



DISTRICT TREE POLICY

PART II APPENDICES

January 2006

DISTRICT TREE POLICY

PART II APPENDICES

Table of Contents

1.0 APPENDICES

Appendix II A – New Plymouth District Council Arboricultural Operations Manual

Appendix II B - Guidelines for Works within the Vicinity of Trees

Appendix II C - High Profile and Street Tree Selection Criteria

**APPENDIX II A –
New Plymouth District Council Arboriculture Operations Manual**

*NEW PLYMOUTH DISTRICT COUNCIL
ARBORICULTURE
OPERATIONS MANUAL*

ARBORICULTURE - OPERATIONS MANUAL

TABLE OF CONTENTS

INTRODUCTION.....	4
1.0 ARBORICULTURAL OPERATIONS.....	5
1.1 Statutory Requirements.....	6
2.0 TREE ESTABLISHMENT.....	7
2.1 Site Selection.....	8
2.2 Handling and Transportation of Trees.....	8
2.3 Planting.....	9
2.4 Support Systems.....	13
2.5 Mulching.....	13
2.6 Tree Isolation Systems.....	14
2.7 Protection Systems.....	14
2.8 Transplanting.....	14
3.0 AFTER-CARE MAINTENANCE.....	15
3.1 Maintenance Periods.....	16
3.2 Maintenance Tasks.....	16
4.0 PRUNING.....	19
4.1 Modern Arboriculture.....	20
4.2 Pruning Practices.....	22
4.3 Power Line Clearance.....	25
5.0 TREE REMOVALS.....	27
5.1 Health and Safety.....	28
5.2 Consultation.....	29
5.3 District Plan.....	29
5.4 Stump Treatment.....	29
6.0 DEBRIS COLLECTION AND REMOVAL.....	32
6.1 Biosecurity.....	32
6.2 Wood Chips.....	32
6.3 Wood.....	33
7.0 ADDITIONAL ARBORICULTURAL OPERATIONS.....	34
7.1 Rootzone Aeration.....	35
7.2 Cable Bracing and Propping.....	35

ARBORICULTURE - OPERATIONS MANUAL

INTRODUCTION

This manual defines the approach and practices to be undertaken by tree work contractors involved in arboricultural operations within the territorial area of New Plymouth District Council.

Contractors should adopt the arboricultural approaches and practices defined herein whenever employed by New Plymouth District Council.

Parks and Leisure Services Division of New Plymouth District Council are responsible for individual trees, groups of trees and areas of existing and regenerating bush on Council administered reserves, civic open spaces and other Council owned lands. In addition the District Plan sets out the regulatory provisions for Protected trees. The District Plan is administered by the Planning team of the Council's Planning and Environmental Services Department.

1.0 ARBORICULTURAL OPERATIONS

Covering: 1.1 Statutory Requirements

- *Codes of Practice*
- *District Plan provisions*
- *District Tree Policy*

Objective: To specify the standards for arboricultural operations in accordance with accepted modern arboricultural principles, whilst complying with all statutory requirements.

1.1 Statutory Requirements

Purpose: To identify and comply with all statutory requirements that are relative to tree maintenance operations.

Codes of Practice

Tree maintenance operations shall be carried out in accordance with the Approved Code Of Practice For Safety And Health In Tree Work, Part 1: Arboriculture, the guidelines specifically given in Appendix A and all relevant regulations pertaining to the Health And Safety In Employment Act 1992.

Tree maintenance operations around electrical conductors shall be carried out in accordance with the Approved Code Of Practice For Safety And Health In Tree Work, Part 2: Maintenance Of Trees Around Power Lines, the guidelines specifically given in Appendix A and all relevant regulations pertaining to the Health And Safety In Employment Act 1992. Personnel engaged in power line clearance work must be competent to perform such tree maintenance.

District Plan Provisions

Tree maintenance operations shall comply with the various New Plymouth District Council District Plan tree protection provisions.

District Tree Plan

All tree maintenance operations shall comply with the policies defined in the New Plymouth District Council District Tree Policy.

2.0 TREE ESTABLISHMENT

- Covering:
- 2.1 Site Selection
 - Considerations*
 - 2.2 Transportation of Trees
 - Transportation*
 - Watering*
 - 2.3 Planting
 - Planting season*
 - Site preparation*
 - Planting hole*
 - Tree preparation*
 - Tree placement and orientation*
 - Backfilling planting hole*
 - 2.4 Support Systems
 - Stakes and ties*
 - Staking method*
 - 2.5 Mulching
 - Mulch types*
 - Mulching methods*
 - 2.6 Tree Isolation Systems
 - Types of isolation systems*
 - 2.7 Protection Systems
 - Types of protection systems*
 - 2.8 Transplanting
 - Transplanting practice*

Objective: To successfully establish trees through appropriate site preparation, correct planting techniques and adequate physical protection systems.

2.1 Site Selection

Purpose: To provide appropriate planting sites which allow trees to fully develop and mature without conflict with surrounding features.

Considerations

Tree plantings will take into account all policies within the District Tree Policy, particularly those defined in 4.1 Tree Planting and 4.4 Consultation.

2.2 Handling and Transportation of Trees

Purpose: To provide appropriate care in the handling and transportation and handling of tree nursery stock to ensure a minimum of damage.

Considerations

Plant material will be handled and transported to avoid any damage to plants.
 Bare root plants will be watered and protected by soil, mulch, scrim or similar materials to prevent root damage and drying.
 Special care will be required to retain as much soil on bare root plants as possible
 Containerised plants with roots that do not fully fill the container will be lifted by the container; not the stem.
 Plant materials will only be stored at the site with the approval of the Assets Officer.
 Any plant material held or transported on site will be protected from stock, environmental conditions or theft.

Watering

Trees may require irrigation if there is a longer period than twenty-four hours between the collection of trees and planting. Container grown trees will be watered thoroughly on the day of planting, unless otherwise specified by the Asset Officer.

Plant Collection and Return

Unless specified to the contrary, all plant material will be collected by the contractor from Brooklands Nursery during the normal hours of work. Plant collection outside of normal working hours will be arranged directly between the nursery and the contractor.

The contractor will give notice of collection of plants to the nursery on the following basis:

Orders	1000 plants or more	five working days
Orders	500 – 1000 plants	three working days
Orders	0 – plants	one working day

Plant material returned surplus to requirement will be returned to Brooklands Nursery on completion of the task. Plant material damaged, desiccated or un-bagged will not be returnable and will be at the contractors loss.

The contractor will maintain an accurate record of plant material used and returned, that will be submitted to the Asset Officer at the completion of work.

2.3 Planting

Purpose: To provide appropriate site preparation and planting techniques that result in successful tree establishment.

Planting Season

Tree planting shall occur during autumn and winter (April– September), unless otherwise specified by the Asset Officer.

Site Preparation and Design

The contractor shall ensure that all underground services that are in the vicinity of works are defined and located prior to any excavation.

Planting will not commence until all preparation works specified in the work instruction are approved by the Asset Officer

The Assets Officer may interpret the design on site and advise/assist the contractor to implement the design. The contractor will advise the Assets Officer in advance of the day of planting two working days before the event.

Planting Holes

Planting holes shall be both wide enough and deep enough to accommodate the entire root system, with room for roots to spread. The planting hole diameter should be 30-60cm wider than the root system, unless otherwise specified by the Asset Officer.

Planting holes may be tapered. Where tapered planting holes are specified, the top of the hole should be 2-3 times as wide as the root ball and the bottom of the hole should be 20-30cm wider than the root ball. (Refer Figure 2.1).

When preparing tapered planting holes, it may not be necessary to remove all of the soil then put it back in the hole. It may be more efficient to first dig the planting hole 20-30cm wider than the root ball, and then widen the hole by partially backfilling with soil as the hole is widened. (Refer Figure 2.2).

The sides of the planting hole shall not be left smooth or glazed as this may inhibit root development. Pan soil at the base of the planting hole shall be broken up to improve drainage. Backfill soil shall be added to the bottom and consolidated but not compacted so the root ball will not settle.

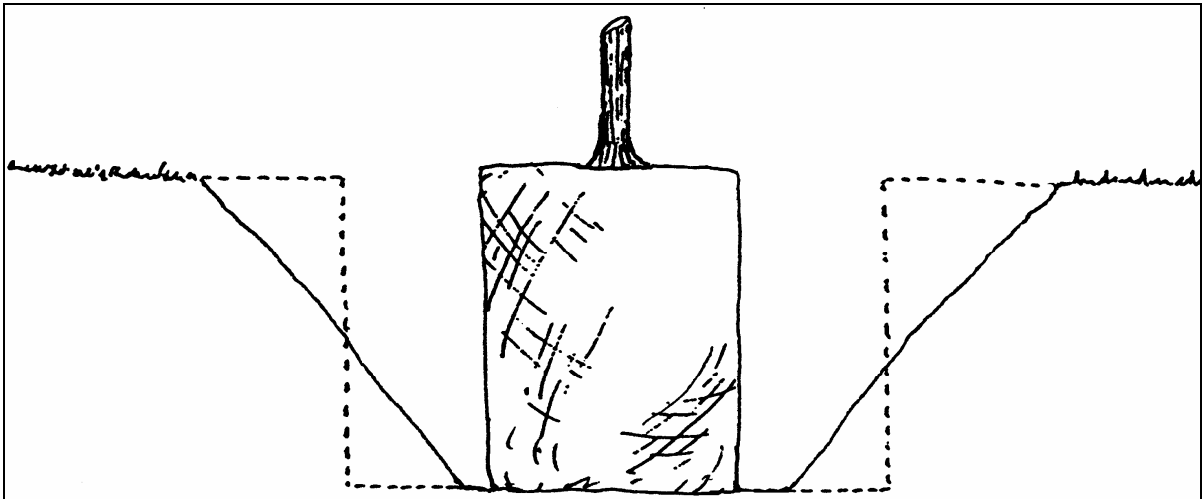


Figure 2.1: The planting hole should be only as deep as the root ball. Compared to a hole with vertical sides of the same volume a hole with sloped sides may be easier to dig and provides an increased volume of friable soil for vigorous root development.

Planting holes for container grown trees shall be no deeper than the root ball. If the planting hole is initially dug too deep soil must be added to the bottom and firmed so the root ball will not settle.

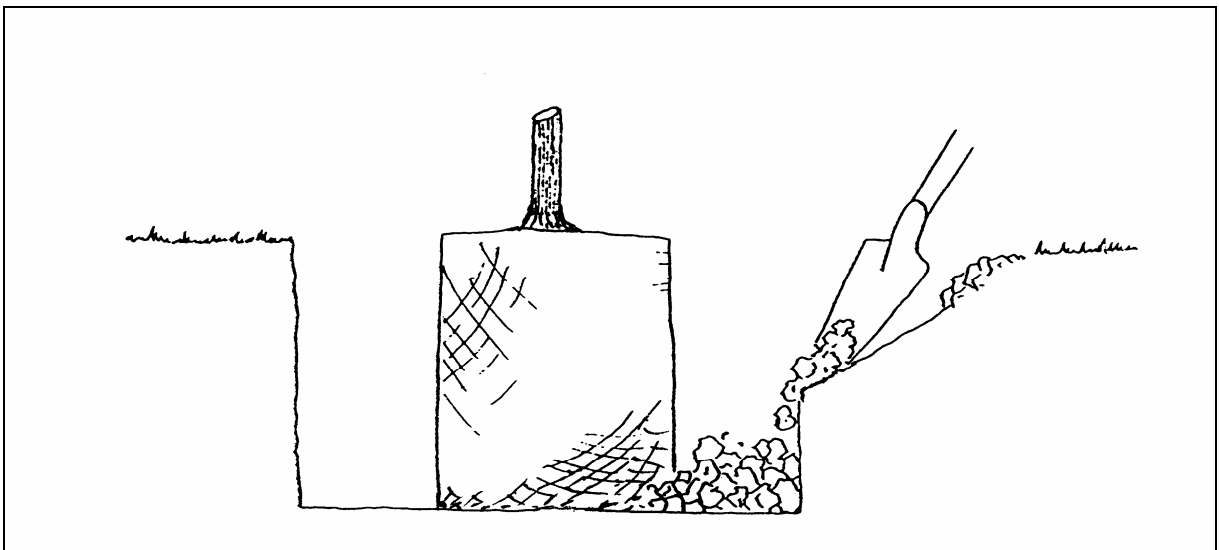


Figure 2.2: The planting hole may be excavated 20-30cm wider than the root ball and then partially backfilled as the hole is widened.

All debris, weeds and grass shall be removed from the planting site. Turf removed to create the planting hole shall not be backfilled into the planting hole.

Tree Preparation

Trees growing in containers shall be watered thoroughly on the day of planting, unless otherwise specified by the Assets Officer.

Damaged branches shall be removed at the time of planting. The tree should be pruned to accommodate the site requirements, including formative pruning.

Container materials, tags, and restrictive ties bindings and shall be removed prior to planting.

Bare rooted trees should be placed in a hole that is both wide enough and deep enough to accommodate the entire root system. Roots should be straightened to prevent kinking, crowding and crossing of main roots. Any damaged, diseased, circling or girdling roots and any unusually long roots that will not fit into the hole without bending should be removed with sharp pruning shears prior to planting.

Container grown trees shall be checked to ensure that the first roots emerge from the stem at the soil surface or just below the surface, as settlement may have occurred within the container or during nursery production.

Container grown trees shall be checked to ensure that roots are not circling within the root ball. Where superficial circling roots on the surface of the root ball are encountered, several vertical cuts down the outer edge of the root ball should be carefully made with a sharp spade or pruning shears to sever the circling roots prior to planting.

Some container grown trees may require the 'butterfly technique' to sever circling roots deep within the root ball. (Refer Figure 2.3). The 'butterfly technique' involves:

1. Remove the tree from the container.
2. Cut any circling roots on the surface of the root ball with sharp pruning shears.
3. Run a sharp spade through the diameter of the bottom third to one half of the root ball using a single cut.
4. Spread the root ball apart to splay out the lower third to one half of the root system.
5. Place the tree on a slightly raised mound at the bottom of the hole to match the indent of the splayed root system.

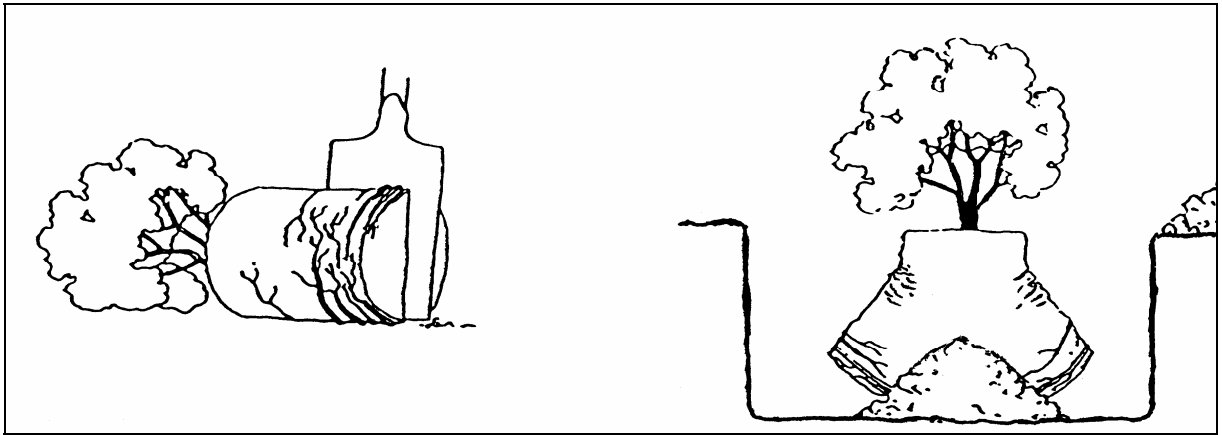


Figure 2.3: The 'butterfly technique' should be used to disrupt circling roots that are sometimes found in container grown trees.

Tree Placement and Orientation

The trees shall be set vertically and planted so the top of the root system is at grade ie level with normal ground surface (within 1.5cm above/below), unless otherwise specified by the Asset Officer.

Trees planted in tree surrounds may be planted slightly proud of the surrounding soil surface level to compensate for contained mulch depth, as specified by the Asset Officer.

Consideration should be given to the most appropriate orientation of the tree in relation to possible effects on surrounding features as the tree develops ie branches overhanging/obstructing the carriageway.

Backfilling Planting Hole

Backfill material shall be free of unbroken earth clumps, rock, weeds, grass and foreign objects.

In most cases the planting hole should be backfilled with the original soil excavated from the hole. Excavated soils which are of poor quality (such as soils of high clay or rock content) shall be amended with a quality soil medium as approved by The Assets Officer.

Soil conditioners, fertilisers, protectant chemicals or water aids may be added to backfill or plant in accordance with the manufactures recommendations and on instruction of the Assets Officer.

The tree should be held in position while backfill is placed around the root ball.

The backfill shall be firmed gently to expel air pockets. Excessive tamping shall be avoided since this may over-compact soil, reducing water penetration and root growth.

The tree shall be checked to ensure that the planting level is correct, and the tree is vertical. All arisings will be removed from the site

Trees may require watering-in at the time of planting. This may depend on weather conditions and site and species requirements. Water shall be applied at low pressure to the base of the tree, from a distance of less than one metre. Care shall be taken to avoid moving soil or mulch away from the tree base with water.

2.4 Support Systems

Purpose: To provide temporary support which aids the establishment of newly planted trees.

Stakes and Ties

Staking methods will be specified in the planting instruction by the Assets Officer.

Staking Method

Stakes shall be driven firmly into the ground, at distance from the tree which is just beyond the root ball. Ties should be secured to each stake at approximately one third the height of the tree or within 100mm of the top of the stake. Each tie should be taut, but should not pull the tree towards the stake. The intention is to keep the tree in place while permitting the top to move freely, as such crown movement may encourage increases in stem diameter and root development.

Stakes should be neatly and vertically placed in a consistent pattern and tied at a similar height using the same method. Street trees with two stakes shall have the stakes positioned parallel with the road kerb, unless otherwise specified by the Asset Officer.

2.5 Mulching

Purpose: To provide an environment at the base of newly planted trees that will encourage successful establishment.

Mulch Types

Wood chip mulch from tree trimming operations shall be well composted, free of weeds and weed seeds and shall have no inorganic content.

Granulated pine bark may be the preferred mulch used in tree surrounds in high profile areas, as specified by the Director of Parks and Leisure Services, or nominated officer.

Mulching Methods

Newly planted trees shall be mulched, when specified by the Asset Officer.

Where tree surrounds are used mulch shall be contained within the surrounds to a depth of 75-100mm.

Where tree surrounds are not used the mulched area shall be maintained at 600mm diameter and 75-100mm depth of a 1m diameter

Mulch should be kept clear from the trunks of young trees.

2.6 Tree Isolation Systems

Purpose: To assist tree establishment by providing an environment at the base of trees that is isolated from surrounding turf or hard surface treatment and by containing mulch.

Types of Isolation Systems

The type of tree isolation system to be used shall be specified by the Assets Officer.
Moulded plastic tree surrounds, where used, shall be installed as recommended by the manufacturer.

Tree surrounds, where used, shall be installed neatly, in a consistent pattern, at an even spacing parallel to kerbs and shall be set flush with surrounding ground levels. Surrounds shall be installed with adequate room for domestic lawn mowers to pass between the surrounds and adjacent features.

The final alignment, spacing and positioning of tree surrounds shall be specified by the Asset Officer.

2.7 Protection Systems

Purpose: To provide physical protection against damage caused by vehicles, pedestrians and machinery in high usage areas, or stock in grazed areas.

Types of Protection Systems

Various protection systems may be specified by the Asset Officer. These systems may include trunk guards, bollards, gro-tubes and cages and any specific requirements of the District Plan or a resource consent.

2.8 Transplanting

Purpose: To undertake appropriate practices which ensure tree transplanting success.

Transplanting Practice

Tree transplanting operations shall be carried out as specified by the Asset Officer.

Tree transplanting operations shall be undertaken in accordance with accepted modern arboricultural practices and shall comply with resource consent regulations and bylaws.

3.0 AFTER-CARE MAINTENANCE

- Covering:
- 3.1 Maintenance Periods
 - Considerations*
 - After-care maintenance cycle*

 - 3.2 Maintenance Tasks
 - Support systems*
 - Mulch*
 - Weed control*
 - Isolation and protection systems*
 - Pruning juvenile trees*
 - Fertiliser application*
 - Removal and replacement*
 - Watering*

Objective: To maintain optimum growing conditions for newly planted trees to ensure successful establishment. This shall be achieved by undertaking various after-care maintenance tasks throughout the year. All materials and practices used shall be consistent with those specified in section 2.0 Tree Establishment.

3.1 Maintenance Periods

Purpose: To provide timely and planned inspections and after-care maintenance to assist in the healthy establishment of juvenile trees.

Considerations

After-care maintenance operations will take into account all policies within the District Tree Policy, particularly those defined in 4.1 Tree Planting, 4.2 Maintenance of Trees, 4.3 Tree Removal and 4.4 Consultation.

After-care Maintenance Cycle

The after-care maintenance period for newly planted trees shall be specified by the Assets Officer.

3.2 Maintenance Tasks

Purpose: To provide appropriate after care-maintenance practices that ensures optimum tree establishment and healthy growth.

Support Systems

Stakes and ties shall be maintained to provide support to juvenile trees as specified in section 2.4 Support systems.

The contractor shall periodically check all trees which are staked and adjust or replace ties as necessary to prevent damage to the tree, or risk to public safety.

Mulch

Mulch around the base of trees shall be maintained in a tidy and functional condition, as specified in section 2.5 Mulching.

Weed Control

Weed control shall be carried out during planned after-care maintenance visits to ensure the bases of trees retain a tidy appearance, free of invasive grasses and weeds, with a defined edge.

Isolation and Protection Systems

Maintenance of tree isolation and protection systems shall be undertaken as part of the planned after-care maintenance programme.

Tree surrounds in grass and sealed areas shall be maintained secure and correctly positioned.

Tree isolation and protection systems shall be maintained to provide a tidy appearance and to prevent risk to public safety.

Pruning Juvenile Trees

Pruning shall be carried out as specified in section 4. Pruning.

Remedial and formative pruning shall be carried out as required.

Formative pruning consists of the selective removal of specific branches to enhance form and improve structure, or to directionally shape the tree in accordance with site constraints. Co-dominant stems, crossing and rubbing branches and branches with potentially weak unions which could fail in adverse weather conditions should be removed. Basal shoots and undesirable epicormic growth should also be removed.

For most street trees, a clear trunk should be maintained from ground level to approximately one third of the tree's height, unless otherwise specified by the assets Officer.

Fertiliser Applications

All trees will require applications of slow release fertiliser at the time of planting and may require additional applications of a general purpose fertiliser during the maintenance period, applied to optimise growth potential.

Removal and Replacement

Juvenile trees shall be removed as part of the planned after-care maintenance programme and as required when they are:

- dead
- in irreversible decline
- damaged or vandalised beyond repair

The Assets Officer shall be informed of juvenile tree removals and a record shall be kept for replacement planting and asset management purposes.

Where the trees formed part of any landscaping required as a District Plan permitted standard or a resource consent condition it shall be replaced.

Materials such as stakes, tree isolation and protection systems may be retained as specified by the Assets Officer.

Watering

Supplementary watering may be carried out in addition to other planned after-care maintenance visits, as specified by the Assets Officer.

Each tree should receive a minimum of twenty litres of water per application.

Water shall be applied at low pressure to the base of the tree, from a distance of less than one metre. Care shall be taken to avoid the displacement of soil or mulch whilst undertaking watering.

4.0 PRUNING

- Covering:
- 4.1 Modern Arboriculture
 - Considerations*
 - Approach to pruning*
 - 4.2 Pruning Practices
 - Relevant Codes of Practice and associated regulations*
 - Formative pruning*
 - Crown lifting*
 - Cleaning out (including removal of deadwood)*
 - Crown thinning*
 - Crown reduction*
 - Remedial pruning*
 - Pollarding*
 - 4.3 Power Line Clearance
 - Relevant Codes of Practice and associated regulations*
 - Required standards*
 - Optimum power line clearance*
- Objective: To undertake pruning operations in accordance with modern arboricultural practices, the policies defined in the District Tree Policy and within the tree protection provisions of the District Plan, which will ensure the long term health and viability of trees in parks, reserves and streets.

4.1 Modern Arboriculture

Purpose: To specify tree management techniques which are in accordance with modern arboricultural practices, Natural Target Pruning (NTP) methods and Compartmentalization Of Decay In Trees (CODIT) theories.

Considerations

Arboricultural operations will take into account all policies within the District Tree Policy, particularly those defined in 4.1 Tree Planting, 4.2 Maintenance of Trees, 4.3 Tree Removal and 4.4 Consultation.

The Approach to Pruning

Natural Target Pruning is the removal of a branch, stem or stub in such a way that a final cut is made as close as possible to the branch collar without cutting into the branch collar or leaving a protruding stub. The aim is to prevent damage to the remaining branch or trunk tissue. (Refer Figures 4.1, 4.2, 4.3 and 4.4).

Consideration shall always be given to the species, health, age, condition and location of the tree, as well as the reason for pruning the tree. Care shall be taken to avoid excessive pruning.

Pruning should allow for the natural distribution of foliage and weight along branches and branch ends according to tree species and stages of maturity.

Removal of large branches should only be carried out when it is unavoidable and wounds resulting from such work shall be kept to a minimum.

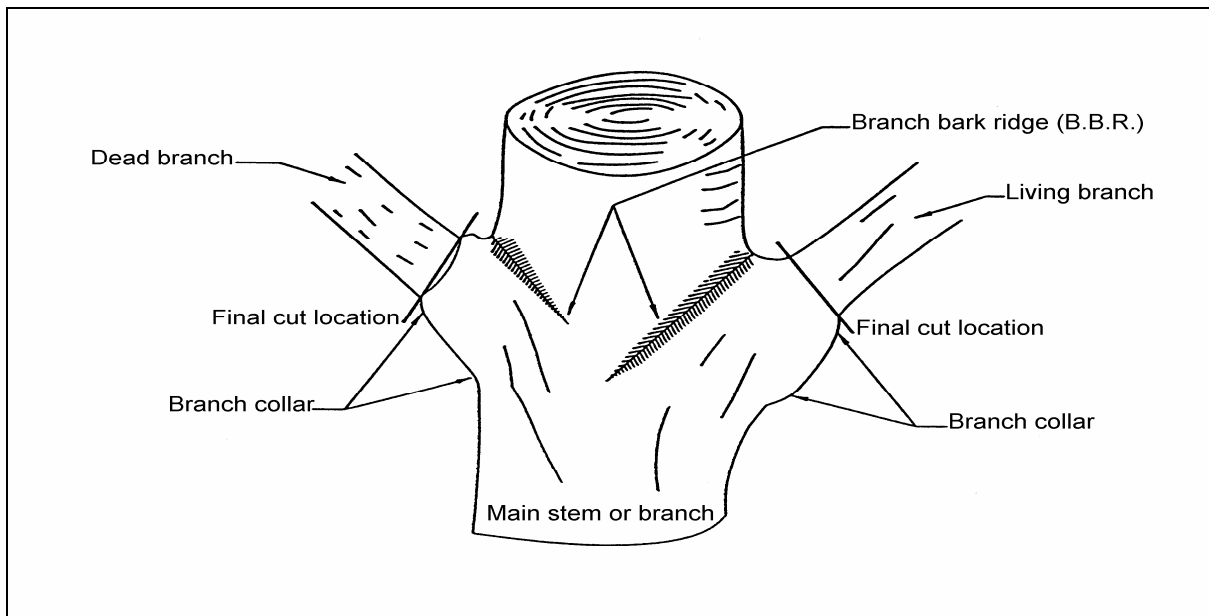


Figure 4.1: Remove branches, stems and stubs so final cuts are made as close as possible to branch collars without cutting into branch collars or leaving protruding stubs.

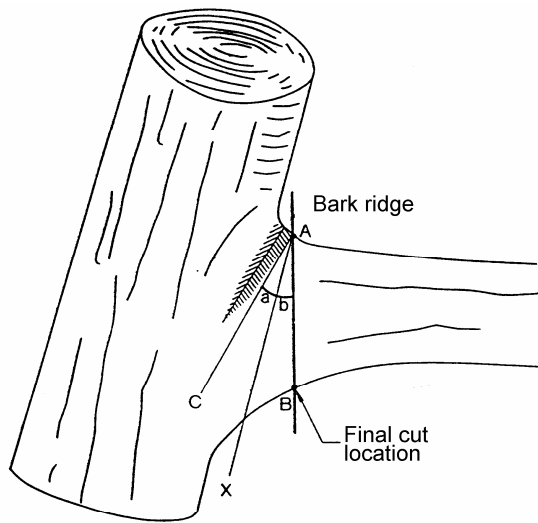


Figure 4.2: On living branches where the branch collar cannot be located the branch bark ridge can be used as a guide.

Line A-X is a line parallel to the stem or trunk occurring just outside the branch bark ridge. Line A-B represents the angle and location of the final cut.

Figure 4.3: On branches with extruded stem bark ridge.

Line A-B represents the angle and location of the final cut.

Point C indicates the bottom of the stem bark ridge.

Point B is directly across from Point C.

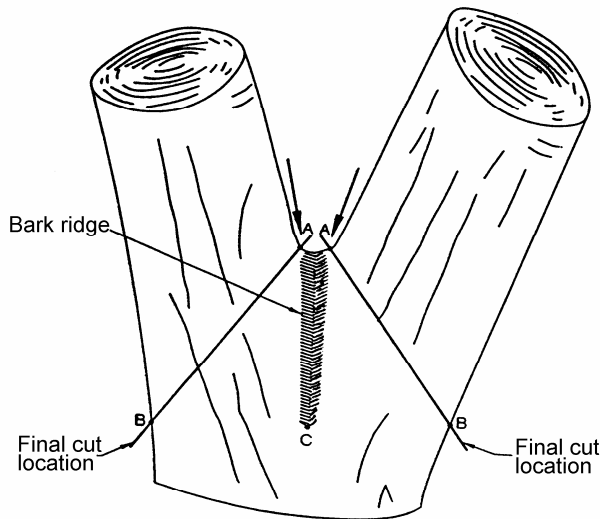
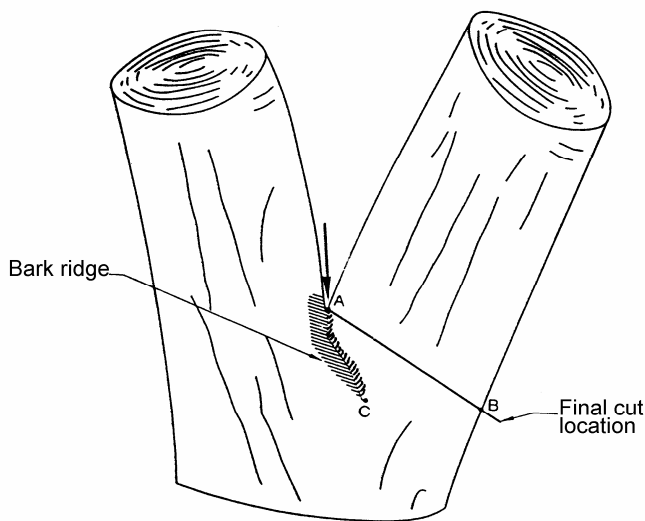


Figure 4.4: On branches with included bark.

Line A-B represents the angle and location of the final cut.

Point C indicates the bottom of the stem bark ridge.

Point B is directly across from Point C.



Note: These figures are a guide only.

4.2 Pruning Practices

Purpose: To undertake tree pruning practices that result in trees being maintained to the standards defined in the District Tree Policy, the tree protection provisions of the District Plan and to meet public safety requirements.

Relevant Codes of Practice and Associated Regulations

Tree maintenance operations shall be carried out in accordance with the Approved Code Of Practice For Safety And Health In Tree Work, Part 1: Arboriculture, the guidelines specifically given in Appendix A and all relevant regulations pertaining to the Health And Safety In Employment Act 1992.

Tree maintenance operations around electrical conductors shall be carried out in accordance with the Approved Code Of Practice For Safety And Health In Tree Work, Part 2: Maintenance Of Trees Around Power Lines, the guidelines specifically given in Appendix A and all relevant regulations pertaining to the Health And Safety In Employment Act 1992. Personnel engaged in power line clearance work must be competent to perform such tree maintenance.

Formative Pruning

Formative pruning should be performed on juvenile trees as they establish, or as required by the Asset Officer, (section 2.3 & 3.2).

Crown Lifting

Crown lifting is the removal of the lowest branches. The actual clearance height achieved will vary with individual trees, depending upon their age, size, form and habit. The natural shape of the tree should be preserved as much as possible.

For young trees, to minimise stress on trunks and to develop or maintain good trunk taper, at least one-half of the foliage distribution should be retained on branches that arise in the lower two-thirds of the trunk.

Crown lifting of young trees should not exceed more than one third of the total height of the tree, unless otherwise specified by the Asset Officer.

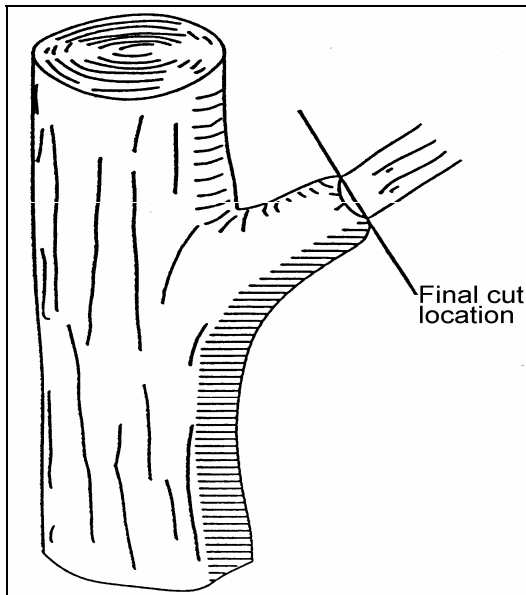
For semi-mature and mature trees crown lifting and lateral branch reductions shall be carried out to retain natural crown shapes. In many cases these clearances shall be 2.5m to 3.0m (minimum range) above footpaths and 3.5m to 4.5m (minimum range) above carriageways. This should be achieved by the removal of only those parts of the branch which extend below the desired clear height. Entire branches may require removal as directed by the Asset Officer.

Cleaning Out (including removal of deadwood)

Cleaning out consists of the removal of dead, diseased, dying, defective, suppressed and conflicting branches.

Cleaning out shall include the removal of foreign objects and plant matter deemed to be detrimental to the tree, when this can be done without inflicting undue damage to the tree and as specified by the Asset Officer.

The extent of deadwooding and the diameter size of dead wood to be removed shall be determined on a site by site basis, as specified by the Asset Officer.



Cuts into live wood should always be avoided when removing dead wood and stubs. In cases where the deadwood has remained in the tree for a long period the collar may extend itself along the dead branch. This collar should be left intact. (Refer Figure 4.5).

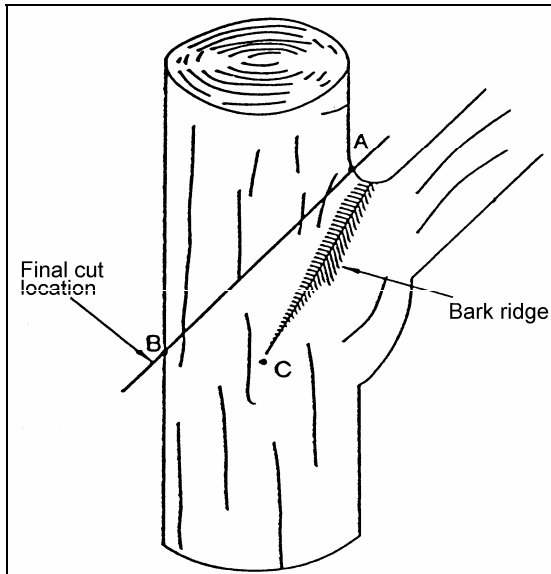
Figure 4.5 The branch collar should be left intact.

Crown Thinning

Crown thinning is cleaning out with the additional removal of secondary healthy and sound branches to produce an even density of foliage and a well-spaced and balanced branch structure.

Crown thinning may be carried out to lessen wind resistance, to reduce the weight of limbs, to increase light penetration and air movement through the crown and (where agreed in relation to the District Plan provisions and adopted policies) to assist in restoring views.

The percentage area of thinning is variable, depending upon the age, size, form and growth habit of the tree. The branch volume and leaf area removed shall not exceed 20% unless otherwise specified by the Asset Officer.



Reduction pruning is carried out to reduce tree height or spread. The ends of branches or stems are removed to internal branches, stems or growth points. (Refer Figure 4.6).

The branch or stem to which the final cut is made should be at least one-third of the diameter of the branch or stem being reduced at the point of the final cut. This may be difficult to achieve when undertaking remedial pruning and power line clearance.

Figure 4.6: Where reduction pruning is undertaken Line A-B represents the angle of the final cut. Point C indicates the bottom of the bark ridge. Point B is directly across from Point C.

Crown Reduction

Reduction pruning is usually carried out in conjunction with power line clearance pruning and is not a recommended practice for normal tree maintenance, unless otherwise specified by the Asset Officer.

Maintenance of some tree species located beneath overhead power lines may require crown reduction pruning to be carried out using hedge trimmers.

Care shall taken to avoid producing a 'topped' or 'lopped tree' appearance. The natural shape of the tree shall be preserved as much as possible, unless otherwise specified by the Asset Officer.

Remedial Pruning

Remedial pruning involves the removal of hazardous, damaged, diseased or poorly pruned branches back to undamaged or healthy tissue to ensure public safety and to improve the overall appearance of the tree.

Hazardous branches shall be removed immediately to ensure public safety

Trees shall be monitored where this type of pruning is planned to be carried out in several stages, in an attempt to induce stable and successful regrowth.

Pollarding

Pollarding is the regular pruning back of branch growth to a set position, in order to maintain the crown within specified dimensions. Pollarding usually occurs in autumn and includes the removal of seasonal growth back to the pollarded head, as specified by the Asset Officer.

Cuts should be made as close as possible to the swollen collars that surround each shoot. Care shall be taken to avoid damaging the pollard heads.

Basal growth of pollarded trees shall also be removed during the pollarding operation and may require successive removal during the summer growth period, as specified by the Asset Officer.

4.3 Power Line Clearance

Purpose: To maintain trees in close proximity to power lines, in accordance with statutory requirements and industry Codes of Practice. The outcome shall be to retain natural tree form as much as possible.

Relevant Codes of Practice and Associated Regulations

Tree maintenance operations around electrical conductors shall be carried out in accordance with the Approved Code Of Practice For Safety And Health In Tree Work, Part 2: Maintenance Of Trees Around Power Lines. Personnel engaged in power line clearance work must be competent to perform such tree maintenance.

Required Standards

Trees located beneath overhead services (such as power lines and telephone wires) shall be pruned such that the minimum clearance between the tree and the overhead service is maintained at all times. The minimum clearance distances for trees beneath overhead services given in the table below shall apply:

DESCRIPTION	MINIMUM CLEARANCE	OPTIMUM CLEARANCE
<i>Aerial Bundled Cable</i>	150mm	150mm
<i>Telephone Wires</i>	150mm	500mm
<i>230 Volt Power Lines</i>	500mm	1.0m
<i>400 Volt Power Lines</i>	500mm	1.0m
<i>11,000 Volt Power Lines</i>	1.5m	2.0m

Optimum Power Line Clearance

The distances listed above are the minimum clearances required. Greater power line clearance distances may be desirable where possible, to allow for seasonal regrowth, as specified by the Asset Officer.

Power line pruning shall be carried out in a manner sympathetic to the tree and in accordance with the principles outlined in section 4.1 Modern Arboriculture.

5.0 TREE REMOVALS

- Covering:
- 5.1 Health and Safety
 - Considerations*
 - Relevant Codes of Practice and associated regulations*
 - Hazardous trees*
 - Surrounding features*
 - 5.2 Consultation
 - Considerations*
 - Approval*
 - Notification*
 - 5.3 District Plan
 - Protected tree provisions*
 - 5.4 Stump Treatment
 - Safety*
 - Timing*
 - Stump grinding standards*
 - Alternative methods*
- Objective: To successfully undertake tree removal operations as required, whilst complying with all relevant health and safety, District Tree Policy, District Plan, resource consent and consultation requirements.

5.1 Health and Safety

Purpose: To undertake safe and proficient tree removal operations.

Considerations

Tree removal operations will take into account all policies within the District Tree Policy, particularly those defined in 4.3 Tree Removal and 4.4 Consultation.

Relevant Codes of Practice and Associated Regulations

Tree removal operations shall be carried out in accordance with the Approved Code Of Practice For Safety And Health In Tree Work, Part 1: Arboriculture, the guides specifically given in Appendix A and all relevant regulations pertaining to the Health And Safety In Employment Act 1992.

Tree removal operations around electrical conductors shall be carried out in accordance with the Approved Code Of Practice For Safety And Health In Tree Work, Part 2: Maintenance Of Trees Around Power Lines, the guides specifically given in Appendix A and all relevant regulations pertaining to the Health And Safety In Employment Act 1992. Personnel engaged in power line clearance work must be competent to perform such tree maintenance.

Hazardous Trees

Hazard trees shall be given priority.

Hazard trees may include any specimen under New Plymouth District Council jurisdiction.

Whole trees shall be removed immediately when they are creating an immediate significant hazard caused by a structural tree defect which cannot be minimised or isolated.

Photographs shall be taken of the tree, together with a condition report, prior to removal.

The Asset Officer shall be notified of such tree removals immediately during normal working hours or by 9.00am of the next working day.

Surrounding Features

Care shall be taken to avoid damage to property, features, neighbouring trees and sub-canopy planting.

5.2 Consultation

Purpose: To provide accurate and timely information to New Plymouth District Council staff and customers regarding tree removal operations.

Considerations

Tree removal operations will take into account all policies within the District Tree Policy, particularly those defined in 4.3 Tree Removal and 4.4 Consultation.

Approval

Trees (other than those specified in section Hazard trees (6.1. Health and safety) and Removal and replacement (3.2 Maintenance tasks) shall not be removed without the prior approval of the Assets Officer.

Notification

Residents shall be notified of intended tree removals and hazard tree removals as specified by the Assets Officer.

5.3 District Plan

Purpose: To provide tree removal operations whilst complying with all New Plymouth District Council District Plan tree protection provisions.

Protected tree provisions

Tree removal operations shall comply with the various New Plymouth District Council District Plan tree protection provisions and bylaws.

5.4 Stump Treatment

Purpose: To provide timely and safe stump removal operations.

Safety

Stump removal operations shall be carried out in accordance with the Approved Code Of Practice For Safety And Health In Tree Work, Part 1: Arboriculture, and all relevant Health And Safety In Employment Act 1992 regulations.

The Contractor shall be responsible for any damages arising from stump removal operations.

Underground utility services shall be located and identified by the Contractor prior to stump removal operations.

Stump removal debris shall be removed from the site and the site shall be left in a tidy and safe condition.

Timing

Stumps shall be removed within a two-week period of the tree removal, unless otherwise specified by the Asset Officer.

Stump Grinding Standards

Stumps shall include surface roots and shall be removed to standards as listed below.

<u>Type</u>	<u>Treatment</u>
Stump removal only:	<i>Stumps shall be removed to 150mm below the surrounding soil surface.</i>
Planting of a replacement tree in the same location as the original stump:	<i>Stumps shall be sufficiently removed to facilitate the planting and establishment of a replacement tree (this may include stakes and a form of tree surround).</i>

Excess chippings shall be removed from site as part of the stump removal operation.

Where stumps are removed the area shall be re-instated to the same standard as the surrounds

Where stumps are removed from turf areas the site shall be re-instated using weed-free top soil and grass seed.

Turf areas shall be re-instated level with and to the minimum standard of the surrounding ground.

The methodology used to re-instate hard surfacing disturbed by stump grinding activities shall be specified by the Asset Officer.

Alternative Methods

Where stump grinding is not practicable or required stumps may be removed either manually (by being dug out), cut to below ground level or treated with an appropriate herbicide, as specified by the Asset Officer.

Where herbicides are used these shall be applied only by competent, approved operators in accordance with the manufacturers directions.

If stumps are to be treated with herbicide then care shall be given to neighbouring trees, which may be root grafted to the stump (to avoid translocation).

Herbicide treatment should be applied to the cambium zone within 40 minutes after the final cut has been made.

6.0 DEBRIS COLLECTION AND REMOVAL

- Covering:
- 6.1 Biosecurity
 - Considerations*
 - Compliance*
 - 6.2 Wood Chips
 - Wood chips and debris*
 - 6.3 Wood
 - Disposal of wood*

Objective: To provide timely, safe and appropriate removal and disposal of debris associated with tree work operations.

6.1 Biosecurity

Purpose: To comply with Biosecurity Act regulations in the handling and disposal of tree work debris.

Considerations

Debris collection and removal operations will take into account all policies within the District Tree Policy, particularly those defined in 4.2 Maintenance of Trees, 4.3 Tree Removal and 4.4 Consultation.

Compliance

Debris from tree work operations shall be handled and disposed of as required under the Biosecurity Act for Dutch Elm Disease (DED) and the White Spotted Tussock Moth.

The Contractor shall be responsible for liaison with the appropriate Government authority regarding disposal of debris.

6.2 Wood Chips

Purpose: To re-cycle woods chip generated from tree work operations where possible.

Wood Chip and Debris

All debris shall be removed from sites unless otherwise specified by the Asset Officer.

Wood chips are required for use in New Plymouth District Council parks and reserves. The Contractor shall transport the wood chip to such sites, for use in other maintenance tasks.

The site shall be left clean, safe and tidy at the end of each day.

6.3 Wood

Purpose: To re-cycle or dispose of wood generated from tree maintenance operations in a safe and timely manner.

Disposal of wood

Wood shall be disposed of as specified by the Director of Parks and Leisure Services, or nominated officer. Wood may be cut into firewood lengths (30-45 cm) and left on site in some locations, as specified by the Asset Officer. Wood that is left on site shall be left in such a way that it cannot become a hazard or damage property.

7.0 ADDITIONAL ARBORICULTURAL OPERATIONS

Covering: 7.1 Rootzone Aeration
Alleviating soil compaction

7.2 Cable Bracing and Propping
Approach to cable bracing and propping

Objective: To undertake additional arboricultural operations wherever necessary, in a timely, safe and appropriate manner, whilst complying with relevant regulations and in accordance with modern arboricultural practices.

7.1 Rootzone Aeration

Purpose: To provide aeration of compacted soils to assist with tree health.

Alleviating Soil Compaction

Rootzone aeration shall be performed as specified by the Asset Officer, to alleviate soil compaction and break up hard soil pans where excess surface water is present.

Rootzone aeration may be achieved by hand auger or compressed air injection.

The intensity of treatment should not be so great that the roots of the tree will be damaged. Compressed air treatment may damage fine root hairs and should be used in accordance with specialist advice.

In some instances a granular fertiliser may be added as part of the soil aeration procedure.

7.2 Cable Bracing and Propping

Purpose: To provide structural support to trees where required.

Approach to Cable Bracing and Propping

Cable bracing and propping shall only be carried out as specified by the Asset Officer.

The tree may require artificial support in appropriate circumstances in order to extend its safe life, or to lessen possible risk should the supported part collapse.

Numerous cabling systems exist and caution should be exercised in the choice and installation of any one system.

Personnel experienced in cable bracing and propping should determine fixing positions and materials.

All materials and workmanship shall be compatible and of appropriate strength and construction to achieve the bracing safely.

**APPENDIX II B –
Guidelines for Works within the Vicinity of Trees**

***GUIDELINES FOR WORKS WITHIN THE
VICINITY OF TREES***

GUIDELINES FOR WORKS WITHIN THE VICINITY OF TREES

TABLE OF CONTENTS

INTRODUCTION.....	40
1.0 HOW TREES FUNCTION.....	40
2.0 TREE PARTS ABOVE GROUND.....	41
2.1 Trunk and Large Branches.....	41
2.2 Tree Crown.....	42
3.0 TREE PARTS BELOW GROUND.....	42
3.1 Tree Root Functions and Growth Patterns.....	42
4.0 TYPICAL ROOT SYSTEM.....	44
5.0 WOUND RESPONSE.....	45
6.0 DAMAGE TO TREES.....	45
7.0 ABOVE GROUND DAMAGE.....	46
7.1 Trunk and Crown Damage.....	46
8.0 BELOW GROUND DAMAGE.....	47
8.1 Soil Compaction.....	47
8.2 Direct Root Loss.....	48
8.3 Soil Grade Changes.....	49
8.4 Chemical Damage.....	49
9.0 TREE PROTECTION AND CARE.....	50
10.0 PROTECTIVE FENCING.....	50
11.0 INSTALLATION OF UTILITY SERVICES.....	51
11.1 Thrusting and Directional Drilling.....	51
11.2 Hand Digging.....	52

GUIDELINES FOR WORKS WITHIN THE VICINITY OF TREES

INTRODUCTION

These guidelines apply to any activities which affect individual trees, groups of trees and trees found generally in areas of existing or regenerating bush under the jurisdiction of Parks and Leisure Services within the area covered by the New Plymouth District Council's District Plan.

The New Plymouth District Council Plan objective in relation to trees is to protect trees and groups of trees which significantly contribute to the district's amenity. There are specific rules within the tree protection provisions of the District Plan in relation to undertaking work within the dripline of a Protected tree: these provisions should be considered prior to the commencement of any works.

Trees have other important ecological, environmental and cultural attributes. They make an important contribution to the sustainable management of natural and physical resources throughout the district. Collectively they endow the rural and urban landscape with distinctive environmental quality and character.

The environmental inter-relationship between people and trees is fundamentally important. Changes in land use and building development pressures often encroach on the continued existence of trees. With this in mind suitable guidelines are required for works within the vicinity of trees.

These guidelines are designed to give a brief overview on several key issues, including how a tree functions, how the different above and below ground parts of a tree are interdependent and how various activities may cause significant damage to trees.

Suitable mitigation measures are described in these guidelines which will assist in deciding the best ways to provide protection to trees – in relation to both the aerial above-ground parts and, in particular, to the below-ground root systems. When prescriptive conditions are placed on work within the vicinity of trees the relevant objective of the District Plan will be achievable and sustainable.

Early consultation with the Council and a qualified arborist is also recommended.

1.0 HOW TREES FUNCTION

A tree is a dynamic living organism. All of the various parts and functions of a tree are interdependent. Understanding these parts and functions is important to prevent unnecessary damage. The trunk, crown and roots function together as a balanced system in a vigorous healthy tree. Any damage to the above or below ground tree parts will upset this balance and cause a reduction in overall tree health.

Trees are often viewed as only trunks, branches and leaves. However, a major portion of every tree, the roots, are below ground and unseen. The root system is generally overlooked and misunderstood. One of the purposes of this guide is to place importance on protecting the roots of trees.

2.0 TREE PARTS ABOVE GROUND

2.1 Trunk and large branches

The trunk and branches of a tree serve three primary functions:

- structural support
- storage of food reserves
- transport of essential substances.

-

These functions are carried out by the various tissues which make up the trunk and branches:

- bark
- phloem
- cambium
- xylem
- sapwood
- heartwood.

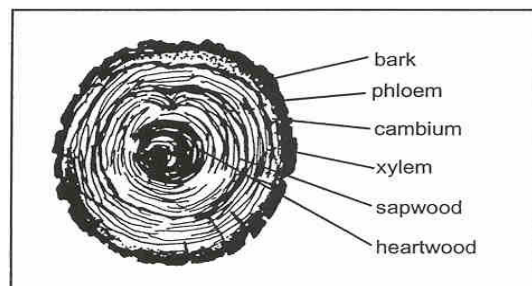


Figure 1: Cross section of a trunk or branch showing the position of each type of tissue.

Bark is the protective outermost layer of tissues. Bark provides some measure of defence against physical and biological damage. It also helps moderate trunk and stem temperatures.

Phloem tissue is one half of the conducting vascular system located between the bark and cambium. Phloem is a series of connected cells designed to transport growth regulators, sugars and carbohydrates from the leaves throughout all parts of the tree.

Cambium is a sheath of actively growing cells, only a single-cell thickness. This crucial layer is continuously dividing to produce new vascular tissue which is either phloem or xylem.

Xylem tissues form inwards from the adjacent cambium layer, developing the other half of the vascular system. Xylem cells conduct water and essential elements from the roots to the leaves. Xylem gradually changes to become the wood of the tree. It is important in providing structural support and a volume of tissues in which to store food reserves.

Sapwood is the outer and active layers of wood, which provide transport, storage, structural support and protection and defence against decay pathogens.

Heartwood is the inner and non-conducting layers of older xylem. The main function of heartwood is to provide structural support for the tree.

The vascular system - that is the conductive cells which transport water and nutrients around the tree - exists just beneath the bark and is easily damaged. Any damage to the vascular system can have a serious adverse effect on tree health.

2.2 Tree crown

The twigs and smaller branches of the crown (or canopy) consist of the same tissues as those in the trunk and larger branches. The branch framework is arranged in a manner which provides the maximum exposure to light for the leaves. Twigs and branches are also the primary growth sites for the buds which develop into leaves, flowers and fruits.

The growth pattern of the crown maximises the total leaf area available for the vital functions of photosynthesis (food manufacture) and respiration (gaseous exchange). Photosynthesis and respiration are the primary functions of leaves.

3.0 TREE PARTS BELOW GROUND

3.1 Tree root functions and growth patterns

Any works process that destroys, disrupts or interferes with the normal function of the root system will have an adverse effect on the tree's health. The stability of the tree may also be compromised.

Roots serve four primary functions:

- absorption of water and mineral nutrients
- anchorage and stability
- transportation of essential substances
- storage of food reserves.

To provide these functions tree roots require a constant supply of oxygen, water, mineral elements and carbohydrates. Tree roots are opportunistic, growing wherever conditions are favourable. Available moisture and oxygen are essential to root growth.

Many people envisage roots growing down-ward at steep angles from the base of the tree trunk, extending deep into the earth. This perception of root growth is a misconception and rarely, in reality, occurs. There is variation in the extent of root spread among tree species. However, the basic growth pattern is similar for most trees. In some cases it will be necessary to protect the root system beyond the drip-line (outer extent) of the crown.

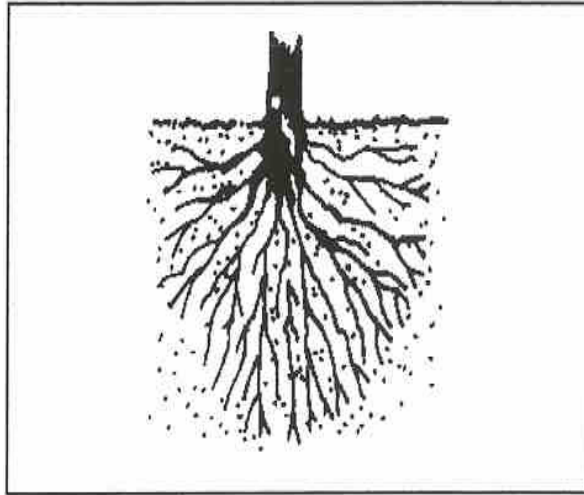


Figure 2: How many people imagine tree root systems. This “mirror image” perception is completely incorrect. While a few species do have deep tap roots most do not. This notion is more artistic than accurate.

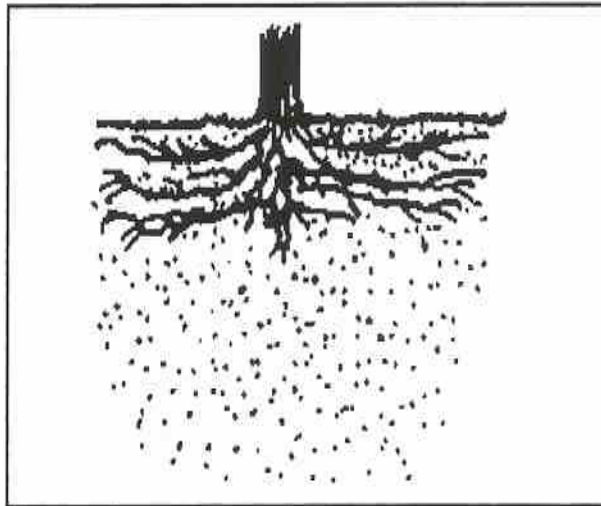


Figure 3: Roots naturally spread horizontally, to where soil conditions provide nutrients and moisture. About 85% of tree roots are within the upper 500mm of soil. This figure depicts the lateral spread of roots, which is more common. Roots may spread laterally 2-3 times the height of the tree.

Under ideal conditions tree roots can extend out from the trunk two or three times the radius of the crown spread (dripline) is, ideally, the minimum area around a tree which should be protected.

4.0 TYPICAL ROOT SYSTEM

Typical root systems are comprised a combination of four types of roots:

- major lateral roots
- sinker roots
- woody feeder roots

- non-woody feeder roots.

Major lateral roots originate from the base of a tree trunk. These roots exist near the soil surface and grow outward in a radial, horizontal direction. They provide anchorage and support.

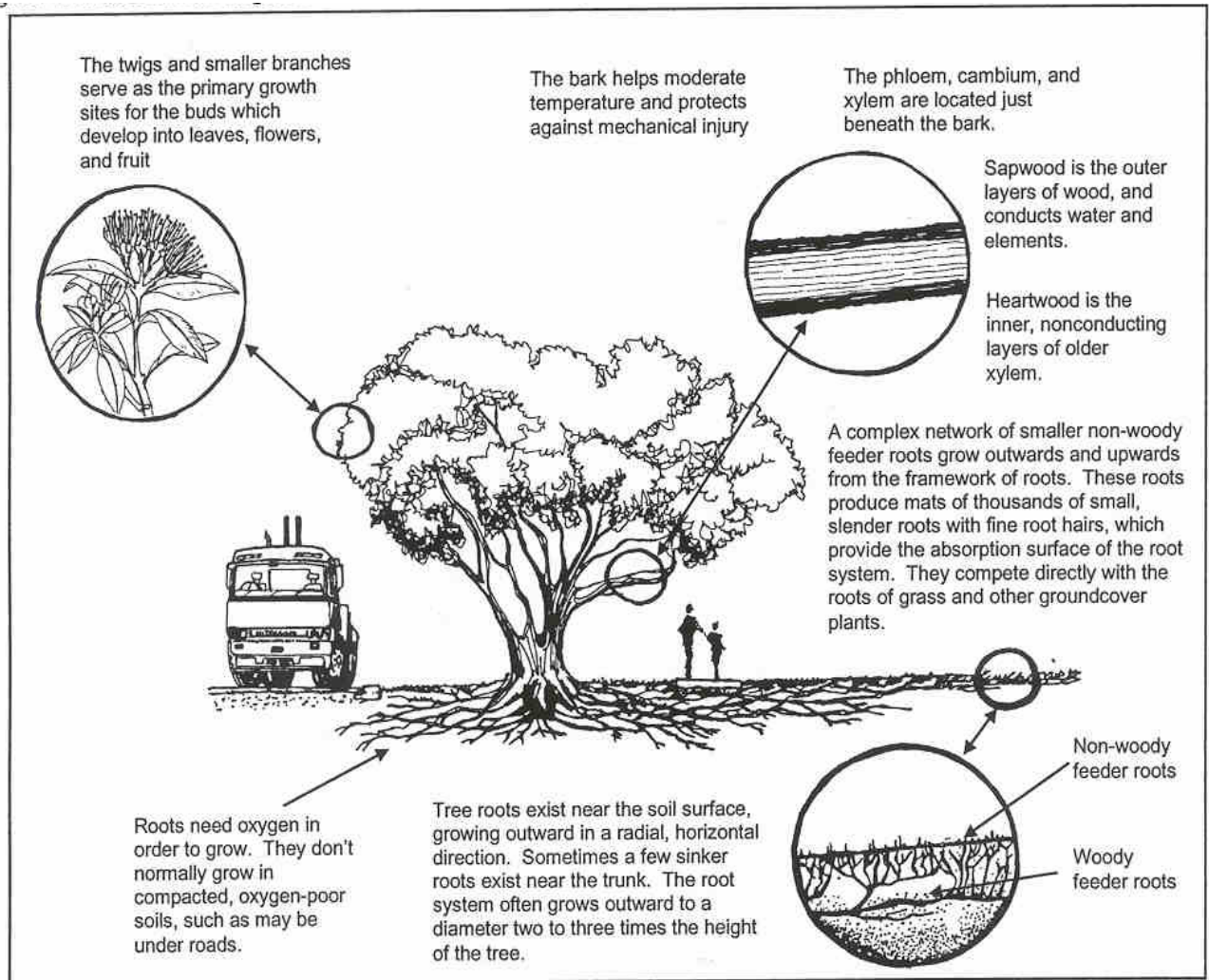


Figure 4: Parts of a tree and their primary function.

Sinker roots grow vertically downward from the lateral roots, providing additional anchorage and increasing the depth to which the root system penetrates. Sinker roots are usually found within a short distance of the tree trunk. Soil type has a fundamental effect upon the tree and its requirement to produce sinker-type roots.

Major lateral roots and sinker roots provide the primary anchorage for a tree. These roots usually do not extend below 1-2 metres in depth.

Woody feeder roots extend outwards from the lateral roots and are typically located in the upper 300mm of soil. They increase the area covered by the overall root system.

Non-woody feeder roots grow well beyond the crown drip-line. They greatly increase the absorption potential of the root system since they are very fine and net-like.

5.0 WOUND RESPONSE

Damage to trees, unlike damage to structures, cannot be repaired. Trees are dynamic, living organisms, but they do not heal.

Damaged tissues are not replaced and restored with new cells. Damaged areas are physically closed off from undamaged areas - by a complex chemical process known as compartmentalisation - and the damaged tissue remains within the tree for the rest of its life.

The tree's defensive reaction to wounding (and the spread of decay) - whether planned pruning or unplanned storm or construction-related damage - is to redirect energy resources. Each time a tree responds to wounding this results in a loss of energy which could have been used for healthy normal growth.

Multiple or repeated energy requirements directed to deal with wound responses may deplete the tree's total available energy reserves. Normal growth processes may be impeded. Repeated, extensive wounding can stress a tree to the point of decline.

6.0 DAMAGE TO TREES

The applicant should seek advice from New Plymouth District Council, prior to commencing works, wherever trees will be affected by proposed land use changes or development works. Expert advice is available from the Council to ensure the health and survival of trees.

Trees are more vulnerable than many people imagine. Special care must be taken on all sites where work is to be carried out within the vicinity of trees that are to be preserved.

Damage to trees caused by construction work occurs both above and below the ground. Root systems can suffer mechanical and chemical damage. Tree trunks and crowns can be subject to various degrees of mechanical and heat damage. Such damage to trees can be serious. In many cases it is preventable and avoidable.

7.0 ABOVE GROUND DAMAGE

Many construction activities cause above-ground damage to trees. Above-ground damage can result from direct impacts with construction equipment and storage of heavy materials against trees. Trees can also be damaged by improper 'pruning' for clearance by construction personnel. Figures 5 and 6 illustrate these points.

7.1 Trunk and crown damage

Trunk and branch wounding can range from minor outer bark damage to total structural failure of the main stem. Damage to the phloem, cambium and xylem disrupts the continuous flow of water, mineral elements, growth regulators and photosynthates (sugars) between the crown and roots. The greater the circumferential damage - the greater the total amount of flow lost. Damage to wood

tissues also reduces the availability of existing stored food reserves, whilst limiting the accessibility of woody tissue available for future food storage.

Trees must also redirect resources to close the large wounds, adding to the net energy loss. The exposed wood tissues at wounds provide open access for wood rotting fungi. Trees stressed or weakened by construction damage may also be predisposed to secondary insect and disease infestations.

When large branches are torn way from trees the damage is substantial. Loss of major limbs reduces the quantity of leaf area, thereby reducing the tree's total photosynthate (sugar) production.

Total leaf area is also reduced by leaf scorch and twig death. This occurs when hot exhaust gases vent from equipment operating beneath tree crowns.

Heat and fumes can kill or injure the tree's trunks, branches and leaves - reducing its capacity to survive.

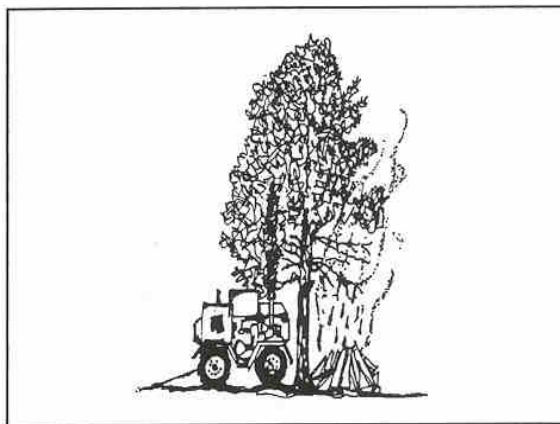


Figure 5: Keep all construction equipment, generators and static machinery well away from tree branches. Do not light fires or create any source of heat or noxious fumes within the branch spread.

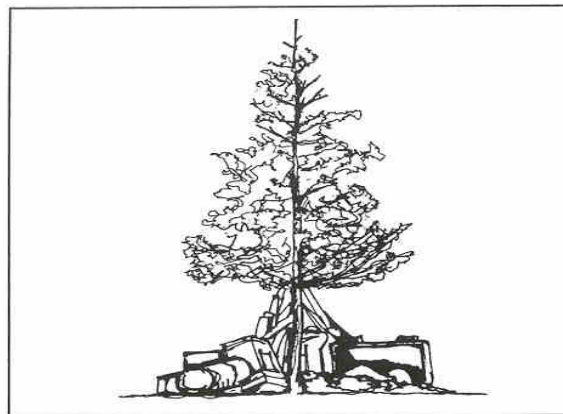


Figure 6: Do not put soil, debris, or any construction materials against tree trunks or within the root zone.

8.0 BELOW GROUND DAMAGE

Tree roots often suffer extensive injury and loss as a result of construction work. The main causes of construction damage below ground are:

- soil compaction
- direct root loss
- soil grade changes
- chemical contamination.

8.1 Soil compaction

The soil within the root zone of a tree may become compacted from the weight of general construction traffic, the operation of heavy equipment and by the storage of construction materials within the root zone. The soil may also be intentionally compacted as an engineering requirement of construction.

Soil compaction changes soil structure by squeezing out air. The effect is an increase in bulk density, or solidity. Compaction decreases soil-borne oxygen, which is necessary for root respiration, and increases the accumulation of carbon dioxide and other toxic gases. It also restricts the filtration of water. See Figure 7.

Compaction will affect water filtration by making some soil types more impervious, whilst others may retain more water. Compaction invariably leads to either the drying or water-logging of soils surrounding tree roots. Such changes in soil moisture can cause direct root mortality.

Abnormal soil moisture and compacted soil structure can also prevent roots growing and extending in to new areas.

Symptoms of compaction are not usually immediately obvious and trees may die several years after compaction damage has occurred.

Figure 7: Avoid operating vehicles or machinery over the root zone.

Apparently healthy trees growing in areas covered by impervious materials (such as concrete or asphalt) have usually grown under such conditions since they were saplings. Mature trees may be killed by new surfacing.

Seek the advice of a qualified arborist before installing hard surfaces over the root system of any notable or protected trees.

8.2 Direct root loss

Excavating and trenching machines are commonly used in construction. This equipment has the potential of causing extensive root loss when no concern is given to root systems during trenching and excavating activities.

Roots can be severed, torn away or crushed causing serious wounding and loss of normal structural stability. This can lead to direct tree mortality and/or uprooting. Less severe damages may lead to drying out and death of exposed roots. Roots that are badly damaged are prone to decay pathogens. The physical loss of roots will affect the tree's stability and ability to survive and may lead to a decline in tree health. See Figure 8.

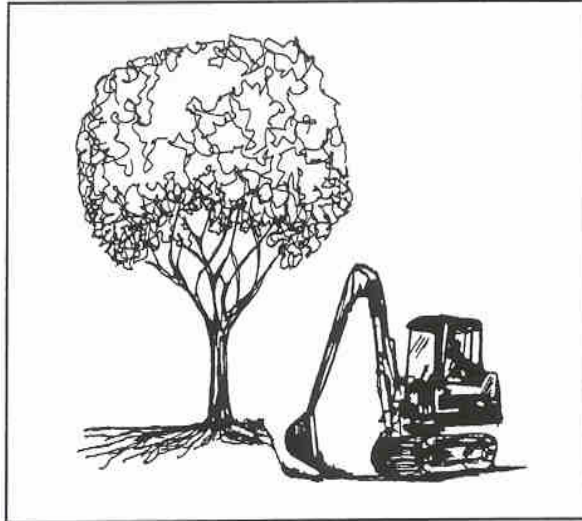


Figure 8: Do not trench or excavate within the root zone of trees - this may damage or sever roots.

8.3 Soil grade changes

Levelling, filling and cutting of soil grades will result in the same types of damage associated with excavating, trenching and soil compaction. Grading may also remove the nutrient-rich topsoil which supplies the basic nutrients and elements which trees require for growth. See Figure 8.

Lowering or cutting grades can remove a large percentage of feeder roots. Raising or filling grades around trees reduces air diffusion and exchange in the root zone. As little as 100mm of soil placed over the established root systems of some species is enough to kill them.

Even if grade changes are not made directly in the root zone they may be close enough to root systems to affect water drainage. This may cause root dieback due to changes in soil moisture content.

8.4 Chemical damage

Leaking or spilling of fuel, lubricants or hydraulic oils, or intentional dumping of masonry resins, paints, acids, solvents, or any other toxic substances may kill roots or impede their functions. When such toxins are deposited in tree root zones they adversely affect tree health or directly cause tree mortality. See Figure 9.

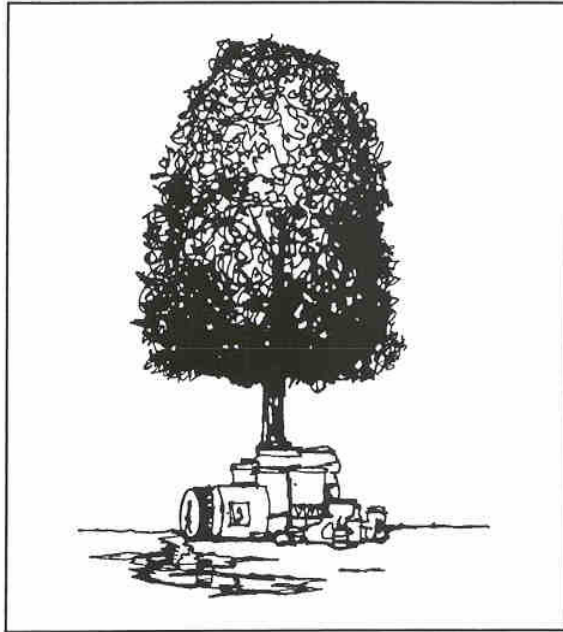


Figure 9: Do not store or dispose of any toxic substances within the root zone.

9.0 TREE PROTECTION AND CARE

Trees require protection on the work site by excluding all construction operations from a defined exclusion area around them.

The success of the tree protection process will depend on the co-operation of all persons involved in the design, construction and implementation of the protective measures.

It is essential for those involved in the site works to appreciate the need for maintaining the area of protection around trees. Breaching the protective zone can easily waste the time, effort and expense which has gone into the protection of the trees.

10.0 PROTECTIVE FENCING

Before any materials or machinery are brought on site, or prior to commencement of any demolition or development, protective fencing must be erected around all trees which are to be retained. Trees on adjacent properties affected by the construction works must also receive appropriate protective fencing. See Figure 10.

The fencing must be strong and appropriate to the degree of construction activity taking place on the site.

The protected area around trees must be of dimensions recommended in Figure 11. The temporary fencing around this area must be maintained throughout construction works. The temporary fencing should be 1.8 - 2m high and must prevent access within the protected area.

No works shall be carried out within the protected area. No materials shall be stored within the protected area.

Notices should be erected on the fencing with words such as "Protected area - no operations within fenced area".

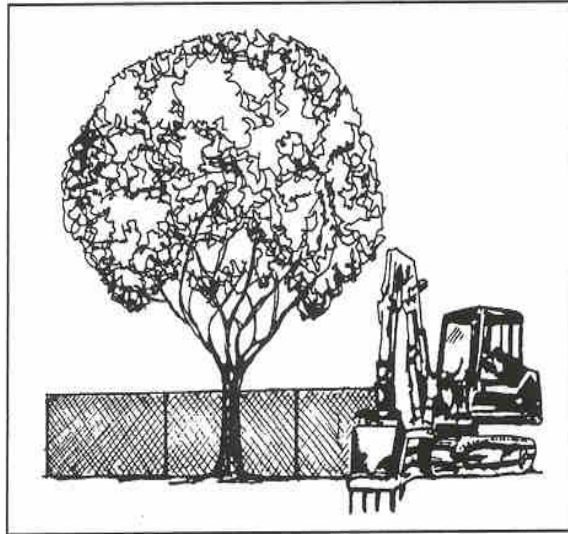


Figure 10: Protective fencing must be strong and appropriate to the level of construction activity taking place on site.

11.0 INSTALLATION OF UTILITY SERVICES

Detailed plans area required to show the routing of all services in the proximity of trees. Plans must indicate the area needed for installation of the services.

Care is also needed in routing above-ground services to avoid any excessive pruning requirement before or after the installation of services.

If an alternative route can not be used then the installation of underground services must be done in a way that minimises damage to trees - for example using techniques such as thrusting and/or hand digging.

Open cut trenching can cause major damage to tree roots, as shown in Figure 12a. Thrusting minimises and localises damage to tree roots, as shown in Figure 12b and is the preferred method of service installation.

11.1 Thrusting and directional drilling

Traditional methods of service establishment (ie. open cut trenching) can cause massive root damage and ground disturbance. The resulting 'change of environment' for the tree will be substantial.

The action of 'thrusting' or 'directional drilling' is the most preferred method of service establishment within the drip-line of trees. When these two methods are used the 'change of environment' around the tree is minimised.

All machinery and starting pits associated with the action of thrusting or directional drilling should remain outside the drip-line of trees. This is to minimise any root loss or ground compaction that may arise from the works.

If the thrusting rod or directional drill head becomes stuck underneath the drip-line of a tree then the arborist responsible for the trees on the site should be contacted prior to the retrieval process. Any retrieval of a thrusting rod or directional drill-head beneath the drip-line of a tree should be undertaken with hand tools unless otherwise stated by the arborist responsible for the trees on the site.

11.2 Hand digging

The excavation method of 'hand digging', if carried out correctly, has the potential to have 'no more than minor' effects on the health and safety of the tree(s) which are within the line of works.

The objective of hand digging is to retain the majority of roots. Great care should be taken when hand digging within, or close to, the drip-line of a tree. Works should be undertaken with due care and attention. The more time and care spent on hand digging the less impact the work will have on the health and safety of the tree.

The main motivation for using hand digging as a method of excavation is root retention.

When digging within the drip-line of a tree carefully remove the soil, making sure that any roots accidentally discovered are not repeatedly hit or severed. Take care not to damage the outer 'bark' of roots, as this is the area where the transport of nutrients and water to the rest of the tree occurs.

Fact: Hand digging takes time. Allow enough time for this method of works to occur when planning works. If a substantial amount of hand digging is required on your site consider training up a specialist crew who will become skilled in this method of excavation and, therefore, reduce the time that is required to achieve the work.

The majority of the roots are usually found near the soil surface. It may be possible to excavate by hand to a certain depth and then, in the absence of any roots that are to be retained, excavation by another method may be possible.

Prior to the work occurring seek advice from the arborist responsible for the trees on the site as to how to proceed with the method of hand digging

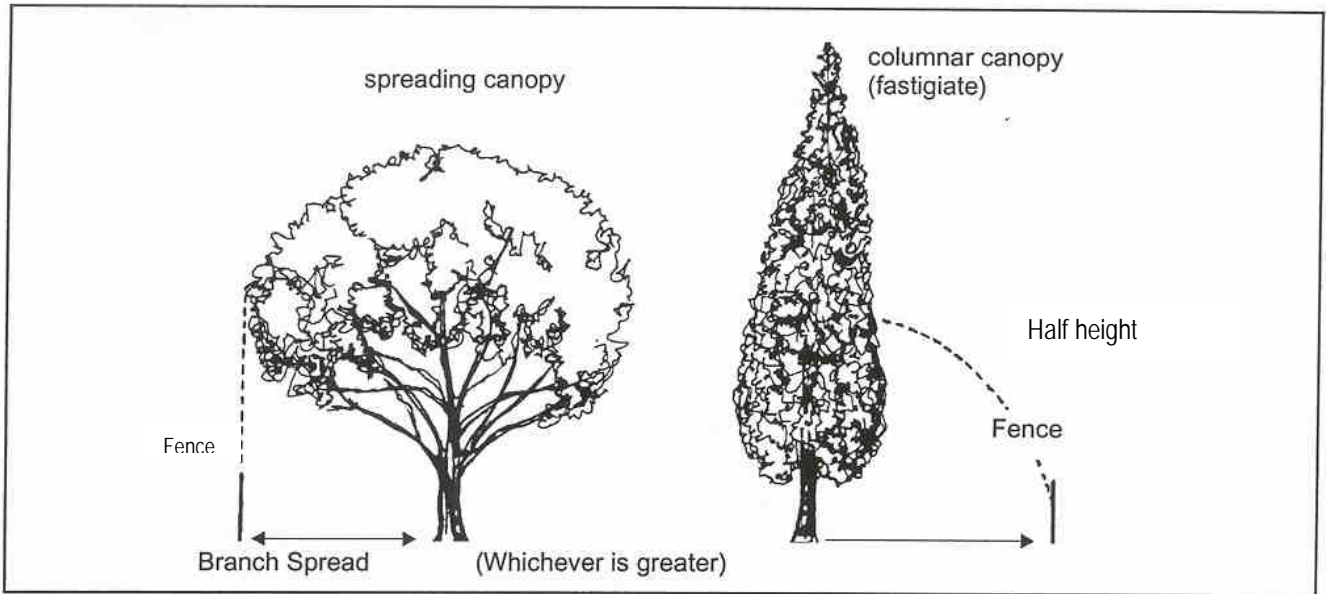


Figure 11: Dimensions for locating protective fencing.

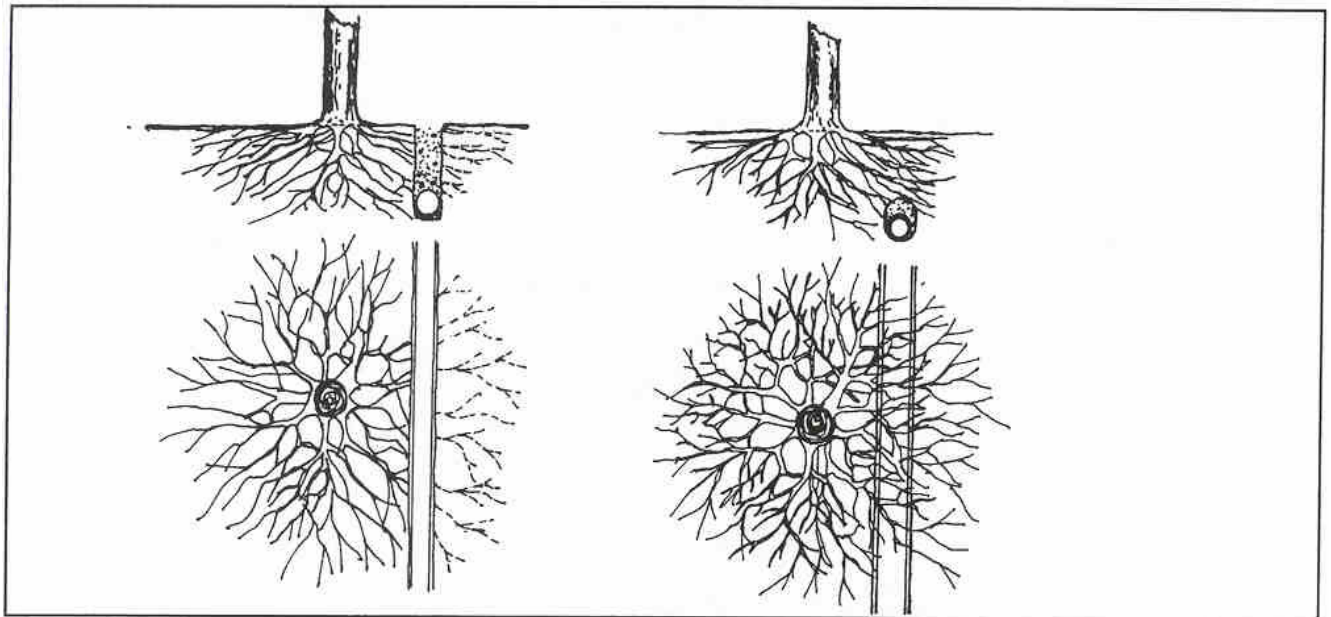


Figure 12a: Trenching causes major damage.

Figure 12b: Thrusting minimises damage.

**APPENDIX II C –
High Profile and Street Tree Selection Criteria**

HIGH PROFILE AND STREET TREE SELECTION CRITERIA

HIGH PROFILE AND STREET TREE SELECTION CRITERIA

The process for the selection of trees for planting on Council land is based upon the following criteria:

1. SITE SUITABILITY TO EXISTING ENVIRONMENTAL CONDITIONS:

Will the species tolerate the site?

1 = Will not do well

10 = Adapts well to wind, salt, exposure

2. RATE OF ESTABLISHMENT:

How practical is it to establish the species in this environment?

1 = Hard or slow to establish

10 = Establishes easily and quickly

3. LONGEVITY:

Is it a long term or short term species?

1 = Short term less - than 40 years

10 = Long term - more than 40 years

4. IMPACT ON THE LANDSCAPE:

What sort of impact does the species create, in terms of scale and suitability in the long term?

1 = Small scale or minimum impact

10 = Large scale or bold impact

5. COMPATIBILITY WITH ESTABLISHED THEMES:

Does the species 'fit in' to the established theme for the area?

1 = Looks out of place with existing character

10 = Reflects local character and theme

6. MANAGEABILITY:

Is the species easy to manage?

1 = Difficult to manage

10 = Easily managed

7. AVAILABILITY OF STOCK:

Is plant material available?

1 = Hard to source or expensive

10 = Readily available - reasonable cost

8. FORM:

Does the species have manageable form?

1 = Unpredictable or inconsistent form

10 = Predictable and manageable form

9. UNDESIRABLE CHARACTERISTICS:

Does the species have particular problem habits, such as messy fruits, excessive leaf litter?

1 = Has some or many problem habits

10 = Has few problem habits

10. AMENITY VALUES

Does the species have attractive/interesting/colourful characteristics?

1 = Has low amenity values

10 = Has high amenity values

NOTE: TO BE ACCEPTED A TREE MUST:

- (a) Score 7 or more out of 10 for item 1; and
- (b) Score 6 or more out of 10 for all other items; and
- (c) Score a minimum of 61 points out of a possible 100 points.