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Attachment 1 (A1591849) - Nelson City Council's production forests - Assessment of non-monetary values report			
Decision			



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Nelson City Council's production forests

Assessment of non-monetary values

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Executive Summary

The Catalyst Group and Peter Gorman were commissioned to undertake a review of Nelson City Council's production forests for the purposes of:

- assessing what values are attributed to Nelson city Council's production forests
- establishing what (if any) conflict exists between production and non-production values
- recommending changes to current/future production forest management, and
- assessing and recommending a course of action for carbon credits

This review follows several recent forestry reviews that have focussed on production and operational matters.

Nelson City Council's production forests total 643ha spread across four main blocks – Brook, Maitai, Marsden and Roding – comprising 87 separate stands. The primary species is *Pinus radiata*, covering approximately 92% of forested land, with Douglas fir the second most common (6%). Further harvesting and replanting of Council's production forest lands is on-hold pending the outcome of this review and the adoption of its recommendations for future management.

Nelson City Council is a registered participant in the Emissions Trading Scheme in relation to ownership of post-1989 forests and operation of a waste disposal facility (landfill). Council has been issued 24,186 New Zealand Units (NZUs), or carbon credits for its post-1989 forests, 33,360 NZUs for its pre-1990 forests, and has completed several unit purchase/surrender transactions in relation to its landfill leaving a current balance of 63,932 NZUs. Council is currently required to purchase approximately 16,000 NZUs per annum for its landfill operation, but this will increase in future years.

It is recommended that:

- Nelson City Council deregisters its Post-1989 forests and hands back the associated carbon credits
- Continues to purchase carbon credits to offset its landfill emissions.

Given Council's Pre-1990 carbon credits are unencumbered Council can either sell them on the open market now, sell/transfer them to the landfill account, or hold onto them in anticipation of a price increase in the future.

Nine high level values – economic, municipal water supply, infrastructure, landscape, residential development, archaeological, recreation, water quality and biodiversity – were identified as being associated with Nelson City Council's production forests (Annex 5). Several high level values were made up by a series of sub-values e.g. the sub-values for Recreation included paragliding, mountainbiking and walking. The identified values were present across the entire production forest estate.

It was determined that some of these values were in direct conflict (incompatible) with production forestry, whereas potential conflict between other values could relatively easily be avoided or minimised at a strategic (forest management and planning) and/or operational (day-today works) level.

A set of criteria were used to guide future management of Council's production forests with respect to harvesting, replanting, and tending. It is recommended (as set out in Annex 6) that:

- some stands are harvested and replanted in production species
- future plantings concentrate on suitable *Pinus radiata* seedlings
- only those *Pinus radiata* stands on more fertile sites such as the Marsden block should be pruned to produce clear timber, with all other stands managed to produce structural timber
- suitable planting set-backs are employed to avoid conflict with other values
- some stands are only partially harvested
- unharvested stands or areas are appropriately treated, and
- alternate land uses are considered for those stands/areas not being continued in production forestry. These alternate uses can include manuka, amenity/long-rotation species, managed native regeneration, and replanting in native species.

From the above criteria Nelson City Council's production forestry area would shrink by approximately 140ha to around 500ha.

Once Council confirms its future directions with respect to production forestry, it should restart harvesting and replanting operations as soon as possible. There is a considerable volume of timber at harvestable age now, and more will be maturing in the next five years. Doing so will put Council's forests slightly (2-5 years) ahead of New Zealand's looming "wall of wood", and more importantly the spike in log availability from Nelson-Marlborough forests.

The financial implications of these recommendations are expected to be minimal given the majority of production forests reaching maturity over the next 10 years will be harvested, with those considered uneconomic to harvest being poisoned/felled to waste. There will be additional costs associated with production forestry operations (e.g. poisoning/felling, track repairs, communication with community groups etc), but also potential additional income streams e.g. sale of Pre-1990 NZUs.

There are also considerable site management and cost implications associated with the decision to discontinue production forestry activities at a site due to recolonisation¹ and weed invasion issues. Council is yet to determine if these additional costs are most appropriately borne by the production forestry output, some other part of council, or is shared across multiple outputs.

The current herbicide use resource consent places a significant limitation on future production forestry operations because it unnecessarily restricts the types of herbicide, and application methods that can be used across much of Council's forests. Council should seek to vary the consent conditions or apply for a new consent.

¹ Cleared production forest areas are quickly colonised by a dense covering of seedlings growing from the seed bank laid down by the last rotation of production trees.

1 Introduction

Nelson City Council owns approximately 600ha of production forest. In recent years concerns have been raised by the community, elected members, and senior management about (1) NCC's management of the forest estate, and (2) the impacts of forest operations on community, recreational and environmental values. In response, several reports have been commissioned to clarify the issues, identify solutions and recommend appropriate courses of action. For a variety of reasons these recommendations have not been adopted and implemented. The key reason being decision-makers have not felt fully informed about the issues, solutions and any implications associated with adopting the recommended courses of action.

In part, this is not unexpected given recent forestry reviews concentrated (as directed) on forestry management, operation and economics. That is, an assessment of the various community, recreation, and environmental values associated with the forested lands and the risks forestry operations pose to those values, was beyond the scope of these reviews.

Accordingly, The Catalyst Group (Annex 1) has been tasked with undertaking a more holistic review of Nelson City Council's production forests as follows:

- assess what values are attributed to Nelson city Council's production forests using various national and local directions and processes as guidance
- map these values
- identify where conflict/reinforcement exists between values
- prioritise values
- recommend changes to current/future forest management
- assess economic impacts of recommended changes on forestry income
- assess and recommend course of action for carbon credits

An assessment of Nelson City Council's Emissions Trading Scheme (ETS) obligations, its carbon credit balance, and recommendations on future management of carbon credits was carried out by Peter Gorman (Annex 1)

This review is presented in 5 parts:

1. A summary of Nelson City Council's forestry resource
2. An assessment of Council's ETS obligations and carbon credits
3. An overview of the production and non-production values associated with Nelson City Council's forestry land and the potential conflicts between these values
4. Recommendations for future production forest management
5. Options for alternate land uses

Further information is presented in Annexes.

The review was informed by:

- Recent forestry review documents²
- 5 year Forest Management Plan (2011) prepared by PFOlsen
- Tree Crop Valuation (2015) prepared by PFOlsen
- Nelson City Council's Property and Facilities Asset Management Plan 2015-2015
- Council and PFOlsen records
- Councillor workshop on 14 June
- Interviews with key Nelson City Council staff
- Interview with Dave Fincham of PFOlsen, the long-term day-to-day manager of Nelson City Council's forests
- A site visit to the Marsden and Maitai forest blocks
- Discussion with Karl Merriman, chairman of the Nelson Mountainbiking Club
- Discussion with Kimberley Evison, manuka expert at PFOlsen, Rotorua
- Variety of other documents as referenced through the body of the document

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- (1) Landvision and Moore and Associates (2014) Review of NCC Forestry Estate. Client report prepared for Nelson City Council.
- (2) Alan Bell and Associates (2015) Nelson City Council – Review of plantations. Client report prepared for Nelson City Council
- (3) PFOlsen Ltd (2015) Response to the Alan Bell and Associates review of Nelson City Council Plantations Report. Client report prepared for Nelson City Council.

2 Nelson City Council's production forests

The following is a quick overview of Nelson City Council's production forests:

- Nelson City Council has been involved in production forestry since the 1940s for a variety of reasons including economic return from otherwise unproductive land, land stabilisation, and water supply protection. More recently, the production forests have assumed an increased amenity and recreation value.
- The Council's production forest resource has been added to through various land purchases, the most significant occurring the 1980s, but continuing through until relatively recent times.
- Nelson City Council's owns 639.5ha of stocked production forests as at June 2016 spread across four main blocks – Brook, Maitai, Marsden and Roding – comprising 87 separate stands (management units) (Annex 2). The Brook block contains a sizeable area within the York Valley (35.1ha) on land that has been set aside for landfill expansion, where the trees may not reach harvestable age, depending upon the rate of landfill expansion. The Council also has 28ha of cleared production forest land that has been harvested and is awaiting decisions on its future use (i.e. replanted in production forest, transition to native vegetation etc.), 16.5ha of former production forestry land that has been converted to native regeneration, 3.6ha of amenity plantings, and 18.4ha of *Pinus radiata* on Bell Island in Tasman District (Annex 3).
- Each forestry block is made up of multiple stands. Each stand comprises trees of the same species, variety, age, and tending regime (i.e. thinned density, pruned versus unpruned etc.). Blocks comprise a mosaic of stands with different species, ages, and tending regimes.
- The key species grown in NCC's forests are *Pinus radiata* (92% of forest area), Douglas fir (6%), macrocarpa (1%), and eucalyptus/acacia/other varieties (1%) (Annex 4).
- The current tree species make-up is a legacy of previous forest managers who, in an attempt to spread risk, required 10% of new plantings to be in species other than *Pinus radiata*.
- The Roding block is into its third rotation of plantings (i.e. there have been two tree harvests from this block previously), the Brook block and parts of the Maitai block are in their second rotation, and the remainder of the Maitai block and Marsden blocks are in their first rotation.
- The Nelson-Tasman region produces good quality timber trees with high growth rates, and high density timber. Such timber has a higher number of end uses and potential markets than lower quality, lower density timber.
- Approximately 240ha of Nelson's current production forest (c.40% of the total area) is either at harvestable age, or will reach harvestable age by 2020. This puts Council's forests slightly (2-5 years) ahead of New Zealand's looming "wall of wood"³, and more importantly the spike in log availability from Nelson-Marlborough forests. The rate of harvest will be driven by market demand and logistics, but there will be more competition in the log market post-2020.

³ Created by the maturing of the extensive *Pinus radiata* plantings that occurred across the country during the 1990s

- Day-to-day management of Council's production forests is contracted to PFOlsen, under the supervision of The Environmental Reserves Supervisor. PFOlsen prepare a 5-yearly Forest Management Plan (last prepared in 2011), annual Tree Crop Valuation and end-of-year reports, quarterly forestry and harvesting reports, and harvest plans and post-harvest monitoring reports as required. Forest management is broadly described in Council's current Asset Management Plan.

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3 Climate change and the Emissions Trading Scheme

New Zealand has committed under the United Nations Framework Convention on Climate Change to reduce its greenhouse gas emissions to 5 per cent below 1990 levels by 2020. In December 2015, countries met in Paris to establish a new international climate change agreement under the Convention that would apply post-2020. An important part of this agreement will be the contributions each country makes to address climate change. New Zealand has announced that its contribution will be to reduce its greenhouse gas emissions to 30 per cent below 2005 levels by 2030.

New Zealand will meet this target through a mix of domestic emission reductions, the removal of carbon dioxide by forests and participation in international carbon markets. The New Zealand Emissions Trading Scheme (ETS) is the Government's principal mechanism to achieve this target.

The ETS puts a price on greenhouse gas emissions. This provides an incentive for people to reduce emissions and plant forests to absorb carbon dioxide. Certain sectors are required to acquire and surrender emission units known as New Zealand Units (NZUs) to account for their direct greenhouse gas emissions or the emissions associated with their products. An emission unit represents one metric tonne of carbon dioxide, or the equivalent of any other greenhouse gas.

When the ETS commenced in 2008, NZUs began trading at a unit price of around \$20. However by 2011, this price had declined to around \$2 because the ETS allowed unrestricted use of very low priced international units. When access to most of these international units was removed in 2015, the NZU price climbed rapidly to around \$18 in July 2016. The NZU price is capped at \$25, and some market commentators expect it to increase closer to this cap over the next few years.

Nelson City Council's involvement with the ETS is through its forests and landfill. The forestry involvement is described below. The landfill creates methane emissions through the biodegradation of organic waste in oxygen-less environments. Landfills have been included in the ETS from 1 January 2013.

The Council is currently registered in the ETS as a participant in relation to the activities of owning post-1989 forest land, and operating a disposal facility.

3.1 Pre-1990 forest land

Pre-1990 forest land is a category of forest land defined in the ETS, which was forest land on 31 December 1989 and remained as forest land on 31 December 2007 and where the forest species on 31 December 2007 consisted predominantly of exotic forest species.

If any of this forest is deforested, that is, converted to non-forest, the landowner becomes an ETS participant, and must notify the ETS administrator, and acquire and surrender NZUs to the Government. There is an exemption for clearing wilding trees which are classified as "weed trees"; and there is a *de minimis* provision that allows up to two hectares to be deforested in every five-year period.

In 2011 and 2012, the Government made a free allocation of NZUs to pre-1990 forest landowners to offset some of the economic impacts of the ETS on these landowners. The Government assessed the Council's eligible pre-1990 forest area to be 556 hectares and allocated 60 NZUs per hectare totalling **33,360 NZUs**.

If the Council deforested any of its pre-1990 forest land, that is converted it to a non-forest use such as residential land or farmland, it would be liable for the CO₂ emissions. These emissions vary with species and age, but the emissions from radiata pine in Nelson at age 28 would be 694 NZUs per hectare.

Clearing pre-1990 forest land and replanting it is not considered deforestation, nor is re-establishing native forest species as in both cases the land remains forest land. It is understood that Council has no intention to deforest any of its pre-1990 forest land, other than possibly some related to landfill expansion in the York valley. The emissions from this deforestation may be able to be covered by the 33,360 NZUs already allocated to Council.

3.2 Post-1989 forest land

Post-1989 forest land is another category of forest land defined in the ETS, which is principally forest land that was not forest land on 31 December 1989 and where the forest species may be exotic or indigenous.

Owners (or forestry right or lease holders) of post-1989 forest land may voluntarily register all or part of this forest in the ETS. This entitles them to NZUs for the growth in their forest since 2008, but they are also liable to surrender NZUs if their forest carbon declines. Post-1989 forests that have a wide range of ages and species may permanently store carbon. In these forests, harvesting is spread over time so harvesting emissions are offset by the growth in younger stands. On the other hand, forests with a narrow age range that are harvested over a short time would not permanently store carbon.

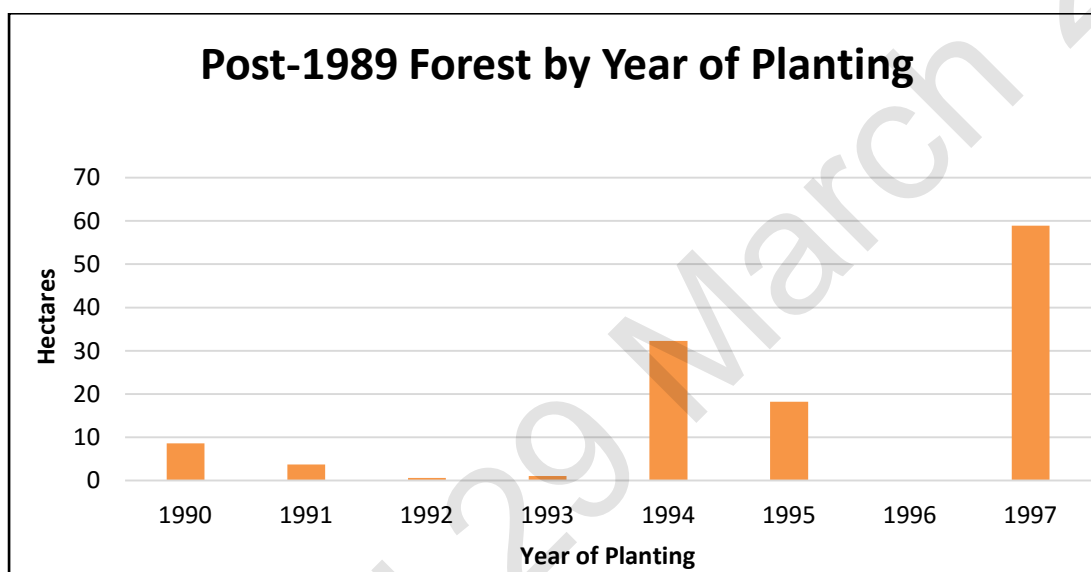
NZU entitlements and obligations are determined by standard lookup tables if a participant's total registered area is less than 100 hectares. If the area is more than this, the participant must collect sample data from their forests every five years, and the administrator will then provide site-specific lookup tables derived from this data, that are used to work out how much CO₂ is stored in the forest or emitted by it. The Council has complied with this process (costing around \$12,000) and has been issued its own tables.

ETS participant's NZU entitlements and obligations are met by filing emission returns. For forestry, these may be filed annually, but must be filed at the end of each five-year period.

3.3 Council's post-1989 ETS forests

The Council has registered all its post-1989 forests in the ETS. The total area is 123.4 hectares and the species are 95% radiata pine. Most of the area (84%) was planted in three years from 1994 to 1997.

Block	Area (hectares)	Year planted	Species	Assumed clearfell year
Maitai	8.6	1990	Radiata pine	2017
Maitai	3.7	1991	Radiata pine	2022
Maitai	0.6	1992	Radiata pine	2022
Maitai	1.1	1993	Radiata pine	2022
Marsden	32.3	1994	Radiata pine	2023
Maitai	18.2	1995	Radiata pine	2025
Marsden	52.7	1997	Radiata pine	2027
Marsden	6.2	1997	Macrocarpa	2042
Total	123.4			



The Council has been issued **24,186 NZUs** for its post-1989 forests. These are still held in the Council's account at the NZ Emissions Register. These NZUs relate to the 2008-2012 period. No further emission returns have been filed, but the Council could file returns for the 2013, 2014 and 2015 years and receive more units. The next mandatory return is due by 30 June 2018, and will require sample data to be collected again before 31 December 2017.

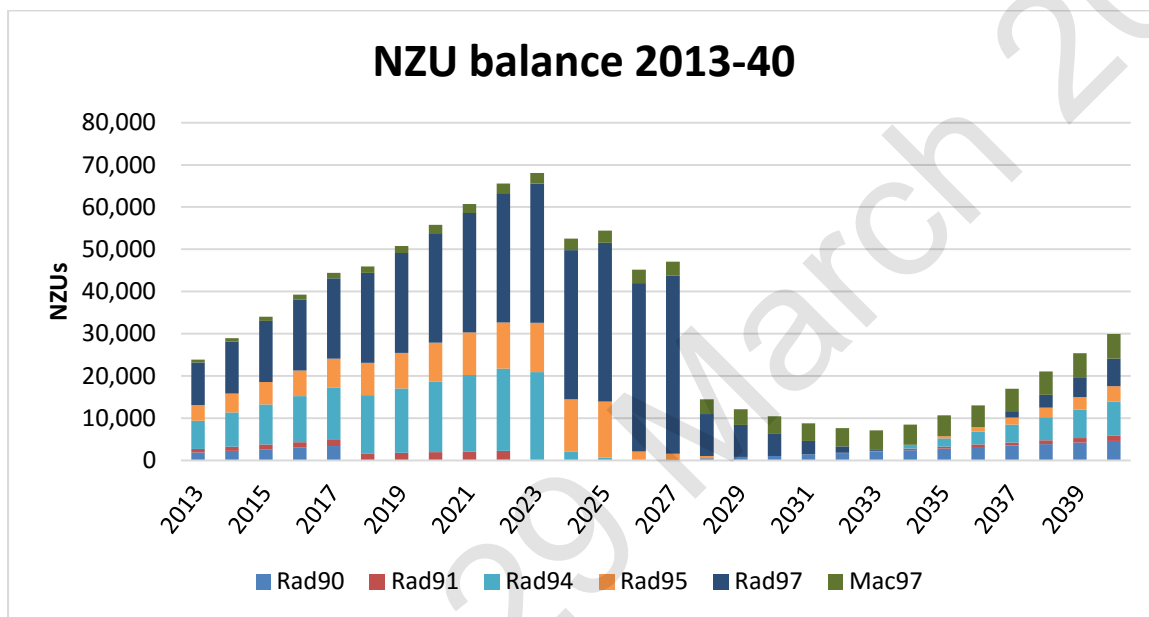
On 31 March 2016, the Council's Commercial subcommittee recommended to the Governance Committee and Council that a decision on staying within the Emissions Trading Scheme be brought back to a future Committee meeting (R5472).

3.4 ETS post-1989 participation options

To assess options, it is necessary to model the movement in the Council's post-1989 NZU balance under the status quo. This exercise has been done for the 2013-2040 period under the following assumptions:

- Each age-class is clearfelled at its conventional rotation lengths in a single year;
- Entitlements and obligations are calculated from the Council's current look-up tables (these will be updated every five years); and
- No change in current ETS provisions.

The result is shown in the following chart:



The NZU balance accumulates from its current 24,186 level to nearly 70,000 by 2023 despite harvesting of the small 1990 and 1991 areas. However it declines after that as the larger 1994, 1995 and 1997 areas are harvested, to a minimum of 7060 in 2033.

This long-term fluctuation is related to the compressed planting period of the post-1989 forests. It could best be improved by delaying the harvest of some of the 1997 planting for 5-10 years. This would smooth out the total post-1989 NZU balance over time, so that it never drops below say 20-25,000. These NZUs could then be sold or used to meet landfill obligations.

Five options have been identified:

	Option	Advantages	Disadvantages
1	Remain registered and hold NZUs for future harvest liabilities	Keeps options open	Minimal financial return as nearly all the NZUs issued must be surrendered at harvest. Five-yearly field sampling cost of \$12,000.
2	Remain registered, sell NZUs as they are issued and pay harvest liabilities with log revenue	Early forest income from NZU sale	Risk of the NZU price being higher when harvest liabilities are due. Five-yearly field sampling cost of \$12,000.
3	Remain registered and delay the harvest of younger stands	Would mean some NZUs could be sold	Windthrow risk increases, would leave exposed cutting faces, higher harvesting and roading costs. Five-yearly field sampling cost of \$12,000.
4	Remain registered and reduce the registered area to 99 hectares (PF Olsen recommendation ⁴). This could be done in conjunction with Options 1-3.	Avoids the five-year field sampling cost. Council would be financially better off.	Minimal financial return as nearly all the NZUs issued must be surrendered at harvest. Would have to use lower ETS standard tables instead of site-specific ones.
5	Deregister by surrendering the 24,186 NZUs issued (Alan Bell & Associates recommendation ⁵).	Least risk to the Council. Harvest planning and operations would be simpler and less constrained compared to Option 4. No further ETS compliance costs.	None

If the Council continues with the status quo of remaining in the ETS, it would have to surrender nearly all the NZUs issued to it as the forest is harvested. This is because the post-1989 forest was planted over a compressed timeframe (84% was planted between 1994 and 1997). It is assumed that each age-class would be completely harvested in one year when it reaches the conventional rotation age. Operationally, this is desirable given that the areas are relatively small.

The option of staying in the ETS, selling the NZUs as they are earned, and paying harvest liabilities out of log revenue is risky. The carbon market can be affected by political decisions and the future NZU price may be much higher than now. Not harvesting is not an option because of windthrow risk.

⁴ PF Olsen August 2015: Response to Alan Bell and Associates Review of Nelson City Council Plantations Report dated 17 August 2015, in Section 1 Summary.

⁵ Alan Bell and Associates: Review of Nelson City Council Plantations Report dated 17 August 2015, page 3.

If the younger stands were felled over a longer timeframe, it would mean the Council could retain (and sell) more NZUs as the harvest liabilities would be spread over a longer time and offset to some extent by the other growing stands. However the main risk with this approach is that older stands would be more exposed to windthrow, and the Nelson area has a history of wind damage to plantation forests. There are also higher harvesting and roading costs with harvesting small areas over a number of years compared with harvesting a complete age-class in one year.

The “remain registered” options may be enhanced if the Council reduced its registered area to less than 100 hectares. This would mean the Council would avoid the five-yearly \$12,000 cost of carrying out mandatory field sampling. However it would also mean that the lower ETS standard tables would have to be used instead of site-specific ones. PFOlsen have calculated Council would be financially better off by taking this option.

Finally, the Council could simply deregister its post-1989 forests from the ETS. The fact that most of this forest was planted over four years does not create a good carbon trading opportunity. Alternative forest management options are fraught with difficulty, so the least risk option for the Council is to deregister. This can be done by surrendering the NZUs issued to these forests (which the Council still holds). This should be completed before 31 December 2017 as the next mandatory field sampling is due by this date.

RECOMMENDATION:

- **That Nelson City Council deregisters its post-1989 forests from the ETS. This involves returning the 24,186 NZUs issued to this forest area. This action should be completed before 31 December 2017⁶.**

3.5 Pre-1990 participation options

The Council were allocated 33,360 NZUs for its pre-1990 forest land. These units are risk-free as they were allocated in recognition of some of the economic impacts of the ETS on this class of land. It appears that 3,800 of these have already been sold, leaving 29,560.

The Council is an ETS participant in relation to operating its landfill in the York Valley. A small area of adjacent pre-1990 forest land may be cleared to expand the landfill. Clearing this forest will incur an ETS deforestation liability related to the age of the trees. If the trees are eight years or younger the liability is calculated from the age at which the previous rotation of trees was harvested. To minimise this cost the Council should only clear trees that are older than eight years. Some of the remaining pre-1990 allocation units could be retained to meet this cost.

The council must acquire and surrender NZUs annually related to the tonnes of waste delivered to the landfill. The current NZU requirement is 16,000 but this will increase significantly in the next few years. In the past low cost international units were purchased to meet the landfill obligations, but these are no longer admissible in the NZ ETS. In the short to medium term, NZUs⁷ will need to be purchased on the NZ market to meet the annual demand.

⁶ If the forests are still registered on 31 December 2017, the second round of field sampling must be completed.

⁷ or possibly international units if access to these develops in the future.

RECOMMENDATIONS:

- That Nelson City Council assesses the area of pre-1990 forest land that may be cleared for an expansion of the York Valley landfill, and retain sufficient NZUs from its pre-1990 forestry allocation to meet the associated obligation to surrender NZUs.
- That any clearing of pre-1990 forest land for landfill expansion be delayed until the stands are more than eight years old in order to minimise the ETS liability.

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4 Values and Issues

The 5 Year Forest Management Plan (2011) states Nelson City Council's production forests will be managed:

"..on a sustainable basis and to maximise net present value, subject to satisfying the various policies described in the Management Plan."

The 'various policies' relate to species selection, tending regime, public access and log marketing. While this policy still sits as a recommendation to be formally adopted by Council, it has been the working policy for the forest manager (PF Olsen) for many years.

However, the singular focus on maximising economic return does not adequately account for the many other non-monetary values and uses now associated with Council's production forests by Council and the community. Unlike the forestry holdings of most other Council's, Nelson City Council has encouraged recreational development and use of its production forests. This is to be applauded, even though it does raise the potential for conflict between production values and the current suite of values ascribed to, and uses of, the production forest resource. The potential for conflict has been further heightened by recent developments adjacent to existing production forests i.e. Brook Waimarama Sanctuary and residential subdivision development, and changes in the community's environmental awareness (e.g. landscapes and water quality).

This chapter explores the different values and uses of Nelson City Council's production forests, the potential for conflict between production and non-production values and uses, and options for addressing these conflicts.

4.1 Economic

The primary reason Nelson City Council developed production forests was to generate an economic return to the Council in order to benefit ratepayers. While not large in comparison to other commercial plantations throughout the country, Nelson City Council's production forests are a valuable asset (as at 30 June 2015 it was valued at \$5.2M, and insured for \$5.8M) that have the potential to generate a sizeable dividend for Council on an annual and long-term basis (Figure 1).

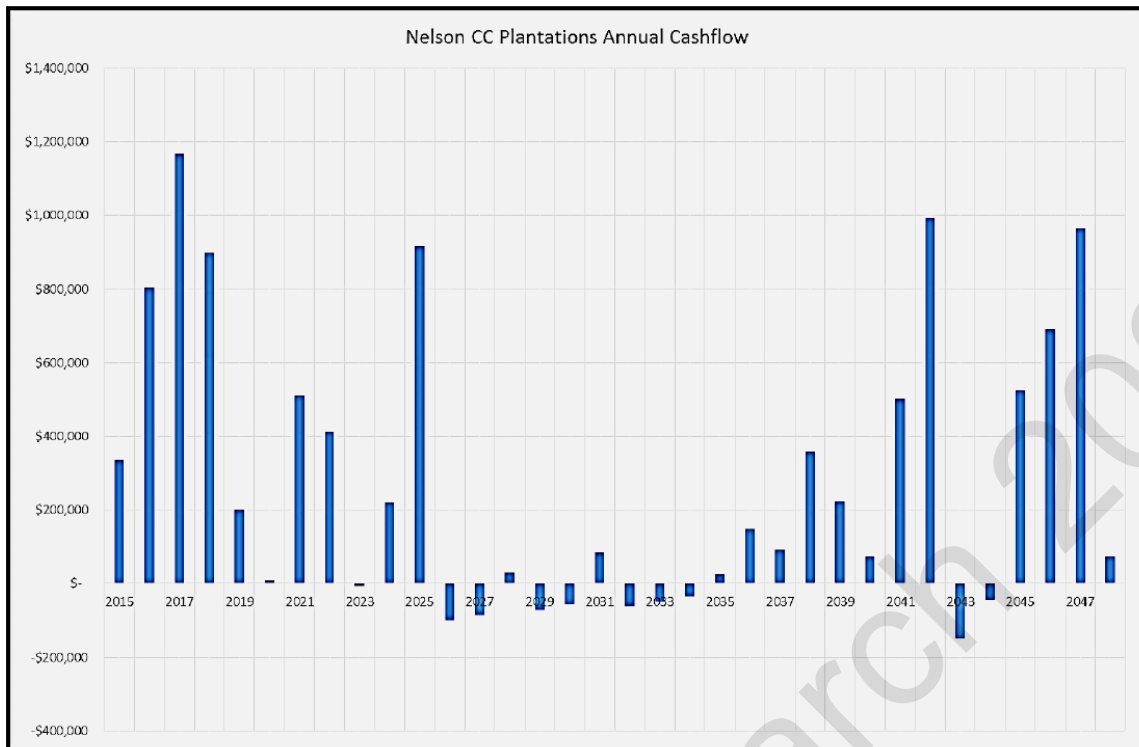


Figure 1: Indicative annual cash flows (revenue minus costs) for Nelson City Council’s production forests (Allen Bell and Associates 2015)

It is important to note that in Figure 1:

- Cashflows are indicative only – it is not until a detailed harvest plan (i.e. what areas will be harvested, when, and the volumes produced) is generated, and the harvested timber is sold that actual cashflow will be confirmed. The price achieved for harvested timber can vary wildly depending upon international and domestic demand and the quality and type of logs produced. Currently, domestic demand is high in response to the building boom.
- Management costs are fixed and incurred whether harvesting occurs (and income is generated) or not. These costs include insurance, day-to-day management, tending the trees (thinning, pruning), monitoring the forests etc.
- The forests are forecast to produce a substantial profit through to 2025, followed by a ten year period of forest losses (due to very little harvest activity, as trees are not at harvestable age), followed by an extended period of forecast profit.
- While the projected cashflows are across the entire production forest, they do not account for the economics of individual stands, which is influenced by factors such as ease of access, cost of establishing access, efficiency of harvesting, quality and health of the trees, the extent of wind damage, harvesting options, health and safety considerations, and site rehabilitation costs (e.g. biking/walking track reinstatement, erosion repairs). Site rehabilitation costs can be substantial e.g. geotechnical work associated with the recent Brook Sanctuary stand harvest were in the order of \$100,000 for engineering assessments, monitoring and sediment control measures. Given the above, it will uneconomic to harvest certain stands, or uneconomic to retain certain stands in production forestry beyond the next harvest.
- The cashflow projections do not account for site reestablishment costs i.e. raking, spraying and replanting

Irrespective of the above caveats, Nelson City Council's production forests are forecast to produce a positive cashflow over the long-term, with a Return on Investment (ROI) somewhere between 5-6%. On this basis Council should retain a reasonable proportion of its production forest into the future, with adjustments made to accommodate the various non-monetary values described below.

As previously mentioned, Nelson City Council's production forest is small in comparison to the total production forest area through Tasman-Marlborough. As such, Nelson City Council's production forestry operation has minimal impact on employment levels in Nelson. The small size of Nelson City Council's forest stands mean only small logging crews (3-5 workers) are required. Further, stands are generally harvested sequentially rather than in parallel, with breaks occurring between harvesting operations, so only one crew is in operation at a time, and then only for part of the year.

4.2 Municipal water supply

The second key reason Nelson City Council planted production forests (after economic return), was to protect municipal water supplies from the effects of erosion and the associated sediment inputs. In this task, plantation forests do a very good job for most of their growing cycle. From around the age of 7 years old seedlings provide a moderate degree of resistance to mass movement (i.e. slips and slumps) and soil erosion. This protection increases progressively over the life of the forest, until at the age of 27-30 years old, the tree is harvested. It is during harvest, through until the replanted seedlings reach 5-7 years old that the area is most vulnerable to mass movement and sediment release.

Harvest operations have the potential to release large volumes of sediment through construction of tracks, vehicle movements (e.g. haulers), and dragging of timber, through disturbance of soil and underlying material. The main concern during this time is surface erosion, rather than mass movement, as the roots of the felled trees still provide a high level of protection. The effectiveness of the stumps to resist mass movement declines steeply over the next 5 years as they rot. This leaves a window of 2-3 years after the stumps have sufficiently rotted and before the new plantings have taken hold when the ground is most prone to mass movement.

It should be noted, that the risk of mass movement is greatly reduced in the Nelson region, in comparison with other parts of the country, given the inherent stability of the underlying greywacke and argillite geology. Sediment generated from these geologies tends to be coarser in nature, rather than the large volumes of fine sediment generated by more readily eroded geologies (e.g. papa mudstone).

Fine sediment movement can be reasonably effectively controlled, but not prevented altogether, through careful planning prior to harvest (e.g. positioning of tracks, harvesting methods, identification of critical source areas of sediment), use of sediment control techniques (e.g. silt detention dams), and monitoring of harvesting operations.

Nelson City Council's production forests are adjacent to three key municipal water supplies:

- Maitai South Branch – the main water supply source for Nelson, located within the Maitai forest block
- Maitai North Branch (Maitai Dam) – supports the Maitai South branch supply, located in the Maitai forest block
- Roding –located in the Roding forest block.



Only relatively small areas of the Maitai and Roding forest blocks are located upstream of the water supply intakes. Given this, the low probability of mass movement, and the measures available to reduce fine sediment movement, the existing forests in these areas can be harvested without disruption to the water supplies. That said, to avoid any such future issues, a buffer zone of 100-200m, depending upon the length and angle of the slope, should be applied to new plantings in those stands where a slope directly connected to a water supply watercourse.

4.3 Infrastructure

A number of major infrastructural assets pass through or adjacent to Nelson City Council's production forests – electricity transmission lines, roads, and watermains. These assets range from nationally to locally important.

- Electricity transmission lines – two main electricity transmission lines pass through Nelson City Council's production forests: (1) part of the national grid which passes from Stoke, through the top of the York Valley, down the Brook Valley, behind Sharland Hill and then up through the Maitai Valley into Marlborough, and (2) a local line extending over the Barnicoat Range to the Roding water supply intake. The key issue with transmission lines is the fire risk posed by line strike (arcing) during strong winds, and damage to pylons during harvesting. These risks are appropriately managed through buffer zones, as defined in the Electricity (Hazards from Trees) Regulations 2003. These regulations set horizontal and vertical buffer zone widths that vary by line voltage and the span distance between poles/pylons. Forest managers have adopted a conservative buffer width of 30m, extending from the centre line of the transmission lines for Nelson City Council's forests.
- Roads – Council's production forests are serviced by a large network of internal private forestry roads (established for forest management purposes), which are in turn connected to the local public road network. The potential issues associated with roads are: (1) tree/branch fall hazards during the growth phase of a forest, (2) tree fall hazards during harvesting, (3) heavy vehicle movements during harvesting, and (4) fire.
 - Tree/branch fall during the growth phase is a natural consequence of trees being in proximity to roads – irrespective of the species or purpose of the trees (i.e. the same level of risk exists for shelter belts and amenity plantings). As such, this is not a major issue, although it does require regular road checking and clearing, especially following storm events, as is current done.
 - Tree fall hazards during harvesting and heavy vehicle movements present a much greater potential hazard. These hazards can be fully managed through appropriate harvesting techniques, and road closures, as is currently done. Obviously, road closures of private forestry roads are less disruptive than closures of public roads. However, disruption can be minimised by providing road users with sufficient warning of a closure, and ensuring a practical approach is taken with traffic management i.e. regular opening times, closures kept to a minimum, regular opening times etc. This is done now, but practices could be improved with respect to notification of road closures i.e. giving increased advance warning of road closures and how road closures will be managed.



- Fire as a result of the likes of smoke butts being thrown from cars, hot car exhausts coming into contact with flammable material, and arson is an ever present danger in production forests. The fire risk can be readily managed, but not removed altogether. Options for controlling the fire hazard include restricting use of the forests when the fire risk is high, firebreaks within the forest, and maintaining a tree-free buffer between roads and the forest edge. All of these are current practice, although the road buffer width should be increased for new plantings to 5m for private forestry roads, and 10m for public roads.
 - Mass movement (slips and slumps) on to or below roads as a result of plantation forestry activities have a low probability given the underlying geology (as described in section 4.2).
- Watermain – an above ground watermain travels down the Maitai Valley, before wrapping around the southern end of Sharland Hill, before it is undergrounded through Nelson. The main issues with the watermain are similar to those described above for roads, although the consequences of a watermain breakage are significantly greater. Likewise the solutions are similar – with a buffer width being the most effective solution. A buffer of variable width is currently in place, but this should be increased to 20m either side of the pipeline for new plantings. These provisions are not required for the new duplicate watermain as it has been undergrounded for much of its length.

4.4 Landscapes

Two recent landscape assessments have been undertaken for Nelson City Council to inform the Nelson Plan development process. The first report⁸ undertook an assessment and evaluation of visual amenity landscapes in the region, and recommended several Outstanding Natural Features and Landscapes for inclusion within the Nelson Plan. The second report⁹ identified evaluated and recommended a number of amenity landscapes for inclusion within the Nelson Plan. By way of explanation:

- Outstanding Natural Features and Landscapes (ONFL) are landscape units or features that are highly valued because they help frame or define an area, they are unique in a New Zealand context, and are generally in an unmodified condition. ONFL are included within regional/district plans for the purposes of protection. None of Nelson City Council's production forests are located within any of the recommended ONFLs. Although the top end of the Maitai block and the Roding block mark are directly adjacent to the proposed 'The Bryant Range and Mineral Belt' ONFL.
- Amenity landscapes are important to local communities for their visibility and the backdrop they provide to an area. Amenity landscapes are generally modified in some way, and their inclusion within regional/district plans is for the purposes of managing within limits the activities that occur within the amenity landscape unit. The recommended visual amenity landscapes called 'Barnicoat Range', 'Grampions', 'Sharland Hill' and 'Fringed Hill' overlap most of the Marsden and Brook forest blocks.

⁸ Boffa Miskell Limited (2015) Nelson landscape study: Preliminary landscape evaluation. Client report prepared for Nelson City Council.

⁹ Boffa Miskell Limited (2016) Nelson landscape study: Visual amenity landscape evaluation. Client report prepared for Nelson City Council.

The inclusion of part of Council's production forest within visual amenity landscape zones is not a cause for alarm. Production forestry within these landscape units is an existing use, and over the forest's growth cycle has contributed positively to the visual amenity of these units. However, there is potential for issues when the forest is harvested, through until the forest is re-established.

Harvesting, particularly if over a large area, will change the landscape visually with the loss of tree cover and an associated change in colour. This is an unavoidable consequence of managing a production forest. Harvesting activities have the potential to 'scar' the landscape through the development of haul routes, roads, and tree drag lines. These effects can be minimised, but not avoided altogether, at the planning stage through the selection of appropriate harvesting methods and the order and area of harvest. The visual effects of harvesting will begin to disappear from 3-5 years following replanting. So over a 30 year growth cycle, visual amenity values are protected by production forestry for approximately 25 of those years.

4.5 Residential development

Since much of Nelson City Council's current crop of production forest trees were planted Nelson has experienced a significant increase in its urban footprint, with residential expansion occurring into the Marsden, York, Brook and Maitai valleys. This gives rise to two potential issues: (1) housing in close proximity to housing, and (2) increased heavy vehicle movements (logging trucks) in residential suburbs as part of harvesting operations.

The presence of residential development within close proximity/immediately adjacent to production forests is a major concern because of the potential fire threat, and the potential dangers created during harvesting. This situation is most obvious in the Brook forest block which has several stands where trees are located immediately uphill of residential areas. In stand 29/01 approximately 3ha of trees are located above a residential area. This stand already has many trees blown over by the wind. Such trees are dangerous for ground crews to deal with as the trees are all under tension, meaning the fallen trees can move or spring upright once the pressure is removed.

Production forestry and residential development are incompatible land uses. As such, remaining trees and trees in stands located adjacent to residential areas cannot be recovered safely or economically, but they must be dealt with to address potential problems into the future i.e. uncontrolled windfall. Three options exist to address this option: (1) the trees are sprayed and left to break down in situ over a period of several years, (2) the trees are mechanically felled (using a specialised digger) and left in place to rot down, or (3) a combination approach where the trees are sprayed, and then after a period of several years they are mechanically felled and left to rot. Obviously, there is a cost to all of these options, in addition to the revenue lost by not recovering the trees. Such areas should be permanently taken out of production forestry.

Residential separation distances of at least 200m metres should be: (1) applied to any areas replanted in production forest species (i.e. keeping trees away from residential areas), and (2) between existing production forests and new subdivisions (i.e. keeping residential areas away from trees).

With respect to heavy traffic movements through residential areas, the increase due to harvesting operations is small in comparison to the pre-existing level of heavy traffic movements associated with subdivision activities and other development. The logging crews engaged by PFOlsen fell and process approximately 150 tonnes of logs per day ready for hauling. This equates to six truck and trailer loads, or twelve logging truck movements per day. On this basis each hectare of production

forest generates about 500 tonnes of logs, which requires approximately 3.3 days to haul. Further, seventy-three percent of Nelson City Council's production forest stands are less than 10ha in size, requiring less than 33 days each to transport the harvested logs. On this basis heavy traffic movement is not a major issue with respect to Nelson City Council's production forests.

4.6 Archaeological

There is only one known archaeological site within Nelson City Council's production forest – the Smith grave site in the Maitai forest block. The site is well known, and damage to the site is easily avoided by careful management of tree tending and harvesting activities in the vicinity.

Obviously, there may be other as yet unknown sites, particularly those related to pre-European activities, in the production forest estate. These sites are best handled through accidental discovery protocols, as is currently the case. Under such protocols work ceases upon discovery of an archaeological site or artefact. What is found determines which agency is contacted, and what further action is required. Work can only resume once the appropriate agency gives its approval.

It is important to note that most of Nelson City Council's production forest land has had at least one rotation of tree's, without any discoveries, so the potential for future discoveries is low.

4.7 Recreation

The three main recreation activities within Nelson City Council's production forests are mountainbiking, walking and paragliding.

- Mountainbiking and walking occurs throughout Nelson City Council's production forests, and more tracks are being added on a regular basis. The extent to which Nelson City Council has allowed, and is now encouraging, public access and use of its production forests is to be commended, and is an example to many other council's who are generally far more restrictive in allowing public access. The most likely conflicts between production forestry activities and mountainbiking/walking occur as a result of harvesting activities i.e. track closures and track damage. For obvious safety reasons harvesting adjacent to access roads and/or in the vicinity of tracks, requires these roads/tracks to be temporarily closed. A conversation with the Nelson Mountainbiking Club indicates that any potential conflicts can be managed through: providing sufficient prior warning harvesting is programmed (i.e. at least 12 months in advance, so calendared events can be accommodated or rescheduled), improved notification that harvesting is to occur (i.e. signage, public notices, website updates and the like starting at least six months prior to works occurring), planning harvesting so the smallest area and/or number/length of track is closed at any one time, and that closures wherever possible are restricted to work hours only (i.e. forests remain open outside of work hours, weekends, holidays, where possible).

Similarly, the Mountainbiking club acknowledged that damage to tracks as a result of harvesting operations was an inevitable consequence of having tracks in a production forest setting. The threat to tracks can be reduced through careful harvest planning and selection of methods. If damage does occur then Nelson City Council should pay for the harvesting machinery on site to make initial repairs. This would be a negligible additional cost, within the overall harvesting cost for a stand. The Mountainbiking club indicated this is their preferred approach, with club members then fine-tuning any repairs once the track is reopened.



- Paragliding is limited to the Barnicoat Range ridgeline, where there is a production forest exclusion zone around the take-off area. The only likely conflict between production forestry activities and paragliding is when harvesting is occurring adjacent to the access road and/or logging trucks are using the access road, necessitating closure of the road for safety reasons. Conflict can be minimised by providing adequate warning of harvesting operations, and ensuring a practical approach is applied to traffic management i.e. restricting closures to normal working hours and work days.

4.8 Water quality

In general, the Nelson region has good freshwater quality, but it is degraded in certain areas and at certain times, which restricts full use of the region's waterways (e.g. swimming). The Nelson community and Nelson City Council are committed (via Project Maitai/Mahitahi and Nelson Plan) to protect water, and improve it where it is degraded (as required by the National Policy Statement for Freshwater Management (NPS-FW) 2014). Production forestry activities can impact on water quality in three key ways via the release of sediment, nutrients, and woody debris.

As discussed in the above (section 4.2), the bulk of Nelson City Council's production forests are situated on greywacke/argillite geology, with only the area extending from Codgers Hill through to the York Valley underlain by less stable volcanic geology. As previously stated the greywacke/argillite geology has a high inherent stability, so is not prone to mass movement (i.e. slips and slumps), as evidenced by the long, steep hill slopes present throughout much of the region. Such areas do not release large volumes of coarse sediment into the region's rivers; a situation largely unaffected by production forestry activities if best management practice is employed.

However, the greywacke/argillite and volcanic geology areas have the potential to produce reasonably large volumes of fine sediment if the ground surface is disturbed; a situation that can be exacerbated through production forest activities. On the greywacke/argillite geology this will be in the form of surface runoff, whereas on the volcanic sediment this can involve surface runoff and small-scale mass movement (as demonstrated by the slips visible across the Tantragee Saddle).

Fine sediment, depending upon the quantity and when (seasonally and in relation to certain-sized rainfall events) it enters waterways can impact upon water clarity (and recreational activities), instream habitat (by filling the gaps between river gravels where insects and juvenile native fish live), and introduce nutrients (especially phosphorus).

Fine sediment runoff is unavoidable as a result of production forest harvest (sediment losses from production forests over the remainder of their life cycle is low), but can be significantly reduced through the adoption of appropriate management practices with respect to matters such as planning (e.g. timing), harvest method selection, haul track and skid site placement and construction, and sediment control methods. The retention of buffers (10m wide) around all waterways, and avoiding the felling of trees into waterways, or hauling across waterways will also significantly reduce fine sediment losses¹⁰. Such approaches will also significantly reduce the potential for phosphorus and woody debris inputs to waterways.

¹⁰ These buffer widths are based upon current best management practices. However, they may need to be amended in the future to ensure consistency with the buffer widths set in the Nelson Plan.

4.9 Biodiversity

The Nelson community is rightly proud of the region's biodiversity values which extend from the back country right through to the edge of the city. Many actions are proposed through Nelson Nature and the Nelson Plan to protect, and restore where required, Nelson's biodiversity. Management of Nelson City Council's production forests has the potential to impact on biodiversity values in several key ways:

- Wilding pines – the greatest potential impact of production forestry on biodiversity values is wilding pines where conifer species spread out of managed areas into natural areas. Wilding pines are a growing concern within New Zealand, particularly the South Island high country with thousands of hectares being overtaken every year by wilding pines. Within the Nelson region, wilding pines are a major threat to the Dun Mountain/Mineral belt with its naturally sparse vegetation. Recent wilding pine survey/treatment work carried out as part of Nelson Nature has revealed there is already a significant wilding pine issue in the region.

Fortunately not all species and sites have the same potential to generate wilding pines. Douglas fir, with its small, light seed, and very shade tolerant seedlings has a much greater potential for wilding than *Pinus radiata*. Similarly, elevated sites, particularly those exposed to high winds (i.e. ridgelines), so called 'take-off sites', have much greater potential for wilding pines.

The national wilding pine calculator¹¹ indicates the wilding pine risk for Nelson City Council's production forests is *very high* for Douglas fir and *high* for *Pinus radiata* at identified take-off points. The current and potential future impact of wilding pines on biodiversity values (and Nelson Nature's objectives) are such that Nelson City Council should destroy all of its current Douglas fir stands (a total of 39 hectares) as soon as possible, and that prominent Barnicoat Range ridgeline should not be replanted in conifer species, and instead be replanted in native vegetation.

Only 3.9ha of Nelson City Council's Douglas fir stands will reach maturity within the next 10 years, with the bulk of the Douglas fir stands (26.4ha) not reaching maturity for a further 26 years. Destroying the Douglas fir stands now will not significantly alter production forest income streams given the immaturity of the stands, and their associated low present value. Destroying them will however, significantly reduce the wilding pine risk generated by these stands.

It is also recommended that Nelson City Council destroys all of its acacia species stands. Although not a conifer, acacia species do have a habit of spreading along waterways. Fortunately, Nelson City Council has only a few, small stands of poorly tended acacia.

- Brook Waimarama Sanctuary – whilst this initiative has been in the planning stage for many years, it is only in the last year that predator-proof fencing has been erected to create a mainland island at the site. In anticipation of the fencing being erected, the production forest stand located immediately upslope of the proposed fenceline was harvested. Future use of this stand for production forestry purposes is impractical given the lack of an economically viable access route for removing harvested timber. As such, this stand should be put to some other use – the most compatible being conversion to native vegetation (which is also consistent with the aims of Nelson Nature).

¹¹ <http://www.forestry.ac.nz/euan/wildings/wrisk.htm>

- Bush areas – There are no identified Significant Areas (SNAs) within Nelson City Council's production forests, but there are stands of mature native vegetation along watercourses flowing through various forest stands, and many stands are located adjacent to native vegetation. Harvesting operations are the primary cause of impact, with trees being felled into areas of native vegetation to facilitate easier log hauling. Felling trees in this way reduces the health of mature native stands, and can open native vegetation up to invasion by weeds. Such impacts can be significantly reduced through the adoption of practices that safeguard native vegetation i.e. felling away from native vegetation (not a universally practice currently) or leaving a buffer (10m wide) during reestablishment.
- Karearea (NZ Falcon) - is a threatened bird species only found in New Zealand, and can be found breeding in pine plantations. The falcons' habit of nesting on the ground can bring it into conflict with production forest operations. However, on the rare occasion that forestry operations encounter nesting falcons, national protocols¹² provide guidance on how to avoid potentially negative effects. Falcon nests are usually located within 200m of the border between a mature stand and stand less than 4 years old, and between the months October through January. Nest sites change from year to year.
- Native fish – Nelson is home to many types of native fish, including several threatened fish species¹³. The most notable is the Poorman Valley Stream which flows through the Marsden forest block. Although Nelson's native fish populations are in reasonable health in comparison to many other parts of New Zealand, given the threats that have caused declines in native fish population and diversity elsewhere are present in the region, Nelson's native fish populations are at risk of further decline. Production forestry operations have the potential to impact on native fish populations through the release of sediment, nutrient and woody vegetation as outlined in section 4.7 (water quality) above. The options for addressing native fish impacts are similar to those for addressing water quality impacts, with the addition of needing to ensure all stream crossing points allow for up- and downstream fish migration.

¹² <http://www.ernslaw.co.nz/assets/resources-contractors/EMS/RTE/NZ-Falcon-Forestry-Management-Protocols-Wingspan-Aug-13.pdf>

¹³ The Catalyst Group (2015) Aquatic sites of significance: document in support of the Nelson Plan water management framework. Client report prepared for Nelson City Council.



5 Future forest management

A large number of values are associated with Nelson City Council's production forests on a block and stand basis (Annex 5). The compatibility or incompatibility of these values with production forestry was explored in the previous chapter, as were options for managing any conflict between monetary and non-monetary values. This information provided the foundation upon which the following criteria and recommendations were developed for guiding future decisions about the stands that should be harvested, those that should be retained in production forestry, and those that should be converted to an alternate use.

5.1 Harvesting

The following criteria were used to guide thinking on whether a stand should be harvested:

- Economic – stands should not be harvested if the projected net return from harvesting after taking all costs including management and road/track rehabilitation into consideration, is negative. In general, small stands, isolated stands, those with no/limited access, or where there are restrictions on harvesting (i.e. proximity to roads, residential areas, heritage sites etc.) are less efficient and economic to harvest. Where possible, smaller stands should be harvested in conjunction with neighbouring stands.
- Wilding pines – the wilding pine risk is very high from Council's Douglas fir stands due to them being located on 'take-off' sites, and in proximity to the Dun Mountain/Mineral Belt. Any income generated from harvesting Douglas fir is likely to be offset by an equal or greater cost of wilding pine control as part of Nelson Nature. Douglas fir stands that are mature should be harvested where it is economic to do so, and all other stands should be poisoned/felled to waste, within the next 2-5 years. Most stands are still many years, decades in the case of the Barnicoat Range, from maturity.
- Residential areas/Brook Waimarama Sanctuary – production forestry is incompatible with these neighbouring land uses due to the risks associated with tree fall (during storms and harvesting) and fire. All stands within proximity to these areas should be harvested where safe and economic to do so, or poisoned/felled if not, within the next 2-5 years.
- Other values – the other values identified are not expected to prevent harvesting of stands, although they may place restrictions on how, or how much of, a stand is harvested i.e. avoiding heritage sites and waterways, and installing sediment controls etc.

5.2 Retention in production forestry

The following criteria were used to guide thinking on whether a stand should be retained in production forestry (i.e. replanted):

- Economic – the economics of growing and harvesting a stand can be fundamentally altered by the imposition of buffers (see below for recommended buffer widths) or other measures (e.g. sediment controls) to address potential impacts on values, by reducing the area available for trees, the costs associated with implementing measures, or the restrictions placed on the methods available for harvesting and/or their efficiency.

- Species – a species should be matched to a site. The Council’s land below an altitude of 650m grows good quality *Pinus radiata*, so this species should be the focus of all future production forestry plantings. It will be more efficient and simpler to deal with a single tree species, rather than a range of species with different rotation lengths and tending requirements, particularly given Nelson City Council’s modest forest holdings. Further, a short rotation species such as *Pinus radiata* (<30 years), has significantly reduced risks of fire and storm damage than longer rotation species such as totara and rimu (50-100 years). The threat of wilding pines is also an important consideration, and the principal reason why the likes of Douglas fir should be discontinued. Finally, species diversification is not warranted, nor can it be economically justified, given the modest size of Nelson City Council’s forest holdings.
- Altitude – *Pinus radiata* establishment, growth and quality declines with altitude, due to wind, frost and snow damage. An operational limit of approximately 650m should be considered when replanting. Experience has shown that seedling establishment above this altitude is challenging. For example, two stands in the Roding block have had to be replanted when as seedlings were destroyed by frost and snow damage.
- Residential areas/Brook Waimarama Sanctuary – production forestry should be discontinued upslope of these land uses, with the area excluded from replanting delineated by topography and the boundaries of efficient/safe harvesting operations. Similarly, residential subdivision should not be allowed to encroach upon existing production forestry and create reverse-sensitivity issues.
- Municipal Water Supply – the potential for sediment movement off production forestry land, particularly during the window from harvesting through to canopy closure (around age 7 years) is relatively high. Such sediment movement could have significant impacts on Nelson City’s municipal water supply, requiring either a shut-down of the supply or the expense of additional treatment. To reduce the potential of this occurring, a 100-200m wide buffer that is retired from production forestry, depending upon the slope, should be adopted in those stands located upstream of the water supply intakes in the Maitai and Roding catchments. This buffer should be converted to an alternate land use e.g. native vegetation.
- Amenity landscapes – at this stage it is proposed to include amenity landscapes within the Nelson Plan. Whether amenity landscapes remain within the Nelson Plan, and what if any land use restrictions may be imposed within them, is still to be discussed with the community. Nelson City Council has previously consulted with the community on its production forestry activity as part of its investment policy, where forestry and where it was located was supported by the public. As such, Council should not alter its forestry management in anticipation of community consultation outcomes around amenity landscapes. Instead, it should be prepared to make changes when/if community feedback requires it. The two amenity landscapes of relevance to Nelson City Council’s production forests are those covering the Barnicoat Range (138ha) and Fringed Hill (61ha, of which 16.5ha has already been replanted in native vegetation).
- Other values – the other values are not expected to prevent replanting of stands following harvest. However, as mentioned above the restrictions imposed to protect these values may impact on the economics of retaining a stand in production forestry.



5.3 Replanting and tending

The following criteria were used to guide thinking about how those stands to be retained in production forestry should be managed into the future:

- All new production forestry plantings should be in *Pinus radiata*
- The following set-backs should be applied to new plantings to protect identified values¹⁴:
 - Municipal water supplies – 200m where there is a direct slope into the adjacent waterway
 - Electricity transmission lines – 30m from the centre of the line corridor
 - Private (forestry) roads – 5m
 - Public roads – 10m
 - Archaeological – 30m
 - Mountainbiking/walking – 5m
 - Paragliding – retention of current set back
 - Mature bush areas – 10m
 - Waterways – 10m
- Only *Pinus radiata* stands on sites where the site productivity index is above a certain threshold should be pruned to produce clear timber. The Marsden block due to its higher soil fertility and the associated thicker branching habit of trees grown in this area, lends itself to a pruned regime. All other stands should be managed to produce structural lumber (i.e. unpruned).¹⁵ This is consistent with advice received from PFOlsen during the review.
- Production forestry stands in the York Valley that are likely to be felled prior to reaching a harvestable age, as a result of landfill expansion, should not be thinned or pruned.

Which stands should be harvested, retained in production forestry, and recommended tending regimes are set out in Annex 6. On the basis of these recommendations, Nelson City Council's production forest area would shrink by approximately 140ha to around 500ha. This 140ha includes trees retained as amenity plantings, areas excluded as buffers, and areas converted to alternate uses.

One complicating factor in these recommendations is the current resource consent Nelson City Council's production forestry must operate under with respect to herbicide use. As mentioned by previous commentators, this consent is unnecessarily strict in terms of the herbicides that can be used, and how and where they can be used. The consent is significantly increasing forest establishment costs, and has major implications for future management of production forest stands, and those stands that are recommended to be taken out of production forestry. As a result of the resource consent restrictions, Nelson City Council's production forests cannot be managed in accordance with the 5-Forest Management Plan or Council's Property and Facilities Asset

¹⁴ Subject to review following confirmation of forestry buffer widths in the Nelson Plan.

¹⁵ The following planting regimes are suggested for Nelson:

- For pruned stands, a GF 24 seedling, planted at 800-1000 stems/ha is recommended. A GF 24 is recommended for its stiffness and suitability for Nelson growing conditions. The stand should be thinned to 500 stems/ha during the first prune (at 4-6 years), and then to 350 stems/ha during the second prune (6-8 years). Prune to 6.5 metres height above ground level. Harvest at 28-30 years.
- For unpruned sites, a SSOP (GF 17 equivalent), planted at 800-1000 stems/ha is recommended. SSOP is recommended for its low branching habit, and good windthrow resistance. The stand should be thinned to 500 stems/ha by 6 years of age. Harvest at 25-27 years.

Management Plan 2015-25. Council should apply for a variation to this consent, or apply for a new consent (the current consent expires in 2019).

5.4 Operational implications

Once Council confirms its future directions with respect to production forestry, it should:

- restart harvesting and replanting operations as soon as possible as there is a considerable volume of timber at harvestable age now, and more will be maturing in the next five years;
- schedule the replanting of bare harvested areas;
- update the Forest Management Plan to reflect the new commercial forestry area and other strategic decisions;
- approve a five-year harvesting plan.

5.5 Financial implications

The financial implications of the proposed recommendations include:

- potential reduction in production forestry income, as set out in the Long Term Plan. Although still to be confirmed, the income impacts are expected to be minimal as it is recommended the majority of production forests reaching maturity over the next 10 years are harvested, with those considered uneconomic to harvest being poisoned/felled to waste. Further, only 3.9ha of the total 39 ha of Douglas fir (recommended by destroyed) will reach harvestable age within the next 10 years. The bulk (26.4ha) of the Douglas fir stands will not reach maturity for a further 26 years.
- a reduction in production forestry area by around 140 hectares to 500 hectares will reduce the forest asset value when it is next revalued for Council's financial statements. These statements will need to show a Loss on Revaluation, and a lower asset value.
- additional costs associated with removal of unwanted stands by poisoning and/or felling to waste need to be included in operational budgets.
- additional costs associated with the repair of tracks etc following harvesting, and the remediation of those sites being converted to alternate land uses need to be included in operational budgets
- additional costs associated with improved communication with community groups and communication of harvesting operations need to be included in operational budgets
- potential income from the sale of Pre-1990 NZUs
- lower insurance costs as a result of a reduced production forest area.

There is also the cost associated with conversion of production forestry stands to alternate land uses e.g. planting and ongoing management. Council is yet to decide if this cost is most appropriately borne by the production forestry output, some other part of council, or a shared cost.

5.6 Other matters

The values assessment identified a number of options for reducing conflict between monetary and non-monetary values. Strategic level options have been covered above, but conflict can also be managed at an operational level i.e. when planning or carrying out harvesting activities. Operations should follow industry best practice as specified in the NZ Code of Practice for Plantation Forestry. Specific approaches to reducing potential conflict include:

- Prepare a 5-year forest harvest plan
- Consult with key forest user groups (e.g. Nelson Mountainbiking Club) as part of developing the 5-year forest harvest plans
- Providing sufficient notice to forest users that a stand is to be harvested, starting at least 6 months prior to harvesting. Notice should be providing using a variety of media e.g. signage, website, notice out to key user groups, public notices etc.
- Each stand harvest plan should have an associated sediment control plan, with the costs of implementing this plan factored into the contract costs and revenue projections for the stand
- Each stand harvest plan should identify the potential for damage to mountainbiking/walking tracks, and the costs of remediation factored into contract costs and revenue projections for the stand
- Road and track closures for safety reasons should be kept to the minimum necessary. Options include, only closing one track at a time, only keeping tracks closed during work hours, opening tracks on weekends and holidays. The decision to open or close a track will obviously need to be made on a case by case basis.
- No dragging of harvested trees through waterways
- Ensuring all constructed crossing points are fish friendly
- No felling of trees into, or dragging trees through, mature stands of native bush
- Adopt and follow national protocols in relation to avoidance of nesting karearea
- Adopt and follow accidental archaeological site/item discovery protocols



6 Alternate land uses

To avoid conflict between monetary and non-monetary values it is recommended that some stands are only partially harvested, poisoned/felled to waste, partially replanted in production forestry, converted to an alternate land use, or allowed to regenerate to native bush (Annex 6). This chapter explores these options and their implications and costs.

6.1 Unharvested trees

Trees that are wind damaged, in close proximity to residential areas, or on very steep slopes, that cannot be harvested safely or economically should be felled to waste, or poisoned then felled to waste. Unharvested trees cannot be left in place because they are very prone to wind damage and falling in an uncontrolled manner. Poisoning, then felling (provided it is done with 2 years after poisoning), to kill the tree first has two benefits: (1) induces needle drop thereby reducing the fire risk, and (2) relieves the stress in windthrown trees making them safer for forestry workers to deal with. Trees can be felled by hand or mechanically. It is recommended that most Douglas fir stands are similarly poisoned/felled to waste.

The cost of this work most appropriately sits with the production forestry output.

6.2 Alternate land uses and native regeneration

Entire or partial stands taken out of production forestry cannot simply be left alone given the potential for recolonisation by exotic production species and weed invasion. Cleared sites have a significant seed bank, so sites will quickly recolonise with the pre-existing production species. Additionally, the Nelson region has a significant weed burden, so unmanaged sites will quickly become infested with weeds – first with wind dispersed weeds, then by bird-dispersed weeds.

It is for this reason that all sites will require some level of management following harvesting poisoning/felling to waste if the intention is to convert the site to an alternate land use. Management will involve spraying production species regrowth, replanting, and ongoing weed control. The level and length of weed control diminishes with distance from major weed sources, with sites close to Nelson City requiring the greatest ongoing support. Sites distant from the city and adjacent to mature native vegetation stands may not require replanting, as it may be possible to rely on the existing soil seed bank or seed rain to revegetate the site.

If replanting is required, careful consideration should be given to the purpose of the planting and the likely costs. Indicative costs of different planting options are presented below:

- Pinus radiata at 1000 stems/ha, including pre-planting spray and planting - \$1100/ha
- Manuka at 1100 stems/ha, including pre-planting spray and planting - \$2500/ha
- Amenity plantings (e.g. redwoods) at 1000 stems/ha, including pre-planting spray and planting - \$2-3000/ha
- Native revegetation 2500 stems/ha, including pre-planting spray and planting - \$5-15,000/ha (depending upon seedling size and type)

All plantings require ongoing releasing to ensure seedling success. Pinus radiata plantings because of their rapid growth rate only require support for 1-2 years, manuka plantings will require support for up to 5 years until canopy closure, while native plantings may require support for up to 10 years depending upon the weed burden. Obviously native revegetation programmes lend themselves well to community involvement, which will lower some of the costs (e.g. planting and releasing), but will increase supervision costs. Community planting programmes should start off slowly and tackle relatively modest areas at a time (i.e. less than a hectare) to ensure all planted seedlings receive the necessary ongoing support.

Manuka plantings, if appropriately sourced, have the potential to generate income for Council through the leasing of sites for manuka honey production. Once manuka plantings reach the end of their productive life (around 25 years) they can either be crushed and replanted, or left in place to facilitate regeneration of native bush. Council already has a modest planted/tended manuka stand in the Maitai block, overlooking the dam.

Amenity plantings (e.g. redwood) can have the dual benefit of weed suppressant (depending upon growth rates and planting density), and future harvest revenue. Redwoods are a long lived, long rotation species (around 60 years).

If options other than woody vegetation are considered (e.g. conversion to pasture) there may be carbon credit implications, as set out in chapter 3 above.

Annex 1: Authors

The Catalyst Group

The Catalyst Group is a strategic planning and environmental management consultancy firm based in Palmerston North. The Catalyst Group specialises in providing high level strategic and environmental policy and management advice to regional and district councils, non-government organisations, and individuals. Alistair Beveridge, a company director, undertook this review.

Alistair has 20 years of experience within the environmental management space. He has provided expert advice into consent, engineering and science matters. More recently Alistair has led complex community engagement programmes, and developed and run several large non-statutory biodiversity restoration, water quality improvement, and community education programmes.

In the Nelson region Alistair is providing technical input and advice to the Nelson Plan development process (primarily the biodiversity and water chapters), and was previously an acting manager for the Environmental Programmes team where he had a lead role in developing the Project Maitai/Mahitahi and Nelson Nature programmes.

While at Horizons Regional Council (16 years), Alistair led the teams delivering biodiversity, water quality and regional parks programmes and provided advice directly to the executive team in relation to major policy initiatives. Alistair also had a lead role in the development of the water, living heritage, and land chapters of the One Plan (a second-generation, unified Regional Policy Statement, Regional Plan, and Coastal Plan for the Manawatu-Whanganui region).

Alistair's experience and involvement with production forestry:

- at a regional council level includes resource consent processing, non-regulatory land protection programmes (Sustainable Land Use Initiative – SLUI), and the One Plan development and consultation processes, and
- at a district council level include district plan review processes.

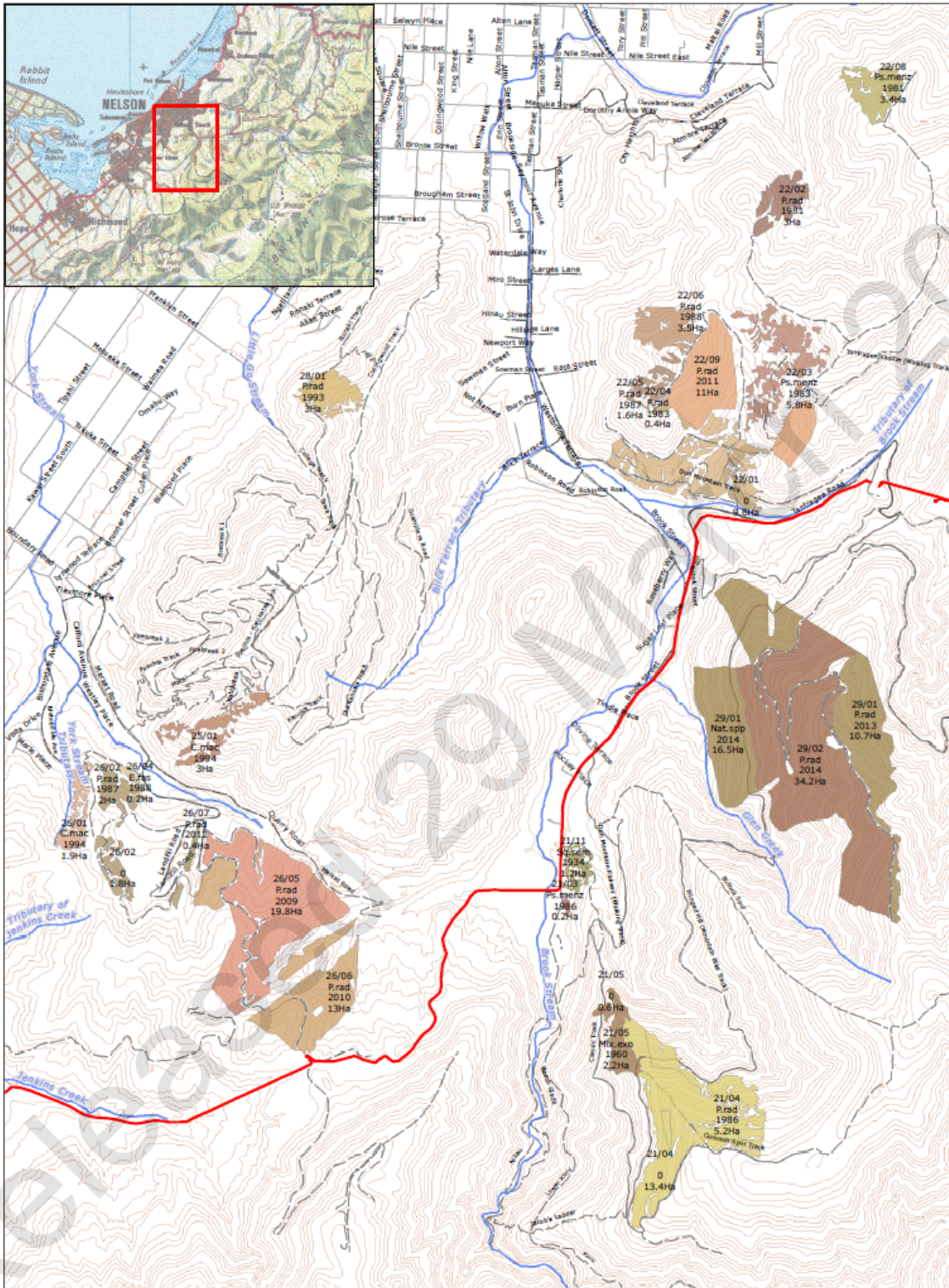
Peter Gorman

Peter is a forestry advisor to the Nelson City Council. He has 42 years of forest management experience with central government, a state-owned enterprise, a private company and a non-government organisation including:


- planning and technical aspects of production forestry, research, budgeting, valuation, land transactions, leasing negotiations and asset sales,
- managing forests for multiple uses such as water quality, erosion control, recreation and non-timber products, and
- Government forestry policy.

From 2007-2015, Peter worked for central government developing and implementing the forestry provisions of the Emissions Trading Scheme; and various government afforestation schemes.

Annex 2: Nelson City Council's Production Forest Blocks and Stands



Brook Forest
Nelson City Council
Forest Stands



te kaunihera o whakatū

Legend

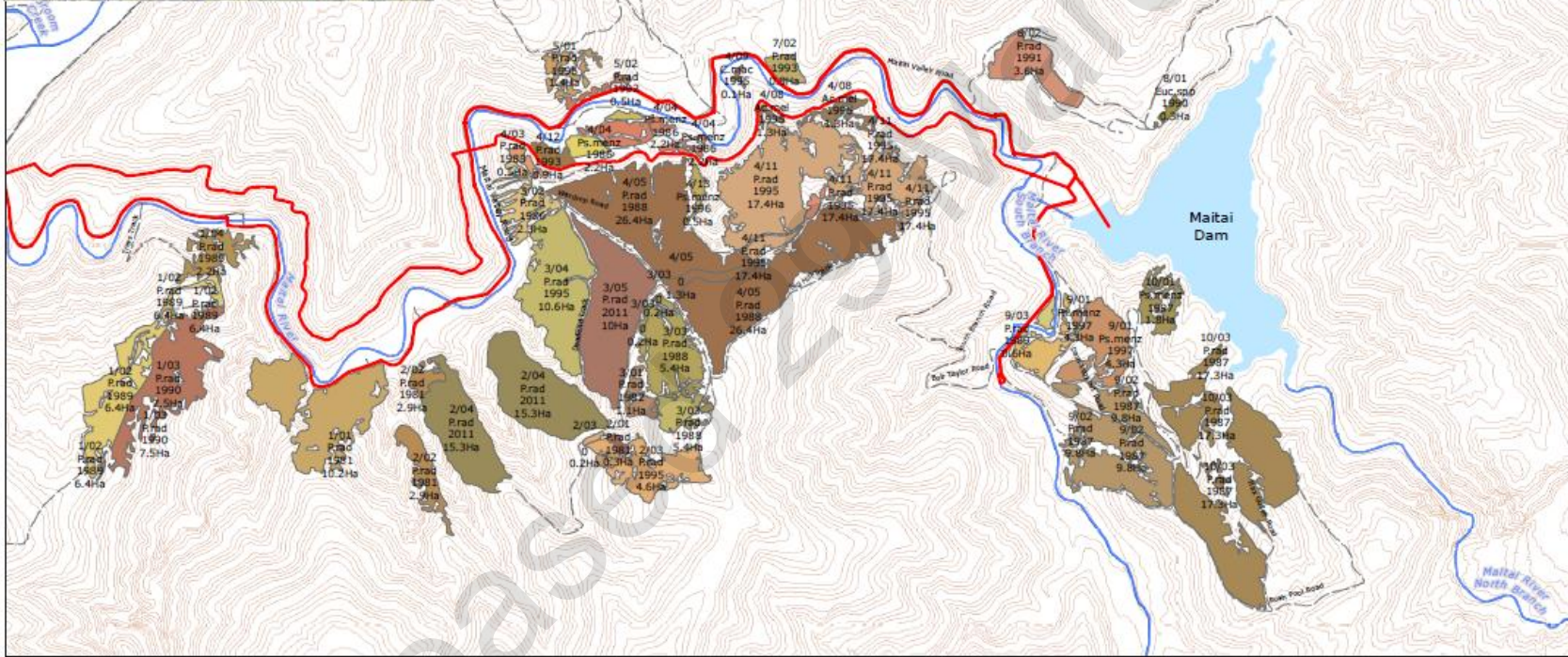
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- Road - Sealed
- Contours - 10m
- Waterways
- Water Supply Line

0 250 500 750 m

Scale 1:15,000 June 2016

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Maitai Forest

Nelson City Council Forest Stands



Legend

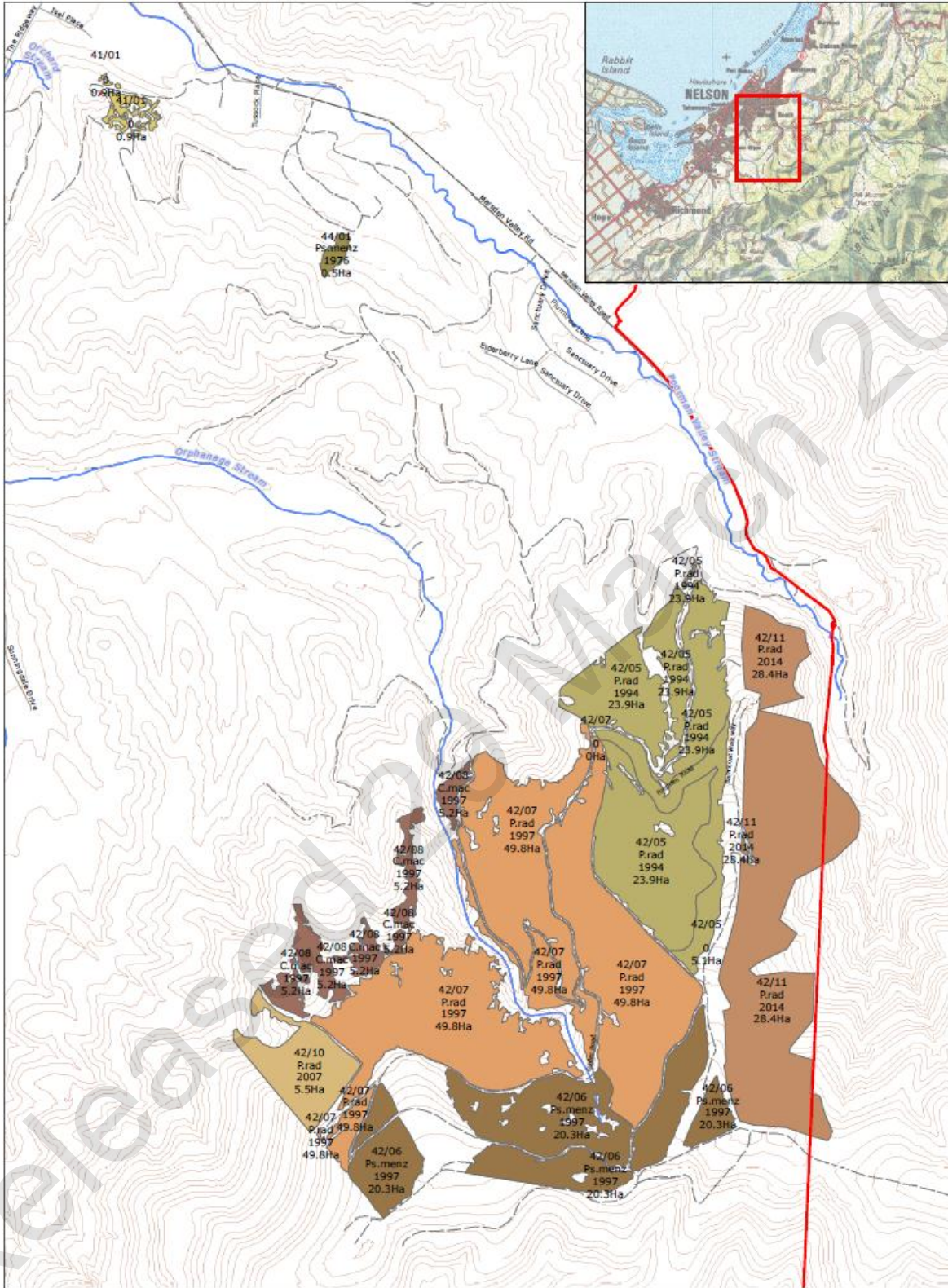
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- Road - Sealed
- Contours - 10m
- Waterways
- Water Supply Line



Scale 1:15,000



File Ref: A150131
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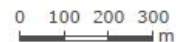
Marsden Valley Forest

Nelson City Council Forest Stands



Legend

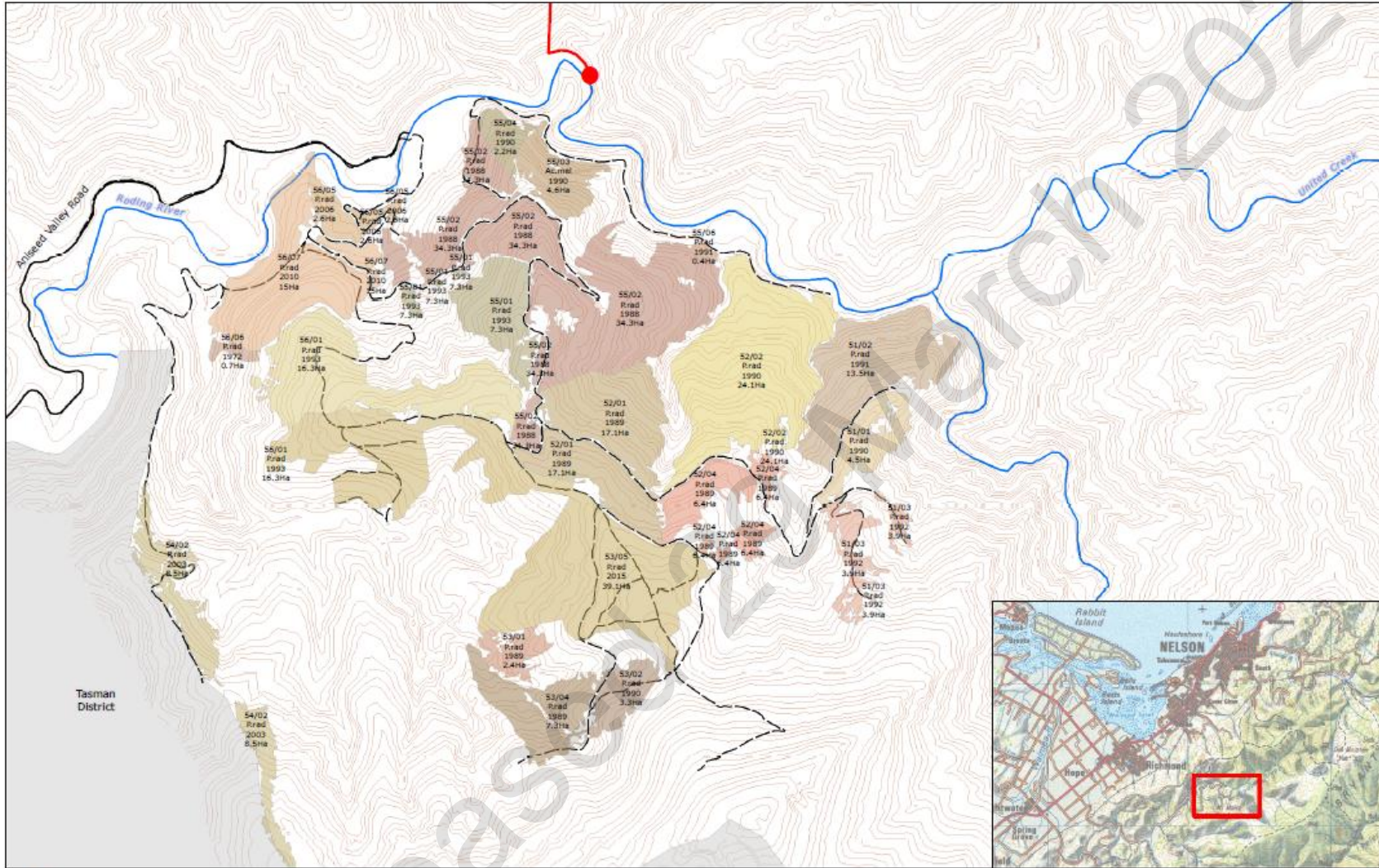
- Road - Unsealed
- Road - Sealed
- Contours - 10m
- Waterways
- Water Supply Line



Scale 1:10,000

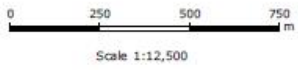


June 2016



Roding Forest
 Nelson City Council Forestry Stands
 Nelson City Council
 te kaitiaki o whakaiti

- Legend**
- Road - Sealed
 - Road - Unsealed
 - Contours - 10m
 - Waterways
 - Roding Dam Intake Weir
 - Water Supply Line



N
 June 2016

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Annex 3: Nelson City Council's production forest

Block	Stand	Area (ha)	Species	Planted	Harvestable	Comment
Maitai	1.01	10.2	P radiata	1981	2010	
	1.02	6.4	P radiata	1989	2017	
	1.03	7.5	P radiata	1990	2017	
	1.04	2.2	P radiata	1985	2014	
	2.01	.3	P radiata	1981	2010	
	2.02	2.9	P radiata	1981	2010	
	2.03	4.6	P radiata	1995	2023	
	2.03	0.2				Clear
	2.04	15.3	P radiata	2011	2039	
	3.01	1.1	P radiata	1982	2012	
	3.02	2.3	P radiata	1986	2015	
	3.03	5.4	P radiata	1988	2017	
	3.03	0.2				Clear
	3.04	10.6	P radiata	1995	2023	
	3.05	10	P radiata	2011	2039	
	4.03	.5	P radiata	1983	2013	
	4.04	2.2	Douglas fir	1986	2031	
	4.05	26.4	P radiata	1988	2018	
	4.05	1.3				Clear
	4.08	1.3	Acacia	1995	2024	
	4.09	.1	Macrocarpa	1995	2030	
	4.11	17.4	P radiata	1995	2024	
	4.12	.9	P radiata	1993	2024	
	4.13	.5	Douglas fir	1996	2031	
	5.01	1.4	P radiata	1995	Salvaged	Wind damaged
	5.02	.5	P radiata	1992	Salvaged	Wind damaged
	7.02	.9	P radiata	1993	2021	
	8.01	.3	Eucalyptus	1990	2020	
	8.02	3.6	P radiata	1991	2019	
	9.01	4.3	Douglas fir	1997	2042	
	9.02	9.8	P radiata	1987	2017	
	9.03	.6	P radiata	1989	2017	
	9.04	2	P radiata	1989	2017	
10.01	1.8	Douglas fir	1997	2042		
10.02	1.9	P radiata	1992	2020		
10.03	17.3	P radiata	1987	2017		
Marsden	41.01	0.9				Clear
	42.05	23.9	P radiata	1994	2022	
	42.06	20.3	Douglas fir	1997	2042	
	42.07	49.8	P radiata	1997	2025	
	42.08	5.2	Macrocarpa	1997	2032	
	42.10	5.5	P radiata	2007	2035	
	42.11	28.4	P radiata	2014	2042	
	44.01	.5	Douglas fir	1976	2026	

Roding	51.01	4.5	P radiata	1990	2018	
	51.02	13.5	P radiata	1991	2019	
	51.03	3.9	P radiata	1992	2020	
	52.01	17.1	P radiata	1989	2017	
	52.02	24.1	P radiata	1990	2018	
	52.04	6.4	P radiata	1989	2017	
	53.01	2.4	P radiata	1989	2017	
	53.02	3.3	P radiata	1990	2018	
	53.04	7.3	P radiata	1989	2017	
	53.05	39.1	P radiata	2015	2042	
	54.02	8.5	P radiata	2003	2031	
	55.01	7.3	P radiata	1993	2021	
	55.02	34.3	P radiata	1988	2016	
	55.03	4.6	Acacia	1990		
	55.04	2.2	P radiata	1990	2018	
	55.06	.4	P radiata	1991	2019	
	56.01	16.3	P radiata	1993	2021	
	56.04	.4	P radiata	1990	2018	
	56.05	2.6	P radiata	2006	2034	
	56.06	.7	P radiata	1972	1999	
56.07	15	P radiata	2010	2038		
Brook	21.03	.2	Douglas fir	1986		Amenity
	21.04	5.2	P radiata	1986	2015	
	21.04	13.4				Clear
	21.05	2.2	Mixed	1960		Amenity
	21.05	.6				Clear
	21.11	1.2	Redwood	1934		Amenity
	22.01	9.6				Clear
	22.02	3	P radiata	1981	2010	
	22.03	5.8	Douglas fir	1983	2028	
	22.04	.4	P radiata	1983	2028	
	22.05	1.6	P radiata	1987	2016	
	22.06	3.5	P radiata	1988	2016	
	22.08	3.4	Douglas fir	1981	2026	
	22.09	11	P radiata	2011	2038	
	25.01	2.5	Macrocarpa	1994	2030	
	26.01	1.9	Macrocarpa	1994	2029	Landfill
	26.02	.5	P radiata	1994	2022	
	26.02	1.8				Clear
	26.04	.2	Eucalyptus	1998	2038	
	26.05	19.8	P radiata	2009	2036	Landfill
	26.06	13	P radiata	2010	2037	Landfill
	26.07	.4	P radiata	2012	2039	Landfill
	28.01	3	P radiata	1993	2021	
29.01	10.7	P radiata	2013	2040		
29.01	16.5				Native revegetation	
29.02	34.2	P radiata	2014	2041		
Bell Island		18.4	P radiata	2011	2038	In TDC

Annex 4: Nelson City Council production forest species coverage

Block	Pinus radiata	Douglas fir	Macrocarpa	Other	Total
Brook	106.3	9.2	4.4	0.2	120.1
Maitai	162	8.3	0.1	1.6	172
Marsden	107.6	20.8	5.2	0	133.6
Roding	209.3	0	0	4.6	213.9
Total	585.2	38.3	9.7	6.4	639.6

Released 29 March 2023

Annex 5: Non-monetary values associated with Nelson City Council's production forests

Block	Stand	Water Supply	Infrastructure			Landscapes		Residential	Archaeological	Recreation			Ecology				
			Electrical	Road	Watermain	ONFL	Amenity			Mountainbiking/ walking	Paragliding	Water quality	Willow pines	Brook Waimarama	Bush	Karearea	Native fish
Maitai	1.01			Y	Y				Y	Y		Y					Y
	1.02																
	1.03																
	1.04			Y	Y											Y	
	2.01									Y							
	2.02															Y	
	2.03									Y						Y	
	2.04									Y						Y	
	3.01									Y							
	3.02											Y					Y
	3.03									Y							
	3.04									Y							
	3.05									Y							
	4.03					Y						Y					Y
	4.04					Y				Y		Y	Y				Y
	4.05					Y				Y							
	4.08					Y				Y							
	4.09											Y					Y
	4.11			Y		Y				Y						Y	
	4.12					Y				Y							
	4.13					Y				Y						Y	
	5.01			Y	Y											Y	
	5.02				Y											Y	
	7.02				Y							Y					Y
	8.01	Y			Y												
	8.02				Y												
	9.01	Y	Y	Y								Y	Y				
	9.02	Y		Y								Y				Y	Y
	9.03	Y	Y	Y								Y					Y
	9.04				Y	Y						Y					Y
10.01	Y	Y									Y	Y					
10.02			Y												Y		
10.03	Y	Y	Y			Y											
Marsden	41.01			Y				Y									
	42.05		Y	Y					Y		Y					Y	
	42.06		Y	Y							Y	Y				Y	
	42.07		Y	Y					Y	Y	Y					Y	
	42.08										Y					Y	
	42.10																
	42.11			Y						Y		Y			Y	Y	
	44.01				Y												

Roding	51.01	Y				Y								Y		
	51.02	Y				Y					Y			Y		Y
	51.03					Y								Y		
	52.01													Y		
	52.02	Y				Y					Y					Y
	52.04													Y		
	53.01													Y		
	53.02													Y		
	53.04													Y		
	53.05													Y		
	54.02													Y		
	55.01															
	55.02	Y					Y					Y		Y		Y
	55.03	Y					Y					Y		Y		Y
	55.04											Y				Y
	55.06	Y					Y					Y				Y
	56.01															
	56.04															
	56.05											Y				Y
	56.06														Y	
56.07											Y			Y	Y	
Brook	21.03			Y				Y		Y		Y				
	21.04									Y			Y	Y		
	21.05									Y			Y	Y		
	21.11			Y				Y								
	22.01			Y				Y		Y						
	22.02							Y								
	22.03									Y		Y				
	22.04							Y								
	22.05							Y								
	22.06							Y								
	22.08							Y								
	22.09							Y								
	25.01			Y										Y		
	26.01			Y				Y			Y					Y
	26.02			Y												
	26.04			Y												
	26.05															
	26.06															
	26.07															
	28.01								Y						Y	
29.01								Y		Y		Y		Y	Y	
29.02																

Annex 6: Recommended future management of Nelson City Council's production forests

Block	Stand	Harvest	Comment	Replant	Species	Tending regime	Comments
Maitai	1.01	Y	Protect grave site	Y	P radiata	Unpruned	
	1.02	Y	Harvest via Hancocks	Y	P radiata	Unpruned	
	1.03	Y	Harvest via Hancocks	Y	P radiata	Unpruned	
	1.04	Y	Partial due to road, harvest via Hancocks	Y	P radiata	Unpruned	Poison/fell unharvested trees, then native regeneration
	2.01	Y	Harvest with 2.03	Y	P radiata	Unpruned	
	2.02	N	Harvest eastern half, leave western	N	P radiata	Unpruned	Poison/fell unharvested trees, then native regeneration
	2.03	Y	Harvest with 2.01	Y	P radiata	Unpruned	
	2.04	Y		Y	P radiata	Unpruned	
	3.01	Y		Y	P radiata	Unpruned	
	3.02	Y		Y	P radiata	Unpruned	
	3.03	Y		Y	P radiata	Unpruned	
	3.04	Y		Y	P radiata	Unpruned	
	3.05	Y		Y	P radiata	Unpruned	
	4.03	Y	Harvest with 3.02, 4.04, and 4.12	N			Convert to alternate use
	4.04	Y	Harvest with 3.02, 4.03 and 4.12	N			Convert to alternate use
	4.05	Y		Y	P radiata	Unpruned	
	4.08	N	Harvest if economic, or fell to waste	N			Convert to alternate use
	4.09	N	Harvest if economic, or fell to waste	N			Convert to alternate use
	4.11	Y	Protect watermain	Y	P radiata	Unpruned	
	4.12		Harvest with 3.02, 4.03 and 4.04	N			Convert to alternate use
	4.13	Y	Poison/fell to waste	Y	P radiata	Unpruned	
	5.01	Y	Only if economic	N			Convert to alternate use
	5.02	Y	Only if economic	N			Convert to alternate use
	7.02	Y		N			Convert to alternate use
	8.01	Y		N			Convert to alternate use
	8.02	Y		Y	P radiata	Unpruned	
	9.01	N	Poison/fell to waste	Y	P radiata	Unpruned	
	9.02	Y		Y	P radiata	Unpruned	Maintain 100m buffer from Maitai South Branch
	9.03	Y		N			Convert to alternate use
	9.04	Y		Y	P radiata	Unpruned	Maintain 100m buffer from Maitai South Branch
	10.01	N	Poison/fell to waste	N			Convert to alternate use
	10.02	Y		N			Native regeneration
	10.03	Y		Y	P radiata	Unpruned	Maintain 200m buffer from Maitai Dam lake
Marsden	41.01	N		N			Convert to alternate use
	42.05	Y		Y	P radiata	Pruned	
	42.06	N	Poison/fell to waste	N			Convert to alternate use
	42.07	Y		Y	P radiata	Pruned	
	42.08	Y	Harvest with 42.07	Y	P radiata	Pruned	
	42.10	Y		Y	P radiata	Pruned	
	42.11	Y		Y	P radiata	Pruned	
44.01	N	Harvest if economic, or poison/fell to waste	N			Convert to alternate use	

Roding	51.01	Y		Y	P radiata	Unpruned	
	51.02	Y		Y	P radiata	Unpruned	Maintain 200m buffer from Roding River
	51.03	Y		Y	P radiata	Unpruned	
	52.01	Y		Y	P radiata	Unpruned	
	52.02	Y		Y	P radiata	Unpruned	Maintain 200m buffer from Roding River
	52.04	Y		Y	P radiata	Unpruned	
	53.01	Y		Y	P radiata	Unpruned	Convert to alternate use if seedlings fail
	53.02	Y		Y	P radiata	Unpruned	Convert to alternate use if seedlings fail
	53.04	Y		Y	P radiata	Unpruned	Convert to alternate use if seedlings fail
	53.05	Y		Y	P radiata	Unpruned	Convert to alternate use if seedlings fail
	54.02	Y	Harvest via Hancocks	Y	P radiata	Unpruned	Convert southern portion to alternate use
	55.01	Y		Y	P radiata	Unpruned	
	55.02	Y		Y	P radiata	Unpruned	Maintain 200m buffer from Roding River
	55.03	N	Poison/fell to waste				
	55.04	Y		Y	P radiata	Unpruned	
	55.06	Y		N			Convert to alternate use
	56.01	Y		Y	P radiata	Unpruned	
	56.04	Y		Y	P radiata	Unpruned	
	56.05	Y		Y	P radiata	Unpruned	Maintain 10m buffer around Roding River
56.06	Y		Y	P radiata	Unpruned		
56.07	Y		Y	P radiata	Unpruned		
Brook	21.03	N					Retain as amenity planting
	21.04	Y	Partially clear	Y	P radiata	Unpruned	Native regeneration of currently clear area, convert remainder to native vegetation after next rotation
	21.05	N		N			Retain as amenity plantings
	21.05		Currently clear	N			Native regeneration
	21.11	N					Retain as amenity plantings
	22.01		Currently clear	N			Convert to alternate use
	22.02	Y		N			Convert to alternate use
	22.03	Y	If economic, or poison/fell to waste	Y	P radiata	Unpruned	Convert to alternate use after next rotation
	22.04	Y		N			Convert to alternate use
	22.05	Y		N			Convert to alternate use
	22.06	Y		N			Convert to alternate use
	22.08	Y		N			Convert to alternate use
	22.09	Y		N			Convert to alternate use
	25.01	N	Poison/fell to waste	N			Convert to alternate use
	26.01	Y	Harvest when landfill moves	N			Convert to alternate use
	26.02	Y	Harvest when landfill moves	N			Convert to alternate use
	26.04	Y		N			Convert to alternate use
	26.05	Y	If get to harvestable age	Y	P radiata	Unpruned	Only those areas that won't be destroyed by landfill expansion
	26.06	Y	If get to harvestable age	Y	P radiata	Unpruned	Only those areas that won't be destroyed by landfill expansion
26.07	Y	If get to harvestable age	N			Convert to alternate use	
28.01	Y		N			Convert to alternate use	
29.01	Y		Y	P radiata	Unpruned	Part of this stand already converted to native plantings	
29.02	Y		Y	P radiata	Unpruned	This decision can be reviewed at the time of harvest	
Bell Island		Y		Y	P radiata	As per rest of block	