Arrowtown South Special Zone

Overarching Open Space Management Plan

Prepared by:

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In collaboration with Lane Neave and CHA Surveyors Ltd

For Arrowsouth Properties Ltd
Updated September 2017

Disclaimer

Rough and Milne Landscape Architects endeavours to ensure that the information in this publication is accurate and current. However we do not accept liability for any error or omission.

This publication is intended to provide the best possible guidance to Arrowsouth Properties Ltd, with regard to establishing and maintaining private open space areas within the Arrowtown South Special Zone. However, the information is provided as a general guidance only and is not intended as a substitute for specific advice. Rough and Milne Landscape Architects takes no responsibility for the accuracy of this information, its completeness or fitness for purpose.

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INTRODUCTION

The objective of this Overarching Open Space Management Plan is to outline a strategy for establishing, re-vegetating and maintaining private open space areas as part of a residential living environment within the Arrowsouth Special Zone. Within this zone, the Queenstown Lakes District Council (QLDC) has adopted a Structure Plan to ensure a comprehensively planned neighbourhood that:

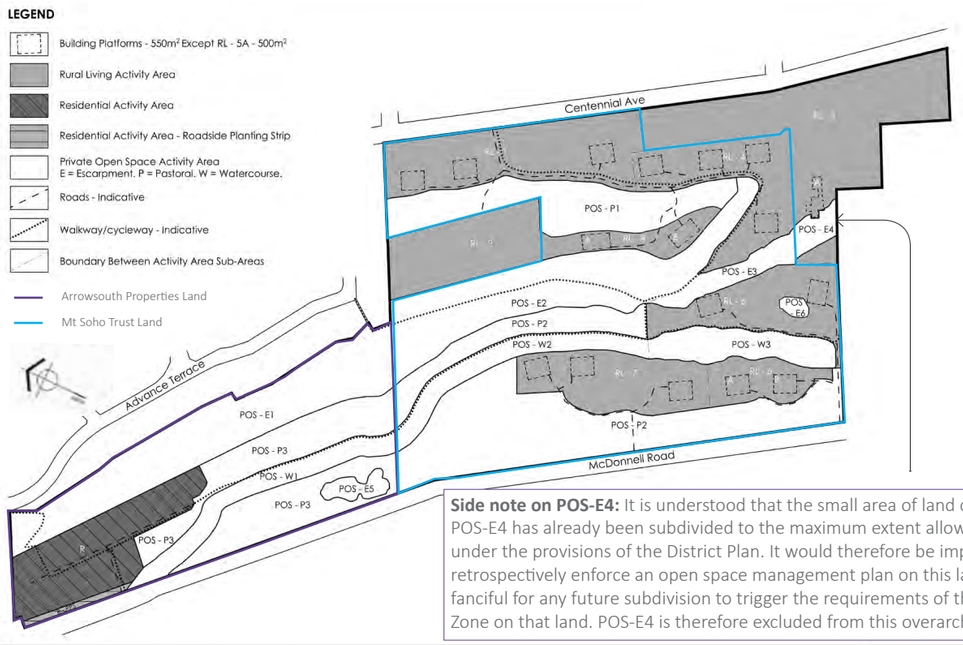
- clearly defines the southern edge of the township
- provides connections between Centennial Ave and McDonnell Road
- ensures protection of the escarpment and watercourse and creates a network of walking trails
- maintains a predominantly low density residential character
- provides consistent landscape treatment of open spaces

This overarching plan starts by proposing a vision for the private open space areas of the Arrowsouth Special Zone, and goes on to describe the strategies proposed for achieving that vision, including:

- methods for eradication and ongoing management of weeds on the site
- stock exclusion and rabbit control
- identification of historic plant communities and suggested revegetation species
- improving the success rate of planting through guidelines and programmes
- suggesting a sustainable structure for ongoing management of open space areas
- the location, construction and visual mitigation of foot/cycle tracks

It is intended that the Overarching Open Space Management Plan will provide a high level strategy on how to regenerate and maintain private open space areas.

FIGURE 1: ARROWSOUTH STRUCTURE PLAN



Side note on POS-E4: It is understood that the small area of land containing POS-E4 has already been subdivided to the maximum extent allowable under the provisions of the District Plan. It would therefore be impossible to retrospectively enforce an open space management plan on this land and fanciful for any future subdivision to trigger the requirements of the Arrowsouth Zone on that land. POS-E4 is therefore excluded from this overarching plan.

SITE DESCRIPTION

Arrowtown South Special Zone occupies approximately 30 hectares of previously rural zoned land on the southern edge of the Arrowtown Township. The zone is located between McDonnell Road to the west, Centennial Avenue to the east and bounded along its southern boundary by the Arrowtown Golf Course. The area to the north of the special zone is an existing residential zone which forms the existing southern edge to Arrowtown's built area. The special zone area is held within nine separate titles ranging in size from 3030m2 to 17.95ha, although all private open space areas are held within the two largest titles, owned by Mt Soho Trust and Arrowsouth Properties Ltd.

The structure plan area is split into two distinct levels by a steep, vegetated escarpment which is mostly well defined until it transitions into two smaller terraces at the southeastern-most end. The upper level, described as the Centennial Avenue terrace, is distinct in elevation and character from the lower level strip of basin floor beside McDonnell Road. It is smaller than the lower level landscape unit and contains six rural dwellings with associated farm buildings and amenity planting, giving it more of a rural lifestyle zone character and density. This terrace is accessed and viewed from Centennial Avenue.

The lower level is a long, reasonably narrow strip of gently rolling land defined by the toe of the escarpment and McDonnell Road. The landscape is characterised by rural farmland with grazed pastures, exotic tree planting, a north – south running creek, a small wetland area and a few rocky outcrops. One residence and associated farm buildings, clearly visible from McDonnell Road, is located near the southern end of the lower level strip of land. This landscape unit is accessed and viewed by public from McDonnell Road. Existing dwellings

Photo 1: Overlooking the Arrowsouth Zone from the escarpment

located at the top of the escarpment also overlook the lower level.

In pre-human times, glaciers grew and retreated through several glaciation periods, carving out the Wakatipu Basin and defining the mountains that surround it. When the ice retreated, rivers continued to carve the landscape forming deep channels and terraces throughout the basin floor. Vegetation cover within the basin would have been predominantly grey scrub with species like manuka, matagouri and mingimingi, dryland woodlands of kanuka, kowhai and totara, and areas of grassland and wetland. Mountain beech and other native forest species would have existed in the shady gullies and on hill and mountain slopes where birdlife, insects and lizards were once plentiful.

Since the arrival of Maori explorers, gold miners and settlers to the Wakatipu Basin, fire, invasive plant species and animals introduced by Europeans have changed the ecological landscape of the basin into one now dominated by pastoral farmland and urban development.

This is characteristic of the existing land in the Arrowtown South Special Zone. Currently the site is dominated by exotic pastures, but also includes areas of exotic scrub and wilding tree species.

OVERARCHING VISION

FIGURE 2: ARROWSOUTH MASTER PLAN

VISION STATEMENT

Arrowsouth will be a unique neighbourhood and open space defining the edge of Arrowtown that provides new living opportunities within an ecologically enhanced and protected environment. A major native revegetation project will see the existing stock damaged waterway and weed infested escarpment, become a lush, enriched ecosystem for wildlife and human communities to share and enjoy. This band of vegetation will create a 'green buffer' on the urban edge of Arrowtown and will assist in blending existing and proposed residential development with the surrounding landscape. A series of tracks will enable public access through the reserve areas and connect to the wider pedestrian/cycle network of Arrowtown. Through establising an Owners Group, residents of Arrowsouth will become stewards of their own ecologically enhanced open space.

PUBLIC TRAILS

Although open space areas within Arrowsouth are to be privately owned and managed, public access will be established through parts of the site that connect on to the wider pedestrian and cycle path network throughout Arrowtown. A 1.5m wide track will be established on the escarpment to connect foot and cycle paths on McDonnell Rd with Advance Tce and Centennial Ave above the escarpment. The cut and fill batters and retaining structures required to construct the track will be screened by native shrubs and trees. A 2m wide path will meander beside the waterway which will allow public to appreciate the ecologically enhanced stream environment.

STRUCTURE PLANTING

Each of the Private Open Space (POS) areas defined on the structure plan are to be revegetated to some extent with what will become *structure planting* areas of mostly native and some exotic vegetation. These areas are to be planted and established by the primary land owner and protected under consent conditions (expanded on further in this document and the Private Open Space Management Plans).

FENCING

Larger revegetation areas such as the escarpments and the waterway are to be fenced with stock and rabbit proof fencing. Fencing along the waterway will be set back 15m on both sides of the stream to exclude stock from the sensitive riparian zone.

MANAGEMENT

Due to the fact Arrowsouth Properties Ltd is developing their land first and no development plans are in existence yet for Mt Soho Trust's land, it is not reasonable, logical or legally possible (given all the subdivided lots don't exist yet), to enforce an overarching body corporate structure (or similar alternative) to manage POS areas across the entire Arrowsouth Special Zone. Instead, an ongoing management strategy for POS areas *on each land holding* is to be established by each primary land owner at the time of subdivision and outlined in the Private Open Space Management Plan submitted with the consenting application. This will best achieve the outcomes sought by the Arrowsouth Special Zone and the overarching vision.

In the case of Arrowsouth Properties land, POS areas are to be planted and managed by the primary land owner for the first two growing seasons. Following this, management of the POS area within Lot 104 will become the responsibility of an Owners Group consisting of the 12 owners of Lots 7-18. Management of the planting in Lot 101 will become the responsibility of QLDC. Management of the balance of POS areas will remain with the primary land owner. All POS areas will remain protected by consent conditions and a consent notice that will run with the land.

WEED AND PEST MANAGEMENT STRATEGY

THE EXISTING SITE

As it exists, the Arrowtown South Special Zone is a block of grazed rural land that has relatively poor ecological health with a prevalence of plant and animal pests. The escarpment is dominated by woody weed species, the waterway is unfenced and suffering stock damage and pollution, pastures are scattered with weeds and self-seeded exotic trees, and rabbit infestation is prevalent throughout the site. Apart from a handful close to the wetland, the presence of native plant species on the land is low to nil, although there may be a presence of some native lizards and birds inhabiting the area.

The POS areas are split between two land holdings and as a result, management and extent of weed infestation differs between properties. For example, the portion of the escarpment owned by Arrowsouth Properties Ltd was sprayed in March 2014, so the majority of invasive species are already dead (although remain uncleared) and rank grass, broom seedlings and wilding trees prevail. The portion of the escarpment owned by Mt Soho Trust is still densely covered in mature broom and gorse and will require a much more intensive programme to eradicate.

For the site to be successfully revegetated, it must first be cleared of any weed and pest species present. The following table provides guidance for eradicating the dominant weed and pest species that have been identified on the site.

TABLE 1: DOMINANT WEED AND PEST SPECIES PRESENT

GORSE *Ulex europaeus* 	**Stage of Infestation**	Well advanced. Escarpment on Mt Soho Trust land infested with scattering of mature plants amongst broom
	Infestation Location	Escarpment on Mt Soho Trust land; near rocky outcrop on Arrowsouth Properties Ltd land
	Control Method:	
	Mature Plants	Aerial spray or cut stump and treat with herbicide
	Seedlings	Herbicide spray or hand pull small plants
	Herbicide	Cut stump application: X-Tree Basal as per label directions; Grazon 50ml/L water; Tordon BK at 100ml/L water; or Escort at 5g/L water. Spray application: Grazon, Escort or Tordon BK at label rates
	Follow-up	At least one follow up application of herbicide will be required. Gorse seeds remain dormant in the ground for many years so it is important to continue monitoring and removing seedlings from revegetation areas.
BROOM *Cytisus scoparius* 	**Stage of Infestation**	Well advanced. Escarpment on Mt Soho Trust land dominated by mature plants
	Infestation Location	Escarpment on Mt Soho Trust land has dense cover of mature plants; pastures and escarpment on Arrowsouth Properties land has dense scattering of seedlings (following spray in Spring 2015)
	Control Method:	
	Mature Plants	Aerial spray or cut stump and treat with herbicide
	Seedlings	Herbicide spray or hand pull small plants
	Herbicide	Cut stump application: X-Tree Basal as per label directions; Grazon 50ml/L water; Tordon BK at 100ml/L water; or Escort at 5g/L water. Spray application: Grazon, Escort or Tordon BK at label rates.
	Follow-up	At least one follow up application of herbicide will be required. Broom seeds remain dormant in the ground for many years so it is important to continue monitoring and removing seedlings from revegetation areas.
HAWTHORN *Crateagus monogyna* 	**Stage of Infestation**	Scattering of trees
	Infestation Location	Escarpment and roadside
	Control Method:	
	Mature Plants	Cut stump and treat with herbicide
	Seedlings	Dig out small plants
	Herbicide	Cut stump application: Grazon 50ml/L water, or Tordon BK at 100ml/L water; or Escort at 5g/L water
	Follow-up	Hawthorn trees are spread by birds which eat their berries. It is recommended that revegetation areas be monitored and any hawthorn seedlings be removed as necessary.

ROWAN *Sorbus spp* 	**Stage of Infestation**	Scattering of trees
	Infestation Location	Escarpment
	Control Method:	
	Mature Plants	Cut stump and treat with herbicide
	Seedlings	Dig out small plants
	Herbicide	Cut stump application: X-Tree Basal as per label directions; Grazon 50ml/L water; Tordon BK at 100ml/L water; or Escort at 5g/L water
	Ongoing Maintenance	Rowan trees are spread by birds which eat their berries. It is recommended that revegetation areas be monitored and any rowan seedlings be removed as necessary.
POPLAR *Populus spp* 	**Stage of Infestation**	Scattering of trees
	Infestation Location	Escarpment and Pastures
	Control Method:	
	Mature Plants	Cut stump and treat with herbicide
	Seedlings	Dig out small plants
	Herbicide	Cut stump application: X-Tree Basal as per label directions; Grazon 50ml/L water; Tordon BK at 100ml/L water; or Escort at 5g/L water
	Ongoing Maintenance	Poplar trees have invasive root systems that send suckers up to form new trees, so it is important to keep an eye out for suckers and remove/poison these if they occur.

CRACK WILLOW *Salix fragilis* 	**Stage of Infestation**	Scattering of trees
	Infestation Location	Along waterway and in pastures
	Control Method:	
	Mature Plants	Drill and Inject method – should be done when willow trees are in full leaf (generally Nov to Feb). Drill 45° into sapwood approx. 10mm and inject holes with herbicide. Drill holes as close as possible to the ground. Repeat every 10cm to form a ring of holes around the base of the tree. Remove tree once dead.
	Seedlings	Hand pulling. Must pull all of the plant as roots and dropped branch fragments will re-shoot.
	Herbicide	5g Escort® + 500ml glyphosate 10mL Pulse® penetrant + .5ml Landmark® dye per 1L water. Dissolve the Escort into the water before adding the other chemicals. Makes 1.5L herbicide (approx. 150 trees). Use 10ml herbicide mixture per hole within one minute of drilling.
	Ongoing Maintenance	Seedlings are to be hand pulled, and much care is to be taken with removing all the roots and dropped branch fragments as these are likely to strike and re-shoot.
DOUGLAS FIR AND OTHER PINES *Pseudotsuga menziesii and Pinus spp.* 	**Stage of Infestation**	Scattering of trees
	Infestation Location	Escarpment
	Control Method:	
	Mature Plants	Cut stump and treat with herbicide
	Seedlings	Dig out small plants
	Herbicide	Apply cut stump immediately after cutting with X-Tree Basal as per label directions; Grazon 50ml/L water; Tordon BK at 100ml/L water; or Escort at 5g/L water
	Ongoing Maintenance	Seedlings are to be hand pulled

FENNEL *Foeniculum vulgare* 	**Stage of Infestation**	Scattering of plants
	Infestation Location	Pasture areas, rocky outcrop and along waterway
	Control Method:	
	Mature Plants	Herbicide spray before flowering or at best before seeds have set.
	Seedlings	Hand pull or herbicide spray
	Herbicide	Grazon 50ml/L water; Tordon BK at 100ml/L water; or Escort at 5g/L water. Spray application: Grazon, Escort or Tordon BK at label rates.
	Ongoing Maintenance	Spot spray or hand pull as necessary
NODDING THISTLE *Carduus nutans* 	**Stage of Infestation**	Scattering of plants
	Infestation Location	Pasture areas, rocky outcrop and along waterway
	Control Method:	Grub, hand pull or cut with weed-eater before flowers appear on thistles. Or spot spray individual plants again before flowers appear.
	Herbicide	Grazon 50ml/L water; Tordon BK at 100ml/L water; or Escort at 5g/L water.
	Ongoing Maintenance	Thistles produce wind dispersed seeds, it is recommended that spot spraying is done annually prior to thistles flowering, which will over time help control the spread and any localised weeds.

BRIAR ROSE *Rosa rubiginosa* 	**Stage of Infestation**	Moderately advanced
	Infestation Location	Escarpment
	Control Method:	
	Mature Plants	Aerial spray or cut stump and treat with herbicide
	Seedlings	Herbicide spray or hand pull small plants
	Herbicide	Cut stump application: X-Tree Basal as per label directions; Grazon 50ml/L water; Tordon BK at 100ml/L water; or Escort at 5g/L water. Spray application: Grazon, Escort or Tordon BK at label rates
	Ongoing Maintenance	At least one follow up application of herbicide will be required, as briar roses are easily re-established so it is important to continue monitoring and removing seedlings from re-vegetation areas.
RABBITS AND HARES 	**Stage of Infestation**	Moderately advanced
	Infestation Location	Whole site
	Control Method:	
	Exclusion	Install rabbit proof fencing to larger revegetation areas (such as the escarpment). Install protectors to individual plants in unfenced areas.
	Culling	Kill rabbits and hares within fenced areas by shooting (initially, while there is no development) or ground baiting (ongoing).
	Poison	Due to the location of the site near an urban area, it is recommended rabbits are poisoned using Pindone in bait stations. Baiting is most effective at the end of Summer- early Autumn when food source is scarce. Poison should be handled by experienced persons only and neighbours should be alerted to it's use. Remove and destroy poisoned rabbit carcasses to prevent them from being eaten by domestic animals.
	Ongoing Maintenance	Continue to eradicate rabbits with poison or trapping as required. Continue to ensure plant protectors remain intact until plants are mature. Although mature plants and trees will not require rabbit protection, to encourage the forest to self seed and regenerate on its own, it is important to protect planted areas from rabbits.

WEED AND RABBIT MANAGEMENT RESPONSIBILITIES

As described previously on page 7, this strategy for ongoing management of POS areas applies only to the land owned by Arrowsouth Properties Ltd and is described in greater detail on the Private Open Space Management Plan for this land holding. An ongoing management strategy for the remaining POS areas in the zone (owned by Mt Soho Trust) is to be provided with the consent application for subdivision of that land holding.

ONGOING MANAGEMENT STRATEGY

FIRST TWO GROWING SEASONS:
The primary land owner will carry out initial comprehensive weed and pest eradication of private open space areas on their land at time of subdivision. Rabbit proof fences will be installed to larger areas of revegetation and will by default become stock exclusion fences. Weeds and rabbits will continue to be managed in all POS areas by the primary land owner for two growing seasons following planting of revegetated areas.

FOLLOWING FIRST TWO GROWING SEASONS:
The Owners Group consisting of the 12 owners of Lots 7- 18, are to resume management responsibilities of revegetation areas within Lot 104. The QLDC is to resume responsibility for the vested reserve land (Lot 101) including the stormwater basin. The primary landowner will continue to manage the balance of POS areas for as long as necessary.

CONSENT NOTICE & CONDITIONS

In order to ensure POS areas are appropriately managed into the future, all will remain protected under consent conditions and a consent notice that will run with the land. Conditions of consent are to include:

- protection from the removal of any native planting
- responsibility for replacement of dead plants
- protection of the rabbit proof fence
- responsibility for the management and eradication of weed species from the revegetation area
- restrictions on the plant species (with wilding potential) allowed to be planted in domestic gardens nearby

FIGURE 3: PRIVATE OPEN SPACE MANAGEMENT RESPONSIBILITIES AFTER TWO GROWING SEASONS

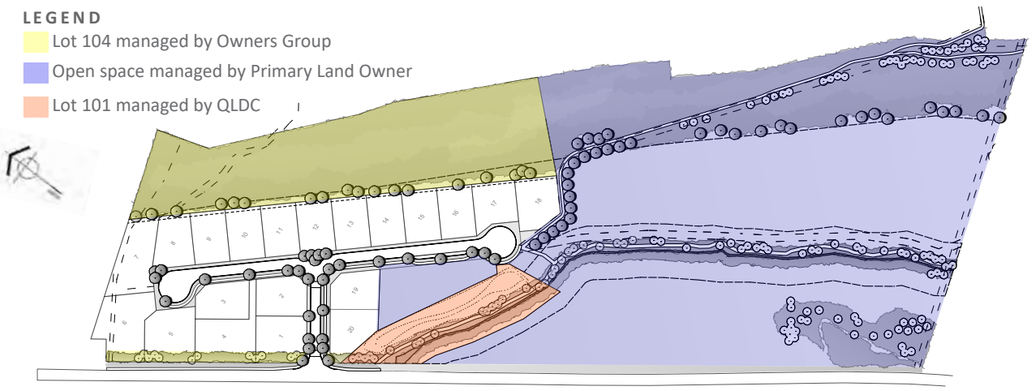


TABLE 2: WEED MANAGEMENT TASKS AND ESTIMATE OF RATES

	unit	est rate
Site preparation - one growing season prior to planting		
Wilding tree felling and mulching	per tree	$110 once
Pre-plant scrub cutting + mulching	per hectare	$1600 once
Pre-plant weed spraying	per hectare	$1000 monthly
Maintenance - first three growing seasons after planting		
Spot spray between plants + remove wilding tree seedlings + replace dead plants + mow ungrazed grass	per hectare	$2000 - $3000 annually
Maintenance - fourth growing season and thereafter		
Spot spray between plants + remove wilding tree seedlings + replace dead plants + mow ungrazed grass	per hectare	$1400 - $2600 annually (tapering as plants mature)

* growing season = Oct - March

TABLE 3: RABBIT MANAGEMENT TASKS AND ESTIMATE OF RATES

	unit	est rate
Site preparation - prior to planting		
Rabbit and stock exclusion fencing	per lm	$19 once
Initial rabbit culling (shooting)	per hr	$60 once
Maintenance - following planting		
Routine rabbit monitoring and fence checks	per hr	$45 bi-monthly for first 4 years after planting
Control of rabbits by Pindone poisoning (2 feeds)	per ha	$145 as required

REVEGETATION STRATEGY

RESTORATION PHILOSOPHY

The goal for all areas of restoration planting will be to create a self-sustaining native shrub and forest areas, free from the pressures of stock, pest browse and weed competition. Particular focus will be on restoring habitats and food sources for native wildlife, including the rare and endangered NZ Eastern Falcon.

PRIVATE OPEN SPACES (POS)

The Private Open Spaces identified in the structure plan represent four main revegetation zones. These are:

POS E1, E2, E3 | ESCARPMENT

A large escarpment divides the upper terrace from the lower plane. The slope faces a south west direction. It is currently infested with rank grass, woody weed species and rabbits.

The long term enhancement goal for the escarpment is to first clear it of invasive weeds and rabbits, then restore it to native bush which will reintroduce a native seed source to the area and provide habitat for native wildlife. A scattering of non-invasive, deciduous trees will be planted at the base of the escarpment to reflect the traditional Arrowtown character.

POS E5, E6 | ROCK OUTCROPS

There are two schist outcrops on the lower plane that have potential to be attractive features of the site (one visible from the McDonnell Road), but are presently obscured with broom and gorse and infested with rabbits.

The long term enhancement goal for these outcrops is to remove the gorse and broom to reveal the schist formations and revegetate the areas surrounding them with native vegetation. This will create a habitat for native birds, lizards and invertebrates.

POS W1, W2, W3 | WATERWAYS

A spring-fed stream (approx 1m wide) flows from a culvert outlet beneath McDonnell Road near the north west corner of the site, in a south east direction across the lower plane. This leads into to a small wetland area before continuing to the Arrow River. The stream is currently unfenced to stock and suffers from pugging and erosion within the flood zone. Some native grasses and sedges are present around the wetland area, although much of the waterway is devoid of native vegetation.

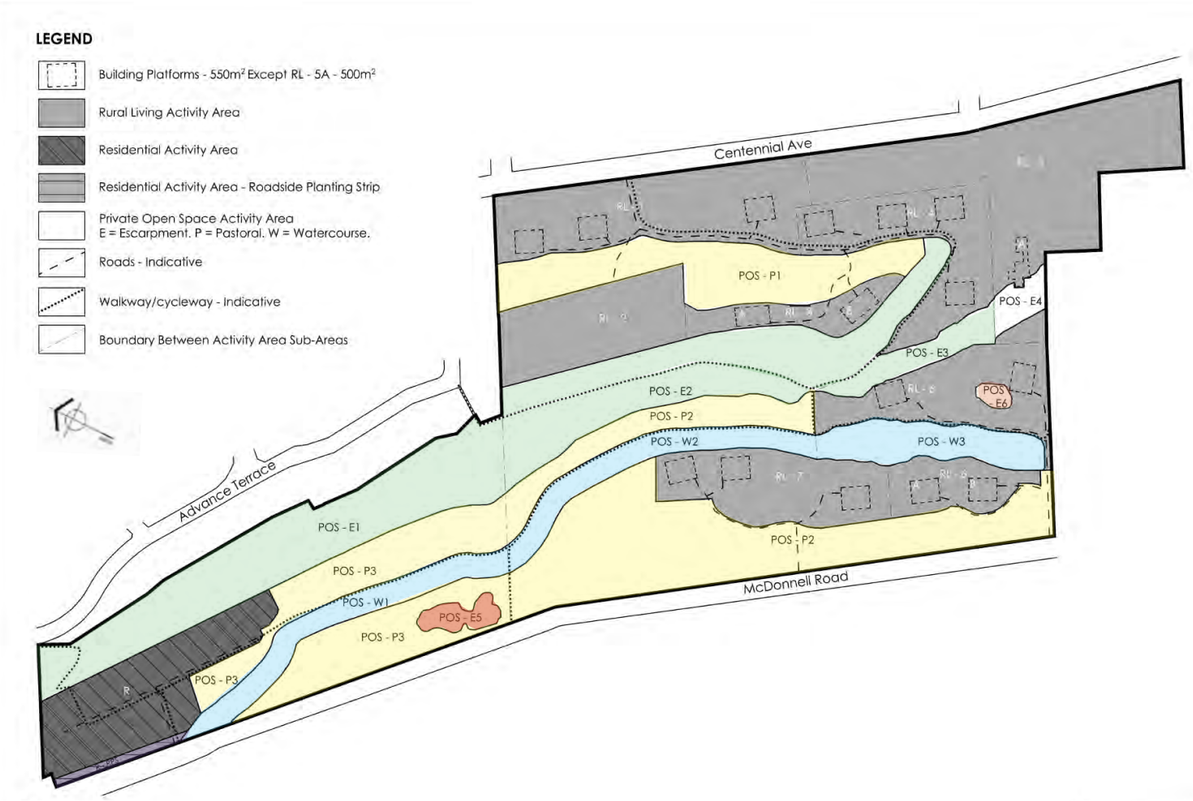
The long term enhancement goal is to exclude stock and revegetate the stream margin with native riparian planting that will improve the ecological health and amenity of the stream. Riparian planting will assist with water quality, provide habitat for wildlife and reintroduce a native seed source to the area.

POS P1, P2, P3 | PASTURES

The flatter areas within the zone boundary on the upper terrace and lower plane are typically open, grazed pastures with a scattering of exotic trees and herbaceous pasture weeds. Rabbits are prevailent.

The long term enhancement goal for the pasture open space areas is to maintain the open character by continuing to graze the grass, but invasive weeds and rabbit populations would be controlled. A row of deciduous specimen trees will be planted alongside the lower section of escarpment track to soften the embankment created during track construction.

FIGURE 4: PRIVATE OPEN SPACE AREAS MAP



ROADSIDE PLANTING STRIP (RPS)

A 6m strip of land beside McDonnell Road at the north western-most corner of the site has been identified in the structure plan to become a roadside planting strip. It is presently part of the pasture land but will one day exist between the road and new residential development.

The long term enhancement goal for this strip is to establish native planting that will contribute to softening and blending the proposed residential development with the wider area.

TABLE 4: PLANT SCHEDULE - NATIVES

NATIVE SPECIES LIST	POS E1, E2, E3	POS E5, E6	POS W1, W2, W3	RPS	STREET SCAPE
Aristotelia serrata | Wineberry	✓				
Austroderia richardii |Toetoe	✓		✓		
Carex buchananii |Buchanans sedge	✓		✓		
Carex secta |Pukoi			✓		
Carex sinclarii |Sinclair's sedge			✓		
Carmichaelia petriei | Native broom	✓	✓	✓		
Chionochloa rigida |Snow tussock	✓	✓			
Chionochloa rubra | Red tussock	✓	✓	✓		✓
Coprosma crassifolia | Thick-leaved Mikimiki	✓		✓	✓	
Coprosma propinqua |Mikimiki	✓	✓	✓		
Coprosma rigida| Mingimingi	✓				
Coprosma rugosa |Coprosma	✓	✓	✓		
Coprosma virescens |Green coprosma	✓		✓	✓	
Cordyline australis | Cabbage tree	✓		✓		
Corokia cotoneaster | Korokio	✓			✓	
Discaria toumatou | Matagouri	✓	✓	✓		
Festuca novae-zelandiae | Tawny tussock		✓			
Fuscospora fusca | Red Beech	✓				
Fuscospora cliffortioides | Mountain Beech	✓				
Griselinia littoralis |Broadleaf	✓	✓			✓
Halocarpus bidwillii | Bog Pine			✓		
Hebe salicifolia | Koromiko	✓		✓		
Juncus edgariae | Wiwi			✓		
Leonohebe cupressoides | Cypress Hebe	✓		✓		
Leptospermum scoparium | Manuka	✓		✓		
Melicytus alpinus | Porcupine Shrub		✓			
Myrsine australis| Matipo	✓	✓			
Olearia arborescens | Tree Daisy		✓			
Olearia bullata | Shrubby Olearia	✓	✓	✓		✓
Olearia fragrantissima | Fragrant Tree Daisy	✓				
Olearia lineata | Mountain Tree Daisy	✓		✓		
Olearia odorata | Scented Tree Daisy	✓		✓	✓	
Ozothamnus leptophyllus | Cottonwood	✓				
Phyllocladus alpinus | Mountain Toatoa	✓		✓		

NATIVE SPECIES LIST CONT'D	POS E1, E2, E3	POS E5, E6	POS W1, W2, W3	RPS	STREET SCAPE
Phormium cookianum | Mountain flax	✓	✓		✓	
Phormium tenax | Harakeke			✓		
Pittosporum eugenoides |Lemonwood	✓	✓		✓	
Pittosporum tenuifolium | Kohuhu	✓		✓	✓	
Plagianthus regius | Ribbonwood	✓				
Poa cita | Silver Tussock	✓	✓			✓
Sophora microphylla |Sth Island Kowhai	✓	✓	✓		

TABLE 5: PLANT SCHEDULE - EXOTICS

EXOTIC SPECIES LIST	POS E1, E2, E3	POS E5, E6	POS W1, W2, W3	RPS	STREET SCAPE
Acer 'Autumn Blaze' | Autumn Blaze Maple	✓				✓
Fraxinus angustifolia 'Raywoodii' | Claret Ash	✓				
Quercus robur 'fastigiata' | Upright Oak	✓				
Tilia cordata | Small Leaved Lime	✓				

PLANT GRADES

General revegetation: Most native shrubs and trees are to be specified at **DRT** (Deep Root Trainer) grade, although similar size plants come in other pot/plant bag types (depending on what is available) such as V150 / V310, 285cc / 310cc and RX90, which would also be acceptable. Although plants are very small at this grade, they are most cost effective to plant on mass (allowing for some casualties) and have a better chance of establishing without irrigation.

Track screening on escarpment: In locations where the cut and fill batters or retaining structures are visible, larger grade shrubs and trees (**PB5** or equivelant shrubs and **1.2m high** saplings) will be required to provide a more immediate screening effect.

Deciduous specimen trees in private open space: Generally, deciduous specimen trees will be supplied as **BR** (Bare Root) stock, so long as they are planted in winter when trees are dormant. This is a cost effective way to purchase deciduous trees.

Roadside Planting Strip (RPS): Shrubs and small trees in the RPS are to perform a screening function and therefore must be supplied at a minimum of **PB3** grade to ensure fast establishment.

Street trees: Specimen street trees are to be supplied at a minimum height of **2m with 30-40mm caliper.**

TABLE 6: REVEGETATION TASKS AND ESTIMATE OF RATES

	unit	est rate
Supply - order up to 18 months prior to planting		
DRT grade plant (plants inside fence only)	per plant	$3.30
PB3 grade plant (RPS)	per plant	$5.50
PB5 grade plant (track mitigation)	per plant	$8.80
BR grade deciduous specimen tree	per tree	$25.00
1.2m high native sapling	per tree	$40.00
Planting - during planting season		
Planting (per DRT)	per plant	$3.30
Planting (per PB3)	per plant	$5.50
Planting (per PB5)	per plant	$8.80
Planting (per BR)	per tree	$15.00
Planting (per 1.2m sapling)	per tree	$15.00
Wool mulch collar (plants inside fence only)	per plant	$1.15
Combi guard (plants not inside fence only)	per plant	$3.00
Tree staking	per tree	$25

DRT = Deep Root Trainer or equivelant

PB3 = Plant Bag size 3 (or 2L pot) grade

PB5 = Plant Bag size 5 (or 3L pot) grade

BR = Bare Root grade (or OG- Open Ground grade)

SITE PREPARATION

Once woody species are controlled, if necessary spot spray long grass in the planting zones (having paced out and planned each planting site based on the spacing suggested, ideally using colour coded dazzle or stakes) for at least 1m diameter around each planting site. This is usually achieved by spraying in a 'z' pattern, one metre across and one metre up.

SOIL CONDITIONS

Soil on the site is predominantly silty loam and schist laden silty/sandy loam. Soil on the escarpment naturally contains more schist fragment and lower moisture content than soils on the lower plane which tend to get wetter and finer with depth before reaching particulate schist and bedrock. Topsoil depths range from 300mm on the escarpment to 500mm on the lower plane. Overall, soil type and conditions are well suited to establishing native planting.

PLANTING TIME

Planting should typically be done in early spring (September, October, up to mid early November) and autumn (April, May, June), but is weather dependent.   In essence the target is the period of increased rain, while moderate temperatures persist. Irrigation can overcome this limitation but is generally not a practical consideration (cost or practicality wise). Winter on the whole is avoided due to frost threat and slow initial growth.

Photo 2: Test pit topsoil sample from the escarpment

HOLE SIZE AND DEPTH

Plants should be planted in a hole that is twice the size of the root ball and at a base-of-stem depth of 20-50mm below the soil surface (this will help direct water to the roots when it rains).

FERTILISING

Fertiliser is not generally required to establish native species and given that the soils are naturally fertile in the site, there are no reasons to add fertiliser when planting.

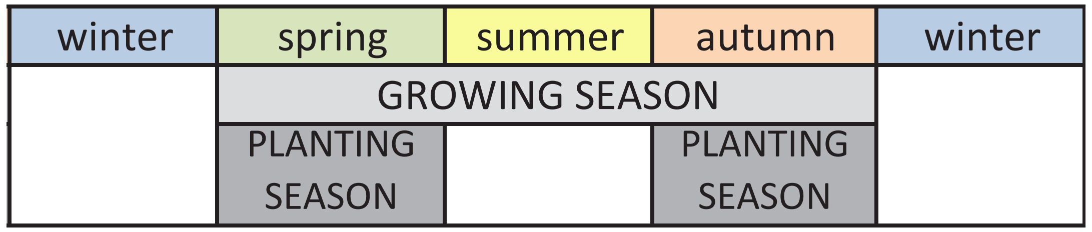


Figure 5: Diagram of Planting and Growing Seasons

MULCHING

Mulch, like fertiliser, is an option normally dependent on cost. While plants do not require mulch, mulching has the benefits of suppressing weed competition around the plant so reducing maintenance; it also helps retain water in the soil over summer periods and adds to the soil nutrient levels as it breaks down. Ideally we would recommend 500mm x 500mm squares of wool mulch be applied around each planting site. This will assist with keeping maintenance costs down as plants establish (making it much easier to spray around seedlings).

WATERING

Although native seedlings should not be planted in dry conditions, when it is necessary that they are, it may be worthwhile to water them immediately after planting to promote fine root development.

BLANKING

Typically 5 - 10% of seedlings will be lost in the first two - three years following planting. This can vary hugely depending on the growing conditions and quality of plant stock. Supplementary planting to replace all dead or sickly specimens may need to be undertaken for at least the first two growing seasons. The species used in these supplementary plantings should be exact replacements (i.e. the same species and grade as those which have died) unless a succession of this species dies in the same place. In this case, another species from the supplied list should be tried. Annual monitoring will be required to establish how many (if any) of which species (and where) need to be replaced.

Photo 3: Successful revegetation project at Wangaloa (closed coal mine near Kaitangata in southeast Otago). This photo is taken seven years after planting (photo credit: www.otago.ac.nz).

TOTAL ESTIMATE OF COSTS

			Arrowsouth Properties Ltd		Mt Soho Trust	
Private Open Space (POS)	**Rate***	**Unit**	**Area**	**Est Cost***	**Area**	**Est Cost***
Escarpment (POS E1, E2, E3)	$ 84,065	ha	2.177	$ 183,008	3.011	$ 253,118
Outcrop (POS E5, E6)	$ 91,086	ha	0.2265	$ 20,631	0.068	$ 6,194
Waterway (POS W1, W2, W3)	$ 87,430	ha	0.7737	$ 67,644	1.864	$ 162,969
Pastures (POS P1, P2, P3)	$ 6,239	ha	2.889	$ 18,023	5.886	$ 36,721
Roadside (RPS)	$ 103,647	ha	0.0726	$ 7,525	n/a	n/a
Total		**ha**	**6.1388**	**$ 296,832**	**10.829**	**$ 459,002**

Notes and Assumptions:

* Rates and estimated costs are indicative only and GST exclusive. They are based on a more detailed preliminary costing for POS areas on Arrowsouth Properties Ltd land and include site prep, fence construction, rabbit control, revegetation and maintenance for the first two growing seasons.

CONCLUDING REMARKS

Given the scale of this restoration and the number of plants involved it will be necessary to give advanced notice to nurseries in order to allow them adequate time to propogate sufficient healthy stock (at least 18 months). However, it is possible that stock may not be obtainable in the proportions indicated in this restoration plan. If so, some deviation from the stipulated planting composition is acceptable provided that only hardy species are planted in equal or greater numbers than indicated.

The success of this restoration programme will depend on numerous factors, such as climate, weed control, pest control, plant stock quality and the skills of the selected plant contractor. It is critical that the appointed planting contractor is experienced in planting natives, as poor planting technique will result in high plant mortality.

As such, this restoration advice is given without prejudice and no guarantee of success is made. However, with careful consideration given to the selection of plant supplier and planting contractor, as well as adequate monitoring and control of threats on the site, the private open space area should develop into a valued area of native vegetation and a thriving ecological habitat.

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