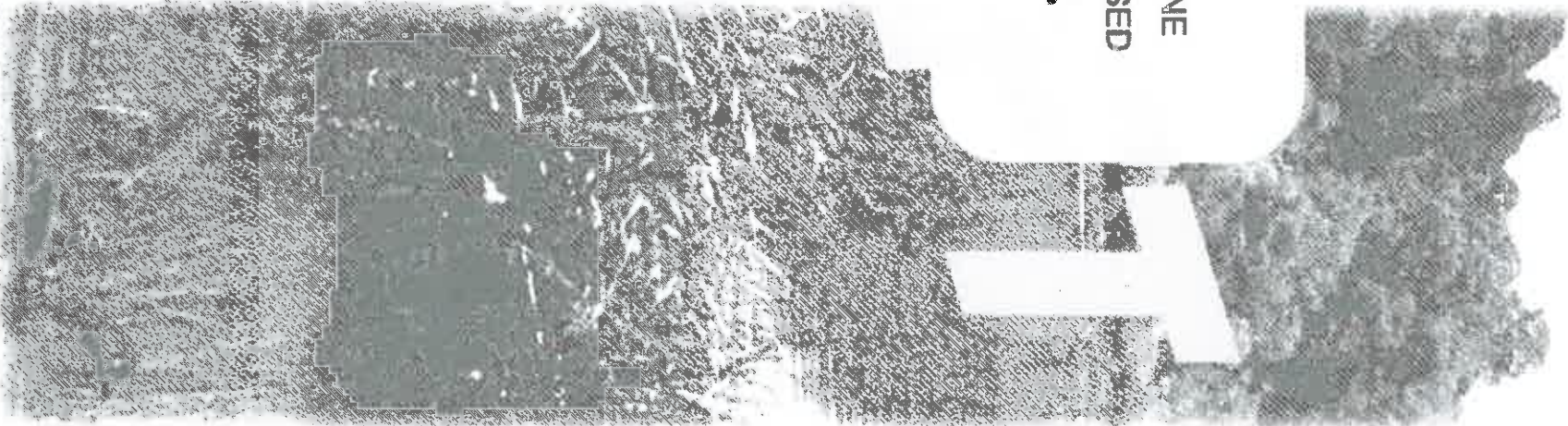


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**ECOLOGICAL ASSESSMENT AND DUNE  
RESTORATION PLANS FOR A PROPOSED  
CARPARK FACILITY, CASTLEPOINT,  
WAIRARAPA**

**APRIL 2009**

**Contract Report No. 2195**

**Prepared for:**

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## 1. INTRODUCTION

The iconic Castlepoint Scenic Reserve is a focal point for many visitors to this popular beach area, with an historic lighthouse reserve nearby and extensive coastal panoramas. In line with increasing visitor numbers and their expectations the Department of Conservation (DOC) wishes to renovate the existing unsuitable and dilapidated car park area adjacent to the St Peters by the Sea Church. An additional aim is to provide high quality conservation information relevant to the area, and to sustainably manage this iconic beach reserve and the many pressures on it, in a progressive manner, addressing various pressures, while working with community concerns and aspirations.

The dunes within the study area are overwhelmingly dominated by the exotic species marram (*Ammophila arenaria*), along with smaller populations of lupin (*Lupinus arboreus*) on the dune back slope. These plants have induced the formation of unnaturally high dunes, prone to erosion on the steep ocean-front face principally due to lack of a tolerance to saltwater inundation, and poor ability for colonisation and slow lateral extension rates (Plate 1).

Early records do not indicate when marram was introduced to this site, but historic photos indicate this may have occurred in the late 19<sup>th</sup> century, with marram clearly dominating the dune landscape by the 1920s (Plate 2). This photograph shows the negative impacts of marram, with the ubiquitous lack of growth on the ocean-front dune face and the many erosional turret formations. A similar view is shown in Plate 3, some 80 years later, illustrating the erosional effects of marram domination. Normal coastal processes were interrupted by marram, and erosion problems consequently became the new norm, with dunes and the beach retreating landward in excess of 50 m during the intervening period.

The marram-dominated dune currently occupying much of the proposed car park area requires some reduction in height, with sand to be relocated immediately to the east and southeast of the current location. This action will provide an opportunity to restore indigenous dune plants in the immediate vicinity of the new carpark, and to re-establish natural stability to these dunes. Further, the local community and visitors alike will have an opportunity to witness dune restoration in action, and become acquainted with the many practical and ecological benefits of having indigenous dune plants returned to this at-risk environment. This progressive project will provide the following benefits:

- Improve views to the southern ocean for parishioners of the nearby church;
- Utilise the most satisfactory site for the carpark;
- Allow staged development of this facility, if required;
- Provide an opportunity for restoring this dune with functional indigenous plants;
- To provide a wide and naturally stable dune buffer along this beach;
- Reverse the current process of erosion of sand to natural accretion;
- Provide opportunities for visitor education;
- Initiate many improvements to dune ecology as an example for visitors.

This report addresses opportunities that exist at this site for improvement of:

- Dune ecology
- Dune stability and natural function
- Dune integrity
- Community awareness of the role and positive impacts of natural dunes.

Sand dune systems are amongst the most degraded natural environments in New Zealand (native duneland has been reduced to 11.5% of its original cover; DOC 2009), and this project will provide an educational opportunity for the many visitors to this site every year.

## 2. PROJECT BRIEF

### 2.1 Part 1

The Department of Conservation requires a detailed restoration plan to implement for the rebuilt dune while addressing the following:

- Successful, sustainable dune restoration techniques for the dune in front of the carpark, including provision of low-impact beach access;
- Restoration of the dune to enhance and improve the natural coastal processes;
- Establishment of a foredune that is low maintenance and self-sustaining, while at the same time providing protection for the carpark from erosion by wind or sea;
- Provide a plan that can be utilised and embraced by the community;

### 2.2 Part 2

The Department of Conservation requires best-practice advice regarding restoration of the sand volume to be relocated and thus prone to wind erosion subsequent to the necessary earthworks associated with the new carpark.

## 3. METHODS

- A site visit was undertaken in conjunction with Department of Conservation staff.
- The site was assessed in terms of opportunities to utilise best practice dune management techniques.
- A consultative public meeting was facilitated on 12 April 2009.
- A project plan was prepared for use as a 'blueprint' for future implementation.



#### 4. SITE DESCRIPTION

The dune system at Castlepoint is unnaturally high - over 15 m above sea level - due to domination by marram, a situation which has permitted wind and wave erosion to continue over time (see Plates 2 & 3). This state was very likely induced by the early impacts of dune grazing and burning reported by Cockayne (1911). The response to these detrimental impacts common at the time was to introduce and plant a range of exotic species to ameliorate the worst effects of the 'sand menace'. Species such as marram, lupin, and various *Pinus* species were all introduced in the mid-late 1800s in attempts to solve the many and calamitous erosion problems (Cockayne 1911).

The dune profiles at Castlepoint today are rather typical of failed efforts to repair the large-scale degradation of the natural dunes of New Zealand. The excessively tall, barren, and steep front faces of these dunes have developed due to the presence of marram, which did slow erosion processes, but the dunes and waves are still moving inland over time. Loose sand along the steep, non-vegetated dune faces is blown along the beach by frequently strong southerly, or west to north-west winds, and then lost from the beach system (Plates 4 & 5). Left in this condition, the dune remnant will, over time, continue this trend of ongoing erosion.

This is in contrast to dunes dominated by indigenous sand-binding species which trap and maintain sediment into naturally lower, wider, and more resilient dune profiles. Dune restoration will mitigate, or more probably reverse the largely human-induced trend for erosion. Encouraging examples of restoration plantings have already been implemented in this location by DOC and the plants have responded positively.

#### 5. VISION

The following vision is suggested for the DOC-administered scenic reserve dune land at Deliverance Cove, Castlepoint Beach:

*To restore a naturally stable dune system, over time, along the length of Deliverance Cove, starting with reversal of existing marram-induced erosion and mitigating the effects of establishing the proposed carpark for the benefit of the beach and community, and for improvement of indigenous biodiversity.*

#### 6. RESTORATION CONCEPTS AND METHODS

##### Timing

It must be stated at the outset that restoration of natural dune function at this site would be more securely achieved if this had been initiated some years before now. However, utilisation of the methods outlined below is likely to achieve a successful outcome.

### History of Dune Restoration

Dune restoration in New Zealand using indigenous duneland species was first attempted in 1993. Subsequently, it has proven to be the most reliable and cost-effective method of controlling and reversing many coastal erosion problems, by ensuring that dunes regain their natural storm buffer function. Successfully restored dunes are increasingly resilient and are prograding (i.e. building forward or seaward by sand deposition and accumulation) and, most importantly, are increasing the widths of adjacent beaches. Current research indicates that this process is the most significant and sustainable advance made in coastal management practice to date (Jenks *et al.* 2007).

### Dune Resilience

Restored dunes have the ability to become increasingly resilient to storm attack as sand accumulates in the seaward edge of the dune. Indigenous dune plants are salt-tolerant and their deep roots help to prevent damage to dune faces during storm surges. A study undertaken in association with Waikato University has revealed that tolerance of damaging storm surges improves with dune accretion (i.e. elevated foredune height and run-up slope) and increased dune resilience, which can be gauged using a device to measure sand porosity (with increased porosity being directly correlated to presence of indigenous dune plants (de Lange and Jenks 2007). Over a period of 5-10 years, with appropriate establishment of indigenous dune plant cover, dunes can again function as an effective 'shock absorber' for the band of sand between the sea and the land (Plate 6).

### Community-Led Programme

Dunes restored by community-led programmes are currently the most affordable coastal management option known, costing <1% of seawalls. Most seawalls currently cost \$3-5 million/km and generally fail after 20-30 years (Jenks *et al.* 2007). However, to ensure success in this challenging and extreme environment, care is necessary in planning and implementing these programmes. Central Government has now recognised the urgency for dune restoration by making sizeable funds available for this purpose.

### Key Roles of Indigenous Sand-Binders

The project area will benefit considerably from restoration of dune habitats. Much has been learned about many of the positive aspects of dune restoration in recent years (Jenks 2006). It is now clear that the indigenous foredune species suggested, in this report, for use at Castlepoint are some of the *keystone species* for New Zealand sand dunes: their presence or absence affects all other dune plant and animal communities *landward* of the foredune toe. Foredune species are therefore essential for 'normal' dune function: including maximising sand accretion and minimising cross-shore sand exchange during storms. Their absence ensures that erosion processes will continue to be dominant. When these species are able to dominate the foredune complex, noticeable positive effects begin to emerge after only 3-5 years, as beach slopes rise to increasingly compel storm surges to run-up against gravitational forces before reaching the toe and gentle slopes of the raised foredune.



The simple process of removing velocity from wave surges has a profound effect on the integrity of the seaward dune slope. This reduction in velocity combined with the high salt-tolerance of foredune plant species, plus their extensive fine-root exploration of the sand mass, and the exceptional sand-trapping ability of their sparse foliage, soon allow dune processes to improve significantly.

Over time, sand accretion by these plants starts to reduce erosion, even during storm events. These effects compound to provide increasing resilience through the storage of newly-arrived aerated sand (through saltation<sup>1</sup> and with a high porosity value) in the seaward 5-6 m of foredune during the early stages of a storm. If, 12-24 hours later, wind-induced waves surge up the beach and reach the dune toe, much of their velocity will have been reduced and their volume partially absorbed by the porous sand which then returns to sea sub-surface, minimising back-wash erosion. Restored dunes thus become increasingly resilient, and are able to absorb energy generated by even the most severe storms. These pivotal processes are now understood more comprehensively, and have been reported in the National Hazardscape report (Department of the Prime Minister and Cabinet 2007), at the New Zealand Coastal Society Conference (de Lange and Jenks 2007), and are the subject of a 2009 Marsden Fund research proposal.

#### Weather Patterns

La Nina conditions experienced over the last nine years, combined with marram domination of the dune, are likely to have increased the dune erosion problem, with winds more frequently emanating from a north-easterly direction, causing increases in storminess and sea levels on the east coast. The dune at Castlepoint is not in a state that is resilient enough to cope with these weather pressures, and so has responded by undergoing ongoing erosion.

## 7. REQUIREMENTS AT DELIVERANCE COVE

Restoration of natural function and resilience is the key to the long term survival of the large degraded dune system at Deliverance Cove. To achieve this goal, replacement of the existing marram and lupins with colonising indigenous dune species is pivotal. The proposal to establish a carpark in this area allows an opportunity to achieve this goal. Dune lowering and marram/lupin removal can be implemented as a consequence of car park development, effectively spreading the otherwise large costs involved.

Successful dune restoration at Deliverance Cove is a substantial undertaking and will require the following elements:

- An adequate budget;
- Careful planning;
- Close liaison with the local community;

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<sup>1</sup> The 'leaping' movement of sand particles as they are transported by wind or water.



- Control of exotic plants, particularly marram;
- Rabbit control;
- Dune reshaping/recontouring;
- Indigenous planting;
- Monitoring;
- Follow-up maintenance works;
- Project review.

Separate sections are provided below on:

- Community involvement;
- Control of exotic plants;
- Rabbit control;
- Dune reshaping;
- Planting plan;
- Beach access.

This is followed by a summary of the dune restoration plan.

### 8. COMMUNITY INVOLVEMENT

Restoration of indigenous dune species can seem easy, and certainly does have an element of ease if the proven procedures are followed closely. However there have been cases of restoration project failure, or unnecessary complications resulting from fundamental mistakes, usually through failures to plan ahead adequately.

Formation of a local volunteer care group is recommended, as these groups have proven to be a very effective means to empower the people who care most about 'their' beaches, so that they can take charge of the restoration process. Suitable facilitation and establishment of a Castlepoint dune care group is suggested, for several reasons:

- a number of suitable people are domiciled in this beach community
- there is a passion for beach improvement amongst the community
- this area is located at an unsuitable distance from Masterton for most other options to be viable.

Therefore this must be the first initiative taken to achieve the goal of sustainable dune management. Demonstration of the achievements of other successful groups (e.g. Riversdale) is a most important step, to give new groups a vision of a more attractive and sustainable future. It is essential to ensure that new groups understand the reasons for using indigenous dune plants, to avoid negative misconceptions or misinformation.

## 9. EXOTIC PLANT CONTROL

Any competition from weeds should be controlled before earthworks and subsequent planting, and for a period of 2-3 years post-planting, to encourage successful establishment and dominance of indigenous dune plants. Satisfactory weed control during this period can be achieved relatively easily by careful prior planning and implementation.

Marram and lupin are the most common adventive plant species requiring control. To achieve satisfactory control, two applications of herbicide will be required:

- February/March - (Glyphosate and Gallant mix, at label rates); and
- Just prior to commencement of earthworks in May (use a Glyphosate and Gallant mix, to control any regrowth, particularly of marram).

Planting can commence after weed control has been achieved and promptly after earthworks are completed, to minimise the period when sand is left bare of vegetation.

## 10. RABBIT CONTROL

Rabbits (*Oryctolagus cuniculus*) are the main pest animal species that can compromise dune restoration activities. There is evidence of rabbit presence at Deliverance Cove beach.

Control using Pindone is the most reliable and successful strategy, if implemented with due care. The best timing is late autumn, when the weather is more settled, competing food sources are reducing, there are fewer people about, and before plantings commence. Extreme care must be exercised to avoid non-target impacts. The following plan has been used on beaches close to large human settlements (>20,000 people) and has proven to be successful.

Engage a local operator with the correct applicators licence, and ensure that the contractor is willing to utilise the skills of local volunteers. The local Medical Officer of Health (MOH) must be notified of the intention to use Pindone at least six weeks prior to the operation. As this is land managed by the Department of Conservation (DOC), early discussions will be necessary to ensure agreement with the proposals and to allow time for preparation of an Assessment of Environmental Effects. During the time period this will involve, the wider community must be advised of the impending programme. Newspaper advertisements and mailbox flyers are important, along with public and personal meetings with any concerned residents, if required. During this phase, it is critical to engender ~~community support~~ support for the control programme. Close liaison with a beach care group of the need for rabbit control is an important element, so that these people can be the first point of contact for any apprehensive members of the community. Public notices of the control programme will need to be posted closer to the time, at the request of the MOH.

The control programme should be managed by the contractor but involve local volunteers where possible, for example to lay and collect baits. This ensures that the 'local knowledge' of the community and the trust of neighbours can be utilised to the

greatest extent. Too many operations have been compromised due to contractors based some distance away from a site only undertaking pest control when they 'can fit it in'.

One pre-feed with non-toxic bait is an important tool to identify the density and locations of rabbit populations. The areas with higher rabbit numbers can then be supplied with larger amounts of Pindone bait, and areas of lower rabbit density with lesser amounts. To minimise human or pet contact with bait, it is recommended that baits are laid at sunset, and that any remnants are collected at sunrise the next day.

Each site where bait is laid should be marked with a small bamboo stake (or similar) located nearby. This process should be repeated at 3-5 day intervals, with baits laid in response to uptake until few baits are taken or signs of fresh activity cease. Most rabbits will end their days underground in burrows, further limiting the risk to people and pets. Following these guidelines will result in the safest implementation of control, while also ensuring maximum effectiveness.

## 11. DUNE RESHAPING

The car park project near St Peters by the Sea Church will require the movement of a large quantity of sand (c.15,000 m<sup>3</sup>), of which most will be required to form the new dune seaward of this development

Earthworks should only be undertaken in autumn, which is generally a more settled time of the year, when rains after the summer dry period often allow planting to commence safely, in late May/June.

Prior to earthworks commencing, the existing exotic plants will require implementation of thorough control, to ensure that re-establishment is minimised after the sand is relocated (see section on control of exotic plants above).

Only when all weeds have been controlled should dune reshaping commence, and then be completed in a timely manner. Rapid relocation is required of the quantity of sand necessary for the carpark development so that all sand can be uniformly dampened by autumn rains before planting commences. Planting with haste is also necessary at this time, to take advantage of the most suitable conditions for plant establishment, including remaining warmth from the sun and early winter rain. There is only a small window of opportunity available for maximising the success rate.

The length of dune requiring reshaping may be up to c.170 m, but the development can be easily limited by staging in accordance with possible budget constraints. The volume of sand available from reshaping, however, necessitates relocation adjacent to the area of dune it has been removed from. This will ensure that reshaping costs are minimised, and sufficient sand volume is present to re-establish a near-natural dune profile.

As sand is taken down to the new level of the carpark (off the high crest) it should be pushed out towards the southeast side, 20-30 m beyond the current limit of marram growth (i.e. c.20 m downslope of existing marram at the northern end of the carpark,

widening out to c.30 m at the southern-most extent). This volume should be placed to fill the existing wind-induced concave dune profile and then graded off into a gentle slope running evenly from the new carpark height down to beach level (Plate 7). This sand will then occupy the same area it was originally blown from, into the increasingly high marram dune over the last few decades. This gradual view-blocking process has been causing considerable concern to the parishioners of St Peters by the Sea.

A modest quantity of sand surplus to this specific use requirement should be made available for the Jetty Road point restoration area (see Wildlands Contract Report No. 2193).

## 12. PLANTING PLAN

Successful restoration of natural coastal processes will largely depend on adherence to the guidelines set out below, presented in two stages:

### Stage 1

An arbitrary estimate of the scale of the first stage of development has been chosen. This is a guide only, and does not reflect any representations made about any likely plans.

Say c.95 m length of carpark was initially developed, from the church down to the first planned pedestrian crossing. The new dune would cover an area of c.2,150 m<sup>2</sup>, requiring 4,300 dune plants (at 2 plants/m<sup>2</sup>).

Place an order for high quality plants in Tinus Root Trainer (RTT) containers of the following species at least 12 months in advance of planting:

Species	No.
Spinifex ( <i>Spiriflex serotus</i> )	3,400
Pingao ( <i>Desmoschoenus spiralis</i> )	900
<b>Total</b>	<b>4,300</b>

Spinifex and pingao should be interplanted, to emulate natural community structure.

### Planting Techniques

Experience indicates that indigenous dune species establish most reliably from Tinus Root Trainer (RTT) stock (Plate 8). The resulting plants are tall and vigorous (top growth must be greater than 40 cm above potting mix level), with roots pre-disposed to grow deeply and so seek suitable moisture before the summer dry period. Plant deeply to ensure that the potting mix is well below the sand surface (at least 100 mm below), with only about 50% of the foliage showing above ground after planting. A useful practice is to leave a shallow depression around the plant to trap any rain after planting. These techniques will ensure that the root mass is not exposed by wind erosion during establishment (see attached Planting Guide). Collar rot fungi are not normally problematic in the dune environment.

Any variation from these planting guidelines will increase the likelihood of failure.

### Timing of Planting

The optimum period for planting is, ultimately, controlled by the weather, and generally the latter half of May through June is ideal. July, August and even September can still be suitable for reliable growth but the risks of summer failure increase later in the season. This regime applies to all foredune and mid-dune species.

Planting in late autumn/early winter will also ensure that the plants benefit from the lower evapotranspiration demands and higher expected rainfalls that occur during winter, meaning that watering plants or the addition of 'water gel' products is generally not necessary. If plants are placed later and do require watering, care should be taken to avoid over-watering; generally a good soaking once per week is sufficient.

### Fertiliser Requirements

All plantings must include the addition of controlled release fertiliser in the planting hole. This will ensure maximum growth when weather conditions are suitable, minimise leaching, and help plants to overcome/survive the hostile beach environment during the inevitable storms. To promote satisfactory growth, use 30-40 g of coated fertiliser with the following typical composition:

N 20% P 10% K 10%, (e.g. Agproben, Nutri-cote, Plantacote or similar).

A total of 6 x 25kg bags of controlled release fertiliser will be required.

This regime can be followed up 6 and 12 months later (i.e. during spring and early autumn) by surface spreading of urea at a rate of 100 - 200 kg/ha. This should be undertaken before rain, so the fertiliser will be washed into the active root zone of new plants.

### Controlling Wind Erosion

There is always a risk of wind erosion following these operations but this risk can be reduced by planting immediately after dune reshaping and additionally by using pine slash<sup>1</sup> (see below). Further techniques are available to reduce wind erosion problems if required.

### Stage 2

This may or may not be necessary, occurring only if the development of the carpark is staged. An assumption has been made that this work would involve the final c.75m of dune. If this proves to be so, then the new dune would be (in this case) c.2100m<sup>2</sup> in size, requiring 4200 dune plants (at 2 plants/ m<sup>2</sup>).

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<sup>1</sup> Pine slash: branches freshly-pruned from pine plantation during trunk 'lifting' operations.



Place an order for **high** quality plants in Timus Root Trainer (RTT) containers of the following species at least 12 months in advance of planting:

Species	No.
Spiriifex ( <i>Spiriifex serceus</i> )	3,300
Pingao ( <i>Desmoschoenus spiralis</i> )	900
<b>Total</b>	<b>4,200</b>

#### Fertiliser

A further 6 x 25 kg of controlled release fertiliser will be required.

Further applications of urea can be made (again during spring and early autumn) by surface spreading of urea at a rate of 100 - 200 kg/ha. Depending upon the success of restoration, the second autumn addition may be the last urea application necessary.

### 13. MARRAM CONTROL

Active ongoing control of marram in all restoration areas should commence promptly after planting by spot spraying any emerging seedlings with Gallant (at label rates). Gallant tolerant indigenous species can now be safely planted to replace marram without fear of erosion. Wiwi (*Ficinia nodosa*) and wau-ata (*Euphorbia glauca*) are particularly useful in this situation when planted towards the rear of the foredune.

As the dune becomes stabilised and increasingly functional, additional mid-dune plant species should be established near the carpark, adding to the diversity of species, colour and textural appeal for visitors, and for improvement of dune ecology goals for the Department. Species such as tauhinu (*Ozothamnus leptophyllus*), tarakupenga (*Coprosma acerosa*), aueataranga (*Pinetia arenaria*), pohrehue (*Muehlenbeckia astorii*) and horokaka (*Disphyma australe*) are useful additions while marram is being controlled.

This restoration work will lead naturally on to further restoration opportunities as marram is eradicated, by utilising species that are not tolerant of Gallant. Examples include hinarepe (*Austrofestuca littoralis*) and perehia (*Lachnagrostis bilkardierei*).

### 14. BEACH ACCESS

This very important aspect requires careful consideration, as paradoxically, more and easier access routes often achieve greater stability than limited provision. This is largely due to the desire of people to reach the beach by the shortest possible route. If this is not provided, 'they' will create accessways, often randomly and through plantings. Once established these 'informal' tracks can be difficult and time consuming to remove. Therefore access tracks no more than 20 m apart are desirable (closer if possible) and this should be considered during finalising of the engineering plans.



It is important that all accessways are constructed to run due east, to avoid having predominant storm force winds (from the south and north-westerly quarters) blowing and removing sand from along the track, and so eroding the dune. This access direction will provide considerable plant-induced shelter to the access tracks, and coincidentally also provide rapid routes to the beach. Use of sand ladders will not be necessary on the gentle dune slopes created during this development.

All accessways must be marked top and bottom with a pole similar to that shown in Plate 9.

## 15. FENCING

Provision of a visual barrier is an important component of dune restoration projects. Experience has revealed that low, 'psychological' barriers are more effective than tall exclusion-type fences, which are often climbed or broken down. Low stature barriers work in tandem with provision of adequate accessways, to encourage use of the tracks, rather than vain attempts to 'force' people one way or another.

This can be achieved with rope and bollard barriers, which will also have a high level of aesthetic appeal on the beach (Plates 10a & 10b). This style of fencing has two advantages:

- \* Low visual and amenity impact;
- \* These 'psychological barriers' are readily moved forward to keep pace with colonisation of new sand by the pioneer indigenous dune plants.

Bollards and rope materials for barrier construction are widely available, so a local supplier should be able to assist. Bollards can be replaced with No. 2-sized fence posts if costs are prohibitive. Both options should be about 1.4 m long, with the lower 700 mm placed firmly in the ground, holes for rope or cable (discussed below) should be drilled at a point about 1,300 mm from the base (or 600 mm above ground level), and 100 mm from the top. The rope commonly used is a 30 mm diameter polypropylene 'manila' look-alike. This rope is extremely durable, but is not completely vandal proof. If cost or vandalism is problematic, then 6 mm galvanised multi-strand wire cable is a less-cost and more durable option, especially where used in conjunction with No. 2-sized fence posts.

Bollards or posts are best placed at 6m centres surrounding the dune and plantings. On the seaward edge of the foredune, align the barrier about 2 m seaward of plantings, to allow for the initial expansion phase of plant growth. In most situations, ensure that the budget contains sufficient funds for low-cost relocation of the front-dune bollards further seaward every 3-4 years, to keep pace with the colonising dune plants.

The use of these barriers must have community support before placement, so that local people understand the reasons for them and support installation.

## 16. LONGER TERM

As the improvements to dune aesthetics and ecology become apparent to the community, calls may be forthcoming to improve foredune integrity and dune ecology beyond the scope of the carpark facility. Reshaping and planting areas of dune to the south of this initial site may become possible as community confidence increases. Dune function, habitats and community awareness of these important aspects of dune ecosystems will be the benefactors of this initial endeavour.

## 17. SUMMARY OF DUNE RESTORATION PLAN

### Methods

- Finalise plans for the carpark.
- Establish a care group to take control of the restoration operations, under guidance.
- Order sufficient indigenous dune plants from a reliable source.
- Prepare an ABE for rabbit control and prepare a suitable plan, as outlined.
- Order materials for dune planting work, e.g. access markers, fence materials, fertiliser, pine slash
- Engage contractor to control exotic weeds.
- Engage an earthmoving contractor to reshape the dune in a responsible fashion, to specifications supplied by DOC.
- Care group to become engaged in planting indigenous dune species.
- Ensure contractor available to provide follow-up control of any regrowth of competing weed species, such as marram.
- Ensure rabbits are kept at low numbers.

### Programme

- Effectively control the rabbit threat.
- Carefully reshape the carpark dune.
- Promptly commence foredune planting by carefully following the planting guidelines.
- Mitigate the expected impact of wind erosion.
- Apply urea at 100-200 kg/ha on existing plants for the two ensuing years.

### Plants

See Table 1 below for summary of suggested plant numbers.

Table 1: Planting schedule for Castlepoint Jetty Road restoration area.

Location	Zone	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Dellverance Cove	Foredune (+ fertiliser)	4,300	?	4,200?	500	500	Consider future plans in response to five years of progress.
	Mild-dune (+ fertiliser)			200	200	200	

## ACKNOWLEDGMENTS

This project was undertaken for the Department of Conservation, Wairarapa Area Office. Garry Foster and Chris Lester of this office are thanked for initiating this progressive coastal project, and for their time providing a very useful site visit, project liaison, and useful information.

## REFERENCES

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- de Lange W. and Jenks G. K. 2007. Effectiveness of dune restoration for the management of coastal hazards and biodiversity. New Zealand Coastal Society Conference, Tauranga
- Department of Conservation (DOC) 2009: DOC website for Community Conservation Fund.
- Jenks G., Dahm J. and Bergin D. 2007: Chapter 6 Coastal systems and low lying areas. Climate Change 2007: The Physical Science Basis, Intergovernmental Panel on Climate Change (IPCC) 4<sup>TH</sup> Assessment Report.
- Jenks G.K. 2006: Back to the future: the functional and aesthetic superiority of New Zealand's native dune plants: New Zealand Plant Conservation Network Conference, Auckland University.
- National Hazardscape Report 2007. Department of the Prime Minister and Cabinet, 140 pp.
- Wildland Consultants 2008: Ecological advice for dune frontage restoration at a proposed carpark and visitor facility, Castlepoint, Wairarapa. *Wildland Consultants Ltd contract Report No. 2057*. Prepared for Department of Conservation, Masterton, 8 pp.
- Wildland Consultants 2009: Assessment of ecological effects of a proposed seawall extension at Castlepoint, Wairarapa. *Wildland Consultants Ltd Contract Report No. 2193*. Prepared for Department of Conservation, Masterton.

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**APPENDIX 1**





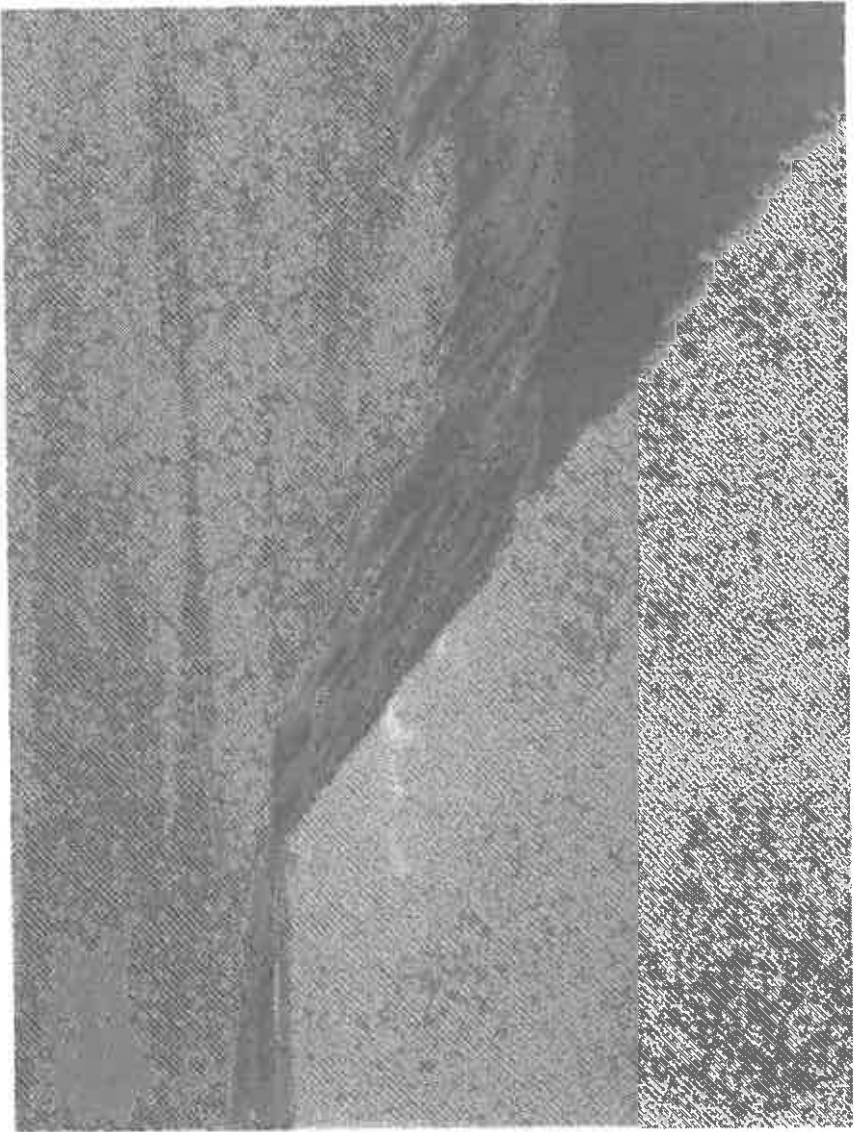


Plate 1: Steep faced marram dune lacking plant growth at toe.

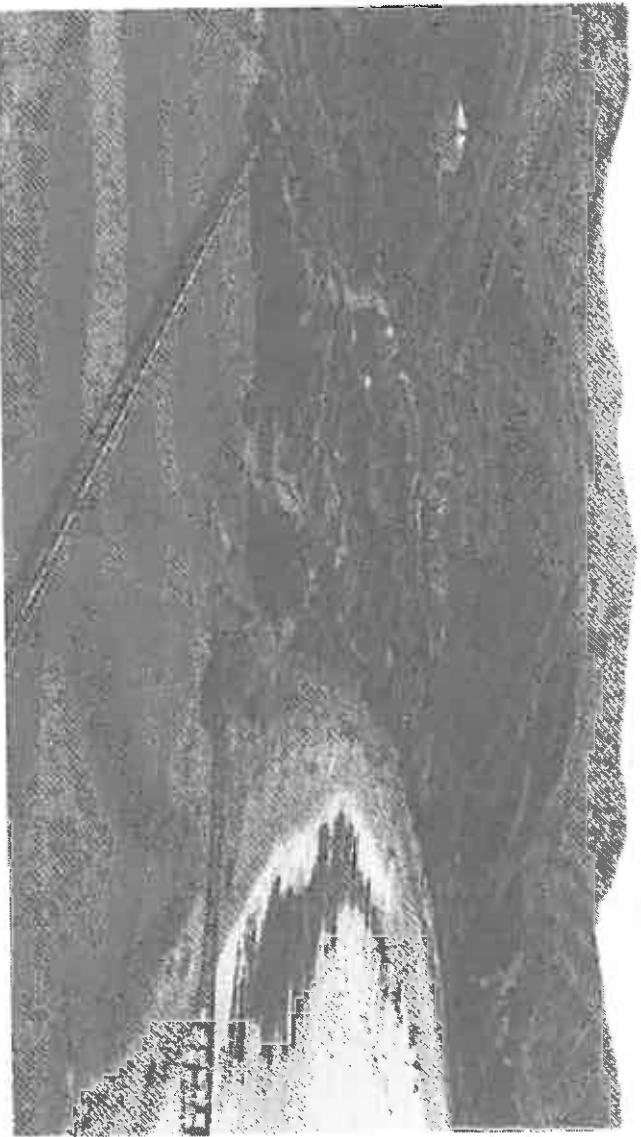


Plate 2: Township and marram dominated dunes 1920s.



**Plate 3: Current state of Jetty Road beach 2009. Compare to Plate 2.**



**Plate 4: Typical, problematic wind erosion of the martram dune.**

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Plate 5: Losses of the finite sand resource, seen here blowing up and over the lighthouse reef complex to the open ocean.



## SHAW ROAD, WAIHI BEACH Restoring the Protective Dune Barrier

2002



Many years of damage to natural dunes resulted in ongoing erosion. The rocks and seawall were placed here during the 1970s to provide a sense of protection for the property owners. The first restoration plantings of native dune species occurred here in 2003.

2008



Using increasing knowledge of sustainable coastal management techniques, this dune is now undergoing restoration with functional dune plants. The remnants of the seawall and rocks are now buried beneath the increasingly wide and protective dune. This photo shows the amount of accumulated sand just two years after the initial plantings occurred. Dune building will continue.

Plate 6: Shaw Road dune restoration, 2006.



Plate 7: Concave dune face induced by wind erosion.

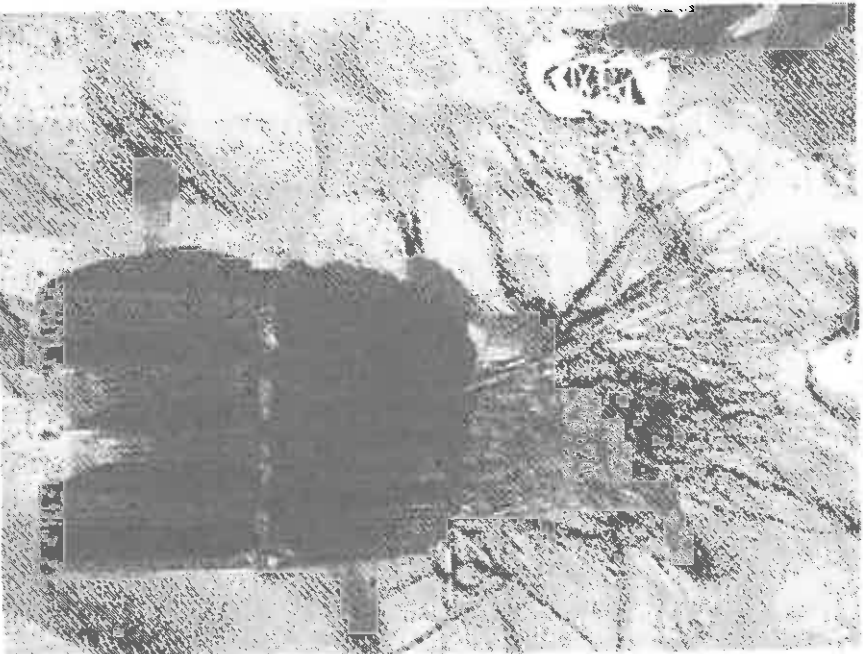


Plate 8: Spintex grown in RTT containers.





Plate 9: Example of a suitable beach access marker.

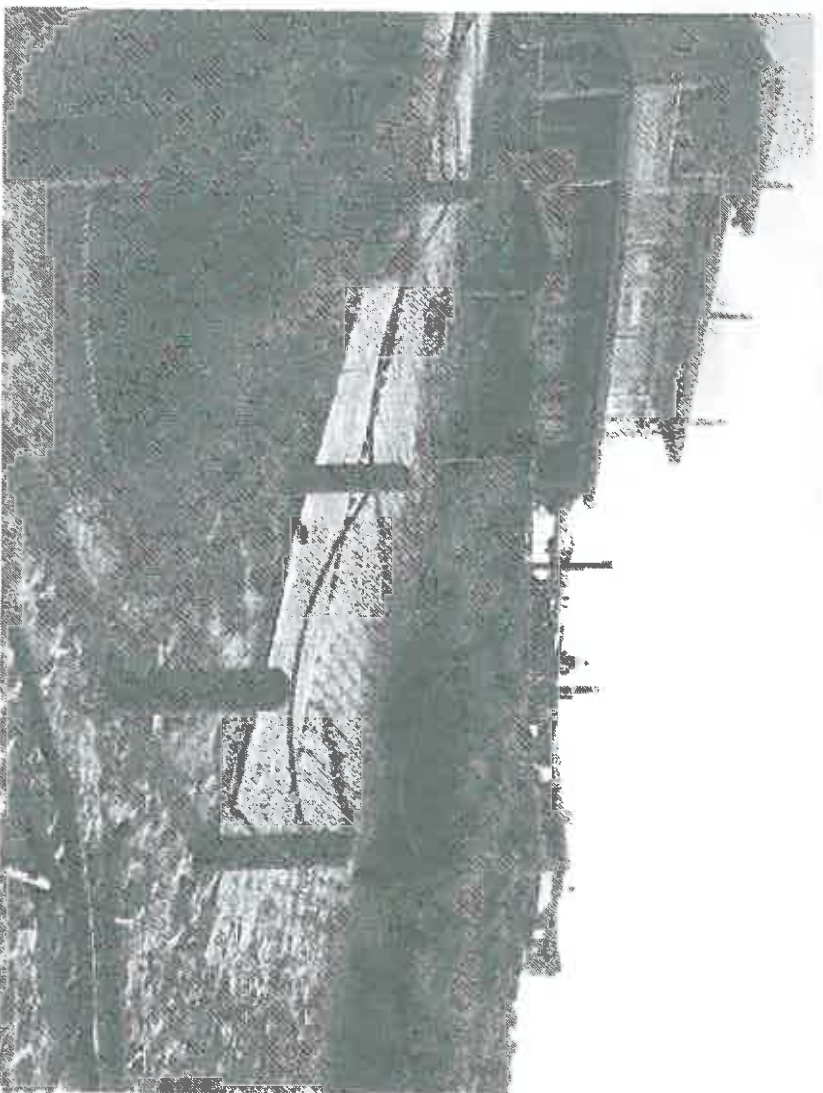


Plate 10a: Example of bollard & rope barrier in use.



Plate 105: Example of a post and rope barrier in use.

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**APPENDIX 2**

**PLANTING FOR SUCCESS  
WITH NATIVE DUNE PLANTS**





## PLANTING FOR SUCCESS WITH INDIGENOUS DUNE PLANTS

Thank you for the time and effort required to plant these amazing coastal plants. Every plant you put in the ground helps towards the restoration of our increasingly important sand dunes and coast.

The plants received are young nursery plants that have been grown with great care to help ensure their optimal survival. Now it is your turn, and your success depends on the correct methods of planting as outlined below:

1. Planting should be undertaken between late May and late August to ensure good establishment before the following and often dry summer season.
2. Ensure these plants are watered just before planting as this reduces planting 'shock'. Dig a hole in the sand approximately 50-60 cm deep. It is vital to ensure deep planting for the following reasons:
  - (i) to ensure the root mass is placed into reliably damp sand.
  - (ii) to minimize the potential of wind erosion exposing and drying the root mass.
  - (iii) Place 30-40 g (a small handful) of Agrobien (safe-to-use controlled-release fertiliser) in the bottom of the planting hole. Use the small plastic measuring cup (if supplied).
  4. Remove the plant carefully from the root-trainer, retaining as much potting mix as possible.
  5. Please don't 'tease' the roots as some species are very sensitive to root disturbance.
  6. Place the plant deep into the hole, and gradually add damp sand around the roots, ensuring the top of the potting mix (where the base of the plant enters the potting mix) is placed at the following depths:
    - (i) Fore-dune plants: 100-200 mm below ground level
    - (ii) Back-dune plants: 50-100 mm below ground level
  7. Leave a hollow in the sand surface around each plant to catch any rain that falls, helping the plant to grow even faster!
  8. Plant at *approximately* 1 m spacings (not mandatory - depends on the hostility of the local environment), and randomly, to avoid straight rows as much as possible.

### Please note:

1. These supplied plants are the only plants to be used in sand dunes.
2. Please do not plant anything purchased from nurseries or home-grown, not even variegated forms of the plants provided, as we guarantee they will not be suitable.
3. It is important that we preserve the genetic integrity of dune areas to ensure the best possible accretion and dune function, to avoid introducing new weeds, and to ensure the best possible habitat for native animals to again flourish in these areas.
4. If severe dry periods occur following planting, plants may require some water (once a week maximum) in the first summer. They should then be left to grow naturally.
5. Use only the supplied Agrobien fertiliser in the planting hole, as other fertilisers may kill these special plants. Do not apply Agrobien on top of the sand, as this won't aid plant growth and is wasteful.
6. Urea however can be applied over the plants to aid their growth after about six month's growth.

Greg Jett's: Wildland Consultants 2003

## Dune Restoration Project Castlepoint

### Project Status as at 14 June 2011

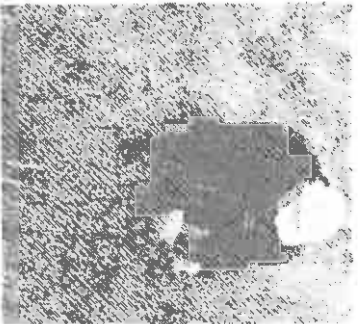
#### Preliminary and Project Development

- At the AGM on 3 April 2010 Council tabled their Project Notes and Plans for the Stage 2 Seawall
- Following receipt of tenders the Council's estimate to complete the Seawall project was \$262,000.
- Council instructed officers to consult with property owners regarding the funding shortfall of \$162,000 as Council had only provided for \$100,000 in their annual budget.
- The Association met with the Mayor and made a submission and verbal presentation to the Draft Annual Plan Hearings Committee. We also submitted to Council that Jetty Road Street Works [Balfour-Basin ] be programmed and be identified in the Annual and Long Term Council Plan as the proposed path behind the seawall no longer featured in the Stage 2 Seawall Plans.
- The outcome of the annual plan process was advised by Council on 15 July:-
  - *The Council is seeking a cost share of \$100,000 from affected residents in order to proceed with stage 2 seawall construction.*
  - The Resource Consent for the Stage 2 Seawall required the written agreement of the adjoining landowners GW and Doc.
  - Letters to the Land Owners were sent out on the 27 August.
  - The Resource consent was issued and the contract let during the week ending 8 October.
  - The [Dune] Restoration Plan was presented on the 6 October and approved on 12 October 2010.
  - The estimated cost of this Plan contribution is \$90,000. Funded by:- Grants, Doc, CRR& and Volunteers contributions in kind. [Conservatory recorded at \$60000 to date] The Plan content included
    1. Summary Planning Procedures
    2. Landscape Plan
    3. Planting and Fertilizer Schedule
    4. General Methodology
    5. Planting on the 1 to 1.5 reshaped Bank
    6. Planting Instructions
    7. Mulching Instructions
    8. Watering
    9. Post and Rope Barriers and Signs
    10. Records
    11. Public Liability Insurance
    12. Following planting photos, fertilizing, monitoring and rabbit control

#### Construction Year 0 [2010]

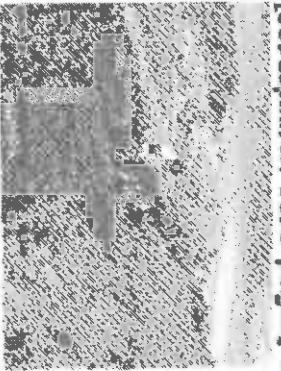
- The Coast Care Group planted 300 pingao and 102 spinifex along the top of the bank in the Doc stewardship land on 10 July 2010.
- Threatened plants in the Doc stewardship land were transplanted on the 3 September. These plants Sand Daphne and Sand Coprosma have since died. Cuttings taken by Brian Innes were initially doing well, however many have succumbed to the Hysterium heat over summer. [More cuttings for propagating were taken on the 25 th May 2011. A decision will be made in August on when to plant these out. It will be most likely in May 2012.]



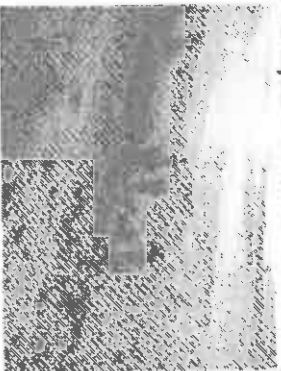


Nurseryman Brian Innes taking cuttings of Coprosma September 2010

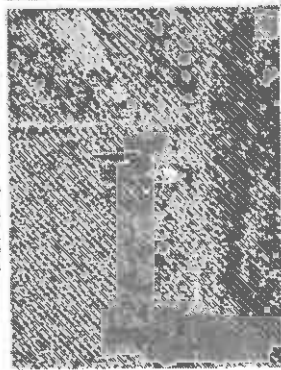
- The Coast Care Group met on the 13 October for a briefing on the Restoration Plan.
- Hoppers Construction completed the shaping behind the Stage 2 Seawall on Saturday the 20<sup>th</sup> November and shaping of the sand wedge and dune on the Doc Stewardship land on Tuesday 23 November.
- Advice received from the nursery experts said it would be best to plant rather than try to nurture the plants over summer, whilst, the Consultant advised of a very high mortality rate if we planted. It was decided to go ahead with the planting using moisture retention crystals with the plants whilst watering each plant at the time of planting as well as assessing conditions and watering in dry conditions over summer.
- Residents and Volunteers commenced planting on Saturday the 20 November 2010.
- Planting, mulching and securing the mulch was completed on Friday 3 November. 4153 plants [309Spirifex 1095 pigoo] 1905 square meters of mulching and 740 volunteer hours.



Securing Slash Mulch Dec 2010



Planting and Mulching



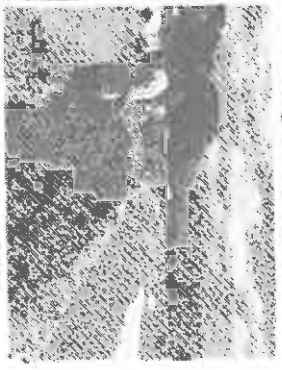
Placing Slash Mulch



Briefing School Children



Planting 21 November 2010



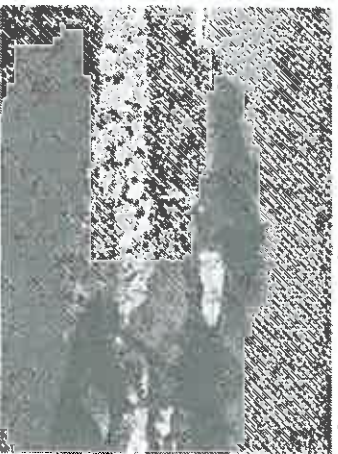
Watering Jan 2011

- All plants were watered on 6/7 December and 14 January 2011.
- Significant rainfall,
  - 10mm 20/21 November,
  - 23mm 16/19 December,
  - 108mm 23/24 January 2011,
  - 112mm 22/23 March
- 143mm 25/27 April
- The weed mat and timber border along the lawn was finished on 16/17 December [Algies - Dulgleishs] and early January. [Edwards]The weed mat is to stop the invasion of Buffalo grass from the lawns and prevent erosion of the interface of the dune and lawn.
- Severe windstorms from the Nor west were experienced on the 27/28 December, 16/17 January and on 2 February. 50 square meters of planting at the Basin end and 110 square meters [at 7 March2011] at the Seawall end the sand wedge has been eroded by the sea

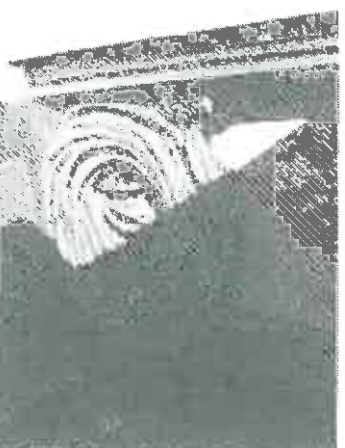
resulting in an estimated loss of 320 plants. A few plants have been buried by moving sand and eroded by wind near profile 10.

- At Guthrie Stream an amendment to locate the barrier perpendicular to the planting rather than along the top of the bank as planned was sought and approved by the District Planner.

The post and rope barrier [17m] along the top of the planting is completed except for a final splice. The barrier along the bottom is on hold pending suitable beach conditions. The barrier is being constructed from recycled posts and roped recovered from the temporary assess post and ropes installed up the bank at planting.



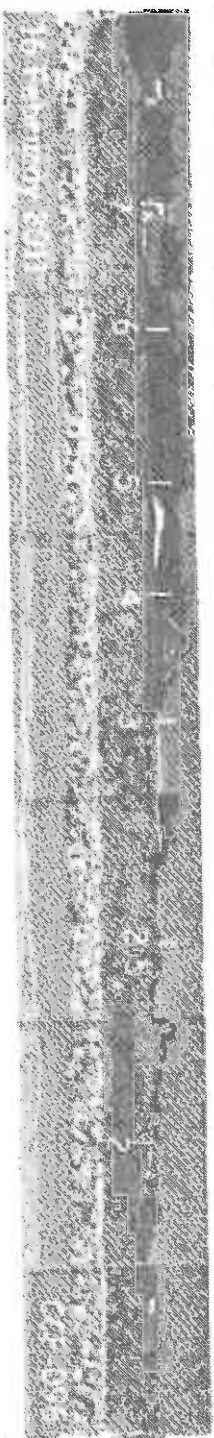
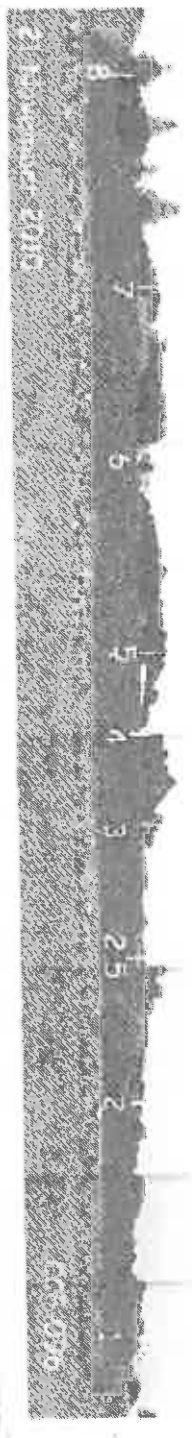
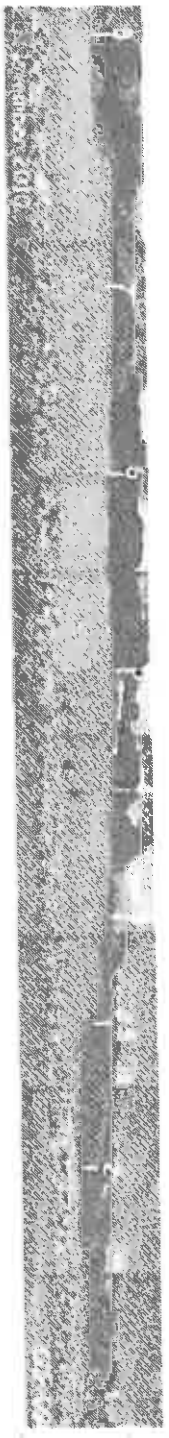
Post and Rope Barrier Guthrie Stream

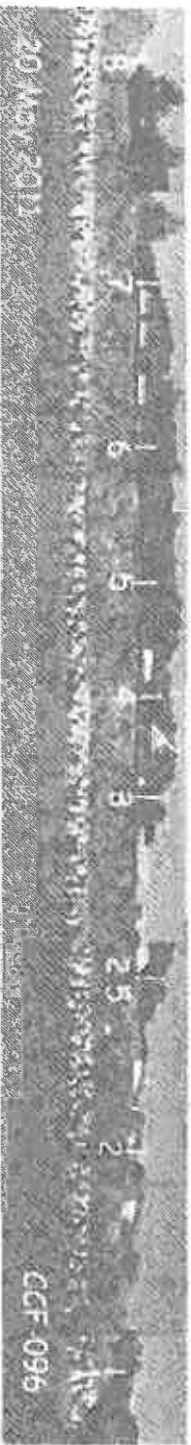


Stored Rope for permanent barriers

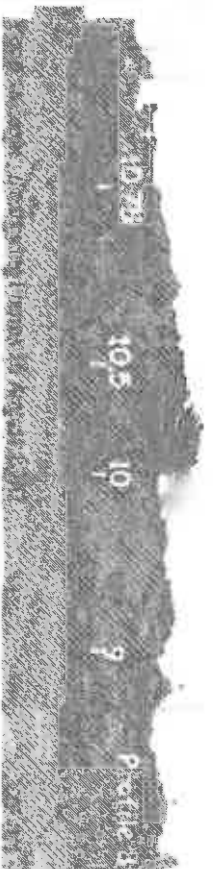
- The Bolland and Rope barrier in front of the sand wedge has been put on hold. Agreement reached with CCF Coordinator [see email 1 March 2011] to hold the materials and erect them later with approval of the Doc Masteron area Office. The rope [120m] is being stored at Gimson's at Castlpoint and Carters are holding the posts [29] until delivery is arranged. Castlpoint Station has agreed to store these in their fencing store area.
- Contributors were acknowledged in the December newsletter.
- Monitoring photographs have been taken at 5/6 meter intervals along the seawall and sand wedge 20 meters out on the beach before, during, after planting and at census in mid February 2011, as well as the photos displayed above.

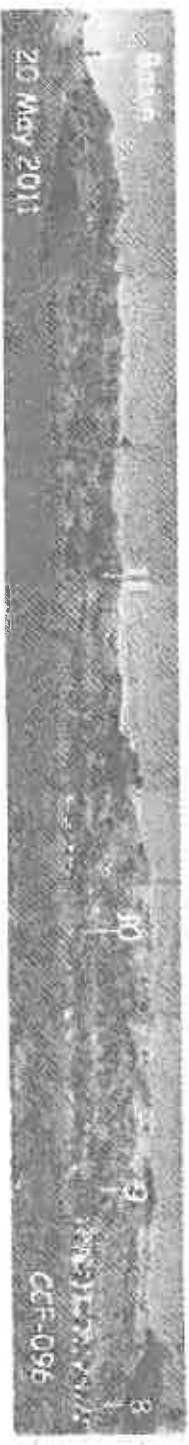
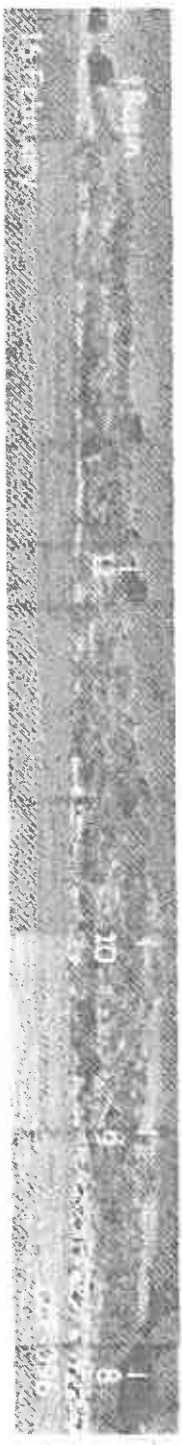
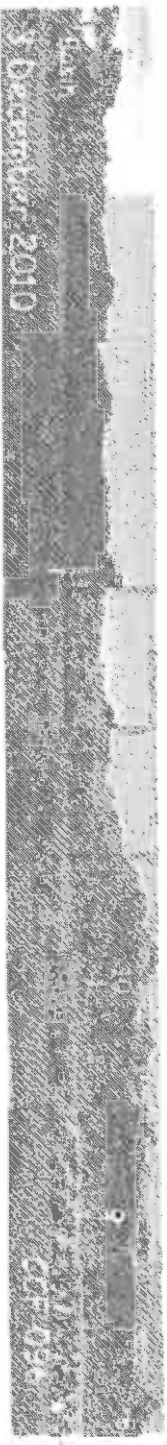
Monitoring Photos :- Profiles 1 to 8





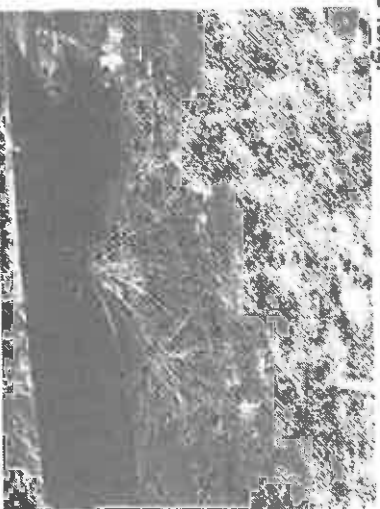
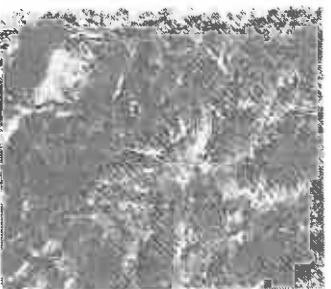
Monitoring Photos:- Profiles 8 to Basin



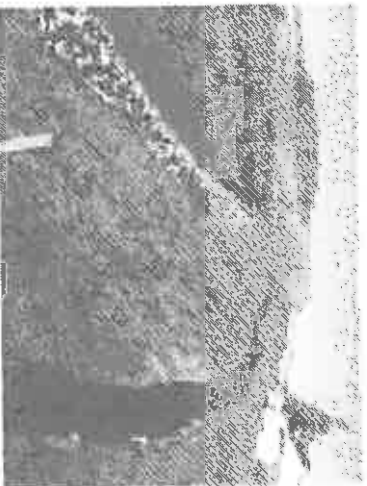


### Monitoring Year 1 (2011)

- Plant census [plants surviving 60-75% spinifex and 20-40% pingao] and monitoring photographs were taken on 15/16 February. Surviving plants are doing incredibly well with some spinifex having stolons 2 meters long.



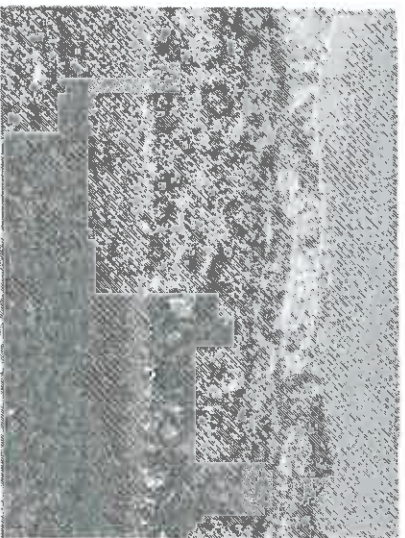
Spinifex and Pingao showing stolons and replacement plants May 2011



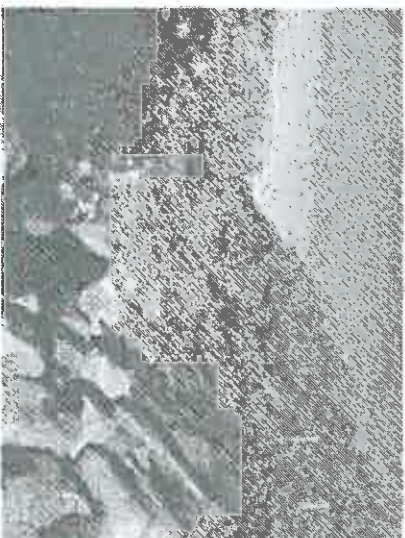
General Overview from Lawned area May 2011

1. Following an assessment of erosion and wind damage and of plant replacements a strategy was developed and agreed by MDC [Grant Hathaway] and Doc [Chris Lester] for the following strategy for 2011.
2. Subsequent to this strategy Doc have placed the surplus sand from the car park next to the beach. Most of the sand disappeared in a few days.

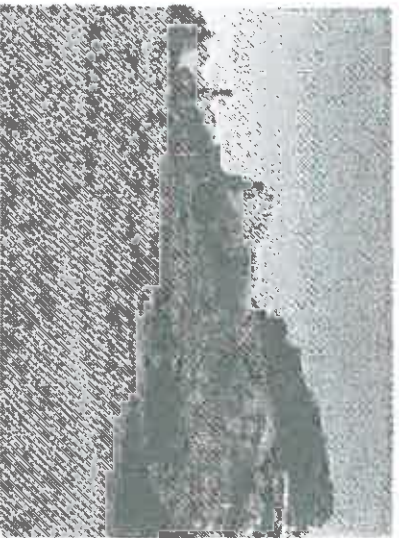




View of eroded sand wedge Profile 9-10



View from end of Seawall

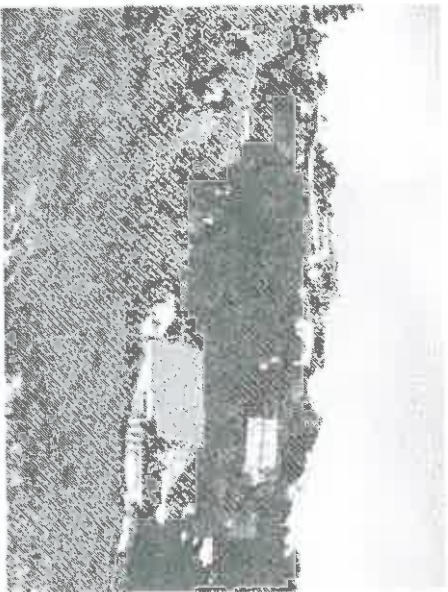


View at Basin End.

Sand wedge intact and surplus sand from car park upgrading

The planned ongoing beach re nourishment will not proceed. The reason for this is that:-

- a. The beach level is at about 500 mm below where it was when the sand wedge was designed by Wildlands Consultants
  - b. The front 5 meters was eroded in a week during calm sea conditions.
  - c. All the small rocks left on the beach from the seawall construction have been pushed up the beach to the eroding edge.
  - d. We have already erected 120m of temporary batten, rope and wire barrier of which 90m has been damaged, but has been recovered.
3. The bank at the top of the Doc stewardship land will not be reshaped and the weed spraying of Marram will not proceed. Reasons being that the wind has eroded and rounded some of the bank, the marram is giving stability and shelter and a reluctance to create any more bare areas with our resources being limited.
  4. Plant all bare areas and mulch where possible in May [700 spinifex 1200 pingao] assess again in August. Plant orders confirmed with Taupo Native plants Nursery 700 spinifex and 500 pingao. Plants supply agreed with Doc Masterton 700 spinifex and 300 pingao.
  5. Leave the bank in front of Loaders and Browns until the planting behind the seawall is established [I have their agreement].
  6. Hold off erecting the bollards and rope. [Agreement with Katrina Edwards.]
2. Plants and fertilizer tablets arrived from Taupo Native Plant Nursery and Doc in late March. Throughout March and April and prior to maintenance planting the entire planted area has been weeded by hand and fertilized with urea. During planting any pull able marram near plants has been removed. Buffalo grass infestations have been sprayed with one and a half strength Roundup 60 ml / litre and a follow up spraying was done on the 21 May. Follow up spraying will need to be done regularly and as weather permits.
  1. Planting bees were held on the 16 April and 22 April with 1225 pingao and 673 spinifex planted over the two days.



Planting with CCG and Earham Students 22 April 2011



CRRA Coast Care Group Planting 16 April 2011

### Funding

In October 2010 the Estimate to complete Year 0 Construction and Year 1 maintenance was \$27086

Funds Granted, Approved or Deeded was \$16334 leaving a shortfall of \$10354 Applications were made to Prime, Pelorus and Eastern and Central Community Trusts with only \$1000 being Granted by ECCF.

Approximately \$10000 savings have been made with the sand wedge and shaping [\$3000], Doc supplying some of the plants [\$2000], beach re nourishment deletion [\$3630], reusing posts and rope at Guthrie Stream [\$1700] and reduced contingencies [\$941].

Costs have increased due to slash mulch security and watering expenses.

Latest Estimates of \$18630 [at 7 March 2011] to complete to Year 1 Maintenance will put us \$535 to \$860 over Funds Granted, Approved or Deeded. The variance being due to contingencies, sundry items and a couple of unresolved invoices.

The CRRA approved up to \$860 at the Committee meeting 7 March 2011 [Year 1 Maintenance planting will be completed within funds held ].

In September 2011 following assessment and planting a decision will need to be made on ordering plants and fertilizer and applying to funding agencies for funds to cover years 2 and 3 maintenance.

### 1 Current Financial Status

Funds Approved \$17958 Funds Estimated to Complete years 0 2010 and year 1 2011 maintenance \$17305

Additional funds required to complete Year 2, 2012 Maintenance \$1436

### 2 CCF Deed of Grant

Deed signed and Initial invoice sent to CCF.

1st instalment of \$1500 paid

Progress Report sent to CCF Coordinator 19 Aug

2nd instalment of \$5459.67 Invoiced 22 October 2010 with Progress Report.

Invoices and Accountability Schedule

Final report programmed for end May and to be supplied if possible before end June

Now targeting 17 June 2011

Trust House Charitable Trust  
Letter Invoices Bank Statement and Accountability Schedule sent to Trust House 11 October 2010

3 Eastern and Central Community Trust  
Granted \$1000 February 2010  
Tax exemption will require a change of rules at our Next AGM.  
New Rules passed at AGM 23 April 2011.  
Tax Exemption certificate to be applied for.  
ECCCT granted a further \$1000 on 13 December 2010.

4 Plants  
We are holding sufficient plants at 42 Jetty Road Castlepoint [ex TNPV Plants 200 Spinifex and 100 Pingao and ex Doc 100 Spinifex and 100 Pingao] for planting out after assessment in August 2011.

5 Rabbit Control  
Further monitoring with only minor evidence of rabbits together with discussions with Garry Foster of Doc has resulted in a decision to apply rabbit repellent should there be any damage to plants. \$ 200 has been set aside for repellent.

6 Maintenance and Monitoring Programme  
Water Retention Crystals were used for maintenance planting to help reduce the mortality rate over summer.  
We used the Fire Service trailer and 1000 litre tank and Honda sprayer pump and 4 hoses to do watering during dry spells. The nozzles and connectors and sufficient hose have been purchased.  
Next assessment will be carried out in August together with an application of Urea at 20gm/sqm. Urea is stored at Robert Camerons.  
Pest Plant Control

Weed Spraying and control will be on-going  
An assessment with Tony Henry of Doc is planned in November 2011

7 'Pine slash'  
Pine Slash operations with Barry Lambourn are complete although he may be called upon if we have any difficulty with securing existing slash.  
In the Area behind the sand wedge at the Basin end the slash was removed and windrowed prior to maintenance planting. This will only be relocated back following successful replanting as it obscured too many small pingao plants at census.

On Anzac day a resident was removing two large trailer loads of slash from his property at Castlepoint for disposal. He agreed to provide this to cover the very wind prone areas in the Doc Stewardship land along the top of the bank where planting first began on 10 July 2010.

8 Dune Reshaping

Happers and MDC provided all the shaping and sand wedge fill from seawall excavations to build the Sand Wedge.

9 Acknowledgements

We would like to acknowledge all those who have contributed to the project.

We are not going to list them for fear of leaving someone out.

Many thanks to you all

Prepared by :- Neville Zander, Project Manager, 14 June 2011.

For :- Castlepoint Ratepayers and Residents Association Inc.

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Castlepoint Stage 2 Seawall  
Restoration Plan

**Preamble:**

**Compiled by: - Castlepoint Restorers and Residents Association [CRRRA]**

**Approved by: - Masterton District Council - Planting Plan approved - Sue Searthy, District**

**March, 12 October 2010**

**Additions Diagram Transition Zone added 13 October 2010.**

**Water Retention Crystals Amended 17 October**

**This Restoration Plan has been developed using Wildlife Consultants report 2193 April 2009 and further consultation with Greg Jenks the report's author, Greater Wellington and the Department of Conservation.**

**The following of the procedures is most important for successful planting especially as the plants are being planted so close to summer.**

**CRRRA Coast Care Group**

**Project Manager Neville Zander, Deputy John Keen**

**Communications Linda Macrae**

**Plant Manager Estelle Gimson**

**Mulching and Barriers Willie James Deputy Cedric Percy**

**Water Anders Crofoot and Mike Ensor**

**Plan Content**

1. **Sunnery Planting Procedures**
2. **Landscape Plan**
3. **Planting and Fertilizer Schedule**
4. **General Methodology**
5. **Planting on the 1 to 1.5 reshaped Bank**
6. **Planting Instructions**
7. **Mulching Instructions**
8. **Watering**
9. **Post and Rope Barriers and Signs**
10. **Records**
11. **Public Liability Insurance**
12. **Following planting**

**1. Sunnery Planting Procedures**

**Plants for behind the Seawall at Estrelles, others at Neville's.**

**Water night before planting.**

**Place 900mm weed mat between lawn and reshaped bank**

**Dig hole 5-600mm deep. [this is the most important thing]**

**If in doubt place plant 2/3 in 1/3 out of the ground.**

**Place 50 ml small soap powder (scoop) of charged water retention crystals in bottom of hole.**

**Place plant in hole, don't tease out the roots.**

**Replace sand around plant put 2 grotas clear of and near top of pot mix.**

**Fill hole and leave a depression 1-200mm deep around the plant.**

**Pour 1/2 liter of water in the hole.**

**Plant trainers, wire cages and polystyrene boxes return to 42 Jetty Road**

**Cover with macrocarpa slash mulch**

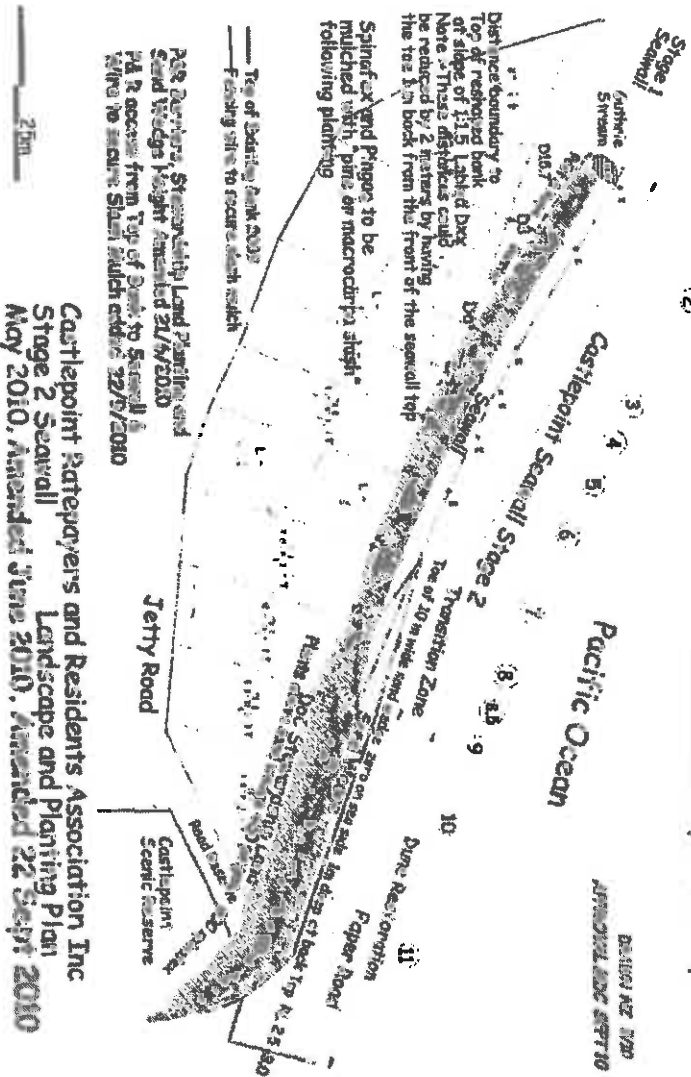
**Secure Mulch.**



## 2 Landscape Plan

1 Profile Numbers  
(2)

Adapted from OCEL Drawings  
020305-120-4 R4  
To be read in conjunction with Wildland  
Consultants Report 2193 April 1003



## 3 Planting and Fertilizer Schedule

Cattlepoint Seawall Stage 2 Planting, Fertilizer, Mulching, and Water Quantities

Gloypud Bank Behind Stage 2 Seawall

Profile #	Start	1.0	2.0	2.5	3.0	3.0	4.0	4.0	5.0	5.0	6.0	6.0	7.0	7.0	7.5	8.0	8.0	8.5	8.5
Profile # Finish		2.0	2.5	3.0	4.0	5.0	6.0	7.0	7.5	8.0	8.5	9.0							
Owners	Brown	Loader	Edwards	Patterson	Aikenhead	Algie	Hodgins	Drysdale	Oakley	McCormack	Tobin								
Length m	20	15	15	12	13	15	19	10	10	10	10								
Area Sloped m <sup>2</sup>	24	94	116	108	115	128	162	79	87	92	128	1172							
1/4 Pinguic @ 2/m <sup>2</sup>	42	47	88	53	57	64	81	40	34	46	64	586							
3/4 Sphagnum @ 2/m <sup>2</sup>	128	140	175	159	172	182	243	119	101	139	192	1758							
Groats @ 2 per plant	396	574	486	426	460	512	649	317	288	369	513	4887							
Aqua Crystals @ 0.5 gms/plant	84	94	116	106	115	128	162	79	67	92	128	1172							
Sisal square meters	84	94	116	106	115	128	162	79	67	92	128	1172							
Water @ 1/2 liter/plant	84	94	116	106	115	128	162	79	67	92	128	1172							

Reshaping Behind Sand Wedge Doc Stewardship Land

	Overlap		Basin		Totals	
Profile # Start	9	10	10.5	10.5		
Profile # Finish	9	10	10.5	10.5		
Owners	McCormack	DOC	DOC	Doc&RR		Totals
Length m	20	20	15	65		
Area Sloped	144	284	108	284		912
1/4 Pingao @ 2/m²	72	132	54	132		456
3/4 Splinter @ 2/m²	216	396	182	398		1368
Gravel @ 2 per plant	576	1056	432	1056		3648
Aqua Crystals @ 0.5 gms/plant	144	284	108	284		912
Slash square meters	144	284	108	284		912
Water @ 1/2 liter/plant	144	284	108	284		912

Sand Wedge

	Overlap		Basin		Totals	
Profile # Start	8	9	10	10.75	11	
Profile # Finish	9	10	10.75	11	11	
Owners	McC & Doc	DOC	DOC	Doc&RR	Doc&RR	Totals
Length m	20	20	28	10	41	
Area Sloped	100	122	158.6	61	123	565
1/4 Pingao @ 2/m²	50	61	79.3	30.5	61.5	282
3/4 Splinter @ 2/m²	150	183	237.9	91.5	184.5	847
Gravel @ 2 per plant	400	488	634.4	244	492	2258
Aqua Crystals @ 0.5 gms/plant	100	122	158.6	61	123	565
Slash square meters	100	122	158.6	61	123	565
Water @ 1/2 liter/plant	100	122	158.6	61	123	565



Two people on the sloped bank, one digging the holes and the other inserting the grotabs and planting the plants, working horizontally along the bank and then down to the next row.

Another 2 people carefully placing the slash one at the top and one about 3 meters down the bank and trimming any branches that may smother the plants. These two could dig and plant the first few rows until there are sufficient plants to place slash over.

The lower few rows can be planted and the slash placed from the top of the seawall if sea conditions permit.

There could be two or three teams doing this if there are sufficient numbers and chutes.

#### 5. Planting Instructions

Charge the water crystals 1 to 2 hours before use [40 grams per 5 liter of water.]

Dig a hole 500 to 600 mm deep to ensure the root mass is placed into reliably damp sand.

Put a scoop [50 ml.] of charged aqua crystals in the bottom of the hole. [Confirm measure this should do 80-100 plants.]

Remove the plant carefully from the root trainer retaining as much potting mix.

Do not tease out or disturb the roots.

Place the plant deep in the hole with the top of the potting mix 100-200 below the ground level and gradually add damp sand around the roots.

Put two [2] grotabs on the uphill side clear of the potting mix and about level with the top of the mix or just below.

Leave a hollow in the sand surface around the plant to catch rain water.

Water in, using half a liter of water per plant. When using the chute the water crystals will need to be flushed down the tube using a part of the half liter of water.

Place the root trainer casings into the wire cages or polystyrene boxes and return to 42 Jetty Road for return to the nursery otherwise we will be charged for them.

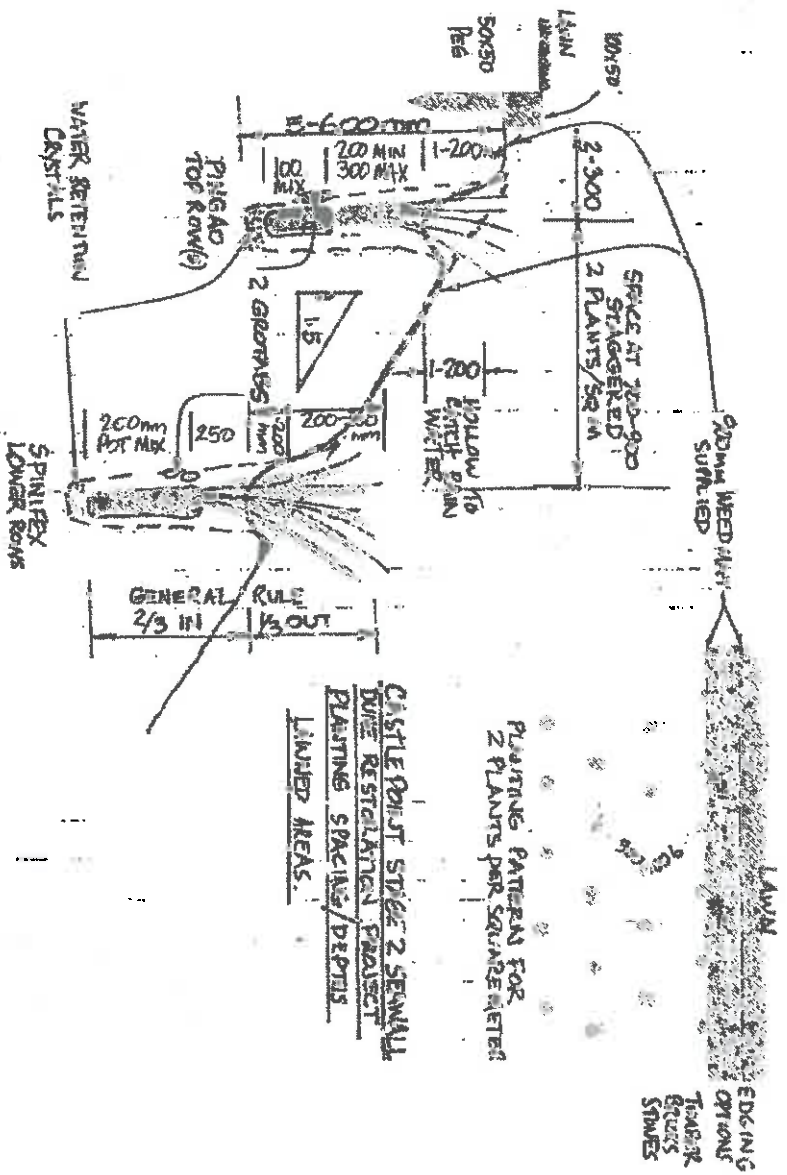


Diagram Planting and Spacing Depths Areas with Lawns

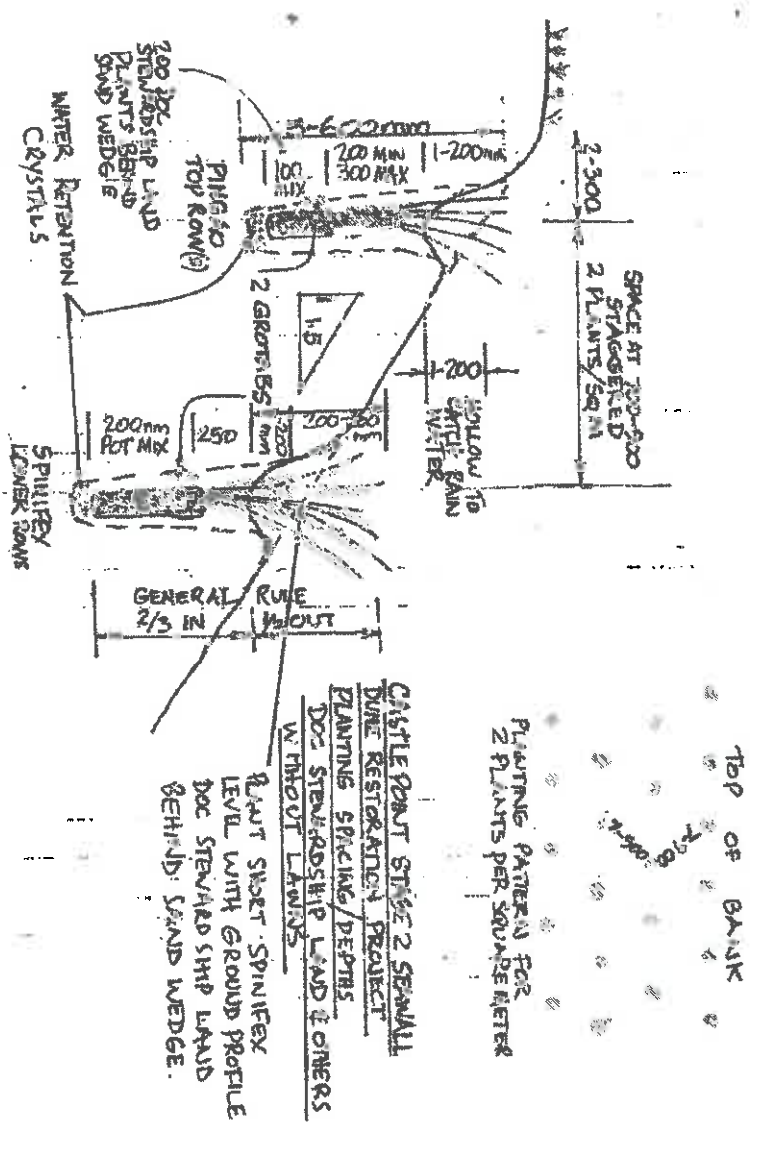


Diagram Planting and spacing Depths Doc Stewardship Land & Other Areas without Lawns



7 Mulching Instructions

Macourpua and pine slash for mulching will be delivered to site during construction of the seawall. Barry Lambourn has been contracted to cut the slash and provide an hourly rate to load and transport to site. Where possible this will be stockpiled near the top of the bank and on the pad at Warren Oakley's. Stockpiles will be placed on the sand wedge clear of the tide.

Generally the slash will be 2 to 5 meters long and is to be placed with the butt [large] end nearest the seawall and towards the northwest.

At the top of the seawall, wedge the butt ends into the spaces between the rock.

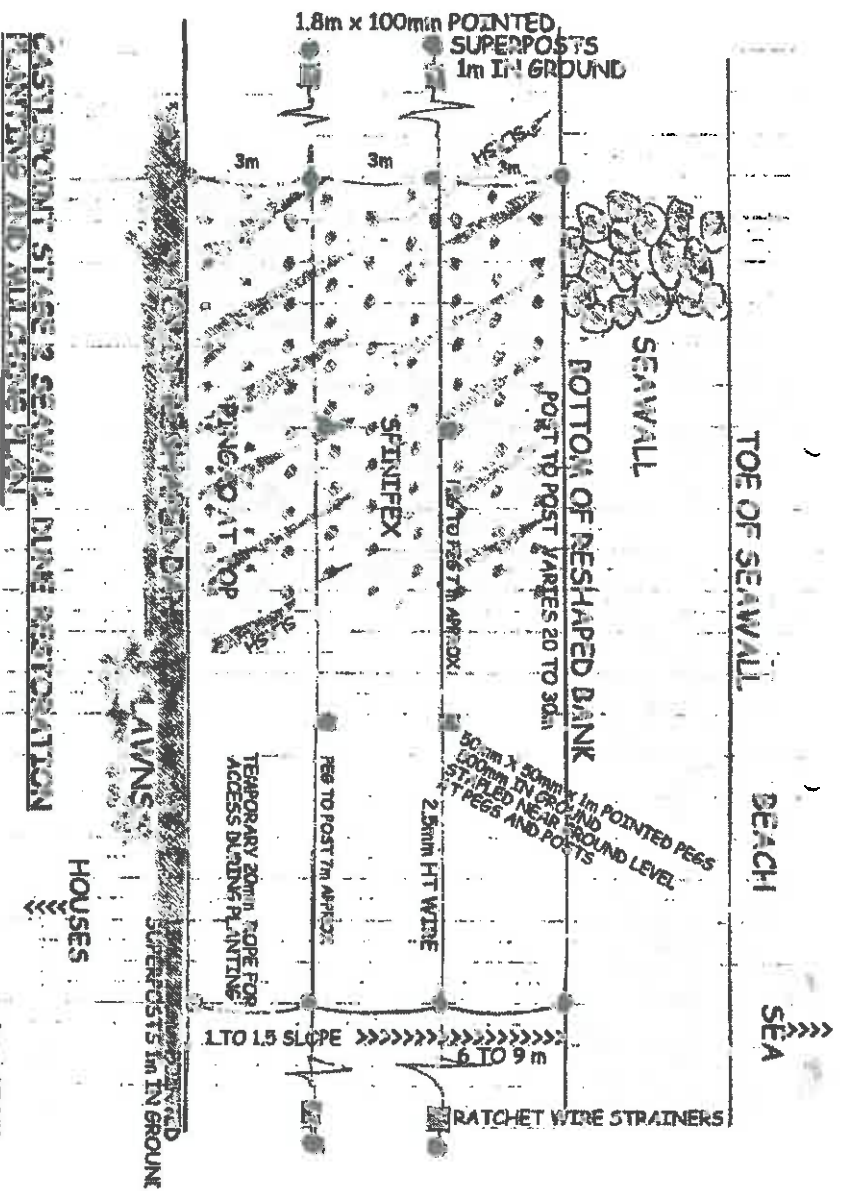
Cut off all or any branches pointing downwards by one third to one half and push them into the sand to anchor each branch.

Cut off any small branches that may smother the plants.

Flick a bit of sand over the tips of each branch to help anchor it. Be careful not to tread on plants while placing the mulch.

A system of wires to stabilize the slash mulch will need to be placed over the area to prevent severe winds moving the mulch. [See Plan below] Wires will be strained and stapled at ground level.

Wires will be removed following stabilization and establishment of the vegetation on the bank.



There will be a post and rope access down the bank at approximately each second property boundary to assist planting and mulching. [See Landscape Plan]

Following planting and mulching the rope access down the bank will be removed. The center posts will remain to anchor the wires. Top and bottom posts can be removed and reused towards the Basin.

## 8 Watering

### Pre watering.

Water plants the night before so they are not too wet at planting time. The plants need to be moist to reduce planting shock.

### Water Retention Crystals

The use of water crystals at planting using Polymer water crystals alleviates the need to water plants at frequent intervals over summer.

Ensure water crystals are partly charged with water first as they expand up to 300 times. [ 1 to 2 hours before use]

Mix 40 grams of crystals per 5 liters 1-2 hours before planting .

Use a small handful per plant [a more precise measure will be confirmed. Put a scoop [50 ml] of charged aqua crystals in the bottom of the hole. [Confirm measure this should do 80-100 plants ]]

Put a few water crystals in the bottom of the hole so that they will be in immediate contact with the roots.

Fill the rest of the hole as in the planting diagram

Water at half a liter per plant into the depression around the plant ensuring the surrounding soil is moist. Do not compact the soil around the plant

### Water Source

1. Residents, see questionnaire and provision of hoses.[Behind Seawall. 1150 liters at half a liter per plant ]
2. Castlepoint Station, Anders Crofoot
3. Masterton District Council Toilet supply, Kevin Godfrey
4. Creeks  
Estimate at half liter per plant 2500 liters, 1150 seawall, 1350 balance .

### Plant

Fire trailer, 1000 liter tank, pump [creek to tank], and tow vehicle CRRA member [Mike Ensor] or Neville's 4WD Rocky.

Suggest this is arranged and filled the night before.

Honda sprayer [bottom half of bank and Doc Stewardship land.] Siphon and garden hoses top half of bank and or Honda sprayer.

Fuel and oil [Charge CRRA Castlepoint Store arrange with Devon ]

Ensure all oil levels are checked and topped up before use and operators are familiar with the plant requirements. Flush out herbicides if necessary.

Back up tanker, Neville's trailer and Devon's tank hire pump if required.

### Watering Plants after planting and routine watering if necessary. [plant as above]

Check with Phyllis Meikle or Kevin Godfrey the rainfall since last watering. [Obtain weekly updates from Kevin by email]

Check soil moisture at several sites.

Consult 10 day forecast for Castlepoint.

<http://weather.ukmnsn.com/Tenday.aspx?wealocations=wc:NZXX0063&q=Castlepoint%2c+NZL+forecast;tenday>

Make an assessment based on the provision of water in the initial stages and during the heat of summer along with the moisture content of the sand and performance of crystals and plants and expected rainfall.

The benchmark is to ensure the plants do not dry out.

### Notes

*With the crystals during severe dry periods plants may require water during the first summer after which they should be left to grow naturally. I have had preliminary talks Phyllis Meikle and MDC regarding rainfall records. However, if plants are planted late in spring the watering will need to start in the weeks following planting if there is no rain.*

*Watering will need to be sufficient to get to root level whilst not eroding the bank.*

*Over watering is just as damaging as under watering. A bit of salt spray keeps fungi at bay ]*

## 9 Post and Rope Barriers and Signs

Post and Rope Barriers will be erected following planting and mulching between profiles 1 & 2 and 10 and the Basin to exclude the public from the planted areas. Post and rope barriers using Domelock [straight post] Bollards 175mm No 2 posts by 1.8 m long, hole 35mm hopefully reduced to 32mm or what's recommended for the 28mm polypropylene rope. [Note the ropes swell near the sea and the wood takes up moisture too.] Spacing will be up to 4 meters and less where a more dominant looking barrier needs to be expressed. Bollards 700mm above ground, 1100mm in ground and 2 m clear of plants on sand wedge. This specification is agreed with Doc to match the proposed barriers in front of the upgraded car park. I will order the posts and rope when the MDC issue the consent. Larry Patterson has been requested to provide an hourly rate for post hole boring. [A detailed set out plan will be provided following planting using the Landscape plan as a guide.] Grait Hathaway has been requested to erect publicity signs re Seawall and Dune Restoration. CRRA can re-erect the 'No Vehicles on Beach' sign when doing the Bollards. 8 Mini 'Feet Kill' signs to be erected at strategic places. Keep 2 spare for replacement.

The photo below of Foxton Beach shows Domelock posts and 32 mm rope



### Foxton Beach Barriers

#### 10 Records

Our Granting agencies require records such as photographs, number of plants planted, hours spent organizing and planting.

#### 12 Public Liability Insurance

As agreed with MDC

#### 11 Following planting

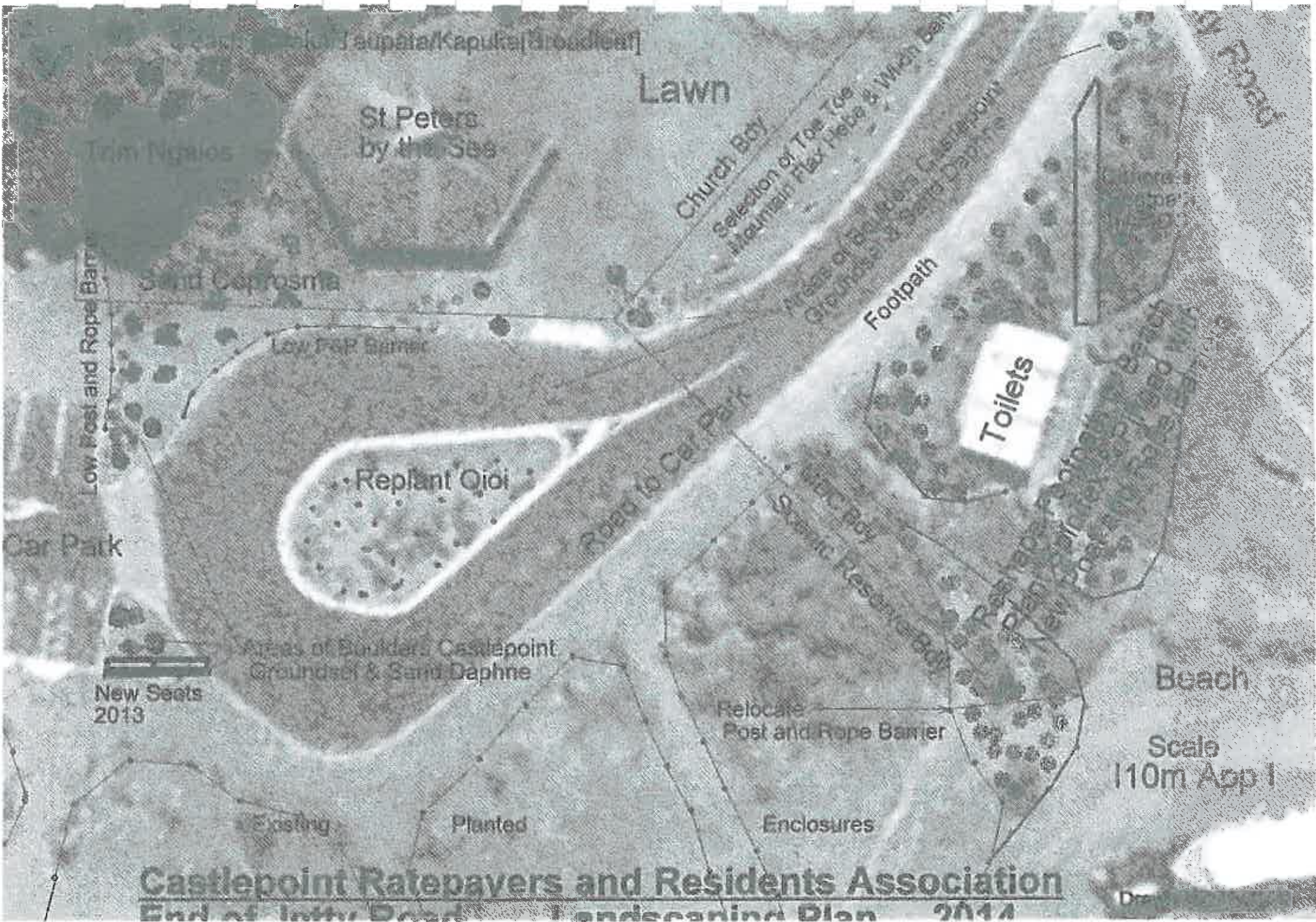
The CRRA will maintain the planting as agreed with MDC and the Community Conservation Fund Coast Care Group will monitor:-

- Rainfall and discuss assistance with watering with landowners.

- During severe dry periods plants may require water [once per week maximum, see above re water retention crystals which will increase watering intervals] during the first summer after which they should be left to grow naturally.
- Plants and mulch and apply fertilizer about 6 months after planting and at 3 monthly intervals thereafter as required.
  - Plant mortality and sand wedge maintenance requirements [Note this is expected and replacement plants 40% are on tentative order and prices for sand wedge maintenance received with applications made to Erecting Agencies in October 2010]
  - Weeds and rabbits and action accordingly if necessary.
- Residents should report any instance of rabbit browsing or digging near the plants.

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**Castlepoint Ratepayers and Residents Association**  
**End of Jetty Road Landscaping Plan 2014**

Dr





Estimate of Costs Years 4 & 5

Description / Activity	Date	Unit	Quantity	Rate	Amount Contract	Volunteer Amount in Kind	
<b>Year 4 2017/18</b>							
<b>Trees</b>							
Fell pines behind Year 3 fellings	Jun-18	Number	80	60	4800		
Extract macrocarpa slash from above track	Jun-18	Number	80	60	4800		
Order Plants Water retention crystals and Gro tabs	Oct-17	Number	50	5.97	298.5		
Plant Toe toe and taupata	Jul-18	hrs	100	5.97	597	400	
<b>Sub total Trees</b>					<b>10495.5</b>	<b>400</b>	
<b>Dunes</b>							
Regrade south end of car park to expose buried posts and ropes	May-18	sq m	600	2.00	1200.00		
Order spinifex and pingao year 4	Oct-17		1200	2.90	3480.00		
Plant replacements spinifex and pingao	May-18		1200	2.9	3480.00	600	
Weed Control Marram and competing weeds	Nov-18	sq m	2500	0.5	1250.00		
Urea	Nov-18	sq m	40	1.25	50.00		
Urea	Apr-19		600	0.1	60.00		
<b>Sub total Dunes</b>					<b>9520.00</b>	<b>600.00</b>	
<b>Sub total Year 4</b>					<b>20015.50</b>	<b>1000.00</b>	
<b>Contingencies 10%</b>					<b>2001.55</b>		
<b>Contract Preparation and Management Photos &amp; Reports</b>					<b>2001.55</b>		
<b>YEAR 4 TOTAL</b>					<b>24018.60</b>	<b>1000.00</b>	<b>25018.60</b>
<b>Year 5 2018/19</b>							
<b>Trees</b>							
Fell pines south end and above track,slash and mulch	May-19	Number	130	110	14300		
Order Plants Water retention crystals and Gro tabs	Oct-18	Number	100	6.15	615		
Order for General plant replacements	Oct-18	Number	100	6.15	615		
Plant Replacements pine areas and others	May-19	Number	200	5	1000	500	
Weed Control Marram and competing weeds All areas	Nov-19	Sum			1000	500	
<b>Sub total Year 5</b>					<b>17530</b>	<b>1000</b>	
<b>Contingencies 10%</b>					<b>1753</b>		
<b>Contract Preparation and Management Photos &amp; Reports</b>					<b>1753</b>		
<b>YEAR 5 TOTAL</b>					<b>21036</b>	<b>1000</b>	<b>22036</b>
<b>GRAND TOTAL Years 4 &amp; 5</b>					<b>45054.60</b>	<b>2000.00</b>	<b>47054.60</b>

