

Executive summary

Selwyn Bush has retained ecological value despite landscape modification and degradation. It is a site worth restoring well.

Aside from drainage issues, rubbish dumping, and changes to the landscape, the major source of degradation is the persistent dominance of plant pests. Animal pests are ubiquitous but are controlled by regular trapping and appear to be a less urgent concern.

The Pourewa Restoration Group, along with Roy Clements, has worked for many years to control pest plants and animals, and to revegetate Selwyn Bush. They have been assisted more recently by other conservation groups (Forest and Bird and CVNZ). Council have provided resources, funding and advice. The school, the gym (ASB Stadium), and many others - including refugee groups - have contributed. The project is at a point where further decisions are needed regarding how to best progress things.

Pourewa Creek connects Selwyn Bush, a significant ecological area (SEA), with Kapa Bush Reserve, along a corridor of NZTA land. There is a strong desire to restore Selwyn Bush and to see it protected, whilst also enabling greater connectivity with other local sites of ecological value.

Selwyn Park (the other key vegetation project on Selwyn College land) has been created with a different goal in mind. The native plant project was begun by Roy Clements in 2001. He has been the principle driving force behind it. This area adjoins the eastern boundary of Selwyn Bush and if well maintained will provide a useful indigenous buffer to Selwyn Bush.

For the purpose of this restoration plan, Selwyn Park will be viewed as being very separate from Selwyn Bush. It will not be included in this document except for orientation purposes. The maps in this document illustrate clearly where the boundary lies between these two sites, based on their different provisions and designations under the District Plan. This plan deals principally with Selwyn Bush – the Selwyn College SEA area and the buffer strip to this (Fig 1).

Selwyn College (Ministry of Education) is the landowner. The school allows the Pourewa Restoration Group and Roy Clements to work on their land and to also enlist the help of other volunteers.

The most important matters that need addressing at this point are:

1. Landownership, land management, and project coordination issues.
2. Restoration guidance to volunteers, particularly as Selwyn Bush is an SEA. It is hoped that this revegetation/restoration document may assist the Pourewa Restoration Group produce yearly operational plans to help all volunteers and contractors working on this site. H&S is an important consideration for all involved.
3. Funding assistance for specialist ecological contractors to help with weed control (over the next 5 years) and for appropriate native plants to assist ecological restoration goals. Funding for professional assistance with large (pest) tree felling and disposal of surplus woody material that interferes with restoration work or is hazardous.



KEY

- Management plan boundary
- SEA buffer
- Minor track
- Selwyn Park walking area
- Selwyn Park view shaft
- Significant ecological area (SEA)
- Main track
- Floodplain area
- Disturbance/plate of special character
- Stream



Selwyn Bush - orientation plan

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Figure 1 Orientation Map of Selwyn Bush, showing the portion that is an SEA under the District Plan.

1. Introduction

This document provides practical restoration guidance to the Pourewa Restoration Group and also to other volunteers assisting with the rehabilitation of Selwyn Bush.

This plan aims to identify a methodology and 5 year work programme to protect and enhance the ecological diversity of Selwyn Bush

Ecological restoration of the Selwyn bush and wider catchment will lead to a structurally and ecologically diverse range of forest, wetland and stream habitats which will enhance indigenous vegetation and better support native fauna and natural ecosystem process.

Community and local landowner engagement will be fostered to ensure a collaborative and sustainable approach. A long-term ecological restoration programme is required and this goal would be expected to be achieved in a 10-20 year time-frame.

Objectives

- To reduce the presence of pest plants through a comprehensive programme of weed control. This will lead to enhanced coastal forest, riparian and wetland habitat which will benefit local wildlife and will be able to carry out ecosystem services more effectively.
- To carry out revegetation planting, in appropriate locations (detailed in Section 9). Eco-sourced plants appropriate to habitat type and from the Tamaki Ecological District will be selected.
- To involve the local community in carrying out restoration tasks in order to foster local ownership of this site and raise awareness of the importance of coastal forest and stream habitats on the urban Auckland Isthmus.
- To encourage neighbouring landowners to carry out ecological restoration tasks on their land, particularly weed control, animal pest control and appropriate native planting, to enhance and protect areas of Selwyn bush on private property.
- To initiate an animal pest control programme around Selwyn bush and link with pest animal control work at Kapa bush, to increase the diversity, survival and breeding success of native fauna - including birds, lizards and invertebrates.

2. Land use history

The Selwyn College property was part of a parcel of land once known as the Kohimarama Block; sold by Ngati Paoa in 1841 to European settlers. Portions of this block were purchased some years later by Bishop Selwyn who began buying farmland in the Pourewa Valley area from the mid 1840's onwards. At this stage parts of Pourewa Valley were still forested. Early accounts (Jackson, 1976) give some idea of the landscape looked like at this time:

- Lady Martin, a contemporary of Bishop Selwyn in the 1840s, described a copse (in what is now Pourewa Cemetery) as "a lovely spot where the high banks were thickly wooded to the water's edge and the drooping rimu and yellow kowhai abound".

- Tree ferns and flax were evident in a sketch of the Selwyn College settlement by W. Bainbridge in 1846.
- Rev. Vicesimus Lush recorded that his cottage (a raupo whare) was infested with fleas, mice, and “exceedingly bold and savage rats”. He also diarised descriptions of “unusual foods” including “fine eels” and native fuchsia berries. The latter were used in puddings.

In an article in “The Post” (1961) Mrs Cluett reminisced about Meadowbank in the early 1930’s. She described her property as a “picturesque wilderness of gorse and tea tree scrub” overlooking “lush green paddocks where cattle grazed and quail and pheasants, hare and rabbits abounded”. She wistfully noted that “under the spreading tide of houses down Meadowbank Rd the bubbling little Pourewa Creek” (along which Bishop Selwyn used to travel down to sea in his boat) had “dwindled down to a series of sluggish marshy pools and water weeds”.

The former St John’s College Trust Board land was purchased in 1954 by Selwyn College (Graeme Hunt, 2007). The land at this stage was still “rough pasture”. Building work got under way a year or two later. The effects on the landscape are evident in the 1956 photo below.



Figure 2 Selwyn College construction (1956)

(Source: White’s Aviation Ltd)

The ‘50s earthworks were later compounded by the development of the school field and also by the addition of the ASB Stadium (and car park) at the head of Selwyn Bush in the late ‘80’s. This development, along with infill housing and upgrades to Kohimarama Rd, will have significantly changed the hydrology of the Selwyn Bush site and the headwaters of the Pourewa Creek tributary (visible to the left of the College). Remnant native bush can be seen in the Selwyn Bush gully.

3. Natural (pre-human) vegetation and geology – Tamaki Ecological District

The Auckland Isthmus (part of the Tamaki Ecological District) is one of 8 ecological districts in the Auckland Ecological Region (Myers, 2005).

Mc Ewen (1987), cited in Myers 2005, describes the geology of the Tamaki Ecological District as characterised mostly by Miocene Waitemata group sandstone, siltstone and minor limestone. In many areas these rocks have weathered to clay-rich soils.

The original vegetation cover of the northern lowlands of New Zealand is described by Leathwick *et al* (2003) in Myers (2005) as follows: “Kauri and its associated species...grew on infertile soils on hill crests and upper slopes. Mid slopes supported rimu, miro, totara, northern rata, tawa, taraire, kohekohe and nikau.”

The lower valleys are thought to have been dominated by kahikatea, matai, puriri, and pukatea.

On the steep coastal slopes mangeao, taraire, whau, houpara, tawapou and karo are believed to have thrived.

Moist alluvial soils are thought to have supported kahikatea forests. Pukatea, swamp maire, kiekie and *Gahnia xanthocarpa* survived happily in places which were fertile and wet, while on drier ground matai was the co-dominant species.

Land clearance began long before the arrival of Europeans. Much of the pre-European land in Auckland was believed to be covered by manuka scrubland and bracken.

According to Myers (2005) Thomas Kirk (1871) “provided the first comprehensive account of the flora of the Isthmus of Auckland” and described the remaining bush as containing mangeao, puriri, pohutukawa, tawa, taraire, kanuka, rewarewa, hinau, pigeonwood and kauri.

Pourewa Creek flows into the (now) intertidal Orakei Basin and out into Hobson Bay. The main natural catchment of Orakei Basin is Orakei Creek which drains from Meadowbank. Hayward and Hayward (1999) estimate Orakei Basin, a young explosion crater, to be c. 25,000 years. The basin is surrounded by a tuff ring.

Auckland Council is at present mapping and defining both historical and current ecosystem types in the Auckland Region. This information will be available in the near future (John Sawyer pers. comm.). Further guidance should be sought about this from the Auckland Council, via the Biodiversity Advisor. It seems likely that the historic vegetation type for this location will fall within the “pohutukawa, puriri, karaka broadleaved forest (WF5)” and “puriri forest (WF8)” ecosystems under the new (draft) classification system (from the Draft Historic Ecosystems Extent Map of the Auckland Region, Auckland Council, 2013). Kepa Bush Reserve serves as a useful reference site for Selwyn Bush in terms of native vegetation.

4. Relevant legislation, designations and rules

Auckland Council Regional Policy Statement:

- Pourewa Valley is a Significant Natural Heritage Area (terrestrial species/environments) under Appendix B of the Auckland Council Regional Policy Statement: “115 POUREWA VALLEY contains remnants of coastal forest and one of the finest examples of mangrove forest in the Auckland area with some trees up to 4m in height. Several patches of eelgrass, now a rather uncommon species in the Waitemata Harbour since its devastation by disease

in the 1950s, are found on the tidal flats. There are some old kanuka, cabbage trees, kowhai and pohutukawa. The forest on the steep northern valley side has a valuable and instructive botany, zoology and geology. ACC and local groups have undertaken the protection and enhancement of this area. Birds of the area include mallard ducks, pied stilts, kingfishers, blue reef herons, grey warblers, tui and pukeko”.

District Plan Designations, Provisions and Tree Rules:

- Designation C13-03 for Selwyn College overrides the Significant Ecological Area provisions for Selwyn Bush in the District Plan. According to Auckland Council Principal Planner, David Wong, “the (ecological) provisions cannot prevent or hinder works undertaken in accordance with the designation for Selwyn College and any conditions”.
- The Selwyn College designation contains tree protection conditions that require the Ministry of Education to obtain consent from the Council to remove indigenous and exotic trees above a certain height and girth.
- Selwyn Bush is covered by Significant Ecological Area (Category B) provisions C13-09.

5. Site overview – the current state of the Selwyn Bush vegetation and landscape

5.1. Vegetation

The most valuable areas of Selwyn Bush are in the hardest to reach places, near the stream and in gullies where there is a good diversity of fern species. These shady damp spots are the more inaccessible parts that escaped earlier conversion to farmland.

Despite some interesting relic vegetation, Selwyn Bush is significantly degraded.

The site is comprised of exotic-native treeland and exotic-native forest. Roughly half of the canopy is exotic. The exotic canopy dominated by tree privet, hawthorn, and poplar. The remaining canopy consists of small native trees - mahoe, karamu, kanuka, with patches of tree ferns (mainly ponga with a scattering of mamaku). Sparsely distributed puriri and kohekohe are visible. A few *Fuchsia excorticata* remain on the stream edge, closer to the bottom boundary of the site.

There are areas of exotic-native shrubland and patches of open grassland.

Plant lists of species recorded at Selwyn Bush, from survey work undertaken in December (2012) – January (2013), can be found in the appendices (Appendix A and B).

One encouraging finding from the field work was the healthy diversity of ferns found at Selwyn Bush – a total of 17 different species. This included one king fern (a nationally threatened plant) in MU 11, near the true left bank of the stream.

5.2 Landscape

Selwyn Bush runs from the north, below the ASB Stadium, towards Pourewa Creek (refer Figure 1).

Three slopes converge at this low point, descending from the northern (ASB Stadium) and eastern boundaries (Selwyn Park, Selwyn College side) and from the western boundary (Kempthorne Crescent) into a water meadow-like strip, which is currently maintained with a weed-eater.

The valley floor in MU 5 (refer to Appendix E) becomes very water-logged in winter, in part due to stormwater overflow issues. This wetness is ephemeral; the ground is completely dry in summer.

The valley follows the stream towards the NZTA land through a weed- infested area of bush in MU 6.

The main path heads upwards, east of the stream, and then drops downwards again as it approaches the convergence of the two tributaries. There is a low, narrow, raised landform (a ridge) just downstream of this tributary convergence.

The Selwyn Bush watercourse appears to be highly modified at the headwater end. In the absence of a hydrology opinion, it seems that the top portion of original stream has been piped under the field to the west of the Stadium and that the original head of the tributary is now lost under “fill”. As with many urban streams, water levels are exceedingly low in summer. In the upper reaches, the stream is reduced to a few shallow pools which do not appear to likely support native fish during the driest months.

There have been several areas of land slippage on the eastern slope, both on the pipeline track and near the southwest corner of the school field. Manhole locations and the broken pipe, and other features can be found on the Tracks and Features map - Appendix F.

It appears that the top edges of the site have suffered the effects of “fill”. Some of these areas may also be very compacted by past earthworks. To the south of the school field, on Selwyn Park, the clay soil is poor draining and more akin to a gumland soil. It is probable that much of this area lacks a natural soil profile and has very little topsoil. The ridges are exposed to strong winds. Drainage from the school field onto this area is an issue, with water logging in winter.

A tongue of fill extends down the “mini slope” at the top of MU 3, and MU 1 and the top portion of MU 2 are also likely to have modified soil.

Pampas is very prevalent towards the top of the MU 10 slope and also abundant along the more open areas of MU 8 and the “pipeline track”. It is probable the areas most infested with pampas (and similar drought-tolerant, light-loving weeds) were the places which were affected by development work.

The buffer areas MU 10a and MU 4a are likely to contain subsoil and possibly fill. Inorganic and organic rubbish continues to be dumped in these areas (see page 17).

Tracks have been created through Selwyn Bush. These can be seen on the Selwyn Bush orientation map (Fig. 1).

6. Summary of Issues at Selwyn Bush

The key issues can be divided into the following categories:

1. Ecological issues
2. Stormwater problems and erosion
3. Rubbish dumping
4. Legal issues
5. Health and safety
6. Landownership
7. Future coordination, project leadership and partnerships
8. Resource issues

6.1 Ecological Issues

- Pest plants
- Pest animals
- Degradation of natural habitat (through modifications and the effects of pest invasion)
- Species loss and impoverishment of natural biodiversity
- Damage to normal ecosystem processes

These issues are covered in more detail in other sections of this report.

6.2 Stormwater Issues

There are stormwater issues at this site that are resulting in erosion, flash flooding, drainage problems and land slippage in places. It is recommended that a stormwater consultant is asked to provide an opinion about the problems and to advise who is responsible if work is required.



(Source: Martin Heffer)

6.3 Rubbish dumping

- Past rubbish dumping including “fill”:



- Current rubbish dumping:



- Accumulated vegetation and woody material as a result of weed control work is in some cases also problematic. Consideration needs to be given to wood piles that present a fire risk, H&S issues, or obstruct restoration work - particularly weed control and planting.





6.4 Legal issues

Rules and designations relating to the Selwyn Bush site need to be understood; some have already been mentioned (see page 6).

Anyone carrying out work at this site also needs to be aware of other legislation that applies:

- Wildlife Act 1953
- Resource Management Act 1991 (including amendments)
- Biosecurity Act 1993
- Auckland Regional Pest Management Strategy 2007 (to 2012)
- Auckland Regional Plan: Air, Land and Water 2004
- Auckland Council Regional Policy Statement 1999 (ACRPS)
- Auckland District Plan – Isthmus Section (1999)

The latter will be changing shortly to the Auckland Unitary Plan.

6.5 Health and Safety

Those supervising volunteers are responsible for health and safety matters. Developing a comprehensive health and safety plan for the Pourewa Restoration Group is advised. CVNZ have an excellent course which they run and this provides very good guidance on this subject.

In terms of use and storage of chemicals, those carrying out chemical (spray) weed control work should ideally attend a *Growsafe* course.

Auckland Council is in the process of updating their guidelines for volunteer's, which will cover health and safety issues with regard to any volunteers or volunteer groups they are offering support to.

Some of the obvious health and safety issues at this site include:

- Storage and use of chemicals and bait

- The use of tools – particularly chainsaws, brushcutters (weed-eaters), mulching machines
- Falling (or felling of) large trees:



- Rubbish on site (used needles were found on site in an area that has been used by young people as a “hang out” and there is broken glass in this area also):



- Steep slopes, poor visibility in some areas where there is dense vegetation – the danger of trips, slips, and eye injuries
- Additional trip hazards – low stumps left above ground or holes left unfilled:



6.6 Landownership

The landownership issue remains a tricky matter. The school does not appear to have the resources to care for and enhance land that is valued for its ecological merits and has SEA status. A Memorandum of Understanding and more formal partnerships between stakeholders may be one way forward to protect this land over time.

6.7 Coordination, project leadership and partnerships

At the current time several groups and organisations are involved with this project, including the Pourewa Restoration Group (PRG), Forest and Bird, CVNZ, and Council. These groups are working with the consent and support of Selwyn College. The ASB Stadium Gym has been supportive to this project. Refugees from Selwyn College, supervised by Roy Clements, also participate. It is hoped that this plan will be used by the PRG to form a detailed yearly operational plan, which will effectively coordinate the efforts of all the groups and individuals involved, including ecological contractors.

7. Ecological framework

a) Key Ecological Priorities

An ecological restoration programme for Selwyn Bush should include and address the following elements:

- Increase indigenous vegetation cover (low scrub through to climax forest)
- Use of suitable native plants ecosourced from the Tamaki Ecological District – these should not be horticultural varieties. Species should be consistent with the natural vegetation of this area.
- Encouragement of natural regeneration
- Protection and enhancement of indigenous vertebrate and invertebrate fauna
- Sustained control (or local eradication) of pest plant species
- Sustained control (or local eradication) of pest animal species
- Creation of regular monitoring and assessment programmes
- Creation and maintenance of infrastructure for ongoing ecological restoration

b) Key Ecological Rehabilitation Objectives

Indigenous revegetation and conservation

It is desirable to revegetate only where required (i.e. to assist with canopy closure).

Many areas with existing canopy cover, particularly in MU 3, 10 and MU 11, require effective weed control at the understorey/groundcover level. In many cases these zones will regenerate themselves without planting, providing careful, consistent and skilled weed maintenance work is carried out.

Exotic tree species are best killed *in situ*. Only trees that present a potential H&S risk, or a threat to native vegetation, should be removed at this stage. In many cases it may be more a matter of taking

off limbs to prevent damage, rather than removing the whole tree. As much as possible the canopy should be retained to protect native forest seedlings, ferns and light-sensitive understorey species.

Enhancement planting of less common species (believed to have been a natural part of the pre-human vegetation at this site) is best left until pest plants and animals are under control and basic pioneer plants are established.

Control and monitoring of pest animals

Possums, rats, mice, cats, mustelids, and hedgehogs present a potential threat to native fauna and flora at this site. The Australian rainbow skink displaces native skinks and competes for resources.

Possum damage to native flora is well documented. The healthy regeneration of kohekohe at this site is a good sign that possum control is effective. Mice threaten invertebrates and interfere with plant regeneration. Rats commonly damage and consume plant seeds as well as threatening birds and lizards. Interestingly the latter have also been shown to have a positive role in the pollination of certain tree species (e.g. pohutukawa), replacing birds and bats lost from urban ecosystems (David Pattimore pers. comm., 2012). Native geckos and insects have a role in pollination and should be encouraged, along with native birds.

The long term effect of impaired pollination and seed recruitment on natural vegetation communities and healthy ecosystem process is of concern. For an ecosystem to be viable over time these natural processes, often animal assisted, do need to occur. Animal pest control which aims to enhance natural ecosystem process is an essential part of an ecological rehabilitation project, as is the enhancement of native fauna to assist these processes.

Sustained control of possums, rats, mice and hedgehogs to low levels (e.g. <5% residual trap catch (RTC) or tracking tunnels), using ground-based methods (e.g. traps and bait stations), is essential to the success of revegetation and native fauna enhancement programmes.

Rat control is likely to result in higher numbers of mice.

A lizard survey would be useful at this site, along with invertebrate surveys and monitoring. Large numbers of rainbow skinks have been observed below the ASB stadium. Eggs are often introduced in potting mix and bark mulch. Care needs to be taken not to transfer these pests to other sites of high value - these diminutive animals readily climb into bags etc.

Pest plant control and monitoring

Ongoing control of weed species to achieve local eradication (where feasible) and to enable regeneration of indigenous plant species is essential.

Weeds should be tackled in two ways:

- *Weed-led approach*: This targets specific environmental weed species (e.g. tradescantia, ginger, climbing asparagus, moth plant, woolly nightshade). Attention needs to be also directed at adjacent areas that surround the site which are a source of repeated re-infection.
- *Site-led approach*: This targets specific sites and controls environmental plant pests in a given area. In terms of managing weeds at a site it is ideally it is best to work from the top to the bottom of the site (particularly with regard to water dispersed weeds like tradescantia and seeding plants e.g. climbing asparagus and ginger, where seeds roll downhill). Refer to Section 9 and the appendices for further weed control details.

Exotic canopy trees should be taken out selectively if they present a threat to native flora or to people; otherwise they are best killed *in situ* in a manner that is strategic and does not open up the canopy in a way that compromises native understorey vegetation. Generally trees larger than 3 metres in height are best killed *in situ*.

Professional ecological weed control input for certain weeds (e.g. tradescantia) is desirable and recommended.

Weed control effort, pest biomass removal, the presence of environmental weeds, and the amount of chemical required at the site should drop steadily over a period of five years, across all management units, if weed control is effective.

Ecological outcome monitoring

Additional monitoring can be potentially carried out at Selwyn Bush. This may be more appropriate once vegetation is more established and weeds are reasonably under control. Techniques are as follows:

- Five-minute bird counts
- Seedling Ratio Index (SRI) monitoring to provide information on the understorey response to browser control
- Foliar Browse Index (FBI) monitoring to provide information on canopy vegetation (response to possum control)
- Constructed weta homes and pitfall traps installed to monitor the response of invertebrate communities to pest control.
- Artificial cover objects (ACOs) installed to monitor lizards, including closed foam retreats (CFRs) for geckos. Expertise in lizard monitoring is necessary and permits to handle lizards are required from DOC.
- Permanent plot vegetation monitoring, photo points, yearly grid searches for pest weeds.

Reintroductions of taxa likely to have been formerly present

Once effective pest management and suitable habitat is in place, species that are likely to have been present could perhaps be reintroduced. Inventory surveys to establish the presence or absence of species would have to be done first and the normal translocation protocols would need to be followed.

8. Ecological Restoration Approach

It is suggested that the groups involved in this site contribute to the formation of a yearly operational plan, to assist them to coordinate their (and contractor) efforts in a strategic and methodical manner. As well as having a long term ecological vision, and aim, it is necessary to build a yearly operational plan, which sets out clear short term objectives and specific actions over the coming 12 month period, using the principles and information in this restoration plan document as a guide.

The recommended priority actions are as follows:

1. Weed control

- Weed control approach (site led vs weed led): Weed control is best carried out by methodically targeting specific management units, to ensure that weed control is effective over time. Indigenous plants should be established in these units, to enhance existing vegetation and to achieve a dense native canopy. The latter will help to control light-dependent weeds. A site lead approach is recommended; however, there may be a few select weeds (e.g. ginger) which specific volunteers could potentially control across the whole site in a methodical way.
- Weed methodologies include: Initial control/site prep, follow up control, and control of pest plant seedbank, using an integrated method which includes both chemical and manual control carried out by volunteers and contractors.
- Description of priority weed control areas, within the management units, should be produced as part of the operational plan, for example:

Management unit	Habitats	Weed issues	Priority (Low, Medium, High)	Actions	Group or person responsible for action
Management unit 3 (MU3)					

2. Animal Pest control (CVNZ manage)

- Describe animal pest control to date
- Pest animal methodologies
- Add map of where bait stations and traps are at the site. This could have table of actions and responsibilities.

3. Restoration planting

- Methodology – species selection (importance of planting in an Significant Ecological Area), ecosourcing, spacing/placement, initial/enrichment, maintenance
- Table of priority revegetation sites

Priority planting site	Location	Initial/enrichment/underplantng	Planting areas (sqm)	Plant spacing	Number plants	Planting year
Z	Management Unit 23	Initial	1435	1 per m ²	1400	2000

9. Priority areas for revegetation in Selwyn Bush

Significant areas of the canopy have been opened up in Selwyn Bush mainly through weed clearance but also in track making. These areas are priority spots for revegetation and are marked on the GIS map (Fig. 3). This accompanies photographs of some of these areas in the subsequent pages.

Areas are marked by numbers that relate to the management units they fall within (see the Management Unit Plan map – Appendix E).



Figure 3: Priority areas for revegetation (Source of GIS basemap: Auckland Council)

10. Site Description

- a) **Management Unit 1, Planting Area A:** The “entrance garden” behind the ASB stadium. This area has a mixture of native plants, including horticultural varieties. Chemical treatment is recommended for tradescantia and convolvulus. This area needs planting to fill gaps and to provide low canopy cover. This is ideal skink habitat. Harakeke, *Phormium cookianum*, *Astelia banksii*, *Muehlenbeckia complexa*, rengarenga, *Coprosma rhamnoides*, *Corokia cotoneaster* and *Dianella nigra* (in the shadier margins) would make suitable low canopy plants in an area that is principally a native garden. Abundant numbers of juvenile skinks have been observed. These appear to be predominantly the exotic rainbow skink. Copper skink may also be present.



Figure 4: MU 1 – ASB Stadium entrance garden

- b) **Management Unit 2, Planting Area B:** This area falls within the SEA. It requires infill planting with species that will provide a good fast canopy, which can be later under-planted. Ponga have been damaged in this area and it makes sense to re-establish these as soon as there is some shelter. Stormwater scouring is evident. A mixture of harekeke and ti kouka would be obvious choices for the scour zones. Karamu, kanuka, manuka, mahoe and mapou would also be good choices throughout this area as pioneer species. Whau may be useful in more sheltered, drier spots. Planted houhere is growing well. Tradescantia, ginger and other weeds require control.



Figure 5: MU 2.

- c) **Management Unit 3, Planting Area C:** This area is covered in tradescantia and nasturtium. There is ginger in the lower section that has been cut and treated. This will need follow-up. There is little canopy in this area. This slope has a great deal of dumped rubbish in places and “fill”. Auckland Council advice has been sought and it is felt that this area is best cordoned off, covered with coconut fibre to prevent surface erosion, and planted principally with low vegetation (eg *Muehlenbeckia complexa* and *Phormium cookianum*) where there is little soil. This area has had an initial spray at the top end but will require at least one further treatment before planting. Planting should happen as early as possible in winter. The aim here is to get rapid canopy closure, but still be able to carry out weed control. Some of the poplars on the western ridge should perhaps be taken out or topped before planting and mulched. Suitable initial revegetation species include kanuka, kowhai, mapou, mahoe, karamu, totara, whau, manuka, titoki and puriri; pigeonwood, karaka, and kohekohe in the shadier areas. Mamaku could be added on the bush edge nearer to the bottom of the slope. On the fence margins *Phormium cookianum* would be useful as a buffer edge species. Ti kouka would be good on very steep areas. Kohekohe, kawakawa and karaka are establishing naturally in the bush areas and some seedlings could be transplanted to bush margins. *Gahnia lacera* would be a useful species once weeds are controlled and some light shade has been achieved.



Figure 6: Top of MU 3 (top photo) and the bottom (bottom photo) of the “mini” slope.

There is an area to the left of the main path (going down), below the stormwater overflow and above the “water meadow”, that needs control of ginger and other weeds. This area might benefit from some infill planting with patches of ti kouka, harakeke, mahoe,

pigeonwood, and putaputaweta to create canopy cover. This area is marked by a small red zone (no number) on map (Fig. 3).

- d) **Pipeline Track – Bordering MU 2 & 8, Planting Area D:** There are still areas of live pampas, woody weeds and climbers (eg. jasmine). All gaps could be planted to achieve more shade, greater land stability and to narrow the track. Suitable species include kanuka, karamu, mapou, totara, houpara, houhere, manuka, whau, *Coprosma lucida*, *Coprosma rhamnoides* and kowhai. Karaka and kohekohe could be put into more sheltered areas with some shade. Ti kouka would be good on the slip. It may be prudent to get a stormwater opinion before planting this area, just in case pipe work needs to be done. Clearly the land is unstable.



Figure 7: MU 2 & 8 either side of the pipeline track.

- e) **Management Unit 4, Planting Area E:** This area (below the phoenix palm) has large gaps. Infill planting would be useful. Some site preparation will be required. Similar species as recommended for the pipeline area could be used. In the short term space should be left around phoenix palm until this has been removed – consent will be required. In the shadier spots lower down the slope taraire could be planted.



Figure 8: MU 4 – below the phoenix palm.

- f) **Management Unit 5, Planting Area F:** This valley floor and its sloping margins would benefit from infill planting. The banks facing west require tough fairly hardy species like houpara, karamu, manuka, mahoe, rewarewa, totara, *Coprosma rhamnoides*, and houhere. In the flood zone kahikatea and mahoe, with nikau, *Gahnia xanthocarpa* and *Carex dissita* (in shady areas nearer the stream once tradescantia has been sprayed and is under control). Ti kouka, harakeke and manuka would be good choices to begin to get some canopy closure in the more open areas.



Figure 9: MU 5 - the valley floor and flood zone.

- g) **MU 5, MU 7 and MU 8 intersection, Planting Area G** : This area is open at the meeting of the pathways and would benefit from site prep in terms of weed control of ginger, pampas, convolvulus, Chinese privet saplings etc. Infill planting with pioneer species – ti kouka, whau, mapou, kowhai, houhere, karamu, kanuka, and manuka would be useful.



Figure 10 – the MU 5, MU 7, MU 8 intersection

- h) **Management Unit 9, Planting Area H**: This is known as “the junction”. Roy Clements and his refugee volunteer group are responsible for this area. This site has been cleared and there is a considerable amount of wood in this area that would need to be largely removed prior to planting. Mulching this and using it on the slope would help prevent surface erosion and inhibit weeds like Veldt grass. Some native ground ferns have been lost due to loss of shade. Wood is useful habitat and some should be left for this purpose providing it does not interfere with restoration work. Site prep in terms of weed control would need to be done prior to planting. There is a slip zone at the top of the slope, toward the school field fence. Suitable species along the open top edge would be pohutukawa with kowhai further down the slope and *Phormium cookianum* on the steep unstable bank. The view shaft needs to be kept fairly open at the top of the area. Widely spaced pohutukawa and dense-planted *P.cookianum* would achieve this in the buffer strip. The lower area – the floor of MU 9 could have a few lowland broadleaf specimen trees – puriri, titoki, pigeonwood, karaka, taraire, kohekohe (the latter four species are best put in sheltered, shadier spots), with some areas of smaller pioneer trees – mahoe, kanuka, whau, *Coprosma macrocarpa subsp. minor* in more open spots. This area is part of the SEA; horticultural varieties are not appropriate.



Figure 11: MU 9 “The Junction”

11. Five Year Weed Control/Planting Plan Priorities, Costs, and Timelines

Overview

This site still has a significant weed problem, despite many years of volunteer effort. It is my opinion that the optimum methodology is a combination of specialist contractor assistance and volunteer effort employed in a strategic and coordinated manner.

A methodical five year weed eradication and control programme, using both specialist contractors and skilled volunteers should achieve a good level of control at this site. There will always be a requirement for pest plant and animal monitoring (which should necessarily include a yearly grid search for weeds and a robust weed management programme) but weed control should require far less effort, cost and time, once the major problems have been dealt with and a native canopy is well established.

There is a need to carry out suitable restoration planting in areas where weeds have been removed, as indicated in section 5.3. Natural regeneration will also occur if weeds are managed; where possible this is the preferred method particularly in the lower reaches of the site. In MU 10 and 11, it

would be appropriate to slowly and selectively kill *in situ* a small percentage of the exotic canopy each year (eg 10 trees/year), to create tiny light wells. Suitable shade or semi shade broadleaved tree species could be planted in these gaps, gradually replacing the hawthorn and privet with suitable native trees consistent with the historic vegetation type. It is suggested this is only started after the 5 year weed control programme is complete.

Priority MU's in terms of weed control/planting over a five year period - including contractor assistance (refer to Management Unit Map for details of MU locations – Appendix E):

Year	Priority Management Units	Management Required
Dec 2013 – Dec 2014	MU 1, MU 2, MU 3 (3a), MU4 (4a) to the pipeline track), MU 9, MU 10a (weed control/planting) Control of asparagus, ginger, woody pest seedlings and tradescantia in MU 10 and 11.	Contractor assistance (spraying and poplar removal). Volunteer weeding. Planting 1100 pioneer plants to create a canopy in MU 1, 2, 3, 3a, 4a and 10a.
Dec 2014 – Dec 2015	MU 5, MU 6, MU 7, MU 8, MU 4 (4a) from the pipeline track towards Pourewa Creek) Follow up in MU 1, 2, 3 (3a), 4 (4a), 10 and 11.	Contractor assistance (spraying and exotic tree removal). Volunteer weeding. Planting infill plants – numbers to be determined at the beginning of 2015.
Dec 2015 – Dec 2016	Follow up in all management units targeted in 2013 – 2015 in addition to the above units.	Contractor assistance (spraying). Volunteer weeding. Infill plants as required.
Dec 2016 – Dec 2017	Maintenance weed control in all management units.	Contractor assistance (spraying). Volunteer weeding. Enrichment planting.
Dec 2017 – Dec 2018	Track edge restoration – 1 metre either side of tracks to create a buffer and to reduce/manage light dependent weed establishment. Whole site vegetation assessment and planning for the following year.	Contractor assistance (spraying). Volunteer weeding. Planting 1000 sub canopy/ground cover plants. Weed grid search and assessment of whole site to inform further planning and management.

Indicative Contractor Costs per Year

Under the current prices, contractor assistance costs for vegetation work would be anticipated to be between \$12,000.00 and \$15,000.00 *per annum*. This would be to target tradescantia and other weeds best killed using spot spray techniques. Volunteers could assist with preparation (eg hand clearing around native seedlings, cutting down vines (so these can be later spot sprayed) and cutting and pasting of weeds like ginger and woody weeds or hand pulling small pest tree seedlings (eg Chinese privet). This estimated cost could also cover a small amount of tree felling work where necessary for H&S reasons or to prevent damage to native bush (eg a few poplar). Anticipated costs over a 5 year period would be between \$60,000.00 and \$75,000.00 if trees are removed in stages. Thereafter costs would be substantially less as the site could potentially be managed principally by volunteers with the exception of possible professional tree removal/pruning as required.

Suitable tasks for specialist arborist and ecological weed contractor assistance:

1. *Arborist* – removal of any poplars that present a H&S risk or a risk to native vegetation mainly in MU 3 and MU 2 and 4 areas.
2. *Specialist ecological spray contractor* – control of tradescantia, acanthus, agapanthus, vines and creepers (honeysuckle, jasmine, climbing asparagus, moth plant, convolvulus, morning glory, nasturtium etc.) pest grasses and sedges (eg. Veldt grass, kikuyu, Australian sedge, pampas, willow weed, *Carex divulsa* etc). Quarterly spraying in the MU's indicated would bring many of the above weeds under control. Thereafter work in the units should be able to be managed by volunteer groups and *Growsafe* trained volunteers who have good plant ID skills. Appropriate restoration planting should be done, where canopy is absent or poor, once the weeds are well controlled, preferably after at least 2 sprays.

Priority weed species to target across the whole site (suitable species for volunteers to target methodically across the whole of Selwyn Bush site, in addition to specific annual MU priority areas tabled on page 24):

Seeding weeds like ginger can be cut and pasted. Tuber or bulb plants like stinking iris and agapanthus can be dug out. Vines like climbing asparagus can be cut about 6 inches from the ground ahead of contractors or a *Growsafe* trained volunteer following up with spot spraying. Woody exotics like privet, woolly nightshade, boneseed and gorse can be cut and pasted – or if small these species can be hand pulled. Careful hand removal of small numbers of outlier populations of tradescantia or selaginella or small pampas or veldt grass outliers, to prevent spread in spots where these weeds are not already established, would be helpful. Large areas of tradescantia are best left to a spray contractor, but careful hand clearing around native seedlings would be useful ahead of spraying. This should be coordinated with the spray contractor as should the cutting of vines, if follow up spraying is to occur. Weed hygiene with regard to tradescantia, plants in seed, or plants with bulbs/tubers, pod plants (e.g. moth plant) and woody species capable of sprouting from branches (e.g. poplar, willow, flame tree, Chinese privet) is very important to attend to.

For further details of the contractor/volunteer weed control methods see Appendix D.

12. Glossary

- *Foliar Browse Index (FBI)* The foliar browse index method (Payton et al. 1999) is a nationally consistent method that was developed to measure the impacts of possum browsing on natural area “health” by monitoring trends in canopy and sub-canopy tree condition. The FBI method uses observers to subjectively measure canopy cover, possum browse, stem use by possum, canopy dieback, recovery and fruiting and flowering levels of individual trees of palatable species. This is useful as an indicator of trends in tree canopy condition, but it does not provide answers to longer-term questions such as recruitment rates of palatable species.
- *Plagioclimax (community)* is a vegetation community which is kept at a particular stage of development by human intervention

- *Residual Trap Catch (RTC)* The residual trap-catch (RTC) index is a simple method of determining relative possum abundance. The protocol requires that lines of 10 leg-hold traps, with the traps spaced 20 metres apart, are set for three consecutive fine nights and are randomly located within the treatment area. Lines are in different locations, before and after control. The number of lines to be used is determined by the size of the management area. The standard performance target commonly set for a reduction in possum densities, is a residual trap catch of < 5% (i.e. less than 5 possums caught for every 100 trap-nights).

13. References

Cameron, E.K 2000: St John's College bush, Meadowbank, Auckland. *Auckland botanical Society Journal* 55 (1):29-34

Cranwell, L.M. 1981: *The Botany of Auckland*. Auckland Institute and War Memorial Museum

Hayward, B.W., Hayward, C.M. 1999: Human Impact on Orakei Basin, Auckland. *Tane* 37:137-152.

Hunt, G.J. (ed.) 2007: *Selwyn College Inspiration and Reflection*. Waddington Press, Auckland.

Jackson, E.T. 1976: Delving into the past of Auckland's Eastern Suburbs. Section 3: Meadowbank – St John's. Jackson, E.T., Auckland.

Myers, S. (compiler) 2005: *North Shore City Ecological Survey: A survey of sites of ecological significance in Tamaki and Rodney Ecological Districts*. Auckland Regional Council and North Shore City.

Payton, I.J.; Pekelharing, C.J.; Frampton, C.M. 1999: *Foliar Browse Index: a method for monitoring possum (*Trichosurus vulpecula*) damage to plant species and forest communities*. Landcare Research, Lincoln. 62 p.

14. Appendices

14.1 APPENDIX A Native Species Present at Selwyn Bush – Plant Survey Jan 2013

<i>Native Species found at Selwyn Bush Dec – Jan 2013 Vegetation Survey</i>	
NATIVE SPECIES - botanical	NATIVE SPECIES Maori/common
<i>Adiantum aethiopicum</i> (F)	true maidenhair, makaka
<i>Adiantum hispidulum</i> (F)	rosy maidenhair
<i>Agathis australis</i> (planted)	kauri
<i>Alectryon excelsus</i>	titoki
<i>Asplenium bulbiferum</i> (F)	hen and chicken fern
<i>Asplenium flaccidum</i> (F)	drooping spleenwort
<i>Asplenium oblongifolium</i> (F)	huruhuru, shining spleenwort
<i>Austroderia fulvida</i> (planted)	toe toe
<i>Blechnum chambersii</i> (F)	nini
<i>Blechnum filiforme</i> (F)	climbing hard fern
<i>Carex flagellifera</i> (planted)	
<i>Carex virgata</i> (planted)	
<i>Carex dissita</i>	
<i>Coprosma macrocarpa</i> subsp. <i>minor</i>	karamu
<i>Coprosma rhamnoides</i>	
<i>Coprosma robusta</i>	karamu
<i>Coprosma repens</i> (planted)	
<i>Cordyline australis</i>	ti kouka
<i>Corynocarpus laevigatus</i>	karaka
<i>Cyathea dealbata</i> (TF)	ponga, silver tree fern
<i>Cyathea medullaris</i> (TF)	mamaku
<i>Dacrydium cupressinum</i>	rimu
<i>Dacrycarpus dacrydioides</i>	kahikatea
<i>Dodonaea viscosa</i> (planted)	akeake
<i>Doodia australis</i> (F)	pukupuku
<i>Dysoxylum spectabile</i>	kohekohe
<i>Fuchsia excorticata</i>	tree fuchsia
<i>Geniostoma rupestre</i>	hangehange
<i>Haloragis erecta</i>	toatoa
<i>Hebe stricta</i> (planted)	koromiko
<i>Hedycarya arborea</i>	porokaiwhiri
<i>Hoheria populnea</i> (planted)	houhere, lacebark
<i>Hypolepis rufobarbata</i> (F)	sticky pig fern
<i>Kunzea ericoides</i>	kanuka
<i>Lastreopsis microsora</i> (F)	
<i>Leptospermum scoparium</i>	manuka
<i>Lygodium articulatum</i> (F) ¹	mangemange
<i>Macropiper excelsum</i>	kawakawa

<i>Marattia salicina</i> (F) (Regionally Threatened)	king fern
<i>Meliclytus ramiflorus</i>	mahoe
<i>Metrosideros excelsa</i> (planted)	pohutukawa
<i>Microsorium pustulatum</i> (F)	hound's tongue fern
<i>Muehlenbeckia australis</i>	pohuehue, large leaved
<i>Muehlenbeckia complexa</i> (planted)	pohuehue, wire vine
<i>Myrsine australis</i>	mapou
<i>Oplismenus hirtellus</i> subsp. <i>imbecillus</i>	
<i>Parsonsia heterophylla</i>	NZ jasmine
<i>Phormium cookianum</i> (planted)	coastal flax
<i>Phormium tenax</i> (planted)	harakeke
<i>Pittosporum crassifolium</i>	karo
<i>Pneumatopteris pennigera</i> (F)	gully fern
<i>Podocarpus totara</i>	totara
<i>Pseudopanax arboreus</i>	whauwhaupaku
<i>Pseudopanax lessonii</i>	houpara
<i>Pteridium esculentum</i> (F)	bracken
<i>Pteris macilenta</i> (F)	sweet fern
<i>Pteris tremula</i> (F)	shaking brake
<i>Rhopalostylis sapida</i>	nikau
<i>Sophora chathamica</i>	kowhai
<i>Uncinia uncinata</i>	hook grass
<i>Vitex lucens</i>	puriri

F = fern

TF = tree fern

¹ Additional species added March 2014

14.2 APPENDIX B Key Weed Species found at Selwyn Bush – Plant Survey Jan 2013

Weed Species found at Selwyn Bush Dec – Jan 2013 Vegetation Survey		RPMS Status
WEED SPECIES - botanical	WEED SPECIES common name	
	Thistles – various species	
<i>Acacia longifolia</i>	Sydney golden wattle	
<i>Acanthus mollis</i>	acanthus, bear's breeches	
<i>Agapanthus praecox</i>	agapanthus	Surveillance
<i>Ageratina riparia</i>	mist flower	Surveillance
<i>Alocasia brisbanensis</i>	elephant's ears	Surveillance
<i>Anredera cordifolia</i>	madeira vine	Total Control
<i>Araujia sericifera</i>	moth plant	Containment
<i>Aristea ecklonii</i>	aristea	Surveillance
<i>Asparagus scandens</i>	climbing asparagus	Surveillance
<i>Carex divulsa</i>		Surveillance
<i>Carex longebrachiata</i>	Australian carex	Containment
<i>Cestrum nocturnum</i>	Queen of the Night	
<i>Chrysanthemoides monilifera ssp. monilifera</i>	boneseed	Surveillance
<i>Cortaderia spp.</i>	pampas grass	Surveillance
<i>Crataegus monogyna</i>	hawthorn	Surveillance
<i>Crocosmia X crocosmiflora</i>	montbretia	Surveillance
<i>Cyperus eragrostis</i>	umbrella sedge	
<i>Cyperus rotundus</i>	nut grass	Surveillance
<i>Ehrharta erecta</i>	panic veldt grass	
<i>Erigeron karvinskianus</i>	Mexican daisy	Surveillance
<i>Erythrina indica</i>	flame tree	
<i>Euonymus japonicus</i>	Japanese spindle tree	Surveillance
<i>Hedera helix</i>	English ivy	Surveillance
<i>Hedychium gardnerianum</i>	kahili ginger	Containment
<i>Ipomoea indica</i>	blue morning glory	Surveillance
<i>Iris foetidissima</i>	Stinking iris	
<i>Jasminum polyanthum</i>	jasmine	Surveillance
<i>Ligustrum lucidum</i>	tree privet	Surveillance
<i>Ligustrum sinense</i>	Chinese privet	Surveillance
<i>Lonicera japonica</i>	Japanese honeysuckle	Surveillance
<i>Paraserianthes lophantha</i>	Brush wattle	Surveillance
<i>Pennisetum clandestinum</i>	kikuyu	
<i>Persicaria maculosa</i>	willow weed	
<i>Phoenix canarensis</i>	Phoenix palm	Surveillance
<i>Phytolacca octandra</i>	inkweed	
<i>Populus spp.</i>	poplar species	
<i>Prunus sp</i>	Taiwan cherry and other cherry species	
<i>Pteris cretica</i>	Cretan brake	

<i>Rubus fruticosus</i>	blackberry	Surveillance
<i>Rumex sagittatus</i>	climbing dock	Surveillance
<i>Selaginella kraussiana</i>	African clubmoss	Surveillance
<i>Solanum mauritianum</i>	woolly nightshade	Containment
<i>Syzygium smithii</i>	monkey apple	Surveillance
<i>Tradescantia fluminensis</i>	tradescantia	Surveillance
<i>Tropaeolum majus</i>	nasturtium	
<i>Ulex europaeus</i>	gorse	Containment
<i>Zantedeschia aethiopica</i>	arum lily	Surveillance

Environmental pest plants are prioritised using to the three categories in the Auckland RPMS (ARC 2007): (i) Total Control Pest Plants, (ii) Containment Pest Plants, and (iii) Surveillance Pest Plants.

(i) Total Control Pest Plants

Total Control Pest Plants have a limited distribution or density within the Auckland Region, or defined parts of the Region. They are considered to be of high potential threat to the Region, and Auckland Council assumes full responsibility for funding and implementing appropriate management programmes for these species. The aim is to eradicate these plants from the Region or defined parts of the Region, over a period of time, which may exceed the life of the current RPMS (ARC 2007). There is one Total Control Pest Plant at Selwyn Bush.

(ii) Containment Pest Plants

Containment pest plants are those that are abundant in certain habitats or areas in the region. Landowners/occupiers are required to control these plants whenever they appear on their land. All containment pest plants are banned from sale, propagation, distribution, and exhibition through the entire Auckland Region (ARC 2007). Five containment pest plants were present in the project area.

(iii) Surveillance Pest Plants

Surveillance pest plants include species that have been identified as having significant impacts on the biosecurity values of the Auckland Region. Auckland Council seeks to prevent their establishment or spread by prohibiting their sale, propagation, distribution, and exhibition (ARC 2007). Twenty seven surveillance pest plants were recorded during the survey:

14.3 APPENDIX C Native tree and shrub species suitable for initial restoration planting

Species	Common Name	Open	Shade	Dry	Damp	Form
<i>Alectryon excelsus</i>	titoki	✓	✓	✓	✓	Tree
<i>Beilschmiedia tarairi</i>	taraire	✓	✓	✓	✓	Tree
<i>Coprosma macrocarpa</i> <i>subsp. minor</i>	large berried karamu	✓	✓	✓	✓	Small tree
<i>Coprosma rhamnoides</i>		✓	✓	✓	✓	Shrub
<i>Coprosma robusta</i>	karamu	✓	✓	✓	✓	Shrub
<i>Cordyline australis</i>	ti kouka	✓		✓	✓	Small tree
<i>Corynocarpus</i> <i>laevigatus</i>	karaka		✓	✓		Tree
<i>Cyathea medullaris</i>	mamaku		✓		✓	T/fern
<i>Dacrycarpus</i> <i>dacrydioides</i>	kahikatea	✓	✓	✓	✓	Tree
<i>Dysoxylum spectabile</i>	kohekohe	✓	✓	✓	✓	Tree
<i>Entelea arborescens</i>	whau	✓		✓		Small tree
<i>Fuchsia excorticata</i>			✓		✓	Small tree
<i>Geniostoma rupestre</i>	hangehange		✓		✓	Shrub
<i>Hebe stricta</i> var. <i>stricta</i>	koromiko	✓		✓	✓	Shrub
<i>Hedycarya arborea</i>	porokaiwhiri		✓	✓	✓	Tree
<i>Knightia excelsa</i>	rewarewa	✓	✓	✓	✓	Tree
<i>Kunzea ericoides</i>	kanuka	✓		✓	✓	Tree
<i>Leptospermum</i> <i>scoparium</i>	manuka	✓			✓	Small tree
<i>Macropiper excelsum</i>	kawakawa		✓		✓	Shrub
<i>Melicytus ramiflorus</i>	mahoe	✓	✓		✓	Small tree
<i>Metrosideros excelsa</i>	pohutukawa	✓		✓		Tree
<i>Myrsine australis</i>	mapou	✓	✓	✓		Small tree
<i>Podocarpus totara</i>	totara	✓		✓	✓	Tree
<i>Pseudopanax arboreus</i>	five finger	✓	✓	✓		Tree
<i>Pseudopanax lessonii</i>	houpara	✓	✓	✓		Tree
<i>Sophora chathamica</i>	kowhai	✓			✓	Tree
<i>Vitex lucens</i>	puriri	✓	✓		✓	Tree

14.4 APPENDIX D: Weed Control Methods

WEED SPECIES BOTANTICAL NAME	WEED SPECIES COMMON NAME	CONTRACTOR OR GROWSAFE TRAINED PERSON	VOLUNTEER GROUPS	TIMING
	Thistles – various species		Grub out	Spring
<i>Acacia longifolia</i>	Sydney golden wattle	Drill larger trees - Met 5g/l	Pull small seedlings, cut	All year around
<i>Acanthus mollis</i>	acanthus, bear's breeches	FS Tri 6ml/l	Hand dig where plants are near broadleaved native seedlings	Spring/Summer
<i>Agapanthus orientalis</i>	agapanthus	FS Tri 6ml/l	Dig out tubers	All year
<i>Alocasia brisbanensis</i>	elephant's ears	CS Met 1.25g/l + Gly 100ml/l	CS Vigilant	
<i>Anredera cordifolia</i>	madeira vine	FS Met 0.33g/l = Gly 15ml/l	CS Vigilant, bag nuts	All year
<i>Araujia sericifera</i>	moth plant	FS Tri 6ml/l	CS Vigilant or dig out, bag pods	All year
<i>Aristea ecklonii</i>	aristea	FS Met 0.50g/l + Gly 15ml/l	Dig out before seeding	Spring
<i>Asparagus scandens</i>	climbing asparagus	FS Gly 15 ml/l	Cut to 4 inches before seeding, dig tubers	Spring
<i>Carex divulsa</i>		FS Gly 15 ml/l		All year
<i>Carex longebrachiata</i>	Australian carex	FS Gly 15 ml/l		All year
<i>Cestrum nocturnum</i>	queen of the night		CS Vigilant (hang up) or pull small seedlings	All year
<i>Chrysanthemoides monilifera ssp. monilifera</i>	boneseed	CS Met 5g/l	CS Vigilant before seeding	All year
<i>Cortaderia selloana (and jubata)</i>	pampas grass	FS Gly 15 ml/l	Dig out small plants	Spring/summer before flowering
<i>Crataegus monogyna</i>	hawthorn	Drill Met 5g/l	CS Vigilant or pull small plants	Spring/summer
<i>Crococsmia X crocosmiiflora</i>	montbretia	FS Met 0.50g/l + Gly 15 ml/l		Spring/summer
<i>Cyperus eragrostis</i>	umbrella sedge	FS Gly 15 ml/l	Cut and bag heads late spring/early summer	All year
<i>Cyperus rotundus</i>	nut grass	FS Gly 15 ml/l		All year
<i>Ehrharta erecta</i>	panic veldt grass	FS Gly 15 ml/l		All year
<i>Erigeron karvinskianus</i>	Mexican daisy	FS Gly 15 ml/l		All year

WEED SPECIES BOTANTICAL NAME	WEED SPECIES COMMON NAME	CONTRACTOR OR <i>GROWSAFE</i> TRAINED PERSON	VOLUNTEER GROUPS	TIMING
<i>Erythrina indica</i>	flame tree	CS Met 5 g/l	Pull small seedlings, CS Vigilant small saplings	All year
<i>Euonymus japonicus</i>	spindleberry	CS Met 1.25g/l + Gly 100ml/l	CS Vigilant, hand pull small seedlings	All year
<i>Hedera helix</i>	English ivy	FS Met 0.33 g/l		All year
<i>Hedychium gardnerianum</i>	kahili ginger	CS Met 1.25g/l	CS Vigilant or Gly gel, cut off seedheads and bag	All year
<i>Ipomoea indica</i>	blue morning glory	FS Gly 15ml/l or Tri 6 ml/l	Release from natives	All year
<i>Iris foetidissima</i>	Stinking iris	FS Met 0.33g/l = Gly 15ml/l	Dig out tubers before seeding	Spring/Summer
<i>Jasminum polyanthum</i>	jasmine	FS Met 0.33g/l = Gly 15ml/l	Cut and release from natives	All year
<i>Ligustrum lucidum</i>	tree privet	Drill Met 5 g/l	CS saplings with Vigilant, hand pull small	All year
<i>Ligustrum sinense</i>	Chinese privet	CS Met 1.25g/l	CS saplings with Vigilant, hand pull small	All year
<i>Lonicera japonica</i>	Japanese honeysuckle	FS Met 0.33g/l = Gly 15ml/l	Cut and release from natives	
<i>Pennisetum clandestinum</i>	kikuyu	FS Gly 15 ml/l		Spring/summer
<i>Persicaria maculosa</i>	willow weed	FS Gly 15 ml/l		Spring
<i>Phoenix canarensis</i>	Phoenix palm	Drill Gly 500 ml/l, FS small plants Met 0.5g/l	Pull or dig small seedlings	All year
<i>Phytolacca octandra</i>	inkweed		CS Vigilant or pull small	Spring/Summer
<i>Populus spp.</i>	poplar species			
<i>Prunus sp</i>	Taiwan cherry and other cherry species	CS Met 1.25g/l	CS Vigilant or pull small	All year
<i>Pteris cretica</i>	Cretan brake	FS Gly 15ml/l		All year

WEED SPECIES BOTANTICAL NAME	WEED SPECIES COMMON NAME	CONTRACTOR OR <i>GROWSAFE</i> TRAINED PERSON	VOLUNTEER GROUPS	TIMING
<i>Rubus fruticosus</i>	blackberry	FS Met 0.33g/l = Gly 15ml/l	Hand pull tiny plants – bag.	Spring/Summer
<i>Rumex sagittatus</i>	climbing dock	FS Met 0.33g/l = Gly 15ml/l	Release from natives	Spring/Summer
<i>Selaginella kraussiana</i>	African clubmoss		Hand remove tiny patches , bag (rubbish)	All year
<i>Solanum mauritianum</i>	woolly nightshade	FS Gly 15 ml/l	CS Gly or Vigilant gel, hand pull small	All year
<i>Syzygium smithii</i>	monkey apple		CS saplings Gly or Vigilant gel, hand pull	All year
<i>Tradescantia fluminensis</i>	tradescantia	FS Tri 6ml/l	Careful hand clearing around native seedlings – bag ALL fragments.	Best in late spring early autumn when ground is damp, but not wet or very dry.
<i>Tropaeolum majus</i>	nasturtium	FS Gly 15 ml/l	Pull off young natives	Spring/summer
<i>Ulex europaeus</i>	gorse	FS small plants Tri 6 ml/l	CS Vigilant, pull small	All year
<i>Zantedeschia aethiopica</i>	arum lily	FS Met 0.33g/l = Gly 15ml/l	Dig out tubers	All year

Key:

FS = Foliar Spray

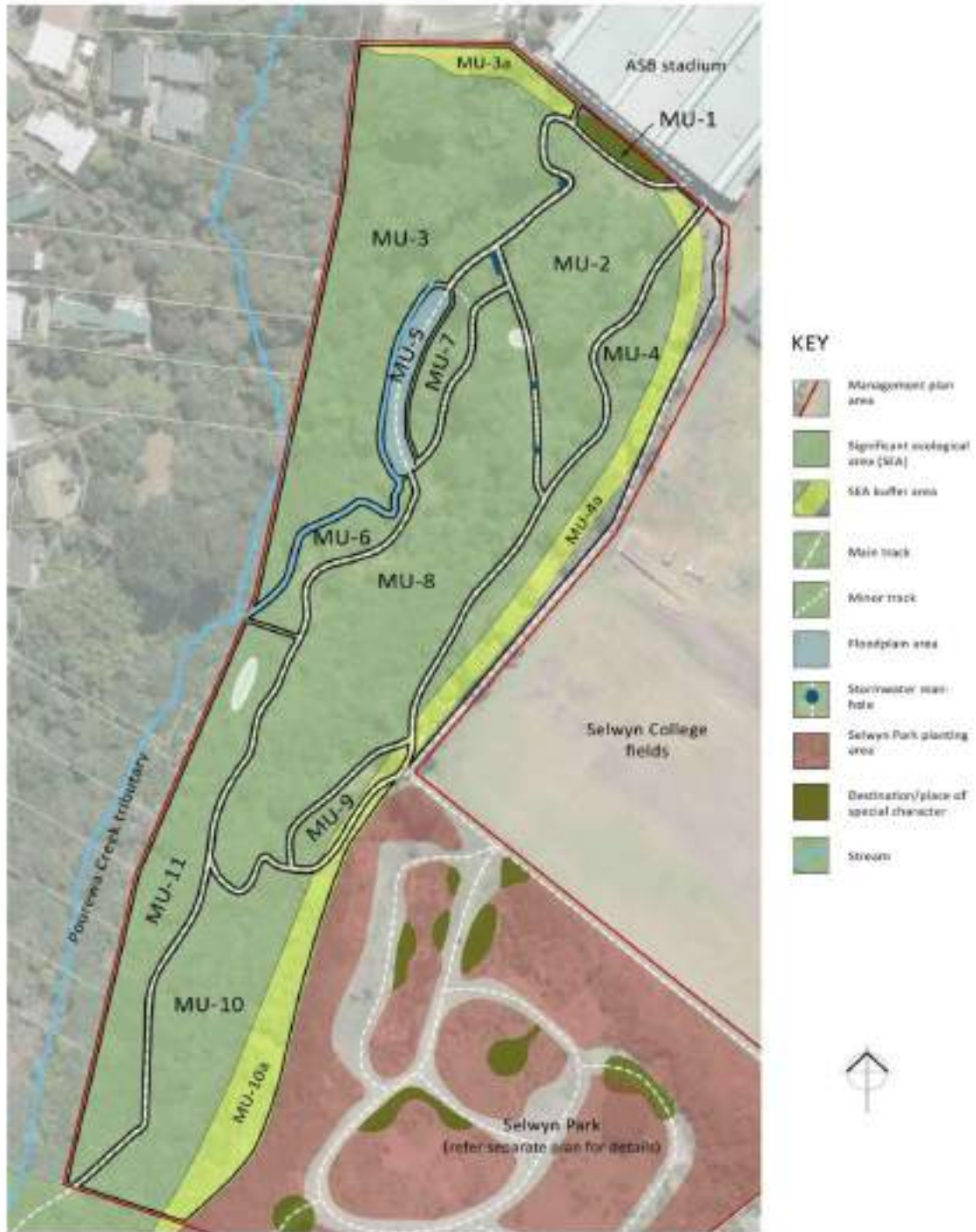
CS = Cut stump

Gly: Glyphosate (360)

Met =Metsulfuron (eg. Escort)

Tri = Triclopyr (eg Grazon)

14.5 APPENDIX E: Management Unit Plan

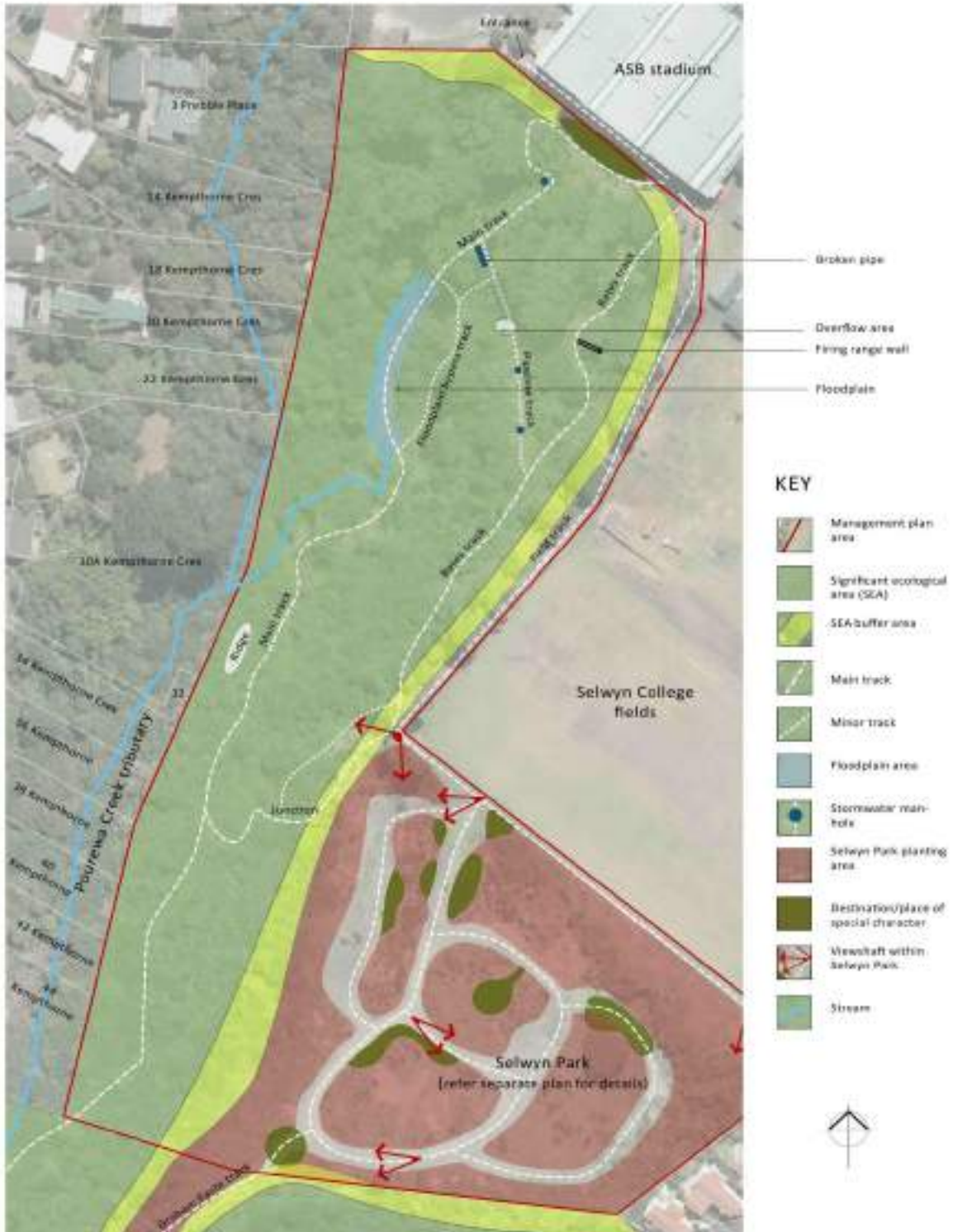


Selwyn Bush - management units

Scale: 1:2000 @ A4
 Date: Nov 2013
 Drawing no: 09
 Version: 02
 Drawn by: PMS



12.6 APPENDIX F: Tracks and Features



Selwyn Bush - tracks and features

Scale: 1:2000 @ A4
 Date: Nov 2013
 Drawing no: 02
 Version: 01
 Drawn by: 188



12.7 APPENDIX G: Selwyn Park – the adjacent native garden of mixed native species and native horticultural varieties and hybrids



KEY

- | | | |
|-----------------------------------|---------------------------|--|
| Management plan area | Main track | Destination/place of special character |
| Significant ecological area (SEA) | Minor track | Selwyn Park view shafts |
| SEA buffer | Selwyn Park planting area | Stream |



Selwyn Park

Scale: 1:200 @ A4
 Date: Nov 2013
 Drawing No: 04
 Version: 01
 Drawn by: 188



