

## ATTACHMENT L

### Five-year outcomes for restoration of the Kate Valley Conservation Management Area.

Outcome 1: Appropriate restoration planning has been implemented.

Explanation: The size of the conservation area being managed (c. 300 ha), the public interest in this area, and the diversity of management actions needed to meet the 35-year goals requires formalised management planning and review to be undertaken on an annual basis.

Performance indicator: The Kate Valley Conservation Management Area restoration plan has been completed, as have annual work plans, and the implementation of the restoration work has been reviewed annually.

Outcome 2: The ecological integrity of both the existing remnants of native woody vegetation and the restoration plantings has been secured.

Explanation: At present the area is heavily grazed by cattle and sheep which are having a significant adverse impact on ecosystem condition, especially through hindering natural successional processes. Additionally, domestic stock will have a significant adverse impact on restoration plantings should they have access to planted areas. Removal of all domestic stock is therefore a high management priority.

Performance indicator: The Kate Valley Conservation Management Area is free of all domestic stock, and if they do enter the area, they have been quickly and efficiently removed and the reasons for their ingress (e.g., damaged fence) has been remedied.

Outcome 3: The Kate Valley Conservation Management Area is kept free of high priority animal pests, while other animal pests are controlled to levels that do not threaten the restoration or other values of the area.

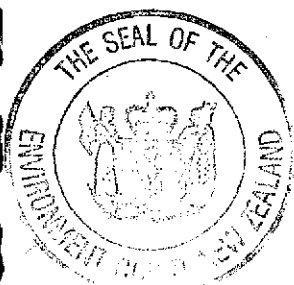
Explanation: Animal pests are the single biggest threat to the success of ecological restoration, as well as natural successional processes. Herbivores can significantly affect the growth of plantings and natural regeneration while predators have devastating impacts on fauna.

Performance indicator: Kate Valley has been kept free of the high priority animal pests identified in the restoration plan, or if they have established, they have been quickly and efficiently removed.

Outcome 4: Plant pests are controlled to levels that do not threaten restoration or other values.

Explanation: Plant pests also threaten the viability of both regenerating forest and restoration plantings, especially through competition, although this plan is pragmatic and recognises that not all exotic plants are necessarily pests. In fact, the restoration plan works with gorse to assist restoration.

Performance indicator: Key plant pests identified in this plan are controlled to a level that do not threaten the restoration or other values of the area.



Outcome 5: Restoration plantings covering an area of at least 5 ha are growing vigorously, and strategically located enrichment plantings have been established as plants become available.

Explanation: One of the primary objectives of restoration is to establish plantings to enhance connectivity between existing native shrubland and forest remnants and to enhance the black beech remnant. This outcome sees this area amounting to at least 5 ha in five years time. In addition, it is proposed to establish enrichment plantings of key native species such as totara, matai and kowhai to facilitate long-term succession and to provide food resources for native birds.

Performance indicator: The planted area exceeds 5 ha with planting survival >50%, and some enrichment plantings have been undertaken.

Outcome 6: A biodiversity monitoring programme has been established that enables the success of the restoration programme to be quantitatively assessed.

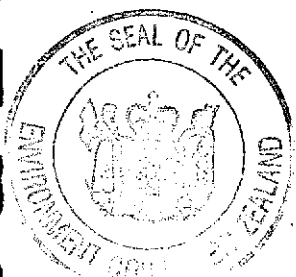
Explanation: Monitoring is an integral part of restoration management as it allows the success of the methods being used to be assessed, and adapted as appropriate, and it provides a means to report on this success to the various groups with an interest in restoration. Monitoring, however, needs to be carefully targeted to ensure that it can supply meaningful information that informs management without being an unreasonable part of the cost of restoration.

Performance indicator: A monitoring programme will have been established and all base-line monitoring completed and, as appropriate, re-measurements undertaken.

Outcome 7: The community of interest, including both the local Waipara community as well as the broader community and are well informed about the restoration project.

Explanation: Restoration is an exciting activity, especially as the outcomes are almost always positive (cf., some threatened species work) and results can be seen in only a few short years. However, there has been considerable concern with the Kate Valley landfill proposal and it is likely that there will be residual scepticism carried through from this to the restoration project. An increase in awareness of the restoration project will therefore hopefully result in an increase in support for restoration, and in the longer-term the use of the project for educational and scientific purposes.

Performance indicator: Appropriate methods have been used to increase the awareness of the community of interest in the Kate Valley restoration project including signage on the Mt Cass Road, production of a regular newsletter and establishment of a web page.



Outcome 8: The Kate Valley Conservation Management Area is being used for passive recreation, and for educational and scientific purposes.

Explanation: The Kate Valley Conservation Management Area has considerable potential for passive recreation (e.g., walking) and the opportunity for the public to access, on foot, a spectacular section of coastline not normally accessible, as well as to view native forest ecosystems and some unusual geological features. In addition, the conservation area provides considerable educational and research opportunities.

Performance indicator: A walking track has been established that links Mt Cass Road with the coast and the Kate Valley Conservation Management Area is being used at least twice per year by school/tertiary institute for educational purposes and at least two scientific studies have been established in the area.



**ATTACHMENT M****Likely constraints to the restoration of the Kate Valley Conservation Management Area.**

Constraint: Climate is likely to limit natural regeneration and restoration through low soil moisture availability and frost. The annual rainfall for Kate Valley is 921 mm (1986-2000 average). Soil moisture deficits are common during summer and during some years can lead to marked dieback in native vegetation. Natural regeneration into grassland and restoration plantings are particularly vulnerable, especially during the initial stages of establishment. Soil moisture levels are strongly affected by the present vegetation. In particular, soils under dense grass swards are very dry because the dense grass root mat quickly takes up any water that reaches the ground. In addition, winter frost can be a major source of mortality for some species in restoration plantings, especially for species such as ngaio and akeake.

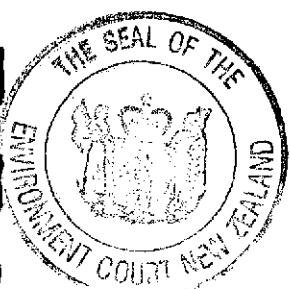
Response: While mortality of natural regeneration can occur during particularly dry summers, the increasing cover of both native and exotic shrubland across Kate Valley in recent years (Section 9) suggests that this is not a major limitation. The primary response to dealing with soil moisture deficits and frost in the restoration plantings is to only use plants adapted to conditions in Kate Valley, including sourcing all plant material locally. Additionally, all plants will be hardened off before planting, planting will be timed to occur so that plants are well established before summer droughts but are not planted until after the worst of winter frosts, herbicide will be used to kill the grass sward before planting, and hand weeding and mulches will be used after planting as required to reduce competition for water. Watering will also be used during particularly bad droughts.

Constraint: Because of the frequent occurrence of long dry periods during summer, and the presence of gorse shrubland which burns readily, a wildfire could rapidly sweep through the Kate Valley Conservation Management Area destroying restoration plantings and natural regeneration.

Response: Ensuring that no burn-offs occur elsewhere on Transwaste Canterbury Ltd. land, liaising with adjacent landowners about the threat of burn-offs to restoration, informing the public of the fire danger through appropriate signs and other means, enforcing a total open fire ban in the conservation area, and maintaining water reservoirs for fire fighting purposes.

Constraint: Because adjacent land uses include pastoral farming and forestry, neighbouring spraying has the potential to damage natural regeneration and regeneration plantings if drift occurs.

Response: Liaising with adjacent landowners about the threat of spray-drift to restoration, and ensuring that any spraying undertaken on Transwaste Canterbury Ltd. Land (e.g., associated with plantation forestry) does not impact on the restoration area..



Constraint: Grazing by domestic stock (sheep and cattle) is presently a major limitation to natural regeneration, with most areas of regenerating forest and remnant forest having severely grazed understories. In addition, domestic stock can quickly destroy young restoration plantings if they gain access to these.

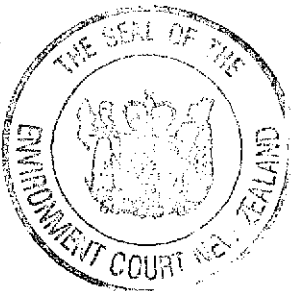
Response: All domestic stock will be removed from the Kate Valley Conservation Management Area at the start of the restoration project and fences will be regularly inspected to ensure that they do not gain entry in the future. Should domestic stock be found in the restoration area, they will be quickly removed.

Constraint: One of the major factors likely to limit restoration success, including through natural regeneration, is browsing and predation by introduced animals, especially possums, ungulates (deer and goats), lagomorphs (rabbits and hares), mustelids (stoats, ferrets and weasels) and rodents (rats and mice). Browsing reduces viability and growth rates of plants, especially young ones, while the impact of predation on invertebrate, reptile and bird species influences restoration success as these species play a key role in ecosystem processes such as pollination, seed dispersal and nutrient cycling.

Response: An ongoing and comprehensive animal pest control programme will be undertaken within the Kate Valley Conservation Management Area. In addition extensive animal pest control will be undertaken in association with landfill management.

Constraint: Introduced plant species have the potential to severely limit the restoration success. A number of grass species are highly invasive and competitive (e.g., browntop and cocksfoot) and can lead to the loss and poor health of plantings. There is considerable potential for invasive woody species already present, or present in adjacent areas (e.g., hawthorn, European broom, wilding conifers, willow and old man's beard) to expand their range and dominate large areas of Kate Valley.

Response: Grasses will be sprayed prior to the establishment of restoration plantings to reduce competition, while some hand weeding together with mulches will be used to reduce subsequent grass growth. Regular surveys and control operations will be undertaken for other identified problem weeds, especially woody weeds, with the aim of eradicating those species identified as a management priority.



Constraint: Several studies have commented on the importance of using planting stock of local genetic origin in restoration projects<sup>75</sup> because of concerns about local adaptation and maintenance of genetic integrity of existing plant populations. Planting of non-local material may result in loss of local adaptations (e.g., to particular environmental conditions) and eventually could lead to loss of overall genetic variation within particular species. It is therefore prudent to use plant material of local origin as local plants will be better adapted to local conditions than non-local plants (e.g., resistance to salt spray) and as a safe-guard for maintaining genetic diversity.

Response: To ensure that plants are adapted to local environmental conditions and to minimise the loss of genetic variability only locally sourced planting material will be used for the restoration plantings (preferably from within the Kate Valley Conservation Management Area or, when not available, from the coastal flanks of the southern part of the Motunau Ecological District).

Constraint: In using seed for propagation a key constraint for some species is year-to-year variation in seed production (called masting). Beech in particular is mast seeding<sup>76</sup>, with years of heavy seed production separated by several years with little or no seed production.

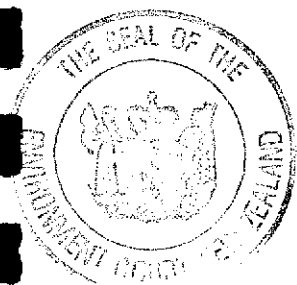
Response: Where seed is to be used as the basis for plant propagation, consideration of mast years will be undertaken as part of propagation planning. In addition all efforts will be made to utilise plant material from Remnant "A" over the 10-year period before it is removed.

Constraint: The development of associations between planted species and various mycorrhizal fungi is important for restoration success. Mycorrhizal fungi are associated with plant roots and play a key role in nutrient uptake for many native plants. The importance of mycorrhizal fungi in restoration plantings is poorly understood, although research suggests that an absence of mycorrhiza may be a limiting factor for some species including beech and kanuka.

Response: Problems associated with mycorrhizal infections do not usually occur with natural regeneration, but can be an issue for plantings. Where possible, nursery propagation of seedlings for restoration will include inoculation with forest organic matter sourced from Remnant "A" to ensure the presence of mycorrhiza (especially for beech and kanuka). In addition, coarse woody debris from Remnant "A" and forest organic matter will be

<sup>75</sup> Timmins, S. & Wassilieff, M. 1984, Register of protected natural areas in New Zealand. Department of Lands and Survey, Wellington; Simpson, P. 1992. Sustaining genetic integrity through restoration using local plant provenances. Pages 336-346 in Proceedings of the International Conference on Sustainable Land Management. Hawkes Bay Regional Council, Napier; Harris, W. 1997. Some perspectives in plant genetic variation and ecological restoration. Pages 26-30 in (eds) M.C. Smale and C.D. Meurk. Proceedings of a Workshop on Scientific Issues in Ecological Restoration. Manaaki Whenua Press, Lincoln.

<sup>76</sup> Allen, R.B. and K.H. Platt. 1990. Annual seedfall variation in *Nothofagus solandri* (Fagaceae), Canterbury, New Zealand. *Oikos* 57:199-206.



collected prior to the removal of Remnant "A" and spread through areas of restoration plantings and regenerating forest to facilitate the spread of indigenous biodiversity and/or to provide habitat for indigenous species to utilise.

Constraint: A key premise of restoration is that management will speed up the natural process of succession by establishing a cover of woody plants that will encourage the development of mature shrubland and forest. While some of the species that occur in these forests are wind pollinated and dispersed, many require birds for either pollination and/or dispersal. The importance of birds for dispersing seeds into restoration plantings has been highlighted in several studies. However, severe predation pressure appears to have reduced bird numbers to levels that may be limiting these processes and hence have the potential to limit restoration success. Furthermore, a diversity of plants is required to support viable bird populations in Kate Valley, especially in order to provide seasonally scarce food resources (e.g., at times when flowers or fruit are naturally scarce).

Response: Undertake predator control to reduce direct impacts on indigenous birds and through the strategic planting of key food resources for these birds where they are considered to be insufficient.

Constraint: The success of the Kate Valley Conservation Management Area restoration programme will not be realised for many years after the end of the life of the landfill. There is therefore potentially uncertainty over the long-term security of the restoration site beyond this time-frame.

Response: The Kate Valley Conservation Management Area will be covenanted through an appropriate organisation (e.g., QEII National Trust) to ensure that the tenure of the site as a conservation area is secured in perpetuity.

