PROTECTION OF A TASMANIAN NATIVE FOREST (PROJECT 3: PETER DOWNIE)

PROJECT DESIGN DOCUMENT (PDD)
For validation with the Voluntary Carbon Standard
14 MARCH 2011

Contents

List of Abbreviations

AFOLU	Agriculture, Forestry and Other Land Uses
A/R	Afforestation/reforestation
BCEF	Biomass Conversion and Expansion Factor
CCB	Community, Conservation and Biodiversity (Standards)
CDM	Clean Development Mechanism
CSIRO	Australian Commonwealth Scientific and Industrial Research Organisation
DPIPWE	(Tasmanian) Department of Primary Industry, Parks, Water and Environment
DPWH	Department of Parks, Wildlife and Heritage
FFIC	Forests and Forest Industry Council
FFT	Farm Forestry Toolbox
FPA	Forest Practices Authority
FPP	Forest Practices Plan
FSC	Forest Stewardship Council
FullCAM	Full Carbon Accounting Model
GHG	Greenhouse Gas
GPS	Global Positioning System
IFM	Improved Forest Management
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
NDSVI	Normalised difference for senescent vegetation index
PDD	Project Design Document
PD	Project Description
PRA	Participatory Rural Appraisal
REDD	Reducing (or Reduced) Emissions from Deforestation and Degradation
RFPA	Redd Forests' Project Area
TASVEG	Tasmanian Vegetation Map
WDU	*Eucalyptus delegatensis* wet forest
DDE	*Eucalyptus delegatensis* dry forest and woodland
DCO	*Eucalyptus coccifera* woodland and forest
DPO	*Eucalyptus pauciflora* forest and woodland not on dolerite
DPD	*Eucalyptus pauciflora* forest and woodland on dolerite
DRO	*Eucalyptus rodwayi* forest and woodland
DVG	*Eucalyptus viminalis* grassy forest and woodland
FRG	Regenerating cleared land
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard

1.0 Description of Project

1.1 Project title

Protection of a Tasmanian Native Forest (Project 3: Peter Downie)

1.2 Type/Category of the project

Improved Forest Management (IFM), specifically conversion of logged forests to protected forests (LtPf).

1.3 Estimated amount of emission reductions over the crediting period including project size

The project is estimated to reduce emissions by 55 549 tCO2-e each year of the project. Therefore, over the twenty-five year crediting period, this project will prevent 1 388 731 tCO2-e being emitted.

1.4 A brief description of the project

The project is designed to protect 7 666 hectares of native Tasmanian forest which would, if not for the project, continue to undergo selective logging or be clear-felled and converted to pasture.

Peter and Anne Downie, private landowners, have historically implemented a regime of selective logging and clearfelling on most of the forest on their land. Interspersed areas of land have also been cleared for conversion to grass pasture. The landowners have asked Redd Forests to design an Improved Forestry Management project that will generate carbon credits resulting from the avoided greenhouse gas emissions that will otherwise take place. This will allow the landowners to avoid continued deforestation by implementing an Improved Forest Management scheme, utilising carbon finance. Protection of the project sites under an IFM model will both prevent the emissions generated from logging and allow the forest to approach its pre-logged conditions

The project is located near the towns of Bothwell, Hermitage and Waddamana in the Central Highlands of Tasmania, Australia. Tasmania is globally known for its old growth native forest, endemic species, significant biological diversity and spectacular wild places. Tasmania is home to one of the world's last great temperate wilderness areas, to the world's tallest hardwood trees (often exceeding 100m in height) and to the largest tract of temperate rainforest in Australia. The exceptional ecological values of Tasmania's natural landscapes have been internationally recognized, notably by the IUCN (IUCN 1989[1]), the Tasmanian Department of Parks, Wildlife and Heritage (DPWH 1990[2]), and the Forests and Forest Industry Council's Balanced Panel of

[1] IUCN (1989) World Heritage Nomination— IUCN Technical Evaluation 507, Tasmanian Wilderness (Australia). International Union for Conservation of Nature, Gland.
[2] DPWH (1990) Annual report, Department of Parks, Wildlife and Heritage, Tasmania

Experts (FFIC 1990[3]). Unfortunately, significant tracts of native forest are still being logged or are scheduled for logging.

The Redd Forests project area (RFPA) includes 7 666 ha of native forest, including vegetation communities dominated by *Eucalyptus delegatensis*, *E. pauciflora*, *E. viminalis*, *E. rodwayi*, *E. amygdalina*, *E. dalrympleana* and *E. ovata.* All of this forest has been selectively logged in the past (see Table No. 05 for past concessions), under Forest Practices Plans issued by the Forest Practices Authority of Tasmania. With no change in regulation since those harvests, the re-growth remains available for logging. A combination of selective logging and clearance and conversion to plantation or pasture is planned in the absence of finance from any carbon trade scheme.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project

The project is located within the Australian state of Tasmania (Figure No. 01). Tasmania is an island located 240 km south of the eastern side of the continent, being separated from it by Bass Strait. The state has an estimated population of 500,000 (as of December 2008) with almost half located in the Greater Hobart area. The state capital and largest city is Hobart. Other major population centres in Tasmania include Launceston in the north and Devonport and Burnie in the northwest.

Tasmania is promoted as 'The Natural State' owing to its significant natural environment. Officially, almost 37% of Tasmania is in reserves, national parks and World Heritage sites. The island is 364 km long from the northernmost point to the southernmost point and 306 km from west to east. It spans an area of 68,401 square km, of which the main island covers 62,409 square km.

[3] Forests and Forest Industry Council of Tasmania & Salamanca Agreement (1990) Key issues and principles likely to shape a forests and forest industry strategy for Tasmania, The Council, Hobart

Figure No. 01. Tasmania, Australia (Source: Google Maps©).

Table No. 01. Properties with forested area included in the Redd Forests' project.

Name of property	Name of owner	PID	Years of ownership	Hectares
Lake Echo	Tasberry Holdings PL	2189572	11	3508
Interlaken	Tasberry Holdings PL Interlaken Estates PL	7612624	5	3799
Weasel	P J Downie	2538314	102	849
Cluny (next to Dungrove)	I K Downie	7271452	102	709
Southernfield	P J Downie	5014153	33	1750
Lagoon of Islands	P J Downie	5005599	152, 68	5920
Kemps Tier (part of LoI)	Tasberry Holdings PL	1798288	152, 68	805
Dungrove	Dungrove CO PL	2538306	143	3013
Mt Vernon	Tasberry Holdings PL	5465149	20	875

Of these nine properties, the forested areas which are available for logging (7 666ha) are included in the project. The remaining areas consist of grazing areas, streamside buffers and other land uses. The respective property names, PIDs and dates of acquisition are presented in Table No. 01. P J Downie is the project proponent, and I K Downie is his father. Ltd. Tasberry Holdings Pty Ltd is a corporate trustee for The Mt Vernon Trust, with the Downie family being the beneficiaries. Tasberry Holdings Pty Ltd owns two thirds of Interlaken Estates Pty Ltd, with the remaining third held by outside interests. They have confirmed their support for the project.

The project boundaries are defined by the above cadastral boundaries, with the forested area mapped in KML and SHP files. The forests are bordered by a combination of roads, pastural land and plantations. All the land is under the control of the project proponent.

The nearest urban areas to the RFPA are Hermitage (approximately 3km from Dungrove and Southernfield, and 6.5 km from Weasel), Waddamanna (approximately 8km from Lake Echo) and Hunting Ground (approximately 4 km from Mount Vernon).

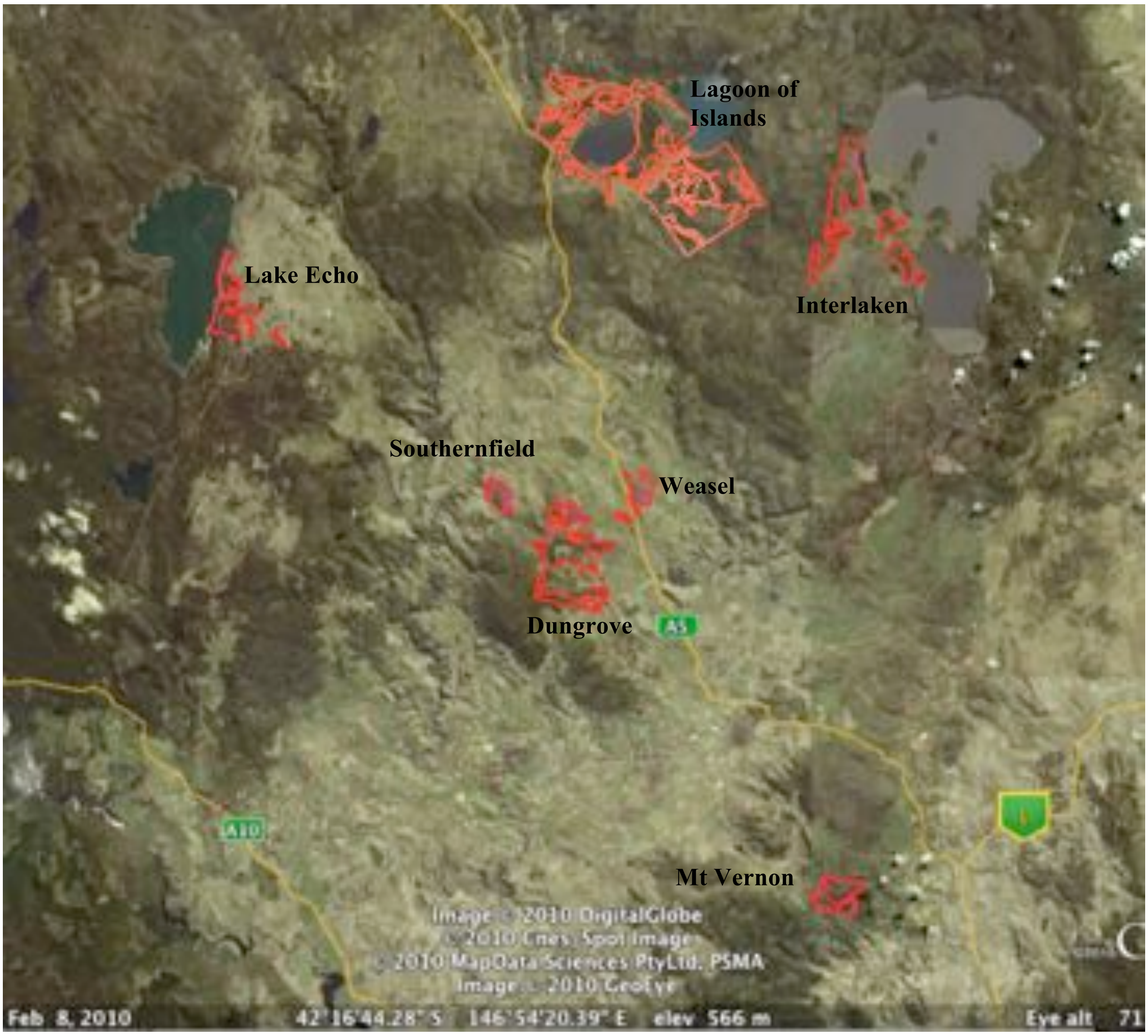

Figure No. 02. Map of the Redd Forests Project Area (Source: Google Earth©). The road marked as 1 is Dennistoun Rd, A5 is Lake Highway and A10 is Lyell Highway. Numbers refer to the property descriptions given in Table No. 01.

1.6 Duration of the project activity/crediting period

The contract between Redd Forests and Peter Downie was signed on 1 March 2010, which therefore serves as the start date of the project. The project developers began preparing the CCBA and VCS Project Description Documents in July. The project will reach financial closure after dual validation and verification.

The project will be implemented and monitored for a twenty-five year period, i.e. until March 2034, with crediting commencing with verification. The project will be verified annually, although the maximum permitted interval between monitoring events is five years.

1.7 Conditions prior to project initiation

Climate

The RFPA has a cool temperate climate with four distinct seasons. According to the Bothwell (Franklin St) weather station, summer lasts from December to February, when the average monthly temperature ranges from 20-23°C. The winter months are between June and July and are generally the wettest and coolest months. Winter maximums are 11°C on average. The average annual rainfall in Bothwell is around 537mm, mostly falling during spring (Figure Nos. 03 and 04)[4].

[4] Tasmania & Antarctica Climate Service Centre, Bureau of Meteorology. Site name: Bothwell (Franklin St). Site number: 095001. Latitude: 42.39°S, Longitude: 147.01°E. Elevation: 352m. Commenced: 1915. Status: Open. < http://www.bom.gov.au/climate/averages/tables/cw_095001.shtml> [Accessed 21/09/2010]

Figure No. 03. Mean maximum temperatures (ºC) in Bothwell, the nearest weather station to the project. The area is subject to distinct seasons, with a peak of 23.5ºC in the summer months and a mean of only 11ºC during mid-winter. This image is the copyright of the Commonwealth of Australia (2010), Bureau of Meteorology.

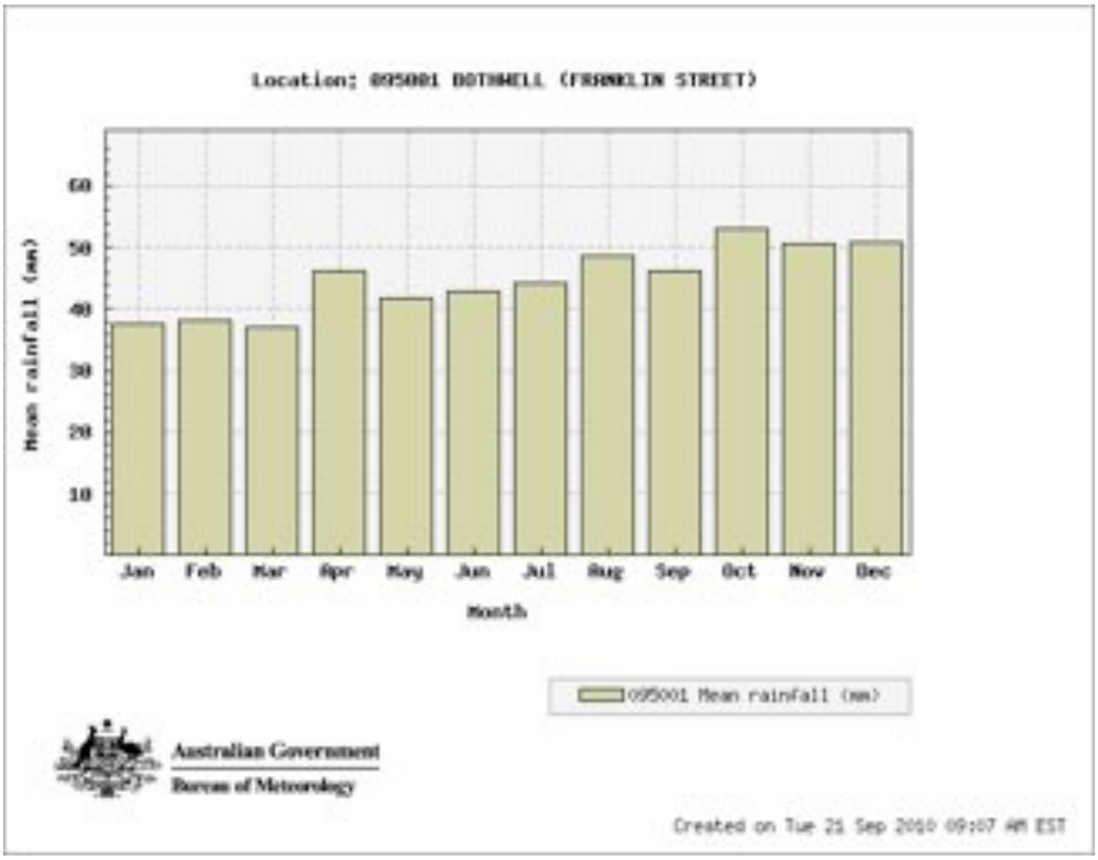

Figure No. 04. Mean rainfall (mm) in Bothwell. The region experiences relatively consistent rainfall all year round, with the mean varying between 38 and 53mm. This image is the copyright of the Commonwealth of Australia (2010), Bureau of Meteorology.

Soils and Geology

The Central Highlands are distinguished by perhumid cool to cold high plateau surface and rugged mountain ranges to the west formed by Jurassic dolerite and Tertiary basalts. The humid cool to cold lower plateau surface is underlain by Jurassic dolerite, Permo-Triassic sediments and Tertiary basalts, with sandy to clay loam soils. Skeletal soils to alluvium form the valleys.[5]

Vegetation Communities

The project area will protect an expanse of native forest, including both wet and dry sclerophyll. The vegetation communities are identified by the dominant eucalypts in the canopy, which include *E. delegatensis*, *E. pauciflora*, *E. viminalis*, *E. rodwayi*, *E. amygdalina*, *E. dalrympleana* and *E. ovata*. These species are usually found in combination with a specific understory type and environmental conditions. The main vegetation categories (according to TASVEG 2.0) within the RFPA are:

[5] Department of the Environment, Water, Heritage and the Arts (2009) Australian Natural Resource Atlas: Biodiversity Assesment – Central Highlands. <http://www.anra.gov.au/topics/vegetation/assessment/tas/ibra-tasmanian-central-highlands.html> [Viewed 13/04/10]

Eucalyptus delegatensis wet forest (WDU)[6]:

This forest type, dominated by *Eucalyptus delegatensis* (Alpine ash), is found in areas above 450 m altitude. *Acacia dealbata* (Silver wattle) and *Acacia melanoxylon* (Australian blackwood) are common subdominants throughout the range. It is a wet sclerophyll community, with the canopy reaching 40 to 80m with a dense, wet understorey of tall shrubs or small trees. WDU is widespread and common in the wetter, upland areas of Tasmania, and distinguished from *E. delegatensis* dry forest and woodland (DDE) by the presence of broad-leafed shrubs and/or rainforest species in the understorey.

On wetter sites where there have been no fires for long periods, the understorey is dominated by rainforest species. These stands typically have one or two age-classes of Eucalyptus species corresponding to past fire years. More age-classes may be present in wet sclerophyll forests, which have shorter intervals between fires than forests on sites that are more humid. By comparison, in the drier and/or most frequently burnt areas supporting *E. delegatensis* wet forest, the understorey is relatively open. The shrub layer becomes taller, denser and more diverse on sites with greater fire intervals and more moisture. The diversity and abundance of ground ferns are high in most wet sclerophyll *E. delegatensis* forests

This community grows mainly on Jurassic dolerite, which forms most of the upland ranges and plateaus in northern and eastern Tasmania, the southern ranges and the Central Highlands. It also grows on basalt, granite and sandstone. Sites are well–drained and surface rock can be continuous on talus slopes and boulder-fields. The altitudinal range of *E. delegatensis* wet forest is mainly from 500–900 m although in areas that receive cold air drainage it will extend downslope to 300 m.

Eucalyptus delegatensis dry forest and woodland (DDE)[7]:

This community is dominated by *E. delegatensis*, with *E. amygdalina* as the most widespread subdominant species. *E. delegatensis* typically forms open forests, though on exposed sites trees may often have a low, spreading, woodland form.

The composition and structure of the understory vary greatly, depending on fire frequency. The shrub layer is typically sparse in areas of high fire frequency, with the most frequent species being *Acacia dealbata* and the ground layer dominated by tussock-forming grasses. As fire frequency decreases, the prominence of the grasses decreases, with a corresponding increase in abundance and/or diversity of shrub and fern species.

This community occurs mainly in association with dolerite, but also on basalt, sandstone and granite. The sites are typically well-drained. The surface rock can be continuous on talus slopes, boulder-fields and outcropping rock platforms. The altitude range of this community is about 500 m to 900 m (1,050 m on the Central Plateau), although in areas that receive cold-air drainage, it will extend down the slope to below 300 m.

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[6] Harris, S; Kitchener, A (2005) From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation. Department of Primary Industries, Parks, Water and Environment, Printing Authority of Tasmania. Hobart. 352-354

[7] Harris, S; Kitchener, A (2005) From Forest to Fjaeldmark: Descriptions of Tasmania’s Vegetation. Department of Primary Industries, Water and Environment, Printing Authority of Tasmania. Hobart. 248-249

Eucalyptus coccifera woodland and forest (DCO)[8]:

E. coccifera forest and woodland is widespread in the subalpine areas of Tasmania over 600 m altitude. This community is found on undulating alpine plateaus and steep slopes up to 1200 m. The lower limit is generally 600 m, at the edges of plains or lakes. In a few places in southeast Tasmania, *E. coccifera* grows at altitudes as low as 390 m. The substrate is usually dolerite and *E. coccifera* primarily occurs on very rocky ground (rises and slopes where drainage is very good). High frost and drought tolerance allows the trees to grow in very exposed sites. A few known stands of *E. coccifera* are from quartzite areas, particularly around Cradle Mountain, and there are small stands on Permian sediments above 800 m in the west and south-west.

The dominant tree species is *E. coccifera*. *E. subcrenulata*, *E. archeri*, *E. urnigera*, *E. gunnii*, *E. pauciflora*, *E. delegatensis*, *Athrotaxis cupressoides* and *A. selaginoides* are sometimes present as subdominants.

E. coccifera forests up to 20 m in height are generally restricted to sheltered sites on the eastern Central Plateau, Mount Field and north-western Tasmania. Some large *E. coccifera* trees also occur on Snug Tiers. There is evidence that large trees were more widespread before extensive wildfires in the 1960s. Woodland trees generally range from 5 to 10 m in height. At exposed sites, it is usual for trees to show fire and frost damage, with the common form of recovery being regrowth from epicormic buds.

Eucalyptus pauciflora forest and woodland not on dolerite (DPO)[9]:

These forests and woodlands are dominated by a canopy of *E. pauciflora* trees rarely more than 25 m in height, often considerably shorter on highly insolated, nutrient-poor sites. These dry sclerophyll communities form open forests or woodlands with a heathy understorey of generally low diversity.

When not growing on dolerite, *E. pauciflora* forest and woodland grows mostly on sands, granite or sedimentary substrates below 800 m. The forest community generally occurs on dry, insolated sites in the southern Midlands and the lower Derwent Valley, and in the southeast and at lower altitudes on the Central Plateau. On the Central Plateau it is strongly associated with Triassic sandstone and Permian mudstone. It also occurs in the far northeast on recent marine and aeolian deposits, and near Rossarden, on granite.

At higher altitudes, DPO grades into areas mapped in *E. coccifera* forest and woodland. In the southern Midlands, DPO grades into *E. tenuiramis* forest and woodland on sediments. There is often a similar mix of eucalypt species (e.g. *E. pauciflora, E. rubida, E. ovata*, *E. viminalis* and *E. tenuiramis*) in these two vegetation communities, so canopy dominance becomes the principal diagnostic feature of these communities. Trees are rarely more than 25 m in height and are often considerably shorter on highly insolated nutrient-poor sites. Old-growth stands of this forest community are uncommon, as there is often rapid replacement before senescence due to the high fire-frequency. The community may form woodland.

Unlike *E. pauciflora* on dolerite (DPD), which has a grassy understorey, this understorey is distinctly heathy. Substrate, insolation and fire-frequency strongly influence the understorey,

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[8] Harris, S; Kitchener, A (2005) From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation. Department of Primary Industries, Water and Environment, Printing Authority of Tasmania. Hobart. 242-243
[9] Harris, S; Kitchener, A (2005) From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation. Department of Primary Industries, Water and Environment, Printing Authority of Tasmania. Hobart. 267-268

which generally has a low cover (< 2 m), little diversity and not insignificant density. There is usually a small, sparse tree layer.

Eucalyptus pauciflora forest and woodland on dolerite (DPD)[10]:

This vegetation community consists of open, grassy forest dominated by *E. pauciflora*, with a high diversity of herbs and small shrubs. This community is distinguished from other *E. pauciflora* dominated vegetation by the substrate and its tendency to occur above 800 m.

E. pauciflora forest occurs extensively on dolerite on the eastern Central Plateau with localised patches in the southern Midlands (e.g. Mount Seymour and Mount Cartwright) and the Eastern Tiers. This community generally grows on the margins of frost hollows or on broad flats that are subject to cold-air drainage and frosts. Due to the high incidence of frosts, tree form can often be very poor but quite spectacular, with broad, spreading crowns and twisted, tortuous shapes. Canopy cover is often low, resulting in an open woodland community.

This community is dominated by *E. pauciflora*, with any of the following sometimes present: *E. dalrympleana*, *E. rodwayi*, *E. amygdalina* and *E. delegatensis.* This community often grades into *E. rodwayi* forest where drainage is impeded at the edges of broad plains and *E. delegatensis* forest outside of the most frost-prone sites. At lower altitudes prone to cold-air drainage (e.g. Nunamara), *E. pauciflora* occupies a narrow band separating *E. rodwayi* on the flats and *E. amygdalina* upslope. On the Central Plateau, areas of well-drained glacial deposits (dolerite) support *E. delegatensis* in the centre, rimmed by *E. pauciflora* (whose seedlings are apparently more frost tolerant), passing out into sedgy, broad valleys with a few *E. rodwayi*.

Two distinct understoreys can be associated with *E. pauciflora* forest. In the Eastern Tiers and lower plateau surfaces, the understorey tends to be shrubby with a sparse to moderately dense medium–tall shrub layer. On rocky sites, ground cover is low and dominated by sclerophyllous monocotyledons (*Lomandra longifolia* and *Diplarrena moraea*). Ground cover improves as soil development increases.

Eucalyptus rodwayi forest and woodland (DRO)[11]:

Forest and woodland dominated by *E. rodwayi* grow on fertile valley flats, usually subject to water logging. The understorey varies between open and grassy or sedgy to densely shrubby.

This community occurs from below 200 m to around 900 m on the Eastern Tiers and eastern Central Plateau, predominantly in upland areas. However, it also occurs in lowland valley bottoms subject to cold-air drainage. Small relict populations are present in the far north-east near sea level. *E. rodwayi* forest invariably grows on poorly–drained flats. The substrates are mainly dolerite, basalt Permian mudstones or alluvium in upland areas (e.g. Central Plateau), but also other substrates at lower elevations. It is widespread but local on poorly–drained upland sites, extending to lower elevations on sites susceptible to frost or cold-air drainage.
The community is dominated by *E. rodwayi*, which typically forms pure stands. *E. pauciflora*, *E. amygdalina* and *E. tenuiramis* may be present, often adjacent to the *E. rodwayi* forest in areas of better drainage. *E. ovata* is often present in slightly better drained areas or higher up

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[10] Harris, S; Kitchener, A (2005) From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation. Department of Primary Industries, Water and Environment, Printing Authority of Tasmania. Hobart. 269-270
[11] Harris, S; Kitchener, A (2005) From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation. Department of Primary Industries, Water and Environment, Printing Authority of Tasmania. Hobart. 277-278

drainage lines where cold air pooling is less severe.

The degree of site exposure and severity of frosts and water logging influence the form of the community. Towards the centre of some marshes, mallee-form trees (< 10 m) occur as a sporadic component of low, open woodland and sedgeland or heathland. Low, open woodland structure is also found on exposed sites subject to severe frosts. Woodlands and open forests (> 40 m) are found in more sheltered situations and on better aerated soils around the perimeter of marshes and flats.

Grassy *E. rodwayi* forest has *Poa* species and *Lomandra longifolia*, with sparse low shrubs. Sedgy *E. rodwayi* forest has *Lepidosperma*, *Gahnia*, *Leptospermum* and *Melaleuca* species as the main shrubs. Scrubby *E. rodwayi* forest is similar to the sedgy facies, but with *Leptospermum* and *Melaleuca* species forming a more prominent layer in the understorey. Wet sclerophyll shrubs may dominate the shrub layer at some sites such as in the Bronte area and at Western Creek.

Eucalyptus viminalis grassy forest and woodland (DVG)[12]:

This forest community is characteristically low to medium height (15–25 m) open forest dominated by *E. viminalis*, *E. rubida* and sometimes *E. dalrympleana*. DVG is widespread in Tasmania below 700 m on well–drained sites (ridges, hills, saddles and slopes), generally on dolerite or basalt (occasionally on sandstone) in the low- rainfall regions in the Midlands and on the lower slopes of the Eastern and Western Tiers. It also occurs on limestone on north-facing slopes in the Mole Creek district, and on a variety of sediments in the north-east of the State. It is well adapted to dry conditions and is found on free draining sites, which are often susceptible to drought.

The dominant canopy species in this forest community is *Eucalyptus viminalis*, which attains around 20 m in height, though this is generally less on poorer sites. *E. pauciflora*, *E. ovata* and *E. amygdalina* may be present as sub- or co-dominants. *E. viminalis* grades into *E. dalrympleana* between 300 m and 600 m altitude. *E. rubida* may occur as localised stands on flats and saddles in the southern Midlands and the Fingal Valley.

The understorey is generally grassy, and low shrubs may form a sparse layer. The specific composition of the understorey depends largely on the fire and grazing regimes. On drier slopes, grasses and herbs dominate the understorey, but in some places, *Acacia mearnsii*, *Allocasuarina verticillata* and *Bursaria spinosa* form an additional stratum of small trees. On moister sites, *E. viminalis* forest has an understorey of *Acacia dealbata*, *Pteridium esculentum* and a herb-rich, grassy ground cover.

Regenerating cleared land (FRG):

The community is characterised by an invasion of native species including graminoid species such as *Lomandra longifolia*, *Isolepis nodosa* and *Juncus* species. This category may include insignificant amounts of *Austrodanthonia* or *Austrostipa* species, and includes small native shrubs during later colonisation.

<u>Biodiversity</u>

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[12] Harris, S; Kitchener, A (2005) <u>From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation</u>. Department of Primary Industries, Water and Environment, Printing Authority of Tasmania. Hobart. 291-292

Threatened species in the Tasmanian Central Highlands are generally in decline. Grazing and clearing have affected some flora and the dependent fauna in parts of the region, and forestry is an ongoing threat for some species. The changing fire regimes that accompany these land uses impact negatively on fire sensitive species in alpine areas. As in other Tasmanian regions, persecution and accidental death are important threats to large vertebrate predators.

The project site has nine endangered species on site and/or within a 500m radius, and 22 endangered or vulnerable species within a 5km radius of the project areas (see Tables No. 02 and 03).

Table No. 02. Endangered flora and fauna within 500 m of Redd Forests Project Area included as threatened in Tasmania Department of Primary Industries, Parks, Water and Environment (DPIPWE) [13] and IUCN Red List status*[14]

Latin Name	Common Name	DPIW Status**	IUCN Status
	Flora		
Brachyscome radicata	Spreading daisy	R	
Lepsidium psuedotasmanicum	Shade peppercress	R	
Pterostylatensis pratensis	Liawenee greenhood	V	
	Fauna		
Accipiter novaehollandiae	Grey goshawk	E	
Aquila audax subsp. *fleayi*	Wedge-tailed eagle	E	
Haliaeetus leucogaster	White-bellied sea-eagle	V	
Oreixenica ptunarra subsp. *Ptunarra*	Ptunarra brown butterfly	PV	
Paragalaxias dissimilis	Shannon galaxias	V	
Paragalaxias eleotroides	Great lake galaxias	V	
Perameles gunnii	Eastern-barred bandicoot	V	Near threatened
Pseudemoia pagenstecheri	Tussock skink	V	
Sarcophilus harrisii	Tasmanian devil	E	Endangered
Tyto novaehollandiae subsp. *Castanops*	Masked owl	E	

* IUCN Red List of Threatened Species.
** (E) Endangered: Those species in danger of extinction because long term survival is unlikely while the factors causing them to be endangered continue operating. (V) Vulnerable: Those species likely to become endangered while the factors causing them to become vulnerable continue operating. (R) Rare: Those species with a small population in Tasmania that are at risk.

[13] DPIW. 2010. Natural Values Atlas Report No. 38909. Attached. Issued on 20 April 2010

[14] IUCN 2008. 2008 IUCN Red List of Threatened Species. <www.iucnredlist.org>. Downloaded on 21 April 2010.

Table No. 03. Endangered flora and fauna within 5 km of Redd Forests Project Area identified as threatened by the Tasmania Department of Primary Industries, Parks, Water and Environment (DPIPWE) [15] and the IUCN Red List*[16]

Latin Name	Common Name	DPIW Status**	IUCN Status
	Flora		
Acacia siculiformis	Dagger wattle	R	
Asperula scoparia var. *scoparia*	Prickly woodruff	R	
Austrostipa nodosa	Knotty speargrass	R	
Barbarea australis	Riverbed watercress	E	
Calocephalus lacteus	Milky beautyheads	R	
Carex tasmanica	Curly sedge		
Colobanthus curtisiae	Grassland cupflower	R	
Cryptandra amara	Pretty pearlflower	E	
Discaria pubescens	Spiky anchorplant	E	
Epacris acuminta	Claspleaf heath	R	
Glycine latrobeana	Clover glycine	V	
Haloragis asperia	Rough raspwort	V	
Hovea tasmanica	Rockfield purplepea	R	
Lepidium hyssopifolium	Soft peppercress	E	
Lepidium psuedotasmanicum	Shade peppercress	R	
Muehlenbeckia axillaris	Matted lignum	R	
Pellaea calidirupium	Hotrock fern	R	
Ranunculus sessiliflorus var. *sessiflorus*	Rockplate buttercup	R	
Scleranthus brockiei	Mountain knawel	R	
Scleranthus diander	Tufted knawel	V	
Scleranthus fasciculatus	Spreading knawel	V	
Vallisneria Australia	River ribbons	R	
Xanthoparmelia jarmaniae		V	
Xanthoparmelia mannumensis		V	
Xanthoparmelia willisii		E	
	Fauna		
Astacopsis gouldi	Giant freshwater crayfish	V	Endangered
Dasyurus maculatus subsp. *Maculates*	Spotted-tailed quoll	R	Near threatened
Galaxias auratus	Golden galaxias	R	

* IUCN Red List of Threatened Species.
** (E) Endangered: Those species in danger of extinction because long term survival is unlikely while the factors causing them to be endangered continue operating. (V) Vulnerable: Those species likely to become endangered while the factors causing them to become vulnerable continue operating. (R) Rare: Those species with a small population in Tasmania that are at risk.

[15] DPIW. 2010. Natural Values Atlas Report No. 38909. Attached. Issued on 20 April 2010

[16] IUCN 2008. 2008 IUCN Red List of Threatened Species. <www.iucnredlist.org>. Downloaded on 21 April 2010.

Condition of the forest

There has been ongoing logging throughout the property, as evidenced in the Forest Practices Plans listed in Table No. 05. The majority of the properties were cleared through ringbarking around 1900, with a more gradual rate of clearance for conversion to pasture and plantation occurring since that date. The remaining forests have been selectively logged to obtain 35 000 to 40 000 tonnes of timber per year, which equates to roughly 70% of aboveground trees every twenty-five years. This means that the forests are in varying conditions, with Lake Echo, Interlaken, Dungrove, Weasel and Southernfield all logged within the last ten years, while Mt Vernon has not been logged for twenty-five years. Aside from the impacts of logging, the forests remain largely free of pests and disease and therefore retain a healthy native forest structure and high levels of species diversity.

(a) recently logged forest in the project area

(b) regrowth of Eucalyptus forest

(c) some Eucalyptus trees have escaped logging for several decades, and have a consequently large DBH of >1.5m.

Figure No. 05 – The condition of the forest varies across the project site, from recently logged sites depicted in (a) to the regrowth in (b) to the relatively large Eucalyptus trees which have escaped logging for forty years or more, such as the individual photographed in (c).

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements

The project will protect native forest that will be logged in the absence of carbon finance. Protecting forest from timber harvest reduces emissions caused by harvesting and maintains the forest carbon stock.

The underlying conceptual approach of this methodology is based on the Agriculture Forestry and Other Land Use (AFOLU) Guidance Document of the Voluntary Carbon Standard, under the Improved Forest Management (IFM) category. Activities related to IFM are those implemented on forest lands managed for wood products such as sawtimber, pulpwood and fuelwood, and are included in the IPCC category "forests remaining forests". This project specifically satisfies the criteria 'Conversion of logged forests to protected forests (LtPF)', i.e. protecting currently logged forests from further logging and degradation.

This site is eligible for crediting under the VCS IFM category because it has historically been approved for logging concessions by the state regulatory body, the Tasmanian Forest Practices Authority (see Table No. 05 for the list of past Forest Practices Plans). With no change to the Forest Practices Code, which determines eligibility for logging concessions, the forest is still vulnerable to harvest (having already excluded streamside buffers and conservation covenants from the project area). The owner of the right to harvest is acting as the project proponent and undertaking forest protection as an alternative to harvesting. The project is specifically eligible for the VCS approved "Methodology for Improved Forest Management: Conversion of Logged to Protected Forests".

This project satisfies all the applicability criteria from the GreenCollar IFM methodology, including:

1. Forest management in the baseline scenario is planned timber harvest as outlined in Table No. 08. No areas have the baseline condition of conversion to managed plantations.
2. The merchantable volume (m^3/ha) extracted in the planned timber harvest is estimated using international forest inventory methods and Tasmanian allometrics.
3. In the project scenario, forest use will not involve commercial timber harvest or forest degradation.
4. The boundaries of the forest land are clearly defined using cadastral parcels and KML files.
5. The project does not include wetland or peatland.

1.9 Project technologies, products, services and the expected level of activity

This project draws on the consultancy services of Redd Forests. Apart from this there are limited technologies, products or activities involved. This is because the project activity seeks to reduce business-as-usual carbon emissions through Improved Forest Management: it requires no additional activity beyond preventing selective logging or clearance and conversion planned by the landowner.

1.10 Compliance with relevant local laws and regulations related to the project

The project developers and landowners adhere to all laws and regulations relevant to the project, including the *Forest Practices Act 1985*, the Forest Practices Code 2000 and the Forest Practices Regulation 2007. The project does not contravene or inhibit compliance with any of the above.

The project follows all the Tasmania Workplace Authority Standards, including the Forest Safety Code. Redd Forests follows appropriate safe labour practices to prevention of injuries in the workplace, a particular risk for workers engaged in forestry operations. Additionally, Redd Forests complies with all other applicable local, state, and national workplace standards.

Indeed, the project does not just satisfy local regulation but demonstrates best practice, as demonstrated by its planned validation under the Climate, Community and Biodiversity Standard and because significant areas of the project are certified by the Forest Stewardship Council.

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements

The greatest risks to an Improved Forest Management project in Australia are from pests or fire.

There are no significant pests in this area. Browsing animals (particularly deer and wallabies) may have a minor effect on regeneration, though in practice the animals have little impact as they largely remain in pastured areas rather than forests. These pests are controlled by shooting under a game management plan: the annual pest control program involves up to 200 people.

Native eucalyptus forests within Tasmania are not highly susceptible to insect damage: single species plantations are much more susceptible than native forests. The forests within the RFPA are even less susceptible given that insect damage to native eucalypts are most susceptible in 'edge' environments where they adjoin cleared lands. The RFPA comprises large tracts of mixed native forests that rarely adjoin cleared farm lands. Louise Gilfedder, Senior Conservation Scientist with the Tasmanian Department of Primary Industries Water and Environment advised the following with regard to insects;

> "*From a carbon perspective, insects only consume a small percentage of individual leaves for a very short period of time and would not have a significant impact upon long term carbon stocks.*" (Gilfedder, *pers comm*, 2010).

While fires are an important part of the regeneration and breeding cycles for many plant species, threatened fauna and carbon stocks may be damaged. Eucalyptus forests are typically fire prone, but the Central Highlands are only susceptible to wildfire for a few months of the year due to the relatively cold and wet climate of Tasmania. The risk is further reduced on private property, such as the project area, which is not accessible to the public. In addition, the landowner has established strategic fire breaks through the roading system, conducts low scale burning off along the roads and keeps four fire trucks stationed on the farm. There is ongoing monitoring by organised recreation groups and all employees.

Due to the regenerative capacity of Eucalyptus species, fires in the region are measured according to the percentage of trees which are left as standing dead in the wake of the fire. The project area has had four fires recorded in the past fifty years[17]:

- 100ha were burnt on Dungrove in 1962, leaving 5% of the trees as standing dead
- 10ha were burnt on Weasel in 1992, leaving 30% of the trees as standing dead
- 300ha were burnt on Interlaken in 2004, leaving 20% of the trees as standing dead
- 200ha were burnt on Dungrove in 2007, leaving 5% of the trees as standing dead

When the area (as a proportion of the total stratum) is multiplied by the percentage of total carbon stocks, all fires are *de minimis* except the fire on Interlaken, which affected 6.5% of the carbon stocks in the aboveground trees of that stratum. In the last 25 years, only 2% of forests have been subject to uncontrolled wildfire on the property[18].

Redd Forests has adopted further measures to mitigate these risks, including periodic visits and monitoring of local climate features, hydrological dynamics and biodiversity.

Finally, Redd Forests has conducted a risk assessment using the Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination (Appendix 1), which determined that the risk level of this project is 'medium'. This is based on the fact that almost all risk factors are 'zero' to 'low', with the exception of the increasing timber value on the site. This determines the number of credits placed in the AFOLU Pooled Buffer Account to be 15% of total credits, a reserve established to address non-permanence. This risk assessment will be repeated with each monitoring event.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction

The properties cover 23 047 ha, of which 10 974 ha are forested. A further 1909 ha are covered by *E. nitens* plantations, with the remainder evenly divided between native and cultivated pasture. The pastures were largely created through ring-barking in 1900. A further 1000 ha were cleared for conversion to pasture and a further 1000 ha for the establishment of plantations in the last ten years. Throughout this time, the landowners have logged the native forests for pulp and sawlog (Table No. 04). In the last twenty years, the landowner estimates that 800 000 tonnes were extracted from the property. These high levels of timber extraction, particularly for pulp, demonstrates that historical business practices created significant GHG emissions.

Table No. 04. The logging history of each property.

Stratum	Date	Event	Area logged (ha)	% of merchantable timber removed from the area logged	Pulp: sawlog
Interlaken	1985	Thin	925	50	90:10
	2003	Thin	925	50	90:10

[17] P. Downie, *pers. comm.*, 17/11/2010
[18] P. Downie, *pers. comm.*, 15/10/2010

Lake Echo - high biomass	1960	Thin	195	10	40:60
	1993	Thin	195	50	90:10
	2004	Thin	195	10	60:40
Lake Echo - low biomass	1960	Thin	216	10	40:60
	1993	Thin	100	75	90:10
Lagoon of Islands – high biomass	1994	Thin	373	70	90:10
	1995	Thin	373	70	90:10
	1996	Thin	373	70	90:10
	1997	Thin	373	70	90:10
	1998	Thin	373	70	90:10
Lagoon of Islands - low biomass	1994	Thin	524	70	90:10
	1995	Thin	524	70	90:10
	1996	Thin	524	70	90:10
	1997	Thin	525	70	90:10
	1998	Thin	525	70	90:10
Southern Central	1999	Thin	488	50	90:10
	2000	Thin	488	50	90:10
	2001	Thin	487	50	90:10
Mt Vernon	1985	Thin	377	60	90:10

The Forest Practices Plans demonstrate that the landowner has an ongoing legal right to selectively log, or to clear the project site (at a rate of 40ha per year) and convert the land to pasture or timber plantations (Table No. 05). The landowner will only adopt improved forest management systems with income from the carbon markets to make them financially viable. The project therefore prevents imminent business-as-usual timber harvesting.

Table No. 05. Details of the most recent Forest Practices Plans on the Redd Forests' project site.

Reference number	Plan valid until:	Applicant	Area (ha)	Estimated timber volume (t):
ABM599	30/06/1997	Rural Timber – Forest Resources	320	40 000
SDH507	31/12/1997	Forest Resources	605	47 000
ABM727	30/06/1998	Dungrove Company Pty Ltd	120	9000
ABM672	31/12/1998	Northern Forest Investments	210	19 000
ABM820	30/06/1999	Dungrove Company Pty Ltd	180	18 000
ABM822	30/06/1999	Dungrove Company Pty Ltd	100	8000
ABM845	30/06/1999	Dungrove Company Pty Ltd	40	3000
ABM797	30/06/2000	Downie Pty Ltd	180	18 000
ABM832	30/06/2000	Downie Pty Ltd	140	12 600
ABM834	30/06/2000	Downie Pty Ltd	100	7 500

ABM002	30/06/2001	Boral Timber Tasmania	142	8 770
AMB003	30/06/2001	Boral Timber Tasmania	227	15 846
ABM798	31/12/2001	Downie Pty Ltd	217	23 000
PRN0040	30/06/2003	Peter Downie	190	18 800
ABM0009	30/06/2004	Gunns Longreach	150	9 090

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates)

This project has not created any other form of environmental credit.

1.14 Project rejected under other GHG programs (if applicable)

This project has not been rejected by any other GHG programs.

1.15 Project proponents' roles and responsibilities, including contact information of the project proponent, other project participants

Peter Downie is the project proponent and key landowner. His family have owned and managed several of the properties for over a hundred years, and have continued to expand their farming and forestry operations over recent decades. He has extensive experience in implementing new projects, including establishing hydroelectric power in the valley and obtaining the first Forest Stewardship Council certification in Australia.

The project proponent is responsible for the ongoing monitoring of the project, in accordance with the Monitoring Plan (14 March 2011 version) prepared by Redd Forests.

Contact person: Peter Downie
Title: Landowner
Address: 3289 Lakes Hwy, Bothwell, TAS 7030
Telephone number: 61 (3) 6259 6192
Email: dungrove@activ8.net.au

Redd Forests Pty Ltd is acting as project developer on behalf of the landowner, and is responsible for the development, validation and first verification of the project. Redd Forests is a leading forestry carbon project developer in Australia.

Contact person: Stephen Dickey
Title: Managing Director
Address: 11 Renfrew Street, St. Andrews, NSW 2566
Telephone number: 61 (0) 421 670 567

Email: stephen@reddforests.com
Website: http://www.reddforests.com

Stephen Dickey is the co-founder and Managing Director of Redd Forests. He has six years of experience on climate change issues, working with Oxfam, WWF-Australia, Redd Forests and as a consultant to Climate Friendly. His experience in senior management is extensive, including positions with TNT, British Airways and Sabre Corporation. This combination of international commercial experience and exposure to climate change issues in diverse sectors gives him a rare set of capabilities and perspectives to lead Redd Forests.

Andrew Ratcliffe is co-founder and Chairman of Redd Forests. He also holds the position of executive director of Incon China, established to assist SMEs to do business in China, and director of Sports Entertainment Asia and Smartframe Pty Ltd. Andrew spent almost twenty years working in the financial sector, including work with Price Waterhouse Coopers, ANZ Bank, First Pacific Limited and the stockbroker Dominguez Barry Samuel Montague (now UBS). Andrew has a combined Commerce/ Law degree from the University of NSW and is a qualified Chartered Accountant.

Jarrah Vercoe is the Project Manager primarily responsible for the implementation and management of IFM projects in Tasmania. He has a Bachelor of Science with first class (Honours) from the University of Tasmania, 2003. His honours research comprised a critique of approaches to achieving voluntary conservation on private land within Tasmania. Following graduation, Jarrah worked as an environmental consultant for 3 years with the international consulting firm GHD. Notably, in 2008 he delivered a large Commonwealth Government ‘Caring for our Country’ project across Tasmania. Prior to joining Redd Forests, Jarrah was the ‘biodiversity coordinator’ with NRM South.

Redd Forests has the capacity to support the landowner and Tasmanian Project Manager in all aspects of the monitoring process. Redd Forests’ Project Manager, Sarah Colenbrander, coordinated the original implementation and validation of the project.

Technical consultant, Christopher Dean, performed the site stratification (using multi-spectral satellite imagery, and environmental and infrastructure layers), sample plot delineation, training in forest mensuration, and the carbon scenario forecasts; employing ArcGIS (customised scripts and Spatial Analyst), MapWindow, GoogleEarth and FullCAM

Technical Specialist, Stephanie O’Donnell, is responsible for ongoing stratification (using satellite imagery, digital elevation models, hydrography/transport layers and vegetation maps) and carbon modelling, drawing on software such as ArcExplorer and FullCAM. This allows effective evaluation of variation from the projections and uncertainty surrounding project area and carbon sequestration.

Redd Forests employs external environmental consultants to complete the fieldwork. The consultants work in teams of three in the field: each team includes at least one experienced botanist (familiar with local Eucalyptus species) and a certified first aid practitioner. Each week of fieldwork begins with training in standard forestry inventory techniques, identification of common local trees and an OH&S briefing. The fieldwork required to satisfy the Monitoring Plan will be conducted with the same accuracy as the forest inventory developed during the project implementation.

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.)

Political environment

Several of the sites within the project area have a baseline involving clearfell of native forest to establish grass pastures, at the legally permitted rate of 40ha per year per property. While ongoing clearfell with native regeneration is still legal and widely practiced, recent legislative changes have created an incentive for landowners to utilize logging concessions and seek additional concessions for clearance and conversion to plantation or pasture in the near future. The "Tasmanian Government Policy for Maintaining a Permanent Native Forest Estate" (December 2009), issued by the Department of Infrastructure, Energy & Resources, states that: [19]

"Broad scale conversion of native forest on public land has now ceased. This revised Policy is intended to provide an orderly phase out of broad scale conversion on private land by 2015… This Policy is given effect through the Forest Practices Authority's consideration of applications for Forest Practices Plans under the Forest Practices Act 1985.*"*

This policy change encourages landowners to take advantage of existing Forest Practice Plans and to seek new plans to clear and convert forested land. This increases the threat to native forests such as those within the project area.

Stratification

SPOT 5 satellite imagery was used because it has infra-red and visible wavelength bands known to respond to variations in vegetation and a spatial resolution compatible with the plot size used for measuring the forest. Specifically the pixel size (2.5 to 10 metres) was much smaller than the plot size (45 metres) and therefore an average of several neighbouring pixels could represent the biomass of a plot. This compares favourably with LANDSAT 7 with its suitable spectral resolution but 25 metre pixels. The larger pixels mean that whenever a plot bridged two pixels, or if pixels were misplaced by one pixel-width during image rectification, then the plot biomass is less likely to be reflected in the band radiances. This would lead to a poor correlation between field measurement and derived vegetation index, and hence a possible high error in biomass interpolated over the project area. The smaller size of SPOT 5 pixels would lessen this error and increase the accuracy and precision of the correlation between index and biomass.

Two separate SPOT images were used for Downie's properties (Figure No. 06). Images had been orthorectified by SPOT and their positional accuracy checked by overlaying vectors of property boundaries, and streamlines—discrepancies were within one band-4 pixel width (10 m). The two images were not mosaiced and were classified separately. Both images were cloud-free summer images acquired midmorning local time (10-Jan-2010, 23:56:34 UTC and 15-Dec-2009 00:15:21 UTC, for the eastern and western images respectively).

[19] Tasmanian Department of Infrastructure, Energy & Resources (2009) Tasmanian Government Policy for Maintaining a Permanent Native Forest Estate, available from <http://www.dier.tas.gov.au/__data/assets/pdf_file/0016/14506/PNFEP_final_23dec09.pdf> [accessed 28/05/10]

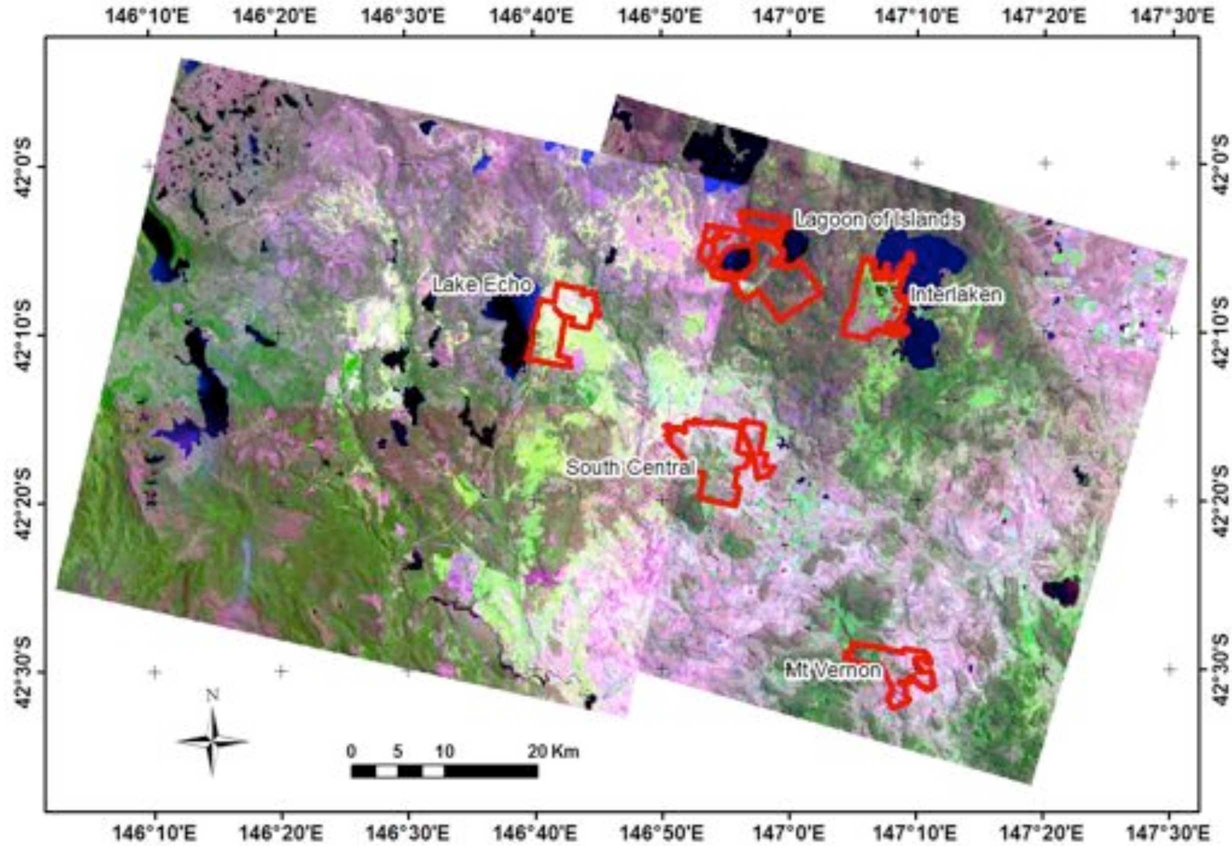


Figure No. 06. Position of properties containing project sites, overlaid on SPOT imagery (bands 4,1,2). The "South Central" area consists of three properties Southernfield, Dungrove and Weasel.

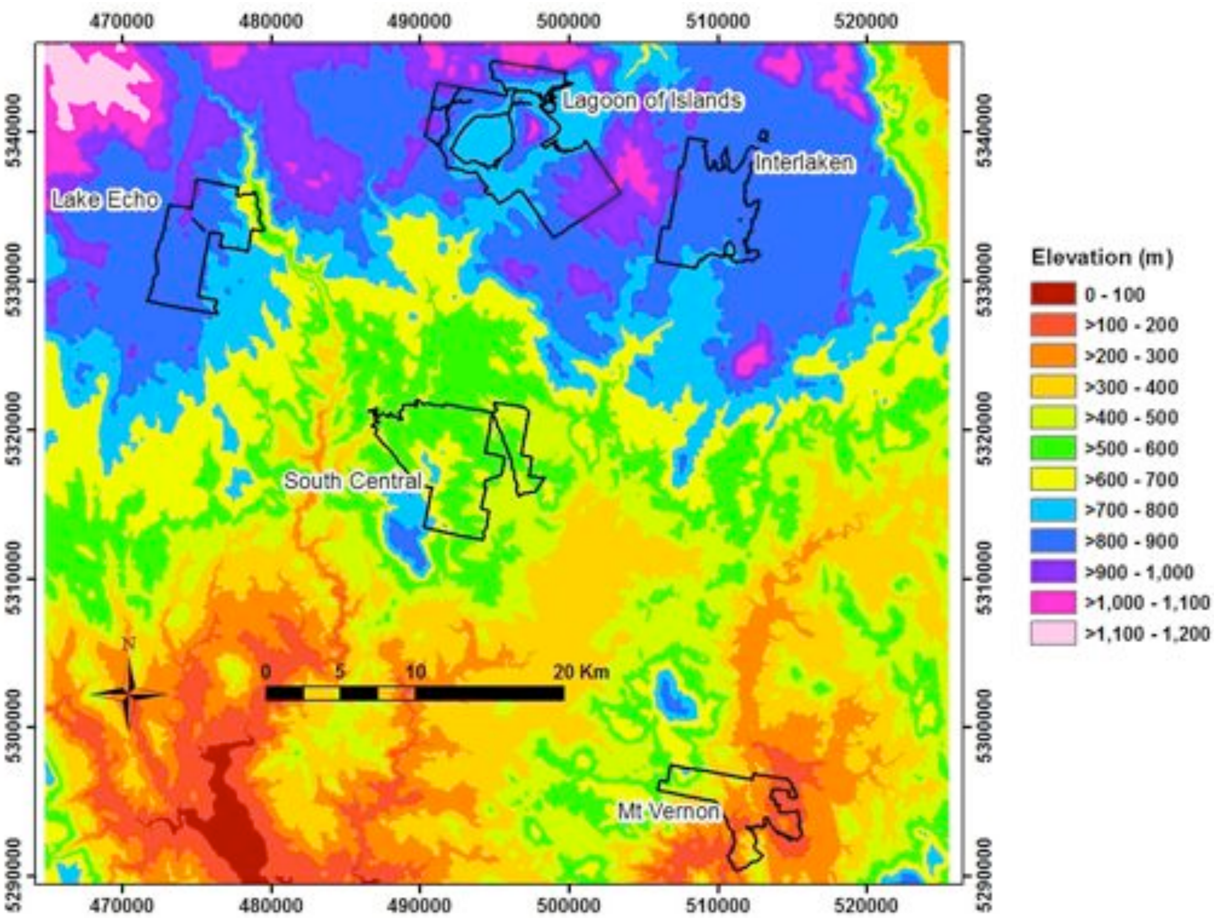
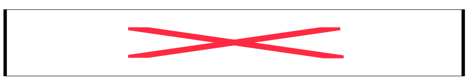


Figure No. 07. Position of properties containing project sites, overlaid on DEM (25 m resolution). Note that the maximum difference in elevation within the project area is 900 m, going from near sea level to subalpine. (UTM projection, datum GDA94, zone 55.)

Two methods of differentiating vegetation were tested: (a) vegetation indices NDVI and NDSVI:

$$NDVI = {(NIR - red)}/{(NIR + red)}$$



and (b) [ISOCLASS] unsupervised classification into 30 classes. The classification was based on a composite image formed from all four SPOT bands plus the digital elevation model (DEM) (Figure No. 07), topographic aspect and topographic slope. The topography was included to counteract differentiation due to, for example, sun angle, while still allowing topographic effects on biomass or vegetation type to be differentiated through the SPOT radiances.

The method using vegetation indices did not represent the distribution of biomass well because it did not differentiate between tree foliage and grass foliage (either tall or lush). However, the unsupervised classification differentiated trees from grass well, possibly owing to a combination of influences from photosynthetic and non-photosynthetic biomass, and tree shadows. This differentiation was pronounced, with trees typically being in classes < 9 (from the total of 30), bare soil being > 25 and grass in between these two. Effects were confirmed by comparison with high resolution imagery in Google Earth© (sub-metre pixel width of pan-sharpened colour QuickBird) and with basal area data from fieldwork. Areas of standing water were excluded from the classified image using the normalized difference water index (NDWI) and a threshold to limit it to the water body:

$$NDWI = {(red - SWIR)}/{(red + SWIR)}$$

This left those classes with smaller numbers to represent only the areas of potentially higher biomass.

Project areas were stratified for biomass sampling, representing: (a) the unsupervised classified imagery, (b) differences between geographic locality, and (c) differences in major vegetation types (Table No. 06). The GIS layer of vegetation segregated major forest or grassland types.[20] The majority of the more-dense forests (by area) were dominated by *E. delegantis*, which was therefore a principal grouping factor; with other species such as *E. pauciflora*, *E. rodwayii* and *E. dalrympleana* contributing to woodland of varying canopy cover across a variety of soil types (illustrated by Figure No. 08). Lake Echo and Mt Vernon were stratified separately due to their distance from the other properties, leading to both different elevation and different SPOT imagery.

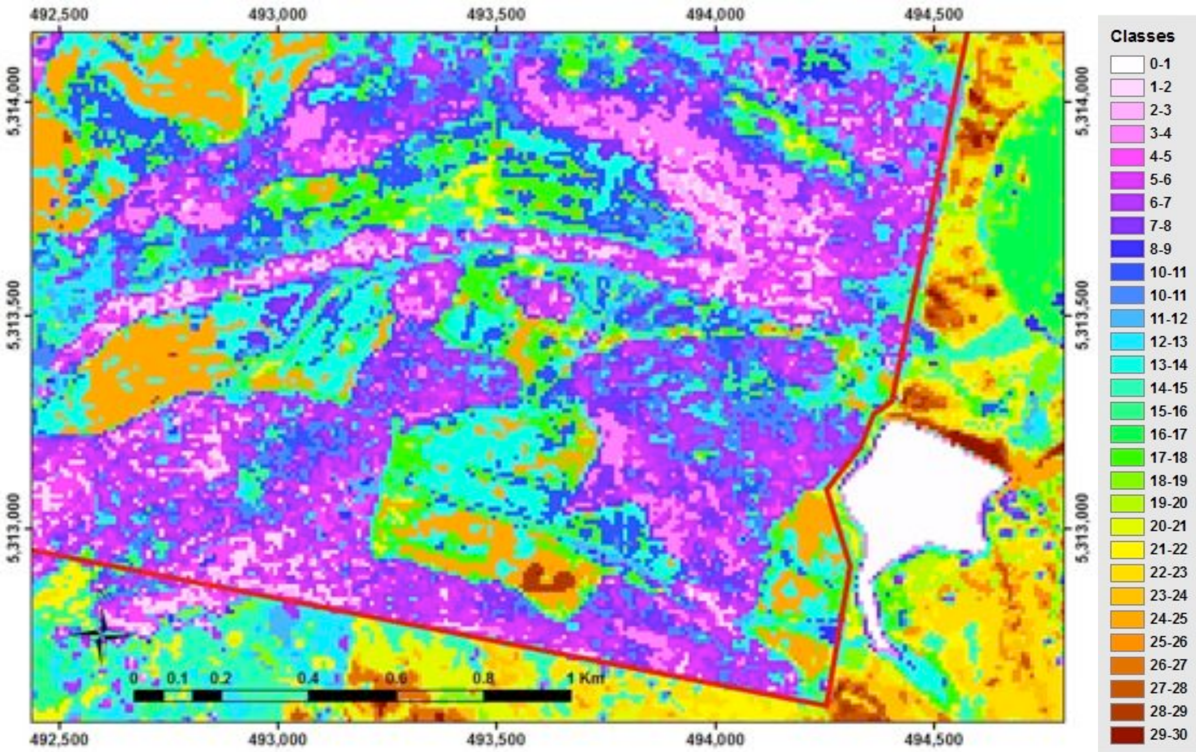
Table No. 06. The original stratification for plot allocation in the project area.

Property Grouping	Properties	Classifications*	Area (ha)	Number of plots
"Southern Central"	Southernfield, Dungrove, Weasel	≤ 5 wet *E. delegatensis*	149	11
		≤ 5 not wet *E. delegatensis*	385	21
		6 – 8	409	22
		≥ 9	520	20
"Northern"	Lagoon of Islands, Interlaken	≤ 6 *E. delegatensis*	1680	27
		≥ 7 *E. delegatensis*	2817	27
		not *E. delegatensis*	1015	29
Mt Vernon	Mt Vernon	*E. obliqua*	249	21
		E. delegatensis	121	7
		≤ 7 *E. pulchella*	6.94	3
Lake Echo	Lake Echo	≤ 5	195	8
		6 – 10	216	14

* Numbers under this column refer to the 30 classes in classified SPOT imagery; smaller numbers correspond to higher biomass.

[20] TASVEG 2.0, Department of Primary Industries, Parks, Water and Environment, Tasmania

(a)



(b)

Figure No. 08. A section of southern Dungrove showing variation in forest cover. (a) Google Earth© imagery, and (b) classified SPOT imagery (UTM projection, datum GDA94, zone 55). Property boundary as red line.

An approximate quantitative guide to the distribution of biomass within each stratum was obtained from the nation-wide 250 m resolution biomass layer from the Department of Climate Change (Canberra). The number of plots required, “n”, for each stratum was determined from:

$$n = \frac{(N \times s)^2}{\frac{N^2 \times E^2}{t^2} + N \times s^2}$$

Where:

$$N = \frac{\textit{stratum area}}{\textit{plot area}}$$

t = sample statistic from the t-distribution for the 95% confidence interval, set at 2
s = standard deviation of biomass in stratum, and
E = allowable error = mean stratum biomass *x* fractional precision required

Plots were square, of side length 45 m. The method of placing plots (deciding their geographic location) was “random” but such that plots were not placed unnecessarily near perimeters of strata. An aid to this location mechanism was to resample the classified imagery to 200 m and 100 m and locate pixels corresponding to specific stratum at these coarser grid resolutions. Within the 200 m pixels, plots were located within the stratum of interest at the 100 m level. If an insufficient number of pixels of the desired stratum were not identified at the 200 m level then the finer 100 m grid was used to find plots. Similarly, if, when placing plots using the 100 m raster, a sufficient number of plots could not be located then they were positioned using the original, finer 10 m layer. This process ensured that plots were located within the most contiguous areas of a given stratum, which also meant they had a low probability of straddling neighbouring strata. Such placement could lead to a bias in the sampling, such that the more fragmented areas in the strata were not adequately represented. However, fieldwork data were later used to consolidate these strata according to areas with comparable aboveground trees, producing the final strata described below (Table No. 07). Since the biomass gradient across the area (i.e. the gradient between the original strata) was not sufficient to warrant multiple strata, in almost all cases, the strata were consolidated to propery level. For example, the three original strata delineated within Mt Vernon were reduced to the single stratum, 'Mt Vernon'. The sampling was therefore clearly representative of the single final stratum on each property. These strata had non-fragmented boundaries defined by property or forest borders.

Table No. 07. Final stratification of the Redd Forests’ project area

Stratum	Property(ies)	Area (ha)	Number of plots	Average merchantable volume of timber (m^3/ha)	Level of error (decimal)
Interlaken	Interlaken	925	29	164	0.08
Lake Echo	Lake Echo	411	22	190	0.06
Lagoon of Islands: high biomass	Lagoon of Islands	1868	36	226	0.10
Lagoon of Islands: low biomass	Lagoon of Islands	3086	40	104	0.09
Mt Vernon	Mt Vernon	377	29	111	0.05
Southern Central	Dungrove, Southernfield, Weasel	1463	67	115	0.06

Forest inventory methods

Plots were allocated according to the procedures and original strata described above, and as depicted in Figures 09 - 13.

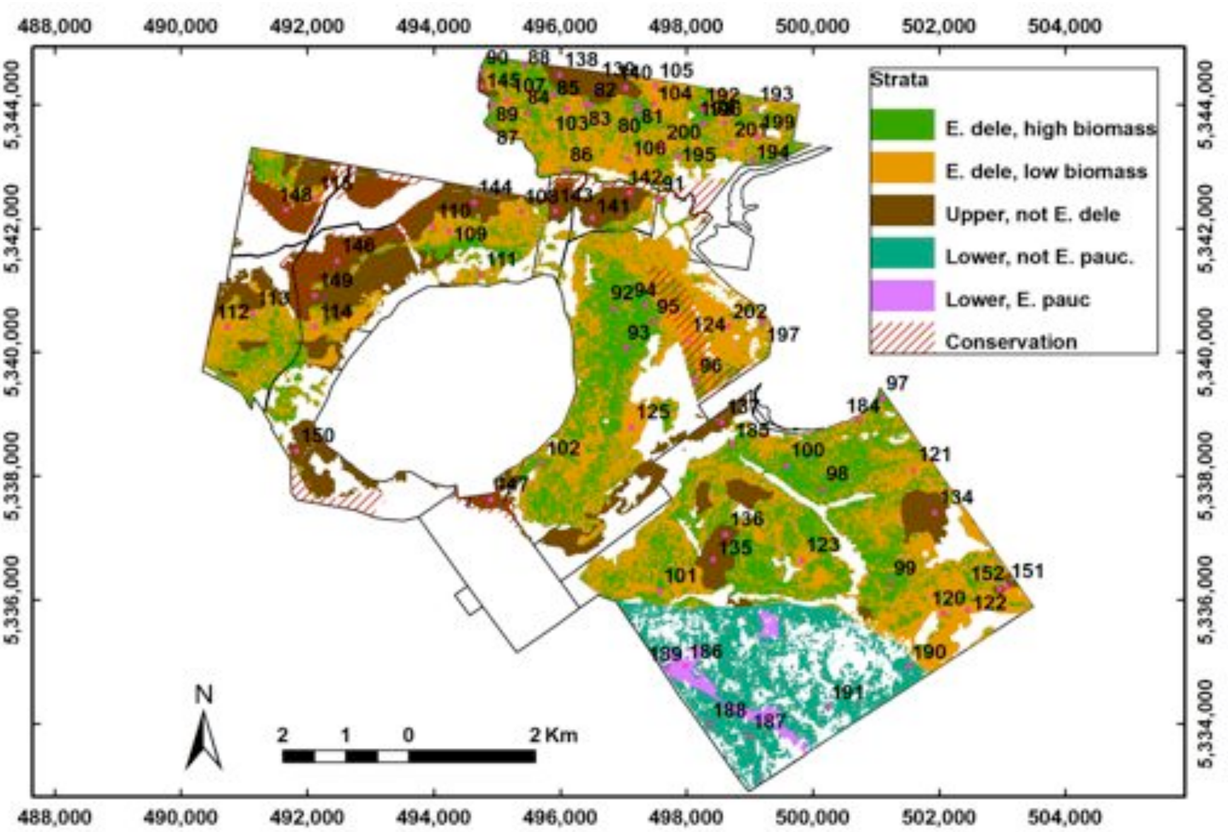


Figure No. 09. Strata and plots on Lagoon of Islands.

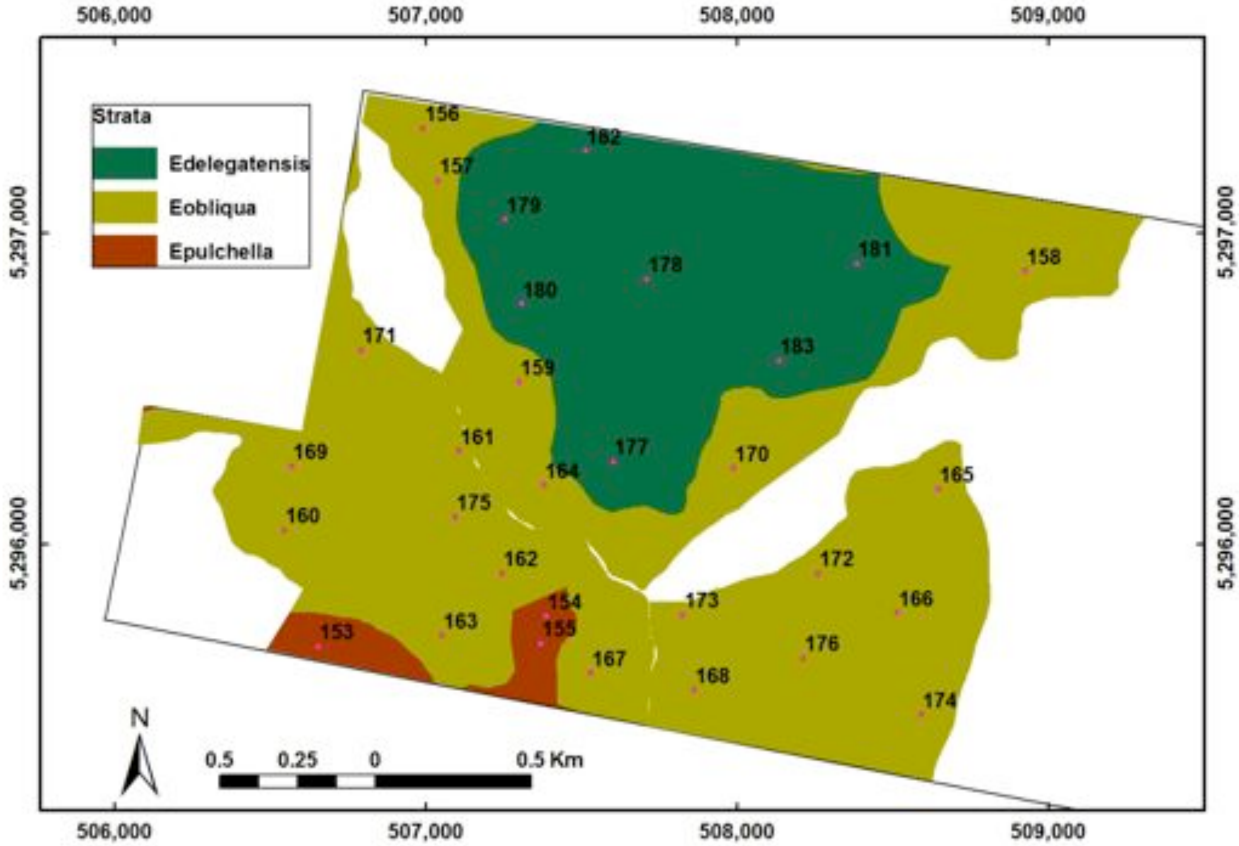


Figure No. 10. Strata and plots on Mt Vernon

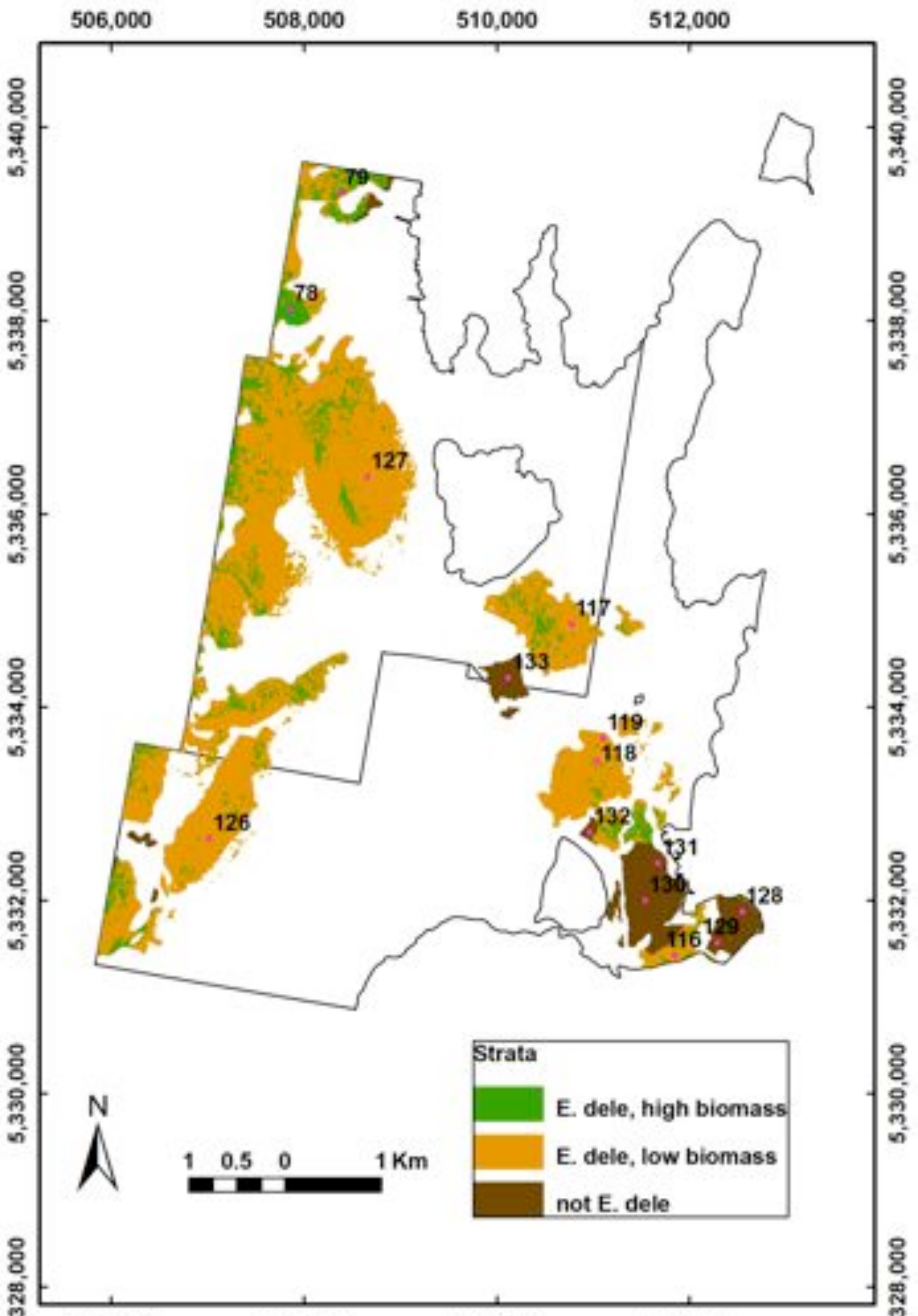


Figure No. 11. Strata and plots on Interlaken.

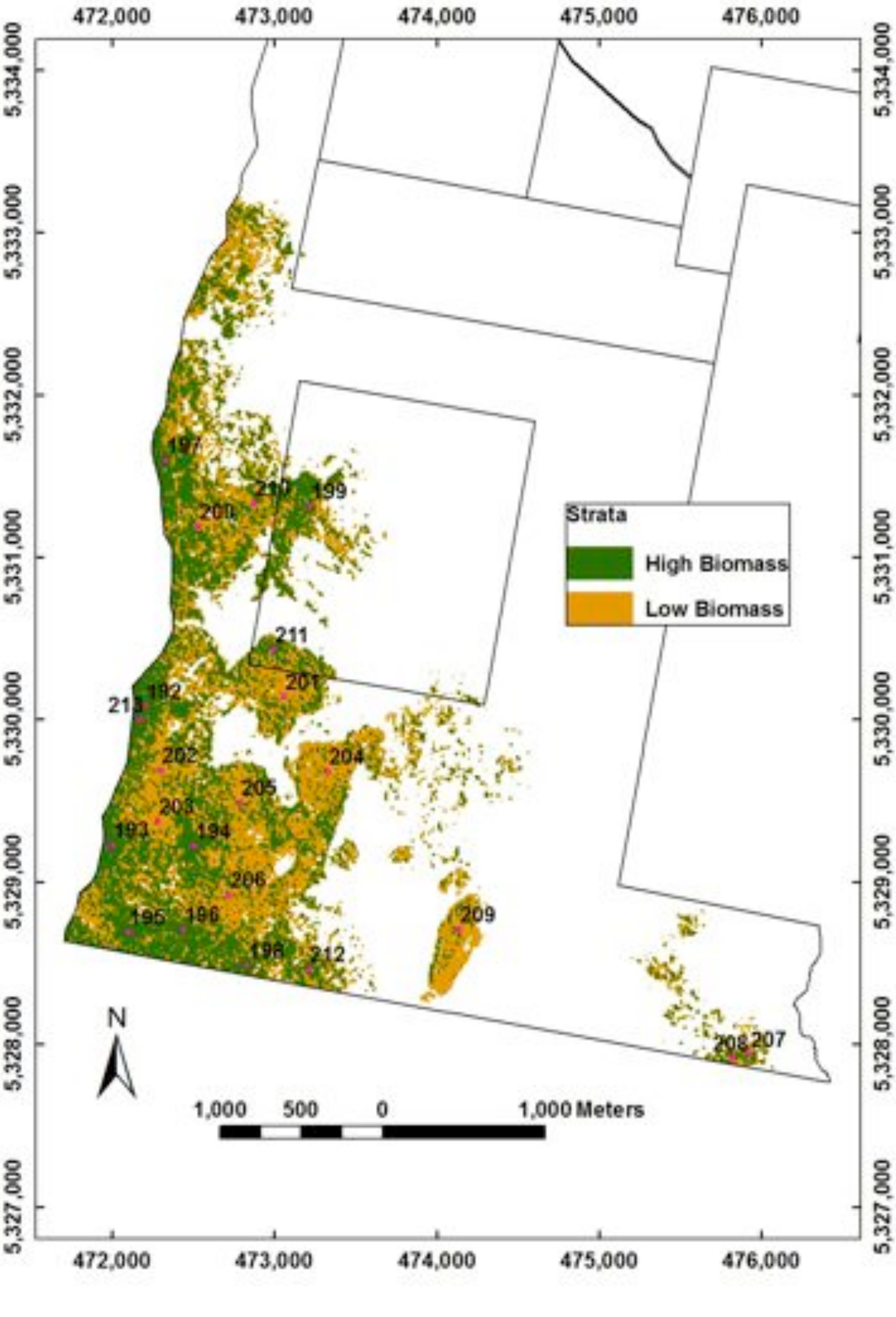


Figure No. 12. Strata and plots on Lake Echo.

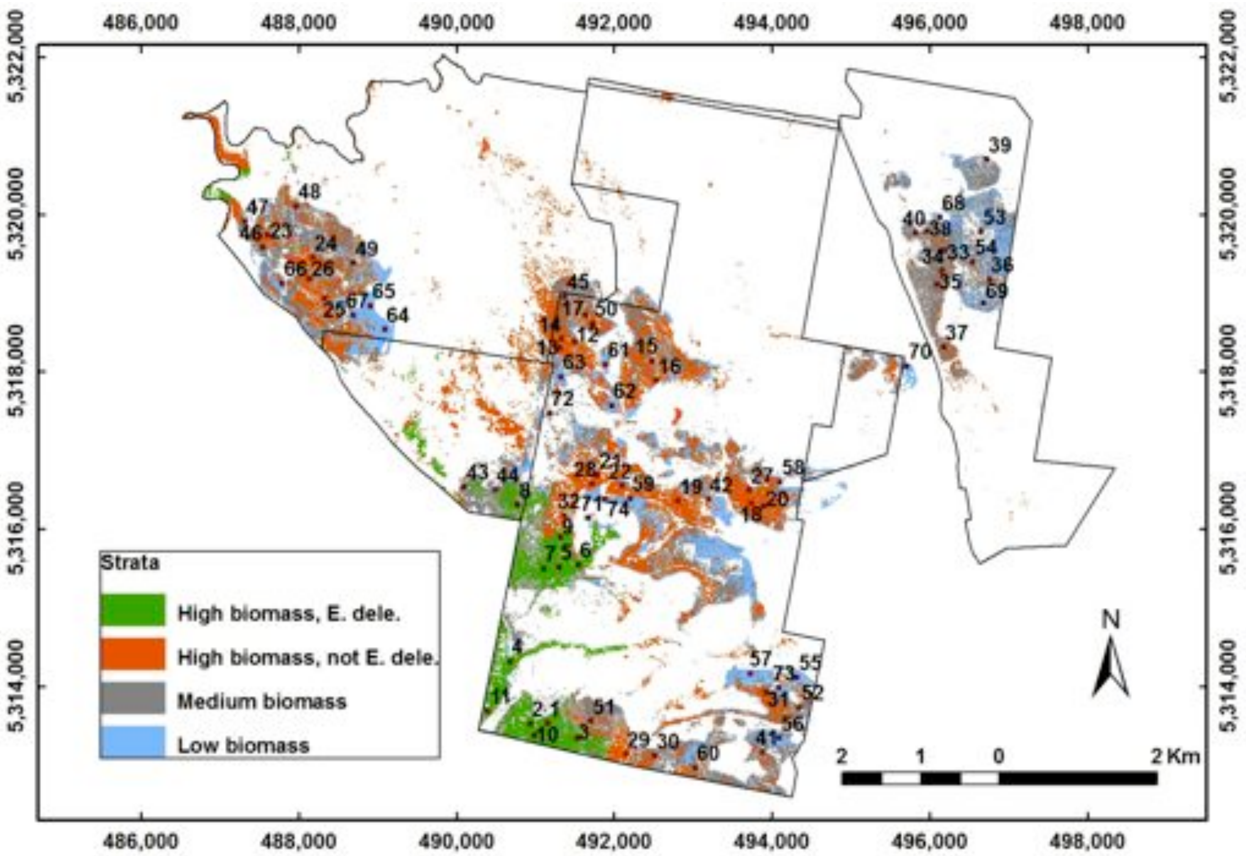


Figure No. 13. Strata and plots on Southern Central (Weasel, Dungrove and Southernfield).

The individual plot dimensions were 45 by 45 m (0.2025 ha). The sides of the plots are aligned with the magnetic compass directions (N, S, E and W) in the field. The locations of plot corners are recorded using GPS. The sides of the plots are determined in the field with compasses and measuring tapes. The corners of each plot are marked with a stake and flagging tape, with the plot sides marked with flagging tape. Thus the plots and their locations can be retrieved during the project period for monitoring.

Data collected for each plot are:

- Date, time, staff involved;
- GPS coordinates for the corner edge of plots;
- Vegetation community type (according to the Tasmanian vegetation classification system);
- Topographic slope and aspect (in degrees);
- Brief description of logging and fire history;
- The DBH of live trees and standing, solid dead trees (as described above). Trees measured in the plots were of DBH ≥ 15 cm. Australian governments recommend measuring DBH ≥ 10cm in a standard forest inventory (e.g. Queensland[21], Tasmania[22]): however, this was considered impractical in the field

[21] Miller, R. (2006) National Forest Inventory <http://www.cqfa.com.au/documents/1231124274_native_forest_inventory.pdf> Australian Department of Agriculture, Forestry and Fisheres; Queensland Department of Primary Industries and Fisheries [accessed 5/11/2010]

due to the high number of very trees with such a low diameter, while using a higher minimum DBH provides a conservative estimate of aboveground trees. Diameters were measured at 1.3m with DBH tapes using the Australian Forestry Standard (which matches IPCC guidelines). Tree basal hollows were recorded, approximated as either a cone or cylinder.

- Photographs to record vegetation and disturbance characteristics;
- Any other noteworthy features.

In addition, the height of at least 10 large trees per species was measured using a LaserAce Hypsometer.

Processing the data

The complete set of DBH and height data were recorded on waterproof paper, using pencil, in the field. The data was then entered into an Excel spreadsheet, and checked independently to ensure consistency with the field data. Electronic copies of this data were stored in two locations.

1.17 List of commercially sensitive information (if applicable)

N/A

2.0 VCS Methodology

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices

This project will use the VCS approved VM0010: Methodology for Improved Forest Management: Conversion of Logged to Protected Forests. This methodology was developed by GreenCollar Solutions Pty Ltd, validated by Rainforest Alliance and DNV, and approved on 11 February 2011. The methodology is available from http://www.v-c-s.org/docs/VM0010%20Methodology%20for%20IFM%20LtPF%20v1.0%20-%2011FEB2011.pdf.

The project also uses:

- The VCS Tool for AFOLU Methodological Issues
- The Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities
- The CDM Tool for the Calculation of the number of sample plots for measurements within A/R CDM project activities
- The VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination

These methodologies fulfil the project proponent's goal of preventing emissions from and clearfell by using carbon finance to protect the project sites.

[22] Brack, C. L. (2004) Projecting native forest inventory estimates from public to private tenures, *Australian Forestry* **67**(4) 230-235

2.2 Justification of the choice of the methodology and why it is applicable to the project activity

This methodology is designed for areas that have been approved for timber harvesting activities. The project site satisfies this requirement because of the concessions for clearance and conversion to pasture available to the project proponent.

The project proponent is seeking to use carbon finance to protect a forest from both ongoing selective logging and clearfelling for conversion to pasture. The methodology provides the means to conservatively estimate the carbon emissions generated under the baseline scenario of clearance and conversion, compared with the project-scenario of improved forest management. In particular, this methodology identifies the relevant carbon stocks, provides the equations to calculate emission reductions and identifies the relevant conditions to demonstrate eligibility and additionality. Therefore, the methodology is compatible with the goals, circumstances and activity of the project proponent.

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project

The only greenhouse gases being considered are carbon dioxide and methane (to determine likely emissions in case of fire). This satisfies the recommendations of the VCS Tool for AFOLU Methodological Issues. The carbon pools considered in the calculations include changes in carbon stocks found in aboveground trees, dead wood and harvested wood products. Aboveground trees and harvested wood products are both carbon sinks, the former storing carbon in the project scenario and the latter in the baseline scenario. Harvested wood products must be included because deforestation does not necessarily lead to net atmospheric emissions if long-lived products retain carbon. It is important to note that the historical and future planned harvesting within the project area is predominantly for pulpwood (80-100%) and therefore has a high rate of atmospheric emission.

Carbon pools in belowground trees, litter and soil have not been included. These sinks are typically less than the *de minimis* (5% of total increase in carbon stock) on mineral upland soils; and in any case, their exclusion is conservative. For example, the exclusion of carbon stored in organic matter in the soil satisfies the A/R CDM Methodology "Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in CDM A/R project activities"[23]: the project area does not include organic soils, erosion is reduced by retaining the forest and fine litter remains on-site. The exclusion of vehicular emissions from logging is similarly conservative; while nitrous oxide does not need to be considered as no nitrogen fertilisers are used nor nitrogen-fixing species planted.

[23] CDM Executive Board (2007) Annex 15: Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in CDM A/R project activities <http://cdm.unfccc.int/EB/033/eb33_repan15.pdf> [accessed 19/10/10]

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario

The baseline projections outlined in Table No. 08 were prepared by Peter Downie, the landowner. This business-as-usual scenario is in accordance with historical practice (as documented in the logging history documented in Table No. 04 and supported by past Forest Practices Plans), while the combination of clearfell for pasture and large-scale selective logging also reflects common practice among private landowners in Tasmania.

The land's capacity to support this logging was tested against estimates of merchantable volume of timber generated through fieldwork and modelling of regeneration rates with FullCAM.

Table No. 08. The logging plans developed by the landowner, based on historical extraction levels, FullCAM regeneration rates and immediate pressures for land conversion from changed legislation. These projections form the business-as-usual baseline scenario.

Stratum	Date	Event	Area logged (ha)	Volume logged (% merchantable timber across the stratum at time of logging)	Volume logged (tonnes/hectare)
Interlaken	2011	Clearfell	40	100	6560
	2012	Clearfell	40	100	6560
	2015	Thin	845	70	101 000
	2029	Thin	845	70	101 000
Lake Echo	2010-2011	Thin	411	70	53 000
	2028	Thin	411	70	53 000
Lagoon of Islands - high biomass	2013-2014	Thin	748	70	100 000
	2018-2019	Thin	374	70	52 000
	2020-2021	Thin	374	70	52 000
	2025-2027	Thin	374	70	52 000
	2033-2034	Thin	748	70	100 000
Lagoon of Islands - low biomass	2026-2027	Thin	1049	70	83 000
	2028	Thin	524.5	70	42 000
	2030	Thin	524.5	70	42 000
	2034	Thin	524	70	42 000
Southern Central	2010	Clearfell	80	100	13 200
	2011	Clearfell	80	100	13 200
	2012	Clearfell	80	100	13 200
	2022	Thin	408	70	37 000
	2023	Thin	408	70	37 000
	2024	Thin	408	70	37 000
Mt Vernon	2010	Clearfell	40	100	5200
	2012	Thin	337	60	27 000
	2032	Thin	337	60	27 000

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality)

The carbon stock change is determined from the difference between the base year carbon stock and projected growth in the forest, minus stock change due to harvest, plus stock change due to regrowth after harvest. When iterated for each year of the harvesting plan, this sequence delivers the net change in carbon stock in the baseline. There is a net reduction in GHG emissions because the existing carbon stock (aboveground trees and dead wood) is protected from the clearance that would have occurred under a business-as-usual scenario. The extensive logging history and listed Forest Property Plans of the landowner demonstrate this risk (Table No. 04).

Under the baseline scenario, a fraction of the carbon currently in the aboveground trees would have been stored in harvested wood products. However, the younger a forest, the lower the carbon stock in the biomass and soil. Preventing ongoing logging enhances the carbon stock on the project site because of ongoing sequestration in the native Eucalyptus forests.

The project satisfies the VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities. This tool was developed and is issued by the VCSA, and approved on 21 May 2010.

STEP 1: Identification of alternative land use scenarios to the AFOLU project activity

1a: Define alternatives to the project activity:

The project activity in this scenario involves the continuation of the pre-project land use, i.e. the native forest on site remains standing, using carbon finance to generate revenue from improved forest management.

There are six alternative land use scenarios to the AFOLU project activity. The first requires no additional technologies or inputs, but options 2-5 require various forms of logging and transport machinery, as described in the Forest Practices Code.

1. Native forest remains standing:
   This scenario fulfils one of the alternative land uses identified in the VCS Tool for Demonstration and Assessment of Additionality: it describes the project activity without registering the project as an AFOLU activity. In this scenario, the landowner generates no income from the property. Given the landowner's intentions and legal right to continue forest harvesting, the continuation of the pre-project activity is only plausible when supported by carbon finance. Therefore, this is not a credible or realistic scenario.

2. Selective logging:
   The landowner adopts a policy of sustainable selective logging on the property. This is the second alternative land use identified in the VCS Tool for Demonstration and Assessment of Additionality: the continuation of the pre-project activity. This is a plausible scenario, and indeed the projected land use for Lake Echo and Lagoon of Islands; as well as most of the forest in Mt Vernon, Dungrove, Interlaken and Weasel. These sites have a long history of selective logging because there is a high proportion of good quality timber trees with relatively high regrowth rates (notably *E. delegatensis*,

but also *E. pulchella*, *E. amygdalina*, *E. viminalis*, *E. obliqua*, *E. pauciflora*, *E. tenuiramis*, *E. ovata*, *E. rodwayi*, *E. gunnii* and *E. dalrympleana*). It would be financially attractive to log these properties at a sustainable rate to maintain a flow of revenue: in short, the financial incentives support a sustainable selective logging approach.

3. Clearance and native regeneration:
   The landowner adopts a policy of clearfell and native regeneration. This baseline scenario would generate a high number of carbon credits, due to the very high emissions from clearfell in the first few years of the project activity and the slow regeneration of native species in later years. This is a credible scenario because a) it is permitted under the existing legislation; b) because it generates high returns with low costs; and c) because it is a widely adopted land use in Tasmania. However, this scenario does not generate equally high revenues for the landowner in the longer run because many smaller Eucalyptus trees are felled before they are a viable size. In this open, dry sclerophyll forest, it is more attract to selectively log a forest than to clearfell.

4. Clearance and conversion to plantation:
   The landowner adopts a policy of clearing the established forest for timber and establishing an *E. nitens* plantation in its stead. This approach is permitted under the established Forest Practices Plan, and has been adopted by the landowners in the past. However, the landowner is not seeking to expand his plantations due to the uncertain demand and falling prices for pulp in the international market. It is therefore not a credible baseline scenario.

5. Clearance and conversion to pasture:
   The landowner clearfells the established forest and uses the land for grazing sheep and cattle, preventing regeneration of the forest. This is a very plausible scenario for landowners who are increasing their animal stocks or trying to avoid exhausting the land by reducing stock density. The landowners have a long history of clearfelling native forests for conversion to grassland, and this is the baseline for Mt Vernon, Lake Echo, Interlaken and Weasel. Conversion would occur at the legal maximum of 40ha per year before 2015, as recent legislative changes have now banned clearfell for conversion from that point onwards.

6. Logging of native forests is banned in Tasmania:
   It is possible that the Forest Practices Authority will, in the future, impose further restrictions on the logging of native forests in Tasmania. If logging of native forests is banned, the baseline scenario would resemble the project scenario: the absence of logging would permit the recovery of native forests, and the carbon stocks would be protected and enhanced. In this scenario, the carbon stocks would be protected and enhanced. However, this is an unlikely scenario. If such policy changes were introduced, the only possible revenue from native forests would be some form of environmental compensation to landowners. Such action would also negate any landowner income derived from the sale of carbon credits (i.e. the project scenario) It is therefore unlikely that government will constrain native timber harvesting due to the loss of income for landowners, and subsequent economic and political costs of compensation. It is also worth noting that, even in discussions with environmental groups, there has been no suggestion that timber harvesting on private lands be abolished. For example, with recent discussions about the future logging of publicly owned 'State Forest" which is

currently managed by the Government Business Enterprise, Forestry Tasmania, specific reference is made to private land within the principles:

"Encourage and support but not mandate to seek assistance for certification and protect, maintain and enhance high conservation value forests on their properties[24]*."*

This reflects the political reluctance to impose any form of regulation on private forest logging. Instead, it is more likely that the need for Forest Stewardship Council or similar certifications will be imposed on native forest wood products, compared to plantation-sourced timber. Such regulations will still permit logging events and the accompanying greenhouse gas emissions.

1b: Consistency with mandatory laws and regulations:

The land use scenarios identified above are in compliance with all the applicable legal and regulatory requirements: the *Forest Practices Act 1985*, the Forest Practices Code 2000 and the Forest Practices Regulation 2007. These were not developed to avoid greenhouse gas emissions, but to regulate harvesting practices. Moreover, selective logging with limited clearfell for conversion conforms to historical practice, and therefore provides the baseline scenario for this project.

The clearance of native forests for plantation or pasture is only legally permitted at a rate of 40ha per year per property until 2015. This is based on the 2009 policy amendments for the issuance of Forest Practices Plans and illustrates the goal of the "Tasmanian Government Policy for Maintaining a Permanent Native Forest Estate" (December 2009) to end 'broad scale clearing' by 2015. This land use could therefore not be implemented across the whole project site.

It is worth noting that the FPA's Annual Report (2008-2009) reported that "the rate of conversion to plantation increased from 2007-2008 levels despite cessation of conversion on State forest and by some large forestry companies complying with the voluntary Australian Forestry Standard. The FPA notes that conversion continued to be carried out at a high level on private land". This demonstrates the clearance for pasture planned on Downie's scenario over the next five years is a very viable baseline scenario for most Tasmanian native forests, at least until 2015." It also worth noting that the current policy relating to 2015 is not certain, i.e. it may or may not result in actual legislative change.

As outlined above, Option 6 – the abolition of logging on private land – is not regarded as a plausible policy shift.

STEP 2: Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios.

2a: Determine appropriate analysis method

Since the project activity generates no financial or economic benefits other than carbon-related income, the simple cost analysis can be used.

[24] *Tasmanian Forest Statement of Principles to Lead to an Agreement* http://www.premier.tas.gov.au/__data/assets/pdf_file/0009/134991/draft_principles.pdf {accessed 23/11/2010)

2b: Option I. Apply simple cost analysis

An overview of the project costs is available for review by the validator.

The project activity only generates income from the sale of carbon credits. The most significant cost involved in developing the VCS IFM project is hiring Redd Forests Pty Ltd to undertake fieldwork and prepare the Project Design Documents in accordance with the Community, Climate and Biodiversity Standard and Voluntary Carbon Standard.

The proponent incurs the cost of project implementation and forfeits income from the sale of pulp and sawlog timber. However, they also have the option of letting the forest stand without any logging or carbon-financed protection. While this generates no income, it is a viable alternative scenario and cheaper than the CDM/VCS project activity.

Therefore, the project activity satisfies the investment analysis for additionality.

STEP 3: Barrier analysis.

This step does not need to be completed. If the simple cost analysis in Step 2 reveals a less costly alternative land use (i.e. allowing the native forest to remain standing without either harvesting or establishing an IFM project), then Step 3 can be by-passed and the analysis move directly to Step 4: common practice analysis.

STEP 4: Common practice analysis.

4a: Analyse other activities similar to the proposed project activity.

There is one similar project activity being undertaken in Australia. This is the nearby Redd Forests' pilot project, established on Woodside Park in the Northern Midlands bioregion of Tasmania. This Improved Forest Management project covers 860ha, 790ha of which is vulnerable to logging, and is therefore on a much smaller scale than this project. The pilot project also has a baseline of selective logging, extracting around 70% of the merchantable volume in the aboveground trees over twenty year logging cycles. It is projected to avoid in excess of 4000 tCO2-e of emissions per year.

4b: Discuss any similar options that are occurring

Improved Forest Management (Logged to Protected Forests) is not a financially competitive land use without carbon finance. Indeed, it generates no revenue apart from carbon finance. For this reason, the proposed project activity would not be implemented without the incentive of VCS approval and subsequent sale of carbon credits. This explains why this land use is additional and not common practice in Tasmania.

However, the project proponent and developer hope that successful projects will encourage the protection of native forests using of carbon finance by landowners, thereby protecting biodiversity and carbon sinks in Tasmania.

3.0 Monitoring

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices

This project will use the monitoring schedule and plan outlined in the VCS approved "Methodology for Improved Forest Management: Conversion of Logged to Protected Forests".

The monitoring requirements outlined in this methodology are designed specifically to address the needs and concerns associated with Improved Forest Management project activities. They are therefore appropriate for this specific project.

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches

The purpose of monitoring a VCS project is to ensure that the carbon credits issued by VCS provide an accurate representation of the carbon offsets generated through improved forest management. The monitoring techniques should assist the project proponent in establishing a credible and transparent schedule for these carbon credits, meeting accepted standards for data collection, recording and quantification.

The recorded project boundaries (in KML files) shall be examined against recent satellite images (where available) to ensure that deforestation has not occurred to reduce the project area. Any variations in the forested area will be calculated as a percentage of that stratum's total area, and incorporated into the uncertainty calculations.

In conformance with Step 8 of the methodology for this project activity, monitoring requires ongoing assessment of carbon stock changes on the project site compared with those that would have been generated under the selected baseline scenario. Data and information to be reported and stored will include:

- the geographic position of the project boundaries;
- the GPS coordinates of permanent sample plots and transects;
- aboveground trees inventory from field sampling throughout the project's lifespan; and
- the stock assessment equations and greenhouse gas assessment equations used to estimate net anthropogenic GHG emission reductions (detailed in the identified methodology)

The data relating to the standing carbon stock shall be assessed through repeat sampling of permanent field plots in each stratum. The same plots shall be sampled at a monitoring event every five years to reduce variables and gain a more accurate idea of growth rates between monitoring events. The plots that will be repeatedly measured are:

Table No. 09. Permanent sample plots for repeat sampling, identified by stored waypoints.

Strata:	Plots:
Interlaken	94, 96, 97, 100, 111, 128

Lagoon of Islands (high biomass)	83, 92, 95, 97, 114, 181, 189, 193-1
Lagoon of Islands (low biomas)	103, 111, 112, 128, 136, 141, 144, 146,
Lake Echo	193, 196, 207, 213
Mt Vernon	160, 163, 165, 167, 170, 177, 183,
Southern Central	1, 6, 8, 11, 12, 26, 28, 47, 57, 58, 60, 64, 67, 74,

These plots were selected using a random number generator[25]. There should be enough permanent plots to assess carbon stock changes to 15% variance within a 95% confidence interval: if not, more of the original sampling plots must be identified – again using a random number generator – and measured as required.

The data generated during fieldwork must be run through Equations 13-16 of the GreenCollar IFM Methodology. The results will be compared to the projected growth, as modelled by FullCAM. The plots will be sampled using a DBH measuring tape, using the standard operating procedures for forest inventory utilized during the initial assessment. The mean and standard deviation of the field data collected will be run through the Winrock sampling calculator. This will determine any uncertainty with respect to sampling error, and accordingly the extrapolation from carbon stocks to emissions for the baseline and project case. The project proponent will be responsible for implementing monitoring events every year, with fieldwork to assess changes in carbon stocks required at a maximum interval of every five years.

The annual monitoring events will involve a comparison of cadastral parcels to check whether project boundaries have changed; a comparison of recent and original satellite imagery to identify the presence and scope of any natural disturbance; and the extrapolation of forest growth trends, based on past field sampling and FullCAM modelling.

In the case of natural disturbance including fire, a monitoring event shall be conducted. Calculations of carbon emissions shall be based on Equations 17-19 from the methodology.

Commercial forest harvesting is regulated through the Tasmanian Forest Practices Authority (FPA). Illegal logging is absent or *de minimis* on private lands. This is partially because forest harvesting on private land can only occur with the consent of the landowner, and property boundaries are well-marked and recognised within Tasmania. Secondly, the major markets for forest products are saw millers and three large export woodchip mills. Timber can only be sold in these markets when associated with an approved Forest Practices Plan.

According to the 2008-2009 Annual Report, the Forest Practices Authority has established three levels to monitor compliance with the FPPs:

1. Routine monitoring of operations by Forest Practices Officers employed by forest managers. This level of monitoring is often undertaken as part of formal environmental management systems and the Australian Forestry Standard, which also involve third- party audits.

[25] Haahr, M. (2011) Random.org, Trinity College, Ireland Available from <http://www.random.org/> [viewed 07/03/2011]

2. Formal reporting on compliance is required for all FPPS under s. 25A of the *Forest Practices Act, 1985*.
3. Independent monitoring is carried out across a representative sample of FPPs in accordance with s.4(E)(1)(b) of the Forest Practices Act.

Given the requirement that all forest harvesting must be undertaken through a certified forest practices plan which, in the case of private land, must be initiated by the landowner, 'illegal logging' within Tasmania would constitute logging that involves breaches of the Forest Practices Code rather than logging that occurs with no forest practices plan. The FPA reports that there were 5 instances where fines for breaches were imposed during the financial year 2008-2009.

During the year ending June 2009, the FPA certified 838 Forest Practices Plans for native forest and plantation operations, totaling 48 630 hectares on public and private land[26]. It is also noted that the rate of conversion of native forest to plantations within Tasmania increased (7768 ha in 2008–09 compared with 5657 ha in 2007–08) [27].

These high rates of native forest clearance represent forest harvesting that is endorsed through existing legislation. Within Tasmania, the legal instrument through which private forest harvesting is established is called a Private Timber Reserve (PTR). PTR's were created by parliament in 1985 to enable landowners to have their land dedicated for long-term forest harvesting. The legislation provides that forestry activities on private land are subject to a single, statewide system of planning and regulation through the *Forest Practices Act 1985*[28].

Firewood extraction within Tasmania does occur but the impact upon forest carbon stocks is negligible. This is because large, dead, hollow-bearing trees and fallen timber are the two timber types most targeted by wood cutters[29]; and because firewood collection tends to occur within public roadsides mainly within proximity to residential areas. The RFPA contains 10m buffers along public roadsides, since these areas are excluded from forest harvesting through the Tasmanian Forest Practices System. Private access to properties is severely restricted by locked gates and vehicular barriers. In addition, there are firewood collection permits issued for public forests within Tasmania and this reduces the demand for illegally sourced firewood from roadsides.

For the reasons outlined above, the threat to the Redd Forests Project Areas from illegal logging is negligible within Tasmania, while the threat to native forests from legally permitted logging is significant. If this is confirmed by the Participatory Rural Appraisal at the first monitoring event, there will be no need for this task to be replicated annually. The PRA will obtain from key stakeholders and authorities a yes/no answer to the question '*Is there potential for illegal extraction of trees from the project area?*'

Activity description	Indicator	Frequency

[26] Forest Practices Authority, Annual Report, 2008 – 2009.
[27] Forest Practices Authority, Annual Report, 2008 – 2009.
[28] Forest Practices Authority, Annual Report, 2008 – 2009.
[29] Resources Planning and Development Commission (2003) State of Environment Report Tasmania <http://soer.justice.tas.gov.au/2003/bio/4/issue/10/ataglance.php> <accessed 15/11/2010>

Complete a Participatory Rural Appraisal	Risk of illegal logging	At first verification event. If >20% of respondents answer 'yes', task must be repeated annually.

Quality of both field data collection and data management will be managed by using the standard operating procedures and quality control procedures of the Forest Practices Authority of Tasmania (http://www.fpa.tas.gov.au/). All data will be archived both electronically and in paper form, and stored in multiple locations for at least two years after the crediting period. The project proponent will be responsible for data archiving and quality control.

Leakage:

For this project, leakage is not a significant risk. This is based on an assessment of both activity shifting and market leakage, in accordance with Step 5 of the methodology.

Activity Shifting:

Consistent with step 5.1, an assessment was undertaken to examine the potential for activity shifting as a result of the project.

The logging projections for the property do not deviate from the historical logging records (as demonstrated in Table No. 02) and are consistent with current legislation.

In addition, the landowners do not hold any other forested properties in Australia, and therefore there is no opportunity for leakage through activity shifting. At each monitoring and verification event, the landowner will provide documentation on the land use of any additional forested properties in their possession, to demonstrate that leakage has not occurred from activity shifting.

Market Leakage:

Step 5.2 requires a determination of a leakage factor due to market leakage.

The GreenCollar IFM LtPF methodology states:

"The leakage factor is determined by considering where in the country logging will be increased as a result of the decreased supply of the timber caused by the project." (Box 2, page 38)

Public forests are harvested to satisfy quotas

State forests (i.e. those on public land) in Tasmania are managed by the government business enterprise, Forestry Tasmania. Specifically, these native forests are managed to meet set quotas of high quality sawlog (300 000m^3 per annum from 2010 to 2030) with pulp and other wood products produced as byproducts of the sawlog harvesting process. This is recorded both in their Sustainability Charter[30] and in the wood supply agreements with Gunns Ltd and Ta An Tasmania Pty Ltd[31]. Similar agreements have been established for all state forests in Australia, according to the National Forest Policy Statement, in order to "[provide] certainty and security for existing and new wood products industries to facilitate significant long-term investments in value-adding projects in the forest products industry."[32] State-specific quotas are detailed in Regional Forest Agreements[33]. Since state forests of Australia are harvested according to long-term quotas, there is no risk that harvesting will be shifted to native forests on public land as a result of the project.

Private native forests in Tasmania produce a minimal quantity of sawlog

The contribution of Tasmania's private native forests to the timber industry is minimal. State forests in Tasmania produce around 580 000m^3 per year, while private native forests produce around 50 000m^3. This has declined steadily from the 200 000m^3 produced on private land at the start of the decade[34]. Indeed, Tasmania contributes only 22% of all the sawlog and veneer timber harvested in private native forests, which in turn only contribute 10% of all the sawlog and veneer timber harvested in Australia[35]. Tasmania's private native forests therefore contribute only 2.2% of high value wood products - a tiny fraction. The sawlog produced on this project site (4000t per year) is minimal: this low volume ensures that it could have no impact on Australian prices, without even considering it is competing on an international market. Private native forests across Tasmania (let alone the project area) do not produce enough sawlog timber to affect price. The marginal reduction in available timber resources will not affect prices and therefore does not encourage market leakage.

Evidence from past and current forest practices plans indicate that 80-94% of the timber from the project area is used to produce pulp and paper products. However, as detailed above, public forests across Australia and private forests on the mainland are logged almost exclusively for sawnwood. In these instances, pulp is a low-value byproduct. Tasmania is the only State within Australia that harvests private, native forests almost exclusively for woodchips. There is therefore no risk of market leakage to these forests on mainland Australia because of decreased supply of timber caused by the project. The leakage factor is therefore determined by considering where logging for pulp and paper may be increased in response to the project.

Ecological constraints on forest growth

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[30] Forestry Tasmania (2008) Forest Management Plan: Sustainability Charter, p19. Available from <http://www.forestrytas.com.au/uploads/File/pdf/Charter_2008.pdf> [viewed 18/02/2011]

[31] Forestry Tasmania (2010) Wood Supply Agreements. Available from <http://www.forestrytas.com.au/forest-management/wood-supply-agreements> [viewed 18/02/2011]

[32] Department of Agriculture, Forestry and Fisheries (1995) National Forest Policy Statement: A New Focus for Australian Forests, Australia. Available from < http://www.daff.gov.au/__data/assets/pdf_file/0019/37612/nat_nfps.pdf> [viewed 18/02/2011]

[33] Department of Agriculture, Forestry and Fisheries (2010) Regional Forest Agreements Home, Australia. Available from <http://www.daff.gov.au/rfa> [viewed [18/02/2011]

[34] Parsons, M.; Pritchard, P. (2009) The role, values and potential of Australia's private native forests, Rural Industries Research and Development Corporation 09/049, Australia.

[35] Parsons, M.; Pritchard, P. (2009) The role, values and potential of Australia's private native forests, Rural Industries Research and Development Corporation 09/049, Australia.

Logging of private lands in Australia is managed on a property-specific basis. Harvesting on private land is currently conducted according to individual landowners' intentions and needs, rather than to satisfy quotas from government or processing agencies. Forest Practices Plans (or the state equivalent) are organised by landowners or their representatives. Those landowners who choose to log their native forests (rather than pursue conservation covenants) will continue to do so at one of two maximums. They will either clearfell their land and allow natural regeneration, which generates the highest possible immediate return: this was historical practice on much of Redd Forests' pilot project, where a quarter of the property was clearfelled in 2006. Alternatively, they will log to obtain the maximum sustainable yield, which involves harvesting roughly 70% of biomass every twenty to twenty-five years, exemplified by the baseline scenario for this project area. In either situation, forests are logged according to the landowners' assessments or advice from a forest agency of the volume of merchantable timber available and the price they will obtain for the sale of the woodchips and small quantity of sawn timber. ***It is therefore not ecologically viable to increase permitted extracted volumes within existing concessions because they are already harvested at (or above) the maximum sustainable rate.***

Market demand is unable to satisfy concession requirements

All available evidence indicates that native forest harvesting within Australia is decreasing, with little or no likelihood of an increase in the future. Consider the following findings from the most recent and comprehensive research into the Australian Forestry sector:[36]

> *"Low consumption growth and surging plantation resources characterises Australia's wood products industry.*
>
> *Plantations now supply 82% of the wood for solid wood products manufacturing (sawn timber and wood panels) in Australia (Figure 7). Production of native forest solid wood products has contracted by an average 2% pa over the past two decades.*
>
> *Hardwood plantation chips are decimating native forest chip exports, the single biggest market for native forest wood. On current trends, we can expect a near complete displacement of Australian native forest chip exports within the next few years".*

[36] Ajani, J. (2011) Australia's wood and wood products industry, situation and outlook, Fenner School of Environment and Society, Australian National University, Australia.

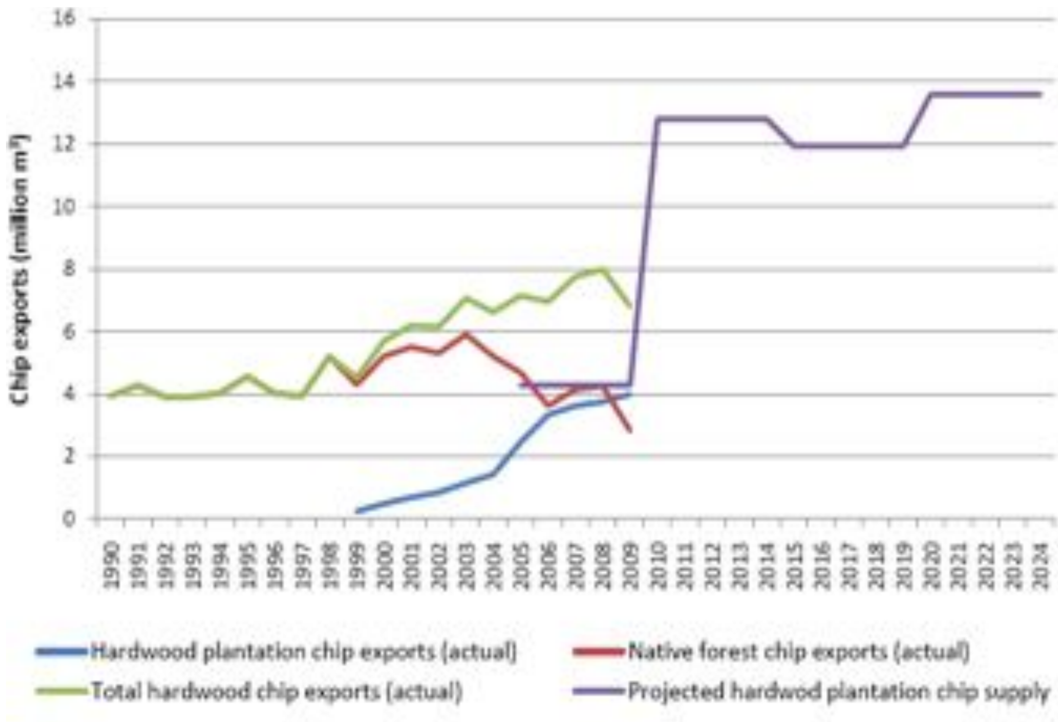

Figure No. 14. **Australian hardwood chip exports and projected plantation supply**

More importantly, ***in the absence of <u>increasing</u> market demand, annual permitted extracted volumes actually cannot be increased, nor can new concessions be issued.*** Land owners and forest agencies not only would not want to log without this demand, but actually cannot undertake a commercial logging event in the absence of an established customer demand. This is because the approval of a concession requires demonstration of the following:

- the destination of the forest product (export demand); and
- a commercial transaction record between the seller (landowner) and the buyer.

Clearly, these requirements cannot be fulfilled in the absence of increasing demand – which is the case for native forest-sourced wood products in Australia. Therefore, approval of increased commercial logging within established concessions – or the issue of additional concessions beyond the current rate – is not possible.

Annual extracted volumes are a response to current market demand and the available timber within a planned and approved harvesting area. It is neither legally nor biologically possible to increase the permitted harvest rate nor issue new concessions. This is because native forests are already harvested at the maximum sustainable rate in response to a steadily declining demand.

Falling prices remove incentives for logging

Finally, it is evident that leakage will not occur due to the shifting incentives. It is clear that timber harvesting on private land in Tasmania is determined by individual landowners in response to market demand. Private landowners, unlike publicly managed forests, are not subject to binding timber supply agreements. Therefore, annual harvesting rates will only increase if the decreased supply of timber from the establishment of the project leads to an increase in price for woodchips.

This is not plausible.

Tasmania's pulp and paper products are competing in international markets, which have been in decline for the past decade. This is firstly because supply is increasingly exceeding demand, and secondly because of a shift in market preferences from native forest-sourced to plantation-sourced wood products. This is reflected in the steadily falling price. Australian National University economist Judith Ajani calculates that the real (inflation-adjusted) price of pulp has trended downwards by an average of 2.4% per year over the past twenty years[37].

The declining value of pulp is only going to be exacerbated as supply continues to outstrip demand. Internationally, the pulp industry is expanding its capacity by more than 25 million tonnes between 2008 and 2012 – roughly five times the world's projected increase in consumption. This growth in supply is concentrated in low-cost competitors such as Indonesia, Brazil, China, Russia and Uruguay[38]. On mainland Australia, pulp is produced only as a byproduct of sawnwood[39]. In Tasmania, the pulp supply is increasing as Eucalyptus plantations across the state mature (refer to Figure No. 14). Output of plantation timber in 2004 was an estimated 2 520 000 (tonnes + m^3), but this is projected to increase to 6 640 000 (tonnes + m^3) by 2019 as these plantations mature, even with no new plantation establishment[40]. 80% of this output is intended to produce low-value woodchips[41]. The timber from the project area is certainly too minimal to impact prices. It is also worth noting that two of the three non-plantation woodchip mills in Tasmania (at Hampshire and Bell Bay) are closing down[42], which means that local demand is further suppressed, exacerbating the oversupply of native forest timber.

The well-documented decline in demand for pulp sourced from native forests, rather than plantations,[43] is driven partially by market preferences and partially by costs. The cost effectiveness of harvesting plantation for pulp far exceeds that for native forests. Harvesting plantation is a largely mechanised operation due to the consistency of tree size and distribution whereas native forests require expensive machinery, manpower and infrastructure. The trend towards plantation-sourced wood is only confirmed by the closure of these woodchip mills. To support this, a 2010 study into trends within the Tasmanian Forest Industry reports that the downturn in the industry has had the greatest impact in the native forest sector, where 41% of

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37 Ajani, J. (11/10/2007) Gunns' double-barrelled dilemma, *The Age*. Available from <http://www.theage.com.au/news/business/gunns-doublebarrelled-dilemma/2007/10/10/1191695991840.html?page=fullpage#contentSwap1> [accessed 22/02/2011]

38 Lang, C. (2007) Banks, Pulp and People: A Primer on Upcoming International Pulp Projects, Urgewald, Germany. Available from <http://www.greenpressinitiative.org/documents/BPP_A_FIN_2.pdf> [accessed 22/02/2011

39 Parsons, M.; Pritchard, P. (2009) The role, values and potential of Australia's private native forests, Rural Industries Research and Development Corporation 09/049, Australia.

40 Green, G. (2004) Plantation Forestry in Tasmania: the current resource, current processing and future opportunities, Timber Workers for Forests. Available from < http://www.twff.com.au/documents/research/pftpt1.pdf> [viewed 22/02/2011]

41 Harwood, C. (2010) Sawn timber from native forests and plantations in Tasmania, *CRC for Forestry Bulletin* **13** Available from <http://www.crcforestry.com.au/publications/downloads/Bulletin-13-Sawn-timber-properties.pdf> [viewed 22/02/2011]

42 (25/11/2010) Gunns quarantines Triabunna mill from closure, *ABC News*. Available from <http://www.abc.net.au/news/stories/2010/11/25/3076498.htm?site=northtas> [accessed 22/02/2010]

43 Nicholson, A. (11/06/2010) Demand for plantation timber continues to grow, *Stateline Tasmania*. Available from <http://www.abc.net.au/news/video/2010/06/11/2925275.htm> [access 22/02/2011]

jobs have been lost since 2006, compared to 26% of jobs dependent on hardwood plantations and 18% of those dependent on softwood plantations[44].

There is therefore no possibility that reducing timber supply from the project area will lead to harvesting of native forests elsewhere through market leakage. Output is simply too small to affect price, particularly as the supply of plantation wood is increasing rapidly and demand for native forest pulpwood is declining steeply.

The establishment of this project will therefore not lead to an increase in annual extracted volumes or to the issue of new concessions.

Illegal logging is effectively non-existent in Australia, as detailed above.

Summary

The pressure on native forests is intense because landowners believe their future income may be constrained by the shift in demand towards plantation-sourced timber (notably by the proposed Gunns' pulp mill) and because of high-level discussions about constraining logging of native forests. This is inducing landowners to obtain and use concessions to clearfell native forests for conversion to plantations: this explains why the conversion rate from native forest to plantations within Tasmania increased to 7768 ha in 2008–09 from 5657 ha in 2007–08[45]. If private land in Tasmania is not already harvested at the maximum rate, carbon financed IFM projects will not be the reason for any increase. Rather, they provide one of the few mechanisms to protect native forests while generating a competitive return.

Therefore, although this project will permanently reduce harvest levels within the project area, there is no capacity or incentive for timber harvesting to shift to other forests in Australia. Rather, IFM projects will stop not only logging of native forests within the project area, but also establishes carbon finance as a competitive land use. This will deter landowners from either ongoing selective logging or converting native forests to plantation or pasture to compensate for the declining revenue from logging. In this way, the project arguably has a negative leakage effect, promoting positive biodiversity and carbon outcomes.

There will be no leakage from market effects within national boundaries by removing the timber yield from this property. For these reasons, a leakage factor of zero was considered appropriate.

The market leakage factor of zero will be assessed at each monitoring event. The project proponent will need to provide evidence that annual extracted volumes have not increased above the baseline threshold during the monitoring period. To achieve this, the project proponent must obtain data about the net volume extracted from private native forests in Tasmania (the most probable site for market leakage to occur) during the monitoring period, or as close as possible. This should be contrasted to the average volume extracted from this area during the ten years prior to the project's start date. If the net volume is lower in the project scenario, or if spikes can be justified (for example, by unusual clearfell events by a major

[44] Schirmer J (2010) 'Tasmanian Forest Industry, Trends in Forest Industry Employment and Turnover, 2006–10.' CRC for Forestry. (CRC for Forestry: Hobart)
[45] Forest Practices Authority, Annual Report, 2008 – 2009.

forestry company), it can be reasonably assumed that no market leakage has occurred as a result of the project.

Activity description	Indicator	Frequency
Compare the annual extracted volume to the long-term average volume of extracted timber from private native forests in Tasmania.	Market leakage factor.	Annually

3.4 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Data / Parameter:	$A_{burn,i,t}$
1. Data unit:	Ha
2. Description:	Area burnt in stratum *i* at time *t*
3. Source of data to be used:	GPS coordinates and/or remote sensing data
4. Value of data applied for the purpose of calculating expected emission reductions	
5. Description of measurement methods and procedures to be applied:	Area burnt shall be monitored at least every five years.
6. QA/QC procedures to be applied:	Standard quality control / quality assurance (QA/QC) procedures for forest inventory, including field data collection and data management, shall be applied
7. Any comment:	

Data / Parameter:	*PMP*
1. Data unit:	%
2. Description:	Merchantable volume as a proportion of total aboveground trees for stratum *i* within the project boundaries
3. Source of data to be used:	Field measurements in sample plots
4. Value of data applied for the purpose of calculating expected emission reductions	
5. Description of measurement methods and procedures to be applied:	Within each stratum, divide the summed merchantable volume by the summed total of aboveground volume. Must be done at least every five years at the time of verification.
6. QA/QC procedures to be applied:	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied

7. Any comment:	*Ex ante* a time zero measurement shall be made of this factor. The timber harvest plan sets the allowable mean extracted volume from the merchantable volume of timber in the forest inventory based on legal limits.

Data / Parameter:	A_i
1. Data unit:	Ha
2. Description:	Area covered by stratum *i*
3. Source of data to be used:	GPS coordinates and/or remote sensing and/or legal parcel records
4. Value of data applied for the purpose of calculating expected emission reductions	
5. Description of measurement methods and procedures to be applied:	
6. QA/QC procedures to be applied:	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied
7. Any comment:	In the baseline scenario, strata shall not change with time. The *ex ante* assumption with the project scenario is that the strata will not change with time: modifications can be made *ex post* in the wake of disturbance.

Data / Parameter:	*DBH*
1. Data unit:	Cm
2. Description:	Diameter at breast height of a tree
3. Source of data to be used:	Field measurements in sample plots
4. Value of data applied for the purpose of calculating expected emission reductions	
5. Description of measurement methods and procedures to be applied:	Typically measured 1.3m aboveground. Measure all trees above the minimum DBH of 15cm in the sample plots. Must be measured at least every five years.
6. QA/QC procedures to be applied:	Standard quality control / quality assurance (QA/QC) procedures for forest inventory including field data collection and data management shall be applied
7. Any comment:	The minimum DBH selected for measurement on plots must be compatible

	with the required minimum DBH for the selected BCEF factor.

3.5 Description of the monitoring plan

Monitoring of the project area and natural disturbance (including fire) will be undertaken every year. In addition, carbon stock changes will be measured through fieldwork every five years. In between fieldwork, changes in carbon stocks from forest growth will be extrapolated from FullCAM modelling and previous fieldwork results.

Since the project is characterised by the creation and implementation of a protected forest in an area that would otherwise be logged, the following monitoring provisions will be adopted.

- Monitoring of carbon stocks:
  The project proponent will organise a detailed forest inventory inside the project boundaries. The plots measured as part of the initial carbon stock quantification are permanent plots, with their NE corners recorded using GPS, and the boundaries defined by stakes and flagging tape.

  The monitoring fieldwork will be identical to that outlined below, and specified in the relevant VCS methodology. This allows the carbon stocks in each plot to be assessed as a function of time. The GPS coordinates of the NE corners of each plot have been electronically stored, and the corners marked in the fields with stakes and flagging tape. In the new forest inventory, data and information to be reported and stored will include:

  - Date, time, staff involved;
  - The DBH of live trees and standing, solid dead trees (as described above). Trees measured in the plots must be of DBH $\geq$ 15 cm. Australian governments recommend measuring DBH $\geq$ 10cm in a standard forest inventory (e.g. Queensland[46], Tasmania[47]): however, this was considered impractical in the field due to the high number of very trees with such a low diameter, while using a higher minimum DBH provides a conservative estimate of standing aboveground trees. Diameters are measured at 1.3m with DBH tapes using the Australian Forestry Standard (which matches IPCC guidelines). Tree basal hollows will be recorded, approximated as either a cone or cylinder.
  - Photographs to record vegetation and disturbance characteristics;
  - Any other noteworthy changes.

The data will be recorded on waterproof paper, using pencil, in the field. The data will then entered into an Excel spreadsheet, and checked independently to ensure consistency with the field data. Hard and electronic copies of the data should be stored in two locations.

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[46] Miller, R. (2006) National Forest Inventory <http://www.cqfa.com.au/documents/1231124274_native_forest_inventory.pdf> Australian Department of Agriculture, Forestry and Fisheres; Queensland Department of Primary Industries and Fisheries [accessed 5/11/2010]

[47] Brack, C. L. (2004) Projecting native forest inventory estimates from public to private tenures, *Australian Forestry* **67**(4) 230-235

The mean and standard deviation of the field data collected will be run through the Winrock sampling calculator. This will determine any uncertainty with respect to sampling error, and accordingly the extrapolation from carbon stocks to emissions for the baseline and project case.

The sequestration from forest growth (tC/ha) will be calculated from field data using Equations 13-16. This will be compared to the plot-specific (point modelling) FullCAM projections (which generate the product of Equation 15) to determine uncertainty associated with regrowth projections. It is worth noting that the increases in accumulated biomass between monitoring periods are not expected to be significant owing to the relatively slow growth rates of eucalypts.

Activity description	Indicator	Frequency
Determination of uncertainty in the forest inventory. Calculated using the Winrock sampling calculator	Sampling error	Every 5 years
Determination of carbon stock in aboveground trees per unit area per stratum. Calculated from plot data.	Carbon stock	Every 5 years
Determination of carbon stock change in aboveground trees. Extrapolated from FullCAM modelling and past plot data.	Carbon stock change	Annually
Determination of carbon stock change in aboveground trees. Calculated from plot data.	Carbon stock change	Every 5 years
Determination of uncertainty in carbon sequestration projections.	Difference (as a percentage) between FullCAM projections and field measurements	Every 5 years

- Monitoring of natural disturbances:

  The first option for assessing the extent of natural disturbance will be using satellite imagery to detect any changes in aboveground biomass. The SPOT or comparable image will have been obtained, if available, to assess changes in forested area (above). Changes to vegetation coverage will be determined by comparing images taken at the start of the project and as close to the monitoring event as possible. The images will be analysed using an [ISOCLASS] unsupervised classification into 30 classes. This classification will be based on a composite imaged formed from all four SPOT bands plus the digital elevation model (DEM), topographic aspect and topographic slope. The topography is included to counteract differentiation due to, for example, sun angle, while still allowing topographic effects on biomass or vegetation type to be differentiated through the SPOT radiances. Of the thirty classes, trees are typically in classes < 9, bare soil in classes > 25 and grass cover between these two. Classes greater than nine are therefore removed from the data array for clarity. The total area covered by the included classes will then be compared between the images to determine if there was any loss of biomass across the project area. These images must be included in the monitoring report for reference.

Any areas concealed by cloud cover must be identified with KML files. These areas must be examined in more depth during the site visit.

If a recent image cannot be obtained, monitoring of natural disturbance will require more extensive groundtruthing. The most probable causes of natural disturbance are wind/storm damage and mudslides: these are highly visible from the roads, as damage is concentrated on forest boundaries and steep slopes. For this reason, monitoring of natural disturbance can be achieved with a comprehensive site visit to the property to assess any deforestation or forest degradation in the forested area. Track logs must be kept to provide a record of the longitude, latitude and dates of the site visit to demonstrate the extent of monitoring.

Should any damage to the forest carbon stocks be observed, the area in which these impacts occur will be mapped using GIS delineation and multiple transects covering at least 1% of the project area. The data collected will be used to assess carbon stock losses in the project scenario, according to the chosen methodology.

Equations 17-20 are used to calculate potential damage or degradation of the carbon stock in aboveground trees in the project scenario. Equation 17 and 18 calculated the risk and likely extent of damage from fire, based on historical incidence of wildfire. The average area lost to fire every twenty-five years (based on records lasting fifty years) is multiplied by the difference between aboveground trees in the project and baseline scenarios. This figure is in turn multiplied by standard IPCC combustion factors (0.63), emission factors (4.7) and the global warming potential (GWP) for methane (21). Equation 19 provides an ex-post means to measure carbon loss from non-fire natural disturbance. Equation 20 allows projections of illegal logging, although this is not considered a plausible risk for IFM projects in Tasmania.

Activity description	**Indicator**	**Frequency**
Site visit to assess natural disturbances	Deforestation in hectares from natural disturbances	Annually
Determination of carbon stock change in the carbon pools by natural disturbances	Carbon stock change	Annually

The landowner will be responsible for coordinating all monitoring tasks (fieldwork, ensuing calculations and the documentation). Redd Forests has prepared a Monitoring Plan (14 March 2011 version) outlining all necessary tasks and has obtained the signature of the project proponent on the monitoring plan confirming their understanding of the responsibilities and requirements. Redd Forests can and will coordinate the process if requested by the project proponent.

To support the landowner in fulfilling their monitoring responsibilities, a handover folder will be prepared by Redd Forests to provide to the project proponent after the first verification. This will enable an effective transition. This folder will contain:

- Paper and electronic copies of this PDD;
- KML files of the land parcels;
- Paper and electronic property maps identifying strata, plot locations and their proximity to access points;

- Paper and electronic copes of original fieldwork data sheets;
- GPS coordinates for the permanent monitoring plots including waypoints for each of the plot boundaries;
- An electronic copy of the following tools:
    - The GreenCollar IFM LtPF Methodology
    - The VCS Tool for AFOLU Methodological Issues
    - The Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities
    - The VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination
    - The Winrock Sampling Calculator (to apply the CDM Tool for the Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities)
- Contact details of Redd Forests and the offer to provide ongoing support in relation to undertaking the required monitoring tasks; and
- Contact details of accredited VCS validators.

Data collected through these monitoring events will be stored through the same process as the original data sheets. The field data sheets will be scanned, photocopied and stored in hard copy format by both the landowner and Redd Forests. Additional electronic copies will be held by Redd Forests at the Redd Forests' Sydney office (Unit 36, 75 Buckland Street, Chippendale, NSW 2008) and the Redd Forests' Tasmanian Office (Level 1 – 148 Elizabeth Street, Hobart, 7000). Comparable precautions will be taken if any entity other than Redd Forests performs the monitoring.

Quality of both field data collection and data management will be managed by using the standard operating procedures and quality control procedures of the Forest Practices Authority of Tasmania (http://www.fpa.tas.gov.au/). All data will be archived both electronically and in paper form.

4.0 GHG Emission Reductions

4.1 Explanation of methodological choice

The "VCS Methodology for Improved Forest Management: Conversion of Logged to Protected Forests" has been used. The project scenario involves protecting native forest. The baseline scenario involves projecting the carbon emissions generated through timber harvest through clearance and subsequent sequestration or emissions in a timber plantation.

Calculating the carbon emissions from the baseline scenario requires an assessment of the standing merchantable timber. This methodology uses standard forest inventory procedures to assess the carbon stock in the aboveground trees and dead wood. This data is then used to determine the avoided carbon dioxide emissions.

4.2 Quantifying GHG emissions and/or removals for the baseline scenario

<u>Calculating the carbon stock harvested and extracted</u>

The aboveground trees was calculated using species-specific allometrics and wood densities where possible; the allometrics for equivalent species or the general forest-type for the remaining trees; and an IPCC-recommended carbon fraction and Biomass Conversion and Expansion Factor. These tools are appropriate as the forest inventory data allows accurate volume estimates, to which expansion factors can be readily applied. The BCEF method is applied to the project area to determine the initial carbon stock, and therefore the stock removed in timber and dead wood under the baseline scenario.

The volume of merchantable timber per tree was derived from the DBH measured for each individual tree above 20cm DBH, combined with the height estimated from a project-specific height curve, using the Farm Forestry Toolbox v5.0. This program was developed by Private Forests Tasmania, a statutory authority funded by the Tasmanian government and private forest owners. The allometrics in the Toolbox were developed from an extensive collection of field data by Forestry Tasmania, the government department responsible for managing State forests. They were therefore developed from Tasmanian tree species growing locally, i.e. in climatic and geographic conditions typical of the species and state. Unfortunately, the measurements used for the FFT were conducted in the 1970s and 1980s, and there are no records or published papers from that time (confirmed by Bric Milligan, Forestry Tasmania). Therefore, it was not possible to find out the specific boundary conditions or error margins used in developing the allometrics. However, the fact that the FFT comprises allometrics derived from species-specific data in Tasmania and remains the primary tool (within a commercial application) for calculating merchantable timber volume is reflective of its accuracy.

The Farm Forestry Toolbox included allometrics for the main species harvested in Tasmania. In the Redd Forests' project area, this included *E. obliqua, E. delegatensis*, *E. viminalis*, *E. amygdalina*, *A. dealbata* and *A. melanoxylon*. There were no specific allometrics for *E. ovata*, *E. pulchella*, *E. gunnii*, *E. coccifera*, *E. tenuiramis* or *E. rubida*. However, a Tasmanian botanist identified species with a similar stature and growth form[48], and their allometrics were accordingly used to calculate the merchantable volume of the equivalent species in the project area. Specifically, *E. gunnii* is comparable to *E. pauciflora*; *E. rubida* is comparable to *E. dalrympleana*, and *E. pulchella*, *E. ovata*, *E. coccifera*, *E. rodwayi* and *E. tenuiramis* are all similar to *E. amygdalina*.

Neither the species-specific allometrics nor a suitable equivalent was available for a range of understorey species found in the project site. For these species, a general allometric for Australian native sclerophyll forest was utilised. This allometric was derived from 135 trees, and had an R2 value of 0.963[49].

This general equation, from Keith *et al.* (2000), was also used to test the FFT results. The DBH and height of 10 larger trees of each species was measured, and the merchantable volume of timber calculated using the Farm Forestry Toolbox and Keith *et al.*'s allometric equations. Since the Keith *et al.* allometric calculates the aboveground biomass in kilograms, this figure was converted into the merchantable timber volume (m^3) by dividing it by the BCEF (1.17) and the wood density (t/m^3). The results were very comparable, as illustrated by Figure No. 14, but overall the FFT offered a slightly more conservative estimate of merchantable volume.

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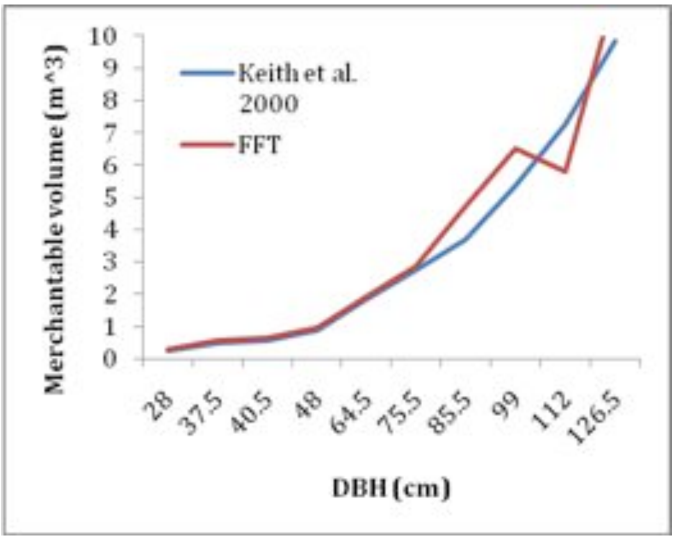
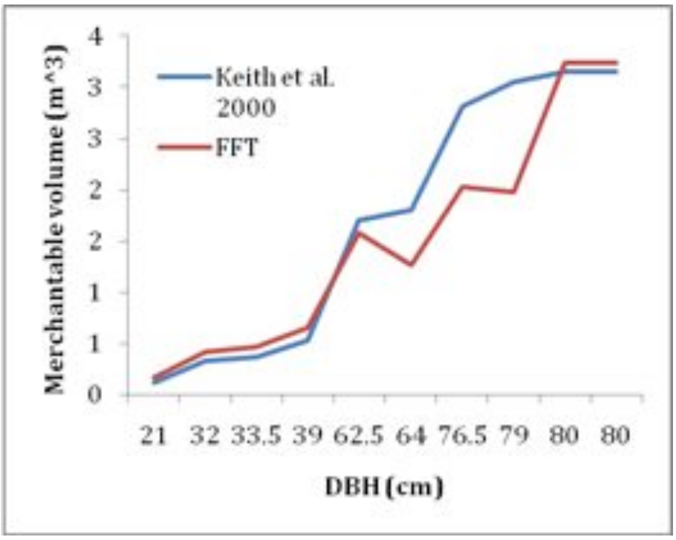
[48] N. Fitzgerald, *pers. comm.*, 2010

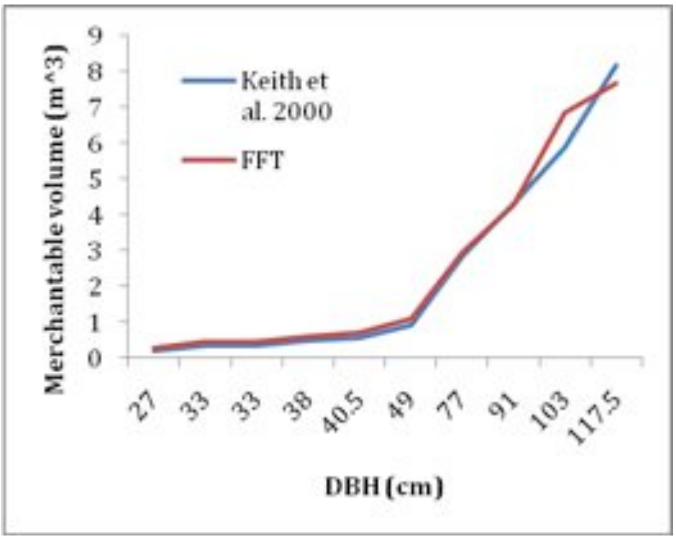
[49] Keith, H; Barrett, D; Keenan, R (2000) Review of allometric relationships for estimating woody biomass for New South Wales, the Australian Capital Territory, Victoria, Tasmania and South Australia, National Carbon Accounting System: Technical Report No. 5B, Australian Greenhouse Office, Canberra, 70



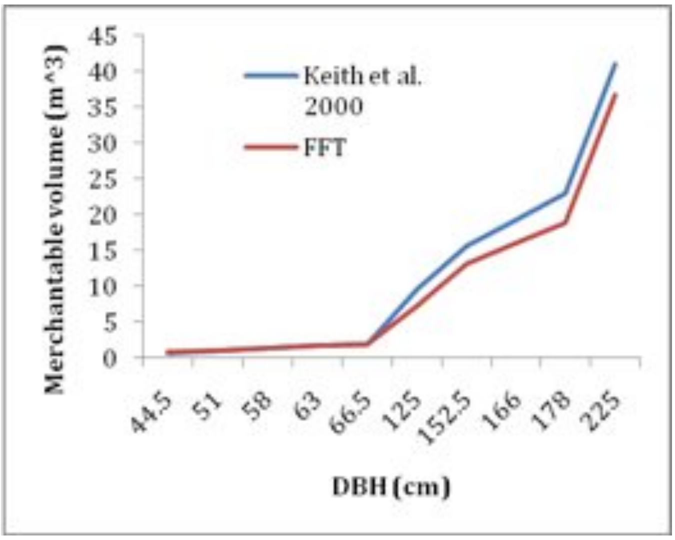
a) *E. rodwayi* and *E. amygdalina*



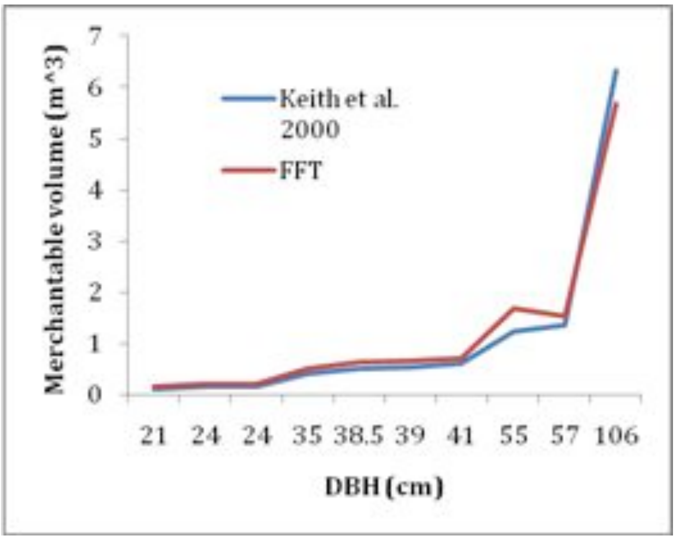
b) *E. pauciflora*



c) *E. dalrympleana*



d) *E. delegatensis*



e) *E. viminalis*

Figure No. 14. The difference between estimates of the merchantable volume using the species-specific allometrics in the Farm Forestry Toolbox (red line), and the native sclerophyll forest allometric equation developed by Keith et al. (2000) (blue line). This was based on ten trees for a) *E. rodwayi* and *E. amygdalina*, b) *E. pauciflora*, c) *E. dalrympleana*, d) *E. delegatensis* and e) *E. viminalis* (immediate left). The FFT consistently provides very comparable results to the more general sclerophyll forest allometric developed by Keith et al.

These allometrics were used to determine the merchantable volume of timber for individual trees measured in the sample plots. This formed the basis for calculating the total merchantable volume per species per hectare, as extrapolated from each sample plot (Equation 1), and then calculating the mean merchantable volume per species per hectare by averaging the results of Equation 1 (Equation 2). This information provided the yield and waste generated under a timber harvest plan of selective logging or clearfelling with native regeneration.

The results of Equation 2 were used to develop the timber harvest plan.

The necessary harvest and transport machinery are described in the Forest Practices Code 2000[50]. The RFPA is on soils with moderate erodibility[51]. Therefore, while some gentler slopes could be harvested using conventional machines classed as C1-C3, the steeper slopes of the property could require the development of high lead and skyline cable systems. This is the preferred harvesting technique under these conditions as it generally results in less soil disturbance and impact than ground based snigging in similar conditions. The timber would be transported on logging trucks along established logging tracks in the property to the main roads adjacent to the property, and from there to one of the woodchip mills at Triabunna on the east coast of Tasmania. No additional transport or processing systems needs to be designed: timber harvesting has historically been practised using this infrastructure. In all cases, the projected output of timber products would be 90% paper and paperboard products and 10% sawnwood products.

All non-harvest forested areas within the project area (conservation covenants, streamside buffers, swamp areas, etc) were excluded using GIS programs prior to stratification to determine the area available for logging within each strata.

On this project area, the species that would be harvested are *E. amygdalina*, *E. coccifera*, *E. dalrympleana*, *E. delegatensis*, *E. gunnii*, *E. obliqua*, *E. ovata, E. pauciflora*, *E. pulchella*, *E. rodwayi*, *E. rubida*, *E. tenuiramis* and *E. viminalis*. There is no minimum or maximum diameter at breast height, top of tree or stump to limit harvests for individual trees: during a clearfell event, all trees will be harvested. During selective logging, some trees will be left standing to support natural regeneration and allow landowners to achieve the maximum sustainable yield. These are typically smaller trees (<30cm DBH). Table No. 10 provides the details for each harvest, based on the standing volume of merchantable timber. This correlates to the logging projections in the baseline scenario (see Table No. 08).

Table No. 10. The timber harvest plan developed for each stratum

Stratum	Standing merchantable volume (m^3/ha) at the project	Year of harvest	Years in a post-harvest state	Harvesting regime:	Annual operating areas (ha)	Mean extracted volume per unit area

[50] Forest Practices Board (2000). Forest Practices Code, Forest Practices Board, Hobart, 46 http://www.fpa.tas.gov.au/fileadmin/user_upload/PDFs/Admin/FPC2000_Complete.pdf [viewed 24/08/2010]

[51] Laffan, MD; McIntosh, PD (2005) Forest soils formed in Jurassic dolerite in Tasmania: a summary of their properties, distribution and management requirements, Division of Forest Research and Development, Technical Report 25/2005, Forestry Tasmania. http://www.fpa.tas.gov.au/fileadmin/user_upload/PDFs/Geo_Soil_Water/DoleriteSoilsOverview.pdf [viewed 24/08/2010]

	start date					(m^3/ha)
Interlaken	177	2	23	Clearfell	40	177
		3	22	Clearfell	40	177
		6	(re-logged)	Selective logging by area	845	125
		20	5	Selective logging by area	845	83
Lake Echo	190	1	(re-logged)	Selective logging by area	411	127
		19	6	Selective logging by area	411	80
Lagoon of Islands (high biomass)	207	4	(re-logged)	Selective logging by area	748	147
		7	18	Selective logging by area	374	170
		9	16	Selective logging by area	374	170
		14	11	Selective logging by area	374	170
		22	3	Selective logging by area	748	78
Lagoon of Islands (low biomass)	104	15	10	Selective logging by area	1049	84
		17	8	Selective logging by area	524.5	87
		21	4	Selective logging by area	524.5	87
		25	0	Selective logging by area	524	123
Mt Vernon	111	0	25	Clearfell	40	111
		3	(re-logged)	Selective logging by area	337	64
		23	2	Selective logging by area	337	43
Southern Central	106	0	25	Clearfell	80	106
		1	24	Clearfell	80	106
		2	23	Clearfell	80	106
		13	12	Selective logging by area	408	79
		14	11	Selective logging by area	408	79
		15	10	Selective logging by area	408	79

The mean extracted volume per unit area (m^3/ha) is detailed in the final column for each harvest on each stratum. This total is recorded at an individual species level in the accompanying calculations.

Using this timber harvest plan, the carbon stock of harvested aboveground trees was then calculated using Equation 3. The parameters include the results of Equation 2, combined with the carbon fraction value prescribed in the methodology (0.5) and a Biomass Conversion and Expansion Factor of 1.17. Redd Forests approached carbon scientists from Australian National University, the University of New England, CSIRO, the NSW Department of Primary Industries ‘New Forests’ department, Private Forests Tasmania and Forestry Tasmania. There is no available data on a BEF or BCEF because the prevailing focus has been on developing allometrics rather than a BEF/BCEF, or on merchantable timber rather than aboveground trees. In the absence of a species-specific or regional BCEF, this figure was drawn from the IPCC 2006 AFOLU Guidelines[52], which provided an estimate for temperate hardwoods with a

[52] Paustian, K; Ravindranath, NH; van Amstel, A; Gytarsky, M; Kurz, WM; Ogle, SM; Richards, G; Somogyi, Z (2006) 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 4: Agriculture, Forestry and Other Land Use (AFOLU) Table 4.5 < http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf> [accessed 21/02/2011]

merchantable volume between 100 and 200m^3/ha. The carbon stocked of extracted aboveground trees, by comparison, is calculated using the result of Equation 2 multiplied by species-specific wood densities and the carbon fraction (Equation 4) to determine the mean carbon stock extracted from the forest.

The wood density figures were based on the species-specific, air dry density values provided in the manual for the Farm Forestry Toolbox, i.e. a mean density of 0.68 g/cm^3 for *E. delegatensis*, 0.8 g/cm^3 for *E. viminalis*, 0.7 g/cm^3 for *E. obliqua* and 0.75 g/cm^3 for *E. amygdalina*. Where there were no species-specific densities, we used either the allometric equivalent (for example, *E. pulchella, E coccifera* and *E. tenuiramis* all had the same density as *E. amygdalina*) or the lowest Eucalyptus density of 0.68 g/cm^3, as this ensured a conservative estimate. With respect to merchantable understorey species, the FFT provided a basic wood density of 0.63 g/cm^3 for *A. dealbata* and 0.65 g/cm^3 for *A. melanoxylon*. As silver wattle is known for the low density of its wood, we adopted this wood density for all other understorey species.

According to this methodology, dead wood is considered only when it is a by-product of the harvesting process. In Equation 5, the mean extracted carbon stock (product of Equation 4) is subtracted from the mean harvested carbon stock (the product of Equation 3) to calculate the dead wood per stratum.

<u>Carbon sequestered in wood products:</u>

Carbon stocks in wood harvested for conversion to long-term wood products (remaining after 100 years) must be included in the baseline scenario. This methodology adopts the simplifying assumption that the proportion remaining after this time is effectively permanent.

The relevant wood product classes were identified as sawnwood and paper and paperboard. The gross percentages of volume extracted for each wood product class were assigned based on historical Forest Practices Plans, which indicate that 10-20% of the extracted timber was used for sawnwood and the remaining 80-90% for pulp and paper (varying by property). The proportion of carbon extracted that remains sequestered in long-term wood products after 100 years was calculated using Equation 7 and data from Winjum *et al.* (1997)[53] and the Climate Action Reserve (2009)[54]. This value was subtracted from the annual change in carbon stocks in the baseline scenario (Equation 8), using the simplifying and conservative assumption all extracted carbon not retained is emitted in the year harvested.

<u>Change in carbon stocks due to regrowth:</u>

Carbon sequestration in the baseline scenario is based on local species growth rates as modelled by FullCAM. This is the Carbon Accounting Model developed by the Australian Government and CSIRO for determining carbon flows in land use, land use change and forestry projects. For this project, Redd Forests used site-specific data to predict native regeneration rates after selective logging and clearfell events. Ongoing carbon sequestration by the standing forest (i.e. the project scenario) was subtracted from this rate to produce a net regrowth rate for the baseline scenario, as modelled in Figure No. 15 (see also Appendix 2).

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[53] Winjum, JK; Brown, S; Schlamadinger, B (1998) Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide, *Forest Science* **44**(2) 272-284

[54] Climate Action Reserve (2009) Forest Project Protocol 3.1: Appendix F. <http://www.climateactionreserve.org/how/protocols/adopted/forest/current/>[accessed 2/07/10].

For each strata-specific model in FullCAM, two values were extracted for the baseline scenario. Firstly, the merchantable volume of timber (tree stems in m^3/ha) was used in Equations 3 and 4 to confirm the possible volume of extracted timber for each harvest. Secondly, the carbon stock of aboveground trees (tC/ha) was used to determine the sequestration according to Equation 9.

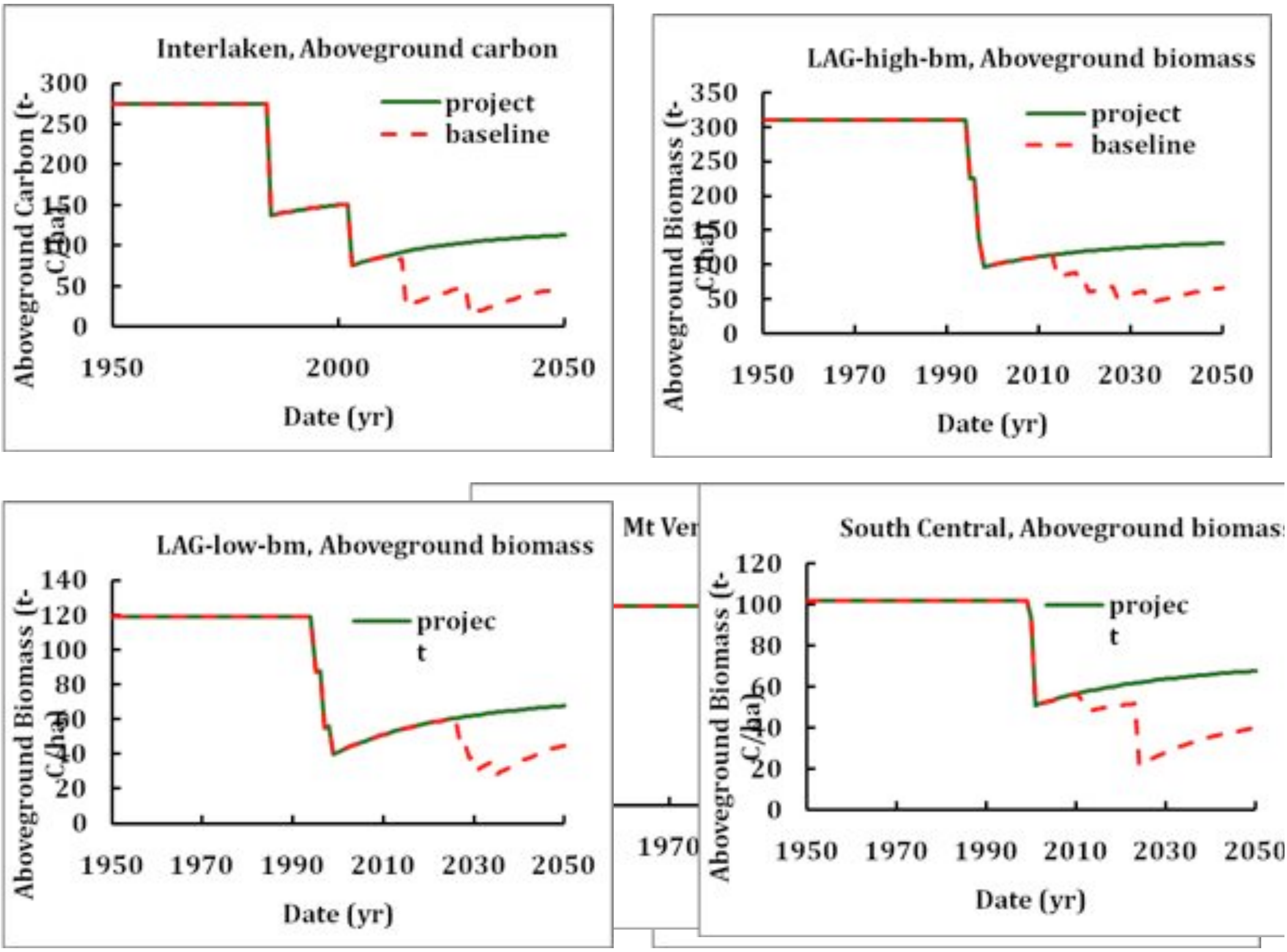

Figure No. 15. Net carbon sequestration by aboveground trees in the baseline scenario, once sequestration from ongoing growth in the project scenario has been subtracted. Stratum-specific net sequestration rates have been calculated and graphed, as labelled.

<u>Calculating changes in carbon stocks:</u>

The total annual change in carbon stocks in all pools in the baseline scenario is therefore equal to the stock change from planned timber harvest, plus the carbon stored through the conversion and retirement of wood products. We must also subtract the vegetation regrowth that follows harvest. This was calculated using Equation 10, and annualized using Equation 11. The final result is converted into tonnes of carbon dioxide equivalent by multiplying it by the relative atomic mass of CO_2 to C (44/12) in Equation 12.

4.3 Quantifying GHG emissions and/or removals for the project scenario

The merchantable volume of individual trees, collated from DBH using the Farm Forestry Toolbox for Equation 1, was used to calculate GHG emissions and/or removals for the project scenario. This data was already extrapolated to produce an estimate of mean merchantable volume (m^3/ha) for each stratum, and entered into FullCAM to calculate carbon sequestration in the baseline scenario (satisfying Equation 9).

The same data and model parameters entered into FullCAM for Equation 9 were used to calculate the carbon stock in aboveground trees (tC/ha), the required output of Equation 15. Its inputs are based on local taxonomix-, geographic- and climatic-specific information, and allometric relationships identified in the Technical Reports prepared for the National Carbon Accounting System[55]. FullCAM is part of the Australian National Carbon Accounting System (N-CAT) and international best practice in modelling carbon flows. However, the program does:

"*tend to be highly conservative and radically underestimates forest carbon generated from mixed native species (Brendan and Mackey, 2008).*"[56]

Moreover, for each stratum, FullCAM's output was calibrated according to fieldwork estimates of aboveground trees (m^3/ha) in 2010, and consistent between the baseline and project scenarios until the first harvest. Because FullCAM was available as a best practice option, Redd Forests is submitting a deviation from the less precise, accurate and conservative requirements of the GreenCollar IFM methodology. Equations 13-15 were therefore not required, and FullCAM used to calculate the product of Equation 15 (tC/ha).

Equation 16 was then used to calculate sequestration (tCO2-e/ha) in the project scenario, by determining the difference in the carbon stock each year and multiplying it by the strata area.

Equations 17-20 were used to calculate potential damage or degradation of the carbon stock in aboveground trees in the project scenario. Equation 17 and 18 calculated the risk and likely extent of damage from fire, based on historical incidence of wildfire. The average area lost to fire every twenty-five years (based on records lasting fifty years) is multiplied by the difference between aboveground trees in the project and baseline scenarios. This figure is in turn multiplied by standard IPCC combustion factors (0.63), emission factors (4.7) and the global warming potential (GWP) for methane (21). Equation 19 provides an ex-post means to measure carbon loss from non-fire natural disturbance. Equation 20 allows projections of illegal logging, although this is not considered a plausible risk for IFM projects in Tasmania.

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[55] Raison, J. (2001) Carbon Accounting and Emissions Trading Related to Bioenergy, Wood Products and Carbon Sequestration: Development of a 'Toolbox' for Carbon Accounting in Forests, *IEA Bioenergy Task 38: Workshop in Canberra/Australia*, CSIRO, Forestry and Forest Products. Available from <http://www.ieabioenergy-task38.org/workshops/canberra01/cansession1.pdf> [viewed 07/03/2011]

[56] Kapambwe, M.; Keenan, R.; (2009) Biodiversity Outcomes from Carbon Biosequestration, The University of Melbourne, commissioned by The Department of Sustainability and Environment, pp 23. Available from <http://www.dse.vic.gov.au/CA256F310024B628/0/761E59489BC57A9ACA2576810079C4D4/$File/Biosequestration+and+Biodiversity.pdf> [viewed 04/03/2011]

Equations 21 and 22 sum the net projected greenhouse gas emissions and reduced emissions in the project scenario, including the products of Equations 13-20. This provided the estimate of carbon sequestered or emitted in the IFM project scenario.

The landowner has longstanding plans to establish a wind farm in the vicinity of the project area. He anticipates that twenty turbines would be constructed within forested area of Lagoon of Islands, each turbine with a footprint of 1-2 hectares. This is intended to provide renewable energy to the farm, reducing both costs and carbon emissions. It may be necessary to clear a maximum of 40ha of trees to create an open area for the wind towers. This is less than 0.5% of the project area (i.e. *de minimis*). However, should the wind farm be developed (as identified at the subsequent monitoring period), 40ha from the Lagoon of Islands 'high biomass' stratum will be subtracted from the calculations to account for this loss of forest. Therefore, the carbon calculations for this stratum will cover 1828ha, rather than the 1868ha identified in the original stratification process.

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project

As detailed above, the dimensionless leakage factor is considered to be 0 in Tasmania. This is incorporated in Equation 23. Therefore, the net greenhouse gas emissions for each stratum, calculated in Equation 24, are the sum of the baseline scenario greenhouse emissions, less the project scenario greenhouse gas emissions.

The sampling error is automatically calculated by the Winrock Sampling Calculator. With a confidence interval of 95%, the statistical uncertainty for each stratum is listed in Table No. 07. There is 15% or less for all strata (see Appendix 3). Uncertainty with respect to the project area is effectively absent, as GIS programs are used to truth the PI layer and cadastral parcels against satellite images obtained from GoogleEarth and SPOT (or a close equivalent). With respect to the uncertainty surrounding the harvest levels (60-70% of the aboveground trees), the landowner estimates that there would be no more than 2% in variation from the targeted extraction per year (specified in tonnes per harvest in Table No. 08), as the landowner instructs the logging contractor to harvest this amount. The projected volume of extracted timber has been tested against FullCAM models of growth to confirm that this is a viable estimate. Lagoon of Islands would have almost no variation from recommended harvest levels, as this area is certified by the Forest Stewardship Council and timber extraction therefore rigorously controlled. The final uncertainty for each stratum is outlined in Table No. 12.

Table No. 12: Uncertainty from sampling error and variation in harvesting levels for each stratum.

Stratum:	**Sampling error (%):**	**Variation in extraction rates (%):**	**Uncertainty (%):**
Interlaken	10.5	2	10.2
Lake Echo	5.5	2	5.9
Lagoon of Islands (high biomass)	9.5	0	9.7
Lagoon of Islands (low biomass)	8.5	0	8.7

Mt Vernon	4.5	2	4.9
Southern Central	5	2	5.4

This uncertainty is taken into account using Equations 25-26. The voluntary carbon units are calculated by subtracting the VCS buffer (15% of credits), producing the totals outlined in Table No. 13.

Table No. 13. Annual GHG emission reductions for the Redd Forests' project area.

Stratum:	**Carbon emissions avoided by the establishment of an Improved Forest Management project (tCO_2-e/year):**	**Voluntary carbon units generated once uncertainty and the VCS buffer have been considered (tCO_2-e/year):**
Interlaken	9 391	7 117
Lake Echo	4 206	3 278
Lagoon of Islands (high biomass)	20 702	16 317
Lagoon of Islands (low biomass)	11 724	8 439
Mt Vernon	4 335	3 586
Southern Central	5 192	3 855
Total:	55 549	42 592

5.0 Environmental Impact

The Redd Forests project does not involve a material environmental impact. The project does not require an environmental impact assessment. The requirement and the content of environmental impact assessments within Tasmania is regulated through the *Environmental Management and Pollution Control Act 1994* (EMPCA). The EPA Board's environmental impact assessment process applies to the following types of projects:

- *Level 2 activities (as listed in schedule 2 of the Environmental Management and Pollution Control Act 1994 'the EMPC Act')*[57]

The Redd Forests project does not comprise a level 2 activity under the Act.

Within the national context, environmental impact assessments are regulated through the *Environmental Protection, Biodiversity Conservation Act 1999.* Under the Act, projects that will have a 'significant' environmental impact are required to be referred and an environmental impact assessment may be required. Significant impact is defined as;

> *… an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity,*

[57] *Environmental Management and Pollution Control Act, 1994*, www.thelaw.tas.gov.au <accessed 14/12/2010>

duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on the environment.

Given that the project represents passive land management and no infrastructure or large scale ground disturbance will be associated with this project it does not represent a 'significant impact' and therefore does not require referral under the EPBC Act.

By protecting the forest from logging, environmental outcomes such as biodiversity, watershed protection and water quality are safeguarded, compared with the impacts of clearfell for conversion to pasture or ongoing selective logging. Moreover, the landowner has achieved Forest Stewardship Council certification for 2500 ha of forest on the property Lagoon of Islands. The Redd Forests' project area will also be submitted for certification under the Climate, Community and Biodiversity Standards. This demonstrates the proponents' commitment to achieving broader environmental and social goals than prescribed under the Voluntary Carbon Standard.

6.0 Stakeholders' comments

The landowners are exercising their legal right continue to harvest their native forest, and not to generate income from timber sales. There are no significant other stakeholders in this decision, and therefore no need for consultation or ongoing communications. However, all potentially relevant parties have been provided with Redd Forests' contact details.

The landowners' decision to use carbon finance to convert logged forests to protected forests has generated considerable interest across Tasmania. Since this project was commenced, two additional landowners have engaged Redd Forests to establish IFM projects. This is helping to diversify income sources, providing important financial security as the demand for native timber declines, while improving the environmental integrity of the region.

The local community benefits from the conservation of the native forest. This ecosystem provides key services, such as pollination for the local crops, pest control by native bird species and the purification of water used by many of the neighbouring properties. A healthy and unlogged forest also creates a more attractive landscape, which is economically important in an area seeking to expand ecotourism income and employment opportunities.

7.0 Schedule

The following table presents the project schedule in relation to projected logging events and validation / verification.

Year:	**Baseline scenario:**	**Project scenario:**	**Responsible party:**	**Annualised voluntary carbon units:**
2010	Clearfell on 120ha	Project initiated.	Redd Forests	34 378

	across Mt Vernon and Southern Central. Thin on 411 ha on Lake Echo, completed over two years.			
2011	Clearfell on 120ha across Interlaken and Southern Central.	Expected validation and verification under VCS and CCB.	Redd Forests	34 378
2012	Clearfell on 120ha across Interlaken and Southern Central. Thin on 377ha on Mt Vernon.	Monitoring	Project proponent	34 378
2013	Thin on 748ha on Lagoon of Islands (high biomass), completed over two years.	Monitoring	Project proponent	34 378
2014		Monitoring	Project proponent	34 378
2015	Thin on 845ha on Interlaken.	Monitoring (including fieldwork).	Project proponent	34 378
2016		Monitoring	Project proponent	34 378
2017		Monitoring	Project proponent	34 378
2018	Thin on 374ha on Lagoon of Islands (high biomass), completed over two years.	Monitoring	Project proponent	34 378
2019		Monitoring	Project proponent	34 378
2020	Thin on 374ha on Lagoon of Islands (high biomass), completed over two years.	Monitoring (including fieldwork)	Project proponent	34 378
2021		Monitoring	Project proponent	34 378
2022	Thin on 408ha on Southern Central.	Monitoring	Project proponent	34 378
2023	Thin on 408ha on	Monitoring	Project	34 378

	Southern Central.		proponent	
2024	Thin on 408ha on Southern Central.	Monitoring	Project proponent	34 378
2025	Thin on 374ha on Lagoon of Islands (high biomass) over three years.	Monitoring (including fieldwork)	Project proponent	34 378
2026	Thin on 1049ha on Lagoon of Islands (low biomass) over two years.	Monitoring	Project proponent	34 378
2027		Monitoring	Project proponent	34 378
2028	Thin on 411ha on Lake Echo and and 524.5ha on Lagoon of Islands (low biomass).	Monitoring	Project proponent	34 378
2029	Thin on 845ha on Interlaken	Monitoring	Project proponent	34 378
2030	Thin on 524.5ha on Lagoon of Islands (low biomass).	Monitoring (including fieldwork).	Project proponent	34 378
2031		Monitoring	Project proponent	34 378
2032	Thin on 377ha on Mt Vernon.	Monitoring	Project proponent	34 378
2033	Thin on 748ha on Lagoon of Islands (high biomass), completed over two years.	Monitoring	Project proponent	34 378
2034	Thin on 524ha on Lagoon of Islands (low biomass).	Monitoring (including fieldwork) Project concludes subsequent to final verification	Project proponent	34 378
			Total:	**859 444**

Monitoring events specifically require assessing the following indicators at the specified dates:

Activity description	Indicator	Frequency	Responsibility
Determination of uncertainty in project area. Calculated by comparing cadastral parcels.	Change in project area	Annually	Project proponent

Determination of carbon stock in aboveground trees per unit area per stratum. Calculated from plot data.	Carbon stock	Every 5 years	Project proponent
Determination of carbon stock change in aboveground trees. Extrapolated from FullCAM modelling and past fieldwork trends.	Carbon stock change	Annually	Project proponent
Determination of carbon stock change in aboveground trees. Calculated from fieldwork data.	Carbon stock change	Every 5 years	Project proponent
Determination of uncertainty in the forest inventory. Calculated using the Winrock sampling calculator.	Sampling error	Every 5 years	Project proponent
Determination of uncertainty in carbon sequestration projections.	Difference (as a percentage) between FullCAM projections and field measurements	Every 5 years	Project proponent
Site visit to assess natural disturbances.	Deforestation in hectares from natural disturbances	Annually	Project proponent
Determination of carbon stock change in the carbon pools by natural disturbances.	Carbon stock change.	Annually (if required)	Project proponent
Participatory Rural Appraisal.	Risk of illegal logging.	At first verification event. If >20% of respondents answer is 'yes', task must be repeated annually.	Project proponent
Compare the annual extracted volume to the long-term average volume of extracted timber from private native forests in Tasmania.	Market leakage factor	Annually	Project proponent

The fire plan is also implemented on an annual basis. This involves both monitoring for fire and minimising the risk of fire damage, and includes:

- An arrangement with a commercial helicopter company with fire fighting capacity is confirmed annually at the start of each fire season, with instructions to collect and dump water from Lagoon of Islands and Woods Lake on any fires, in response to a telephone call from the owner.
- Arrangements exist for the utilisation of specialist ground fire fighting equipment owned by Gunns Limited and designed specifically for fire fighting in native forests.

- Vehicles, fire fighting equipment, staff and family members from the main property 'Dungrove' are maintained in a state of readiness during the main fire risk period.
- Reciprocal commitments exist between the owner and adjoining landowners to provide assistance, where possible, in the event of fire.
- The Game Management Plan between the owner and the Steppes Wildlife Trust obliges any members in the area at the time of a fire to help in fire fighting.
- The local volunteer Bush Fire Brigade of the Tasmanian Fire Service.

8 Ownership

8.1 Proof of Title:

The proof of ownership of the properties, and the contractual agreement between the landowner and the project developer (Redd Forests), are available for review by the validator.

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

This project does not reduce GHG emissions under an emissions trading scheme, to meet binding limits or similar.

Appendix 1: Project risk analysis

This project risk analysis was developed in accordance with the VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination.

Sub-step 1a: Risk factors applicable to all project types

Risk factor	Risk rating for AFOLU project	Comments
Project risk:		
Risk of unclear land tenure and potential for disputes	Very low	Land ownership and property boundaries are clearly defined and protected under Australian law. The project proponent or his family members are the sole or dominant shareholders in all properties, and have obtained written support for the project from all other shareholders.
Risk of financial failure	Low	After the first verification, the project is estimated to generate over 30 000 VCUs per year for the duration of the project. With estimated monitoring cost of $7000 per year, or a higher rate of $16 000 with fieldwork monitoring events every five years, the credits would have to be valued at less than $0.55 for the landowner to be unable to cover costs. Based on historical and projected carbon credit prices, these costs will be more than covered by revenue generated from the sale of carbon credits. Moreover, the proponent has independent wealth and alternative means to generate income from his property. This will provide a buffer if the carbon market performs poorly.
Risk of technical failure	Very low	The project has limited technical requirements from this point. No advancements in technologies or maintenance of technical systems are required for the project's success. The project proponents will each be provided with the resources and guidelines to assume responsibility for the project through the provision of a property transition file. This contains all of the necessary information, instructions, tools and contacts to allow the proponent to undertake the technical requirements associated with their obligations for verification and monitoring. This file contains; • Paper and electronic copies of their project specific PDD; • Paper and electronic copies of the signed monitoring plan (14 March 2011 version), including:

		- o The monitoring and verification schedule - o Guidelines for forest inventory techniques - o Data management and quality control procedures - o Guidelines for relevant parameters for using the relevant VCS methodologies - KML files of the land parcels; - Paper and electronic property maps identifying strata, plot locations and their proximity to access points; - Electronic copes of original fieldwork data sheets; - GPS coordinates for the permanent monitoring plots including waypoints for each of the plot boundaries; - A copy of the following tools: o The GreenCollar IFM LtPF Methodology o The VCS Tool for AFOLU Methodological Issues o The Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities o The VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination o The Winrock Sampling Calculator (to apply the CDM Tool for the Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities) - Contact details of Redd Forests and a proposal to provide ongoing support in relation to undertaking the required monitoring tasks; and - Contact details of accredited VCS validators. The proponents will benefit from an increasingly educated network as more landowners adopt carbon financed Improved Forest Management as a mechanism to generate revenue while enhancing privately owned native forests. Finally, Redd Forests and its external staff will also remain available to undertake any technical work, should they be required. This will grant the landowners ongoing access to staff with relevant qualifications and suitable experience.
Risk of management failure	Low	Due to the stable political and social environment, and simple future requirements of the project, management of the project

		from this point is not complex. The allocation of responsibilities and revenue are clearly delineated in all contracts. Moreover, the project proponent has a long history of successfully managing his land and implementing projects, such as the local hydroelectric power system.
Economic risk: Risk of rising land opportunity costs that cause reversal of sequestration and/or protection	Low	Since the project is intended to protect (rather than grow) forest, reversal of sequestration is not a risk (compared to, for example, afforestation/reforestation projects). The main consideration is therefore reversal of protection. Likely land opportunity costs will arise from high prices for animal products (creating a risk of conversion to pasture) or high demand for timber (creating a risk of either conversion to plantation or a resumption of logging). Until 2015, the landowner can only convert land to plantation or pasture at a rate of 40ha per year. There are unlikely to be significant changes in land opportunity costs between now and 2015, and the landowner will thereafter not be permitted to clearfell the native forests for conversion. This provides protection against rising land opportunity costs if meat, wool or plantation timber significantly increase in value. The risk of an increasing value of native forest timber is addressed in sub-section 1b, under 'high timber value'. The main risk to the forested area is from the establishment of a wind farm, which will require clearance of a maximum of 40ha on Lagoon of Islands. To address this, 40ha have been removed from the 'Lagoon of Islands - high biomass' stratum in the carbon calculations, so area equivalent to the wind farm is not counted towards net emission reductions.
Regulatory and social risk: Risk of political instability Risk of social instability	 Very low Very low.	Australia has a long history of political and social stability. The main source of contention in Tasmania has been between the logging industry and environmental groups. Logging has historically provided a major source of employment and income, and environmental campaigns for forest conservation have arguably not recognised the socio-economic impact of banning logging of native forests. Carbon financed IFM projects arguably provide a synthesis between these two positions, providing comparable employment to foresters and income to landowners while protecting the carbon stocks and biodiversity of Tasmania's native forests. This should help ameliorate any political and social tension associated with land use management in Tasmania.
Natural disturbance risk:		

Risk of devastating fire	Low	Eucalyptus forests are typically fire prone, but the Central Highlands are only susceptible to wildfire for a few months of the year due to the relatively cold and wet climate of Tasmania. The risk is further reduced on private property, such as the project area, which is not accessible to the public. In addition, the landowner has established strategic fire breaks through the roading system, conducts low scale burning off along the roads and keeps four fire trucks stationed on the farm. There is ongoing monitoring by organised recreation groups and all employees. Only one fire in the past fifty years has had more than a *de minimis* impact on the carbon stock of any strata[58]: 300ha were burnt on Interlaken in 2004, leaving 20% of the trees as standing dead and thus destroyed 6.5% of the carbon stocks in the aboveground biomass of that stratum. If events occur once every twenty to fifty years, the VCS Tool assigns them a likelihood (L) of 0.0286. It is unlikely that more than 300ha would be burnt (due to the extensive fire monitoring and response systems in place), and even a very intense fire would leave only 30% of the trees as standing dead. This is in agreement with the fire history on the property. This means that between 4 900 and 10 700tC would be emitted in this logging event, depending on which stratum experienced the burning event. Multiplying this impact by the likelihood provides us with a significance (S) of between 140 and 305. Risk mitigation efforts on the property are best practice, conforming to the recommendations of the Tasmanian Fire Service. The monitoring and response procedures are clearly outlined, with regular reviews. The on-site efforts are supplemented by the extensive training and support provided by the Tasmanian Fire Service. Both mitigation efforts (C) and mitigation managements systems (M) would therefore be rated as 4 under the VCS Tool. Risk (L x S x (1-(C*M)/16) is therefore 0, or low.
Risk of pest and disease attacks	Very low	There are no significant pests in the area. Insect damage has no impact on long-term carbon stocks in Eucalyptus forests,

58 P. Downie, *pers. comm.*, 17/11/2010

		according to the Senior Conservation Scientist with the DPIPWE. Browsers (such as deers and wallabies) may have a minimal effect on regeneration, but preferentially feed in pastures. Populations are controlled by shooting under a game management plan: the annual pest control program involves up to 200 people.
Risk of extreme weather events	Very low	Tasmania is not located within a cyclone area. The main contributing factor to cyclones is an ocean surface temperate above 26.5 degrees[59]. Tasmania is located at a latitude of 40 degrees south from the equator and ocean temperatures do not permit cyclonic activity. Tasmania does experience cold winter conditions including ice and snow. Ice and snow is experienced predominantly within the mountainous, western portion of the island although snow seldom lies for more than a few weeks [60]. There are no records of ice storms such as those experienced within the northern hemisphere. Furthermore, the frequency of cold outbreaks with snow declined over the 40-year period to 1996, the most marked decline being during the 1980s[61]. The frequency of cold occurrences of the lower troposphere as measured by the above parameters also declined to 1990, but then increased again during 1992 to 1996. The decline in cold outbreaks with snow may be associated with this reduction in cold occurrences of the lower troposphere as well as reduced precipitation[62]. A detailed history of flood events from 2000 to 2009 was recorded by the Tasmanian State Emergency Services[63]. During this period, no floods were reported on or near the project area. Owing to the size of Tasmania and the topography, flood events

[59] Atlantic Oceanographic and Meteorological Laboratory: Hurricane Research Division. "Frequently Asked Questions: How do tropical cyclones form?", National Oceanic and Atmospheric Administration. <http://www.aoml.noaa.gov/hrd/tcfaq/A15.html> <accessed 21/02/2011>

[60] Parks and Wildlife Service, Tasmania, <http://www.parks.tas.gov.au/index.aspx?base=3216> [accessed 21/02/2011]

[61] M. C, Jones (2003) Climatology of cold with outbreaks of snow over Tasmania *Australian Meteorological Magazine* **9** Tasmania and Antarctica Region, Bureau of Meteorology, Australia Antarctic Cooperative Research Centre, University of Tasmania, Australia

[62] M. C, Jones (2003) Climatology of cold with outbreaks of snow over Tasmania, *Australian Meteorological Magazine* **9** Tasmania and Antarctica Region, Bureau of Meteorology, Australia Antarctic Cooperative Research Centre, University of Tasmania, Australia

[63] Tasmanian State Emergency Services (2009) Floods and You <www.ses.tas.gov.au/.../Floods%20and%20You%20-%20Final%20Report.pdf> [accessed 21/02/2011]

		within Tasmania are typically short in duration and low in intensity. The documented flooding history below supports this, with almost of the historical references referring to *minor* flooding events. Moreover, flooding typically occurs in floodplains, which are largely cleared of forests for agricultural use. Tasmania enjoys for the most part a "temperate maritime" climate with the sea, never more than 115 km distant, suppressing temperature extremes. The prevailing westerly airstream leads to a West Coast and highlands that are cool, wet and cloudy and an East Coast and lowlands that are milder, drier and sunnier. Annual rainfall varies markedly across the state, averaging less than 600 mm in the Midlands but over 3500 mm in some part of the mountainous west. Therefore, droughts have not plagued Tasmania to the same degree or severity as the mainland states of Australia[64]. Drought in Tasmania is generally not widespread: it is not unknown for one part of the state to be suffering very low rainfall, while in another the rainfall is considerably above normal[65]. Few significant droughts have been recorded in the project area.
Geological risk (e.g. volcanoes, earthquakes, landslides)	Zero	There are no active volcanoes in Tasmania, or indeed on the Australian continent[66]. There was one earthquake of significant size recorded in Tasmania in the late 1800s, which caused some damage to buildings in Launceston. The probability of another such quake is considered possible but unlikely[67]. The main consequence of such a quake for the projects would be landslides. However, the risk of landslides is considerably lower on forested areas because tree roots hold the soil structure in place more effectively. Therefore, the IFM projects reduce the risk to Zero, i.e. the project scenario is only as likely or less

[64] Australian Bureau of meteorology (2010) Services for Agriculture in Tasmania. <http://www.bom.gov.au/lam/agment/agtas.shtml> [accessed 21/02/2011]

[65] Australian Bureau of Statistics (2008) Droughts in Tasmania 1384.6 - Statistics - Tasmania <www.abs.gov.au> <accessed 21/02/2011>

[66] Australian Bureau of Agricultural and Resource Economics (2010) Australian Energy Resource Assessment: Geothermal Energy, Australia. Available from <http://www.abare.gov.au/publications_html/energy/energy_10/ch_7.pdf> [viewed 18/02/2011]

[67] Tasmanian Department of Infrastructure, Energy and Resources: Mineral Resources Tasmania (2010) Earthquakes, Australia. Available from <http://www.mrt.tas.gov.au/portal/page?_pageid=35,869828&_dad=portal&_schema=PORTAL> [viewed 18/02/2011]

	likely to cause a loss of carbon stocks than the baseline scenario. Please see attached sheet for further information on earthquakes and volcanoes.

Sub-step 1b: Determination of the risk factors associated with specific project types

Risk factor	VCS-designated risk rating for IFM projects	Comments
Devastating fire potential	Low	Fire prevention measures in place include fire breaks, back burning, fire monitoring systems and fire fighting equipment kept on site.
High timber value	Medium	For the majority of the project's lifetime, the main opportunity cost for the land is the loss of income from harvesting the native forest. The majority of extracted timber (80-96%) is used for pulp and paper. This is a very low-value product: prices have hovered around $8-10/ton over recent years[68], and are continuing to decline as international markets demand plantation-sourced wood products. Forest carbon prices historically compare favourably: in 2009, the average price in compliance markets was over US$10/ton[69]. As the forests are allowed to recover from years of logging, the opportunity cost of not logging will increase. This is because a growing proportion of the merchantable timber will consist of sawlog rather than pulp or paper. At roughly $35/ton[70], prime sawlog has a much higher value than either alternative wood products or – historically – carbon. However, since the proportion of sawlog will only increase over the project's lifetime and since the landowner is under contract to complete the project, there is little risk of reversal of protection during the project's lifetime.

[68] Private Forests Tasmania (2002) Tasmanian Market Information Update for Farm Forestry: Number 4 < http://www.privateforests.tas.gov.au/files/active/0/marketreportpft4.pdf > p12

[69] Hamilton, K; Chokkalingam, U; Bendana, M (2009) State of the Forest Carbon Market, Ecosystem Marketplace <http://www.ecosystemmarketplace.com/pages/dynamic/resources.library.page.php?page_id=7525&section=our_publications&eod=1> [accessed 16/11/10]

[70] Private Forests Tasmania (2002) Tasmanian Market Information Update for Farm Forestry: Number 4 < http://www.privateforests.tas.gov.au/files/active/0/marketreportpft4.pdf > p12

		After completion of the project, it is probable that most landowners will resume logging of the land. For this reason, this issue has been assigned a risk factor of 'Medium'. However, three factors should be taken into account. Firstly, after twenty-five years without logging, most of the native forests will have changed their condition. A higher proportion of the merchantable timber will be sawlog quality, or approaching that state. Selective logging for sawlog allows landowners to extract a significantly lower fraction of the biomass for the same return. This will allow the landowner to shift his harvesting practices from extracting 70% of the biomass to extracting merely ~20-30% of the biomass with equal financial returns. This will maintain the carbon stocks at a higher level than the present period, so the project will yield a net benefit in emission reductions. Secondly, it is possible that carbon credits will continue to increase in value, particularly those with biodiversity and socioeconomic premiums like Redd Forests' projects. They may therefore be competitive not just with pulp, but also sawlog. Finally, there is a high probability of a policy shift towards the end of the project's lifetime, as social and cultural norms tend towards environmental conservation. Should this occur, this risk rating will be reduced to 'Low' as the forests will be protected regardless of their increasing timber value.
Illegal logging potential	Very low	Illegal logging is *de minimis* in Tasmania. Forest harvesting on private land can only occur with the consent of the landowner, and property boundaries are well-marked and recognised within Tasmania. Secondly, the major markets for forest products are saw millers and three large export woodchip mills. Timber can only be sold in these markets when associated with an approved Forest Practices Plan. This is not a form of certification: however, it prevents illegal logging. FPPs are routinely monitored by Forest Practices Officers, formal reporting on compliance and additional independent monitoring across a representative sample of FPPs. High clearance rates within the FPPS indicates that the main threat to native forests in Tasmania

		is legal rather than illegal logging. Firewood extraction within Tasmania does occur but the impact upon forest carbon stocks is negligible for the following reasons: 1. Large dead hollow-bearing trees and fallen timber are the two timber types most targeted by wood cutters[71]. 2. Firewood collection tends to occur within public roadsides. The RFPA contains 10 metre buffers along public roadsides given that these areas are excluded from forest harvesting through the Tasmanian Forest Practices System. Private access to properties is severely restricted by locked gates and vehicular barriers. In addition, there are firewood collection permits issued for public forests within Tasmania and this reduces the demand for illegally sourced firewood from roadsides. Illegal logging therefore poses no risk to the permanence of the carbon emission reductions.
Unemployment potential	Very low	Only 5.6% of the Tasmanian population are employed in agriculture, forestry and fishing[72]. More specifically, between 2006 and 2010, the number of people employed in harvesting and processing timber (the affected industries) declined from 4528 to 3216 people. Among those forestry workers working with native forests, employment declined from 3459 to 2033. In short, logging of native forests employs only a tiny proportion of the 200 000 strong Tasmanian workforce, and the industry is declining rapidly due to mechanisation, poor demand and a shift towards plantations[73]. By contrast, tourism employs 6.1% of

[71] Resources Planning and Development Commission (2003) State of Environment Report Tasmania <http://soer.justice.tas.gov.au/2003/bio/4/issue/10/ataglance.php> <accessed 15/11/2010>

[72] Australian Bureau of Statistics (2006) Employment by Industry, Australia. Available from <http://www.censusdata.abs.gov.au/ABSNavigation/prenav/ViewData?&action=404&documentproductno=6&documenttype=Details&tabname=Details&areacode=6&issue=2006&producttype=Community%20Profiles&&producttype=Community%20Profiles&javascript=true&textversion=false&navmapdisplayed=true&breadcrumb=PLD&&collection=Census&period=2006&producttype=Community%20Profiles&#Working%20Population%20Profile> viewed 18/02/2011

[73] CRC for Forestry (2010) Trends in Forest Industry Employment and Turnover, Australia. Available from <http://www.crcforestry.com.au/publications/downloads/Schirmer-Tas-forest-industry-WEB.pdf> [viewed 18/02/2011]

	workers (some 13 600 people) and the professional, scientific and technical sector employs 4.5% of the workforce[74]. Both these areas frequently offer higher wages and more scope for skill development. They will be encouraged by the Redd Forests' IFM projects, which enhances the aesthetics of the countryside through forest protection and generate demand for environmental expertise. Declining unemployment will not threaten the permanence of the emission reductions because the project is on private property: the landowner's decision to implement an Improved Forest Management regime using carbon finance will therefore not be negotiable according to changing employment conditions. Moreover, these projects create alternative sources of employment, including fieldwork to assess and monitor forests protected under VCS IFM projects.

There is a very low risk of significant damage to the carbon stocks in the native forest from disturbance such as pests, fire or natural disasters; socio-political conditions such as low unemployment, poorly defined land rights or instability; or from a financial, technical or managerial failure on the part of the project proponents. These are the advantages of avoiding carbon emissions in a developed nation with well-established legal and physical infrastructure, an educated population and absent or well-managed ecological risks.

The main risk to the project does not arise during the project's lifetime. Rather, there is a risk that the forest will be logged after the project is completed, as outlined above under 'high timber value'. This is the only factor to have been assigned a 'medium' risk in the project.

This risk requires only the minimal medium risk buffer of 15% of VCUs.

Firstly, the risk lies outside the project's lifetime: we can be confident that the carbon stocks will be protected for the twenty-five years of the project's duration.

Secondly, over the twenty-five years, the composition of the native forests in this project area will shift away from low-value products (woodchips) towards high quality sawlog products. This is partially because the prolonged period without logging will allow the forest to recover, and partially the proponent has historically adopted logging practices that encourage the growth of sawlog timber. Landowners harvesting for sawlog generally remove a much lower fraction of biomass (20-30%) than those harvesting for woodchips (70-100%): this yields the same return due to the greater value of sawlog, while maximising regrowth of high quality timber. The establishment of the IFM project will therefore improve the carbon stocks in these native forests in the long-term.

Thirdly, the legality and extent of logging after the project is not certain. The project proponents' future capacity to log their native forests may be constrained by policy shifts.

[74] Tourism and Transport Forum (2010) Tourism in Tasmania: Industry Update, Australia. Available from <www.ttf.org.au/DisplayFile.aspx?FileID=776)> [viewed 18/02/2011]

Already there are proposals to require FSC certification of timber from private native forests: if such requirements are imposed and extended during the project's lifetime, the long-term value of the carbon stocks will have been enhanced by the establishment of this project.

Finally, the forest carbon markets are already proving an attractive and competitive alternative to low-value wood products. The downward trend in the price of pulp, paper and woodchip has been evident for a decade, while carbon credits are likely to increase in value with the expansion of the voluntary market and implementation of emissions trading schemes. It is therefore very plausible that the project proponents will seek to continue protecting their forests using forest carbon projects, rather than resume logging.

For these reasons, 15% of VCUs is a more than adequate buffer for the risk of this IFM project.

Appendix 2: Carbon sequestration from forest growth on the project site, as modelled by FullCAM

Table No. 14. Carbon sequestration in the baseline scenario.

	INTERLAKEN		LAGOON OF ISLANDS (HIGH BIOMASS)		LAGOON OF ISLANDS (LOW BIOMASS)	
YEAR	Carbon in aboveground tree components (tC/ha):	Carbon sequestration (tC/ha/year):	Carbon in aboveground tree components (tC/ha):	Carbon sequestration (tC/ha/year):	Carbon in aboveground tree components (tC/ha):	Carbon sequestration (tC/ha/year):
2009	85.63		110.58		50.33	
2010	87.05	1.42	111.56	0.98	51.16	0.83
2011	84.58	0.00	112.49	0.93	51.96	0.80
2012	81.91	0.00	113.39	0.89	52.72	0.76
2013	83.03	1.11	114.24	0.85	53.44	0.72
2014	84.08	1.05	82.97	0.00	54.14	0.70
2015	25.51	0.00	84.41	1.44	54.80	0.66
2016	27.65	2.15	85.82	1.40	55.43	0.64
2017	29.81	2.16	87.19	1.37	56.04	0.61
2018	31.93	2.12	88.51	1.32	56.63	0.59
2019	33.99	2.06	73.18	0.00	57.20	0.56
2020	35.97	1.98	74.74	1.56	57.74	0.54
2021	37.87	1.89	59.46	0.00	58.26	0.52
2022	39.67	1.81	61.27	1.81	58.76	0.50
2023	41.39	1.72	63.01	1.74	59.23	0.48
2024	43.03	1.64	64.69	1.68	59.70	0.47
2025	44.58	1.55	66.28	1.60	60.15	0.45
2026	46.04	1.46	67.81	1.53	60.58	0.43
2027	47.43	1.39	52.20	0.00	44.18	0.00
2028	48.75	1.32	53.96	1.76	45.22	1.03
2029	14.97	0.00	55.64	1.68	37.57	0.00
2030	16.97	2.00	57.25	1.60	38.86	1.28
2031	19.10	2.13	58.78	1.53	31.34	0.00
2032	21.26	2.16	60.23	1.45	32.85	1.51
2033	23.40	2.15	61.62	1.38	34.30	1.45
2034	25.50	2.09	43.98	0.00	35.68	1.38

	LAKE ECHO		MT VERNON		SOUTHERN CENTRAL	
YEAR	Carbon in aboveground tree components (tC/ha):	Carbon sequestration (tC/ha/year):	Carbon in aboveground tree components (tC/ha):	Carbon sequestration (tC/ha/year):	Carbon in aboveground tree components (tC/ha):	Carbon sequestration (tC/ha/year):
2009	92.90		54.77		55.99	
2010	93.94	1.04	49.25	0.00	56.52	0.53
2011	63.52	0.00	49.53	0.28	53.90	0.00
2012	29.98	0.00	20.72	0.00	51.22	0.00
2013	32.60	2.61	21.98	1.26	48.47	0.00
2014	35.17	2.57	23.18	1.20	48.84	0.37
2015	37.66	2.49	24.31	1.14	49.20	0.37

2016	40.06	2.40	25.40	1.08	49.55	0.34
2017	42.37	2.30	26.42	1.03	49.89	0.34
2018	44.56	2.19	27.40	0.97	50.21	0.32
2019	46.65	2.09	28.32	0.92	50.53	0.32
2020	48.62	1.98	29.19	0.88	50.83	0.30
2021	50.51	1.88	30.03	0.83	51.12	0.29
2022	52.29	1.78	30.81	0.79	51.39	0.28
2023	53.98	1.69	31.56	0.75	51.67	0.28
2024	55.58	1.60	32.27	0.71	21.56	0.00
2025	57.10	1.52	32.95	0.68	22.80	1.25
2026	58.55	1.45	33.59	0.64	23.98	1.18
2027	59.92	1.37	34.21	0.62	25.10	1.12
2028	18.33	0.00	34.79	0.58	26.17	1.07
2029	20.91	2.58	35.35	0.56	27.18	1.00
2030	23.56	2.65	35.89	0.54	28.14	0.96
2031	26.20	2.64	36.40	0.51	29.04	0.90
2032	28.79	2.59	15.56	0.00	29.90	0.86
2033	31.31	2.52	16.94	1.38	30.72	0.82
2034	33.72	2.41	18.25	1.31	31.50	0.78

Table No. 15. Carbon sequestration in the project scenario.

	INTERLAKEN		**LAKE ECHO**		**LAGOON OF ISLANDS (HIGH BIOMASS)**	
YEAR	**Carbon in aboveground tree components (tC/ha):**	**Carbon sequestration (tC/ha/year):**	**Carbon in aboveground tree components (tC/ha):**	**Carbon sequestration (tC/ha/year):**	**Carbon in aboveground tree components (tC/ha):**	**Carbon sequestration (tC/ha/year):**
2009	85.63		92.90		110.58	
2010	87.05	1.42	93.94	1.04	111.56	0.98
2011	88.4	1.35	94.94	1.00	112.49	0.93
2012	89.67	1.27	95.89	0.95	113.39	0.89
2013	90.89	1.22	96.81	0.91	114.24	0.85
2014	92.04	1.15	97.68	0.87	115.05	0.82
2015	93.14	1.1	98.51	0.84	115.84	0.78
2016	94.19	1.05	99.32	0.80	116.58	0.74
2017	95.19	1	100.09	0.78	117.30	0.72
2018	96.14	0.95	100.83	0.74	117.99	0.69
2019	97.05	0.91	101.54	0.71	118.65	0.66
2020	97.92	0.87	102.22	0.68	119.28	0.64
2021	98.75	0.83	102.88	0.66	119.90	0.61
2022	99.54	0.79	103.52	0.64	120.49	0.59
2023	100.3	0.76	104.13	0.61	121.05	0.56
2024	101.03	0.73	104.72	0.59	121.60	0.55
2025	101.73	0.7	105.29	0.57	122.13	0.53
2026	102.41	0.68	105.84	0.54	122.64	0.51
2027	103.05	0.64	106.37	0.53	123.13	0.49
2028	103.68	0.63	106.88	0.51	123.61	0.48
2029	104.27	0.59	107.38	0.50	124.07	0.46
2030	104.85	0.58	107.86	0.48	124.51	0.44
2031	105.41	0.56	108.32	0.46	124.94	0.43
2032	105.94	0.53	108.77	0.45	125.35	0.41
2033	106.46	0.52	109.21	0.44	125.76	0.41

2034	106.96	0.5	109.63	0.42	126.15	0.39

	LAGOON OF ISLANDS (LOW BIOMASS)		**MT VERNON**		**SOUTHERN CENTRAL**	
YEAR	**Carbon in aboveground tree components (tC/ha):**	**Carbon sequestration (tC/ha/year):**	**Carbon in aboveground tree components (tC/ha):**	**Carbon sequestration (tC/ha/year):**	**Carbon in aboveground tree components (tC/ha):**	**Carbon sequestration (tC/ha/year):**
2009	50.33		54.77		55.99	
2010	51.16	0.83	55.10	0.33	56.52	0.53
2011	51.96	0.80	55.41	0.31	57.02	0.50
2012	52.72	0.76	55.72	0.31	57.50	0.49
2013	53.44	0.72	56.01	0.29	57.96	0.46
2014	54.14	0.70	56.30	0.29	58.40	0.44
2015	54.80	0.66	56.58	0.28	58.84	0.44
2016	55.43	0.64	56.85	0.27	59.24	0.41
2017	56.04	0.61	57.11	0.26	59.65	0.41
2018	56.63	0.59	57.36	0.25	60.03	0.38
2019	57.20	0.56	57.60	0.24	60.40	0.38
2020	57.74	0.54	57.84	0.24	60.76	0.36
2021	58.26	0.52	58.07	0.23	61.10	0.35
2022	58.76	0.50	58.29	0.22	61.43	0.33
2023	59.23	0.48	58.51	0.22	61.76	0.33
2024	59.70	0.47	58.72	0.21	62.07	0.32
2025	60.15	0.45	58.93	0.21	62.37	0.30
2026	60.58	0.43	59.13	0.20	62.67	0.30
2027	61.00	0.42	59.32	0.19	62.95	0.28
2028	61.40	0.40	59.51	0.19	63.23	0.28
2029	61.79	0.39	59.70	0.19	63.49	0.27
2030	62.17	0.37	59.88	0.18	63.75	0.26
2031	62.53	0.36	60.05	0.17	64.01	0.26
2032	62.88	0.35	60.23	0.18	64.25	0.24
2033	63.22	0.34	60.39	0.16	64.48	0.24
2034	63.56	0.34	60.55	0.16	64.71	0.23

Appendix 3: Uncertainty from sampling error, as modelled by the Winrock Sampling Calculator

REQUIRED ERROR AND CONFIDENCE LEVEL		
e - level of error (%)	15.0%	
Error level (decimal)	0.15	
Z(1-a) - Confidence level	95.0%	
Sample statistic Z(1-a)	1.96	
Total project area size	7625.87	hectares

SIZE AND VARIANCE OF EACH STRATA						
Stratum	Stratum Name	Area (ha)	Mean C/ha (tonnes)	Standard Deviation (tonnes C/ha)	Plot size (ha)	Cost C_h If no cost, put C_h =1
stratum 1	Southern Central	1463	62.26	36.19	0.2025	1
stratum 2	Lagoon of Islands - high biomass	1827.9	120.93	60.64	0.2025	1
stratum 3	Lagoon of Islands - low biomass	2622	60.64	35.77	0.2025	1
stratum 4	Lake Echo	411	111.11	54.59	0.2025	1
stratum 5	Mt Vernon	376.94	64.92	46.53	0.2025	1
stratum 6	Interlaken	925.03	103.29	64.52	0.2025	1

Results - Aboveground Carbon - Number of plots to be used							
		Sourcebook for LULUCF Projects		AR-AM0001, AM0005, AM0006		AR-AM0003, AM0004, AM0007	
Stratum	Stratum Name	Plot Quantity	Rounded Plot Quantity	Plot Quantity	Rounded Plot Quantity	Plot Quantity	Rounded Plot Quantity
Total Sample Size		53.65	**62**	53.73	**62**	53.65	**62**
stratum 1	Southern Central	7.95	**10**	7.96	**10**	7.95	**10**
stratum 2	Lagoon of Islands - high biomass	16.65	**20**	16.67	**20**	16.65	**20**
stratum 3	Lagoon of Islands - low biomass	14.08	**17**	14.11	**17**	14.08	**17**
stratum 4	Lake Echo	3.37	**4**	3.37	**4**	3.37	**4**
stratum 5	Mt Vernon	2.63	**4**	2.64	**4**	2.63	**4**
stratum 6	Interlaken	8.96	**11**	8.98	**11**	8.96	**11**
TOTAL NUMBER OF PLOTS			**66**		**66**		**66**