

Wairarapa Group Forest

Forest Management Plan

Summary

This Report sets out the Radiata pine forest management plan for a forestry Managed Investment Scheme to be managed by Forest Enterprises Limited (FE or Forest Enterprises) called the Wairarapa Group Forest Investment.

The assumptions and calculations in this Report have been independently reviewed by Forme Consulting Group Limited and commented upon in their separate Forestry Audit Report (included in the Offer Register of the Product Disclosure Statement). The financial consequences of the forest management plan and the projections have been incorporated into the financial cashflow for the investment set out in the Offer Register of the Product Disclosure Statement.

Disclosure

Forest Enterprises Limited, specifically Mr HE Hughes, the CEO and Forestry Director, has given and not before distribution withdrawn, his written consent to the inclusion of this Report as part of the Product Disclosure Statement and Offer Register for the Wairarapa Group Forest Investment. Mr HE Hughes is a New Zealand Institute of Forestry Registered Forestry Consultant and a director of Forest Enterprises, the licenced manager for the investment.

Forest Description

Location and Access

The Wairarapa Group Forest consists of 3 properties: Awaroa Block, Korori Block and Rangiora Block.

Awaroa Block

This property is located 40km north-east of Masterton in the Bideford district. Access from Masterton is via Bideford road to the north-east, and then Mangapurupuru road to the east. About 33km of the distance from Masterton is sealed, with the last 7km to the forest gate being unsealed metal road. Awaroa forest is bordered by farmland (about two-thirds of the boundary length), and other forest (about one-third of the boundary); including plantation forest managed by Forest Enterprises, and forest under the management of others.

Korori Block

This property is located 53km south-east of Masterton in the Ngahape district. Access from Masterton is through Wainuioru, via the Masterton-Stronvar road to the south-east, and then Ngahape road to the south. About 39km of this is sealed road with the last 14km being unsealed metal road. The last 2km to the Korori forest gate is through two neighbouring forest properties to the west of Korori. Legal right of road access from Ngahape public road to Korori forest, in favour of the Korori forest property, is registered on the neighbouring property titles.

Korori forest is bordered by plantation forest managed by Forest Enterprises and other forest management organisations over about two-thirds of the boundary length, and natural forest/regenerating scrubland along the other third.

Rangiora Block

This property is located 42km south-east of Masterton in the Te Wharau district. Access from Masterton is via Te Wharau road and Driscoll road, with all except the last 2km being sealed road. Rangiora forest is bounded by plantation forest managed by Forest Enterprises and other forest management organisations over about 60% of the boundary length, and a combination of farmland and regenerating scrubland along the other 40%.

All three blocks are well served by internal roads formed for harvesting the first rotation of trees. These roads will provide excellent access for re-establishment and tending operations as well as for forest inspection, maintenance and protection during the second rotation. Whilst they will require some upgrading work prior to harvesting the re-established tree crop, this will be minor and of lower cost than that required for the harvesting of the first rotation of trees.

Legal Descriptions

Awaroa Mangapurupuru Road, 345.40 hectares (ha), CT WN30B/613

Korori Ngahape Road, 193.63ha, CTs WN38B/585 and WN8A/1435

Rangiora Driscoll Road, 604.42ha, CTs WN24B/731, WN31C/494, and WN31C/495 registered FRs

Previous Status of the Properties

The three properties were originally planted from farmland into Radiata pine, mostly in the 1980s. These original tree crops have now been largely harvested and replanted, with the last of the harvesting to occur in 2018 and the last of the replanting to be in 2019.

Gross and Commercially Stocked Forest Area

Area Definition

Area measurement has been taken from a Geographic Information System (GIS) maintained by Forest Enterprises, using orthorectified aerial imagery and Land Information New Zealand (LINZ) Primary Parcel data.

Estimated current stocked areas of commercial Radiata pine plantation forest and the areas that are to be replanted are:

Awaroa Block 225.4ha planted in 2016 and 2017, with a further 33.1ha planned for planting in 2018, and a final 49.4ha to be planted in 2019.

Korori Block 136.9ha planted between 2013 and 2017 with a further 10.2ha planned for planting in 2018.

Rangiora Block 502.4ha planted between 2005 and 2017 with a further 12.6ha to be planted in 2018.

The total stocked area of the combined forest estate, at the end of the planting season in 2019, is expected to be 970ha. This includes 25.4ha of 'take' areas that are outside the legal boundary of the forest properties and within neighbouring properties. These are currently not secured by Registered Forestry Right, but we will look to do so in the foreseeable future provided the process is not cost-prohibitive. There are also reciprocal 'give' areas totalling 16.2ha.

The difference between the total gross legal title area of 1,143.4ha, and the 970ha of stocked forest (that is the commercial tree crop component of the Wairarapa Group Forest Investment), comprises natural scrub and forest, riparian reserve, boundary setbacks, roads and landings, the give and take areas referred to above, and approximately 6ha of old crop trees that are uneconomic to harvest and will be left as they are.

Block	Year Established									
	2005	2009	2013	2014	2015	2016	2017	2018	2019	Total
Awaroa	0.0	0.0	0.0	0.0	0.0	107.9	117.5	33.1	49.4	307.9
Korori	0.0	0.0	33.6	14.2	0.0	43.8	45.3	10.2	0.0	147.1
Rangiora	5.9	2.4	95.8	85.8	83.9	116.2	112.4	12.6	0.0	515.0
Total Area (Hectares)	5.9	2.4	129.4	100.0	83.9	267.9	275.2	55.9	49.4	970.0

Areas are based on recent aerial photography and mapping. Updated photography and mapping is undertaken during the life of a forest and it is usual for the measured net stocked area to change with each update and the changes can be material.



Topography, Altitude, Soils and Climate

Awaroa Block

- The property is mainly medium hill country with the aspect evenly split between north-east and south-west faces. The north of the property drains towards the west into the Mangapurupuru Stream, with the remainder draining south-west into the Mangapakeha Stream.
- The range in altitude is from 200m above sea level to a high point on the boundary of 434m, with a mean altitude of 328m.
- Soils are mainly brown firm soil with some brown orthic soil. Brown soils are very common in New Zealand and occur in locations that do not typically experience either severe summer drought or extreme winter rains. They are naturally fertile for forestry use, without impervious pans that can restrict tree root growth. Their capacity to support high levels of tree growth and yield is borne out by the production results of the first rotation of forest, and this will be enhanced with the genetic improvement (based on tree selection and breeding not genetic modification) of the replanted forest.
- Average annual rainfall in this area is approximately 1,000mm.

Korori Block

- The property is steep hill country with the aspect evenly split between north and south faces. The property drains towards the west into the Kaiwhata River.
- The range in altitude is from 120m to a high point of 347m, with a mean altitude of 220m.
- The soils are brown orthic or ordinary brown soils, and are well suited to forestry use.
- Average annual rainfall in this area is approximately 1,200mm.

Rangiora Block

- The property is mainly medium hill country, with some easy land at the road front and an evenly distributed aspect. The property drains towards the south into the Pahaoa River.
- The range in altitude is from 145m to a high point of 368m, with a mean of 243m.
- The soils are mainly brown orthic with some brown firm soil, and are well suited to forestry use.
- Average annual rainfall in this area is between 1,200mm and 1,400mm.

Forecast Forest Productivity

Forest productivity is expressed using a measure known as the 300 Index. This is a measure of volume productivity in *cubic metres per hectare per year* (m³/ha/yr) for a defined reference regime.

Based on information from the first rotation forests, we have assessed an area weighted average 300 Index¹ for Wairarapa Group Forest of 26.7m³/ha/yr. This is from first rotation trees of approximately GF16². The improved average 300 Index using genetically improved GF Plus (gr 25) treestock is assessed as 29.6m³/ha/yr.

Local Authorities and Land Use Environmental Consents

The main influence of local authorities on forestry activities is on environmental management. This includes the granting of resource consents which may have various conditions attached to them, and the monitoring of permitted and consented forestry activities. This process has recently undergone significant change with the implementation on 1 May 2018 of the National Environment Standards for Plantation Forestry (NES-PF). These standards recognise ten different forestry activities, from land preparation to harvesting, and seek to standardise the treatment of forestry as a land use throughout New Zealand.

¹ 300 Index is a forestry term used to express the productivity of a site in terms of volume growth. It is the mean annual volume increment in cubic metres per hectare of a 300 stem per hectare Radiata pine stand at age 30 years.

² 'GF' stands for Growth and Form and is a rating system used to compare treestocks. In general terms, the higher the GF rating, the higher the assessed projected performance in terms of the growth and form of the resulting trees.



As part of the NES-PF, all land in New Zealand has been classified and mapped in terms of its erosion risk. There are four risk classes, or zones, recognised. These are Green (low risk), Yellow (moderate risk), Orange (high risk) and Red (very high risk). Whether a certain activity requires a resource consent, and the type of consent required, depends on the nature of the activity and the erosion risk of the land where it is planned to be undertaken. The key forestry activities impacted by the erosion susceptibility class of the underlying land, are earthworks and harvesting. Earthworks can be controlled by the Greater Wellington Regional Council where they are large in scale and on Red and Orange (high risk) erosion zone land. Similarly, harvesting can be controlled on Red Zone land.

The Wairarapa Group Forest consists of 0.2% Red Zone, 33.4% Orange Zone, 28.2% Yellow Zone and 38.2% Green Zone.

Earthworks will be much smaller in terms of the volume of material moved than in the road and landing construction for the harvesting of the first rotation tree crop, and will be subject to a Restricted Discretionary Resource Consent. This is a standard requirement for the large majority of FE's current earthworks activity in preparation for harvesting and is not at all problematic. All but the 0.2% of land which is Red Zone (at most 2.2ha) is a permitted activity and will not require any consent for harvesting. Because it is more than 2 hectares, the 2.2ha of Red Zone land may need a Controlled Resource Consent.

Any environmental controls imposed on forestry activities planned as part of this investment are not onerous and are part of normal and routine forest planning and management. Resource planning costs have been incorporated in the cashflow forecast of the investment.

Forest Management

Forest Enterprises specialises in the management of Radiata pine plantation forests. Radiata accounts for over 90% (1.5 million ha) of all plantation forests established in New Zealand. It has very good growth rates and can be managed to produce high value clearwood³ logs in a relatively short rotation of 25 to 30 years. It is particularly well suited to northern Wairarapa as evidenced by the first rotation growth and yield and adjacent and nearby forests.

Forest Audits

All forests are audited annually by Forme Consulting Group Limited to ensure that approved management plans are completed to specification and quality standards, consistent with good forestry practice.

Establishment

Genetically improved GF Plus seedlings have been planted to date and are ordered for the remaining planting in 2018 and 2019. This proven high-quality stock produces high growth trees of extremely good form in terms of straightness and branch size.

The trees have been/will be planted at a square spacing of 3.2m by 3.2m to produce a target planting density of 1,000 stems per hectare. The square spacing results in relatively even growth, branch size control, assists tree selection for the tending operations and results in less exposure to wind after thinning.

The trees will be release sprayed in the spring following planting to remove competing grass growth. Prior to winter, a survival survey of the previous year's plantings will determine if any blanking⁴ of failed trees is required. Provision has been made in the cashflow for blanking (and subsequent release spraying) of 3% of the total planted area, however normally less is required.

Maintenance

Existing roads used for harvesting the first crop rotation will be used for all establishment and tending operations. Annual maintenance will be required to keep the watertables and culverts clear.

³ Clearwood is the forestry term for wood which is free of knots and other defects.

⁴ Blanking is the forestry term used to describe the planting of replacement trees in areas where it is assessed that insufficient trees have survived to ensure adequate selection for the final crop.



Silvicultural Regime

It is proposed to maintain a silvicultural regime consistent with achieving the maximum volume of high value pruned logs and small branch sawlogs at harvest. Pruning is planned to take place in two lifts to a final pruned height averaging 6.1m, with one thinning to a final crop stocking of 375 stems per hectare.

There will be a spread in growth rates within the forest according to the 300 Index, influenced by altitude and aspect. As noted earlier, we have assessed the average forest 300 Index as 29.6m³/ha/yr.

Age	Tending Program	Target Mean Top Height	Target Stems per Hectare
5.0/6.0	Prune to average height 3.1 metres	7.0 metres	375
7.0/8.0	Prune to average height 6.1 metres	9.5 metres	375
7.0/8.0	Thin to final crop	10.0 metres	375
Slight timing variations may result from the optimum scheduling of tending.			

The growth models in Forecaster⁵ will be used to schedule the tending to ensure the optimum timing of each operation. The objective is to restrict the diameter of the defect core and maximise the volume of clearwood produce in the sawing or peeling of the pruned log.

Forest Enterprises is a member of key forest industry organisations⁶ and fully utilises the information and research findings membership provides. Changes to the tending program may be proposed if new research indicates changes would, on a cost-benefit analysis, enhance the projected rate of return from the forest.

Records, Mapping and Inventory

Forest Enterprises uses the Geographic Information System (GIS) ArcGIS in conjunction with the stand record system called GeoMaster. GeoMaster is the repository of stand records that can be interrogated to supply specified data and reports, and ArcGIS is the means by which a wide range of maps are produced; both in support of forest planning, management and reporting. These are industry standards for mapping and record keeping in forestry, and are comparable with the general ledger in the financial sense. These systems have been used to produce the maps and data underlying the analyses in support of the Product Disclosure Statement.

Aerial imagery in support of mapping and updating area records is captured throughout the life of the tree crop or stand. This process uses a range of methods broadly outlined as follows:

- At about tree age 4 years, once planted tree crops are well established and growing and are clearly visible from the air - often using a drone.
- Immediately prior to the mid-rotation inventory at about age 12-14 years, undertaken in support of planning, valuation and reporting - using aerial photography or lidar technology⁷.
- Immediately prior to the pre-harvest inventory at about age 23-25 years, in support of harvest and marketing planning - using aerial photography or lidar.
- Regularly during the harvesting phase to monitor and report production and crop yields - using a drone.
- Prior to re-establishment of the next rotation of trees in support of the necessary planning for land preparation and planting activities - using a drone.

⁵ Forecaster is a suite of computer models for Radiata pine developed by SCION, the New Zealand Crown Research Institute for forestry.

⁶ Forest Enterprises belongs to many industry organisations including the New Zealand Forest Owners Association, the New Zealand Farm Forestry Association and the New Zealand Institute of Forestry (NZIF).

⁷ Lidar is a relatively new remote sensing survey method that can be used to complement ground based inventory and reduce the overall cost of obtaining area and crop condition data and information.



Forest Protection

There are a number of risks to forests that can be significantly reduced through good management practice and relevant insurance cover.

Fire

Fire risk is not great as there is little public access with the properties being on no exit side roads. Fire insurance cover details are set out below. Response to vegetation fires is managed by Fire and Emergency New Zealand.

Wind

Young trees with rapid initial foliage growth, which is not always matched by root development can be at risk of toppling⁸. Re-standing and remedial pruning have proven to be very effective corrective methods to address toppling events. Windthrow⁹ after thinning can also occur. Wind loss insurance cover details are set out below.

Animals

Allowance has been made in the early years for hare and rabbit control. As part of an Animal Health program, regular possum control and monitoring is carried out in this area by Greater Wellington Regional Council.

Security

Public trespass is not expected to be a problem because there is little road frontage, however the road gates will be locked.

Disease

Dothistroma fungal disease is a rare occurrence in the Wairarapa, historically not reaching levels where control would be required. Scattered patches of *Cyclaneusma* needle cast have sometimes been seen in Wairarapa forests but this is not a serious risk to growth. Red Needle Cast is present in the Wairarapa and affects most forests sporadically, causing some loss of growth in those years. This has been taken into account in the modelling by calibrating against first rotation yields.

Insurance

The forest will be insured under a special purpose group forest insurance scheme with wind and snow cover included. The value of the cover is an agreed sum per hectare for like areas in each forest. Forest Enterprises identifies the like areas based upon the age classes present.

The group policy functions on a 'first loss' basis. The agreed value per hectare will be paid up to a total for all events for the 12 months insured. The total first loss limitation is \$30 million for defined events including \$6 million for wind, \$1 million for snow, and \$5.1 million for replanting.

The policy is organised by Insurance Facilitators Pty Ltd, an Australian based specialist forestry and crop insurance provider, and is underwritten by SJ Catlin & Others Syndicate 2003 at Lloyd's of London. The overall Lloyd's market has a Standard & Poor's rating of A+ (Strong) as at August 2018.

Forest Health

Forest Health is monitored by the Forest Biosecurity System which is funded by the Harvested Wood Products Levy.

⁸ Toppling is a forestry term to describe the leaning over of young trees within a socket of soft ground following strong wind events associated with heavy rain.

⁹ Windthrow is the forestry term to describe when trees are pushed over or uprooted by wind.



Growth and Yield

Harvest is anticipated when the trees are in their 26th year. The volume estimates were calculated from Forecaster for GF Plus (gr 25) rated treestocks using the 300 Index growth model. This produced a total recoverable volume of 665 tonnes per hectare. A conversion factor of 0.959m³/tonne has been applied¹⁰.

The assessed breakdown of the recoverable volume by log at harvest is as follows -

Log Type	Tonnes per Hectare	% of Total Recoverable Volume
Export P40	77	12%
Domestic P35	71	11%
Domestic M30	125	19%
Domestic M20	95	14%
Export A	130	20%
Export K	43	6%
Export KI	53	8%
Export Pulp	64	10%
Domestic Pulp	7	1%
Total Recoverable Volume	665 t/ha	100%

Forecaster Growth Model Settings¹¹

Model	Setting	Model	Setting
Growth Model	GM300Index	Sweep Model	Generic
Monthly Adjustment Model	8	Forking Model	Generic
MAPD	0.35	Tree Volume Table	182
MMPA	30	Tree Taper Table	182
Regional Drift	0.25	Breakage Table	1
Height Age Table	112	Branch Model	Generic
DOS Function	DOS1999	BIX Model	KnowlesKimberley1997

Attrition

An area attrition of 2% has been allowed for between establishment and harvest, ie between the established area of 970ha and the projected harvested area 951ha. Natural attrition within the forest is also allowed for by assuming that only 337 stems per hectare are harvested of the 375 stems per hectare that remain after thinning.

Calculation of Harvest Receipts

Markets

A range of markets have been included in the analysis based on point of sale during the current first rotation harvest. Export logs will be exported through Port of Wellington, with Domestic logs destined for mills in Masterton, Dannevirke and Napier.

The intensive tending silvicultural regime selected is directed towards production of a spread of log types with a bias towards high quality large pruned logs and small branch sawlogs. This regime will provide the greatest spread across the range of log markets at harvest, plus the opportunity to sell down into lesser grade markets should this be warranted, hence minimising exposure to any one market and consequently market risk.

¹⁰ Source: Ellis and Crawley 2014, Practical Log Scaling Guide, Pg 24.

¹¹ MAPD – Mortality Additive Percentage Adjustment

MMPA – Mortality Multiplier Percentage Adjustment



Log Production Costs

Based on the soon-to-be-completed first rotation harvest, the Wairarapa Group Forest harvest has been assessed to be 65% hauler logging and 35% ground based. Harvesting and transportation costs are historical averages based on the first rotation harvest. The following costs have been calculated to the point of sale -

Activity	Costs per Tonne
Logging & Loading	\$ 33.51
Internal Roads & Landings	\$ 3.75
Cartage to point of sale	\$ 25.81
Management & Marketing	\$ 5.12
Other Costs and Contingency	\$ 0.84
Total Average Production Cost	\$ 69.03

Revenue

Log prices used to achieve the revenue projection are the average prices for the last 12 quarters to 30 June 2018, achieved by Forest Enterprises (for the Southern North Island).

Log Type Grades	Point of Sale	Spot Price as at 30.06.18	12 Quarter Average Price	Prices Used (\$/t)
Export P40	Wellington	\$ 201	\$ 185	\$ 185
Domestic P35	Dannevirke	\$ 182	\$ 174	\$ 174
Domestic M30	Waingawa	\$ 124	\$ 111	\$ 111
Domestic M20	Waingawa	\$ 109	\$ 98	\$ 98
Export A	Wellington	\$ 146	\$ 127	\$ 127
Export K	Wellington	\$ 130	\$ 113	\$ 113
Export KI	Wellington	\$ 124	\$ 103	\$ 103
Export Pulp	Wellington	\$ 106	\$ 89	\$ 89
Domestic Pulp	Waingawa	\$ 31	\$ 31	\$ 31

Projected Net Stumpage per Hectare

Based on the assumptions set out in this document, and using the 12 Quarter Average Price, the projected net stumpage per hectare is \$36,735, as detailed below.

Log Type Grades	Gross Price per Tonne	Total Costs per Tonne	Net Return per Tonne	Tonnes per Hectare	Contribution To Stumpage
Export P40	\$185	-\$75.84	\$ 109	77	\$8,380
Domestic P35	\$174	-\$75.74	\$ 98	71	\$6,991
Domestic M30	\$111	-\$59.16	\$ 52	125	\$6,486
Domestic M20	\$98	-\$58.84	\$ 39	95	\$3,723
Export A	\$127	-\$74.40	\$ 53	130	\$6,912
Export K	\$113	-\$74.03	\$ 39	43	\$1,660
Export KI	\$103	-\$73.79	\$ 29	53	\$1,563
Export Pulp	\$89	-\$73.45	\$ 16	64	\$1,021
Domestic Pulp	\$31	-\$31.06	-\$ 0	7	\$0
			Total	665	\$36,735

Using spot prices set out in the Revenue table above as at 30 June 2018, the projected net stumpage per hectare would increase from \$36,735 to \$46,237.

Bert Hughes

Bert Hughes
CEO and Forestry Director
NZIF Registered Forestry Consultant

