LINKWATER FOREST

Owned by
PERMANENT FORESTS LIMITED

Forest Management Plan

For the period 2014 / 2019

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1. Introduction

Principles and Criteria

Permanent Forests Limited is committed to adopt the Forest Stewardship Council (FSC) Principles and to meet their Criteria and the FSC standards of good forest management. These standards include ecological, social and economic parameters.

Permanent Forests Limited is committed to the PF Olsen FSC Group Scheme that is implemented through the Group Scheme Member Manual and associated documents.

About this Plan

This document provides a summary of the forest management plan and contains:

- Management objectives;
- A description of the land and forest resources;
- Environmental safeguards;
- Identification and protection of rare, threatened and endangered species;
- Rationale for species selection, management regime and harvest plan and techniques to be used;
- Appropriate management of unstocked reserve areas;
- Maps showing plantation area, legal boundaries and protected areas;
- Provisions for monitoring and protection.

2. Forest Investment Objectives

Provision of services

Permanent Forests Ltd.'s objectives are to obtain an economic return on investment while providing environmental benefits, including:

- Enhanced water quality;
- Soil, stabilisation and conservation;
- Providing a buffer against flooding during storms;
- Shading waterways for aquatic life;
- Enhance wildlife and plant habitat leading to increased biodiversity;
- A reduction in greenhouse gases;
- Economic and social benefits to the community and the Linkwater forest owners.

Forest management goals

The forest is managed to:

- Grow trees and produce logs for the manufacturing of different wood products in New Zealand and overseas with a focus on describe primary products;
- Ensure that the productivity of the land does not decline;
- Ensure that environmental values are identified and maintained;
- Ensure that historic sites are identified and protected;
- Ensure that other forest values and products are identified, protected and where possible enhanced;
- Harvest the trees as close as possible to their economic optimum age; and
- Replant following harvesting.

These objectives are delivered via the Quality Management System implemented by PF Olsen that includes ISO 9001 and ISO 14001 certification, and FSC environmental certification (when requested by the customer).

All activities within Linkwater Forest are subject to management within a framework set by PF Olsen's environmental policies and Environmental Management System (EMS).

Environmental policy

PF Olsen Limited Environmental Policy:

PF Olsen Ltd is committed to:

- ***Sustainable forest and land management;***
- ***Promoting high environmental performance standards that recognise the input from the community in which we operate;***
- ***Where appropriate applying the Principles and Criteria of the Forest Stewardship Council across forest management.***

Substantial additional detailed policies are contained within PF Olsen's Environmental Management System (EMS).

EMS framework

The EMS is a core document defining the policies, processes and procedures that govern the physical implementation of forest management activities. The EMS applies a systematic approach certified to ISO 14001 standards to ensure that prevention of adverse and harmful impacts is effective.

An Environmental Management Group (EMG) assists the Environmental Manager, who is responsible for ensuring that the EMS is maintained and implemented. Internal audits to ensure compliance with the EMS and to improve the procedures of the EMS are undertaken at least once every two years.

3. Forest Landscape Description

Overview

This section describes the physical and legal attributes of the land on which the forest is located. Included in this section are discussions of:

- Location and access;
- Topography;
- Soils;
- Climate;
- Legal ownership and tenure.

Location and access

Linkwater Forest is located in two distinct blocks near Linkwater in the Marlborough Sounds. Linkwater is a rural area centred around a small shop and garage, 12 kilometres east of Havelock, on Queen Charlotte Drive. Access to the Jenkins Block is off Kenepuru Road to the north of Queen Charlotte Drive, while the Jones block is to the south accessing directly opposite the Linkwater store. Internal forest roads provide access to all parts of the forest.

The location of the forest in relation to potential markets is listed in the table below and shown in Map 1.

Table 1: Distances from forest to log markets

Potential Market or Export Port	Distance from Forest (km)	Log market
Picton	75	Export
Blenheim	60	Domestic
Richmond	108	Pulp

Topography

The predominant aspect of the forestland is west facing and the topography rolling to steep with slopes 25 to 30 degrees not uncommon.

The steep slopes in this high rainfall area require well constructed roads with regular and well maintained water tables and culverts. Harvest pads are limited to flat spurs where access roads can be built to transport the logs. Uphill hauling systems for log extraction will be utilised at harvesting.

Altitude is 40 metres to 500m above sea level.

Soils

The soils within Linkwater Forest are Tuamarina Hill Soils and Onamalutu Steepland Soils. These soils are derived from greywacke and schist of yellow-grey to yellow-brown earth, and are of low natural fertility and prone to erosion when cleared.

Roading in these soils presents challenges caused by slipping and slumpage. Road grades need to be kept to a minimum, 12% or less wherever possible, and avoidance of wet areas, springs and rock faces is required.

Soils are prone to slipping; well constructed water controls away from gully formations and onto hard spurs will aid in reducing erosion, as will replanting soon after harvesting.

Climate

Rainfall: The average rainfall at nearby Linkwater is about 1,600 mm/year and is relatively evenly distributed during the year.

Temperature: The mean annual temperature is around 11.8^{o}C measured at Rai Valley.

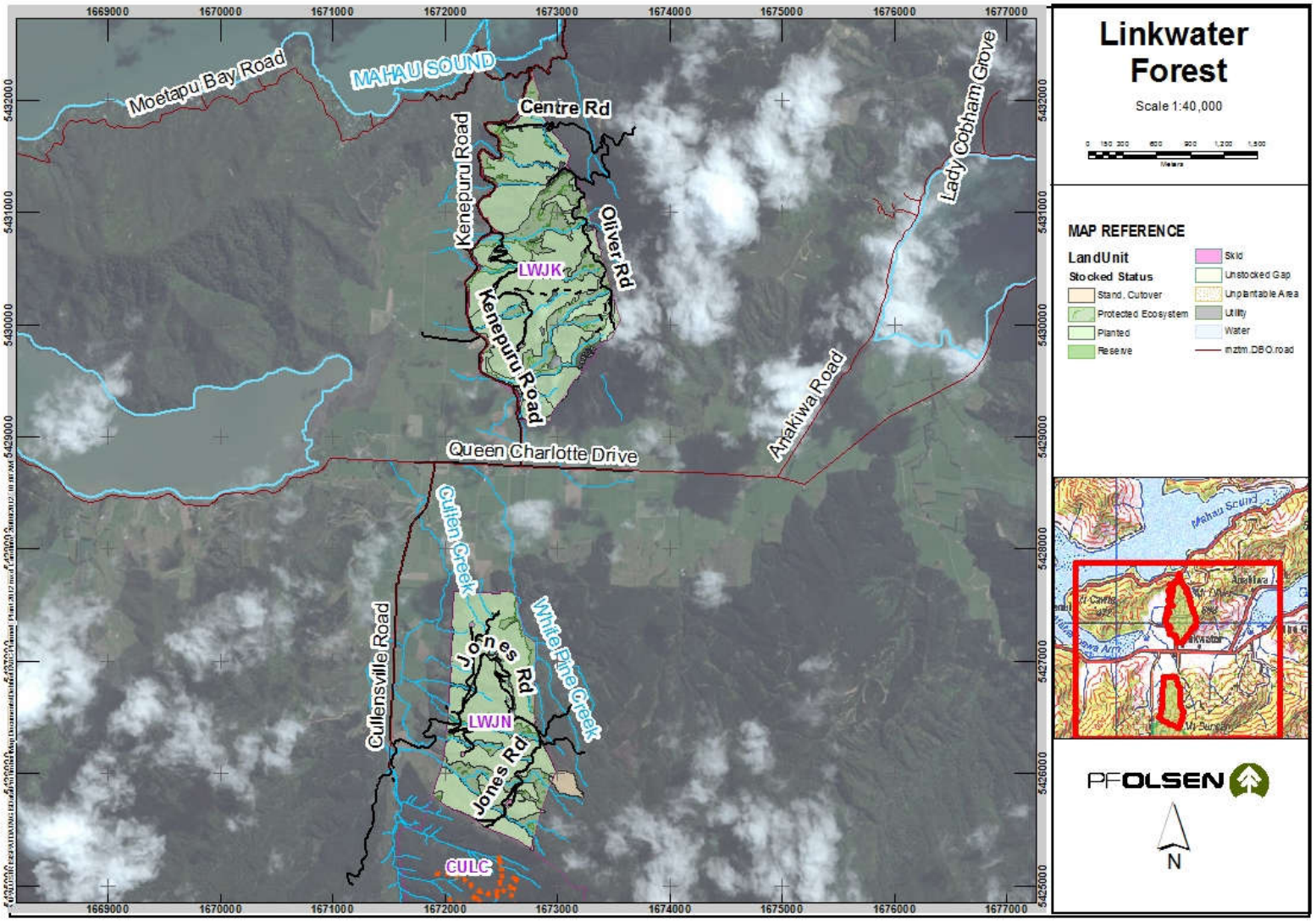
Legal ownership

The legal description of the land on which the forest is situated is:

- Jenkins Block: PT Lot 1, 244.2250 hectares
  Blks V, VI, IX, X, Linkwater SD
- Jones Block: Section 29 and Sec 35, 168.1460 hectares
  Blk X, Linkwater SD

The tenure is freehold.

4. Map 1 - Forest Location Map



5. The Ecological Landscape

Ecological District

The forests are located within the Sounds Ecological District (ED) on the lower slopes of a complex of sunken valleys that form the Marlborough Sounds. These slopes rise steeply to the high Richmond Ranges that form an elevated boundary along the long Wairau fault separating the Nelson and Marlborough regions.

In pre-human times, the Sounds ED was primarily forested throughout, dominated by beech (hard-black at lower altitude, making way for silver and red to a lesser extent as altitude increased). Hardwood and podocarp elements were present in the outer coastal edges of the ED and within the sheltered valleys of the inner Sounds.

With the arrival of humans, much of the most accessible forest was burned and cleared for agriculture, in particular semi-extensive sheep and beef. Today much of this area has been converted to plantation forestry. The beech-hardwood-podocarp forests are greatly reduced in area, and limited to isolated gullies and alluvial fans. Secondary scrub (manuka, Spanish heath, bracken) and forest (tauhinau, manuka) has regenerated but lacks the once-dominant beech component.

The indigenous remnants in Linkwater Forest are part of a substantial area of lowland, montane and sub-alpine forest reserved as part of the public conservation estate in the Mt Richmond Forest Park. The hard beech/red beech remnants in Linkwater forest are extensively represented in the adjacent conservation estate.

The Sounds ED showcases an impressive array of terrestrial, coastal and marine animals. Owing to human disturbance, most of the native bird species are now restricted to the remaining native forest remnants and intact coastal vegetation, as well as several island refuges, both passively and actively managed by DoC. Indigenous forest remnants, like those in Linkwater Forest, are important habitat for native species such as the NZ falcon, kereru and robins.

Protective Status

The following table shows natural vegetation representation within the forest relative to the wider ecological landscape of the Sounds Ecological District.

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Table 2: Protective status of the ecological landscape

Ecological District : Sounds		
Original (pre-Maori) percentage of Ecological District under natural vegetation	100%	115,169 ha
Natural ecosystem area remaining	69.7%	80,304 ha
Proportion of remaining natural ecosystem under protection:	58.1%	46,645 ha
Protection by certificate holder	0.22%	101.3 ha
Protected areas as a % of management estate	35.7%	

Threatened Environments Classification

The Landcare Threatened Environments Classification (TEC) is a measure of how much indigenous vegetation remains within land environments, its legal protection status, and how past vegetation loss and legal protection are distributed across New Zealand's landscape. The TEC is a combination of three national databases:

- Land Environments New Zealand (LENZ)
- Landcover Database 2
- Protected Areas Network

The TEC uses indigenous vegetation cover as a surrogate for indigenous biodiversity, which includes indigenous ecosystems, habitats, and communities; the indigenous species, subspecies and varieties that are supported by indigenous vegetation; and their genetic diversity. It uses legal protection as a surrogate for the relative vulnerability of indigenous biodiversity to pressures such as land clearance, extractive land uses, and the effects of fragmentation. The TEC is therefore most appropriately applied to help identify places that are priorities for formal protection against clearance and/or incompatible land uses, and for ecological restoration to restore lost species, linkages and buffers.

Table 3: Reserve areas by Threatened Environments Classification

	LINKWATER
<10% indigenous cover left	
10-20% left	
20-30% left	
>30% left and <10% protected	
>30% left and 10-20% protected	
>30% left and >20% protected	101.3 ha 100%
TOTAL	**101.3 ha** **100.0%**

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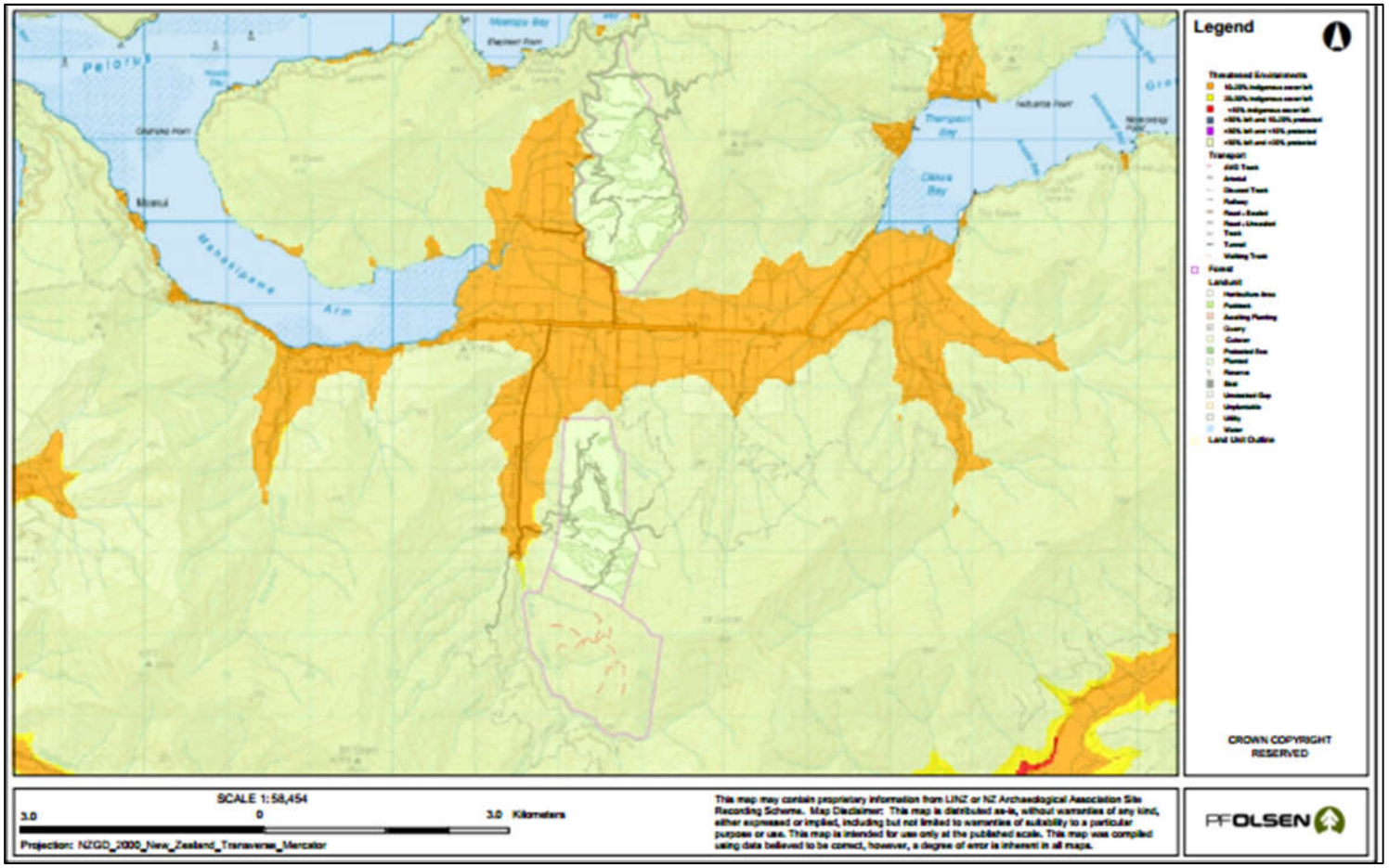
All of the reserves within Linkwater Forest are within a predicted environment of which more than 30% of the original cover remains and thus are not amongst the most highly threatened environments.



6. Socio-economic Profile and Adjacent Land

Forest history

Linkwater Forest was originally covered in tall forest prior to the arrival of humans. Hardwoods were logged during the 19th century from the more accessible areas of the forest, and then the land was fully cleared and burned for farming.

During the late 19th century, the Jones Block was on the edge of a gold rush in Cullens Valley. Gold mining activity is evident on neighbouring property on the Cullens Creek boundary while workings are still visible in the White Pine Creek catchment on the eastern boundary. Extensive archaeological surveying throughout the Jones Block has shown no further gold mining activity within the plantation boundary.

Farming was the predominant land use through the early part of the 20th century until the forest was sold for forestry purposes in the 1970's. Afforestation was considered the best future landuse because of the diminishing returns from sheep farming and increasing costs of controlling brush weeds and applying fertiliser.

Current social profile

Although forestry in the Marlborough region is a major industry, it is only a part of a highly diversified economy based around horticulture, viticulture, agriculture, aquaculture, forestry and tourism and associated servicing. A total of 17.7% of the Marlborough population is employed in the agriculture, forestry and fishing industries, cf the national figure of 5.7%[1]. Manufacturing and Retail employment in the region sit at 16.5% and 10.9% respectively. Employment is concentrated around the urban centres of Blenheim and Picton. In this context, Linkwater Forest is a negligible contributor to the local community. Most employment is during the harvesting phase, but establishment and silviculture also offers employment throughout the early years of growth.

The New Zealand Atlas of Deprivation[2] shows the District in the immediate area of Linkwater Forest to suffer moderate levels of socio-economic deprivation based on national attributes compiled by the Ministry of Health.

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[1] Statistics New Zealand 2013 Census data.

[2] *Atlas of Deprivation*
http://www.health.govt.nz/publication/dhb-maps-and-background-information-atlas-socioeconomic-deprivation-new-zealand-nzdep2006

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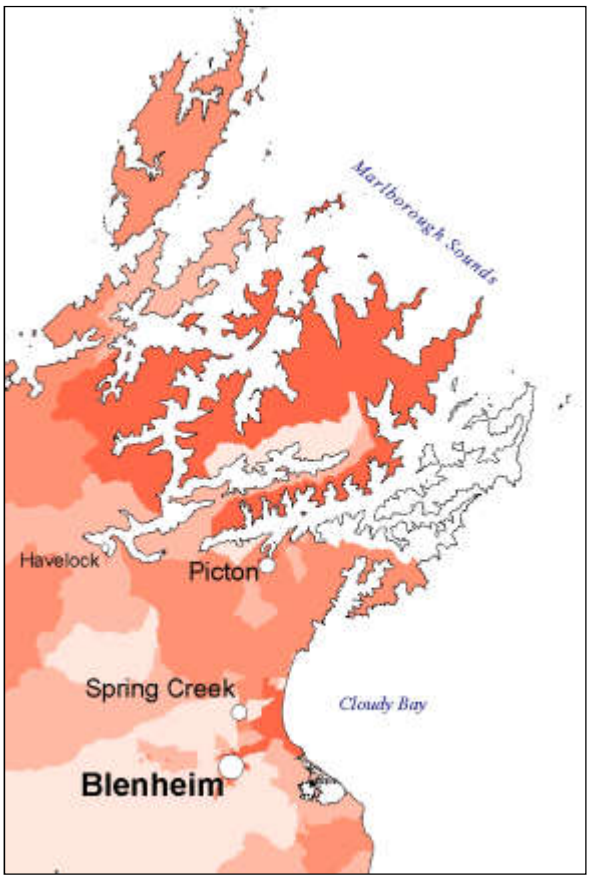
Figure 1: Extract from NZ Atlas of Deprivation 2006
Darker red = most deprived



Associations with Tangata Whenua

Several Maori tribes have been identified as having an interest in the Linkwater Forest land. They have been kept informed of management issues and operations. The tribes are Ngati Raru, Te Runanga O Rangitane, Te Runanga O Ngati Kuia, Ngati Apa.

Neighbours

Neighbours to the forest estate boundaries have a special interest in the management of the forest. Activities within the forest may positively or negatively impact upon their quality of life or businesses in a number of ways, while inappropriately managed operations could create risks of adverse health, safety and environmental hazards. Neighbours may use the forests for recreational purposes or place reliance on the forests for provision of water quality or quantity services. Boundary issues such as weed and pest control, access and boundary alignment issues may also involve neighbours.

The following table lists the forest neighbours and their primary activities. Some or all of these parties should be consulted when operations are proposed in forest areas adjacent to their boundaries.

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Table 4: Forest neighbours

Owner/Occupier	Contact #	Location (See Location Map)	Activities	Other Notes
		West Jenkins	Farming	Takes water
			Forest owner	Shares access
		South Jenkins, North Jones	Farming	
		North Jones	Farming	
		West Jones	Farming	
		South Jones	Forest owner	Shares access
		East Jenkins, South East Jones	Forest owner	
		East & North Jenkins	Forest owner	Shares access
		East Jones	Forest owner	

7. The Regulatory Environment

Regulatory considerations

In order to minimise the risk to forest owners, managers and contractors, it is important that relevant legislation and agreements are identified and appropriate measures put in place to ensure that breaches of legislation are avoided.

The following legislation and agreements summarise key regulatory and voluntary controls that currently apply to forest operations in the forest.

Resource Management Act

Linkwater Forest is subject to the provisions of the Resource Management Act (RMA) 1991. The RMA sets up a resource management system that promotes the sustainable management of natural and physical resources and is now the principal statute for the management of land, water, soil and other resources in New Zealand.

Under the RMA, Linkwater Forest falls under the Marlborough District Council for land, soil conservation and water quality management issues. The Marlborough District Council is a unitary authority.

District Plan

The forest comes under the jurisdiction of Marlborough District Council as a unitary authority. This Council has two land and water management plans under the RMA, one covering the Marlborough Sounds area, the second the Wairau Valley and surrounds. Linkwater Forest falls within the Marlborough Sounds Resource Management Plan which became operative in part on 28th February 2003 and 28th March 2003.

The forest falls within the Rural Zone 2 (Appendix 1). The only features on the Ecology map affecting Linkwater Forest is Cullens Creek which is designated as a Riparian Category 1, and White Pine Creek, a Riparian Category 2 creek (Appendix 2). Both creeks border the Jones block for a short distance and require a 20m land disturbance, spraying and replant setback.

The Hazard map indicates a small area of unstable ground at the northern tip of the Jenkins block (Appendix 3).

The District Plan is being reviewed in the 2015 year.

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Table 5: District Plan rules as they affect forestry

Rule Ref	Status	Requirement
36.1.3.2.1 – 36.1.3.2.4	Conservation Heritage & amenity	Disallows modification or land disturbance over any areas listed (none listed), archaeological sites or sites of significance to Maori. Archaeological sites require Heritage New Zealand 'Authority to Modify'.
36.1.3.4 36.1.3.4.2.4	Noise	Noise subject to common day and night levels with day levels applying 7.am to 10.pm & Saturday. But **exceptions apply:** to "activities in Rural Zones One & Two required by normal rural practice provided the activity is no louder than necessary and complies with section 16 of RMA (i.e. best practicable option).
36.1.5	Land Disturbance	**Permitted subject to general conditions** Water clarity as measured by black disc should not decline by more than 20%. No woody material >100mm diameter to be left in any permanently flowing river or wetland. Land disturbance sites to be stable in storm events of <10% frequency.
36.1.5.3.1 – 36.1.5.3.8	Excavations & fills	**Permitted subject to conditions** **Side cuts -** <1:6 average and no more than 1:5 for >20m **Water Control/ Culverts -** No culverts <300mm to drain side cuts. Inside edge of cut protected or stable. **Stabilisation -** Side cuts & batters to be stabilised by seeding, compacting, drainage or other revegetation. **Crossings -** Must be stable and maintain fish passage where fish present. **Riparian -** Except for direct approaches for crossings, no excavation of filling within riparian zones scheduled in plan. Cullens Creek is scheduled, buffer = 20m. **Slope -** >20deg slopes but <35deg, up to 1000m^3 cut and or filled in any one year + compliance with 36.1.5.3.1 - 3.6 **Backfill -** Surplus fill to be removed and placed in stable location.
36.1.5.4.1	Vegetation Clearance	**Permitted subject to conditions** **Blading /rootraking** - only on slopes <20deg **Burning -** on class 7e or 8 land, only if drought code >=200 & BU index >=40. **RMZ-** Not within any scheduled riparian zone, 20m for Cullens Creek. **Revegetation -** within 24 months to 80% of cleared area. **Soil Scour - <**=15% of site to a max of 20mm. **Coastal Broadleaved Scrub /Indigenous vegetation -** <=0.2 ha/year/certificate of title. **Plantation understorey -** or within 50m of plantation forest is permitted. **Wetland / Duneland Vegetation -** <u>not to be cleared</u>.

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36.1.5.4.2	Vegetation Clearance in RMZ	**Permitted subject to conditions** Not within any scheduled riparian zone, except existing plantations, - exotic shelter belts up to 100m/km of riparian edge, - plant pests OK, - plantation trees to be directionally felled, not pulled through bed of flowing river, revegetated as above, topsoil scour <=20mm depth on not more 15% of clearance site.
36.1.7.9.3 – 36.1.7.9.3.6	Application of agrichem's	**Permitted subject to conditions** ○ excluding any surface waters, ○ notification of neighbours within 100m, and ○ compliance with NZS 8409:2004, and ○ Growsafe or equivalent trained applicators. **- RMZ-** Scheduled riparian zones not to be sprayed. 20m buffer on Cullens Creek.
36.1.7.10	Application of fertiliser	**Permitted subject to conditions** - All reasonable steps to prevent discharge into water, - no more than 200Kg/ha/yr nitrogen loading.
36.1.7.16	Other discharges to air	**Permitted subject to conditions** – no discharge which is noxious, toxic, dangerous, offensive or objectionable beyond boundary of property. - Best practicable option to avoid remedy or mitigate is employed.
36.1.8.1	Commercial Forestry	**Permitted in Rural Zone 2 subject to conditions** - no winter shading between 10am-2pm on shortest day, - 10m setback from adjoining property, - 35m from existing adjoining property residential unit, - not within scheduled RMZ (20m Cullens Creek), - not within 100m of a residential zone, - not within 70m of the intake point of a domestic water supply, - slopes to be less than or equal to 35deg. Discretionary –Rural Zone 1.

Heritage New Zealand

Under the Heritage New Zealand Pouhere Taonga Act 2014 it is the landowner's responsibility to identify any historic sites on their land prior to undertaking any work which may disturb or destroy such sites. Records of archaeological and historical places are maintained in the NZ Archaeological Association (NZAA) Site Recording Scheme http://www.archsite.org.nz/ .

Checks of this website show fifteen recorded sites within or close to the Jones block of Linkwater Forest (Appendix 4), and are related to gold mining between 1840 and 1900.

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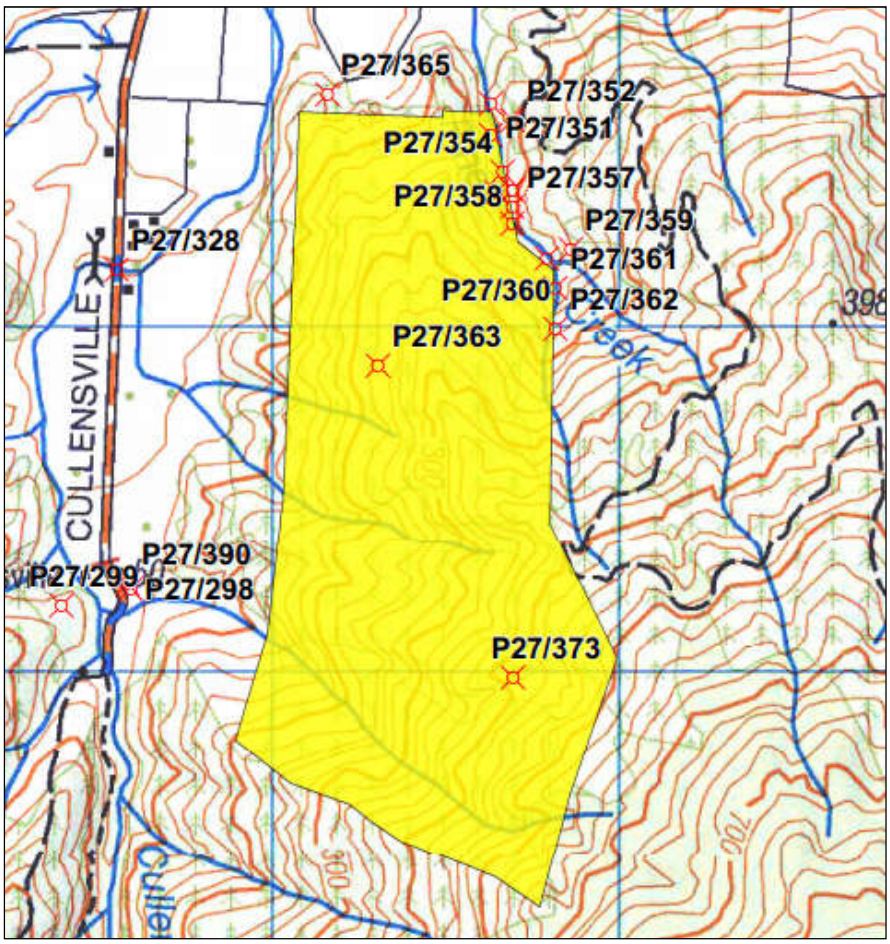
Archaeological survey work was completed in late 2007 in the Jones Block by a registered archaeologist, Mr. Reg Nichol of Picton, prior to the harvest of the first rotation. His work unearthed most of the fifteen sites now identified within the forest boundary in White Pine Creek to the north east of the planted forest.

An 'Authority to Modify' from Heritage NZ was obtained to re-construct the entranceway to the Jones block to allow access for logging trucks.

Sites within 1 km of the forest are mainly gold mining related with only four Māori related sites. The Māori related sites are situated near the northern tip of the Jenkins Forest. Consultation with an archaeologist prior to harvesting is recommended for the Jenkins end of Linkwater Forest.

Figure 2: Location of archaeological sites near Jones block



Consents & authorities held

Resource consents and HPT authorities that apply to Linkwater Forest are listed below. These consents relate to the harvest of the majority of the first crop in the mid 2000s and only one is still current.

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Table 6: Consents and authorities held

Authority	Consent ID	Granted	Expiry	Status	Details
Marlborough	U060721	09/10/06	09/10/14	Expired	Land disturbance and river activity
Marlborough	U090291	26/05/09	26/05/14	Expired	Construction of > 1km tracks
Marlborough	U021085	19/06/03	23/06/38	Current	Land disturbance and river activity
Heritage NZ	2007/45	20/11/06	20/11/11	Expired	Construct access to Jones block

Emissions Trading Scheme

Forests in New Zealand are governed by rules related to New Zealand's Kyoto commitments to reduce the nation's carbon footprint and contribution to associated climate change.

Linkwater Forest has an exotic forest area of approximately 283.8 hectares. This forest was planted between 1975 and 1981. During 1999 the first harvesting took place in Jenkins Block and this was subsequently replanted during 2000. In 2004, further harvesting commenced and has continued on a regular schedule since that time. Replanting of harvested stands has commenced with 18 months of harvest. From 1 January 2008, all stands will be subject to a deforestation tax at time of harvest, equivalent to the tonnes of CO_2 projected to be released from decomposition of the forest at a unit financial value determined by the internationally traded emission units. This tax is payable if the forest is not replanted or, if left to regenerate naturally, does not achieve the regulated heights and stocking densities.

These forests have not been registered to participate in the NZ Emissions Trading Scheme and are not subject to the accrual of emissions credits and liabilities under that scheme.

Environmental Code of Practice

All operations carried out on the property should be undertaken to the standards specified in the New Zealand Environmental Code of Practice for Plantation Forestry. This document sets out guidelines which ensure safe and efficient forest operations that meet the requirements of sound and practical environmental management.

Forest Road Engineering Manual

Roading and engineering techniques employed within the forest should conform to the industry best practice as outlined in the New Zealand Forest Owners Association publication, 'NZ Forest Road Engineering Manual', published 2012.

Other relevant legislation

Other relevant legislation in relation to the growing and harvesting of the tree crop are:

- Animal Welfare Act 1999.
- Biosecurity Act 1993.
- Climate Change Response Act 2002.
- Conservation Act 1987.
- Crown Forest Assets Act 1989.
- Fencing Act 1978.
- Forests Act 1949.
- Forest and Rural Fires Act 1977.
- Forests Amendment Act 1993.
- Forestry Rights Registration Act 1983.
- Freshwater Fisheries Regulations 1983.
- Hazardous Substances and New Organisms Act 1996.
- Health in Safety in Employment Act 1992.
- Heritage New Zealand Pouhere Taonga Act 2014.
- Injury Prevention, Rehabilitation and Compensation Act 2001.
- New Zealand Forest Accord.
- Noxious Plants Act 1978.
- Pesticides Act 1979.
- Reserves Act 1977.
- Resource Management Act 1991.
- Soil Conservation and River Control Act 1971.
- Trespass Act 1980.
- Wildlife Act 1953.

For a comprehensive list of relevant legislation refer to PF Olsen's EMS. Forest owners can be held liable for breaches of these Acts and may be held responsible for damage to third party property. Appropriate protection should be taken to minimise these risks.

8. Forest Estate Description

Forest area

The net stocked areas have been measured from a map produced by PF Olsen Ltd (Forest Map). The estimated net stocked areas of each stand are set out in the following table.

Table 7: Area statement (ha)

Gross area	Net stocked area	Reserves	Other
386.9	283.8	101.3	1.8

Unproductive 'Other' areas as referred to here are skid sites that will not be replanted. Total unproductive area has been derived by subtraction.

Current species

The species grown at Linkwater Forest is predominantly *Pinus radiata* (radiata pine). This species has been chosen to best meet the management objectives set out above and in Section 2 given the characteristics of the forest land as described in Section 3.

Treestocks established in the forest are summarised in the table below. Re-establishment will aim to use high quality treestocks suitable for the site and market. Trees planted in 2000 and in 2005 were high wood density bare rooted *P.radiata* seedlings.

Table 8: Treestock Seedlot and GF Rating

Stand	Area	Species	Year	Seedlot	GF	Cutting Seedling
LWJK-0001-01	26.8	P.rad	2000	99/387	26	Seedling
LWJK-0001-02	1	P.rad	1976			
LWJK-0001-03	0	P.rad	1977			
LWJK-0001-04	0.4	P.rad	1978			
LWJK-0001-05	1.1	E.del	1978	UNKNOWEDEL	0	Seedling
LWJK-0001-06	0	P.rad	1977			
LWJK-0001-07	1.2	P.rad	2005	03/203	24	Seedling
LWJK-0001-08	0.5	P.rad	2005	UNKNOWN10	19	Seedling
LWJK-0001-09	21.8	P.rad	2007	06/206	25	Seedling
LWJK-0001-10	0.6	Sq.sem	2007	UNKNOWSSEM	0	Seedling
LWJK-0001-11	82.6	P.rad	2008	06/206	25	Stool Cutting
LWJK-0001-11	82.6	P.rad	2008	07/202	0	Seedling
LWJK-0001-12	21.8	P.rad	2009	08/212	0	Seedling

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LWJK-0001-13	2.4	P.rad	2005			
LWJN-0001-01	0	P.rad	1977			
LWJN-0001-02	0	P.rad	1977			
LWJN-0001-03	4.7	P.rad	2008	06/206	25	Seedling
LWJN-0001-04	64.8	P.rad	2009	08/212	0	Seedling
LWJN-0001-05	53.4	P.rad	2010	09/206	0	Seedling
LWJN-0002-01	0	P.rad	1980			
LWJN-0002-02	0	P.rad	1980			
LWJN-0003-01	0	P.rad	1981			
LWJN-0003-02	0.7	P.rad	1981			

Productivity indices

The two most common estimators of the productivity of a site are the Site Index and 300 Index. Site Index is a measure of productivity of a site in terms of height growth of radiata pine at age 20. The 300 Index is a measure of productivity of a site based on stem volume growth (mean annual increment) of 300 stems per hectare.

The Site Index for Linkwater Forest is approximately 26.6 metres.
The 300 Index for Linkwater Forest is approximately 25.9 m^3/ha/yr.

Linkwater Forest has slightly lower site productivity compared to other forests in the region.

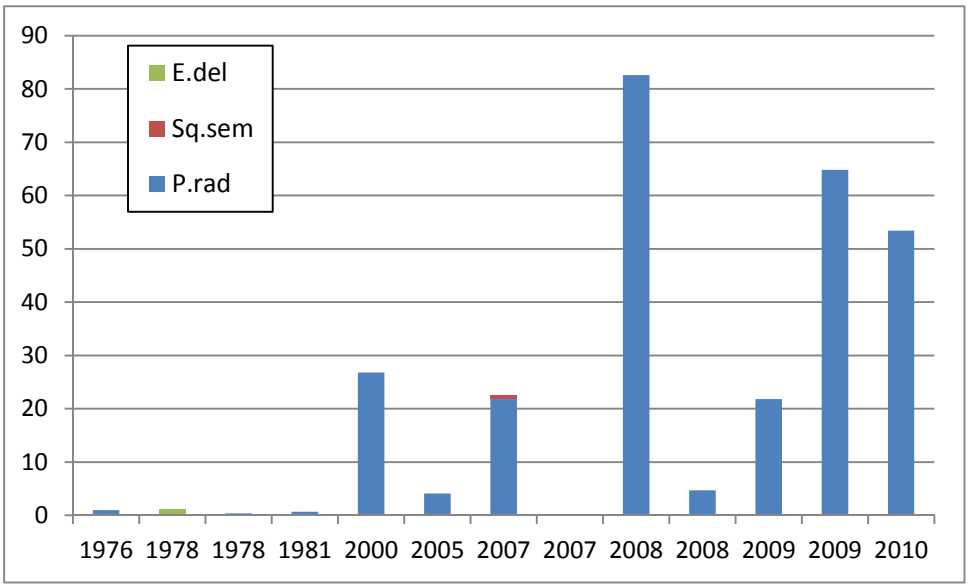
Current crop status

Measurement data from the most recent inventory was summarised to give the current status of the tended crops.

Table 9: Current crop status

Stand	Area ha	Year est.	Inventory Date	Stocking stems/ha	DBH cm	Basal Area m^2/ha	Pruned Ht m	MTH m	DOS cm
LWJK-0001-01	26.8	2000	20/11/2007						
LWJK-0001-02	71.1	1976	30/06/1994						
LWJK-0001-04	34	1978	29/06/1994						
LWJK-0001-07	1.2	2005	27/01/2011						
LWJK-0001-09	21.8	2007	15/08/2007						
LWJK-0001-10	0.6	2007	13/09/2007						
LWJK-0001-11	82.7	2008	14/08/2008						
LWJK-0001-12	21.8	2009	25/06/2009						
LWJN-0001-03	4.8	2008	26/11/2008						
LWJN-0001-04	64.8	2009	16/07/2009						
LWJN-0001-05	53.4	2010	7/07/2010						
LWJN-0003-02	8.1	1981	30/05/1994						

Age class distribution The age class distribution of Linkwater Forest is illustrated below:



9. Reserve Areas and Significant Species

Introduction

Indigenous biodiversity management in or associated with exotic forests is an essential component of everyday forest management. Although exotic forests can provide a level of biodiversity, the reserve areas are usually the source of most indigenous biodiversity. Rare and threatened species can also be found associated with exotic forests and require special attention for management.

Reserve areas

There are 101.3 hectares of reserves within Linkwater Forest, though none are significant natural areas. The vegetation associations within the reserves are well represented within the adjacent Mt Richmond Forest Park. All the forest types falling within the Linkwater estate have been modified to some degree, mostly significantly.

On the basis of rankings determined under the protocols of the EMS, all areas are ranked as either 'limited' or 'passive' protection status. Nevertheless the remnant reserved areas do provide continuous riparian corridors of developing indigenous vegetation that links lowland waterways with upper headwaters in tall virgin forest in the Forest Park. It is this characteristic that contributes most to their ecological value. Given time and protection from fire, forest operations and animal pests, these reserve areas will develop further into mixed hardwood-beech forest types.

The protected ecosystems are shown on the Forest Stands Map in Section 10.

Table 10: Protected ecosystems and reserve areas

Stand	Area (ha)	Protective Status	Protective Function	Forest Type	LENZ Remaining %	LENZ Protected %	Ranking	Protection Category
LWJK-SECF-01	36.7	NZ Forest Accord	Terrestrial Ecosystem	Manuka/ kanuka/ BroadleavedHW	49	31	2048	Limited
LWJK-SCRB-01	30.7	Management Plan	Erosion Control	Broadleaved Hardwood Shrub & fernland	82	84	64	Passive
LWJN-PRIF-01	2.6	NZ Forest Accord	Riparian Ecosystem	Beech Hard/ Red dominant/ Podocarp	0	0	1024	Limited
LWJN-SECF-03	15	NZ Forest Accord	Riparian Ecosystem	Broadleaved Hardwood Shrub & fernland	82	84	512	Limited

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...continued

Stand	Area (ha)	Protective Status	Protective Function	Forest Type	LENZ Remaining %	LENZ Protected %	Ranking	Protection Category
LWJN-SECF-01	6.8	NZ Forest Accord	Riparian Ecosystem	Broadleaved Hardwood Shrub & fernland	82	84	256	Passive
LWJN-LEPT-01	3.3	Management Plan	Terrestrial Ecosystem	Manuka/ kanuka/ BroadleavedHW	82	84	128	Passive
LWJN-SECF-02	6.1	NZ Forest Accord	Riparian Ecosystem	Broadleaved Hardwood Shrub & fernland	82	84	32	Passive
LWJN-LEPT-02	0.5	Passive	Non Specific	Manuka/ kanuka/ BroadleavedHW	82	84	4	Passive

Rare and threatened species

In accordance with EMS protocols, records have been maintained of key wildlife observed in Linkwater Forest. The full record of sightings is reproduced in Appendix 5. Three species are of note, being the NZ falcon, long tailed cuckoo and weka. Management implications for these species are discussed in Section 16.

Although most of the reserves are fragmented and degraded, they do serve as corridors for native species from the coastal edge to the higher altitude Richmond Forest Park.

CITES species

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments.

Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 34,000 species of animals and plants.

The full list of New Zealand CITES listed species are available in the EMS, or online at http://www.doc.govt.nz/about-doc/role/international/endangered-species/cites-species/nz-cites-listed-species/ .

Riparian reserves

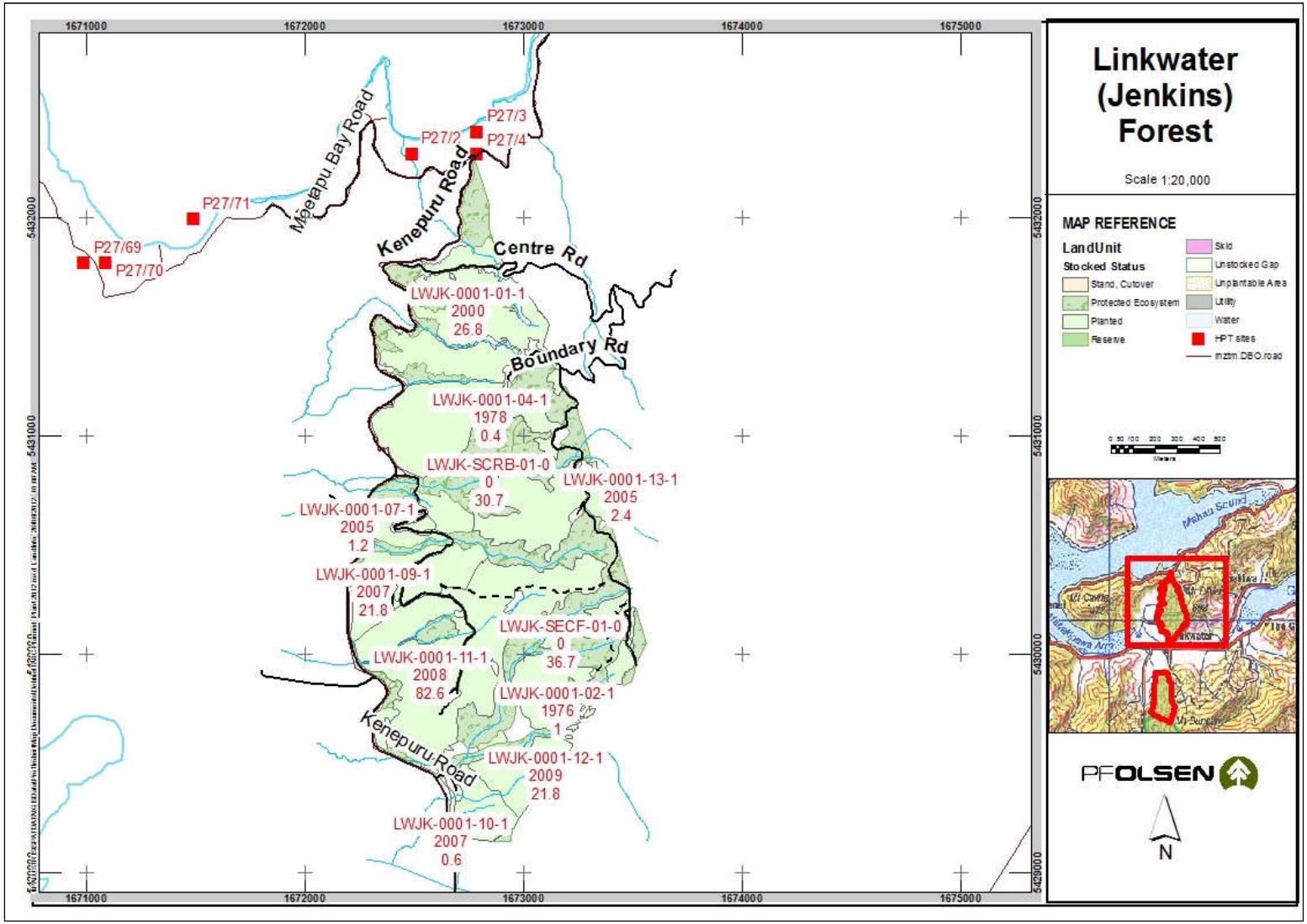
A standardised GIS-based stream classification system has been developed specifically for PF Olsen, based on NIWA's River Environment Classification (REC) and Freshwater Environments of New Zealand (FWENZ) models. Categorisation of each stream reach is done by the physical characteristics of the particular reach, e.g. underlying geology, streambed slope, climate, and reach order. Each stream category corresponds with a set of rules in the EMS that apply to operations occurring near the riparian reserve.

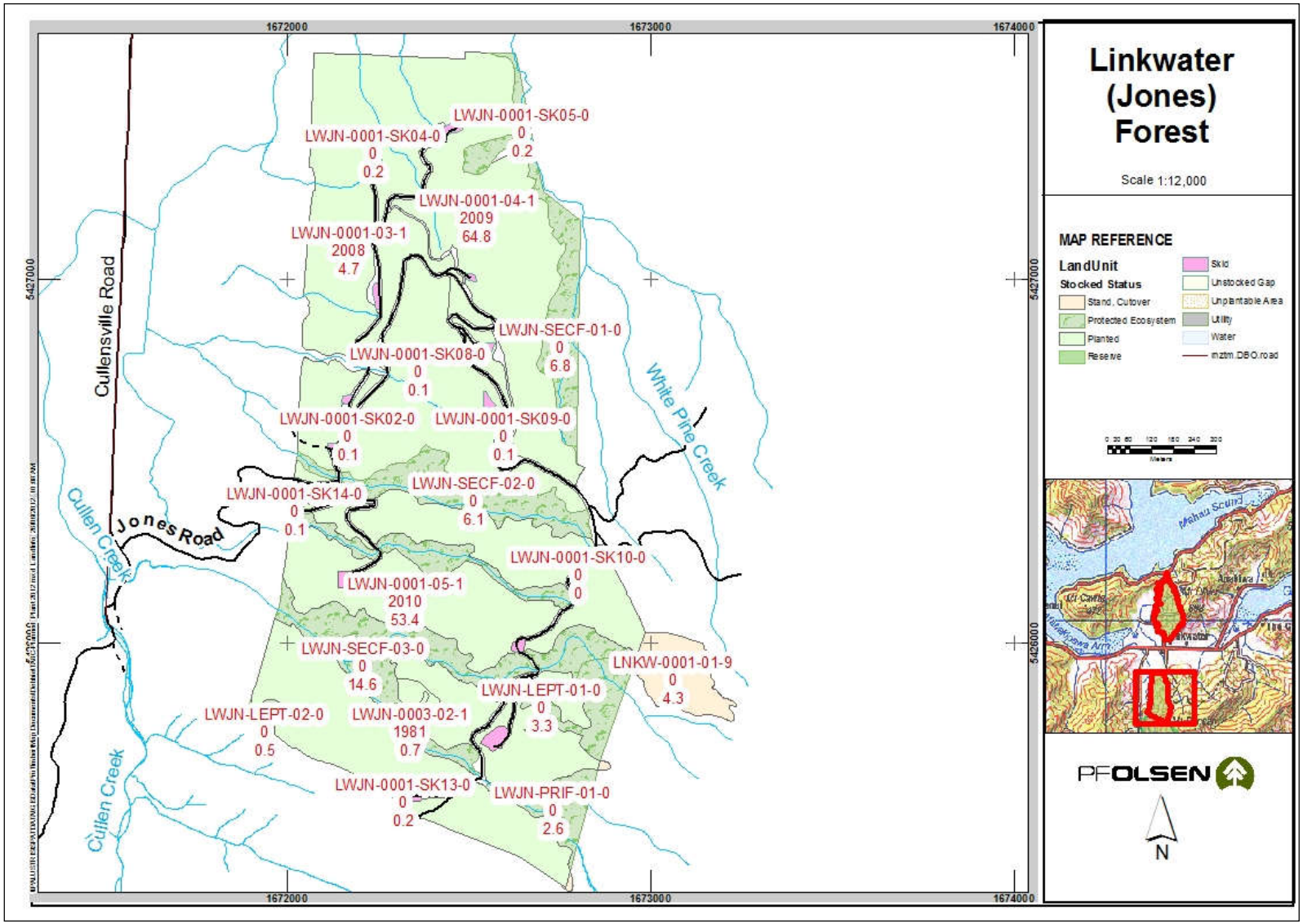
The stream categories within Linkwater Forest are summarised below.

Table 11: Riparian reserve categories

Category code	Category name	Total length (m)
MMWH	Med Mod Wet Hard	3237.8
MLWH	Med_Low_Wet_Hard	206.9
SMWH	Small_Mod_Wet_Hard	307.2
SLWH	Small_Low_Wet_Hard	133.6
	Total forest stream length (km): 3.88	

10. Map 2 - Forest Stands Map




Linkwater (Jones) Forest
Scale 1:12,000
MAP REFERENCE
LandUnit
Stocked Status
Stand, Cutover
Protected Ecosystem
Planted
Reserve
Skid
Unstocked Gap
Unplantable Area
Utility
Water
mztm.DBO.road
Meters
0 30 60 120 180 240 300
1672000
1673000
1674000
5427000
5426000
Cullensville Road
Jones Road
Cullen Creek
White Pine Creek
LWJN-0001-SK05-0
0
0.2
LWJN-0001-SK04-0
0
0.2
LWJN-0001-04-1
2009
64.8
LWJN-0001-03-1
2008
4.7
LWJN-SECF-01-0
0
6.8
LWJN-0001-SK08-0
0
0.1
LWJN-0001-SK02-0
0
0.1
LWJN-0001-SK09-0
0
0.1
LWJN-0001-SK14-0
0
0.1
LWJN-SECF-02-0
0
6.1
LWJN-0001-SK10-0
0
0
LWJN-0001-05-1
2010
53.4
LWJN-SECF-03-0
0
14.6
LNKW-0001-01-9
0
4.3
LWJN-LEPT-01-0
0
3.3
LWJN-LEPT-02-0
0
0.5
LWJN-0003-02-1
1981
0.7
LWJN-0001-SK13-0
0
0.2
LWJN-PRIF-01-0
0
2.6
N

11. Non-Timber Forest Products and Other Special Values

Introduction

Forest plantations can provide non-timber forest products and special values that enhance the economic wellbeing of the owner or legitimate forest users. Non-timber products are an important means of maximising the production capacity of the forest whilst maintaining environmental and social values. The forest management plan provides procedures for developing and managing these resources.

Non-timber forest products

Presently there are no non-timber products being produced or developed in Linkwater Forest. PF Olsen Ltd's forest management systems include provision for tracking forest use and other product extraction should it be developed.

Environmental and Social cost-benefit analysis

Forests can deliver numerous social and environmental products, both positive and negative to varying degrees. These non-timber values can be difficult to quantify, unlike financial costs and benefits.

The table below rates the relative positivity and negativity of the more common social and environmental products produced by Linkwater Forest relative to the most likely alternative primary production system, pastoral drystock farming.

Table 12: Environmental and social cost-benefit analysis

Environmental or social product	Increasingly negative				Neutral			Increasingly positive			
	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Soil stabilisation				HP							MR
Erosion/soil loss								HP			MR
Water quality							HP				MR
Riparian shading					HP					MR	
Water quantity					MR			HP			
Carbon sequestration				HP							MR
Native wildlife habitat								HP		MR	
Threatened fauna				HP						MR	
Native fish										✓	
Air quality					HP				MR		
Native reserve protection										✓	
Landscape/visual					HP			MR			
Recreation										✓	
Commercial forest use										✓	
Firewood							MR				HP
Local employment							MR				HP

NB: where the ratings differ throughout a rotation, 'MR' is used to indicate the mid rotation (growing) stage of the forest, and 'HP' refers to during or post-harvest

Other special values

Possums are trapped throughout the forest for fur.

Recreational usage

Linkwater Forest receives some recreational demand from the wider public. Over the period between 2008 and 2013, a total of six permits were issued for hunting and road control.

The forest will continue to be open for legitimate use subject to entry by permit.

There are no formal nor informal legal public accessways or routes recorded for use by the general public on the Walking Access NZ website *http://wams.org.nz/wams_desktop/index.aspx*

Table 12: **Permits issued between 2008 and 2014 for Linkwater**

Block	Permit Category	Permit Type	Total Permits
Jenkins	Recreational	Hunt- goat	1
Jenkins	Recreational	Hunt- other	2
Jones	Recreational	Hunt- other	2

12. Environmental Risk Management

Assessment of environmental risks

Several areas of typical forest management have been identified as posing a possible environmental risk within Linkwater forest. The Environmental Assessment Matrix below summarises the identified risks for Linkwater forest. The level of risk has been evaluated in the matrix as high 'H', medium 'M', low 'L', or not applicable 'NA'.

Prior to operations such as clearfelling, land preparation and production thinning, an assessment is undertaken to quantify the risk involved in carrying out the particular operation, and steps are implemented to manage the risks.

	ENVIRONMENTAL VALUES/ISSUES											
Forestry Operational Activities	Erosion& Sed -iment Control	Water Quality	Soil Conservation & Quality	Air Quality	Aquatic Life	Native Wildlife	Native Vegetation	Historical & Cultural Values	Landscape & Visual Values	Neighbours & other forest users	Public Utilities	Recreation Values
Harvesting	M	M	M	L	M	H	H	H	H	H	M	H
Earthworks	H	H	M	L	M	M	M	H	H	H	L	L
Slash Management	L	M	L	NA	L	M	M	M	M	M	M	L
Stream Crossings	H	H	L	NA	H	M	M	M	L	L	L	L
Mechanical Land Preparation	M	M	M	L	M	H	M	H	H	M	L	M
Burning	L	L	M	H	L	H	M	L	H	H	M	H
Planting	NA	NA	NA	NA	NA	L	L	H	L	L	L	L
Tending	NA	NA	NA	NA	NA	NA	L	NA	L	NA	NA	L
Fertiliser Application	NA	H	M	M	H	M	L	NA	NA	L	L	L
Agrichemical Use	NA	H	L	M	H	M	H	NA	L	H	L	H
Oil & Fuel Management	NA	H	L	L	H	L	L	NA	NA	H	L	L
Waste Management	NA	L	L	NA	L	L	L	M	M	M	L	L
Forest Protection	NA	NA	NA	NA	NA	L	NA	NA	NA	L	NA	NA

Hazardous substances management

Hazardous substances are any substances, which may cause adverse environmental impacts and/or injury or health problems if incorrectly handled or used.

The hazardous materials which may be used within Linkwater forest are:

- Pesticides
- Herbicides
- Fuels and oils
- Fire retardants
- Surfactants

Transportation, storage and labelling of these hazardous materials must all comply with the provisions of the Health and Safety Manual, which is maintained under ISO 9001 certification and incorporate legislative controls under EPA and NZS 8409:2004 Management of Agrichemicals code of practice.

Furthermore, the forest manager is committed to reducing the use of hazardous substances as much as possible. This involves use of alternative methods for the control of weeds, pests and diseases where these are effective and efficient. The use of fuels and oils is minimised where possible. Fire retardants are only used when required and surfactants are only used to make more efficient use of specific herbicides.

FSC highly hazardous chemicals

There are four agrichemicals that have been classified 'highly hazardous' by FSC that are used in forestry and conservation operations within PF Olsen certified forests. Special derogations to continue usage subject to conditions are maintained by PF Olsen.

Table 13: Highly hazardous chemicals used by PF Olsen Ltd

Active ingredient	Purpose	Common usage
Terbuthylazine	Gorse and grass control to aid establishment	Once/twice per rotation
Hexazinone	Bracken, grass, pampas and blackberry	Some specific sites
Sodium cyanide	Possum control (ground-based)	Rare
Sodium Monofluoroacetate (1080)	Possum control	Rare; usually by Animal Health Board

13. Commercial Crop Establishment and Silvicultural Operations

Introduction

Forest operations are implemented to ensure a good quality crop and maximum growth. These operations include land preparation, establishment, weed control, pest and disease control, fire protection, pruning and thinning, and general property asset maintenance.

Crop species

In Linkwater forest, the main crop species grown is radiata pine. This species has been chosen to best meet the management objectives set out above and in Section 2 given the characteristics of the forest land as described in Section 7.

Radiata pine, when intensively managed, will produce a range of different log types suitable for various processing options. The pruned butt log can be used to make knot-free veneer or decorative timber. The unpruned logs can be used for structural timber, for veneer or for feedstock for fingerjointing. The small logs and those with defects and excessive knots can be used for pulp and paper, MDF and other reconstituted wood products such as tri-board and particle board. Radiata pine is the most common species processed in New Zealand, and export markets are well developed for both finished products and logs.

In New Zealand radiata pine is also the main focus in terms of research and development. Past research and development has resulted in improvements in growth, form and wood characteristics as well as development of a range of finished products, building codes and timber standards.

Other species

A small area (1.7 hectares) of *Eucalyptus delegatensis* is planted on the lower slope of Jenkins Block. These trees are showing poor health and are of little commercial value but are retained as a screen for the radiata crop during harvest.

A further planting of redwoods for screening purposes has been attempted along the lower slope of the Jenkins Block near Waterline Road.

Establishment

Replanting will follow harvesting as it occurs, with minor deviations for seasonal or operational reasons and boundary rationalisation. Re-establishment will aim to use high quality treestocks suitable for the site and market. This will be investigated at time of establishment. There is no establishment planned during the life of this management plan.

Pre-establishment forest flora and fauna

Prior to re-establishment of the tree crop, a review will be conducted to identify whether there are any rare, threatened or endangered species of flora or fauna within the area to be planted and what, if any, adjustments in planning may be required. This may include the extension of an existing wildlife corridor or riparian area by increasing setbacks at the time of crop replanting.

A plantation crop is likely to confer beneficial habitat buffering rather than cause adverse effects. These considerations are covered by the afforestation checklist and riparian rules contained within the EMS.

Tending

The tending regime currently executed at Linkwater Forest is a clearwood one, consisting of two pruning lifts to 6 metres with a one hit thinning operation to 330 stems per hectare following the 2nd lift prune. No further tending operations are anticipated.

Tree nutrition

The soils in Linkwater Forest are not likely to be deficient in nutrients for healthy tree growth. However, there are soils within New Zealand that are deficient in one or more nutrients. The most common nutrient deficiencies are likely to be:

- **Nitrogen** – Generally west coast sands in the North Island and the Canterbury Plains, West Coast and Nelson regions in the South Island.
- **Phosphate** – Upper North Island, Marlborough and West Coast have marginal available phosphate concentrations. This is often associated with clay soils.
- **Boron** – Boron deficient trees can suffer dieback from the terminal buds and this symptom is closely associated with moisture stress and drought. Trees growing on the drier East Coast of both Islands and on the pumice soils of the Central North Island are prone to boron deficiency. It is common for forests in Marlborough to be fertilised with ulexite to increase boron levels.

Foliar samples will be taken if nutrient deficiency symptoms are seen or expected. Fertiliser will only be applied if the health and the growth of the trees are significantly affected and or where economic analysis demonstrates a benefit.

14. Forest Inventory, Mapping and Forest Records

Inventory

Forest growth and development is monitored through forest inventory. Forest inventories providing stand information are required at different times and for different reasons throughout the life of the rotation. PF Olsen have procedures for each of the following four types of inventory to be applied on Linkwater Forest:

- Pre-assessment: for silviculture rate setting and validating operational timing vs silvicultural targets;
- Quality control: to check contractor's performance and update stand records;
- Mid crop: to collect measurement inputs for growth modelling;
- Pre-harvest: to obtain estimates of recovery by log grade.

Mapping

Digital mapping of Linkwater Forest currently exists, but will require updating from time to time as the forest changes.

The digital data is retained, processed and managed on PF Olsen's GIS (Geographic Information System) to an accuracy fit for purpose.

Stands are remapped from new aerial photography around age four (when the trees are visible on aerial photography) to accurately determine boundaries and areas and around two years prior to harvesting to assist with harvest planning.

Forest records

Forest records are essential in monitoring the forest operations by providing a historic perspective to the physical condition of each stand.

Linkwater Forest records are maintained on PF Olsen's FIPS system (Forest Information and Planning System). These record systems allow for fast retrieval of information, production of reports and statistics and provide a comprehensive audit trail.

Forest records are essential to understand the status and condition of forest stands, reserves, and important fauna species as well as the retention of inventory data and operation monitoring data.

15. Harvesting Strategy and Operations

Harvesting strategy

As a plantation with a non-normalised age-class structure, the harvesting strategy employed at Linkwater Forest is to harvest the forest or constituent stands as close as possible to the optimum economic age as practical. This is the age at which the growth in volume and improvement in quality is offset by the cost to maintain the forest for another year. The optimum rotation length (for radiata pine) is expected to be within 25 to 30 years (this may be less for framing or unpruned stands).

Getting harvest ready

Forward planning is essential when considering harvesting activities. Harvest planning should ideally commence 2 years before harvesting to enable roading infrastructure to be developed and any resource consents, archaeological surveys, etc. to be undertaken. This reduces the chance of hold-ups to the commencement of harvesting, which can be costly when log prices are fluctuating.

Harvest planning is conducted within a detailed structured framework controlled within the PF Olsen FIPS system. Planners are guided through a total of 100 elements involving environmental, cultural, community, infrastructural, and safety issues that must be addressed as well as direct operational and economic considerations, prior to the issuing of final prescriptions.

No harvesting is planned within the term of this plan.

16. Property Management and Protection

Statutory pest obligations

Pest management within Linkwater Forest is subject to statutory obligations under the Regional Pest Management Strategy that become operative 17 December 2012 and is administered by the Marlborough District Council, a unitary authority.

The strategy applies to both pest plants and animals and categorises them in terms of management objectives. The categories and landowner obligations are summarised below.

Table 14: Statutory pest regulations

Pest Category	Plant pest objectives	Animal Pest Objectives
Total Control	Long term = eradication; Short term = reduce distribution & density.	Eradication
Containment control	Prevention of infestation of un-infested neighbouring areas & reduce density.	Reduction in density & range in targeted areas.
Surveillance	Monitor distribution, spread and impacts.	Monitor distribution, spread and impacts.
Forest Landowner Obligations		
Total Control	Plants to be destroyed before seed produced – Landowner funds 25% where pest occurs on landowner's property. Occupier notifies council. No sale, propagation or distribution.	Occupier to notify Council of presence. Council destroys. No sale, propagation or distribution.
Containment control	Occupier maintains weeds clear of clean neighbour boundaries – control spread. Occupier notifies council of new pests present. Occupier destroys plants before seeding. No sale, propagation or distribution.	Occupier to maintain population below threshold. No sale, propagation or distribution.
Surveillance	Monitor for appearance & spread.	Monitor for appearance & spread.

Rule Ref	Designation	Target	Pest Species relevant to Linkwater forests
6.1.1	Containment	Gorse & Broom	10m clear boundary. Control isolated patches
6.1.8	Containment	Ragwort	50m clear boundary
6.1.7	Containment	Nodding Thistle	100m clear boundary
6.2.1	Containment	Rabbit	3 or less on the Mclean Scale
6.2.2	Containment	Possum	No knowing release or spread to offshore islands

Full details of classifications and obligations are in Part 3 of the Marlborough District Council Pest Management Strategy[3]. The full list of pest species are contained in Appendix 6.

[3] http://www.marlborough.govt.nz/Environment/Biosecurity/~/media/Files/MDC/Home/Environment/Biosecurity/RPMS/RegionalPestManagementStrategyforMarlborough2012.ashx /

Pest control

The main animal pest in Linkwater Forest is the introduced possum. Possums attack attack the growing tips of both plantation and native trees, causing stem malformation and die back. In native vegetation, possum through their preferential diet habits will, over extended periods, force a species composition shift in protected ecosystems as preferred species are repeatedly eaten out and less preferred species gain greater dominance.

Possums are also a threat to neighbouring property owners who are farmers as they can carry and spread tuberculosis to domestic stock.

The other main pest mammal is wild goats. During the first half of the crop rotation when bark is soft and palatable, goats can cause extensive damage if left uncontrolled.

Animal pests in Linkwater Forest will be controlled using ground control methods as required, which prevent impacts on non-target species. The forest manager will coordinate operations with organisations such as the Regional Council and the Department of Conservation to achieve effective and efficient control with in the forest area and on neighbouring land, where required.

Weed pests will be monitored and controlled as required under the Regional Pest Management Strategy, including regular surveillance for new species.

Disease control

Diseases, which can affect the forest trees and adjacent native vegetation, are monitored throughout the year by the forest manager, and once a year by a professional independent forest health assessor. Most diseases cause little damage and do not require control. The exception is *Dothistroma*, a fungus which attacks pine needles. This fungus is controlled using a copper-based fungicide, but only when the infection reaches a critical level.

Dothistroma infection can also be controlled though silviculture by timely thinning and pruning operations, which increases air movement and lowers humidity levels.

There is *Dothistroma* control carried out at present in Linkwater Forest as and when required.

Protected ecosystems, reserves and species

PF Olsen's Conservation and Ecology Manual provides detailed guidance and specification on the application and execution of ecological management targets and actions, as are broadly laid out in the Environmental Management System (EMS). Programs for ecological management are specified and monitored in FIPS Ecological Management module.

The full list of protected ecosystems is listed in Section 9. While protection from operational damage and other influences is afforded all areas, in accordance with the EMS and the ecological rankings pertaining to each area, only those with a 'full' and 'special' ranking will be prioritised for more active interventions. None of the Linkwater reserves achieve a high ecological status ranking and are instead ranked for limited or passive protection.

Under these criteria, management aims to protect the passive status stands where practical and avoid any loss of area during reestablishment. Limited status stands are to be protected from damage during harvest and reestablishment and are to have pest control undertaken where ancillary to adjacent plantation stands or able to be practically coordinated with adjacent landholders. All areas are to be protected from fire.

Sightings of rare and declining species are recorded in this forest. NZ falcon are likely to have their habitat enhanced due to the increased hunting area and food resources that become available after clearfell harvesting. Linkwater Forest is likely to make only a partial contribution to the habitat home range requirements for this species. Operations should avoid any nesting sites.

Kereru will make transitory use of the protected ecosystems within Linkwater and this functionality will remain unaltered. The forest remnants represent a miniscule proportion of the available habitat for this species in the region and as such no specific active management is contemplated.

Long-tailed cuckoos are regular inhabitants of semi-mature and mature pine plantations as well as seral indigenous forest. This plantation habitat will be lost during harvest. However there are a significant number of plantations of various sizes in the area, all in close association with indigenous remnants and mature pine forests. The temporary loss of a small area of habitat in one area is unlikely to pose any direct threat to the long-term presence of the species in the vicinity.

Ecological equivalence

Linkwater Forest is a small (SLIMF) forest as defined under the FSC New Zealand Standard. By these definitions the forest avoids the requirement to have 5% of its area under protection but the FSC estates within the PF Olsen Group Scheme must in aggregate achieve a level of 10% of the certified estate within each Ecological District also under protection. Where such thresholds cannot be met, there are other mechanisms generally termed 'ecological equivalence actions' that can be undertaken to meet the standard.

Linkwater Forest falls into the Sounds Ecological District which has 35.7% of its managed area in reserves. The table below illustrates how the requirements are met.

	<1000 ha SLIMF	>1000 ha L
5% Forest Reserves	NA	
10% Ecological District Reserves		
- Met within forest	✓	
- Met within eco district	-	
- Met by eco district adjacency eco equivalence effort	-	
- Met by eco region adjacency eco equivalence effort	-	

Fire prevention and control

With the weather patterns normally experienced in New Zealand during the period late spring/summer, fire can be a real threat to the forest. This can be minimised by:

1. Having an effective fire plan;
2. Active prevention measures which include restrictions on allowable access, fire prevention signage, publicity when fire danger prevails, access to adequate water sources, constructing and maintaining firebreaks, and selective forest grazing to reduce fuel within stands;
3. Effective detection systems which includes good communication systems, mapping, and fire plan alert procedures;
4. A close link with the relevant fire authorities, and an understanding of equipment and trained manpower requirements, and
5. Good forest management that recognises the influence of terrain, roading network and accessibility, and fuel build-up from silvicultural practice, that will influence fire prevention and control measures.

Fire authority responsibilities

The legal responsibility for fighting forest fires lies with the respective territorial land authorities where the forest is situated. In the case of Linkwater Forest the Rural Fire Authority (RFA) is the Marlborough North Rural Fire Authority.

In the event of a fire that starts within the forest, the RFA is responsible for attending and providing the resources to extinguish the fire. Where a fire starts outside the forested area and moves into the forest, the RFA has recourse to the Rural Fire Fighting Fund to compensate for fire fighting costs.

There is a close liaison with the RFA in terms of developing the 'fire plan' and the maintenance of good communication relative to potential risks and fire danger ratings.

Fire insurance

With regard to the location of the forest and the high public activity around the fringes, there will always be the potential for fire. If a fire originates within the forest, the owners will ultimately be liable for suppression costs. A major fire may cost many thousands of dollars to extinguish, with the main costs being the use of heavy machinery, helicopters, and manpower.

Insurance for Linkwater Forest is

Public liability insurance

It is recommended that Permanent Forests Limited maintain public liability insurance cover, with a fire fighting extension, to indemnify against unforeseen adverse activity both within the forest area and adjoining land tenure. In the case of fire spreading from Linkwater Forest onto adjoining land, Permanent forests Limited would be liable for the fire fighting costs and any damage to property.

17. Monitoring

Introduction

To ensure that the management objectives identified in this plan are being achieved, various monitoring exercises outside normal operations management have been developed. Monitoring results are summarised and reported to Permanent Forests Ltd as and when required and are also, where appropriate, made publicly available through the PF Olsen webpage.

Values monitored

Management inspections are completed regularly during operations and periodically between times to monitor all aspects of the forest growth, health and conditions. The findings of the inspections are detailed and, where appropriate, summarised on the PF Olsen FSC website. The full monitoring framework implemented and applicable to Linkwater Forest is tabulated below.

Environmental Process Monitoring Framework

Monitored Element	Include √	Components	Data Source	Data medium	Reporting / Website frequency
Chemical usage	√	A.I usage/ Area overuse	operations supervisors	FIPS Form	On demand / annual
Consultation Activity	√	Complaints	operations supervisors & planners	Form	Annual / annual
Environmental Incidents	√	Incident number / categories	operations supervisors	FIPS Form	On demand / annual
Flora & Fauna	√	Species & Status frequencies/ new finds	operations supervisors, public, crews	FIPS Form	Annual / annual
Forest estate Structure	√	Area (plantation & Protected ecosystem)/ age-class/ species/forest type/protection status	management plans/stand records	FIPS stand records	On demand / annual
Forest growth	√	PSP protocols / periodic inventory. ISO 9001	contractors	To be established	Periodic-annual – not on web
Forest Health	√	Disease & health	National Forest surveillance program[4]	document	Periodic-annual – not on web

Continued on next page...

[4] Forest health inspections are undertaken annually, by an independent specialist forest health assessor, through the NZ Forest Owners Association forest health scheme.

...continued

FSC Membership	√	Block/ location/name	FIPS register	FIPS client database	On demand / annual
Health and safety statistics	√	LTI / accidents & incidents.	operations supervisors	FIPS	Monthly/ annual
Internal Audit CAR activity	√	Frequency * category	Auditors/ees	FIPS Form	Annual / annual
Log Production	On harvest	Total logs/ FSC markets	log dockets	Woodtrack	On demand / annual
Operational monitoring	√	Audit trends/cause analysis	operations supervisors	FIPS Form	Monthly / annual
Pests	√	RTC / kill returns or other	supervisors /contractors	Via permits	Annual where relevant
Protected Ecosystem Condition	NA	Condition trends/photopoint monitoring	Contractors/ supervisors		Bi-annual if restoration initiated
Recreational & non-timber	√	Permits issued	branch offices / forest security	FIPS Form	Annual / annual
Resource consents	NA	Number/compliance	operations planners	FIPS	6 monthly / annual
Stream Monitoring	NA	Clarity +/- other specific	supervisors /contractors	Spreadsheet	Monthly / annual where relevant
Environmental Training	√	Courses, numbers, names	Staff	FIPS Form	Annual/as relevant
Client satisfaction	√	Post-operation client survey	clients	Survey form	Post-operational /annual
Social survey	√	Demographics, values, work conditions	contractors	Survey form	5 yearly/annual

Financial

Budget versus expenditure is monitored through the PF Olsen FIPS system and presented to Permanent Forests Limited when requested. This information is not made public.

Social

Consultation with stakeholders has been undertaken and constant feedback from these stakeholders (and others as they become apparent) is monitored. This includes actions undertaken to resolves disputes and issues.

18. Future Planning

Introduction

This plan pertains to the management of Linkwater Forest and will be adhered to for the next 5 years. Any deviation from this plan will be justified only on the basis that the changes do not adversely affect the environment. Any changes which are contrary to the policies contained in this management plan require a full review of this plan.

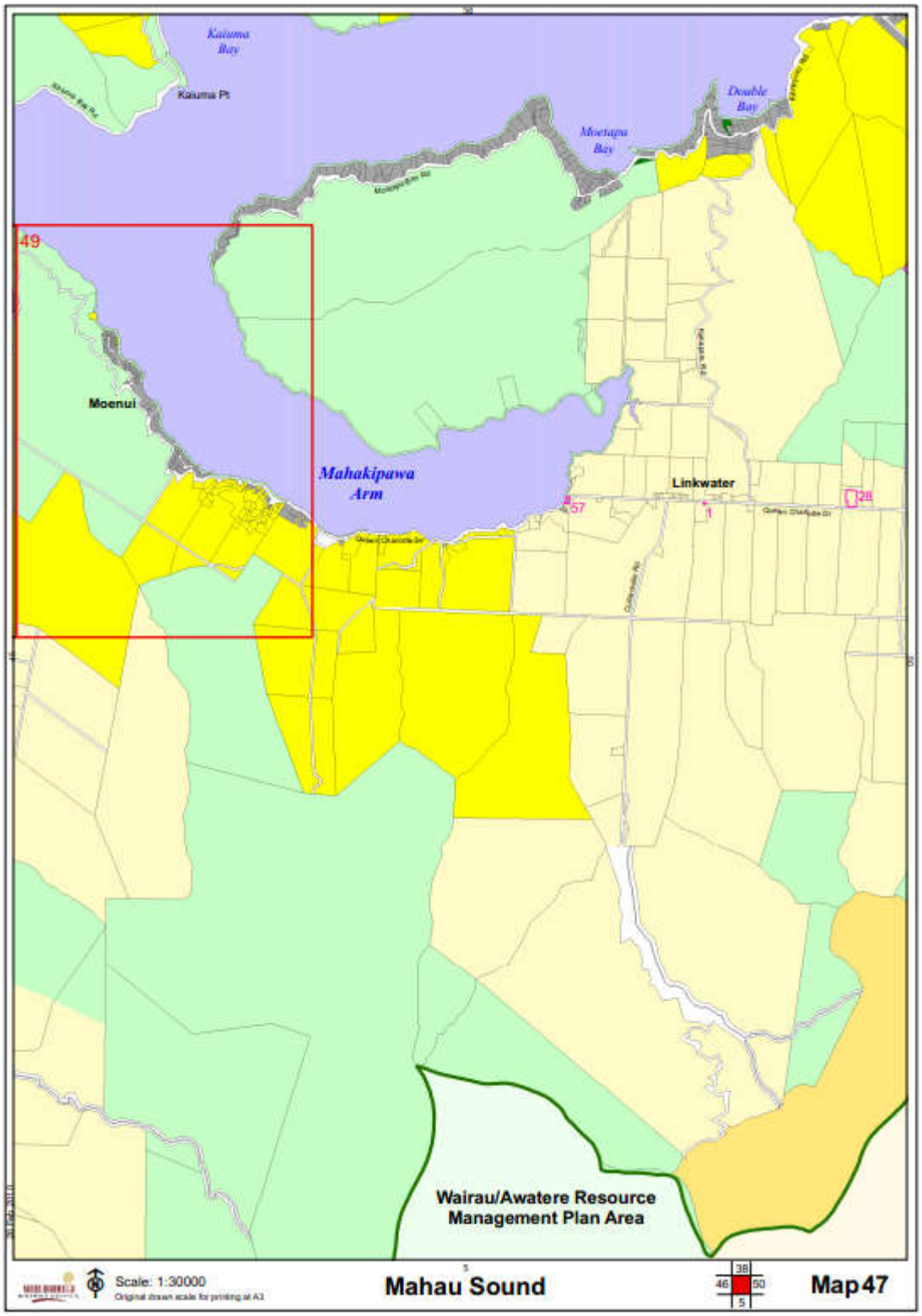
The next review date for this plan is September 2019.

The forest management plan is used for both medium and long term planning.

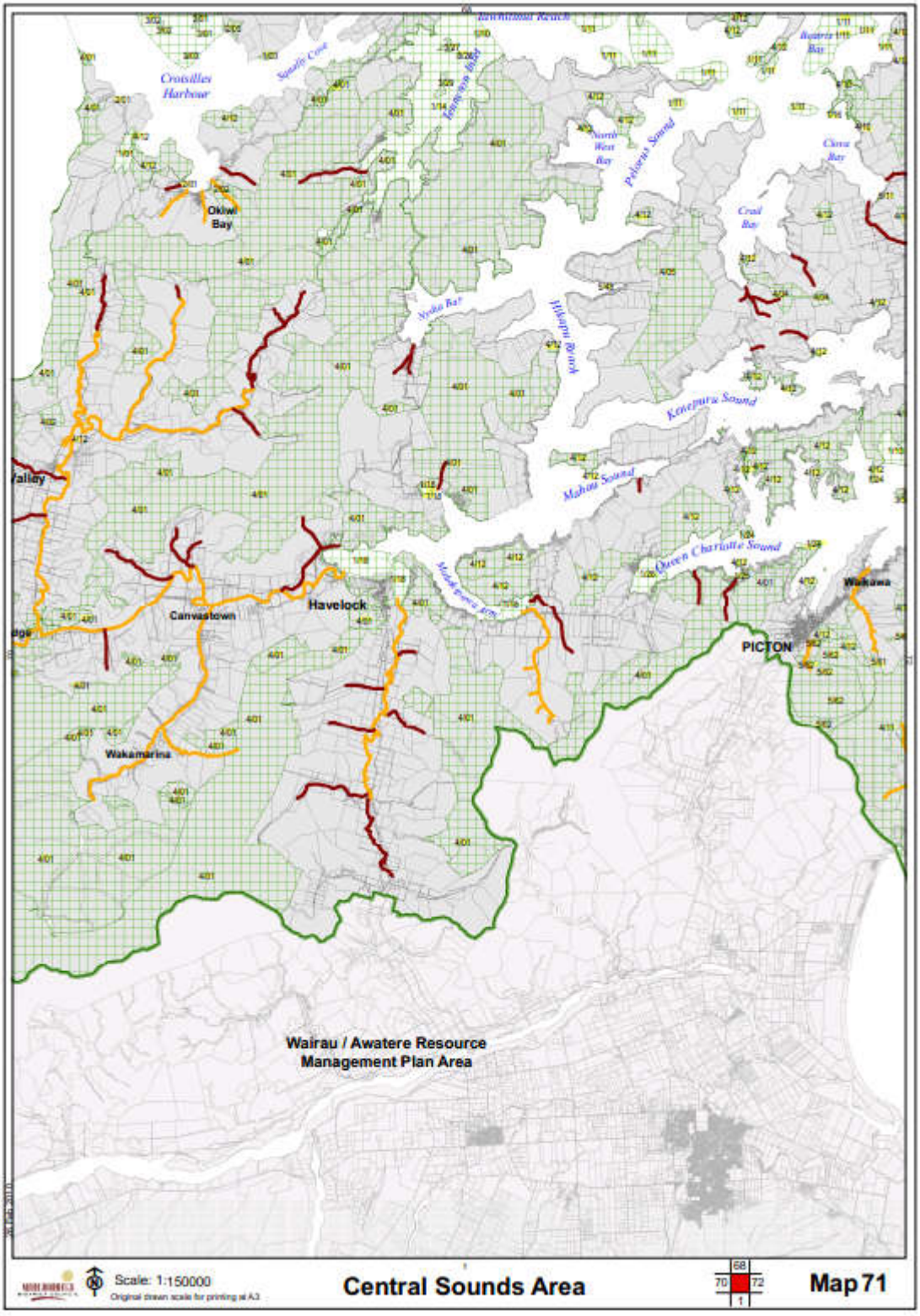
Operation plans

For the short term we use operation plans. These plans are prepared annually in accordance with this management plan. This operation plan and associated budget are subject to approval by Permanent Forests Limited at the beginning of each financial year.

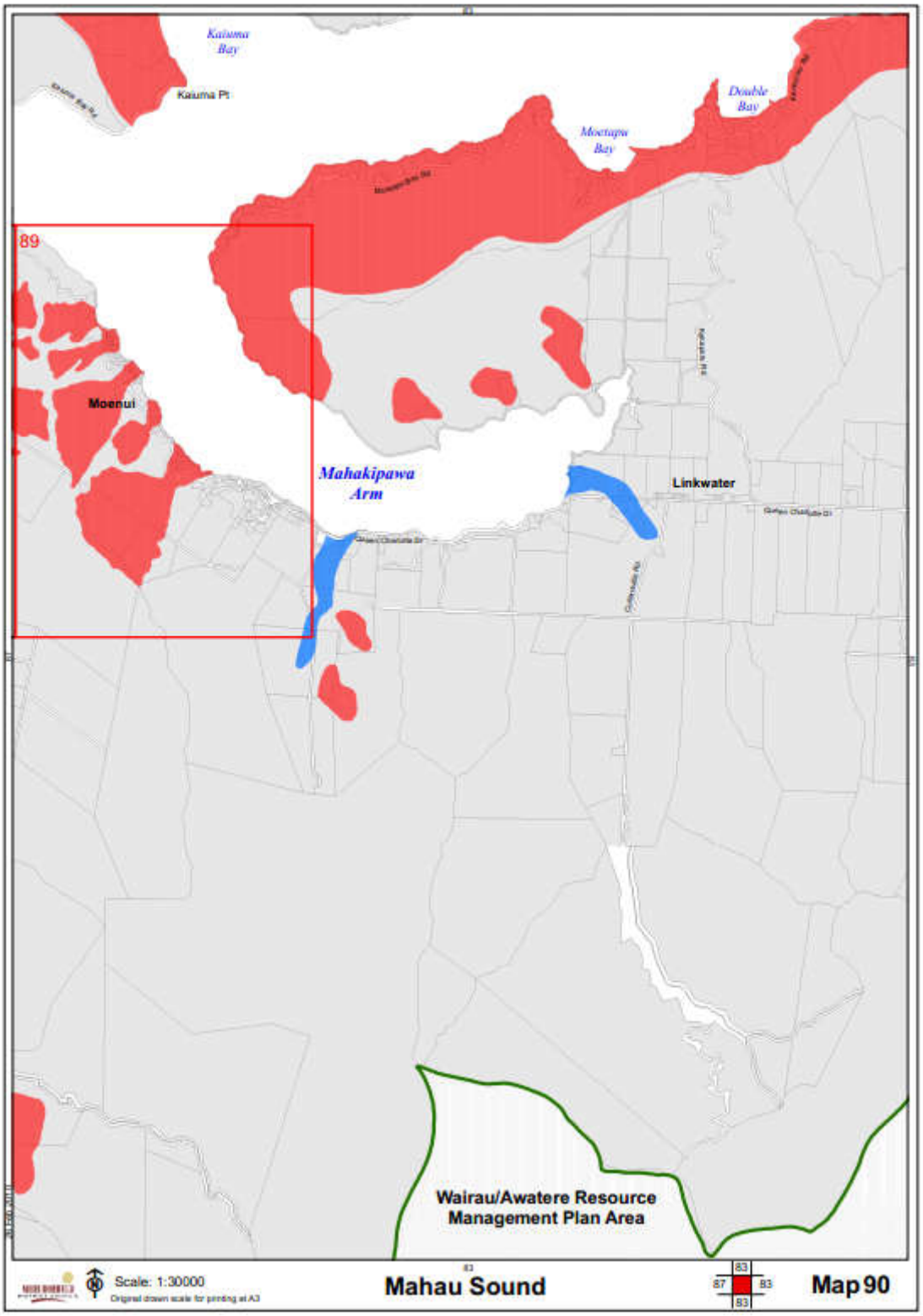
Appendix 1: Marlborough District Council Zoning Map



Appendix 2: Marlborough District Council Ecology Map



Appendix 3: Marlborough District Council Hazard Area Map



Appendix 4: Archaeological Sites

Sites within Linkwater Forest

NZAA ID	Period	Site Description
P27/351	Colonial 1840-1900	Alluvial workings. Prospecting pit/ trench, Tailings, Trench.
P27/354	Colonial 1840-1900	Hut site and gold workings. Chimney, Hut floor/ site, Tailings, Water race - tail race.
P27/355	Colonial 1840-1900	Sluicing gully and tail race.
P27/358	Colonial 1840-1900	Stream diversion and tailings.
P27/363	Colonial 1840-1900	Road.
P27/373	Colonial 1840-1900	Prospecting pit/s and drive.

Sites within 1 km of Linkwater Forest boundary

P27/328		SUSPENSION BRIDGE
P27/298	Colonial 1840-1900	Hotel.
P27/299	Colonial 1840-1900	Historic township.
P27/2	Indigenous pre-1769	Artefact - adze, Artefact - stone flakes, Working area/ flaking floor
P27/3	Indigenous pre-1769	Midden, consisting of cockle, pipi and mudflat snail, argillite flakes, and small indefinite pits.
P27/71	Indigenous pre-1769	Pa site, originally recorded as consisting of terraces and at least two pits.
P27/350	Colonial 1840-1900	Stacked stone tailings.
P27/352	Colonial 1840-1900	Tailings and trenching.
P27/353	Colonial 1840-1900	Sluicing gully, tail race and roads.
P27/356	Colonial 1840-1900	Gold workings, stacked stone and trenching.
P27/357	Colonial 1840-1900	Stacked stone tailings.
P27/359	Colonial 1840-1900	Prospecting trenches and tailings.
P27/360	Colonial 1840-1900	Stone fireplace, trenching and stacked tailings.
P27/361	Colonial 1840-1900	Stacked stone tailings.
P27/362	Colonial 1840-1900	Stacked stone tailings.
P27/365	Colonial 1840-1900	Mining/prospecting tunnel.
P27/390	Colonial 1840-1900, Modern 1900-	Sheep dip. Possible site of farm cottage.
P27/4	Indigenous pre-1769	Five pits; some with raised rims.

Appendix 5: Rare Species Sightings in Linkwater Forest

Forest	Species	Threat Class	Number	Date Seen	Easting	Northing
LWJK	Kereru	Not Threatened	2	1/06/2012	0	0
LWJK	Kereru	Not Threatened	2	1/11/2011	0	0
LWJK	Kereru	Not Threatened	12	5/11/2010	0	0
LWJK	Kereru	Not Threatened	4	2/03/2009	0	0
LWJK	Kereru	Not Threatened	8	10/09/2008	0	0
LWJK	Kereru	Not Threatened	1	4/08/2008	0	0
LWJK	New Zealand Falcon	Nationally Vulnerable	1	8/03/2012	0	0
LWJK	New Zealand Falcon	Nationally Vulnerable	3	7/05/2011	0	0
LWJK	New Zealand Falcon	Nationally Vulnerable	1	11/09/2010	0	0
LWJK	New Zealand Falcon	Nationally Vulnerable	1	26/09/2009	0	0
LWJK	New Zealand Falcon	Nationally Vulnerable	1	31/08/2009	0	0
LWJK	New Zealand Falcon	Nationally Vulnerable	1	20/05/2006	1672808	5430681
LWJK	Western Weka	Declining	1+	1/04/2012	0	0
LWJK	Western Weka	Declining	4	7/09/2010	0	0
LWJK	Western Weka	Declining	2	26/08/2010	0	0
LWJK	Western Weka	Declining	4	18/08/2010	0	0
LWJK	Western Weka	Declining	3	12/07/2010	0	0
LWJK	Western Weka	Declining	3	17/06/2010	0	0
LWJK	Western Weka	Declining	4	4/04/2010	0	0
LWJK	Western Weka	Declining	1	31/08/2009	0	0
LWJK	Western Weka	Declining	1	15/06/2009	0	0
LWJK	Western Weka	Declining	2	20/05/2009	0	0
LWJK	Western Weka	Declining	4	15/05/2009	0	0
LWJK	Western Weka	Declining	2	4/04/2009	0	0
LWJK	Western Weka	Declining	2	4/04/2009	0	0
LWJK	Western Weka	Declining	1	9/03/2009	0	0
LWJK	Western Weka	Declining	1	9/03/2009	0	0
LWJK	Western Weka	Declining	2	3/03/2009	0	0
LWJK	Western Weka	Declining	1	14/02/2009	0	0
LWJK	Western Weka	Declining	3	2/11/2008	0	0
LWJK	Western Weka	Declining	1	10/09/2008	0	0
LWJK	Western Weka	Declining	1	4/08/2008	0	0
LWJK	Western Weka	Declining	4	21/12/2004	1672808	5430681
LWJK	Western Weka	Declining	1	28/06/2004	1672808	5430681
LWJK	Western Weka	Declining	2	16/05/2004	1672808	5430681
LWJK	Long Tailed Cuckoo	Naturally Uncommon	1	14/12/2006	1672773	5431548

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LWJN	Kereru	Not Threatened	3	12/11/2011	0	0
LWJN	Kereru	Not Threatened	2	19/11/2008	0	0
LWJN	Kereru	Not Threatened	1	31/10/2008	1672502	5427506
LWJN	Kereru	Not Threatened	1	2/05/2008	0	0
LWJN	Kereru	Not Threatened	1	12/11/2007	1672356	5426874
LWJN	New Zealand Falcon	Nationally Vulnerable	1	4/05/2012	0	0
LWJN	New Zealand Falcon	Nationally Vulnerable	1	8/02/2012	0	0
LWJN	New Zealand Falcon	Nationally Vulnerable	1	30/10/2011	0	0
LWJN	New Zealand Falcon	Nationally Vulnerable	1	25/08/2011	0	0
LWJN	New Zealand Falcon	Nationally Vulnerable	3	20/04/2011	0	0
LWJN	New Zealand Falcon	Nationally Vulnerable	1	1/08/2010	0	0
LWJN	New Zealand Falcon	Nationally Vulnerable	1	2/04/2009	0	0
LWJN	New Zealand Falcon	Nationally Vulnerable	1	24/01/2009	0	0
LWJN	New Zealand Falcon	Nationally Vulnerable	1	1/04/2008	1672622	5426902
LWJN	Western Weka	Declining	12	1/06/2010	0	0
LWJN	Western Weka	Declining	1	15/04/2009	0	0
LWJN	Western Weka	Declining	1	14/02/2009	0	0
LWJN	Western Weka	Declining	2	17/12/2008	0	0
LWJN	Western Weka	Declining	1	10/09/2008	0	0
LWJN	Western Weka	Declining	2	20/08/2008	0	0
LWJN	Western Weka	Declining	1	2/05/2008	0	0
LWJN	Western Weka	Declining	2	30/04/2008	0	0
LWJN	Western Weka	Declining	4	28/02/2005	1672502	5426411
LWJN	Tui	Not Threatened	3	24/01/2009	0	0
LWJN	Bell Bird	Not Threatened	1	12/11/2007	1672356	5426874
LWJN	Kakariki (Yellow Crowned)	Not Threatened		8/02/2012	0	0

Appendix 6: Regional Pest Management Strategy Pests

Common Name	Scientific Name	Pest Designation
African Feather Grass	*Pennisetum macrourum*	Total Control
Bathurst Bur	*Xanthium spinosum*	Total Control
Boneseed	*Chrysanthemoides monilifera*	Total Control
Bur Daisy	*Calotis lappulacea*	Total Control
Cathedral Bells	*Cobaea scandens*	Total Control
Chinese Pennisetum	*Pennisetum alecuroides*	Total Control
Climbing Spindleberry	*Celastrus orbiculatus*	Total Control
Eel Grass	*Vallisneria australis*	Total Control
Evergreen Buckthorn	*Rhamnus alaternus*	Total Control
Giant Needlegrass	*Stipa rudis*	Total Control
Madeira Vine	*Anredera cordifolia*	Total Control
Moth Plant	*Arauja sericifera*	Total Control
Parrots Feather	*Myriophyllum aquaticum*	Total Control
Saffron Thistle	*Carthamus lanatus*	Total Control
Senegal Tea	*Gymnocoronis spilanthoides*	Total Control
Spartina Grass	*Spartina anglica*	Total Control
Broom	*Cytisus scoparius*	Containment Control
Chilean Needlegrass	*Nassella neesiana*	Containment Control
Contorta Pine	*Pinus contorta*	Containment Control
Gorse	*Ulex europaeus*	Containment Control
Kangaroo Grass	*Themeda triandra*	Containment Control
Nassella Tussock	*Nassella trichotoma*	Containment Control
Nodding Thistle	*Carduus nutans*	Containment Control
Ragwort	*Senecio jacobaea*	Containment Control
Reed Sweet Grass	*Glyceria maxima*	Containment Control
White-Edged Nightshade	*Solanum marginatum*	Containment Control
Blue Morning Glory	*Ipomoea indica*	Surveillance
Climbing Asparagus	*Asparagus scandens*	Surveillance
Cotton Thistle	*Onopordum acanthium*	Surveillance
Egeria	*Egeria densa*	Surveillance
Kahili Ginger and Yellow Ginger	*Hedychium gardineramum and H. Flavescens*	Surveillance
Lagarosiphon	*Lagarosiphon major*	Surveillance
Purple Loosestrife	*Lythrum salicaria*	Surveillance

Common Name	Scientific Name	Pest Designation
Rooks	*Corvus frugilegus*	Total Control
Feral Rabbits	*Oryctolagus cuniculus*	Containment Control
Possums	*Trichosurus vulpecula*	Containment Control
Darwin Ants	*Doleromyrma darwiniana*	Surveillance