HUDSON FOREST

Owned by
HUDSON TECHNOLOGY LIMITED

Forest Management Plan

For the period March 2018 – March 2023

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1. INTRODUCTION

Foundation Principle

Hudson Technology Limited's Hudson Forest is managed under the PF Olsen Ltd FSC Group Scheme certificate RA-FM/COC-000190 issued by the Rainforest Alliance.

Hudson Technology Limited are committed to 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.

Hudson Technology 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 Management Plan provides a summary of Hudson Forest, the intended management over the specified period, and contains:

- A description of the land and its landscape context;
- A description of the external operating environment;
- Management objectives;
- A description of the commercial plantation estate and its non-commercial elements and obligations;
- Forest management, harvesting, protection and land management intentions;
- Provisions for monitoring and protection and public usage;
- Maps showing plantation area, legal boundaries and protected areas.

This plan pertains to the management of Hudson Forest and will be current for the next 5 years. The next major review date for this plan is **March 2023**.

The Landscape Context

2. The Forest Land

Overview

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

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

Legal ownership

The table below gives the legal description of the land on which the forest is situated.

Table 1. Legal description of Hudson Forest

Certificate of Title	Survey District	Appellation	Tenure	Area (ha)
NA599/237	North Auckland	Fee Simple, 1/1, Part Allotment 53 Parish of Hoteo	Freehold	85.84
NA125B/504	North Auckland	Fee Simple, 1/1, Allotment 85 Parish of Hoteo	Freehold	83.08

Location and access

Hudson Forest is located off Hudson Lane, which in turn is located off Tauhoa Rd or Kaipara Flats Rd on the Kaipara Flats near Warkworth. Internal forest roads provide access to all parts of the forest.

The location of the forest is shown in Map 1, while it's relation to potential markets are listed in the table below.

Table 2. Distances from forest to log markets

Potential Market or Export Port	Minimum Distance from Forest (km)	Log market
Marsden Point	65	Export
Auckland	50	Domestic
Marasumi	95	Pulp

Topography

Much of the forest is on steeper country with typical slopes being in excess of 25^0. Some flats areas exist adjacent to tributaries of the Kaitoto Stream but comprise <10% of the total forested area.

The forest encompasses 3 tributaries of the Koutawhero Stream that ultimately flows into the Hoteo River.Cable log extraction methods will be utilised at harvesting.

The land rises to 192m above sea level at the Salt Hill trig.

Soils

The soils over most of the block are Puhoi Clay Loams formed from weathered sandstone claystone. These soils are imperfectly drained. Prior to the establishment of exotic forestry, the property was run as part of a hill country sheep farm.

The soil is classified as having moderate potential for erosion and this has been confirmed with soil slumping occurring in the late 90's.

The soils are conducive to high growth rates for *P. radiata* although their instability will result in some losses to either windthrow or soil movement.

Roads will largely be limited to ridge tops only to avoid creating the potential for erosion and subsequent sedimentation of the waterways. The ridges are flat topped and therefore ideal for cable logging.

Climate[1]

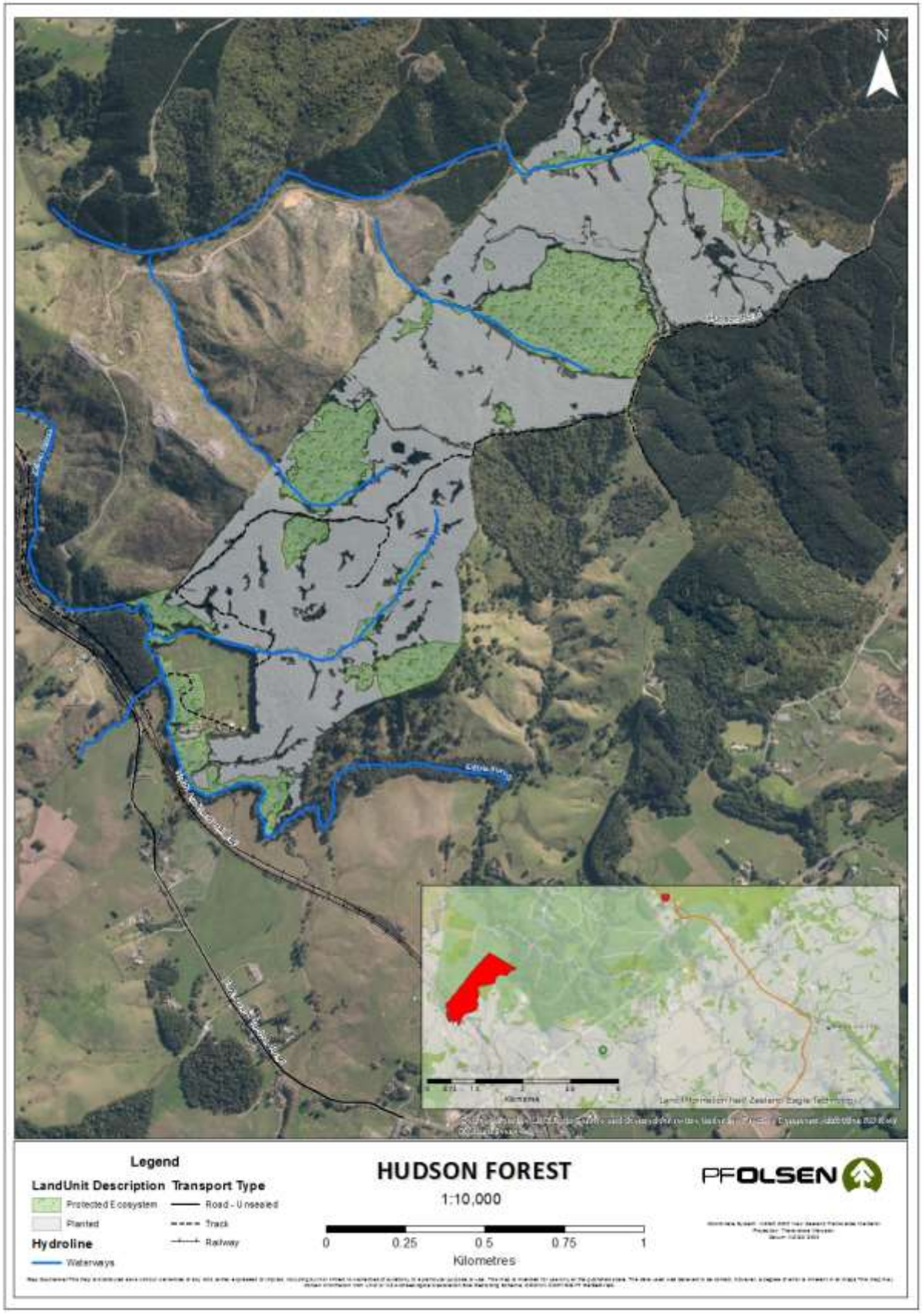
Hudson Forest is located within the Rodney District of the Auckland Region. According to NIWA, Auckland experiences a subtropical climate. Summers tend to be warm and humid, while winters are relatively mild, and many parts of the region only receive a few frosts each year. Rainfall is typically plentiful all year round, with sporadic very heavy falls. Dry spells may occur during the summer months, but they are usually not long-lived. Most parts of Auckland receive around 2000 hours of bright sunshine per year. Sometimes Auckland experiences extreme events that cause flooding and wind damage, but generally these events are not as severe as in other regions. The region's prevailing wind is from the south west, with destructive winds from the east and north east.

Rainfall: The average rainfall is between 1,000 and 1,500 mm per annum and is relatively evenly distributed during the year.

Temperature: The mean annual temperature is between 14 and 16 degrees Celsius.

[1] https://www.niwa.co.nz/static/web/Auckland_Climate_NIWA.pdf. NIWA, The Climate and Weather of Auckland, 2nd Edition. Viewed 16/01/2018.

Map 1 - Forest Location Map



3. The Broader Landscape

Ecological Districts

Hudson Forest falls within the Rodney Ecological District, an area of approximately 200,000 ha comprising mainly lowland, (300m above sea level) hill country with associated dunelands and peninsulas on the eastern coastline. Underlying geologies and soils are mudstones and sandstones overlain by clay textured soils and small areas of volcanic ashes.

In its pre–history status, the District was extensively forested with mixed associations of kauri, podocarps and dense hardwood associations with transitions to pohutukawa/hardwood and estuarine mangrove and sedge associations at the coastal margins.[2]

Today only approximately 10% of an original forest cover of 80% of the District remains in tall forest with a further 15% in regenerating shrublands.

As recently as 1984 land clearance has diminished existing depleted forest and scrub cover by 10% in less than a decade.

The following table shows vegetation types as required by the FSC National Standard for Plantation Forest Management in New Zealand (revised 2013).

Table 3. Dominant vegetation types in Hudson Forest

Ecological District or LENZ type:	A6.1		A7.2	
	Area (%)	Area (ha)	Area (%)	Area (ha)
Original (pre-Maori) percentage of ecosystem type in Ecological District within land title	100	766,293	100	346,272
Natural ecosystem area remaining	29.5	226,056	3.9	13,505
Proportion of remaining natural ecosystem under protection	16.3	34,847	14.3	1,931
Proportion of remaining protected by certificate holder	0.16	36.1	0.013	1.8
Area of Hudson Forest reserves vs. stocked area	**35.15**		**1.57**	

[2] http://www.doc.govt.nz/documents/science-and-technical/ecoregions1.pdf. Department of Conservation, Ecological Regions and Districts of New Zealand. Viewed 15/01/13

Historic and archaeological sites

Records of known archaeological and historical places are maintained in the NZ Archaeological Association (NZAA) Site Recording Scheme. The Archaeological Site Probability model published by the Department of Conservation[3] provides further guidance on the probability of pre-European archaeological evidence existing based on the geographical location of the forest and historical occupation of the local area.

A check of the NZAA Site Recording Scheme and the District Plan shows no sites recorded for the Hudson Forest property. The closest recorded site is a pit, 3km to the North West of the forest.

If a site is found or suspected on any block, the protocols specified in the PF Olsen EMS, and any others specifically developed in conjunction with HPT and Iwi or other stakeholders must be observed. Where such circumstances require, an 'Authority to Modify or Destroy' will be sought from Heritage New Zealand. Such authorities are similar in function to a resource consent and, if granted, normally come with conditions that must be met. The process to apply for authorities is documented in PF Olsen's EMS.

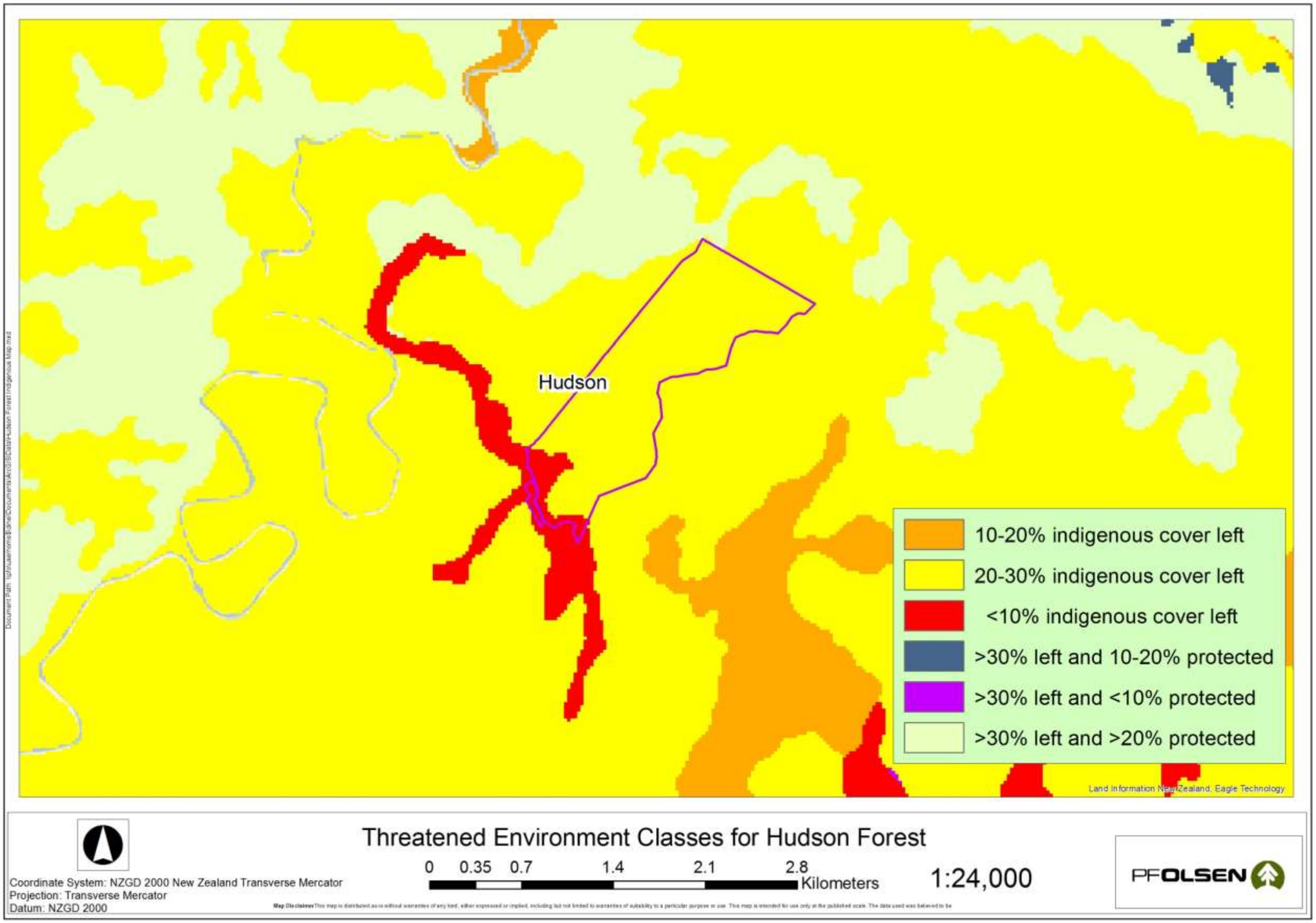
Note also that authorities to modify an archaeological site may sometimes be required from the local District Council and sites of cultural significance are often included in schedules of places and sites of significance in District Plans. Update checks for any sites will be required before any harvesting or related earthworks commences.

Threatened Environments Classification

Hudson Forest falls across several of the Threatened Environments categories (Map 2). While the majority of the forest's area has much of the original indigenous forest remaining (Category: 20 – 30 % of indigenous cover left), in the south-west corner of the forest there is an area which represents < 10% of indigenous cover remaining. These areas have been identified and classified, and afforded the appropriate protective status.

[3] Arnold, G.; Newsome, P.; Heke, H. 2004: Predicting archaeological sites in New Zealand. *DOC Science Internal Series 180*. Department of Conservation, Wellington. 24 p.

Map 2 - Forest Ecological Context



4. Socio-economic profile and adjacent land

Forest history

The land was farmed as a drystock farm for more than 100 years prior to the establishment of *P. radiata*. The poor farm returns and soil instability led to afforestation being considered a viable option.

As well as plantation establishment, the indigenous areas were protected including the stand PRIF-01 which is QEII covenanted.

Current social profile

Hudson Forest represents a small incremental addition to the large corporate forest estates and infrastructure located north of Auckland.

Such opportunities contribute in a small way to the overall total of ongoing forest related employment and processable log supply to the greater Auckland economic catchment.

The forest is managed as a private financial investment, with derived employment being intermittent and undertaken as and when needed from the regionally available contractor pool. Under these conditions the forest is individually, a very minor contributor to the overall social-economic structure of the region.

Table 4. Key statistics as summarised from Census[4] data

Census Category	Auckland	NZ
Ethnicity: European	59.3%	74%
Ethnicity: Māori	10.7%	14.9%
Formal qualifications	83.2%	79.1%
Unemployment	8.1%	7.1%
Dominant occupation	Professional	Professional
Median income	$29,600	$28,500
Family with children	46.5%	41.3%
Internet access	81.6%	76.8%
Home ownership	61.5%	64.8%
Employed in agriculture, fishing & forestry	-	5.7%

Associations with Tangata Whenua

The local iwi are Ngāti Whatua and Ngāti Wai. As freehold fee simple land there are no specific interests known in this land.

[4] http://www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-a-place.aspx?request_value=13853&tabname=Business#

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.

Table 4 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.

Table 5. Hudson Forest Neighbours

Owner/Occupier	Address	Phone	Location	Activities	Other Notes
	Hudson Lane Kaipara Flats Rd		Lives on the property		Nephew of forest owner
					Flats adjacent to Hudson Lane
					Lifestyle block adjacent to Hudson Lane
	P O Box 928 New Market Auckland				
	PO Box 269 Orewa Hibiscus Coast		East	Farming	
	RD 4 Warkworth		South West	Farming	On flat adjacent to Hudson Land
			North East	Forestry	

Regulatory Environment & Risk Management

5. The Regulatory Environment & Risk

Regulatory considerations

Forestry operations throughout New Zealand are undertaken within the context of a regulatory framework that aims to ensure wider economic, social and environmental goals are achieved for the populace as a whole.

Failure to meet regulatory requirements is a key business risk that must be managed. The following section summarise key regulatory requirements and risk management controls exercised over forestry operations in Hudson Forest.

Health and Safety at Work Act 2015

Leadership, a constant focus on health and safety, and the strong message that safety rates as the number one priority ahead of any other business driver are all highly important for PF Olsen management. The company also takes the following steps to ensure worker health and safety:

- Contractor selection process including emphasis on:
  - safety systems and track record;
  - worker skills and training; and
  - equipment type and standard.
- Work planning.
- Contractor induction.
- Monitoring, including random and reasonable cause drug testing, safe work practices and PPE.
- Incident investigation and reporting, including investing in software, training and processes development to enable good transparency on lag and lead indicators.
- Regular reporting to and interaction with the Client on matters related to safety.
- Regular (annual) review and update of the critical risks as identified in PF Olsen data sets and from Industry indicators. Such a review shall focus on incidents that have caused harm and/or loss, any known cause factors and mitigations and revised controls.

Resource Management Act (RMA) 1991

Hudson 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, Hudson Forest falls under the new super-city Auckland Council. The Auckland Council undertakes the combined regulatory functions of both a district and regional council, encompassing land management, biodiversity and soil conservation and water quality issues. The Councils contact details can be found in Appendix 1.

At the time of formulation of this Management Plan, it is highly likely that many individual Council rules will be superseded by a new instrument under the RMA, the 'National Environmental Standard for Plantation Forestry' (NES-PF). The NES-PF comes into effect on 1 May 2018, and is explicitly designed to assist streamlining, efficiency and consistency in the application of environmental law to the forest industry (see next section). Nevertheless, until such time as an NES-PF and any transitional arrangements become operative, the currently operative and proposed District, City and Regional planning documents prevail, and all operations are subject to these in the respective council jurisdictions.

National Environmental Standard for Plantation Forestry (NES-PF)

Coming into law on 1 May 2018, the NES-PF is a whole new rule hierarchy that applies the same rule set uniformly across most forestry operations in all parts of New Zealand. Operations will come under the legal force of this RMA instrument, though local Councils will retain the ability to regulate specific areas outside the NES-PF, e.g. Significant Natural Areas, Outstanding Landscapes, giving effect to the Coastal Policy Statement etc.

The underpinning the structure of the NES-PF is a rule hierarchy linked to the erosion susceptibility of the lands upon which forestry operations are to be conducted.

Work commissioned by the Ministry of Primary Industries led to the creation of a national spatial map, the 'Erosion Susceptibility Layer' (ESC) that classifies all of New Zealand into a series of four classes of erosion susceptibility from low (green) to very high (red).

The stringency of the rules hierarchy, i.e. whether consents are needed and the degree to which Councils can apply discretion to the conditions attached to a consent, is then tied closely to the recognised erosion susceptibility of the lands involved and the risks created by the operations.

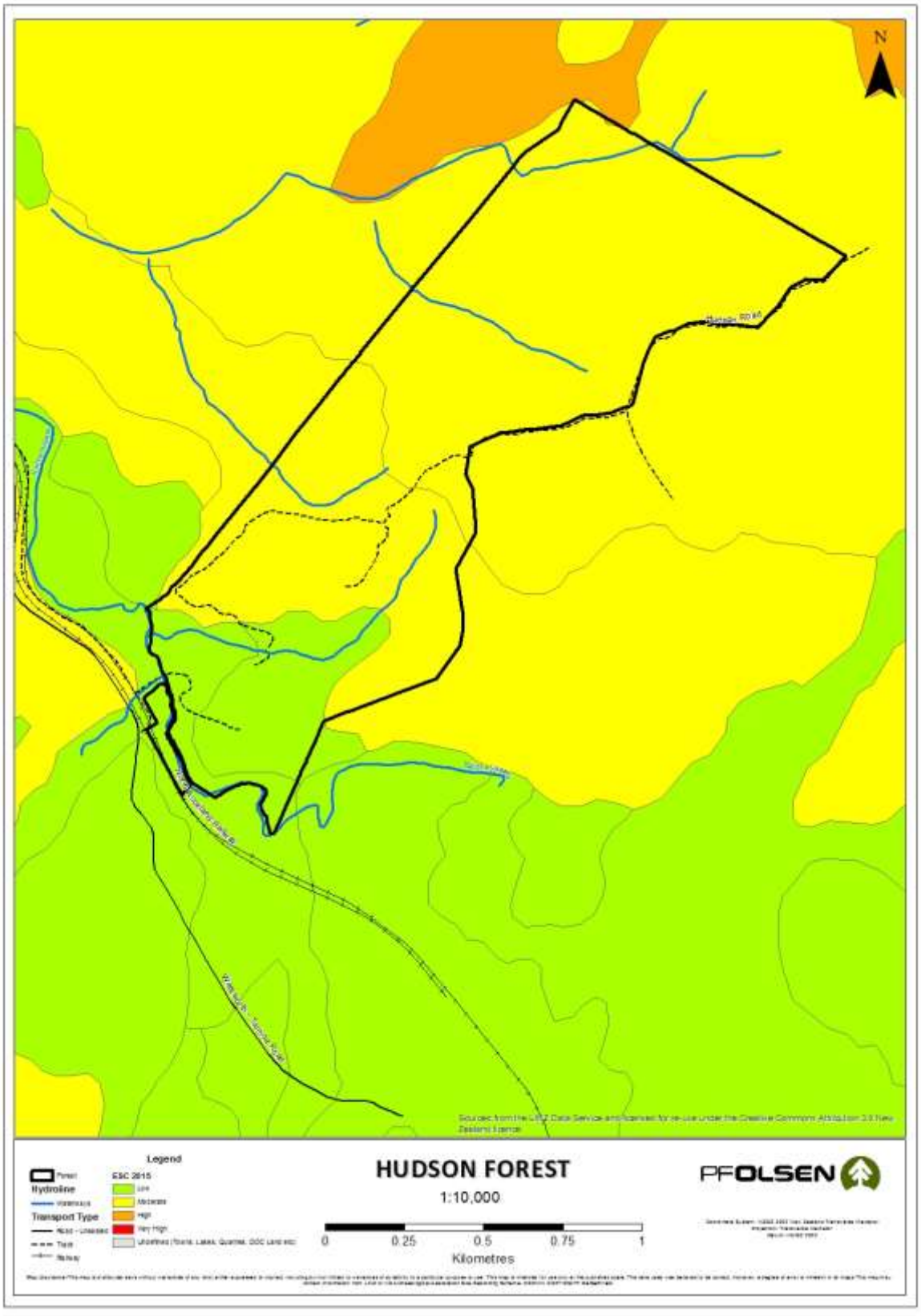
In the case of Hudson Forest, the table below indicates the proportion of the forest by the respective ESC classes.

Table 6. ESC Classes (Erosion Risk) for Hudson Forest

	Low	Moderate	High	Very High
Area (ha)	81.31	90.73	0.07	-
Area (%)	47.24	52.72	0.04	-

In broad terms, harvesting, roading (earthworks) and new afforestation operations will need consents in the red zone. Earthworks will need consents in orange, and in the green and yellow zones most operations will be permitted subject to conditions. The coverage of the erosion classes within the estate are illustrated in Map 4.

Map 4 - National Environmental Standard Erosion Susceptibility Classes in Hudson Forest



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.

If a site is found or suspected on any block, protocols specified in PF Olsen's EMS, and any others specifically developed in conjunction with Heritage NZ, archaeologists and Iwi or other stakeholders, will be observed and the necessary Archaeological Authorities obtained with Heritage NZ and if necessary the local Territorial Authority.

These responses may include, but are not limited to:

- Map and ground surveys to identify, mark and protect known heritage sites.
- Iwi consultation and surveys for unknown sites.
- Archaeological Authorities to modify sites if required.
- Accidental Discovery Protocols to stop work and engage experts if sites are discovered during operations.

Consents & authorities held

There are no current resource consents or Heritage NZ authorities that apply to Hudson Forest.

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.

Hudson Forest was not an existing forest as at 31st December 1989. The forest was planted on "Kyoto compliant" land that was vacant as at 31st December 1989. The forest areas have been registered to participate in the NZ Emissions Trading Scheme and will be subject to the accrual of emissions credits and liabilities under that scheme.

Other relevant legislation

There are numerous other statutes and regulations that impact on forest operations. Forest owners can be held liable for breaches of these Acts and may be held responsible for damage to third party property. Management processes seek to manage and minimise these risks.

Other relevant legislation is listed in Appendix 2.

6. Commercial Risk Management

Market access retention

It is a major focus of the Property Manager to ensure contracted products are delivered on time and in specification to ensure Hudson Technology Limited retains credible access to its markets.

Hudson Technology Limited maintains independent third party environmental certification for its estate under Forest Stewardship Council certification (FSC). PF Olsen Ltd is responsible for the excecution and maintenance of the required FSC certification elements of which this management plan forms an important component.

Log customer credit risk

There have been a number of NZ sawmills fail in recent years leaving log customers unpaid for the last month's deliveries. The PF Olsen manages customer credit risk exposure and mitigation measures for both export markets and domestic log customers.

Infrastructure damage or service disruption

Hudson Forest has no power or gas lines within the forest boundary. Risks around these are managed by:

- Identification on maps and on the ground any utilities at planning stage.
- Early engagement with utility owner to plan operations to minimise risks.
- Operational execution of agreed plans with parties specifically qualified for the tasks involved when working close to utilities.

Fire

Fire is always a risk to the forests. Hudson Forest has minor risk as it is in the centre of the North Island, where there is a variety of weather conditions annually.

Fire risk is managed through:

- Protocols to restrict work hours or to stop work in periods of extreme fire risk.
- Annual auditing and regular monitoring of contractors' fire prevention and first response equipment prior to fire season each year.
- Maintenance of trained personnel and fire suppression equipment.
- Protocols for pooling of resources as a first response to fires under the leadership of Fire & Emergency NZ.

Pests and diseases

Pests and diseases are managed according to any statutory obligations and best practices as identified by scientific research and past experience, with the type and intensity of treatment (if any) subject to what is at risk and the age of trees.

7. Environmental Risk Management

Environmental risk

Environmental risk is managed by PF Olsen as appointed property manager, through a cascade framework from high level 'intent' determined by the Forestry Rights owner, through PF Olsen's own environmental policies, thence through defined and documented processes constituting an Environmental Management System (EMS), supported by monitoring and reporting. PF Olsen's policies and Hudson Technology Limited's business objectives are considered to be well in alignment.

Environmental policy

PF Olsen Limited is committed to:

- ***Sustainable forest and land management;***
- ***Promoting high environmental performance standards that recognise the input of the community in which we operate;***
- ***Supporting an environment of continuous improvement in environmental performance;***
- ***Obtaining and retaining independent 3rd party forest certification in conformance with the Principles and Criteria of the Forest Stewardship Council and / or the Programme for Endorsement of Forest Certification as specified by forest owning clients, or in any case ISO:14001 Environmental Management Systems.***

In order to achieve these commitments **PF Olsen** (and PF Olsen Certification Scheme Members) will undertake the following:

- Where applicable to a particular forest, comply with the presiding **Certification Standards** as set out in any agreements between the forest owners and PF Olsen.
- **Planning** of operations to avoid, mitigate or remedy degradation of **ecological, heritage** and **amenity** values;
- Compliance with all relevant **legislation** and where appropriate exceed environmental statutory requirements;
- **Training** for all employees and contractors to ensure an understanding of certification member's commitments to high standards of environmental performance, their responsibilities under the environmental legislation and to assist the implementation of sound environmental practices;
- **Monitoring** environmental and socio-economic research and international agreements that may improve environmental and certification performance;
- Regular environmental performance **audits** of operations;
- Support for environmental **research**;
- Undertake forest management in accordance with the principles and ethics of the **NZ Forest Accord** the **Principles for Commercial Plantation Forest Management in NZ**, and other relevant agreements, conventions and accords.
- Promotion of the prevention of **waste** and **pollution** / efficient use of **energy**;
- Due regard for the well-being of the **community.**

Objectives, targets and monitoring

PF Olsen's objectives, targets and monitoring categorised across 5 key aspects of the business:

1. Economic
2. Legal
3. Social
4. Health & safety
5. Environment

A systematic management approach ensures these objectives and targets remain the cornerstone of PF Olsen's business, backstopped by monitoring processes that form a regular review of practices.

EMS framework

The Environmental Management System (EMS) is an integrated set of cloud based, defined and documented policies, processes and activities 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.

The framework is reviewed annually with the input of an Environmental Management Group (EMG).

Environmental Code of Practice

As a member of the New Zealand Forest Owners Association, all operations carried out on the property should be undertaken in conformance to the NZ Forest Owners Association 'New Zealand Environmental Code of Practice for Plantation Forestry'. This publicly available document sets out guidelines that underpin the requirements for sound and practical environmental management.

Forest Road Engineering Manual

As a member of the New Zealand Forest Owners Association, 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.

Assessment of environmental risks

Environmental risks arising from forest operations are assessed and managed on a site-by-site basis prior to execution. The relative probability and magnitude of adverse effect attributable to any particular operation on any particular site is highly variable.

At a high level, 'risks' are presented as consuming services summarised for a typical plantation life cycle in Appendix 8. Several areas of typical forest management have been identified as posing a possible environmental risk within Hudson Forest. The Environmental Assessment Matrix below summarises the identified risks for Hudson Forest. The level of risk has been evaluated in the matrix as high 'H', medium 'M' or 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.

Table 7. Environmental Assessment Risk Matrix

ENVIRONMENTAL VALUES / ISSUES / FORESTRY OPERATIONAL ACTIVITIES	Erosion & Sediment 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	H	H	NA	M	M	H	L	L	H	L	L
Earthworks	H	H	H	NA	H	L	L	L	L	L	L	L
Slash Management	M	H	L	NA	H	L	L	NA	L	L	L	L
Stream Crossings	H	H	L	NA	H	L	L	NA	NA	M	M	L
Mechanical Land Preparation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Burning	L	L	L	H	L	L	L	NA	H	H	L	H
Planting	NA	NA	NA	NA	NA	NA	L	L	L	L	L	NA
Tending	NA	NA	NA	NA	NA	NA	NA	NA	NA	L	L	NA
Fertiliser Application	NA	NA	L	NA	NA	NA	NA	NA	NA	NA	NA	NA
Agrichemical Use	NA	L	L	L	L	L	L	NA	L	L	L	L
Fuel & Oil Management	NA	H	L	NA	H	L	L	NA	NA	H	L	NA
Waste Management	NA	L	NA	NA	L	L	NA	NA	L	L	NA	NA
Forest Protection	NA	L	NA	NA	L	L	L	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 Hudson Forest are:

- Pesticides;
- Fuels and oils.
- Fire retardants
- Surfactants

Transportation, storage and labelling of these hazardous materials must all comply with the provisions of legislative controls under the Environmental Protection Agency (EPA) and the NZS 8409:2004 Management of Agrichemicals code of practice.

During actual usage, the highest risks are associated with chemical trespass or bulk fuel spillages. These risks are managed by:

- Neighbour consultation over planned spray operations.
- Careful planning and timing of any aerial operations having regard to wind and spray drift.
- Unsprayed buffer strips on neighbour boundaries and riparian or other protected reserves.
- GPS flight path control and records.
- Monitoring and recording of weather conditions during the operation, including using smoke bombs and photos/video.
- Moving contractors into the use of double skinned bulk fuel storage tanks as the preferred method of containment for all larger capacity tanks.
- Tracking of all active ingredient usage within the estate.

Risk management includes active involvement in and review of technologies and research into alternative methods for the control of weeds, pests and diseases where these are effective and efficient.

Fuel use is directly related to the machinery used in forestry operations and the market locations. Using modern efficient machine technology is still the primary area where efficiency gains can be made. There is a steady programme to transfer chain bar oils to vegetable based low toxicity oils.

Highly hazardous chemicals

There are seven agrichemicals that have been classified 'highly hazardous' (HH) by FSC that are used in forestry and conservation operations within PF Olsen group certified forests. Special derogations to continue usage of these chemicals, subject to conditions, are being applied for by PF Olsen as FSC Group Manager in conjunction with the wider NZ certified industry. The derogation process is run according to specific policies put in place by FSC, including extensive canvassing of stakeholder views. These chemical pesticides are listed in the table below.

All the classes of formulations used are registered and legally approved for in use New Zealand by the NZ Environmental Protection Agency, subject to various controls, and for the purposes to which they are applied as listed below.

Table 8. FSC Highly hazardous chemicals used or potentially used in Hudson Forest

Active ingredient	Purpose	Common usage
Copper based products	Fungicide	Needle cast control
Picloram	Herbicide	Establishment weed control
Carbaryl	Insecticide	Localised wasp control
Cholecalciferol	Vertebrate pesticide	Localised possum control
Pindone	Vertebrate pesticide	Rabbit and hare control
Use also subject to Animal Health Board emergency provisions		
Sodium cyanide	Vertebrate pesticide	Animal Health Board only, ground based possum control
Sodium Monofluoroacetate (1080)	Vertebrate pesticide	Animal Health Board only, extensive aerial possum control

The PEFC classification for 'highly hazardous' chemicals are based on the WHO classes. Chemicals that are classified class 1a and 1b are banned from use in certified forests, unless a ruling from PEFC international representation via the local PEFC administrative support organisation is given, approving the local use of a certain chemical. In NZ, this approval for use has been given to sodium monofluoroacetate (1080, class 1a).

The Managed Plantation Estate

8. Commercial Plantation Estate

Productive Capacity strategy

Forest management is carried out to ensure the productive capacity of the Hudson Forest is not compromised. This encompasses multiple aspects that include:

- Pests and weeds and forest health- can reduce productivity,
- Inventory- to feed into growth estimation, a core step in timing silviculture and formulating the cutting strategy,
- Silviculture- to enhance the value of the resource,
- Harvesting- achieving a successful harvest in terms of the forest owner's health and safety, environmental and commercial objectives.

Forest Area

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

Table 9. Hudson Forest Area (Ha)

Gross area	Net stocked area	Reserves
146.1	108.4	37.7

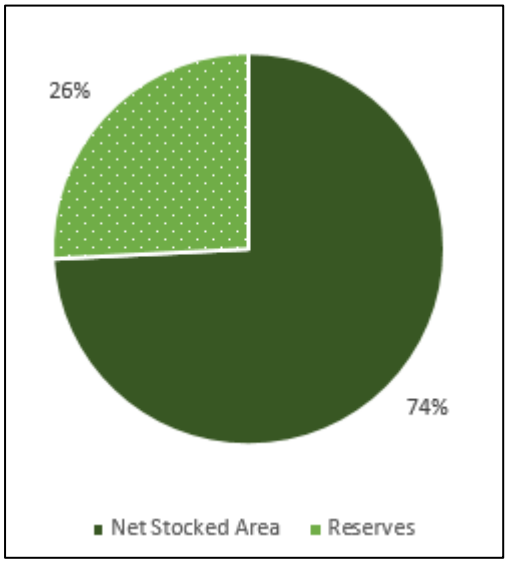


Figure 1. Hudson Forest Area (Ha)

Current species

The species grown at Hudson Forest is *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.

Table 10. Treestock seedlot and GF rating

Stand	Treestock
1.01	Containerised GF28 cuttings
2.01	Unknown
2.02	Bare root GF Plus cuttings

Age class distribution

The age-class distribution for Hudson Forest reveals relatively older crop with the youngest's being 20 years old. The current age-class distribution for the radiata pine in Hudson Forest is summarised in the figure below.

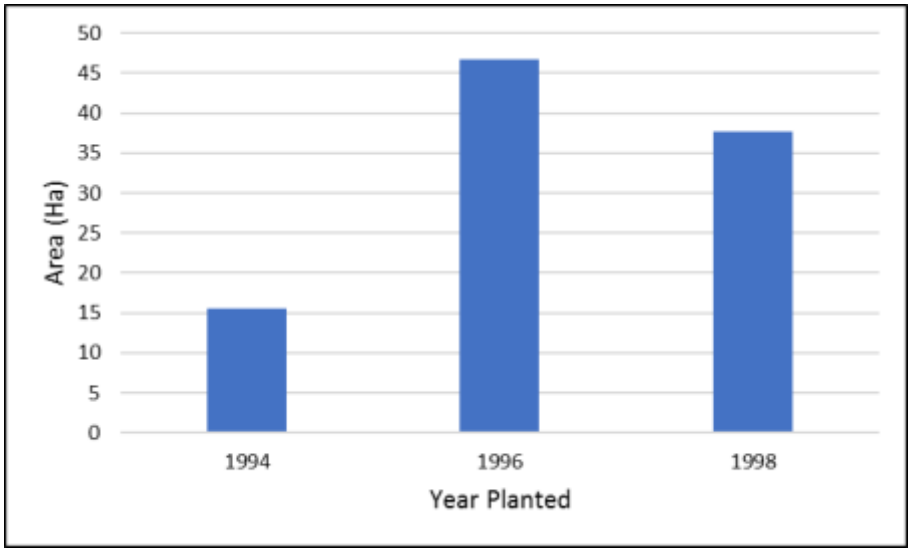


Figure 2. Area / Age class distribution within Hudson Forest

Productivity indices

A standardised estimator of the productivity of a plantation site in NZ for radiata pine is the 300 index[5].

The site index for Hudson Forest is 32 m.
The 300 index for Hudson Forest is 33 m.

Hudson Forest has site productivity comparable to other forests in the region.

Current crop status

Measurement data from the most recent inventory is stored in PF Olsen databases and summarised in reports to provide the current status of the stands. This is shown in the table below.

Table 11. Current crop status

Stand	Year planted	NSA (ha)	Total stocking (stems/ha)	Basal area (m^2/ha)	Mean top Ht (m)	Mean DBH (cm)	Pruned stocking (stems/ha)	Pruned height (m)
1/01	1996	50.8	354	13.4	13.6	22.6		
2/01	1994	16.8	344	7.3	13.3	21.6		
2/02	1998	40.9	354	12.4	12.7	21.1		

Infrastructure

Forest infrastructure includes roads, tracks, landings, bridges and culverts. Design specifications for these are outlined in the 'PF Olsen Standard Specifications for Road and Landing Construction'.

Typically, infrastructure within an early- to mid-rotation age 'greenfields' forest is limited to access for a 4WD vehicle. During harvest planning, upgrades of existing roads/culverts/bridges and planning for new roads, landings, crossings will be identified and scheduled. The type of infrastructure designed and constructed is influenced by topography, harvest duration and intensity of use.

Once established, these require maintenance. The PF Olsen Asset Hazard Register is a GIS-linked database of forest assets that includes bridges, culverts and crossings under resource consent. This provides the framework for a record of the asset attributes, and its associated maintenance schedule, some of which are required under consent conditions.

[5] A measure of productivity of a site based on stem volume growth (mean annual increment) of 300 stems per hectare.

9. Commercial Crop Establishment and Silviculture

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.

Forest management goals

The Hudson Forest owners are committed to ensure that Hudson Forest will be managed to:

- Grow trees and produce logs for the manufacturing of different wood products in New Zealand and overseas with a focus on 'fit for purpose' log production;
- 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;
- Ensure that the forest estate's contribution to carbon cycles is maintained or enhanced;
- Harvest the trees as close as possible to their economic optimum age and achieve the best possible financial returns to the owners;
- Replant following harvesting where agreements require;
- Meet all statutory requirements and comply with forest industry best practice;
- Provide recreational opportunities where practical;
- Act as a good corporate citizen and neighbour; and
- Ensure all forest management practices are consistent with the principles of the Forest Stewardship Council and NZS AS:4708:2014

These goals are further detailed in 'PF Olsen Key Aspects- Objectives, Targets and Monitoring'.

Crop species

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 finger jointing. 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

Alternative species have been considered, but these did not meet the Hudson Technology Limited objectives.

The development of the bio-fuels industry may in the future favour other species which will be assessed if markets develop.

Unwanted pine spread

The use of the Wilding Spread Risk Calculator is a requirement under the NES-PF when afforesting or changing species when reforesting. There is no intention to replant in other species with a calculated risk index higher than the existing radiata crop.

Pre-establishment considerations

There may be situations arising from pre-harvest assessments, ecological or archaeological surveys, post-harvest operational review or other activities, including consultation with stakeholders, where small areas are retired from production after harvest for practical, safety, environmental or heritage reasons.

These situations will normally only become apparent during the planning phases ahead of harvesting and other operations.

Tending

The tending regime executed at Hudson Forest is a pruned regime. The current forest has been pruned in three and production thinned in 2004. All operations are now complete and there is no further tending required.

Tree nutrition

The soils in Hudson 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.
- **Magnesium** – Magnesium deficiency is a particular problem of the Central North Island and is associated with the phenomenon known as mid crown yellowing where the middle of the tree crown turns a yellow colour. Heavily pruned trees and some seedlots are more predisposed to the deficiency than others.

Foliar samples are 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 or where economic analysis demonstrates a benefit.

Site productivity and tree nutrition are actively researched components of industry research programmes in which PF Olsen is an active stakeholder and all harvesting entities are a financial contributor through the Forest Research Levy Fund.

10. Harvesting Strategy and Operations

Harvesting strategy

The harvesting strategy employed at Hudson Forest will be to harvest the forest as close as possible to their 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.

Of importance in this assessment is the actual growth of the tree crop, the market for the wood at the time of the harvest and the outlook then for the near future. These factors, together with logistics such as the availability of suitable harvest contractors and the requirements of resource consents, will determine the actual harvest time.

Variation in growth and development of the tree crop may allow a longer period of harvesting to develop for this and subsequent crop rotations and longer economic rotations may also be implied if stands are entered into the Emissions Trading Scheme should it eventuate, thereby spreading any impact harvesting of this forest may have over a longer period. The markets for wood are cyclical and spreading the harvest over a longer period can reduce the risk associated with fluctuations in market prices provided also that account is taken of any site risks associated with increased windthrow in older stands.

At this stage harvesting is only planned to occur for stands 1/01 2/01 within the current period of this management plan. Forward planning should commence at least 2 years before harvesting to enable roading infrastructure to be developed and any resource consents, archaeological surveys, etc. to be undertaken.

Establishment Methods

Re-establishment where provided under the terms and conditions of the various agreements will aim to use high quality tree stocks suitable for the site and market. These will be investigated at the time of establishment.

Replanting, which is important for maintaining soil stabilisation functions of the forests, will follow harvesting as it occurs with only minor deviation for seasonal or operational logistics reasons and boundary rationalisation.

Infrastructure

The roading and other infrastructure work proposed for the areas to be harvested in the first year are detailed in the Annual Cutting Plan.

Forest infrastructure includes roads, tracks, landings, bridges and culverts. Design specifications for these are outlined in the 'PF Olsen Standard Specifications for Road and Landing Construction'.

Typically, infrastructure within an early- to mid-rotation age 'greenfields' forest is limited to access for a 4WD vehicle. During harvest planning, upgrades of existing roads/culverts/bridges and planning for new roads, landings and crossings will be identified and scheduled. The type of infrastructure designed and constructed is influenced by topography, harvest duration and intensity of use.

Once established, these require maintenance. The PF Olsen Asset Hazard Register is a GIS-linked database of forest assets that includes bridges, culverts and crossings under resource consent. This provides the framework for a record of the asset attributes, and its associated maintenance schedule, some of which are required under consent conditions.

Contractor management

Prior to engaging a new contractor, a comprehensive review of the contractor's safety systems, safety record, systems of work organisation and equipment is carried out. With regard to crew configuration, where topography and terrain allows, mechanised felling, extraction and processing is a mandatory requirement. PF Olsen as the Property Manager must be satisfied on this review, regardless of the tendered price.

Upon appointment all new contractor crews undergo a comprehensive safety and environmental induction, while PF Olsen Ltd, in conjunction with its contractors and NZQA training providers NorthTech, runs a comprehensive programme of training to ensure the workforce is competent for the work they are required to perform. The formal NZQA qualifications are supplemented periodically by internally run training courses including those on environmental matters.

All contractors are subject to quarterly contractor monitoring audits and random drug testing. A full safety systems audit is scheduled and carried out annually. Full crew re-inductions take place every 5 years. Weekly crew visits and monthly (or fortnightly according to risk) KPI assessments including environmental audits pick up corrective actions and follow-up on those.

WorkSafe undertakes audits on an unannounced basis from time to time.

11. 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:

- 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 inventory is scheduled for stands around age 24, to collect measurement data on the crop. This is used for harvest planning, marketing and revenue estimation.

New technologies may see some of this information gathered and analysed using remote sensing in the future.

Mapping

All mapping of Hudson Forest is in digital format and is constantly updated in a Geographic Information System (GIS) that is linked to FIPS. The GIS system spatially records a vast array of forest data, from stand and legal boundaries, to reserves, rivers, roads, infrastructure, topography and soils.

Accurate mapping also assists budgeting, planning, calculation of future revenue/tree crop value, calculation of payments, infrastructure location, and harvest planning.

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

Forest records

Detailed records of each stand's silvicultural management history, productivity, inventory and other attribute data are compiled and maintained in a stand records database and Geographic Information System (GIS). These records form the basis for informing silvicultural scheduling, harvesting schedules and other management activity.

Forest records assist with planning and control of forest operations and provide a means of measuring the performance of a Forest Manager. In a management audit forest records can be verified against the status of the tree crop and unit costs derived for each operation

Quality control

Quality control is carried out during and after a tending operation. The aims of the quality control system PF Olsen have established are to:

- Collect sufficient data to monitor a contractor's performance and correct this if necessary, with minimum delay;
- Collect sufficient quantitative data to provide reliable estimates of the crop state;
- Provide data as input for growth modelling; and
- Provide data for estimating timing of the next tending operation.

PF Olsen's 'Tending Manual' details the procedures to follow for pre-assessment and quality control plotting. Quality control was completed at Hudson Forest at the completion of each tending operation.

Mid-crop inventory

The principal aim for the mid-crop inventory is to collect stand data for inputs for growth modelling. Under current tending regimes mid-crop inventory is scheduled between 11 and 15 years of age.

Sampling intensity is targeted to achieved 10% confidence limits on basal area on a stand-by-stand basis. Smaller stands may be aggregated into crop types to achieve this.

Pre-harvest inventory

The principal aim for the pre-harvest inventory is to obtain estimates of recoverable volume by log grade. This information can then be used to develop marketing and harvesting strategies. Pre-harvest inventories will be undertaken when stands reach five years or less from harvesting.

Sampling intensity is targeted to achieve 10% confidence limits on basal area on a stand-by-stand basis. Smaller stands may be aggregated into crop types to achieve this as in mid-crop inventory.

Non-commercial Estate Management & Protection

12. Protected Forests, Habitats, Ecosystems and Species

Introduction

Indigenous biodiversity management in or associated with exotic forests is a normal component of everyday forest management. Environmental certification systems place obligations upon the forest manager to be aware of and, where required, enact procedures to assist with the maintenance and protection of important biodiversity where they are able.

Exotic forests can and do provide a level of biodiversity, though this is often enhanced by natural forest ecosystem remnants embedded within the plantation matrix. These are often the most important contributor to the total of the productive landscape's biodiversity. However, rare and threatened species can also be found associated with exotic forests and may require special attention for management.

Protected ecosystems

The protected ecosystems are recorded and ranked on the basis of ecological criteria reflecting the stands representativeness, rarity of species, size and connectivity, function and landscape values. Relative value in terms of the 'ecological landscape' (Section 4) also informs that process.

The seven identified remnant indigenous vegetation area within Hudson Forests are all worthy of basic levels of protection. Two in particular (PRIF-01 and SECF-02) are identified as good representative examples of what existed in the area in pre-human times. PRIF-01 has been covenanted as a QEII area.

The primary management objective for this QEII area is to manage in accordance with the covenant deed, the conditions of which are contained in Appendix 6. Basic photopoint monitoring will be installed by the end of 2013. SECF-02 is also fenced to provide for full exclusion of stock.

The primary goal for management of all the areas over and above the fencing and covenant requirements is to keep pest numbers as low as practical with possum trapping/hunting, and to encourage pig shooting where sign is present.

Actions are prioritised according to the 'Protection Category' status allocated to the areas from the assessments and classifications undertaken. The management implications pertinent to each status are summarised in the table below. Prioritisation of work effort will also be based on the principle of ensuring successful and maintainable outcomes at limited scales as a priority over wide scale but marginally beneficial outcomes.

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Table 12. Protected Ecosystems Management Categories

Protection Category	Primary Management Objective	Activity Level	Monitoring
Passive	Minimise non-essential damage, maintain area.	Fire protection.	Area- with adjacent stand assessments.
	Observe RPMS obligations.	3rd party arrangements re: pests, apply RPMS.	Pests- to meet RPMS.
			General forest health survey.
Limited	Protect from non-essential damage, maintain area, maintain function (where practical).	Fire protection.	Sample forest condition monitoring.
	Observe RPMS obligations.	3rd party arrangements re: pests, apply RPMS. Associated maintenance pest control.	Low level pest monitoring where relevant. Sample related fauna if relevant.
Full	Protect from all controllable damage, maintain area and function.	Fire protection.	Area monitoring.
	Improve quality.	Specific management.	Forest condition monitoring.
	Observe RPMS obligations.	Targeted pest control, 3rd party arrangements re: pests.	Pest monitoring where relevant, related fauna monitoring if relevant.
Special	Restoration if practical.	As above, plus fencing, covenanting, co-management agreements and funding where practical.	As above, plus as defined in any restoration agreement.

The table below details the areas in each protection category within Hudson Forest, categorised by protective function.

Table 13. Protected ecosystems management categories by function and area

Protective Function	Protective Category				Total Area
	Special	Full	Limited	Passive	
Erosion Control					
Landscape / Amenity					
Non-specific					
Rare Species					
Riparian Ecosystem			4.6	6.6	11.2
Terrestrial Ecosystem		1.8	24.7		26.5
Wetland Ecosystem					
Total Area (ha)	**0**	**1.8**	**29.3**	**6.6**	**37.7**

Management and riparian setbacks

A standardised GIS-based stream classification system based on NIWA's River Environment Classification (REC) has been used to develop a rationale for defining riparian management with a set of rules in the EMS that apply to operations occurring near the riparian corresponding with each stream category. 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.

It also provides the minimum set-backs upon establishment or reestablishment of forest after harvest where riparian setbacks had not existed before. The morphology of streams can mean that the minimum set back is wider in many instances.

The stream categories within the Hudson Forest are summarised below. The total length of waterways within the forest is 2.2 kilometres.

Table 14. Length of stream by REC class

REC Class	Length (m)	Length (km)
Small_Mod_Wet_Hard	341.7	0.341
Small_Low_Wet_Hard	22.9	0.022
Large_Low_Wet_Soft	325.7	0.325
Small_Low_Wet_Hard	759.2	0.759
Large_Low_Wet_Soft	77.8	0.077
Large_Low_Wet_Hard	14.8	0.014
Large_Low_Wet_Soft	109.3	0.109
Small_Mod_Wet_Hard	531.2	0.531
Med_Low_Wet_Hard	14.5	0.014
Small_Low_Wet_Hard	9.3	0.009
Total	**2206.4**	**2.2**

Rare and threatened species

Where a range distribution suggests the possibility of rare fauna existing, surveys are undertaken for those species. Any appropriate management responses are devised in conjunction with conservation authorities. Protection requirements are also reassessed at the time of re-establishment or land handback where additions to riparian or buffering setbacks are often recommended.

The Ecological Districts report indicates that within Rodney District parakeet, kaka, striped skinks, kauri snail and Hochstetter's frog are present.[6] As listed below, kereru is clearly using the habitat provided by the remnant forest areas at least in a transitory seasonal fashion.

The NIWA Freshwater Fisheries Database reveals eel, Galaxiid, inanga and bully present downstream of the forest in the Kaitoto Stream.[7]

Records of sightings and locations are collected and reported in FIPS. Over time this has enabled the build-up of a spatial distribution picture of species within different geographical locations. Recorded sightings within the plantations and indigenous reserves are summarised in the table below. These records are made available to conservation authorities.

A listing of key species of interest is held by all contractors and staff along with species sighting forms and a request to report such information.

Table 15. Rare and threatened species reported in Hudson Forest

NZ Threat Classification System Category	Species
Declining	Hochstetter's Frog
	Long finned eel
	Koura
Naturalised	Chaffinch
Not Threatened	Kereru
	Grey Warbler
	Kingfisher
	Fantail
	Paradise Shelduck
Total	

[6] http://www.doc.govt.nz/documents/science-and-technical/ecoregions1.pdf. Department of Conservation, Ecological Regions and Districts of New Zealand. Viewed 10/1/13.

Fish

PF Olsen uses the Freshwater Environments of New Zealand (FWENZ) models to inform the potential for threatened fish species that may be present in streams affected by operations and if necessary any response to such a presence. The Fish Spawning Indicator published by NIWA to accompany the NES-PF is also used, particularly for works over/in stream beds.

Primary management actions in relation to fish, in addition to those already covered under water quality are:

- Development and maintenance of a register of crossings and an inspection routine to ensure fish passage,
- Sound design and construction of all new stream crossings,
- Timing of in bed crossing construction to avoid peak spawning period,
- Minimising damage to streamside environments and provision of setbacks where they were not originally present,
- Identification of, and avoidance and/or buffering of waterbodies during aerial spraying for replanting and *Dothistroma* control or aerial fertilisation if ever required,
- Protection of any wetlands identified within the plantation matrix.

Avifauna

While the local lists of threatened bird species are much more extensive, most of those species habitats are shore, sea, estuarine and river bed focussed. Of the forest birds, many of the more common species listed can be expected to be regularly within or transient through the plantation forests.

Primary management actions in relation to avifauna are:

- Adherence to industry protocols developed for management of NZ falcon kiwi, bats and shortly, lizards.
- Inclusion of threatened species sightings into the PF Olsen sightings database, and subsequently into the NZ Forest Owners NatureWatch – Biodiversity in Plantations Project[8],
- Minimising damage to natural forest areas and any small wetlands and scrublands during harvest and reforestation, particularly any gully systems that already form natural corridors through the larger plantation areas,
- Promotion of the development of improved riparian corridors after harvest,
- Co-operation with neighbouring landowners undertaking vertebrate pest control within the wider area.

[8] http://naturewatch.org.nz/projects/biodiversity-in-plantations

Herpetofauna

Most NZ lizard species are now threatened, principally due to predation but also habitat loss. The northern forests in the North Island have been known to be home to certain frog species, and as shown in the rare species section earlier, there have been sightings of the hochstetter's frog.

Special care will need to be taken around these areas as such to not disturb the species within their habitats.

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/.

Anticipated activities

In line with the prioritisation approach described previously, key areas of work related to protected ecosystems within Hudson Forest over the next 5 years are expected to be:

- Maintenance of threatened species records database and integration into industry Naturewatch 'Biodiversity in Plantations' project.
- Maintaining a series of photopoints in reserve areas.
- The use of Bat Boxes to monitor the presence of Bats within the Forest boundary.

13. Property Management and Protection

Statutory pest obligations

Pest management within Hudson Forest is subject to statutory obligations under the Regional Pest Management Strategy administered by the Auckland Regional Council

The strategy applies to both pest plants and animals and categorises them, in terms of management objectives. The categories, objectives and land owner obligations are summarised the Regional Pest Management Strategy Plan in Appendix 3. These plans are maintained online by the relevant Regional Council.

Plant pests

The overall objective in managing plant and animal pests is to:

- Meet statutory obligations under the Regional Pest Management Strategy,
- Reduce their direct impacts on both plantations and indigenous biodiversity values,
- Ensure that any impacts on neighbouring properties are promptly dealt with,
- Monitor the abundance and distribution of these species within Hudson Forest.

The major plant species potentially threatening production values within the plantation forests are various grasses, gorse, broom, buddleia, pampas, blackberry and wilding conifers.

Competition from colonising weeds will limit tree growth in their first few years after establishment. Control of these plant pests involves chemical control.

Grasses, gorse, broom, buddleia, pampas, blackberry and wilding conifers all threaten indigenous biodiversity in open communities where they can smother native species, however gorse can also act as a nurse crop in some areas for native regeneration. Blackberry can displace native species by outcompeting and smothering them.

Insects and fungal disorders

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.

Pest control

Plant pests

When controlling plant pests, chemicals are applied in keeping with all legislative and safety requirements and with industry best practice. Herbicides are used to desiccate most harvested areas prior to re-establishment or land handback to reduce weed competition. Re-established trees are also released with another chemical application where necessary during the first one to two years after establishment.

A bio-control weevil (*Cleopus japonicus*) that was being trialled in the previous plan period for efficacy against *Buddleia* has now widely established and is having some impact in some areas. Its full efficacy will not be known for some years.

Animal pests

Animal pests are controlled using shooting, trapping or toxins, especially prior to establishment and in the first few years of a tree's life. Only licensed operators are used for toxin control and all legal requirements are enforced. Permits are issued to private/recreational hunters on occasion and these permits require that kill returns be completed after hunting to provide information on animal densities, location and health.

The forest manager will co-ordinate operations with organisations such as the Regional Council and Department of Conservation to achieve effective and efficient control within the forested area and on neighbouring land where required.

Fungal pests

Dothistroma pini is the most commonly occurring fungal disorder within the radiata pine plantation. This fungus is controlled using an aerially applied copper-based fungicide spray, but only when the infection reaches a critical level.

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

No control is currently completed on the other fungal disorders.

Chemical control

All chemical applications are managed in accordance with PF Olsen EMS, the NZ Standard for agrichemical application, HSNO regulations and the obligations conferred by FSC and PEFC to manage and minimise the use of chemicals including use of alternatives where available and to manage stakeholder expectations.

As part of the FSC and PEFC commitments:

- All chemical usage is tracked by active ingredient and application area to enable reporting and monitoring of trends and is reported on an annual basis.
- PF Olsen is an active participant in research into chemical reduction, efficacy and safety issues related to the 'restricted use' derogations applied by FSC to various activities pursuing biological control agents.
- No chemicals classified by FSC as 'Highly Hazardous' are used other than under the terms of any derogations applied by FSC.
- Under PEFC no WHO class 1a or 1b chemical cannot be used unless legally approved for use in the country and with the additional clearance for use by PEFC following submissions of evidence from NZ Forest Certification Inc.

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 and rural fire control organisation;
2. A close link with the relevant fire authorities, and an understanding of equipment and trained manpower requirements;
3. Active prevention measures which include restrictions on allowable access, fire prevention signage, publicity when fire danger prevails, access to adequate water sources, and if required constructing and maintaining firebreaks;
4. Effective fire reporting communications systems, mapping, and fire plan alert procedures;
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 recently created new organisation 'Fire Emergency New Zealand' (FENZ) that came into existence on the first of July 2017 ready for the 2017/18 fire season.

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

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

Public liability insurance

It is recommended that Hudson Technology Limited maintain public liability insurance cover. In the case of fire spreading from Hudson Forest onto adjoining land, Hudson Technology Limited could be liable for the fire fighting costs and any damage to property.

There is public liability insurance held by Hudson Technology Limited for Hudson Forest.

However, PF Olsen as management agency does carry comprehensive insurance against such issues and all contractors working in the forests must also maintain a level of cover approved by PF Olsen and provide regular verification of currency of policies.

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 Hudson Forest is held by Hudson Technology Limited. The current extent of cover is:

- Fire fighting cover (the costs of fire suppression).
- Cover for the crop value and re-establishment costs are retained.

Hudson Technology Limited should liaise closely with the forest manager at the time of fire insurance renewals and if necessary instruct the forest manager to keep premiums paid up.

Other Benefits from the Forest

14. Recreation, Forest Products and Other Special Values

Introduction

Forest plantations can provide non-timber forest products, recreational opportunities and special values that enhance the economic well-being 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.

Environmental and social cost-benefit analysis

Forests can deliver numerous social and environmental products and services, both positive and negative to varying degrees. These non-timber products 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 relative to the most likely alternative primary production system, pastoral dry stock farming.

Table 16. Environmental and social cost-benefit analysis of key non-timber products & services

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

NOTE: 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.

Recreational usage

All access is controlled through a permit system; though this control is sometimes delegated to some (usually hunting) clubs with Iwi affiliations and customary right usage of their lands or otherwise strong controls over membership.

Primary requirements in management of such forest usage are:

- Access subject to non-conflict with current operations and any other safety requirements,
- Acceptable fire danger status,
- Access provided to defined areas other than those freely open to the public,
- Appropriate liability and fire insurance to be carried by permittees,
- Forest usage rules to be adhered to.

The following recreational values have also been identified in Hudson Forest:

- The forest is used by beekeepers for pollen and honey production;
- Permitted persons are allowed access to hunt possums for fur;
- Grazing is undertaken by Mr Hudson in areas fenced off from the reserves;
- Pig hunting access is the responsibility of Mr Hudson with records to be forwarded to PF Olsen for FSC Group Scheme recording purposes. Last year, 12 pigs were caught.

Forest usage numbers and trends are monitored and published on PF Olsen website. The forest will continue to be open for legitimate use subject to the permit system.

Grazing

Grazing of stock within some of the forest areas can be useful for partial weed control and reduction in fuel build up as well as assisting local farmers and earning a minor additional forest income.

Conversely uncontrolled grazing can lead to contamination of waterways, crushing and browsing of indigenous forest remnants, introduction of weeds and damage to streamside habitat. As mentioned, the grazing of Hudson forest is undertaken by Mr Hudson in areas fenced off from the reserves.

Non-timber forest products

Currently there are no non-timber products being developed from Hudson Forest.

Other special values

In the regional landscape context, the Hudson Forest plantation and indigenous ecosystems in combination provide well-defined 'environmental services'. These include:

- Enhanced water quality, and buffering of regionally significant water bodies from agricultural and urban generated nitrification;
- Soil stabilisation and conservation;
- Providing a buffer against flooding during storms;
- Temperature moderation in waterways for maintenance of aquatic life including threatened native species and world-renowned sports fisheries;
- Enhance wildlife and plant habitat leading to increased biodiversity;
- Expanded habitat opportunities for some declining and or threatened fauna;
- Carbon sequestration and buffering of the effects from a nationally adverse carbon generation footprint.

In recent times some of these environmental services have acquired quantifiable and significant financial value (nitrogen and carbon in particular).

Over the term of this plan, the regulatory environment will continue to be actively monitored and where possible efforts made to secure the introduction of properly structured market mechanisms to ensure forestry is not dis-incentivised, relative to other land uses.

Other environmental services will continue to be supplied or enhanced based on good corporate citizenship and responsible environmental management.

Public access roads

There is one primary road adjacent to the South-East side of the forest. This route remains open to public, subject to any temporary closures, organised through the local Territorial Authority, required for safety such as during times of high fire risk or forestry operations. All signage must be followed and those using the route will still require a permit if there is any intention to access the forest from the road routes.

These public road locations are publicly viewable in the Walking Access Commission website[9]. Any users are expected to abide by the Outdoor access code[10] published by the Walking Access Commission.

[9] https://www.wams.org.nz/wams_desktop/index.html
[10] http://www.walkingaccess.govt.nz/walkways-and-access/outdoor-access-code

Looking Ahead

15. 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 as and when required and are also, where appropriate, made publicly available through the PF Olsen webpage.

Values monitored

Management inspections are undertaken regularly. The direct forest monitoring framework implemented and applicable to Hudson Forest is tabulated below.

Table 17. Hudson Forest monitoring framework

Monitored Element	Components	Data Source	Data medium	Reporting / Website Frequency
Chemical Usage	- A.I Usage - Area Overuse	- Operational Supervisors	- FIPS - Form	- On Demand - Annual
Client Satisfaction	- Post-operation client survey	- Clients	- Survey Form	- Post-operational - Annual
Consultation Activity	- Complaints - Other Interactions	- Operational Supervisors - Planners	- FIPS - Form - Meeting Minutes	- Annual - Annual
Environmental Incidents	- Incident Number - Categories	- Operational Supervisors	- FIPS - Form	- On Demand - Annual
Environmental Goals	- All	- Environmental Management Group	- Meeting Minutes	- Annual
Environmental Training	- Courses - Numbers - Names	- Staff	- FIPS - NZQA	- Annual - Individual
Flora & Fauna	- Species & Status Frequencies - New Finds	- Operational Supervisors - Public - Crews	- FIPS - Form - Naturewatch	- On Demand - 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	- Volume Reconciliations - Estate model	- Periodic-annual - Not on web

Continued on next page...

…continued

Monitored Element	Components	Data Source	Data medium	Reporting / Website Frequency
Forest Health	- Disease & health	- NFH Surveillance Program[11]	- Document	- Periodic-Annual - Not on web
FSC Membership	- Block - Location - Name	- Certifying Body	- Certificate	- On Demand - Annual
Health & Safety Statistics	- LTI / MTI / TIFR - Accidents & Incidents - Initiatives	- Operational Supervisors	- Noggin	- Monthly - Annual
High Conservation Value Forests	- Condition Trends - Photopoint Monitoring	- Contractors - Supervisors	- Spreadsheet	- Annual
Internal Audit CAR Activity	- Frequency * Category	- Auditors(ees) - Operational Supervisors	- Noggin	- Annual
Log Production	- Total Logs - FSC Certification	- Log dockets at harvest	- Woodtrack	- On Demand - Annual
Operational Monitoring	- Audit Trends - Cause Analysis	- Operational Supervisors	- FIPS - Form	- Monthly - Annual
Pests	- RTC / RTI - Kill Returns - Other	- Contractors - Supervisors - Permitees	- FIPS - Various	- Annual - Where Relevant
Protected Ecosystem Condition	- Condition Trends - Photopoint Monitoring	- Contractors - Supervisors	- Spreadsheet	- Bi-annual if restoration initiated
Recreational & Non-Timber	- Permits Issued	- Branch Offices - Forest Security	- FIPS	- Annual
Resource Consents	- Number - Compliance	- Operational Planners	- FIPS	- Monthly - Annual
Social Survey	- Demographics, - Values - Work Conditions	- Contractors	- Survey form	- 3 yearly
Stream Monitoring	- Clarity +/- other specific - Full NOF	- Supervisors - Contractors - BOPRC	- Various	- Operational - BOPRC S.o.E.

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

Other monitoring

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

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..

16. Industry Participation and Research

NZFOA and FGLT

Hudson Technology Limited's primary means of participating as part of the forest owner community, and to gain industry intelligence and access to research findings is via:

- Membership of New Zealand Forest Owners' Association Inc. (NZFOA) http://www.nzfoa.org.nz/ and representation through its Property Manager on the Executive Board and working committees of NZFOA.
- Payment of a commodity levy to the Forest Growers' Levy Trust (FGLT). http://fglt.org.nz/ .The FGLT uses these funds to finance pan-industry good programmes and contracts NZFOA to carry out this work.

Research

A certain amount of the funds raised by FGLT are allocated to forestry research projects. These funds are supplemented by NZ Government research for industry funds that are bid for on a contestable basis every few years.

Application of the research is via knowledge gained in workshops, uptake by contractors, commercial providers and better genetics. PF Olsen's direct involvement with other research bodies such as FFR contributes to and benefits Hudson Technology Limited through early application of good ideas and research findings.

FISC

The Forest Industry Safety Council (FISC) was set up in early 2016 following an independent review of safety in the forest industry. FISC is a forum for exchange of safety improvement initiatives, and to develop resources for forest managers and contractors. These resources are primarily delivered via the Safetree website http://safetree.nz/. FISC is financed jointly from FGLT and government, primarily Accident Compensation Corporation (ACC).

PF Olsen's continued support of FISC in the form of senior staff involvement in the OAG and TAG committees ensure Hudson Technology Limited's interests are considered and that outcomes are understood and applied in practice.

Additional representation

Other bodies that either or both the TIMO and Property Manager are active in, that bring benefit to Hudson Technology Limited include:

- Wood Council of New Zealand (Woodco)
- Business Leaders' Health and Safety Forum
- NZ Forest Nursery Growers' Association
- Forest Health and Biosecurity Committee
- Log Transport Safety Council
- Port of Wellington Users Group
- NZ Institute of Forestry Inc.
- NZ International Business Forum
- NZ China Council
- Various organisations dealing with fresh water quality regulations
- Auckland Rural District Fire Authorities
- National Environmental Standard for Plantation Forestry (setting new legislation).

17. Future Planning

Introduction

This plan pertains to the management of Hudson Forest and will provide guidance for the next 5 years. Minor revisions will be made on at least an annual basis. Changes made will be documented in the following section. The next major review date for this plan is March 2023.

Deviations from this plan will be justified on the basis that the changes do not adversely affect the environment and are necessary or beneficial to achieving the management goals and objectives.

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

Operation plans

Short term tactical planning is accomplished through development of annual operations plans in conjunction with detailed budgeting. These plans are prepared in accordance with this Management Plan. Harvesting operations are also planned on a block by block basis because of the level of detail required.

This operation plan and associated budget are subject to approval by Hudson Technology Limited at the beginning of each financial year.

Stakeholder consultation

Consultation with key stakeholders has been enabled as part of the development of this plan which will be publicly available on the PF Olsen Certification website. Feedback from stakeholders (and others as they become apparent) is monitored, including actions undertaken to resolve disputes and issues and may inform changes in operational practice or future plan reviews.

18. Register of Plan Change and Review

Introduction This plan pertains to the management of Hudson Forest and will be reviewed on an annual basis. This section documents specific changes made during each review.

Change	Date	Section/Page

Appendix 1 - Contact details for Councils with jurisdiction over Hudson Forest

Council	Phone	Fax	Email	Website
Auckland Council	09 301 0101		-	https://www.aucklandcouncil.govt.nz/

Appendix 2 - Other Relevant Legislation

Statutes and Regulations
Accident Compensation Act 2001 #49
Animal Welfare Act 1999
Biosecurity Act 1993
Climate Change Response Act 2002
Commercially relevant statutes
Conservation Act 1997
Crown Forest Assets Act 1989
Fencing Act 1978
Forest and Rural Fires Act 1989
Forestry Rights Registrations Act 1983
Forests Amendment Act 1993 (Forests Act 1949)
Freshwater Fisheries Regulations 1983
Hazardous Substances and New Organisms Act 1996
Health and Safety at Work Act 2015
Heritage New Zealand Pouhere Taonga Act 2014
National Environmental Standard for Plantation Forestry 2017
Protected Objects Act 1975
Relevant regulations
Reserves Act 1977
Resource Management Act 1991
Resource Management Act – administrative jurisdiction
Soil Conservation and Rivers Control Act 1971
The Treaty of Waitangi Act 1975
Trespass Act 1980
Wildlife Act 1953

Relevant regulations to the above legislation also apply as well as various industry Accords, Codes of Practice as listed below.

Industry Accords & Codes
New Zealand Forest Accord
Principles of Commercial Plantation Forest Management
New Zealand Environmental Forestry Code of Practice
New Zealand Code of Practice for the Management of Agrichemicals.
Climate Change Accord
NZ Log Transport Safety Accord
Eliminating Illegal Forest Products in New Zealand
MoU Federated Farmers and Forest Owners Association and Farm Forestry Association
New Zealand Forest Road Engineering Manual

Appendix 3 - Auckland Council Pest Management Strategy

Total Control Pest Plants

Common Name	Scientific Name
African feather grass	*Pennisetum macrourum*
Asiatic knotweed	*Reynoutria japonica* syn. *Fallopia japonica, R. sachalinensis* syn. *F. sachalinensis* & hybrids
asparagus species	*Asparagus drepanophyllus* & *A. umbellatus*
balloon vine & small balloon vine	*Cardiospermum grandiflorum* & *C. halicacabum*
broomsedge	*Andropogon virginicus*
cathedral bells	*Cobaea scandens*
Chilean needle grass	*Nassella neesiana*
climbing spindle berry	*Celastrus orbiculatus*
devil's fig	*Solanum torvum*
devil's tail	*Persicaria perfoliata* syn. *Polygonum perfoliatum*
egeria	*Egeria densa*
great reedmace	*Typha latifolia*
green cestrum	*Cestrum parqui*
houttuynia	*Houttuynia cordata*
kudzu vine	*Pueraria montana* syn. *P. lobata*
lantana	*Lantana camara*
Madeira vine	*Anredera cordifolia*
Manchurian wild rice	*Zizania latifolia*
marshwort	*Nymphoides geminata*
Mexican feather grass	*Nassella tenuissima*
nassella tussock	*Nassella trichotoma*
needle grass	*Austrostipa rudis*
old man's beard	*Clematis vitalba*
purple loosestrife	*Lythrum salicaria*
rhamnus	*Rhamnus alaternus*
royal fern	*Osmunda regalis*
Sagittaria species	All *Sagittaria* spp. (except *S. teres*)
scrambling lily	*Geitonoplesium cymosum*
Senegal tea	*Gymnocoronis spilanthoides*
spartina	*Spartina alterniflora, S. anglica & S. x townsendii*
water poppy	*Hydrocleys nymphoides*
white edged nightshade	*Solanum marginatum*
wild broom	*Cytisus scoparius* (excl. cultivated varieties)