot, a change in land use, or the construction of buildings and structures requiring approval under the Planning Act;
- b) Site alteration activities such as fill, grading and excavation that would change the landform and natural vegetative characteristics of a site; and
- c) Various forms of intensification, infill development and redevelopment.

Development does not include activities that create or maintain infrastructure authorized under an environmental assessment process or works subject to the Drainage Act. In spite of the above definition, for the Special Policy Area Flood Plain of this Plan, development means the construction, erection or placing of one or more buildings or structures on lands, or an addition or alteration to a building or

structure which adds more than 50% of the existing ground floor space area to the building or structure.

Diameter at breast height (DBH) – A measurement, in centimeters, of the **diameter of a tree’s trunk at 1.4 m above grade.**

Dripline – **Imagined line from the outer edge of a tree’s foliage extending down to the ground.**

Hedgerow – Trees left standing or planted along the edge of a former or existing agricultural field or laneway to create a physical and/or visual amenity. Hedgerows also typically include trees remaining along former fence lines.

Injure – Means to cause, directly or indirectly, whether by accident or by design, including through construction activities, lasting damage or harm to a tree, which has or is likely to have the effect of inhibiting or terminating its growth, whether by cutting, burning, girdling, interfering with its water supply, applying chemicals, puncturing, or compacting, regrading or resurfacing within its drip line.

Invasive species – Species of plants, animals and microorganisms introduced by human action outside their natural past or present distribution whose introduction or spread threatens the environment. An invasive plant is one that has been moved from its indigenous habitat to a new area (possibly for garden/domestic use), and reproduces so aggressively that it displaces species within indigenous plant communities.

Landscape Architect (LA) – A member in good standing with the Ontario Association of Landscape Architects (OALA).

Potential rooting area (PRA) - Is defined as an area within which site development works are permitted but must be undertaken in a more sensitive manner than in areas outside this zone. A PRA is typically double the size of a **subject tree’s TPZ.**

Restoration areas – Include existing and new stormwater management areas abutting the NHS, areas within City parkland and GRCA lands that are not intended for active uses and isolated gaps within the NHS.

Significant injury –

- Damage to or removal of greater than 30 per cent **of a tree’s branches or crown;**
- **Exposure, severing, or compacting greater than 25 per cent of the tree’s roots that are within the minimum TPZ;** or
- Any bark or trunk wound greater than 50 per cent of the diameter (or 25 per cent of circumference) of the tree.

Site alteration – Activities such as grading, excavation and the placement of fill that would change the landform and natural vegetative characteristics of a site.

Tree - Any species of woody perennial plant including its root system, which has reached or can reach, a height of at least 4.5 metres at physiological maturity. The **term “tree” refers to all parts of the tree; roots, branches, leaves and stem.**

Tree protection zone (TPZ) - An area within which no site development works are permitted. The radius of the TPZ is generally determined based upon the trunk

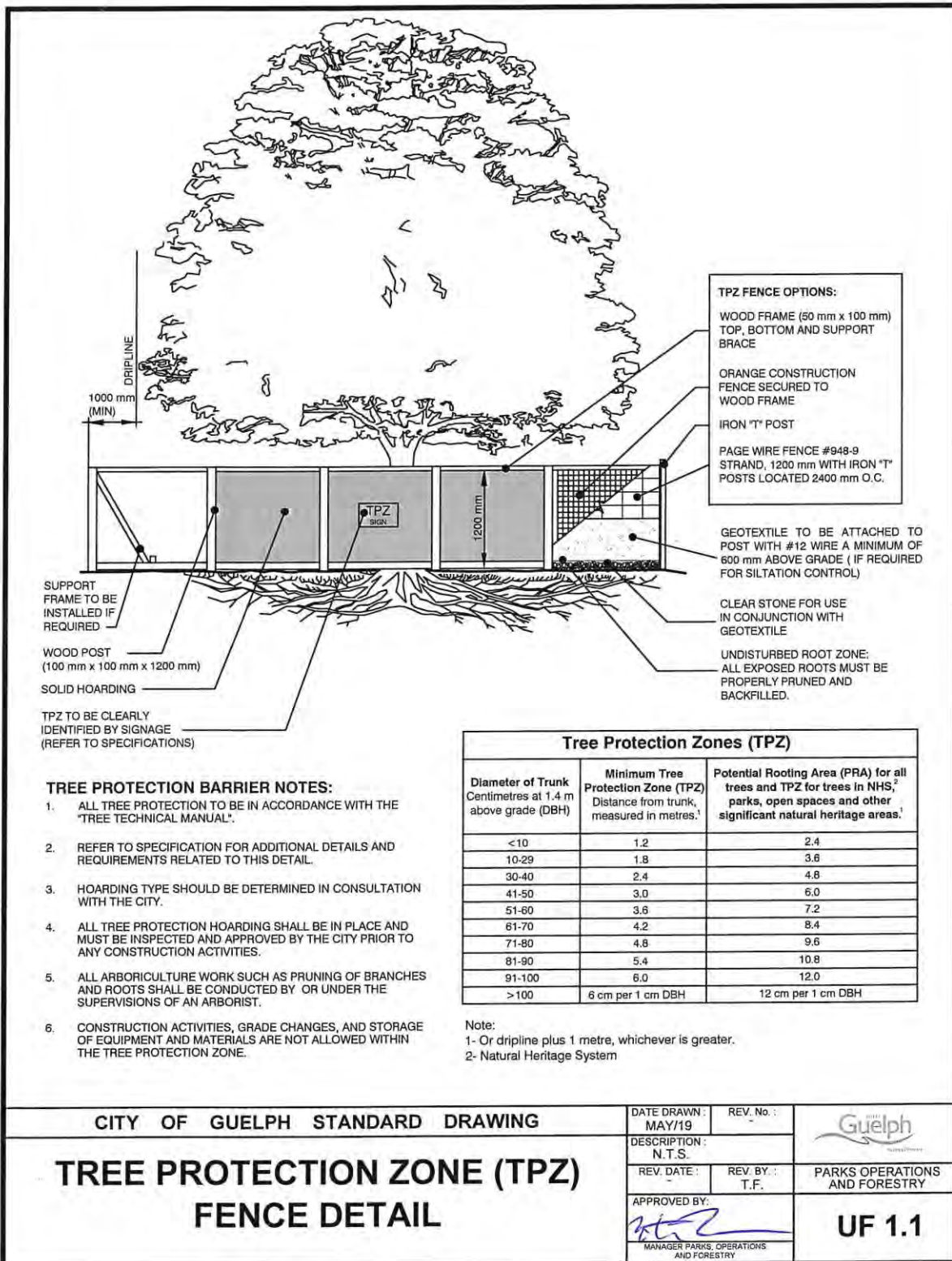
diameter of the subject tree, and is measured from base of the stem of the subject tree. Site development works within a TPZ constitute injury to the subject tree.

Tree removal – Causing, directly or indirectly, whether by accident or design, including through construction activities, uprooting or severing of the main trunk of a tree in a manner which causes or is reasonably expected to cause a tree to permanently cease normal biological functions associated with life.

Urban forest –Means plantations, woodlands, hedgerows, treed areas and **individual trees outside the City’s Natural Heritage System.**


Vegetation unit – A grouping of vegetation, which is distinct from other groups because of structure, composition and general characteristics.

Schedule B: Tree protection standard drawings



TREE PROTECTION ZONE (TPZ)

NO



**GRADE CHANGE
DUMPING
STORAGE OF MATERIALS
STORAGE OF EQUIPMENT
UNAUTHORIZED ENTRY
TREE INJURY OR REMOVAL
DISTURBANCE OF ANY KIND**

THIS FENCING MUST NOT BE DAMAGED OR MOVED

CONTACT: Contractor name and telephone number of contact


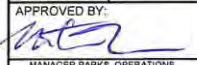
**City of Guelph: Forestry 519-837-5626 (parks@guelph.ca)
Planning 519-837-5616 (planning@guelph.ca)**

Sign Design, Installation and Maintenance: TPZ information signs shall be constructed from metal, corrugated plastic, Gatorboard or wood, and shall be installed in an appropriate manner such that it will be able to withstand inclement weather conditions. Signage shall be maintained in good condition and in the original location throughout the duration of site development works. Signage shall be clearly legible, with black text on a white background being the preferred design.

Sign Content: The TPZ information sign shall, at minimum, provide a list of activities prohibited within the TPZ. Such activities shall include, but not be limited to: grade change, dumping, storage of equipment and materials, unauthorized entry by personnel, tree injury or removal, or other disturbance of any kind. The signage shall also note that TPZ fencing shall not be damaged or removed. The signage shall also provide the contact information for the City of Guelph. A City of Guelph corporate logo shall be displayed on the TPZ information sign.

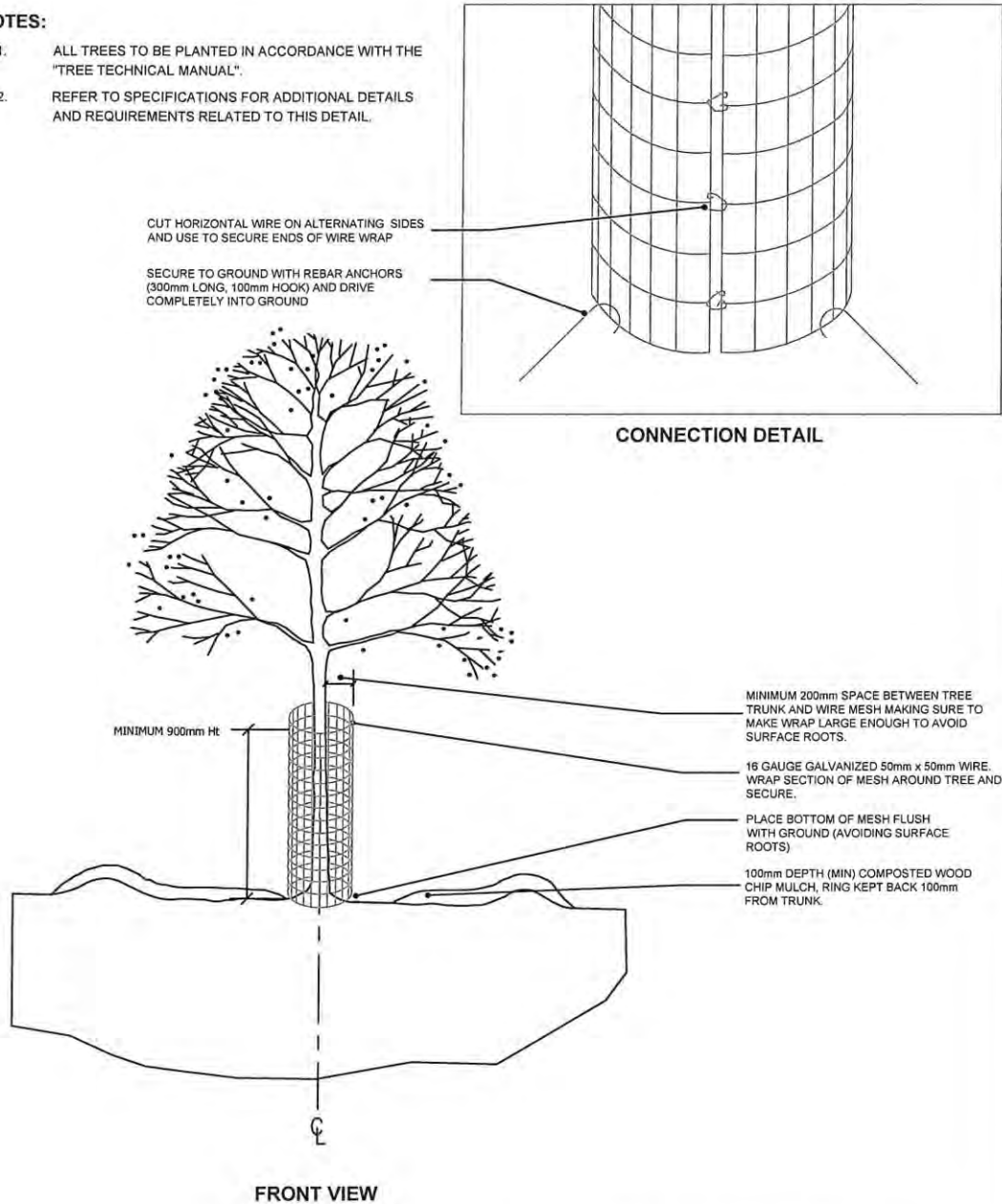
Sign Placement: TPZ information signs shall be affixed no more than 20 m apart on each side of tree protection fencing, at a height of no less than 100 cm.



Sign Size: TPZ information signs shall be a minimum of 40 cm × 60 cm in size

CITY OF GUELPH STANDARD DRAWING	DATE DRAWN : MAY/19	REV. No. : -	
TREE PROTECTION ZONE (TPZ) INFORMATION SIGNAGE DETAIL	DESCRIPTION : N.T.S.		PARKS OPERATIONS AND FORESTRY
	REV. DATE : -	REV. BY. : -	
	APPROVED BY: 		UF 1.2
MANAGER PARKS, OPERATIONS AND FORESTRY			

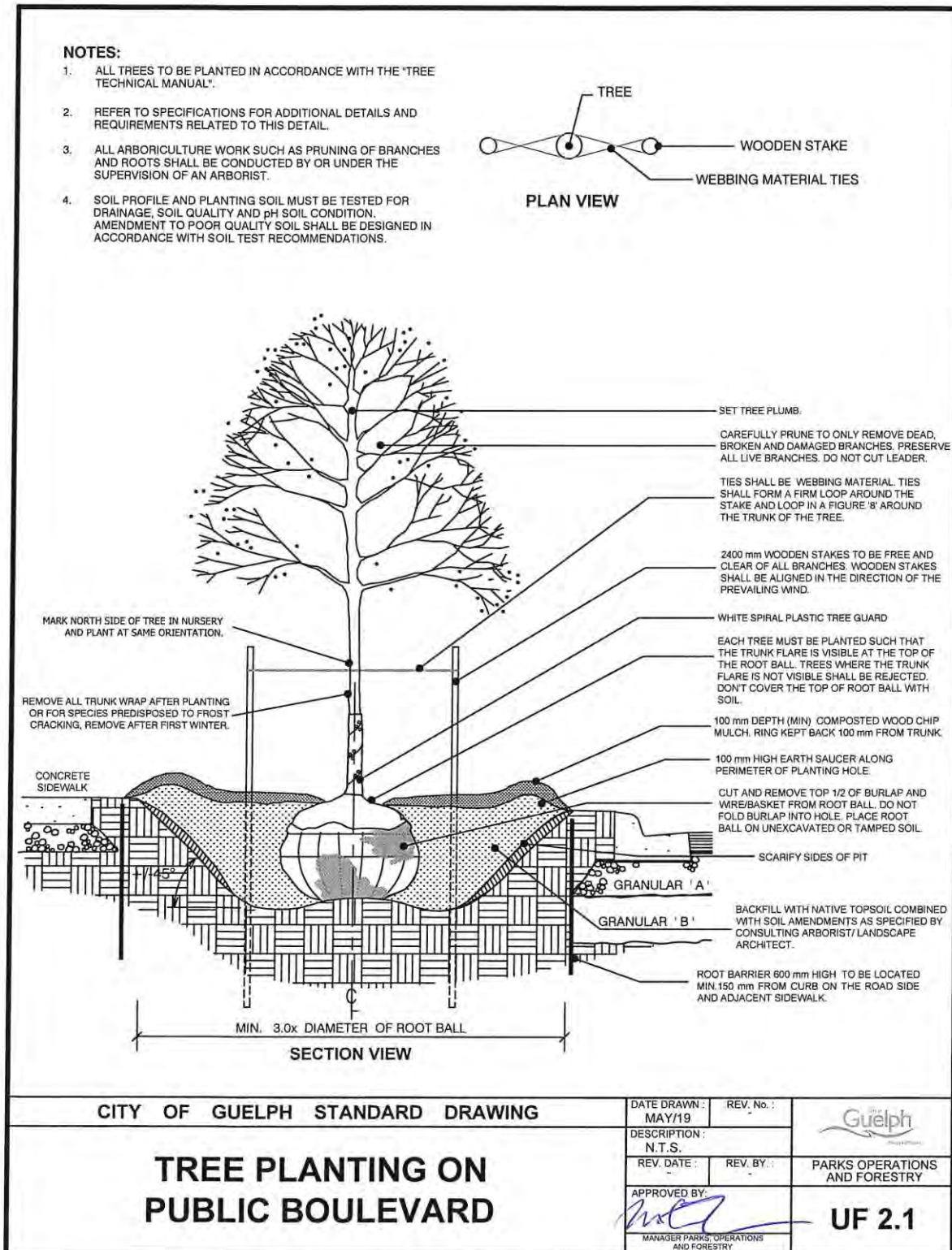
NOTES:

1. ALL TREES TO BE PLANTED IN ACCORDANCE WITH THE "TREE TECHNICAL MANUAL".
2. REFER TO SPECIFICATIONS FOR ADDITIONAL DETAILS AND REQUIREMENTS RELATED TO THIS DETAIL.



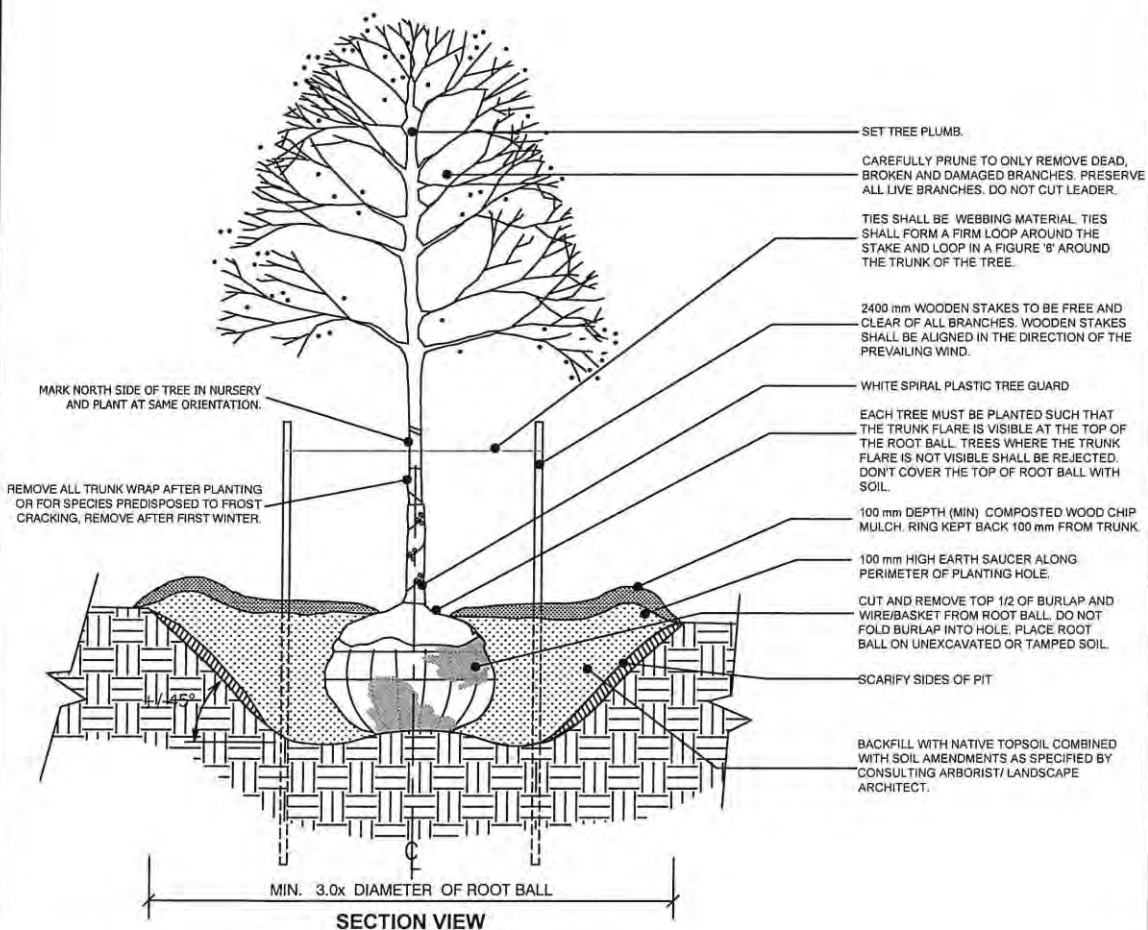
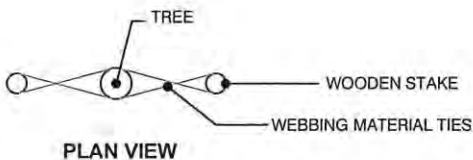
<p>CITY OF GUELPH STANDARD DRAWING</p> <p>TYPICAL BEAVER GUARD</p>	DATE DRAWN : APR/19	REV. No.:	 PARKS OPERATIONS AND FORESTRY
	DESCRIPTION : N.T.S.	REV. DATE :	
	APPROVED BY:  MANAGER PARKS OPERATIONS AND FORESTRY		<p>UF 1.3</p>

Schedule C: Tree planting and establishment standard drawings



NOTES:

1. ALL TREES TO BE PLANTED IN ACCORDANCE WITH THE "TREE TECHNICAL MANUAL".
2. REFER TO SPECIFICATIONS FOR ADDITIONAL DETAILS AND REQUIREMENTS RELATED TO THIS DETAIL.
3. ALL ARBORICULTURE WORK SUCH AS PRUNING OF BRANCHES AND ROOTS SHALL BE CONDUCTED BY OR UNDER THE SUPERVISION OF AN ARBORIST.
4. SOIL PROFILE AND PLANTING SOIL MUST BE TESTED FOR DRAINAGE, SOIL QUALITY AND pH SOIL CONDITION. AMENDMENT TO POOR QUALITY SOIL SHALL BE DESIGNED IN ACCORDANCE WITH SOIL TEST RECOMMENDATIONS.

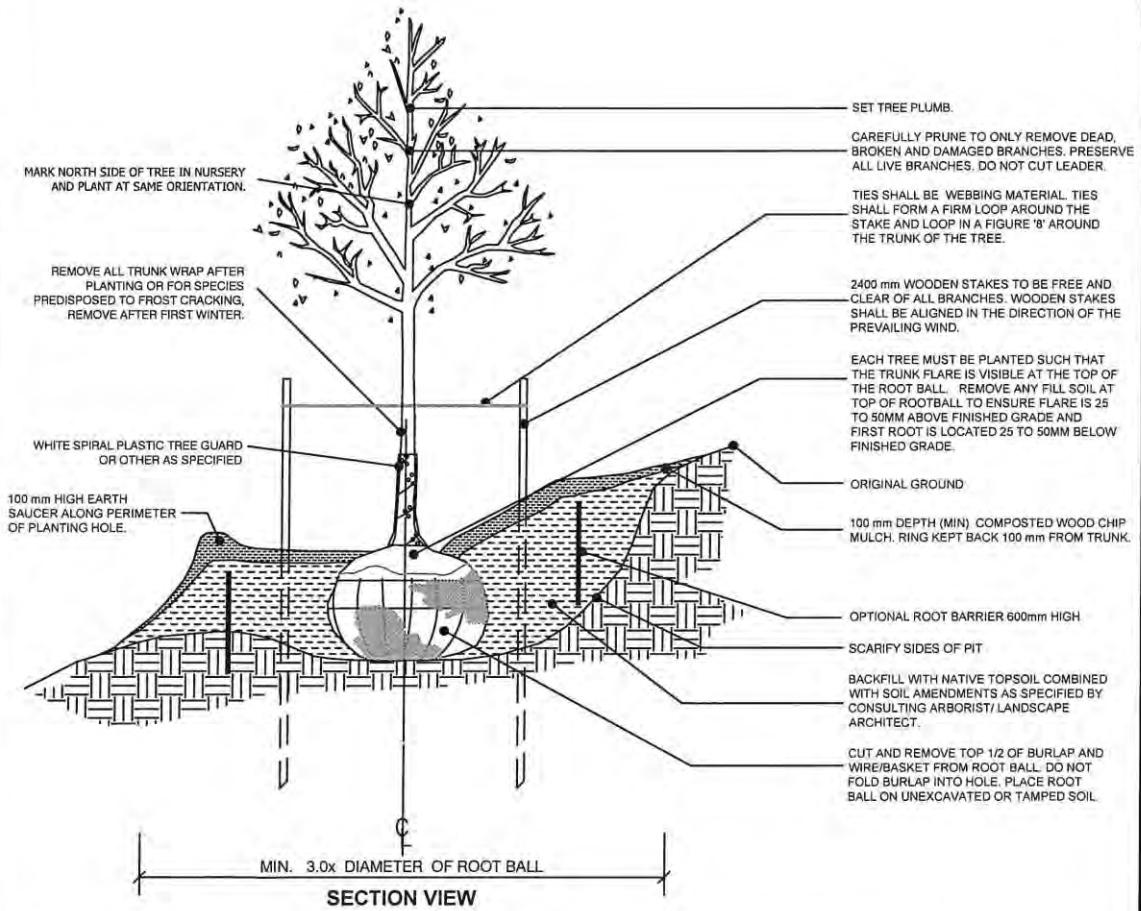
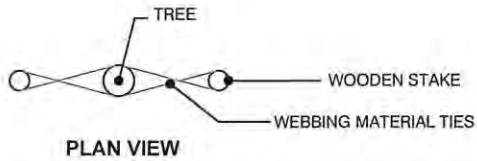


<p>CITY OF GUELPH STANDARD DRAWING</p> <p>TREE PLANTING - DECIDUOUS</p> <p>(PARKS, OPEN SPACES AND STORMWATER MANAGEMENT FACILITIES)</p>	DATE DRAWN : APR/19	REV. No. : -	
	DESCRIPTION : N. T. S.		
	REV. DATE : -	REV. BY : -	<p>PARKS OPERATIONS AND FORESTRY</p>
	APPROVED BY: 		<p>UF 2.2</p>
	MANAGER PARKS OPERATIONS AND FORESTRY		

NOTES:

ALL TREES TO BE PLANTED IN ACCORDANCE WITH THE "TREE TECHNICAL MANUAL".

1. REFER TO SPECIFICATIONS FOR ADDITIONAL DETAILS AND REQUIREMENTS RELATED TO THIS DETAIL.
2. ALL ARBORICULTURE WORK SUCH AS PRUNING OF BRANCHES AND ROOTS SHALL BE CONDUCTED BY OR UNDER THE SUPERVISION OF A CERTIFIED ARBORIST.
3. SOIL PROFILE AND PLANTING SOIL MUST BE TESTED FOR DRAINAGE, SOIL QUALITY AND pH SOIL CONDITION. AMENDMENT TO POOR QUALITY SOIL SHALL BE DESIGNED IN ACCORDANCE WITH SOIL TEST RECOMMENDATIONS.



CITY OF GUELPH STANDARD DRAWING

**TREE PLANTING -
DECIDUOUS (SLOPE)**

DATE DRAWN: MAY/19 REV. No.:

DESCRIPTION: N.T.S.

REV. DATE:

REV. BY.:

APPROVED BY:

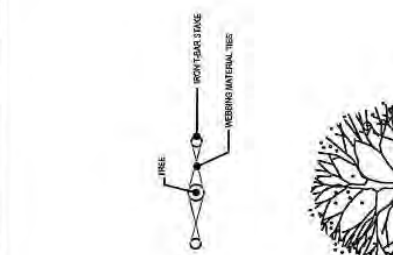
[Signature]
MANAGER PARKS OPERATIONS AND FORESTRY



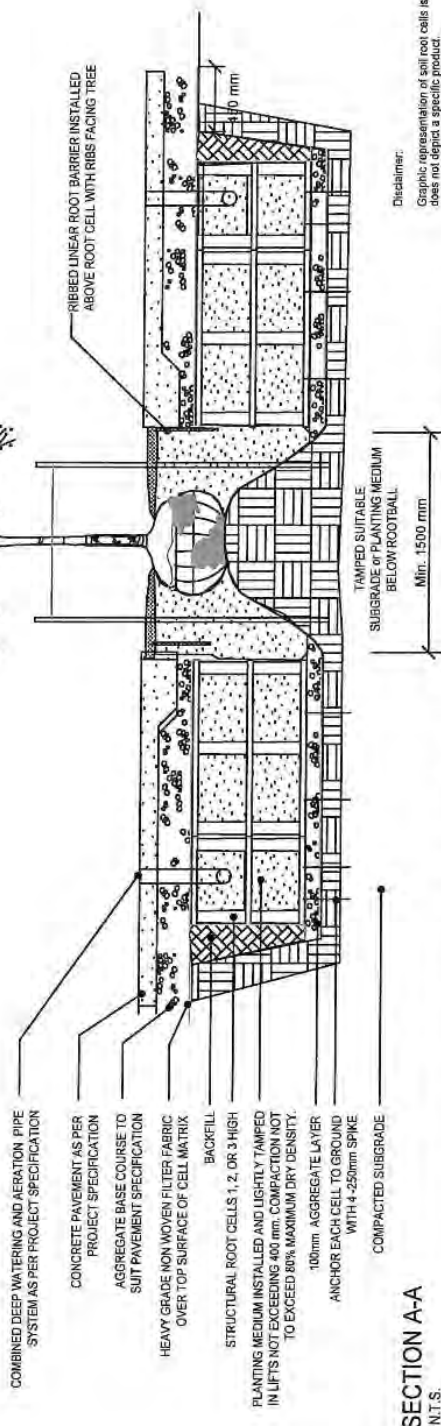
PARKS OPERATIONS AND FORESTRY

UF 2.3

- NOTE**
1. ALL TREES TO BE PLANTED IN ACCORDANCE WITH THE TREE TECHNICAL MANUAL.
 2. SOIL VOLUME SHALL BE PROVIDED IN ACCORDANCE WITH THE TREE TECHNICAL MANUAL.
 3. REFER TO SPECIFICATIONS FOR ADDITIONAL DETAILS AND REQUIREMENTS RELATED TO THIS DETAIL.
 4. ALL ARBOURICULTURE WORK SUCH AS PRUNING OF BRANCHES AND ROOTS SHALL BE CONDUCTED BY OR UNDER THE SUPERVISIONS OF AN ARBORIST.
 5. DESIGN OF TREE PIT, ROOT CELL, IRRIGATION AND PLANTING SOIL ARE PROJECT SPECIFIC.
 6. TREES TO BE INSTALLED IN ACCORDANCE WITH DETAILS SHOWN ON DRAWING UF 2.1.
 7. DETAILS ARE TYPICAL AND FOR REFERENCE ONLY.



PLAN
N.T.S.



SECTION A-A
N.T.S.

Disclaimer:
Graphic representation of soil root cells is generic and does not depict a specific product.

DATE DRAWN: MAY/19	REV. No.:
DESCRIPTION: N.T.S.	
REV. DATE:	REV. BY.:
APPROVED BY: <i>[Signature]</i>	
MANAGER PARKS OPERATIONS AND FORESTRY	

CITY OF GUELPH STANDARD DRAWING

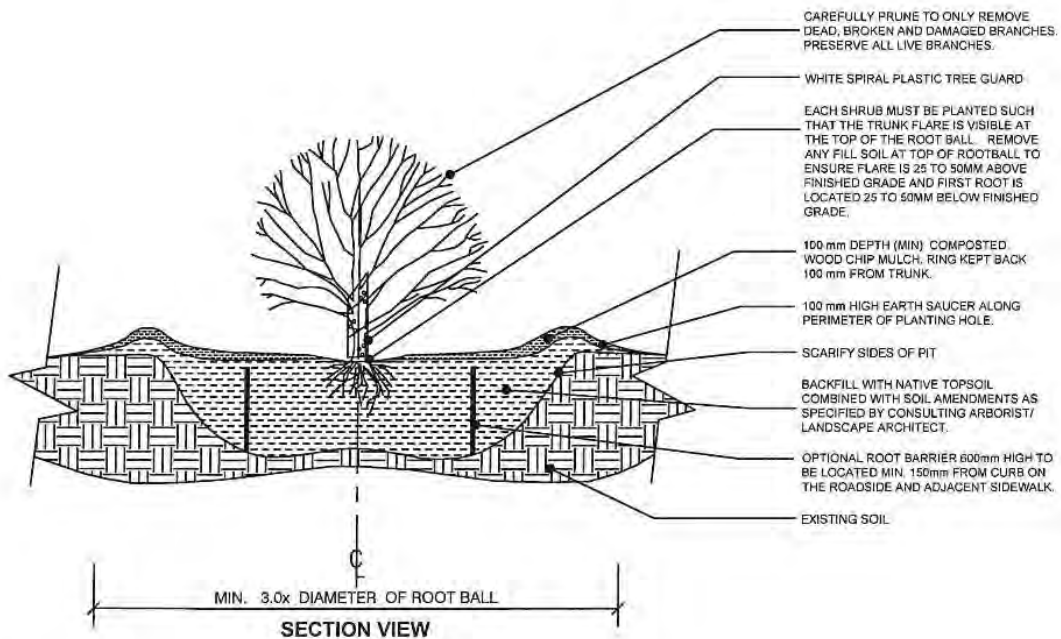
TREE PLANTING USING STRUCTURAL ROOT CELLS

TYPICAL SINGLE SQUARE TREE PIT IN CONCRETE PAVING

UF 2.5

NOTES:

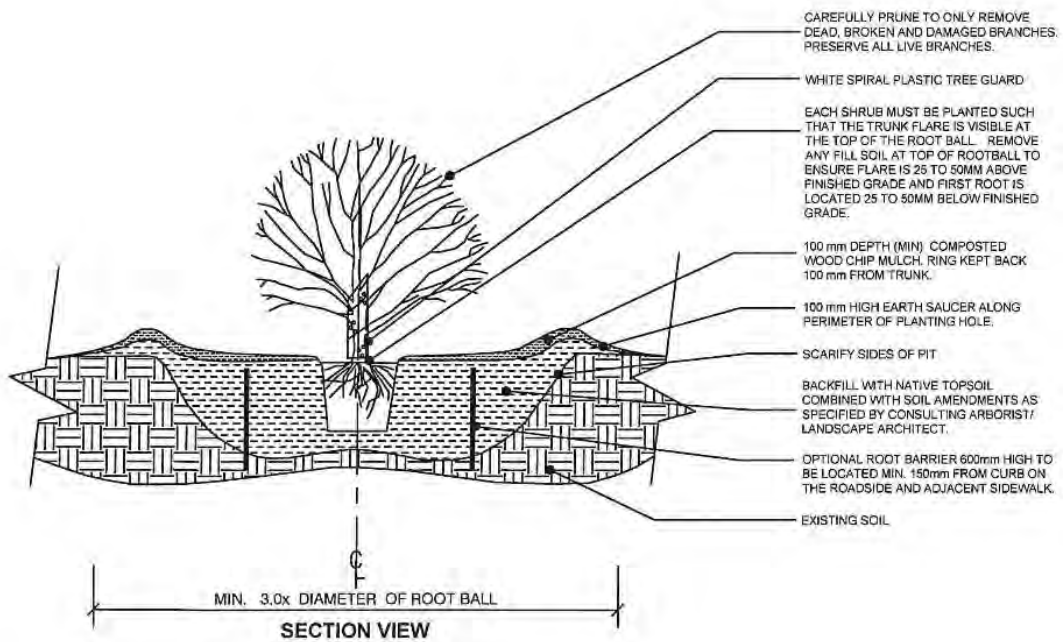
1. ALL TREES TO BE PLANTED IN ACCORDANCE WITH THE "TREE TECHNICAL MANUAL".
2. REFER TO SPECIFICATIONS FOR ADDITIONAL DETAILS AND REQUIREMENTS RELATED TO THIS DETAIL.
3. ALL ARBORICULTURE WORK SUCH AS PRUNING OF BRANCHES AND ROOTS SHALL BE CONDUCTED BY OR UNDER THE SUPERVISION OF AN ARBORIST.
4. SOIL PROFILE AND PLANTING SOIL MUST BE TESTED FOR DRAINAGE, SOIL QUALITY AND pH SOIL CONDITION. AMENDMENT TO POOR QUALITY SOIL SHALL BE DESIGNED IN ACCORDANCE WITH SOIL TEST RECOMMENDATIONS.





<p>CITY OF GUELPH STANDARD DRAWING</p> <p>TYPICAL SHRUB PLANTING</p>	DATE DRAWN MAY/19	REV. No.:	
	DESCRIPTION: N.T.S.	REV. DATE:	
<p>APPROVED BY:</p> <p>MANAGER PARKS OPERATIONS AND FORESTRY</p>			<p>PARKS OPERATIONS AND FORESTRY</p> <p>UF 2.6</p>

NOTES:

1. ALL TREES TO BE PLANTED IN ACCORDANCE WITH THE "TREE TECHNICAL MANUAL".
2. REFER TO SPECIFICATIONS FOR ADDITIONAL DETAILS AND REQUIREMENTS RELATED TO THIS DETAIL.
3. ALL ARBORICULTURE WORK SUCH AS PRUNING OF BRANCHES AND ROOTS SHALL BE CONDUCTED BY OR UNDER THE SUPERVISION OF AN ARBORIST.
4. SOIL PROFILE AND PLANTING SOIL MUST BE TESTED FOR DRAINAGE, SOIL QUALITY AND pH SOIL CONDITION. AMENDMENT TO POOR QUALITY SOIL SHALL BE DESIGNED IN ACCORDANCE WITH SOIL TEST RECOMMENDATIONS.



<p>CITY OF GUELPH STANDARD DRAWING</p> <p>TYPICAL SHRUB PLANTING - POTTED</p>	DATE DRAWN : MAY/19	REV. No. :	 <p>PARKS OPERATIONS AND FORESTRY</p>
	DESCRIPTION : N.T.S.	REV. DATE :	
	<p>APPROVED BY</p>  <p>MANAGER PARKS OPERATIONS AND FORESTRY</p>		<p>UF 2.7</p>

Schedule D: Recommended street trees

Botanical name	Common Name	Native to Southern Ontario	Urban Tolerance	Mature Height (m)	Mature Width (m)	Tree Size ³
<i>Acer campestre</i>	Hedge Maple	No	high	10	10	Small
<i>Acer nigrum</i> 'Green Column'	Green Column Black Maple	No	moderate	17	8	Medium
<i>Acer rubrum</i>	Red Maple	Yes	low	25	13	Very Large
<i>Acer rubrum</i> 'Autumn Spire'	Autumn Spire	No	low	15	7	Medium
<i>Acer rubrum</i> 'Karpick'	Karpick Maple	No	moderate	15	6	Medium
<i>Acer saccharinum</i>	Silver Maple	Yes	moderate	35	15	Very Large
<i>Acer saccharum</i> 'Green Mountain'	Green Mountain Maple	Yes	low	20	15	Large
<i>Acer tataricum</i>	Tatarian Maple ¹	No	low	8	8	Small
<i>Acer x freemanii</i>	Freeman's Maple	Yes	moderate	15	9	Medium
<i>Amelanchier arborea</i>	Downy Serviceberry ¹	Yes	low	7	3	Small
<i>Amelanchier canadensis</i>	Canada Serviceberry ¹	Yes	moderate	7	3	Small
<i>Amelanchier laevis</i>	Smooth Serviceberry	Yes	moderate	12	6	Small
<i>Amelanchier x grandiflora</i> 'Cumulus'	Cumulus Serviceberry ¹	Yes	low	7	7	Small
<i>Catalpa speciosa</i>	Northern Catalpa	No	high	17	14	Medium
<i>Cercidiphyllum japonicum</i>	Katsuratree	No	moderate	20	10	Large
<i>Celtis occidentalis</i>	Common Hackberry	Yes	high	20	17	Large
<i>Cornus racemosa</i> 'STD'	Grey Dogwood (tree form) ¹	Yes	low	5	4	Small
<i>Corylus colurna</i>	Turkish Hazel	No	moderate	15	8	Medium
<i>Crataegus crus-galli</i> var. <i>inermis</i>	Thornless Cockspur Hawthorn	No	high	9	9	Small
<i>Ginkgo biloba</i>	Maidenhair Tree ⁴	No	high	20	13	Large
<i>Ginkgo biloba</i> 'Autumn Gold'	Autumn Gold ⁴	No	high	15	6	Medium
<i>Ginkgo biloba</i> 'Princeton Sentry'	Princeton Sentry ⁴	No	high	18	3	Medium
<i>Gleditsia triacanthos</i>	Honeylocust	No	high	17	13	Medium
<i>Gymnocladus dioicus</i>	Kentucky Coffee-tree ⁴	Yes	high	20	15	Large
<i>Gymnocladus dioicus</i> 'Espresso-JFS'	Espresso Kentucky Coffee-tree ⁴	No	high	16	11	Medium
<i>Liriodendron tulipifera</i>	Tulip Tree	Yes	low	35	10	Very Large
<i>Malus</i> spp.	Crabapple varieties ¹	No	high	3-10	3-8	Small
<i>Ostrya virginiana</i>	Ironwood / Hop Hornbeam	Yes	moderate	12	8	Medium
<i>Platanus x acerifolia</i> 'Bloodgood'	Bloodgood London Planetree	No	high	16	13	Medium
<i>Prunus maackii</i>	Amur Chokecherry	No	moderate	12	10	Small
<i>Prunus sargentii</i>	Sargent Cherry	No	moderate	12	12	Small
<i>Prunus serrulata</i> 'Kwanzan'	Kwanzan Cherry	No	low	10	10	Small
<i>Pyrus calleryana</i> 'Chanticleer'	Ornamental Pear ^{1,2}	No	high	17	5	Medium
<i>Quercus robur</i> 'Fastigiata'	English Oak	No	high	20	18	Large
<i>Quercus rubra</i>	Red Oak	Yes	high	25	17	Very Large
<i>Sorbus aucuparia</i>	European Mountain Ash ^{1,2}	No	high	6	5	Small
<i>Sorbus x thuringiaca</i> 'Fastigiata'	Oakleaf Mountain Ash	No	moderate	10	6	Small
<i>Styphnolobium japonica</i> 'Regent'	Regent Japanese Pagoda Tree	No	high	20	18	Large
<i>Syringa reticulata</i> 'Ivory Silk'	Ivory Silk Tree Lilac ^{1,2}	No	moderate	8	5	Small
<i>Tilia cordata</i>	Littleleaf Linden	No	moderate	15	11	Medium
<i>Tilia cordata</i> 'Corzam'	Corinthian Linden	No	moderate	15	5	Medium
<i>Tilia cordata</i> 'Greenspire'	Greenspire Linden	No	high	13	10	Small
<i>Ulmus</i> x 'Accolade'	Accolade Elm	No	high	18	12	Medium
<i>Ulmus</i> x 'pioneer'	Pioneer Elm	No	high	18	18	Medium
<i>Viburnum lentago</i> (Std.)	Nannyberry (Tree Form) ¹	Yes	high	6	2	Small
<i>Zeikova serrata</i>	Japanese Zeikova	No	moderate	20	18	Large

¹ appropriate for use under Hydro

² not recommended within 200 m of the NHS

³ refer to Table 4 for soil volume requirements

⁴ male only