

5.4 Erosion and sediment control

Erosion can become an issue if a large area is cleared of vegetation, requiring sediment control to minimise adverse effects on the local environment. Erosion through flooding and bank scouring is likely to be minimal given the characteristics of the site. Most of the planting area is of a low profile. Surface runoff and associated sediment load due to weed clearance is likely to be minimal. Erosion risk can be minimised by exercising care to minimise soil disturbance when undertaking weed control/clearance and planting works.

Revegetation of the site should be undertaken as soon as possible following weed control operations to minimise potential ongoing erosion problems.

5.5 Disposal of material

Many weed infestations will be dealt with *in-situ* removing the need for disposal. Any larger weed plants removed (e.g. black wattle, maritime pine) should be mulched and left on site. If any material is required to be removed from the site, this should be taken to an approved disposal site, such as the Recycling Station at The Concourse, Henderson.

It is essential that plant seeds, tubers, spores and fragments are not dispersed from the current infestation areas. Many species can easily be spread by seed, e.g. Chinese privet, Japanese honeysuckle and pampas. Therefore, it is strongly recommended that all infestations that are unsuitable to mulch, be dealt with *in-situ*. Where cut vegetation is to be left on site, seed heads should be removed wherever possible and disposed of carefully to avoid new infestations establishing. The Standard Specifications for Weed Hygiene in Waitakere City should be adhered to at all times.

6. PLANTING RECOMMENDATIONS

6.1 Site preparation

Site preparation will be a key factor in the successful implementation of this project. All environmental weeds should be removed prior to undertaking planting, with the exception of the tree species providing shade over the stream. Many weed species will require follow up control operations to ensure total removal prior to planting.

Non-invasive weeds can either be trimmed with a weed eater, or alternatively, sprayed with a Glyphosate based herbicide. Gorse may be left to assist in the natural establishment of indigenous species. Gorse may also be controlled for amenity purposes as required.

All rubbish should also be removed from the site as part of site preparation operations.

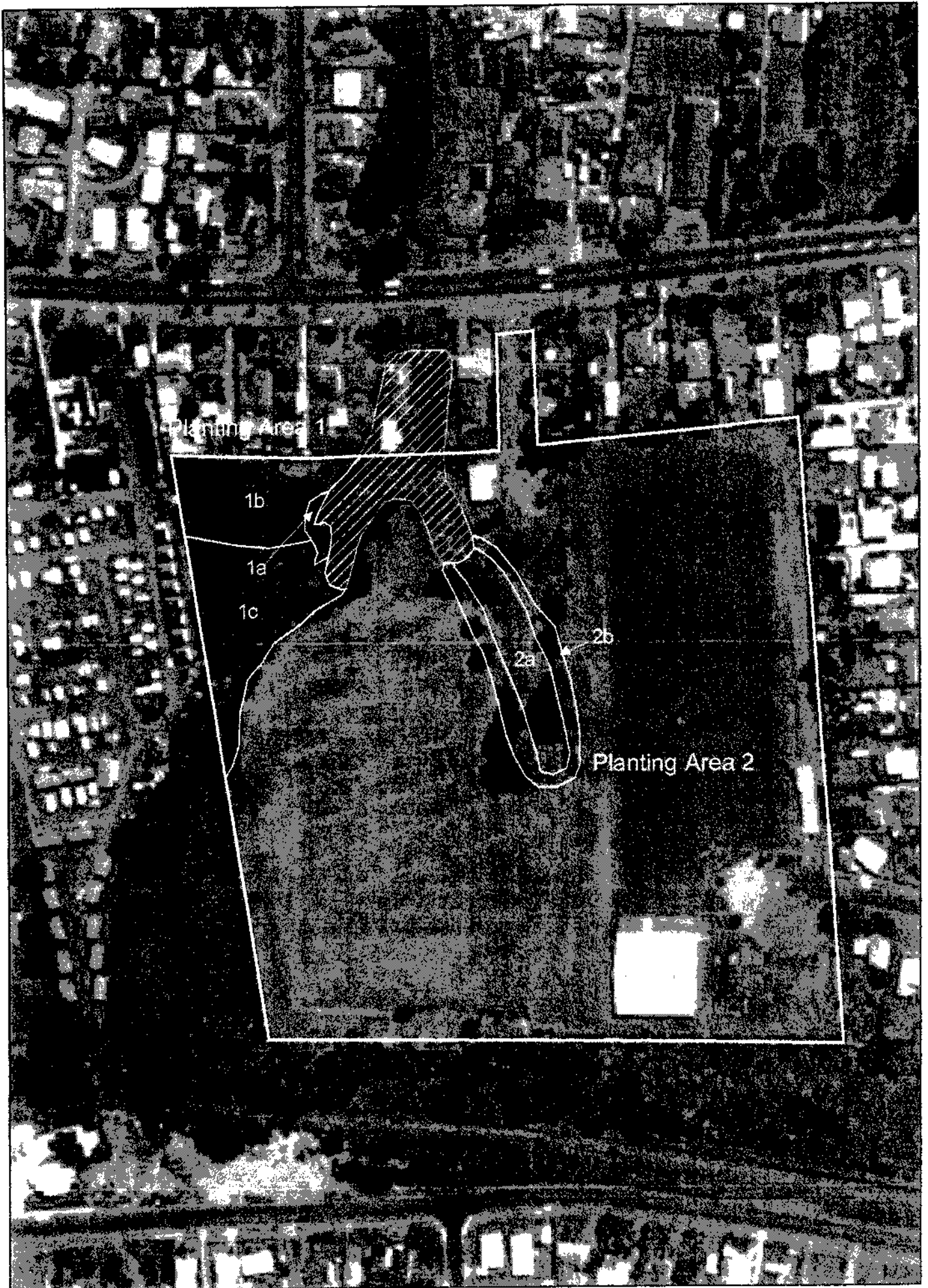
6.2 Maintenance

Plantings should be inspected monthly for 12 months following planting operations to identify any management that may be required. Plantings should be released from weed competition a minimum of three times a year for the first two years, with further releases at a reduced frequency as required over the following three years. Some parts of the site may only require releasing for the first year, depending on site conditions.

Blanking (replacement of dead plants) should be undertaken as required (two months after initial planting) to replace those plants that have not survived the initial planting.

Limited infill planting¹ may be required in the second planting season. Infill plants should be of a bagged grade (PB3). Infill planting requirements should be identified in February/March preceding the upcoming planting season.

¹ Infill planting is required on sites where there are gaps in the planting because of plant mortality or where initial stocking rates were too low.



Planting Area 1

1b

1a

1c

2a

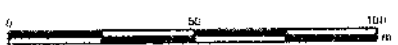
2b

Planting Area 2

N
Legend

1a - 2b Proposed planting zones
Refer to text

Figure 2. Proposed Planting Zones in Ranui Domain



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Scale: 1:2,000
Date: 25/10/05
Cartographer: RPB

6.3 Plant schedules

Two areas have been identified that would benefit from indigenous planting. Area 1 comprises an area currently comprising scrub and weedfield in the north-west part of the reserve. Area 2 comprises a swale area in the middle of the reserve which drains into the stormwater pond. Recommended planting locations are presented in Figure 2.

Area 1 has been divided into three zones for planting. Zone 1a comprises the immediate margins of the stormwater pond. Zone 1b comprises the large area of weedfield currently dominated by wild ginger and jasmine. Zone 1c comprises an area of mixed scrub and pest plant species.

Area 2 has been divided into two zones for planting. Zone 2a comprises the wettest area in the centre of the swale and comprises a mix of wetland species. Zone 2b comprises a buffer area around Zone 2a.

Plant schedules have been compiled for each area based on physical site characteristics and existing vegetation cover. These are based on species that would occur naturally on sites with these characteristics. Other factors considered include the selection of species that are likely to have a relatively high growth rate and survival rate. These planting schedules are presented in Tables 1-3 below.

6.3.1 Planting Area 1

Planting Area 1 comprises three zones for planting. Zone 1a comprises species suitable for planting on the pond margin, predominantly sedges, cabbage tree and toetoe. Zones 1b and 1c comprise species such as kanuka, manuka, cabbage tree and karamu. Zone 1c planting will involve infilling between existing indigenous vegetation.

Table 1: Plant schedule for Zone 1a

Species	Common Name	Grade	Spacing (m)	Number
<i>Blechnum minus</i> ²	kiokio	PB3	0.5	71
<i>Carex geminata</i> ¹		PB3	0.5	107
<i>Carex virgata</i> ¹	purei	PB3	0.5	178
<i>Cordyline australis</i> ²	ti kouka, cabbage tree	PB3	0.75	47
<i>Cortaderia fulvida</i> ¹	toetoe	RT	0.75	93
<i>Cyperus ustulatus</i> ¹	giant umbrella sedge	PB3	0.5	36
TOTAL				532

1. Plant in swathes
2. Plant in small groups

Table 2: Plant schedule for Zone 1b

Species	Common Name	Grade	Spacing (m)	Number
<i>Alectryon excelsus</i>	titoki	PB3	6	19
<i>Aristotelia serrata</i>	wineberry	PB3	0.75	19
<i>Astelia banksii</i>		PB3	0.75	19
<i>Blechnum novae-zelandiae</i>	kiokio	PB3	0.5	66
<i>Blechnum chambersii</i>		PB3	0.5	66
<i>Carex virgata</i>	purei	PB3	0.5	220
<i>Coprosma robusta</i>	karamu	PB3	0.75	480
<i>Cordyline australis</i>	ti kouka, cabbage tree	PB3	0.75	384
<i>Cortaderia fulvida</i>	toetoe	RT	0.75	288
<i>Cyathea dealbata</i>	ponga	PB3	0.75	77
<i>Cyathea medullaris</i>	mamaku	PB3	0.75	58
<i>Dianella nigra</i>	turutu	PB3	0.5	150
<i>Dicksonia fibrosa</i>	wheki ponga	PB3	0.75	96
<i>Dicksonia squarrosa</i>	wheki	PB3	0.75	192
<i>Gahnia</i> spp.	gahnia	RT	0.75	192
<i>Hebe stricta</i>	koromiko	PB3	0.75	96
<i>Hedycarya arborea</i>	pigeonwood	PB3	0.75	192
<i>Kunzea ericoides</i>	kanuka	PB3	0.75	192
<i>Leptospermum scoparium</i>	manuka	RT	0.75	288
<i>Macropiper excelsum</i>	kawakawa	PB3	0.75	192
<i>Meliccytus ramiflorus</i>	mahoe	PB3	0.75	168
<i>Myrsine australis</i>	mapou	PB3	0.75	192
<i>Parsonsia heterophylla</i>	NZ jasmine	PB3	0.75	65
<i>Phormium tenax</i>	harakeke, flax	PB3	0.75	192
<i>Pomaderris kumerahou</i>	kumerahou	PB3	0.75	63
<i>Pseudopanax arboreus</i>	five finger	PB3	0.75	50
<i>Pseudopanax crassifolius</i>	lancewood	PB3	0.75	38
<i>Sophora microphylla</i>	kowhai	PB3	6	96
TOTAL				4,230

Table 3: Plant schedule for Zone 1c

Species	Common Name	Grade	Spacing (m)	Number
<i>Alectryon excelsus</i>	titoki	PB3	6	13
<i>Aristotelia serrata</i>	wineberry	PB3	0.75	13
<i>Astelia banksii</i>		PB3	0.75	13
<i>Beilschmiedia tarairi</i>	taraire	PB3	6	25
<i>Blechnum novae-zelandiae</i>	kiokio	PB3	0.5	43
<i>Blechnum chambersii</i>		PB3	0.5	43
<i>Coprosma robusta</i>	karamu	PB3	0.75	315
<i>Cordyline australis</i>	ti kouka, cabbage tree	PB3	0.75	252
<i>Cortaderia fulvida</i>	toetoe	RT	0.75	189
<i>Cyathea dealbata</i>	ponga	PB3	0.75	63
<i>Cyathea medullaris</i>	mamaku	PB3	0.75	63
<i>Dianella nigra</i>	turutu	PB3	0.5	150
<i>Dicksonia fibrosa</i>	wheki ponga	PB3	0.75	63
<i>Dicksonia squarrosa</i>	wheki	PB3	0.75	126
<i>Gahnia</i> spp.	gahnia	RT	0.75	126
<i>Hebe stricta</i>	koromiko	PB3	0.75	63
<i>Hedycarya arborea</i>	pigeonwood	PB3	0.75	126
<i>Kunzea ericoides</i>	kanuka	PB3	0.75	126
<i>Leptospermum scoparium</i>	manuka	RT	0.75	189
<i>Macropiper excelsum</i>	kawakawa	PB3	0.75	192
<i>Melicytus ramiflorus</i>	mahoe	PB3	0.75	126
<i>Myrsine australis</i>	mapou	PB3	0.75	126
<i>Parsonsia heterophylla</i>	NZ jasmine	PB3	0.75	65
<i>Phormium tenax</i>	harakeke, flax	PB3	0.75	126
<i>Pomaderris kumerahou</i>	kumerahou	PB3	0.75	63
<i>Pseudopanax arboreus</i>	five finger	PB3	0.75	50
<i>Pseudopanax crassifolius</i>	lancewood	PB3	0.75	38
<i>Rhopalostylis sapida</i>	nikau	PB3	0.75	250
<i>Sophora microphylla</i>	kowhai	PB3	6	63
TOTAL				3,100

6.3.2 Planting Area 2

Planting Area 2 has been recommended for planting as it is very wet and already has some existing exotic trees around the margins of this area. Zone 2a comprises the wettest part of the swale and will be planted with wetland species such as sedges, cabbage tree and harakeke. Zone 2b will comprise a mixture of species to buffer Zone 2a. Species for planting in Zone 2a include manuka, kanuka, karamu and kowhai.

Table 4: Plant schedule for Zone 2a

Species	Common Name	Grade	Spacing (m)	Number
<i>Baumea rubiginosa</i> ¹		PB3	0.5	45
<i>Baumea teretifolia</i> ¹		PB3	0.5	45
<i>Carex geminata</i> ¹		PB3	0.5	728
<i>Carex lesssoniana</i> ¹		PB3	0.5	303
<i>Carex virgata</i> ¹	purei	PB3	0.5	2,183
<i>Cordyline australis</i> ²	ti kouka, cabbage tree	PB3	0.75	398
<i>Cortaderia fulvida</i> ¹	toetoe	RT	0.75	601
<i>Cyperus ustulatus</i> ¹	giant umbrella sedge	PB3	0.5	152
<i>Phormium tenax</i>	harakeke, flax	PB3	0.75	398
TOTAL				4,853

1. Plant in swathes
2. Plant in small groups

Table 5: Plant schedule for Zone 2b

Species	Common Name	Grade	Spacing (m)	Number
<i>Blechnum minus</i>	kiokio	PB3	0.5	148
<i>Carex lambertiana</i>		PB3	0.5	148
<i>Carpodetus serratus</i>	putaputaweta	PB3	0.75	65
<i>Coprosma robusta</i>	karamu	PB3	0.75	194
<i>Cordyline australis</i>	ti kouka, cabbage tree	PB3	0.75	517
<i>Cortaderia fulvida</i>	toetoe	RT	0.75	388
<i>Cyathea dealbata</i>	ponga	PB3	0.75	65
<i>Dicksonia squarrosa</i>	wheki	PB3	0.75	129
<i>Gahnia</i> spp.	gahnia	RT	0.75	129
<i>Hoheria populnea</i>	houhere, lacebark	PB3	0.75	65
<i>Leptospermum scoparium</i>	manuka	RT	0.75	194
<i>Macropiper excelsum</i>	kawakawa	PB3	0.75	129
<i>Meliccytus ramiflorus</i>	mahoe	PB3	0.75	194
<i>Phormium tenax</i>	harakeke, flax	PB3	0.75	259
<i>Sophora microphylla</i>	kowhai	PB3	6	129
TOTAL				2,753

6.4 Plant stock and availability

All plants should be sourced from the Waitakere or Tamaki Ecological Districts in line with Waitakere City Councils eco-sourcing Code of Practice.

Waitakere City Council has ordered plants in advance from local nurseries for supply in April 2006, and comprise a mix of root trainer and PB3 grade plants.

6.5 Plant spacing

Plant spacing should generally be at 0.75 metre centres, ensuring relatively rapid canopy closure to assist reducing the opportunity for weed establishment. This equates to 17,500 plants per hectare.

Plant spacing for sedges on the stream, pond margins and swale area should be at 0.5 m centres (40,000 plants per hectare) as these species are smaller when mature and require larger numbers to minimise the establishment of weed species, than do species that are larger when mature.

7. TIMING

Timing is based on the Waitakere City Council financial year of 1 July to 30 June.

Year 1:

TASK	TIMING
1. Initial weed control	October - December
2. Follow up weed control	March - April
3. Site preparation (weedeating, rubbish clearance etc)	March - April
4. Planting	May - June

Year 2

TASK	TIMING
1. Blanking (as required)	September
2. Ongoing follow up weed control and monitoring	October - November March - April

Years 3, 4 and 5

TASK	TIMING
1. Ongoing follow up weed control and monitoring	March - April October - November

8. CONSENTS

8.1 General Natural Area

Ranui Domain is designated as General Natural Area in the Waitakere District Plan. The following rule applies:

Rule 2.1.(a) states:

“(b) any *vegetation alteration* of
(ii) vegetation listed in the Removable Vegetation Appendix and the Environmentally Damaging Plants Appendix

provided that any *clearance* does not exceed a *total cleared* area of 500m²”

is a permitted activity.

Weed control operations in Ranui Domain are not likely to result in the clearance of more than 500m². Therefore, no resource consent is required for the removal of the environmental weed species. If however clearance was to exceed 500m², then a resource consent would be required.

8.2 Riparian Margins Natural Area

A small portion of Ranui Domain is designated as a 10m Riparian Margin Natural Area in the Waitakere District Plan. The following rule applies:

Rule 2.1.(c) states:

Activities meeting the following Performance Standards are *Permitted Activities*.

“(c) any *vegetation alteration* of

2. *exotic vegetation* which is less than 6.0 metres in height and less than 600mm in girth (as measured at any point higher than 1.4m above the ground), and
3. vegetation listed in the Environmentally Damaging Plants Appendix,

provided that any *clearance* does not exceed 10% of the Riparian Margin/Coastal Edge on the site.”

Weed control operations in Ranui Domain will not result in the clearance of more than 10% of vegetation within the Riparian Margin/Coastal Edge of the site. Therefore, no resource consent is required for the removal of the environmental weed species.

REFERENCES

Agrichemical Users' Code of Practice: NZ Agrichemical Education Trust.

Auckland Regional Council: Pest Facts No.30: Plant Pests of the Auckland Region

Auckland Regional Council. 2002: Regional Pest Management Strategy 2002-2007

Auckland Regional Council: Riparian Zone Management Guidelines (TP148).

New Zealand Standard NZS 8409 2004: The Management of Agrichemicals.

Waitakere City Council, 2001: Eco-sourcing Code of Practice & Ethics

Wildland Consultants Ltd 2002a: Environmental Weed Management Plan for Opanuku Stream -- Opanuku Reserve, Henderson Park, Shona Reserve, Vintage Reserve, Plumber Domain, Opanuku Stream Reserve, Border Road Esplanade Reserve, Palomino Reserve, Henderson Valley Park. *Wildland Consultants Ltd Contract Report no. 556*. 10pp plus maps.

Wildland Consultants Ltd 2002b: Environmental Weed Management Plan for Henderson Creek Reserves – Henderson Creek Esplanade Reserve, Flanshaw Esplanade Reserve, Sherwood Park, Colletta Esplanade, Epping Esplanade, Chilcott Brae, Tui Glen Reserve, Cranwell Park, Cranwell Esplanade and Falls Park. *Wildland Consultants Contract Report no. 558*. 12pp plus maps.

Wildland Consultants Ltd 2004: Weed Management Plan for Riparian Restoration Sites – Project Twin Streams. *Wildland Consultants Ltd Contract Report No. 870*. 33pp plus appendices.

APPENDIX 1

List of pest plant species recorded in Ranui Domain.

Common name	Species
alder	<i>Alnus glutinosa</i>
arum lily	<i>Zantedeschia aethiopica</i>
black wattle	<i>Acacia mearnsii</i>
blackberry	<i>Rubus fruticosus</i> agg.
Chinese privet	<i>Ligustrum sinense</i>
garden forget-me-not	<i>Myosotis sylvatica</i>
gorse	<i>Ulex europaeus</i>
inkweed	<i>Phytolacca octandra</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
jasmine	<i>Jasminum polyanthum</i>
maritime pine	<i>Pinus pinaster</i>
montbretia	<i>Crocsmia x crocosmiiflora</i>
pampas	<i>Cortaderia selloana</i>
plectranthus	<i>Plectranthus ciliata</i>
radiata pine	<i>Pinus radiata</i>
Sydney golden wattle	<i>Acacia longifolia</i>
three cornered garlic	<i>Allium triquetrum</i>
tradescantia	<i>Tradescantia fluminensis</i>
watsonia	<i>Watsonia meriana</i> cv. <i>Bulbillifera</i>
wild ginger	<i>Hedychium gardnerianum</i> , <i>H. flavescens</i>
woolly nightshade	<i>Solanum mauritianum</i>

RECOMMENDED CONTROL TECHNIQUES FOR SELECTED WEED SPECIES

Weed	Control Method(s)	Chemical(s)	Application Rate	Timing	Remarks
Arum lily (<i>Zantedeschia aethiopica</i>)	Hand pull seedlings/small plants	-	-	Year round	Only if this can be done without posing a weed hygiene risk Monitor for re-growth. Spray immediately following cutting.
	Dig out and dispose off site	-	-	Year round	
	Cut and spray stems of large plants	Escort	5g per 10 litres water	October-March	
Black wattle (<i>Acacia mearnsii</i>)	Handpull seedlings/small plants	-	-	Year round	
	Cut and treat stumps	Grazon	1 part Grazon to 20 parts water	October-April	
	Drill and inject	Escort	20g Escort per litre water, plus 2 ml pulse	October – April	
Blackberry (<i>Rubus fruticosus</i> agg.)	Knapsack – foliar spray	Escort	5g per 10 litres water	December-April	
	Knapsack – foliar spray	Grazon	60ml per 10 litres water	December-April	
Canna lily (<i>Canna indica</i>)	Dig out and dispose off site	-	-	Year round	Monitor for re-growth
Chinese privet (<i>Ligustrum sinense</i>)	Seedlings – hand pull	-	-	November-April	
	Trees – drill and inject	Escort	20g Escort per litre water, plus 2ml pulse	November-April	
	Saplings - cut and stump treat	Grazon	1 part Grazon to 20 parts water	November-April	
Gorse (<i>Ulex europaeus</i>)	Knapsack – foliar spray	Escort	5g per 10 litres water plus 10mls pulse	Year round	Only foliar spray where non-target species are not present
	Cut and treat stumps	Grazon	1 part Grazon to 20 parts water	Year round	

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Weed	Control Method(s)	Chemical(s)	Application Rate	Timing	Remarks
Japanese honeysuckle (<i>Lonicera japonica</i>)	Knapsack – foliar spray	Versatill	40-50mls Versatill to 10 litres water	October-March	Pull away from non-target species before spraying. Spray to run off. Ensure no epiphytic attachment.
	Cut and treat stems	Grazon	1 part Grazon to 20 parts water	October-March	Do not pull cut vegetation from host plant
Jasmine (<i>Jasminum polyanthum</i>)	Cut and treat stems	Grazon	1 part Grazon to 20 parts water	October-March	Do not pull cut vegetation from host plant
	Where practical foliar spray	Glyphosate	20ml per litre water and 20ml Pulse with clean water	October-March	Pull away from non-target species before spraying
	Where practical foliar spray	Escort	5g per 10 litres water	October-March	
Montbretia (<i>Crocsmia x crocosmiiflora</i>)	Knapsack – foliar spray	Grazon	60mls per 10 litres water, 10ml Pulse per 10 litres water	October-February	
Pampas (<i>Cortaderia selloana</i> , <i>C. jubata</i>)	Knapsack – foliar spray	Glyphosate	10ml per litre water	October-March best results	Use clean water and thoroughly soak centre of large plants. Best on smaller plants.
	Knapsack – foliar spray	Gallant	150ml per 10 litres water plus crop oil	October-March	
Pine (<i>Pinus radiata</i> , <i>P. pinaster</i>)	Handpull seedlings/small plants	-	-	Year round	
	Ring bark or fell	-	-	Year round	
Plectranthus (<i>Plectranthus ciliata</i>)	Knapsack – foliar spray	Glyphosate	100ml per 10 litres water plus 20ml pulse	November-February	
Sydney golden wattle (<i>Acacia longifolia</i>)	Handpull seedlings/small plants	-	-	Year round	
	Cut and treat stumps	Grazon	1 part Grazon to 20 parts water	October-April	
	Drill and inject	Escort	20g Escort per litre water, plus 2 ml pulse	October – April	
Three cornered garlic (<i>Allium triquetrum</i>)	Knapsack – foliar spray	Grazon	15ml per 10 litres water	September-December	
Tradescantia (<i>Tradescantia fluminensis</i>)	Knapsack – foliar spray	Grazon	10ml per litre water + 2ml Pulse per litre water	November-March	Pull away from non-target species before spraying.

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Weed	Control Method(s)	Chemical(s)	Application Rate	Timing	Remarks
Wild ginger (<i>Hedychium gardnerianum</i> , <i>H. flavescens</i>)	Hand pull seedlings/small plants.	-	-	October to February	Ensure no tuber left behind.
	Knapsack – foliar spray	Escort	5g/10 litres water + 10ml Pulse	Spring to late autumn	Not for use around native vegetation or waterways.
	Knapsack – foliar spray	Glyphosate	100ml/10 litres water + 10ml Pulse	Spring to late autumn	
	Cut and treat stems/tubers	Escort	20g/10 litres water	Spring to late autumn	For application near waterways and indigenous vegetation.
	Cut and treat stems/tubers	Glyphosate	50:50 mix with water	Spring to late autumn	For application near waterways and indigenous vegetation.
Woolly nightshade (<i>Solanum maurifianum</i>)	Seedlings/small plants – hand pull	-	-	Year round	
	Trees – drill and inject	Escort	20g Escort per litre water, plus 2ml pulse	Year round	
	Saplings - cut and treat stump	Picloram (Vigilant gel)	Apply gel to cut stems	Year round	
	Saplings - cut and treat stump	Grazon	1 part Grazon to 20 parts water	Year round	

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